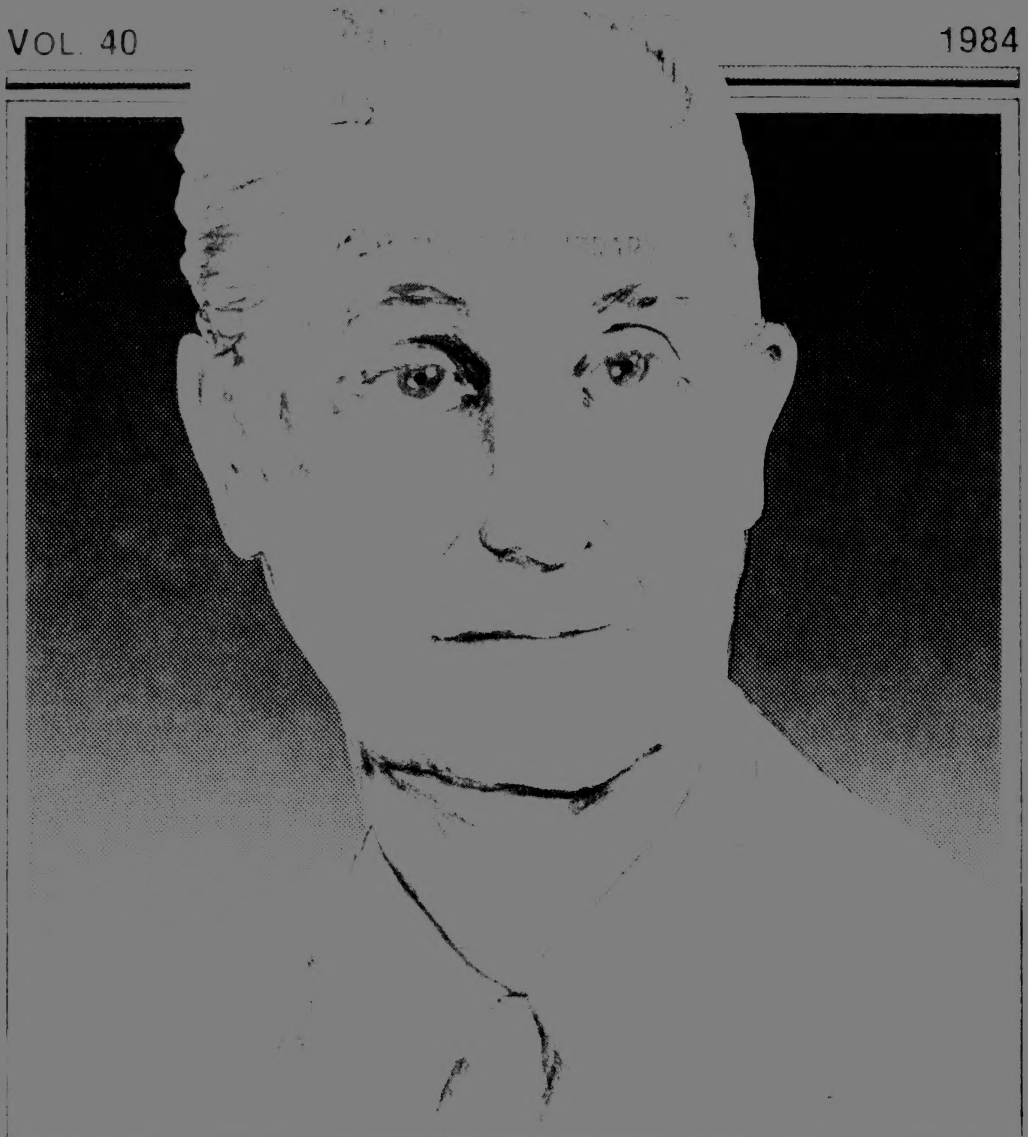
HERBERTIA

1934-1984

VOL. 40 1984



HAMILTON PAUL TRAUB, PHD 1890-1983

HERBERTIA

International Journal of the American Plant Life Society, devoted to the increase and diffusion of knowledge on bulbous plants and petaloid monocot families, especially the Amaryllidaceae.

VOLUME 40
1984

THE AMERICAN PLANT LIFE SOCIETY
Post Office Box 150
La Jolla, California 92038

A non-profit scientific and educational organization incorporated in California in 1943. Dues and donations to the Society are tax-deductible under provisions of Section 501 (c) 3 of the Internal Revenue Code.

Dues for the Society are currently $10 per annum, payable to the Executive Director.

Printed in the United States of America by

Dover Litho Printing Company
1211 North DuPont Highway
Dover, Delaware 19901

Library of Congress Card Number : 51-23475

In This Issue . . .

The submittal of articles has been very good for this issue. Authors have been very kind to this new Editor (and vice versa). The passing of two major Society figures is covered by various biographies and touching memorials. Three Herbert Medal awards are noted, two of them posthumously. The articles on plants cover *Crinum, Clivia, Boophane, Nerine, Hemerocallis, Amaryllis* and *Hippeastrum*. Dr. Howard's popular travel notes also appear in this issue.

Of course, the biggest item of this issue is color. The Directors have authorized its use in order to upgrade the quality of our Journal and also to increase our membership. Covering a group of plants as showy as our amaryllids without color does them no justice. However the cost of color cannot be borne too long if our subscription base doesn't expand.

The return to *Herbertia* as the journal's title was an editorial decision. Hopefully not too many librarians and indexers will be confused by this restoration.

The recognition of the genus *Hippeastrum* is now the editorial policy. This issue has several articles wherein *Amaryllis* is used for South American elements and their hybrids. Rather than ask to have the registrations and manuscripts revised by the several, very senior, authors, it was decided to let them appear as originally drafted. The Editorial Board will begin reviewing manuscripts for publication in the 1985 edition and this editorial policy will be observed. To do otherwise would only serve the amusement of the international botanical community.

Mitchel Beauchamp, Editor

PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

AMARYLLIDACEAE: TRIBE AMARYLLEAE by Traub and Moldenke, 194pp. $8 postpaid.

DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893-1948 by Norton, Stuntz & Ballard. 100pp, $5 postpaid.

THE GENERA OF AMARYLLIDACEAE by Traub, 85pp, $8 postpaid.

LINEAGICS by Traub, 163pp, $8 postpaid.

THE SOUTHERN AFRICAN SPECIES OF CYRTANTHUS — A REVIEW by Reid & Dyer, ca 85pp. $12 postpaid, $14 Non-Canadian Foreign.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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(B) PLANT LIFE, including numbers on various plant subjects, 1945-1948; thereafter, 1949 to date, various plant subjects, **PLANT LIFE,** and the **AMARYLLIS YEAR BOOK** are combined in a single volume entitled, **PLANT LIFE.**

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Sets of 5 consecutive volumes published after 1979, when completed, may be purchased at $40.00 postpaid, per set.

Single volumes, when available, may be purchased at $10.00 each, postpaid.

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Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
Box 150, La Jolla, Calif. 92038

HERBERTIA, Volume 40, 1984

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HAMILTON PAUL TRAUB

IN MEMORIAM

1890-1983

HAMILTON PAUL TRAUB—A BIOGRAPHY

Hamilton Paul Traub was the 13th of 17 children born to Rev. Lorenz Traub and Elisabeth Graf Traub. The ancestral home of the Traub family since 1534 was Heiningen bei Göppingen, Württenberg, Germany. With two brothers and a sister, Rev. Traub immigrated to America in 1862. The move was financed by their wealthy father, Gottlieb Traub, so that his sons would establish the Traub family in America, as well as help sustain the spiritual welfare of German immigrants now there. The immigration was brought about by Prussian militarism which threatened to split Germany. Rev. Traub received his degree from Concordia College in St. Louis. Here he met his future wife. He was married by his brother, Rev. Gottlieb Traub, to Elisabeth Graf in Crete, Illinois on 18 September 1870.

The maternal Graf line immigrated to New Orleans in the 1850s from the Swiss ancestral home at Diessbach, Bern Canton. The mother, Magdalena Luethi Graf, and a younger daughter died of yellow fever. The father moved his surviving family to St. Louis, where he died of a stroke due to over-exertion. The surviving children were adopted by different families and contact between the siblings was lost.

Childhood

The duties of a Lutheran minister required Rev. Traub to move his residence frequently. Based on the birth places of their children, the following towns served as Traub residences: Monticello, Iowa; Yellowhead near Kankakee, Illinois; St. Clair, Michigan; Peoria, Illinois; and Crozier, Iowa. At Crozier, Iowa, near Storm Lake in Buena Vista County, Hamilton Paul Traub was born on 18 June 1890. By the time he was 18, Paul Traub had lived in three other Iowa towns, attending parochial and public schools. While the family was living in Cumberland, Wisconsin, the father died when his youngest son, Paul, was 17 years of age. It was in Cumberland that Paul first attended high school. In 1909 he graduated from North High School in Minneapolis, Minnesota. Not having any particular career in mind, he taught school for three years before pursuing college study. He taught German language and literature, having a good idiomatic basis in that tongue, as well as European history. He also coached baseball and basketball. This portion of his teaching career saw him in Gothenberg, Iowa; Harvey, North Dakota; and Aitkin, Minnesota.

Undergraduate Study

In 1911, Traub entered the University of Minnesota, pursuing undergraduate study, principally in economics. He attended summer school there in 1909. He was at Harvard University as an undergraduate from September 1914 until June 1915, when he left without receiving a degree. It was as an undergraduate that he further developed his interest in literature and the theater. An interesting comment written on the margin of his class notes from this period, which might reflect his attitude was "I would rather be flippant than dull."

Sturm und Drang

After leaving Harvard University he was apparently confused and restless, a period in his life involving his undergraduate college and military years, which he called "Sturm und Drang." Perhaps this time of his life is related to a delayed adolescence. During the latter part of this period, he had a girlfriend, Myrtle Longbella. He cared for her greatly and wanted to marry her, but she considered him only as a good friend. This

Figure 1. Hamilton Paul Traub and Miss Myrtle Longbella at the Fergus Falls County Fair, Minnesota, 22 September 1920.

rejection appears to have had a profound influence, resulting in the lack of any other romantic relationships for the rest of his life. He taught in Minnesota at Buyck and Deer River, until Spring 1917, then traveled about the eastern seaboard of the United States, visiting such towns as Washington, D.C., and New York City, going as far south as Virginia and North Carolina.

Military

The nation's involvement in World War I precipitated in Traub a desire to participate in this effort against oppression, even though he had relatives living in Germany. He was 27 years of age, and had difficulty being accepted into the Army. His attempts to enter officers' training camp were rejected. Ultimately in 1917 he enlisted in New York City as a medical assistant in the Medical Reserve Corps. His army career saw him at Preston, Virginia, and Fort Porter, Buffalo, New York. He was transported to Scotland and England, ultimately serving at the U.S. Headquarters Hospital Center, Unit F, in Savenay, Loire Inferieure, France from 7 September 1918 to 18 February 1919. He did not like his assignment there. After attempting to have his family bring about influence to get him a new duty station and being admonished to do as he was told, he resigned himself to the assigned duty. He was promoted on 4 Nov. 1918 to Sergeant 1st Class. Although he never saw combat, he learned while in France that an uncle had been killed at the first battle in Belgium in 1914 while fighting on the German side.

His return from the war, aboard the USS Maui, is well chronicled in his diary of the voyage: "Friday, Feb. 28, 1919 Land was visible at 9:30 A.M.—At noon to-day we passed the light-ship "Ambrose". Several other smaller transports and the "Aquitania" also sailed into the harbor. The U.S. battleship "New Mexico" was also in the harbor. We received a hearty welcome from all the smaller craft that passed at 2:30 P.M. We passed "Sandy Hook", and the Statue of Liberty came into view at 4 P.M. This was a dramatic moment for most of us—We were deeply moved—This is our land, our native land!"

Sergeant Traub was honorably discharged on 12 March 1919.

Prior to his enlistment, Traub was preparing a summary treatment of American literature. This effort reached its full and only development in 1919 with the publication of ***The American Literary Yearbook***. The issue was produced while he was in France. His brother and sister-in-law, John and Clara Traub, in Minnesota, assisted in the production of this issue. No other volumes followed, although requests from librarians for subse-

Figure 2. Sergeant Paul Traub, ca. 1918.

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THE AMERICAN LITERARY YEARBOOK

BIOGRAPHICAL AND BIBLIOGRAPHICAL DICTIONARY OF LIVING NORTH AMERICAN AUTHORS; A RECORD OF CONTEMPORARY LITERARY ACTIVITY; AN AUTHORS' MANUAL AND STUDENTS' TEXT BOOK.

VOL. 1
1919

EDITED BY
HAMILTON TRAUB

FOUNDED, 1918
REVISED AND REISSUED ANNUALLY

PAUL TRAUB, Publisher
HENNING, MINNESOTA

Figure 3. Sgt. Traub's first and only issue of the American Literary Yearbook.

quent issues continued to be received for several years. The literary yearbook is a good summary document for its time, but had little, if any, actual literary content.

The American Epic

The end of World War I gave Traub time to travel in France. At Paris and Marseille, he attended several operas and was impressed with the involvement, at that time, of the populace with classical opera in their own language. Also, he noted the vast difference in outlook of Americans, as contrasted with that of Europeans. He believed that this difference was due to the American experiences since colonial days. He vowed to start a literary project, secretly at first, which consumed a tremendous amount of his time throughout the remainder of his life. He saw opera as an educational tool and, although not fully developed, he produced an outline of an opera on the origin of life, and phylogeny of flowering plants.

Figure 4. Hamilton Paul Traub, Ph.D. 1927.

Graduate Study

After returning from the war, he resided at Henning in west central Minnesota, where his brother, John, had a real estate business. From 1919 to 1922 he was involved with real estate and even was a reporter for a regional newspaper. He decided in 1922 that he wanted to do biological research. He returned to the University of Minnesota in 1922 for a semester to complete his B.A. requirements and received his degree on 14 June 1922. After teaching German in Webster Grove, South Dakota in 1922 and winter of 1923, he again entered the University of Minnesota at St. Paul. His Master of Science Thesis was on "The History of American Horticulture, 1800 to 1850", completed in June 1924. He continued his studies at Minnesota, and received the PhD in Plant Physiology in 1927. His thesis was concerned with the regional and seasonal distribution of moisture, carbohydrates, nitrogen and ash in 2-3 year old portions of apple twigs. As a graduate student he had classes with such noted scientists as F.E. Clements and C.O. Rosenthal. He was stimulated particularly by Clements.

The National Horticultural Society

Traub's involvement with horticulture and agriculture during his graduate study, as well as his hobby interests in growing plants since a youth of 10, developed into his organization of the National Horticultural Society. He was disturbed that the existence of many specialty plant groups did not allow a unified lobby for horticulture in America, as the Royal Horticultural Society did in England. Considerable correspondence in 1921 and 1922 with Madison Cooper, editor of *The Flower Grower* magazine moved Traub to incorporate the National Horticultural Society on 1 July 1922. He visualized a society with regional affiliates, bylaws, regional vice-presidents, and a publication called the *National Horticultural Magazine.* Traub was the editor and secretary of the Society and editorial offices were at Henning, Minnesota, while permanent offices were listed as located in Washington, D.C. Traub envisioned a society similar to the National Geographic Society. The stated purpose of the NHS was "the increase and diffusion of horticultural knowledge and the stimulation of universal interest in horticulture." Members were referred to as Fellows and on the publication's masthead, listed officers had curious abbreviations, much like the British, after their names. C.F.N.H.S. meant a Charter Fellow and F.N.H.S. was a subsequent subscriber. This inference of peerage was perhaps one of the earliest anti-

VOLUME II—No. 3 SUMMER, 1923

The NATIONAL HORTICULTURAL MAGAZINE

FIRST ANNIVERSARY NUMBER

CONTENTS

Issued Quarterly and Owned Exclusively by
THE NATIONAL HORTICULTURAL SOCIETY OF AMERICA.
Permanent Headquarters to be Established at Washington, D. C.
Office of the Secretary, Henning, Minnesota

25 CENTS A COPY

Figure 5. An Anniversary issue of Traub's National Horticultural Magazine.

European manifestations of Traub's activities. Honorary fellows of the Society included L.H. Bailey, Luther Burbank, George W. Park, Charles S. Sargent and E.H. Wilson.

The formation of the competing American Horticultural Society created a situation which proved to be fatal for Traub's society. Correspondence between NHS officers and AHS founders was often vitriolic. In a letter discussing strategies, including a merger, Traub mentioned to NHS President, Fannie Mahood Heath, that " . . .the later society wants to dictate to the prior society . . . who ever heard of such audacity!" In a letter to Madison Cooper, President Heath summed up the controversy " . . .it is a shameful and useless waste of energy for two societies working for the same thing to spend much money, years of time and an endless amount of good effort in trying to outdo each other when all of it might have been saved and their useless waste had gone at once into the upbuilding of one grand society." It appears that the NHS ceased to exist about 1929.

Agricultural Research

Traub began his professional botanical career when he moved to Bryan, Texas, and from 1928 to 1930 served as Chief, Division of Horticulture at the Texas Agricultural Experiment Station at College Station. From 1930 to 1931 he was at Austin, Texas. His work in Texas was on pecans and subtropical fruits and his annual salary was $5000, considered a fabulous sum in its day.

In 1932, he moved to Gainesville, Florida to serve as Horticulturist in Charge of Subtropical Fruits. Due to a favorable impression he made on then USDA Plant Bureau Chief, Dr. E.C. Auchter, Traub was offered a position in 1933 at Orlando, Florida. There he was involved with further research on subtropical fruits including citrus, avocado, pineapple and sapote. While involved with research at Orlando, Traub traveled to Central America to discuss issues with Wilson Popenoe in Honduras and also to visit Guatamala. Once, during his vacation time, he visited Cuba, where his inability to speak Spanish hindered his discussions somewhat. A short assignment intended to improve mango culture in Puerto Rico seemed to him to be a waste of time, attributing the failure to the inability of the Puerto Ricans to follow his advice since they stayed with sugar cane as a cash crop. He saw Puerto Rico as the poorhouse of the United States. In September 1937 and December 1939 he made official tours of subtropical fruit production areas in California, Texas and Arizona. Included on the later tour was a visit to the Date Research Station at Indio, California and a visit with fellow physiologist Dr. Fritz Went at Cal Tech in Pasadena,

California.

At Orlando he built Mira Flores, the first of four luxurious residences he occupied during his life. The two-story structure located on Albertson Drive, was planned by Philadelphia architect, Llewellyn Price. Here Traub started his collection of Amaryllidaceae, expanding upon his childhood interest in plants.

Figure 6. H.P. Traub's residence, Mira Flores, at Orlando, Florida.

The American Amaryllis Society

The interest in Amaryllis was sufficient in Florida to induce Traub once again to initiate a plant society, this time less grand in scope but with adequate local as well as good Southern California support. In company with commercial growers and hobbyists, Traub formed the American Amaryllis Society on 21 May 1933. With Traub as editor, the Society published its first yearbook in 1934. A constitution and by-laws were finally adopted in December 1934. The development of the Society is well chronicled in *Herbertia,* the society's annual publication.

International Horticultural Congress

The established botanical interests, both horticultural and agricultural, shown by Traub, his high government position and his ability with German, brought about his appointment by the State Department as one of several U.S. delegates to the XII International Horticultural Congress in Berlin from 12 to 17 August 1938. He served on the tropical and subtropical fruit growing section but apparently did not give a paper at the meetings. He sailed from New York City aboard the Swedish-American Lines' Gripsholm on 23 July 1938, arriving at Norheimsund, Norway on 1 August. He returned aboard Cunard White Star Lines' Queen Mary, leaving Southampton on 13 October 1938. While in Europe he toured plant physiology labs and attended operas. His itinerary was worked out by Cook's Tours and included France, Switzerland, Italy, Hungary, Austria, Czechoslovakia, Norway, Sweden, Denmark, Holland, England and Scotland. His daily trip notes indicate that he was delayed in eastern Europe by the Nazi regime, almost losing his luggage; however, revealing his diplomatic passport, he convinced Czech authorities not to delay him further. While in Germany he was able to visit his relatives and locate important

Figure 7. Dr. Traub during his 1938 European tour.

genealogical records, going back as far as 1532. Later these records were destroyed by the allied bombings of Germany.

In Stuttgart he attended an address by Rudolf Hess, directed at "Auslands Deutsch," encouraging those in attendance to go back to their foreign homes and start the revolution there. He walked out since he could not stomach such a charge.

Amaryllis versus Hippeastrum

The publication in 1939 of a paper by Theodore Uphoff, caused Traub to review the proper application of the name Amaryllis. The several articles he generated on this topic are well known, yet it must be pointed out that the determination of his friends and foes was also predicated on their position on this single issue. As editor for the American Amaryllis Society he rejected proposals other than his own on the Amaryllis issue. The creation of the separate Amaryllis Research Institute in the 1970s was largely in response to his editorial policy. While at Kew in 1938, Traub discussed the issue with botanists there. His and Uphoff's points were dismissed without, as Traub believed, suitable justification. He considered the continued use of the genus *Amaryllis* for South African plants to be incorrect. He considered this to be a botanical travesty, which resulted in the lovely, New World plant losing its euphonic name, in exchange for a most vulgar sounding genus. From then on, Traub had no truck with leading British botanists, except when necessary. Even the American botanist, Harold Moore, fell into disfavor when *Hortus III* appeared with recognition of *Hippeastrum*. In this matter Traub had a very strong opinion.

The War Years

In the late 1930s a major dispute developed between Traub and E.C. Auchter, Chief of the Bureau of Plant Industry, over civil service procedures, and alleged inappropriate treatment of a veteran, i.e. Traub, and subordination of Traub's position at Orlando. In a draft note Traub alleged that Auchter had planned to offer him the position of Director of the Tingo Maria Experiment Station in Peru, a position Traub did not care to assume because of his age (52) and maladaptation to the tropics by the Minnesota-reared researcher. On 1 December 1940, after having moved to Bureau of Plant Industry headquarters at Beltsville, Maryland, Traub sold his Mira Flores estate.

The Guayule Project

Perhaps as an out of the civil service controversy, Traub accepted an assignment to the Emergency Guayule Rubber Project as his part in the war effort. The purpose of the project was to produce rubber from a native Mexican-Texan composite, *Parthenium argentatum*. The project was located at Salinas, California. Traub served as Chief Physiologist for the project. He served at the U.S. Horticultural Station, Cheyenne, Wyoming from August 1942 until his move to Salinas in 1942 or 1943. He considered the project to be a political football and a waste of time due to the uncooperative nature of the researchers who went off on their own research tangents. Not one tire was said to have been produced by the project: however a souvenir of the project, a solid rubber ball labeled as "U.S. GROWN GUAYULE" was made. Apparently from a garden magazine of the day, Traub had clipped the following:

Guayule

Guayule is truly no bush to enthrall.
Its growth is unruly, its blossoms are small,
It doesn't belong in a garden at all.

Unlovely, unchummy and classed with the briers,
It also is gummy, which no one admires.
But oh! what a plant when a country needs tires!

Selected.

The American Plant Life Society

The American Amaryllis Society was incorporated under California law on 4 September 1943 by Justice E.G. Duckworth, Pres., and Wyndham Hayward, Secy., Florida officers of the Society since its inception. What precipitated this action after 10 years of existence is not clear. The first meeting of the Incorporated Society was held 14 October 1943, in Salinas. The next year, on 24 November, 1944, in Salinas the name of the Society was changed by the directors to the American Plant Life Society and the additional publication, Plant Life, was established to address plant life in general. The directors present, i.e., F.T. Addicott, O.F. Curtis and H.P. Traub, gave no details of the basis for their action.

Figure 8. Guayule Research Project, Salinas, California.

Figure 9. A souvenir rubber ball of "U.S. Grown Guayule", 2" in diameter.

Colchicine Polyploids

With his reassignment to Beltsville in 1945, at the termination of the Guayule Project, Traub became involved with research on stain and preservation techniques for microscope specimens. He also pursued officially the use of the poisonous plant alkaloid, colchicine and its analogs, to induce polyploids in sterile *Hemerocallis* hybrids. He developed many lovely hybrids and assigned the royalties to the Society. Poor marketing, however, did not allow any substantial return.

Retirement

Dr. Traub retired from government service in October 1952, at 62 years of age. He moved to Arcadia, California where he had previously purchased property, and had a home remodeled and a research lab built to his specifications on Rodeo Road. The smog, even in those early days of development in southern California, was too much for him, and he moved

Figure 10. H.P. Traub's residence on Rodeo Road, Arcadia, California, showing greenhouse.

in 1954 to his Camino de la Costa residence in La Jolla, California, a home previously owned by Ginger Rogers of movie fame. The residence overlooked the Pacific Ocean from its sea cliff location. The traffic noise from the adjacent restaurant forced his move again in 1969 to the Prestwick Court address, a new "tract" area further from the sea breezes but still with an ocean view. The proximity of the home to the new University of California, San Diego campus gave him some hope of possibly developing a horticultural center.

Figure 11. Dr. Traub's first La Jolla, California residence, Camino de la Costa, previously owned by actress Ginger Rogers.

Figure 12. Dr. Traub's last residence at 2678 Prestwick Court, La Jolla, overlooking Scripp's Institution of Oceanography and the Pacific Ocean.

Figure 13. H.P. Traub, circa 1952.

The Call of Destiny

The culmination of his secret work on an epic American opera was reached in 1981 with the publication of the text to his opera, *The Call of Destiny*. The book was published by a local vanity press after an earlier attempt to have a bankrupt Pittsburgh publisher produce the volume lost Traub about $5000.

Vale

After sending the printer the checked galley proofs of the *Plant Life* issue celebrating the 50th anniversary of the Society, Hamilton Paul Traub died at 2 am. 14 July 1983 in his sleep of congestive heart failure at his residence in La Jolla. Southern California members of the Society held an Amaryllidaceae Symposium honoring Dr. Traub and the 50th Anniversary of the Society on 12 November 1983 at the Los Angeles State and County Arboretum. Traub's estate of nearly one-half million dollars, accumulated largely by his wise real estate ventures in acquiring and disposing of his residences, was willed to his Alma Mater, the University of Minnesota, with the stipulation that his epic American opera be performed, and a journal covering his ideas on biosystematics, called *Lineagics,* be printed annually. He was a member of the Society of American Physiologists, American Association for the Advancement of Science (since 1928), American Society of Horticultural Science, and Alpha Zeta.

Philosophy

Traub went by various renditions of his name throughout his life. Paul Traub was the name he preferred in his youth. Hamilton Traub is the name he signed during his professional career and retirement. Dr. Traub was the name by which he was called during his retirement age by all those junior to him. Traub was a very proud man. He stated that no one ever told him what to do. Early accounts of his childhood relate that he was a precocious child and, being the youngest surviving child in the family, received instruction from his many siblings and parents. German was spoken in the home but he was proud that he also spoke English without an accent. He was very knowledgeable of his German heritage and maintained contact with relatives in Germany during World War II.

Although raised in a Lutheran household, Traub became a Unitarian by the age of 19. His outlook on life was to treat persons fairly; to respect the intrinsic values of each human being unless there was some indication to the contrary. He saw his knowledge of history, literature and science as a gift which had to be repaid by service to mankind. His investigations on the evolution of life reached beyond earth. He was keenly interested in exobiology. When asked, on the day before his death, what he believed his major contribution was, he said, "Being grateful for the life I've lead, I've tried to compensate by doing things useful to the country."

RMB

THE PUBLISHED WRITINGS OF HAMILTON PAUL TRAUB, PhD, UNIV. MINN. 1927

"The essence of science is organized, verifiable knowledge."

HPT. 1927. The regional and seasonal distribution of moisture and food in 2-3 year apple twigs. *Proc. Amer. Soc. Hort. Sci.* 1926. 23:127-131.

HPT. 1927. The regional and seasonal distribution of moisture, carbohydrates, nitrogen and ash in 2-3 year portions of apple twigs. *Minn. Agr. Expt. Sta. Tech. Bull.* 53.

HPT. 1927. Dr. Russow on the disappearance and reappearance of starch in the bark of woody plants. Translated from German. *Minn. Hort.* 55:241-242.

HPT. 1927. Preliminary report on the effect of height of water-table on the development of vegetable crops on peat land. *Proc. Amer. Soc. Hort. Sci.* 23:414.

HPT. 1927. Preliminary report on summer frost prevention on peat lands-vegetable crops. *Proc. Amer. Soc. Hort. Sci.* 23:414.

HPT. 1927. The European background of American horticulture. *Nat. Hort. Mag.* 6:88-91, 104-112. July-Aug.

HPT. 1928. Economic factors in the development of American horticulture, 1800-1850. *Nat. Hort. Mag.* 7:12-19.

HPT & C. E. Steinbauer. 1928. The effect of height of ground-water table on the development of truck crops on peat land. *Proc. Amer. Soc. Hort. Sci.* 1927. 24:49-55.

HPT & C. E. Steinbauer. 1928. Summer frost prevention on northern peat lands by raising the ground-water table. *Proc. Amer. Soc. Hort. Sci.* 1927. 24:54-60.

HPT. 1928-9. The development of American horticultural literature, chiefly between 1800 and 1850. *Nat. Hort. Mag.* 7:97-103, 1928; 8:109-115. 1929.

HPT, C. J. Thor, J. J. Willaman & Robert Oliver. 1929. Storage of Truck Crops: The Girasole, *Helianthus tuberosus. Plant Physio.* 4:123-134.

HPT & G. S. Fraps. 1929. Ripening and composition of the Texas mangolia fig. *Proc. Amer. Soc. Hort. Sci.* 25:306-310.

HPT, C. J. Thor, Lawrence Zelany & J. J. Willaman. 1929. Chemical composition of Girasole and Chicory grown in Minnesota. *Jour. Ag. Res.* 39:551-555.

HPT., C. J. Thor, & Lawrence Zeleny, 1929. Chemical composition of truck crops. I. New Zealand spinach, *Tetragona expansa. Minn. Hort.* 57:172-173.

HPT. 1929. Horticultural periodicals, 1800-1850. *Nat. Hort. Mag.* 8:109-115.

HPT, G. S. Fraps & W. H. Friend. 1930. Quality of Texas Lower Rio Grande Valley grapefruit. *Proc. Amer. Soc. Hort. Sci.* 1929. 26:286-296.

HPT, W. S. Hotchkiss & P. R. Johnson. 1930. Tentative classification of types of "Tomato Pockets." *Plant Physio.* 5:235-240.

HPT. 1930. Tendencies in the development of American horticultural associations, 1800-1850. *Nat. Hort. Mag.* 9:18-26; 134-140. 1930.

HPT. 1930. Reports of Chief, Division of Horticulture: Sept. 1, 1927 to Aug. 31, 1928. In *Forty-first Ann. Rept.* 1928. Tex. Agr. Exp. Sta. 1929. pp. 19-27; Sept. 1, 1928 to Aug. 31, 1929. In *Forty-second Ann. Rept.* 1929. Tex. Agr. Exp. Sta. 1930. pp. 15-29.

HPT & W. H. Friend. 1930. Citrus production in the Lower Rio Grande Valley of Texas. *Tex. Agr. Exp. Sta. Bull.* No. 419. Dec, 1930.

HPT & R. H. Stansel. 1931. The lateral root spread of the fig tree. *Am. Soc. Hort. Sci.,* 1930 27:109-113.

HPT. 1931. USDA, BPI Research Program for the Western Pecan Region, *Texas. Pecan Growers' Assoc. Proc.* 11:18-23.

HPT & Joseph Hamilton, 1931. The Effect of various degrees of cutting back prior to top-working on the subsequent development of large Pecan Trees. Thirtieth Annual Convention, *National Pecan Association.* 30:116-119.

HPT, Leonard W. Gaddum, A. F. Camp & A. L. Stahl. 1932. Relation of anatomy and method of extraction to quality of Satsuma Orange juice. *Science* 76(1970):298-299. 30 Sept. 1932.

HPT. 1932. Pecan culture. *Bienn. Rpt. Kansas St. Hort Soc.* Vol. 41 and in *Proc. Missouri St. Hort. Soc.,* Dec. 1, 1930 to Nov. 30, 1923, Columbia, Mo., pp. 133-140.

Camp, A. F., HPT, L. W. Gaddum & A. L. Stahl. 1932. Type, variety, maturity and physiological anatomy of Citrus fruits as affecting quality of prepared juices. *Florida Ag. Exp. Sta. Bull.* 243.

HPT, Leonard W. Gaddum, A. F. Camp & Arthur L. Stahl. 1933. Physiological anatomy, type, variety and maturity of Citrus fruits as affecting quality of prepared juices. *Plant Physio.* 8:35-80.

HPT. 1933. Satsuma Orange maturity and quality. *Proc. Amer. Soc. Hort. Sci.* 29:89.

HPT & L. D. Romberg. 1933. Methods of controlling pollination in the Pecan. *Journ. Agrl. Res.* 47(5):287-296.

HPT & E. C. Auchter. 1933. Sprouting and grafting fractional parts of Avocado embryos with attached cotyledonous material. *Science* 78(2026):389-390. Oct. 27, 1933.

HPT. 1933. Propagation of hybrid Amaryllis (Hippeastrum) by cuttage. *Science* 78(2032): 532. Dec. 8, 1933.

HPT. 1933 to 1983. With the founding of the annual publication of the American Amaryllis Society, later the American Plant Life Society, Traub, as editor, published hundreds of articles on Amaryllidaceae and other plant families in the annual, called at one time or another as *Herbertia, Amaryllis Yearbook, or Plant Life*. These popular and scientific articles are not cited here due to their volume.

HPT. 1934. Satsuma Orange maturity and quality. *Die Gartenbauwissenschaft* 8(3):385-393.

HPT & H. J. Muller. 1934. X-Ray dosage in relation to germination of Pecan nuts. *Bot. Gaz.* 95(4):702-706.

HPT & E. C. Auchter. 1934. Propagation experiments with Avocado, Mango and Papaya. *Proc. Amer. Soc. Hort. Sci.* 30:382-386.

HPT & E. C. Auchter. 1934. Avocado fractional embryo graftage. *Fl. St. Hort. Soc.*, 129-130.

HPT. 1935. The William Herbert Centennial. *Science* 81(2107):486-487.

HPT. 1935. Artificial control of nucellar embryony in Citrus. *Science* 82(2137):569-570. Dec. 13, 1935.

HPT. & T. Ralph Robinson. 1936. Maturity and quality in acid Citrus fruits. *Proc. Florida State Hort. Soc.* 1935, 173-180.

HPT, T. Ralph Robinson & H. E. Stevens. 1936. Latex test for maturity of Papaya fruits. *Science* 83(2146):185-186. Feb. 14, 1936.

HPT. 1936. Propagation of the Hemerocallis. *Horticulture* 14:478.

HPT & L. C. Marshall. 1937. Rooting of Papaya cuttings. *Proc. Amer. Soc. Hort. Sci.* 34:291-294.

HPT, C. T. O'Rork, Jr. 1937. Papaya pollen germination and storage. *Proc. Amer. Soc. Hort. Sci.*, 1936. 34:18.

HPT & T. Ralph Robinson. 1937. Improvement of subtropical fruit crops: Citrus, in *Yearbook of Agriculture*, 1937, 749-826.

HPT & T. Ralph Robinson. 1937. Improvement of subtropical fruits other than Citrus. *Yearbook Separate* No. 1589, 1-77.

HPT. 1938. Growth substances with particular reference to subtropical fruit plants. *Proc. Amer. Soc. Hort. Sci.* 1937, 35:438-442.

HPT, C. H. Russell, C. T. O'Rork, Jr., J. M. Tubbs & R. E. Caldwell. 1939. The sulphuric acid oil digestion method for Avocados. *Proc. Amer. Soc. Hort. Sci.* 1938. 36:429-431.

HPT, & C. T. O'Rork, Jr. 1939. Course of pollen tube growth in *Carica papaya* and *Cucurbita* spp. *Nature,* 143:562.

HPT. 1939. Polyembryony in *Myrciaria cauliflora. Bot. Gaz.* 101(1):233-234.

HPT, William C. Cooper & Philip C. Reece. 1939. Inducing flowering in the Pineapple, *Ananas sativus. Proc. Amer. Soc. Hort. Sci.* 37:521-525.

HPT, & T. R. Robinson. 1940. Effect of various degrees of heading back on subsequent growth of Avocado trees. 1939. *Proc. Fla. State Hort. Soc.* 52:43-48.

HPT. 1941. Effect of sulfanilamide and other sulfa compounds on nucellar conditions in plants. *Jour. Heredity* 32(5):157-159.

HPT, Carl S. Pomeroy, T. Ralph Robinson & W. W. Aldrich. 1941. Avocado production in the United States. *USDA Circular* No. 620. 28pp., Sep. 1941.

Magness, J. R. & HPT. 1941. Climatic adaptation of fruit and nut crops, in *Climate and Man— Yearbook of Agriculture, 1941* pp. 401-420.

HPT, T. Ralph Robinson & H. E. Stevens. 1942. Papaya production in the United States. *USDA Circular* No. 633. 36pp., April 1942.

McRary, Willard L. & HPT. 1944. Fructosan, a reverse carbohydrate in Guayule, *Parthenium argentatum* Gray. *Science* 99(2578):435-436.

HPT. 1946. Rapid photometric methods for determining rubber and resins in Guayule tissue and rubber in crude-rubber products. *USDA Tech. Bull.* 920.

HPT. 1946. Concerning the function of rubber hydrocarbon (Caoutchouc) in the Guayule plant, *Parthenium argentatum* Gray. *Plant Physio.* 21:425-444.

HPT & M.C. Slattery. 1947. Levulins and Inulin in Guayule, *Parthenium argentatum* Gray. *Plant Physio.* 22:77-78.

HPT, E.L. Green & M.C. Slattery. 1947. The beta-D-furanofructosidase activities of the invertases from top and bottom yeast on Levulins. *Science* 106:11-12. 4 July 1947.

HPT, M.C. Slattery & E.D. Walter. 1946. Fructose and other Monosaccharides in Guayule. *Proc. Amer. Soc. Hort. Sci.* 48:358-360.

HPT & M.C. Slattery. 1946. Analysis of Levulins, Inulin and Monosaccharides in Guayule. *Bot. Gaz.* 108:295-299.

HPT, M.C. Slattery & W.L. McRary. 1946. The effect of moisture stress on nursery-grown guayule with reference to changes in reserve carbohydrates. *Amer. Jour. Bot.* 33:699-706.

HPT. 1946. Method for separating root tissue from root-gravel mixtures. *Proc. Amer. Soc. Hort. Sci.* 48:347-350.

HPT. 1949. Colchicine poisoning in relation to *Hemerocallis* and some other plants. *Science* 110(2869):686-687. 23 Dec. 1949.

HPT & Harold N. Moldenke. 1949. *Amaryllidaceae, Tribe Amarylleae.* American Plant Life Society, Stanford, Calif. 194pp.

HPT. 1950. Non-moisture-proof cellophane and cellulose acetate film for preserving herbarium specimans. *Phytologia* 3:297-298.

HPT. 1951. Further notes on drying plant specimens between sheets of moisture-permeable plastic films. *Phytologia* 3:473-475.

HPT. 1952. Biosystematic experiments involving *Zephyranthes, Habranthus* and *Amaryllis. Taxon* 1(8):121-123.

HPT. 1953. Rapid chromosome methods for the taxonomist. *Taxon* 2(2):28-29.

HPT. 1953. Arabinic acid, a new non-precipitating ingredient in combined staining and mounting media. *Rev. Euclides* 13:103-114; 149-159. Marzo. 1953.

HPT. 1953. Pure arabinates as the chief non-volatile ingredients in combined staining and mounting media. *Rev. Euclides* 13:289-298.

HPT. 1953. Acenapthene in 0.5% ethanol-water solution as a chromosome shortener. *Rev. Euclides* 13:445-446.

HPT. 1954. Typification of *Amaryllis belladonna. Taxon* 3:102-111.

HPT. 1954. Measured application of heat in relation to combined staining and mounting media. *Rev. Euclides* 14:61-63.

HPT. 1954. Triploid daylilies. *Rev. Euclides* 14:221. Mayo, 1954.

HPT, & Ira S. Nelson. 1956. Amaryllis Evansiae, sp. nov. *Baileya* 4(2):84-88.

HPT. 1957. Statistical enumeration of the genera of Amaryllidaceae. In João Angely (ed.) *Catálogo e Estatistica dos Gêneros Botânicos Fanerogâmicos.* Vol. I.

HPT. 1958. *The Amaryllis Manual.* The Macmillan Co., N.Y. 338pp.

HPT. 1958. *Zephyranthes tubispatha, Z. puertoricensis, Z. insularum, Z. nervosa, Z. commersoniana,* and *Habrathus robustus. Taxon* 7(4):109-113.

HPT. 1959. "*Leopoldia* Herb. 1821" Invalidly published. *Taxon* 8(2):67-70.

HPT. 1963. *The Genera of Amaryllidaceae.* American Plant Life Society, La Jolla, Calif. 85 pp.

HPT. 1964. *Lineagics.* American Plant Life Society, La Jolla, Calif. 163 pp.

HPT. 1970. *An introduction to Herbert's "Amaryllidaceae, etc." 1837, and related works.* Verlag von Cramer, West Germany. 93pp.

HPT. 1974. *Liliales.* Encylcopaedia Brittanica, 15th edition, Macropaedia, Vol. 10:971-976.

HPT. 1975. Class *Liliida* of the Superclass *Monocotyidra. Taxon* 24(4):453-460. Aug., 1975.

HPT. 1980. *The Call of Destiny, the Epic of the American Republic.* Golden Hills Books, San Diego, Calif. 614pp.

HPT. 1983. The lectotypification of *Amaryllis belladonna* L. (1753). *Taxon* 32(2):253-267. May, 1983.

* Reprints of many of these publications are available through the Society.

THE DR. HAMILTON P. TRAUB I KNEW

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With the death of Dr. Hamilton P. Traub on July 14, 1983, at La Jolla, San Diego County, California, the plant world suffered the loss of a true and faithful friend. Dr. Traub was a man of great worth; a man of original ideas; a man with a definite mission in life; a man completely capable of standing on his own as a lone worker, if necessary, in the field of his beloved Amaryllidaceae.

Dr. Traub was one of the founders of the American Plant Life Society in 1933 and for 49 years unselfishly devoted his life to the publication of *Herbertia* (1934-1948) and *Plant Life* (1945-1983). These publications have provided a wealth of information to those interested in the plant world.

In addition, during these years, he also created finer, more beautiful, flowers and published numerous research articles and books. However, his contributions cannot be measured by these achievements alone. Through the Society and its publications, he fostered a better understanding of the plant world, especially the family *Amaryllidaceae,* and delineated many goals yet to be achieved.

Dr. Traub loved his plants and his chosen field with a passion. Nothing gave him more pleasure than sharing his botanical treasures and knowledge with his friends. In this sharing, he radiated an enthusiasm that inspired and encouraged many to participate in creative endeavors of their own.

Hamilton Paul Traub at age 92 at his La Jolla residence. Photo by Herbert Kelly, Jr.

I was blessed with the good fortune to have known him during these last two years. He was a true scientist in his approach to his work, setting high standards for himself and for those associated with him. I will never forget his words to me: "Always investigate thoroughly," he said, "Base everything in your work upon fact, not false supposition." He will always live for me in the plants and gifts he insisted I accept, but beyond these material things, I know I have emerged a richer, better, and wiser person for having known him.

The world, too, is the richer. What better legacy could any man leave than the Society he created, the flowers he loved and improved upon, and the better understanding he created within the plant world. He will be missed by the many friends who knew him and admired him, and by a plant world left richer for his having lived.

HAMILTON PAUL TRAUB—MASTER OF THE AMARYLLIDS 1890 - 1983

A Memorial by a Colleague and Friend

The purpose of this account is to record a few of the numerous, substantial, scientific, and organizational contributions of Dr. H. P. Traub to science and human welfare.

It seems reasonable to suggest that Dr. Traub's reearch on the taxonomy, systematics, breeding and culture of the amaryllids places him in the same category as those two great students of the Amaryllidaceae, William Herbert (The Amaryllidaceae) and J. G. Baker (Handbook of the Amaryllidaceae.)

Other than this statement, I will make *no* attempt to assess the significance of Dr. Traub's research. Such evaluation can best be done from a historical perspective. I will also relate certain anecdotes that will perhaps convey to you a better understanding of the man.

Hamilton Paul Traub was born June 18, 1890 in Crozier, IA, a small farming community in Buena Vista County, one of the small counties of northeastern Iowa. He died in his sleep July 14, 1983, about one month after his 93rd birthday. During his waning days, Dr. Traub was fond of thinking of himself as a computer, programmed to complete 3 monumental tasks before death should overtake him. They were: (1) complete his memoirs; (2) bring to completion a systematic treatise of the onions and their allies; and (3) to complete a monograph of the genus *Amaryllis* for the proposed revision of the Amaryllis Manual. The first two projects were in

Hamilton Paul Traub at about 22 years of age.

advanced stages of completion at the time of his death. The third project was essentially complete—so much for computers and programming.

Dr. Traub was an extremely complex individual, a visionary with unlimited goals of what he expected to accomplish. He was essentially a "loner." This may account for his eccentric behavior under some circumstances. While he was at home in the company of attractive women, he never married. He had few, if any, close friends, even his scientific col-

leagues had no real knowledge or appreciation of the man. If he had a close associate, I was perhaps that individual.

He was a shrewd money manager. At an early date he recognized the Mutual Funds as a growing force in the financial structure of the country. He invested heavily in I.D.S., which later became a giant in the field. In the heyday of the growth of Mutual Funds, he told me that the money came in so rapidly and in such quantity and regularity that he did not know what to do with it. His wants were simple, hence the dilemma. With the decline of the Mutual Funds, he sold his stock and shifted his investments to tax shelter instruments. Evidently a wise move.

On the other hand, he could be very gullible in the hands of experienced manipulators. For example, he wrote an opera with the title "CALL OF DESTINY." The manuscript was offered to several reputable publishers, with negative results. Next, he canvassed the so-called "ego presses." These people as a group are notorious for their sharp practices. He finally decided upon a publisher in Pittsburgh who requested a $3500.00 down payment to commence the job. Dr. Traub willingly handed over this sum, and sent the manuscript forward, neglecting to investigate the credentials of the firm, or the executive officer. After more than six months of wrangling through correspondence and over the telepone, Dr. Traub demanded the return of his deposit and the manuscript, as it became evident the firm did not have the resources or intention to publish. He was in luck. The manuscript was returned. Immediately thereafter the Postal Service closed the operation down on complaints from several would-be customers, charging mail fraud. His net loss in this operation must have exceeded $5000.00. Next he tried a small press in Pacific Beach, California. These people were not experienced in printing books. The firm, however, was located in the vicinity of La Jolla, and he could give the printing close supervision. It was not a very satisfactory operation, but at any rate, "CALL OF DESTINY" was published in 1980.

At this point in the discussion, I would like to digress for a few minutes to establish my credibility as a reliable witness on the life and times of H. P. Traub. We first met in December, 1933, at the AAAS Meeting held in Cambridge, Massachusetts. At that time I was a Post Doctoral Fellow at Harvard University and Dr. Traub was Horticulturist-in-charge of citrus and sub-tropical horticultural research for the Bureau of Plant Industry, U.S. Department of Agriculture, located at Orlando, FL. He asked me to prepare a short article on the status of cytology in the Amaryllidaceae for Volume I of Herbertia, which he expected to publish in 1934. As a young Ph.D., and anxious to build up a list of publications, I gladly complied.

My next contact with Dr. Traub occurred in 1937 at the Torrey Pines Horticultural Field Station, La Jolla. He was touring CA in his capacity as the leader of the Citrus and Sub-Tropical Fruit Investigations. Evidently, Southern California and, more particularly, La Jolla made a lasting impression upon him as a desirable place for retirement. In 1942 he was transferred from Florida to the Agricultural Research Center, Beltsville, MD, just outside Washington, DC. After a few months in Beltsville, he was transferred to Salinas, CA to work on guayule, a rubber plant native to the high plains of Texas. The Japanese invasion of Malaysia had dried up sources of natural rubber, and rubber was desperately needed for the war effort. Guayule seemed to offer an alternative source, but nothing was known about the taxonomy, genetics, culture or physiology of the plants. A team of scientists from various disciplines was assembled, and work commenced at Salinas. Some good, fundamental research was published, but not a single pound of rubber was produced before synthetics and *Hevea* rubber took over at the end of World War II. Dr. Traub was skeptical of this effort, claiming that poor cooperation between indivduals from several units thwarted any progress that might have been made.

After the war the guayule project was terminated; Dr. Traub was again transferred to Beltsville. Bureau officials were at a loss to find a suitable assignment for him. The citrus and sub-tropical project was in place and fully manned; besides he preferred not to return to Florida. To their eternal credit, his superiors did nothing, allowing him to choose his own course. Their rationale was that he was within 2 years of retirement andhe could not do much damage, whatever work he chose to pursue. At this time there was much interest in the effects of colchicine on cells. He chose to work on the effects of colchicine on plants, more particularly on daylilies. During this interval, Dr. Traub devised techniques for the use of colchicine to produce tetraploids. He produced a flock of tetraploid *Hemerocallis,* some of which became the basis of breeding stock for the modern day tetraploids.

Upon retirement in 1952, Dr. Traub moved from Beltsville, MD, to Arcadia, CA. This was an unfortunate choice. He proved to be very sensitive to air pollution, and the poor quality of the air in parts of the L.A. Basin caused him severe respiratory problems. He felt that he had no choice but to leave Arcadia, although he had purchased a home on a fair sized lot, and had constructed a small greenhouse for his research.

In 1953, Dr. Traub moved to La Jolla. He purchased a home at 5804 Camino de la Costa and moved his collection of plants to this location. With his plants established, and his experimental work moving along well, he decided after about 5 years that traffic flow in front of his house was

too heavy and too noisy; besides he was located adjacent to the parking lot of a well patronized and popular restaurant. Thus, in 1970 he made a final move to 2678 Prestwick Court, taking his bulb collection with him but, because of poor soil, and mostly because of declining health, they were never planted and essentially lost.

To summarize, Dr. Traub and I have known each other in a professional way for about 50 years. After his move to La Jolla we saw each other frequently, especially during the last 5 years of his life, when I assumed the task of driving him to La Jolla for his weekly shopping tour, and chauffered him to medical appointments and other routine matters.

Surprisingly, at the end of about one-half century of association, Dr. Traub and I remained on easy speaking terms. This fact suggests a great deal of tolerance or forbearance on the part of each party, considering such disparate personalities as Dr. Traub and myself. Clearly, he was human and, like many of us, hampered somewhat by his shortcomings. Probably the most damaging was his tendency to engage in polemics with his adversaries, which he seemed to enjoy. Nevertheless, it was a time-wasting exercise.

Dr. H. P. Traub has a long list of accomplishments to his credit. I intend to enumerate those that I consider outstanding, but not necessarily in the order of their importance.

1. *The organization of the American Amaryllis Society in 1933, later changed to The American Plant Life Society in 1944.* These societies played a major role in bringing the attention of the gardening public to the beauty and horticultural desirability of the Amaryllidaceae. Through approximately a half-century of publication under the editorship of Dr. Traub, *Herbertia* and *Plant Life* have published articles with a high standard of scientific integrity mixed with a pleasing blend of observations and experiences from practical gardeners. This policy has created a persistent demand for back and current issues of these publications. The need for back issues originates with researchers, libraries, horticultural societies, and just plain gardeners. Dr. Traub not only served as Editor for *Herbertia* and *Plant Life,* but he contributed lavishly to each issue with technical articles on various facets of his research.

2. *Two monographs, AMARYLLIDACEAE: TRIBE AMARYLLEA, 1949, co-authored with Moldenke; and THE GENERA AMARYLLIDACEAE, 1963.* These monographs established the basic taxonomy of the Amaryllidaceae and gave amaryllid enthusiasts a means of becoming better acquainted with their plants. The monographs were based mainly upon his work and the researches of his illustrious predecessors.

3. *THE AMARYLLIS MANUAL, published by the MacMillan Company in 1958.* The MANUAL, while not a cook book, was an immediate success because it brought together in a single volume information about *Amaryllis* culture, breeding, systematics and plant protection. Although a first printing of 5000 copies was made, the book was out of print in about 5 years. This testifies to the usefulness and popularity of the book. Moreover, there has been a sustained demand for it. The book should be brought up-to-date and go into a 2nd Edition.

4. *AN INTRODUCTION TO HERBERT'S AMARYLLIDACEAE, ETC. 1837 and related works.* In 1968 or thereabouts, at the invitation of J. Cramer, a German publisher of botanical works, Dr. Traub authored a critique of Herbert's Amaryllidaceae. This critique of 87 pages was published (1970) as an Introduction to a reprint of Herbert's monumental work. Dr. Traub's critique is a tightly knit essay on the history of plant hybridization up to Herbert's time, followed by a detailed examination of Herbert's experimental results and conclusions.

5. *Lilales.* In 1972 the Editors of *The Encyclopedia Britannica* invited Dr. Traub to prepare the section on the plant Order Lilales for the 15th Edition. This task involved much research, and the organization of a large number of random observations into a meaningful whole.

6. *Distribution of seeds and bulbs.* Dr. Traub was very generous in the distribution of seeds and bulbs to his friends and co-workers. He was no armchair gardener. Until he moved to Prestwick Court he had taken a lively interest in growing plants.

Dr. Traub was an ardent plant breeder. He had an uncanny knack for spotting combinations that would be useful for their esthetic as well as other virtues, and he proceeded to exploit them. He developed and released several tetraploid cultivars of daylilies, besides those of *Crinum, Brunsvigia,* etc.

The items I have listed by no means exhaust the significant accomplishments of Hamilton Paul Traub, but they do suggest that he was a prodigious, intelligent, innovative, creative researcher. He could well be named Mr. Amaryllid of the 20th Century. *Thomas W. Whitaker*

MARCIA CLINT WILSON

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Marcia's sudden and untimely death came as a shock to me, as it did to all who knew and loved her. I was awakened early in the morning and received the bad news from Janice, her youngest daughter. For a moment I was speechless. In about two weeks or so Marcia was to fly to California to receive the coveted Herbert Medal, and give her presentation on the *Zephyranthes* of Texas and Mexico. Earlier she had asked to borrow some of my slides, to show with those of her late mother, Kitty Clint, and her personal slides as well. I had sent her my own notes of the rain lilies covering the collections I had made since 1953. Thus, she was going to California fully "armed" with the knowledge and experiences that all three of us had accumulated in over thirty years of collecting, growing, and hybridizing this group. She was excited, to say the least. What a tragic and devastating disaster it was to see this taken away from her on almost the eve of her triumphant trip to California.

Members of the American Plant Life Society were equally stunned. At first they did not know what to do, until someone suggested that I be asked to go in her place. I was pretty well acquainted with her presentation, as we had discussed it at some length in our correspondence. Then her children found the box of slides that she had planned to take with her. These were restricted to *Zephyranthes, Habranthus,* a few *Sprekelia,* and some habitat scenes. I broadened the range to include other Mexican Amaryllids as well, but in effect her presentation on the Mexican rain lilies was given intact. There were some tearful moments when I accepted her Herbert medal, and a few more, when the family received it.

Marcia was only fifty-three years old when she died. She had not seen a doctor in several years, and if she had high blood pressure she either ignored it or was unaware of it. She had been very supportive when I had my own heart attack five years ago. Little did either of us suspect that this would happen to her too, in time. Her mother was still alive then, and her father had died (also from a heart attack) a few years earlier. As it turned out, she did not live as long as either of her parents. All died of heart attacks.

I first met Marcia in 1953, just prior to graduating from College. She had completed her education in 1951, and was working, living at home with her parents. She was a very sweet young lady, friendly and soft

spoken. But she was in no way interested in plants. I doubt if the idea even entered her mind in those days. That was to come much later. Thus, after saying "Hello," she would excuse herself and go about her business, leaving her parents and me to talk about *Zephyranthes* for several hours.

I did not hear from her again until she married and moved to Galveston. It was there that suddenly she became interested in her mama's favorites, the little rain lilies. All of a sudden, her interest grew like a ragweed! At first she wrote little annual reports for PLANT LIFE, on her limited experiences with the rain lilies, but you could tell that her knowledge grew with each passing year. She corresponded with those folks who shared her interests, and she was an exceptionally good correspondent, answering promptly, and always cheerfully.

Marcia and her three children moved back to Brownsville after her husband died, and it was then that she decided to try to fill the vacuum left by the late Wyndham Hayward and James Giridlian, and the retired Mr. Goedert. Apparently there was a steady demand for Amaryllids and miscellaneous bulbs, and no one to supply these plants. At first she timidly began offering species *Amaryllis* (*Hippeastrum*) and a few species *Zephyranthes* and *Habranthus*. Very quickly she expanded to take in *Crinum* and many miscellaneous species and hybrids of various genera. Then she began offering exotics from Mexico, South Africa, South America and Australia. Indeed, toward the end, she seemed to be in contact with bulb growers and dealers from all over the world. She made very little money from her early efforts, and it was only towards the end that things were becoming very optimistic as to the future. Already she had told me that she'd love to expand and buy land nearer the river, but was fearful of the neighborhood there. Indeed, if she had had more help (she did have a part-time yardman) of the right kind, there seemed to be no end to the possibilities. I often warned her not to spread herself out too thin. But she seemed obsessed in growing and learning, and in achieving excellence and a very fine reputation. She was particularly concerned with Mosaic virus in her plants, and she would rogue them out ruthlessly, no matter how valuable the plant might be. When her mother, Kitty Clint, was alive, she was much concerned about Marcia's "burning the candle at both ends", saying that Marcia would wake up at four a.m. each day, just to get all her chores and gardening done. Mrs. Clint did not understand how she could keep this pace up for long. And she was right.

Marcia will be missed by all. I've not heard one unkind remark about her. Everyone loved her. More than once I've heard grown men say, "She was like a mother to me." She was that kind of person. Marcia and I were the same age, she being about three months younger, so to me she was like

a sister. We corresponded steadily from the time she began gardening in Galveston until her death in Brownsville. The exchange of newsy gossip and technical information was of mutual benefit to each of us. I like to think that the support that she got from me (and others as well) went a long way in motivating her to achieve as she did. She will be sorely missed-and extremely difficult to replace. Goodby, Marcia. We all loved you.

MARCIA CLINT WILSON—HERBERT MEDALIST, 1984

(This text was prepared by Dr. Thomas W. Whitaker, Executive Secretary of the American Plant Life Society for the 1984 Herbert Medal presentation to Mrs. Marcia Clint Wilson. The award was made posthumously on behalf of Mrs. Wilson to her colleague and fellow Texan, Dr. Howard. Mrs. Wilson died several days after this presentation text was adopted. The text is presented here in its unedited form.)

Marcia Clint Wilson, our Herbert Medalist for 1984, is well known to this group. Her avid interest in amaryllids was evidently derived from heredity and stimulated by the South Texas environment. Her parents, Katherine and Morris Clint, were excellent gardeners with an interest in amaryllids. They made several expeditions to Mexico and returned with new and exciting plants for our gardens. As for environment, anyone raised in South Texas could not avoid marveling at the beauty of the delicate little rain lilies (amaryllids) that spring up over the countryside immediately after a rain shower.

To say that Marcia is a bundle of energy is a gross understatement. In her home she wears 4 hats: homemaker, gardener, business woman, besides providing guidance for 3 college-age children. A single one of these responsibilities would overwhelm most of us, but Marcia handles each task with consummate ease and grace.

Recently, I was privileged to spend a day at Brownsville visiting Marcia's operation. I was much impressed. Her vast collection of amaryllids is grown out-of-doors, mostly on raised beds. The plants are thrifty, well cared for, and adequately labeled. We hope Marcia and her bulb business will continue to prosper, not only for her sake, but because her collection is a great natural resource for The American Plant Life Society. Through Marcia, members can beautify their gardens, diversify their collections, and improve the quality of their plants for breeding or other experiments.

This is a noteworthy occasion because it is the first time in the history of the Society that two members of the same family have been honored

Dr. Thomas W. Whitaker (left) and Dr. Thad M. Howard during posthumous Herbert Medal presentation to Mrs. Marcia Clint Wilson at the Los Angeles State and County Arboretum, Arcadia, California, 12 November 1983. Photo by Jim Bauml.

with Herbert Medals. Katherine Lamberton Clint, Marcia's mother, was designated Herbert Medal recipient in 1957.

The Society is honored to offer the prestigious Herbert Medal to Marcia Clint Wilson. Marcia is being honored for her indefatigable efforts to bring amaryllids to the attention of the gardening public.

Marcia Clint Wilson
May 23, 1930 - October 30, 1983
1984 Herbert Medalist

Richard Wilson
255 Galveston Road
Brownsville, Texas 78520

My mom, Marcia Clint Wilson, made collecting trips as a youngster with Oma and Opa (her parents, Kitty and Morris Clint) to Mexico. It began for them as a hobby, since traveling in Mexico was inexpensive. Mom was bored, never once suspecting that later she too would be interested in bulb collecting.

After graduating from high school, she attended Texas State College for Women at Denton, Texas. Later she attended the University of Texas, graduating with a Bachelor of Arts degree in Art in 1951. After her graduation she worked as a secretary for Standard Oil in Brownsville, Texas and met Captain David Earl Wilson at a party. Dad was a Merchant Sea Captain, and she thought he was unlike any man she had ever met. They married in February 1956. Dad ran a freezer boat to Carmen and a shrimp boat out of Brownsville, but since he couldn't make ends meet, he decided to go back to sea. For a couple of years he sailed as a Chief Mate on a ship making runs to India. It was a hard time for both of them. In 1958 the first child was born into their family. Two years later we moved to Houston, where Dad got a job with G & H Towing Co. He was Executive Vice President at his death.

Mom was a good mother, and I recall her taking interest in my reading and art when I was very young. She had two daughters, Jamie, born in 1962, and Janice, 1964. We moved to Galveston so Dad wouldn't have to continue commuting. It was in Galveston that Mom really began to develop her gardening talents. Friends always admired her yard. She gradually began collecting rain lilies (*Zephyranthes* & *Habranthus*) as a hobby.

After Opa (Morris Clint) died, as a family we took Oma (Kitty Clint) on a couple of collecting expeditions. Mom then caught the "bug" for bulb collecting. We occasionally drove to the west end of Galveston Island, hunting *Zephyranthes*. She inherited some of Oma's correspondents and began acquiring information about the plants. Dad encouraged her and took some interest himself. He would talk at the office about our trips and call off some plant names. He once told Mom, "You know, you only have to know a little bit about something to impress some people." My Mom replied, "Not in *my* circles!"

Marcia Clint Wilson, circa 1956.

Dad died in August 1974, of natural causes. In the summer of 1975, Mom and her three children moved to Brownsville, moving in with Oma. Mom would talk to Oma for hours about plants. Oma had so many memories that she would get off the track and Mom would have to steer her back. They both spent many hours in Oma's garden.

I was fortunate in accompanying them on two trips into Mexico. I really wasn't sure just how successful those trips were, but every night we were there, we would clean, trim, and label bulbs, in order to have them ready for inspection by U.S. Customs at the Texas border. On one of these trips we ran into some "Federales", Mexican Federal Police, armed with machine guns. Nothing serious came of it, but I think that my little old Oma was the one most shaken by the incident. She had never had this experience before in her earlier travels.

In April 1976, we moved into our new home where Mom set up housekeeping, and began her new bulb nursery business. Mom would spend every morning at Oma's over breakfast, talking about plants. After that she'd come home and do the daily chores and work in her garden.

Then came the typewriter and the tat-tat-tat, often until 1 a.m. or 2 a.m. The sound put me to sleep, but not my sister, Jamie, who would shout "Mama, I've got to wake up early. Shut that thing off." Mom would call back "I'm almost finished." I heard that a lot. Often, after turning off the electric typewriter, she'd continue her correspondence with hand-written letters.

The garden grew and grew. She began having sand hauled in so that she could have raised beds. These were easier for her to dig in than the black, heavy gumbo soil beneath. At first there were only four piles, then it was simply piles and piles, seemingly never ending. I would spread sand, then she would spread sand, but I think it was she that had the most drive and stamina.

At first she kept most of her Amaryllids in the greenhouse. She began with *Amaryllis* (*Hippeastrum*), but soon Crinums began to be a big part of the landscape. She had carpenters build four raised-bed sandboxes. After planting in them, she looked at me and said, "Richard, I really need some more boxes." I shrugged and told her to order the lumber. By then I was in the Merchant Marine, as my Dad had once been. It seems that each time I came back from the sea, she needed more boxes. I built boxes. Lorenzo (her gardener) built boxes. She kept filling them with more and more bulbs and Cycads. She would dig, clean, and pack her plants, take them to the phytosanitary station for inspection, and then ship them out. Then more and more shipments of plants would arrive, and the cycle was repeated. Then she said, "I can almost see an end to this venture," meaning that she was going to quit expanding. I wonder if she actually *believed* that? She had so many friends and correspondents, and they blessed her in so many kindly ways.

Once, when I was down in the dumps, she showed me a packet of seed with a note. Apparently St. Francis of Assisi was asked what he would do if he only had one more day to live. He answered that there is always work to be done in the garden and there is peace there. Also, if the Lord came for him tomorrow, He'd probably find him in the garden. Mom then got me to cut the grass!

On the eve that she passed away, she had spent a full day in her garden.

My youngest sister, Janice, and Mom talked more and more about plants in the last years, and Janice expressed a desire to learn. But she felt that would have to come after she completed her education. If any of we three children are to follow in the footsteps of Oma, Opa, and Mom, it very likely will be Janice. She's had the right environment for it, but we all feel that heredity has had a part in it too.

PICKARD AWARDED 1983 HERBERT MEDAL

(The following is a transcript of the presentation ceremony on 21 Oct. 1983, when Dr. Thomas W. Whitaker, Executive Secretary, American Plant Life Society, presented the 1983 Herbert Medal to Nell Miller Pickard.)

Mrs. Pickard, and members of the Houston Amaryllis Society:

Your courtesy and kindness in permitting me to participate in this luncheon and ceremony honoring Mrs. Pickard is very much appreciated. I cannot think of a more deserving person to receive the prestigious Herbert Medal than Mrs. Pickard. This Medal is awarded annually to a person or persons who have made outstanding contributions to promoting our knowledge and understanding of these beautiful plants through judging, classification, cultural practices, breeding, plant protection, etc. Mrs. Pickard qualifies on many of these criteria, particularly in the art of judging flowers, where she has practically written the rules.

Dr. T.W. Whitaker and Mrs. Pickard with the 1983 Herbert Medal.

It is abundantly clear from the record that Mrs. Pickard is a dedicated horticulturist. The Herbert Medal is only one in a long list of honors she has accumulated for her work with ornamental plants, especially those of the Amaryllidaceae.

Up until a few minutes ago, I had only known Mrs. Pickard through correspondence. My excuse is that almost 1500 miles separates Houston, Texas from La Jolla, California. Dr. Traub often mentioned, with admiration, the activities of the Houston Amaryllis Society, spark-plugged by Mrs. Pickard. We have 3 very active Amaryllis Clubs and Societies in the country—one in New Orleans, one in Southern California, and, of course, the Houston Amaryllis Society. These local societies have been a key factor in the growth and maintenance of The American Plant Life Society as a viable entity through the past 40 years. We are especially grateful for the continued and reliable support of the Houston Amaryllis Society.

Mrs. Pickard, I am very pleased to have an opportunity to present the Herbert Medal to you at this time; let me add, you have earned it.

Traub Awarded Herbert Medal Posthumously

The American Plant Life Society Board of Directors ordered the casting of a Herbert Medal for posthumous awarding to former Director, Hamilton P. Traub. The presentation ceremony is tentatively set for this spring at the Missouri Botanical Garden in Saint Louis, where the Traub Herbarium, containing many unique and priceless type plant specimens, has recently been relocated from its former San Diego location.

It is expected that Dr. Traub's niece will accept the award on her late uncle's behalf and also make the formal presentation of the Traub Herbarium to the Trustees of the Missouri Botanical Garden.

REPORT ON THE 1983 SYMPOSIUM ON THE AMARYLLIDACEAE

JAMES BAUML
LOS ANGELES STATE AND
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ARCADIA, CALIFORNIA 91006

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2195 E. ORANGE GROVE BLVD.
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Overcast skies and drizzle did not dampen the spirits of the approximately seventy-five attendees at the first Symposium on the family Amaryllidaceae held on Saturday, November 12, 1983, at the Los Angeles State and County Arboretum, Arcadia, California. The Symposium celebrated the Fiftieth Anniversary of the American Plant Life Society and honored the late Dr. Hamilton P. Traub. The event was sponsored by the American Plant Life Society (APLS) and its local affiliate, the Southern California Hemerocallis and Amaryllis Society (SCHAS).

The Symposium's central topic, Amaryllid species, was chosen in response to replies to a questionnaire sent to all regional and selected national members. The invited speakers for the species session had all recently been on collecting expeditions to the areas of their reports. They spoke on their field observations in Peru, Bolivia, Chile, Mexico, South Africa, Texas, and California and on the hybridizers and botanical experts they met. In the commercial session, papers were presented on cultivation by the two largest growers of Amaryllids in the United States. In addition to the invited speakers, members of the APLS and SCHAS were invited to contribute short papers. Two excellent reports, given by experts on South African plants, concluded the Symposium.

Two tragic events occurred in the time preceding the Symposium: Dr. Traub died in the early stages of the planning, and Marcia Wilson died two weeks before the Symposium. Consequently, the program was changed so as to honor the memory of a founder of the APLS and the editor of its yearbook for 49 years. Dr. Whitaker, a close associate of Dr. Traub, presented his biographical sketch. The Society's new editor, Mitchel Beauchamp, discussed his ideas on the future of the Society and the yearbook, to be renamed *HERBERTIA*. Marcia Wilson, the 1984 Herbert Medal winner, was scheduled to present the Herbert Medal Paper. Dr. Thad Howard, a close family friend of both Marcia Wilson and her parents, the Clints, read her paper and accepted the Medal on behalf of her children.

A very generous grant from the SCHAS provided critical initial fund-

ing for the Symposium and covered 40% of the overall expenses. The minimal registration fee covered an addition 20%. A large number of rare species bulbs, generously donated to the Symposium by Leonard Doran and many others, helped defray the remaining expenses.

The Symposium was highly successful, far exceeding the original intent and expectations of its organizers. Many of the leading experts on the Amaryllidaceae in the United States presented excellent high quality papers, and the large enthusiastic audience was very responsive to this flood of information. The real success of the Symposium was in the tremendous interest demonstrated during the entire program.

The Symposium was organized and directed by members of the SCHAS with the encouragement and assistance of the members of the Board of the APLS. Based on the enormous positive response to this Symposium, it is likely that the Southwest Region will sponsor more such events in the future. The outcome of this regional Symposium demonstrates that other local chapters can and should sponsor such meetings with every expectation of success. The result will be healthier and more vigorous local societies and thus, national organization.

Session chair, Dee Cothran (right), with speaker, Mike Rudometkin, of Supreme Bulb, Inc. who grows more than one million amaryllis bulbs per year.

SYMPOSIUM ON AMARYLLIDACEAE

SATURDAY, NOVEMBER 12, 1983

THE SPECIES OF SOUTH AMERICA, SOUTH AFRICA, AND NORTH AMERICA GROWING AMARYLLIDS FOR THE COMMERCIAL MARKETS

8:00 - 8:45 a.m. **Registration**
Registrar: Kenneth Mann
Lecture Hall
Los Angeles State and
County Arboretum, Arcadia, California

8:45 a.m. **Welcome**
Randell K. Bennett
S.W. Regional Vice President
The American Plant Life Society (APLS)

8:55 a.m. **First Session**
Chair: Leonard Doran
Herbert Medalist, 1972
Alternate: **James Bauml,** Plant Taxonomist, Los Angeles State and County Arboretum, Arcadia, California

9:00 a.m. **SOUTH AMERICAN AMARYLLIDS**
Report on the 1982-1983 Collecting Expedition to Peru, Bolivia, and Chile
Caryn Ecker
Plant Explorer and Collector
William Gielow
Commercial Grower of Exotic Cut Flowers

10:05 a.m. **INTRODUCTION OF 1984 HERBERT MEDAL WINNER PRESENTATION OF HERBERT MEDAL**
Dr. Thomas W. Whitaker
Executive Secretary, APLS

10:20 a.m. **COFFEE BREAK**

10:35 a.m. **PRESENTATION OF THE HERBERT MEDAL PAPER: ZEPHYRANTHEAE AND OTHER AMARYLLIDS OF TEXAS AND MEXICO**
Marcia C. Wilson
Herbert Medalist, 1984
Owner: Marcia's Amaryllidaceae, source of rare and unusual Amaryllids and other bulbs

11:05 a.m. **SOUTH AFRICAN AMARYLLIDS**
Dr. Harold Koopowitz
Professor of Biology
University of California-Irvine
Director of UCI Arboretum: featuring rare S. African bulbs and corms
Author: **Plant Extinction: A Global Crisis**

12:00 Noon **LUNCH BREAK**

1:30 p.m. **Second Session**
Chair: C. D. Cothran
Herbert Medalist, 1980

1:35 p.m. **HISTORY OF THE AMERICAN PLANT LIFE SOCIETY AND BIOGRAPHICAL SKETCH OF DR. TRAUB**
Dr. Thomas W. Whitaker
Executive Secretary, APLS
Emeritus U.S. Dept. of Agriculture

2:05 p.m. **THE FUTURE OF THE AMERICAN PLANT LIFE SOCIETY**
Mitchel Beauchamp
New editor of **Plant Life**

2:35 p.m. **REVIEW OF THE GENUS BRODIAEA**
Dr. Theodore Niehaus
Author: Monograph of genus **Brodiaea**
Vol. 60, Berkeley Press Botanical Series
Author: **A Field Guide to Pacific States Wildflowers**
Vol. 22, Peterson Field Guide Series

2:55 p.m. **AMARYLLIDS OF THE SOUTHWEST**
Dr. Theodore Niehaus

3:30 p.m. **COFFEE BREAK**

3:45 p.m. **GROWING AMARYLLIDS FOR THE WHOLESALE MARKET**
Mike Rudometkin
Partner: Supreme Bulb, Inc.

4:15 p.m. **GROWING NERINES FOR THE CUT FLOWER TRADE**
Fred Meyer
Commercial Grower of Amaryllids for the flower markets of Europe

4:45 p.m. **PRESENTATION OF SHORT PAPERS**

5:30 p.m. **ADJOURNMENT**
James Bauml, Plant Taxonomist
Los Angeles State and County
Arboretum, Arcadia, California

1983 Mexican Bulb Collecting Field Trip

Thad M. Howard, D.V.M.
16201 San Pedro Avenue
San Antonio Texas 78232

In mid-July, 1983, I returned to the southern-most parts of Mexico for the first time in ten years, traveling down the coastal roads along the Gulf of Mexico. This was quite an extended route, from Brownsville to Tampico, the City of Veracruz, to Villahermosa, in the state of Tabasco, and on into the state of Chiapas, and the highland Indian City of San Cristobal de las Casas. I had hoped to find new plant material along the new isthmus highway (Mexico 195).

Leaving Tampico behind us, we crossed on a ferry boat into the state of Veracruz. I was determined to recollect a fine stand of aquatic *Crinum loddigesianum* growing in mangrove swamps along the roadside. I had first found a good colony of them in 1976. Unfortunately the swamp has been drained and turned into a banana plantation. The first trip I had made through this area twenty years before had shown that *Crinum* was common along the roadside in low, wet places. Not so anymore. In fact, we did not see a single native *Crinum* between Tampico and Villahermosa. Like so much of the rich Mexican bulb life, their habitat is being systematically destroyed for cultivation.

Our luck was much better in finding various cultivated *Crinum*. Just north of Tampico we came upon the ruins of what had once been an old home, and there were many clumps of a fine *Crinum* hybrid that we have dubbed 'Empress of Mexico'. This unusual *Crinum* has narrow, low, spreading foliage, and an erect plum-colored scape topped by white flowers with reddish narrow stripes. The flowers are large and of near-platyaster form and have a light pleasing fragrance. This is strictly a night flowering *Crinum*, as the flowers droop depressingly when the morning sun first hits them. Until now, most specimens of this unusual *Crinum* have been collected on the Pacific coast of Mexico in such far flung places as Mazatlan, Manzanillo, and Tapachula. This was our first Gulf Coast collection. We did not see any more of these for the rest of the trip.

The following morning we spotted clumps of *Crinum zeylanicum* in vacant lots in a little coastal village north of Nautla. This was the favored dark wine-red striped variety that everyone prefers. Foliage of this form is nearly erect, and deeply ribbed, like a corn plant. Flowers are very striking and colorful. There is a smaller form with pink stripes that one is apt to find here and there. Also there is an intermediate form of medium size,

and slightly more spreading foliage, and this seems to be the form commonly found in Florida.

We also spotted another *Crinum* of the *C. jagus* complex, identical to some I had found in southeastern Oaxaca in 1981. Foliage is thin and erect, and a medium-light green, with petioles at the base. The flowers are white, tulip-shaped, and scented with the smell of lemon drops. The flowers resemble the Florida "St. Christopher lily" but is larger and more erect. Though not actually a common *Crinum,* it does occur here and there in the dooryards in little villages of coastal Veracruz. They seemed to be in bud everywhere we saw them, but none were yet open. Another couple of days and it would have been a different story. Apparently recent rains must have lulled them into bud at exactly the same time.

We saw occasional plantings of *Hymenocallis fragrans* in yards and containers, but we did not stop to inquire about them, as we already have a few back home. Though not native to Mexico, they seem to be a favored container plant in coastal Veracruz. Wherever we saw them, they were in full bloom, and easily recognized by their broad, petioled leaves and large umbels of snowy-white flowers with bright yellow pollen. I suspect that this species grows below Mexico, around the Caribbean coastal areas.

Later that morning, still north of the City of Veracruz, we came upon a large roadside colony of *Hymenocallis baumlii* in full bloom (Figure 1). These grew in hilly volcanic soil among large rocks and in wet places. Brahman cattle grazed about them, but seemed not to touch them. Mosquitos were agressively active and we were forced to spray ourselves heavily with repellant in order to dig bulbs and take pictures. Many of the flowers had their staminal cups torn by the rains of the previous night. It was obvious that they had been in flower for some time as there was much ripened seed for gathering. Because of the dangling greenish petals, small cups, and geographical habitat, it was obvious that these were *Hymenocallis baumlii,* which I had first encountered in 1962. At that time they were unidentified and unpublished. Foliage was broadly erect and bright green, of swordlike form. We gathered several pounds of seed for future distribution before leaving the colony. This particular species is still fairly abundant in the State of Veracruz, down to the States of Campeche, Chiapas, and Oaxaca on the Gulf Coast. It also later turns up on the Pacific side in Chiapas in low areas. Nearing the City of Veracruz, we saw more and more of them, not only in pastures along the roadsides, but on slight hillsides as well.

We lunched in Veracruz City and relaxed a bit before resuming our drive down the coast to Alvarado and a rendezvous with the most fantastic naturalized colony of *Crinum zeylanicum* I've ever known (Figure 2). We arrived at mid-afternoon, and they were flowering by the hundreds, in

many clumps covering about an acre, with many thousands of bulbs. This was a conservative estimate, as some clumps easily had more than a hundred bulbs. I was careful to neither underestimate the numbers nor exaggerate them either.

Our first encounter with this colony was two years earlier when it quite took us by surprise. We had been overwhelmed by the total numbers of the population, and the great numbers of variations within the colony. I was determined to spend a bit more time with them seeking out more extremes within the scope of their variations. There were even more bulbs and variations than we had remembered from 1981. There were miniatures, giants, fat ones, skinny ones, some with bright green foliage, and others with glaucous foliage. Foliage of some was very wavy edged, and others had straight edges. Some clumps had bulbs that were quite large and others had bulbs no larger than baseballs. Most bulbs were rounded, but a few had longer, more narrowish shapes.

I would have loved to spend several hours studying this colony, but we were getting short on time and the mosquitos were almost unbearable. As I walked up and down the hillsides where they grew, and in the ravines, I stirred up large numbers of mosquitos resting in the vegetation and were they aggressive! Were it not for the repellent which I carried along with me, spraying constantly to keep from being devoured, I would not have been able to do much digging. Here we were, on a grassy hillside in the full afternoon sun, being viciously attacked by hordes of hungry mosquitos while we were desperately trying to make selections of the better and more unusual *Crinum* forms in a systematic manner. The mosquitos made this almost impossible, and I was in constant motion in order to avoid being bitten. After hurriedly digging what we wanted and taking a few pictures, our only thought was in getting out of there and the quicker the better!

Of the many forms, I was impressed by one little *C. zeylanicum* that had rather narrow petals and a light pink stripe. Not really all that special, but it was unusual for the species. I also dug a few squatty types of short stature and a few of the grand "veracruz" form with the widely open flowers striped a dark cherry-red. Mosquitos aside, this was a most impressive collection. The colony seemed to be comprised of both Asian and African forms. We managed to gather plenty of seed for future distribution. The heat and humidity added to our discomfort in the form of heavy perspiration. One can only imagine how relieved we were to get back into our air conditioned auto and leave all the discomfort behind. It was late when we arrived at Villahermosa and had time to rest and "unwind" in a large modern hotel with all the civilized accouterments that we are accustomed to.

The following day (Monday) we drove from Villahermosa to Frontera, Tabasco, near the Tabasco-Campeche state line on the Gulf of Mexico. At Frontera we crossed the Rio Grijalva on another ferry and drove into the state of Campeche. Here we found many large colonies of *Hymenocallis baumlii* at the Laguna de Terminos. It was getting late, so we ate supper and returned to Villahermosa. At long last we did see aquatic *crinum* along the lagoon. These were *C. loddigesianum,* but they were not flowering.

Twenty years earlier (1963) I had first encountered the large populations of *Hymenocallis* along the Gulf Coast of Veracruz and Tabasco on into Campeche. Dr. Traub had declared them to be a new species, but never got around to naming them. In Yucatan they are replaced by *H. latifolia.* Years later, Ravenna was to find the new *Hymenocallis* in Chiapas, near Ocozocuautla, and name it in honor of Jim Bauml, who was then a botany student at Cornell, as *Hymenocallis baumlii.*

Hymenocallis baumlii is considered very beautiful, as the segments often are greenish. The plants are rarely larger than medium size, and a single large bulb will produce a second scape in a season. As the bud count is fairly high, it can make a fine show in the garden or in a pot. Actually, *H. baumlii* seems to be a more northerly extension of *H. tenuiflora* from Guatemala. I collected the latter in 1973 on the Pacific coast of Guatemala and it differed mainly in its near-prostrate foliage, which was also broader. Flowers of both species are very much alike. Both have smallish cups, and reflexed petals that seem to dangle like a spider. There is little to choose between them in the flowers.

Tuesday morning we left Villahermosa and turned toward the State of Chiapas on Mexico 195, a newly paved highway that transects the lower part of the isthmus. This was the main objective of our trip and we had high hopes that we might find some new species of bulbous plants. Previous experiences with new roads have usually given us a goldmine of new and interesting material. Such was not to be the case in this instance. The drive was scenic enough, and pleasant enough with plenty of vegetation, but not a single new plant did we find that would be of interest to us. What a disappointment. I had hoped for perhaps a new *Hymenocallis, Sprekelia,* or bulbous Irid. We took a few short side trips on lesser roads, thinking that this would somehow change our luck, but no, it was not to be. Eventually we joined the Pan American Highway (Mexico 190) and drove southward to the highland Indian city of San Cristobal de las Casas, arriving before sundown.

Figure 1 (upper) **Hymenocallis baumlii** in full bloom.

Figure 2 (lower left) **Crinum zeylanicum** naturalized colony.

Figure 3 (lower right) Dr. Howard examining **Crinum.**

San Cristobal is a very lovely small city, 7000 ft. high in the mountains with a wonderfully cool and invigorating, spring-like climate. From there it is roughly one hundred miles to the Guatemalan border, and there are many species of bulbs of great interest. Here, in 1970, I found a new *Hymenocallis* species, which was later to bear the name *H. chiapasiana.* Nearby grew the lovely white flowered *Tigridia chiapensis,* a very pretty white-flowered *Calochortus* species, *Milla* species with nocturnal flowers and stoloniferous corms, yellow *Sisyrinchium* with tuberous roots, and a pretty blue flowered Irid, *Orthosanthus.* What a great place to retire, or just get away from it all! Even in mid-July one can find the Cape Belladonna (*Brunsvigia rosea*) in its darkest red flowers, due no doubt to the cool climate, in all their finery, flowering a good two months ahead of those in California. The old *Crinum* hybrid favorite, *C.* X *powellii var. alba,* is literally grown by the millions around the city, for cut flowers. They seem to be everywhere. I did not know that so many even existed. I suppose they take the place of true lilies in church services, etc. and likely are a substitute for Easter lilies. *Tigridia pavonia,* in its common red form, is found as a wildling or garden escape. If one continues toward the Guatemala border from there, one will find a yellow *Calochortus* species near Comitan. Bromeliads, especially *Tillandsia,* are found in the pine forest and hardwoods, but these are high altitude species that need a cool climate to survive. Another of the brown-flowered *Tigridia* is found midway between San Cristobal and Comitan.

For the Amaryllid collector, it is *Hymenocallis chiapasiana,* that is the main attraction, although those other bulbs are almost equally as tempting. This is a particularly early summer flowering species, with sweetly scented flowers and nearly erect, broad, petioled to sub-petioled foliage of a lovely bluish-green color. Until 1983, the only known collection was my own from a site just immediately south of the town, near a rocky outcropping, and we had concluded that the plant must be extremely rare. This time, however, we took a bit more time to sniff and snoop more leisurely and found small colonies about the city. What a relief! Though still very rare, it is less rare than we were beginning to believe. Still, it is quite a rare endemic as these things go. We were lucky enough to collect both seeds and bulbs without decimating any single colony, so that we could distribute them to interested parties.

H. chiapasiana is most nearly related to *H. glauca* of south-central Mexico, but is of smaller habits, flowers fully a month earlier, and is more fragrant. Overall, the flowers are daintier and more delicately formed. Geographically, *H. chiapasiana* is more far-flung and southerly than the mainstream *H. glauca.* Foliage is more erect, and goes dormant much

earlier than its better known cousin. It seems to do very well in cultivation and is certainly winter hardy at least to zone eight, no doubt due to its high elevation habitat. In colder quarters, it should make a fine pot plant as it is of very simple culture.

Digging *H. chiapasiana* is difficult as bulbs all-too-easily separate from their basal plates. The same may be said for *H. glauca,* and this odd characteristic seems to verify their close affinity. Ordinarily any bulb stripped of its basal plate is like an Aztec sacrificial victim separated from his heart. They tend to die. Not so with either *H. glauca* or *H. chiapasiana*! When these bulbs are stripped of their basal plates, they immediately heal, and form a multitude of small bulblets around the concentric tunics, which can be separated and planted as propagation stock. In this respect, it is identical to the Dutch propagation of Hyacinth bulbs, which are intentionally "cored" to force them to produce bulblets.

That afternoon (Wednesday, July 20) we regretfully left San Cristobal and began our drive homeward as we had reached our halfway mark. The trip from San Cristobal to Tuxtla Gutierrez, the capital city of the State of Chiapas, is less than two hours, without rushing, and all downhill. Bulb life is present, but my favorite is *Tigridia hallbergii,* a fall flowering Irid with pendant, maroon-brown flowers looking somewhat like *Fritillaria.* These flower in our area in late November, and rarely complete blooming before our first hard frost. But they do have their beauty and charm in spite of their sombre colors. Surely they must bring the Mexican *Tigridia* season to a close, and would best be grown in pots and allowed to finish their cycle in a greenhouse. We spent the night in Tuxtla.

Early the next morning we headed northward towards Oaxaca, another fabulous area for serious plant collecting. I kept an eye out for colonies of *Hymenocallis baumlii,* but saw only one group, inaccessibly fenced in. Formerly they grew in pastures in fair quantities, but they have been put to the plow and are now almost extinct. There too once grew a small pinkish-white *Zephyranthes, Z. miradorensis,* but these too are gone.

But our efforts were not to be disappointed. The early morning sun had brought out myriads of *Cipura paludosa,* a sparkling white Irid looking something like a tiny Gladiolus with crystalline flowers. Previous experience had taught me that these do very well in cultivation in San Antonio, but one must observe them early in the morning while the dew is still upon them as they only last a few hours. They stay in flower for several weeks and thus are a joy in the midsummer morning. Clumps of a terrestrial orchid grew with them, but these were not in flower so we were unable to identify them.

Later that morning, shortly before noon, we took a side trip off the Pan American Highway on Mexico 200, near Arriaga, Chiapas to look for a lovely Irid, *Alophia* species which grew with *Z. miradorensis* in the sandy loam along the roadside. With these also grew *Cipura,* and a strange little *Hypoxis* species with a tuber like a carrot and fairly large flowers held at ground level. Really more unusual than beautiful. Here also grew the strange *Milla* species of Chiapas and Guatemala, a stoloniferous plant with night flowering habits.

The rest of the day was spent driving with a few collecting stops. About the only bulbous plant of note was an unusual *Shoenocaulen* species with *Eremurus*-like spires of creamy white flowers on stems 3-5 feet tall. Pretty enough they were, but ugh! What an awful scent! Like rancid butter! Though attractive enough, I did not bother to dig any as they have never done well for me in cultivation. Anyway, we have a couple of species in Texas that grow very well, and one has the pleasant scent of coconut. The other is sweetly scented too. I can do without the rancid butter.

That evening, we arrived in the City of Oaxaca, and it was bustling and busy as always. Though not a place for collecting, I managed to obtain a very dark wine-red form of *Crinum* X *powellii* cultivated in a churchyard. There were hundreds of them. I obtained two and was grateful to get them. These would classify as variety "rubra", but they were far and away the darkest I have ever seen, as dark as the old hybrid *C.* 'Ellen Bosanquet'. Although my main motives are to collect wild flowers, I don't hesitate to stop and beg, buy, or trade for cultivated bulbs when the opportunity and interest inspires me. I considered this *Crinum* a real "find." It will remain to be seen if bulbs will retain the dark coloring in our warmer San Antonio climate.

The next morning we drove to Mitla for some sight seeing (Figure 3). Along the roadside we ran into a very old Texas friend, *Cooperia (Zephyranthes) chlorosolen.* These were growing in fair abundance not far from Mitla, where famous Indian ruins are the main attraction to tourists. This is a very common rain lily in Texas. What it was doing so far south in this part of southern Mexico is anybody's guess. But it was our familiar old species, with no trace of anything to remark over. They are known to turn up much farther south in Brazil, and those too are exactly like our Texas forms. Some riddles will never be satisfactorily explained.

From Mitla, we returned to the city of Oaxaca, but not before taking a side trip up Mexico 175 some 30 or so miles to Guelatao. There are a few very interesting bulb species on this road, each of which is very fascinating. The first of these is a lovely deep pink *Habranthus* species, which is

still undescribed, found in hilly, hardwood terrain. We first found these in 1968 in flower, and again in 1970. I have not been able to relocate them since, as they are not abundant, but sparsely scattered among the oaks in hilly, dryish spots. At higher elevations, the dazzling *Rigidella orthantha* is nearly overwhelming with its scarlet *Tigridia*-like flowers on three foot plants. They can dominate the landscape, and would be a showy addition to gardens were it not for the fact that they only seem to thrive in alpine situations, and will not tolerate lowland summer heat. It is worth a pilgrimage on this road just to see them in their native habitat. If one is fortunate to find a meadow where *Tigridia seleriana* can still be found in the llanos of this part of Oaxaca, one can consider oneself fortunate, as they are nearly all gone from overgrazing. We went directly to such an alpine meadow where we had last seen them in 1973, but we could not find one. I fear such treasures of the Irid world are rapidly approaching extinction. The flowers of *T. seleriana* were on short stems only a few inches tall, and a most lovely shade of violet. At lower elevations on this same road, we found some particularly colorful forms of *Oxalis lassiandra,* with rich rose-red flowers. Some were fuchsia, but all were showy.

After eating lunch in Oaxaca City, we took another side trip that afternoon on Mexico 175, on the road to Puerto Angel. This area, which leads to the Pacific coast, likewise has its share of interesting bulbous material. Here we found *Milla oaxacensis,* and an *Echyandia* species. The latter is a small lily-like tuberous rooted plant, similar to an *Anthericum,* but the numerous tiny white flowers recurve like so many little turk's cap lilies. Though more interesting than showy, they are easy enough to grow. *Anthericum* grow there too, and these had fuzzy leaved rosettes and orange-yellow starry flowers.

The highlight of the afternoon was in finding *Fosteria oaxacana,* a cute little relative of *Tigridia,* with tawny-yellow flowers. These grew on the road to Puerto Escondido (Mexico 131) on outcroppings above the highway. The flowers are small. Too much so to be showy, but they are most interesting. We collected a few of these as previous experiences with them had shown them to be easy to grow and flower.

A bit later we stopped to collect a few bulbs of *Hymenocallis glauca,* which is slightly different from the more usual forms. This one has slightly smaller flowers with slightly smaller tubes and cups. Nothing to get excited over, but just a variation from the mainstream of this species. These grew in rather dry situations above the highway, and looked as if they had not really had enough moisture for several years. A very different situation at Zimatlan, a nearby village below, with a cypress-lined creek where grew aquatic *Hymenocallis* of the *riparia/acutifolia* alliance. These *Hymeno-*

callis seemed never to suffer from lack of water.

We returned to the city of Oaxaca without spotting any of the rare red and yellow *Polianthes* known to grow in this area. This latter plant is extremely rare and looks considerably like tuberoses, but minus any fragrance.

The next morning we left the city of Oaxaca and drove toward Tehuacan, Puebla. This was another newly paved road and once more we had high hopes that we might find something new. As before, we were disappointed. The road was scenic, but strangely devoid of any bulb life. We arrived at Tehuacan at noon, and then drove toward the Pan American highway once more. This part of the trip was vastly more interesting and allowed us to collect various *Milla, Zephyranthes* and other odds and ends. The country was on the dry side, with much giant cacti and xerophytic plant life.

This particular section of Mexico is most notable for its variety of *Milla* species. Giants and miniatures may be found here, with both nocturnal and diurnal (day flowering) forms, and with some species forming stolons and others forming basally attached corms. There are at least five species within this area, including *Milla biflora* and four undescribed ones. Each has its own restricted habitat and sufficiently distinct habits to justify separate species status.

Basically, *Milla* species may be broken down into the night bloomers and those that stay open all day long. The night bloomers open in the evening, and close before sunrise. The day flowering species open in the evening, but remain open throughout the day. There are other details that separate them of course, such as lengths of filaments, shapes of tepals, number of nerves, etc., but the simplest and quickest way to spot them is whether or not they have flowers that remain open during the heat of the day. Most *Milla* species produce cormlets that are basally attached to the mother corm, but a few species reproduce vegetatively by sending out long rhizomes or stolons and forming a small corm at the terminal, several inches away from the mother corm. This too has proven to be a very useful way of separating certain species. There are foliar differences as well, and these too are helpful in distinguishing species.

Late that afternoon (Sunday, July 24th) we arrived at Huajuapan de Leon, Oaxaca. This small town was hit by a terrible earthquake in 1981, and is still rebuilding. But our real interest is the bulb life to be found around this small city. There is a very interesting little brown flowered *Tigridia, Milla* species, *Nemastylis* species (miniature), *Zephyranthes verecunda,* the famed miniature *Sprekelia* species still to be described as new, an exciting little red and yellow *Polianthes* species (undescribed),

common *Sprekelia* forms, and a very exciting new *Habranthus* species in light pink with reddish veins. This latter plant, along with the mini-*Sprekelia,* were beloved by the late Marcia Clint Wilson and were to have been published in *Herbertia* shortly. She had sent me a complete description and we were to co-author the new *Habranthus* as *Habranthus vittata.*

After leaving Huajuapan, we spent the following day in some serious driving in getting to and through Mexico City. Not long ago this could be done in a couple of hours. Now it takes a half day. One simply cannot circle Mexico City. One must drive through it. And one must dedicate at least a half-day to that task. Traffic is a nightmare, and not for the faint of heart. Eventually, we found ourselves on the way to Queretaro and away from the bumper-to-bumper bit. But one should not be deceived. Traffic is still heavy and frantic even on the open road. They have signals given in combination with headlights, turn signals, and warning lights and one must constantly be alert to yield to whatever the truck behind you dictates. If he wishes to pass (and he does!) he will tell you, and simultaneously tell you to move over or else!

Eventually we reached Queretaro and then drove northward to San Luis Potosi, where traffic thinned out a bit. Even here, Mexico's highways are woefully inadequate to carry the normal automobile traffic plus the incredible numbers of trucks and busses. The situation seems hopeless.

Upon reaching San Luis Potosi in mid-afternoon, we took a side trip up into the mountains on Mexico 70, on the road to Rio Verde. About 15 miles East of the city of San Luis Potosi, we stopped to dig bulbs of *Habranthus concolor* and *Zephyranthes longifolia.* Here, too grow *Allium potosina,* and a pretty night flowering *Milla.*

We did not linger long as it was beginning to get late and we still had some more collecting to do east of here in the mountains. We drove eastward, all the time climbing in altitude until we reached Valle de las Fantasmas (Valley of the Ghosts). Here we can find strange rock formations having a Halloween-like appearance in the landscape. Here also grow a variety of bulbous plants, such as *Tigridia ehrenbergii, Allium glandulosum, Sprekelia formosissima,* pink *Zephyranthes,* a white flowered *Habranthus, Milla biflora,* and odds-and-ends terrestrial orchids. We made a special effort to collect the *Habranthus,* as this may or may not be a new species. These grew in pockets of humus among the limestone rocks. Though somewhat similar to *H. concolor* of lower elevations, it is found in a totally different type of habitat. The color is white instead of yellow, and bulbs tend to be smaller. I suspect its nearest relative is *H. immaculatus.*

We returned to the City of San Luis Potosi, all downhill, stopping only to collect a pretty little lavender flowered *Oxalis* species with many leaflets, similar to *O. lassiandra,* but with a honey-like scent. Not too exciting, but just nice enough to merit a spot back home in the garden. Mexico has many *Oxalis* species, and most of them either have leaves or flowers (or both) pretty enough to grow either as garden plants or as pot plants. The variety seems endless. There is hardly a spot in Mexico that is not represented by at least one species in the genus *Oxalis.*

The day grew late as we headed towards Matehuala, but it was still light enough to make a final collection for the day, an *Allium.* These were in full bloom, and really quite showy, in many shades of lavender pink. These were stoloniferous and nearly a foot and a half tall, with starry flowers in a loose umbel. I have yet taken the time to try to identify them, but they are likely allied to *A. potosina,* although the latter does not make stolons nor grow so tall.

The next morning we left Matehuala and headed for our rendezvous in Texas that evening. But our collecting was not yet quite over. As we crossed into the state of Nuevo Leon, we made a stop and found another little *Allium* in flower. These grew with lavender-white flowers on stems about 10″ tall, and casually resembled *A. drummondii* from Texas, save that bulb coats were membranous rather than reticulated, and that these flowered in midsummer, instead of early spring. Not an exciting species, beauty-wise, but still one more new *Allium* from Mexico. There are now more than twenty species, and the list continues to grow.

Our return to Texas was uneventful, and we were only too happy to arrive home once more, safe and sound. Once upon a time, I used to worry mostly about livestock on the roads at night. Now the livestock is all fenced in, but the traffic is the real danger. Drivers of trucks and busses seem to feel that the road belongs to them, and they drive aggressively. They don't hesitate to intimidate the tourists. Luckily, the more remote regions, where collecting is still fairly good, have sparse traffic, so it is not all the nightmare that one might perceive. But good times are running out.

THE STATUS OF CRINUM SPECIES

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With the unfortunate passing of Marcia Wilson, the commercial availability of Crinums is rather unsettled, since she and Ty Ty Plantation in Georgia had been about the sole source of many bulbs not otherwise available. Perhaps by the time this report appears in print some solution may occur. I hope so; otherwise one will have to really *scrounge* around amongst old gardens. There were plenty of collectors and dealers forty to fifty years ago, and even twenty. It's been a great thing to have known Wyn Hayward, Cecil Houdyshel, Grace Hinshaw, Claude Davis, Jimmy Giridlian, Alek Korsakoff, Major Pam, Willie Mae Kell, Mrs. Leonard Swets, Frank Leach and a host of others. The continual exchange of bulbs, ideas, sources and cultural information has meant much. We could reminisce and write volumes and still not run dry.

Since I'm located in the Sacramento Valley I have to contend with wet, foggy winters and hot, dry summers. (Don't report me to the Chamber of Commerce.) Out of the over 100 *Crinum* species, plus a host of variants and synonyms which are listed in the "Crinum Bulletin" master index (*Bull. Louisiana Soc. Hort. Res.* 3(5):1-327. 1972), less than half a dozen species are suited to take outdoor, year-around treatment here. About twice that will do well in southern California and some three-fold about the Gulf or Florida.

The hardiest is probably *Crinum moorei.* It can thrive on neglect. The bulbs grow shallow enough that they don't drown out in a wet winter. But give it some summer water, and it makes a good background plant with its showy pale pink blossoms. Yes, the snails like *Crinum,* but use your *Crinum* as snail traps and don't let too much litter accumulate.

There are at least a half dozen *C. moorei* variants, most without names. It took me some years to realize that these variants didn't intercross, or the seed that set was normally parthenogenetic. So the plants from "seed" remains as a pure maternal line despite the bees or your own efforts. One often finds a small non-descript form in old gardens. I finally eliminated these as their semi-dormant conditions during midsummer was far from desirable; but not until I had used it to cross on the Cape *Amaryllis belladonna* var. *rubra-bicolour* to obtain the dwarf, red-flowered *X Amarcrinum* "Dorothy Hannibal'.

There are two, deep pink, late-flowering types. The variety

makoyanum from Natal sets quite a bit of seed which can be used in school science classes to demonstrate germination. The second is a large, bluish-pink which I finally found was tetraploid and was a potent breeder when its pollen was applied on other species. Next is the relatively tall form with flat, widely expanded, pale pink tepals. It's the form featured by I.C. Verdoorn as the type species. It sets few seeds.

Lastly, we have the white variety *schmidtii* which is sometimes listed as a separate species since it has a bifid stigma, in lieu of trifid. It's a good show plant for the garden and a fair breeder, but I never seem to have enough seed.

During the last few years I've had some showy, deep pink *C. moorei* forms turn up. All throw five foot foliage and scapes and are sterile or near sterile. So on tracing back the parentage I realized that they were throwbacks from a fertile tetraploid *C. moorei* x *C. macowanii* hybrid of Luther Burbank origin. From the glossy texture of the tepals (petals) I believe that most still have some *C. macowanii* genes present. Several will take on other *C. moorei* variants better than non-hybrid pollen and yield some interesting, near intraspecific, hybrids, including some with light red blossoms. *Crinum* 'Cecil Houdyshel' will also take their pollen.

Another hardy species is *C. bulbispermum*. The type species is the Orange River red-flowered, hexaploid form, called the 'Orange River Lily' in South Africa. It will inter-cross best with tetraploids, but the resulting red-flowered hybrids all look much the same due to the hexaploid dominance. *Crinum* 'Cape Dawn' was my best development. Unfortunately Marcia Wilson had all of my stock.

Then there is the old *C. bulbispermum* var. *album,* the diploid white-flowered 'Capense alba'. It's been used in untold *C.* X *powellii* and *C.* X *herbertii* crosses with *C. moorei, C. scabrum* and *C. zeylanicum* forms. Of late, several other *alba* variants have wandered my way. All cross readily with a number of species and hybrids. I wouldn't consider *C. bulbispermum* a good show plant but the hybrids are well worth developing. The old *C.* X *powellii cv. album,* with *C. moorei,* dates back to 1888.

A fourth hardy species is *C. macowanii*; at least some forms are hardy, as it has variants spread clear up into Tropical East and West Africa. There are both diploid and tetraploid forms and plenty of variation, many with tall floppy scapes. As a group the species rarely produces offsets, so seedlings must be grown and these take 8 to 10 years to flower.

Luther Burbank used several polyploids in his breeding program—in fact, Frank Leach did much of the pollinization for him pior to 1906 and all kinds of combinations were tried, even with *Hippeastrum,* gingers and

Canna. Parthenogenetic seed puzzled them. It had to be hybrid! Since the hybrids rarely produced offsets, sibling plants were produced to meet the nursery demand. Usually hybrids were sold in lieu of the species as the species' scapes are notorious for dropping to the ground. Most polyploid hybrids are fertile or semi-fertile; so a hodgepodge of throwbacks exists about Southern California. The true species has blossoms which resemble striped balloons just before the buds open, and the seeds are often striped, zebra-like, with light and dark areas. Crossing a polyploid form with the Orange River *C. bulbispermum* was the source of 'Cape Dawn'.

A fifth hardy *Crinum* is *C. yemense* from the 5000 ft. level in western Arabia. It has large, white, semi-campanulate blossoms and has often been considered a white *C. latifolium,* since the two belong to the same alliance. It is an excellent background garden plant as it is tall, with fairly clean foliage. It increases slowly and rarely sets seed; so it is scarce. Yet it crosses fairly readily and has potent pollen.

Another good *Crinum* often confused with *C. yemense* is *C. abyssinicum* from Ethiopia. It is lower in stature and has spreading foliage. It crosses readily with many Crinums, including most subtropicals and, like *C. yemense,* has huge seeds, indicating a high desert habitat, some 5000-7000 ft. This may account for its unusual adaptation to the Sacramento Valley climate. I have three variants, one with quite pendant blossoms. All self somewhat, but intercross with heavy seed sets and outcross with the least difficulty ever experienced.

One of my variants came from Burbank. Henry Nehrling describes it in L.H. Bailey's *Cyclopedia of Horticulture,* saying it wasn't too suited to the Florida climate. But obviously he and others used it as a breeder, since its foliage features show up in several hybrids. Cecil Houdyshel never listed it. I don't know why, because it's an ideal California plant. Its identity was lost about 1935 and it was only by chance that I recognized it last year. So it will be several years before *C. abyssinicum* seedlings are distributed. Still, there must be specimens scattered about Southern California. Look for a white-flowered *Crinum* with a stature much like *C.* 'Ellen Bosanquet', with droopy blossoms.

There are several hardy *Crinum* species in south Africa, which are endangered species, including *C. lineare* L. and *C. variable* Herb. Both grow 200 miles north of Cape Town. *Crinum lineare* has extremely slender foliage and semi-slender, white blossoms with bright red keels to the tepals. It is winter-growing here. We have no knowledge regarding its seeding habits or breeding possibilities, but its fountain-like, narrow foliage and bright flowers offer interesting possibilities. *Crinum variable* is a stream-side plant with much the same habits. The flowers open near-white but deepen

to a marked red. No specimens are known in this country.

Other hardy *Crinum* species are reported in Ethiopia and western Arabia, but with the unsettled political conditions, there is little possibility of specimens being obtained. But, there may be material of fair hardiness in the Kenya highlands.

As for semi-hardy species, one of the most interesting is the *C. flaccidum* from Australia, and particularly the yellow-flowered variant. *Crinum flaccidum* is to be found in scattered colonies across the entire continent and, although several species have been named, they are mere ecological variants and are far from distinct species. The semi-rare, yellow-flowered form from Pichi Richi Pass, near Port Augusta, South Australia, was found in 1960 (Plant Life 19:46-48, 1963; 20:40-41.1964) and investigated by Dr. David Symon of Waite Institute (Figures 1 & 2). I obtained bulbs four years later when visiting the location, but unfortunately the South Australian desert air is not as dry as Sacramento summer conditions, so the bulbs failed.

After my describing the location, Alan Lee of Murray Bridge, South Australia relocated the area and made plants available to Marcia Wilson. I'm inclined to believe they are adaptable to Southern California if protected from dry east winds off the desert. They grow perfectly in Texas. Alan Lee also located more yellow variants in Queensland recently, some 2000 miles distant from the original, and I saw other colored variants in 1964 near Quirinda, New South Wales. Many of the variants have rather pungent odors. Hybrids developed by William Morris have not been too spectacular but better material may be possible. The name, *C. luteolum*, which Dr. Traub proposed (*Plant Life* 21:96 1965 and 22:46-47 1966) appears to have no taxonomic or morphological distinction.

Crinum asiaticum forms are near legion, varying from the huge *C. procerum* nearly eight or nine feet tall, to small forms not unlike *C. japonicum*. Some of the more spectacular are the red-leafed, red-flowered forms, like variety *kaaawanum* (you pronounce each vowel separately in Hawaiian) or variety *splendens*. These tropical forms, along with the variegated ones, are on exhibition at the Waimea Botanical Gardens at Haleiwa, some 20 miles north of Honolulu, Hawaii. The *Crinum* garden there has about eighty species and hybrids and Keith Woolliams is always on the lookout for more species, particularly those which are endangered. Don't fail to go to the garden's field house area if you ever visit there. A few people have examples of these red-leafed Crinums in Southern California and the Gulf Region. When given a little water along the edge of a lawn, they are truly spectacular. In turn, the yellow variegated form was distributed from Beltsville by the USDA some years back. Some still exist

in cultivation.

Crinum xanthophyllum, the golden foliage *Crinum,* is a show plant in Hawaii, Fiji and Queensland. These regions' tropical soils are acid. Here it seems to lose the golden color; possibly acidifying the soils as one does for Rhododendrons, is the answer. It's been grown in the open in the Los Angeles area. Joe Werling can supply more information on this.

Crinum rattrayii, a member of the *C. gigas* group with the petioled foliage, as well as some of the other *C. gigas* (ex *Gigantea*) types, should grow well in Southern California. I grew several in the open here for some five years. The white tulip-like blossoms are quite spectacular. Leonard Doran reports the bulbs are to be found all over inland Peru and Brazil, although it is native to the Congo basin.

Crinum japonicum, a dwarf ally of *C. asiaticum,* is an interesting plant. It is hardy to Tokyo, Japan. I've crossed it with *C. americanum,* with some interesting results; so it should do well in Southern California and the Gulf Region. Possibly some nurseries who import from Japan can find a source. The USDA once had a supply.

Crinum submersum, a native to Rio Janeiro is fairly hardy, but wants near-swamp conditions. There is a continual debate going on whether it is a recent hybrid, as stated by Herbert, or a species, or an old natural hybrid. A field population survey about Rio Janeiro might settle this ongoing debate. The plant rarely produces offsets and fails to yield seed about the Texas Gulf. If, of a hybrid origin within the past two or three hundred years, then the Rio population would be limited. If a native plant, then a far greater population should exist. The vivid red stripes down the center of the white petals are quite striking.

Crinum americanum and the larger variety, *robustum,* are commonly found in the south. The white flowers and fragrance are well known, as is its habit to send out underground runners up to six feet long into lawn areas. It can be grown in Southern California if given ample moisture. My wet winters are a bit too much for it. It is a good breeder and seeds freely. Its allied forms, like *C. loddigesianum, C. cruentum* and *C. erubescens* of Central and South America, are much too tender to grow in drier inland areas so are only usable along the Gulf.

The same problems apply to many tropicals, like *C. scabrum, C. zeylanicum* and *C. latifolium.* These named species are all inter-related and, although grown for ninety years or more in Florida and the Gulf Region and crossed with many hardy species, like *C. bulbispermum var. album* to give some hardy hybrids of show quality, attempts to grow them under dry conditions are difficult. Our Californian Santa Ana dry winds can dehydrate these plants to the point of exhaustion in a matter of a few

hours. Humid greenhouse culture is possible, but a number of bulbs from around the Caribbean will not take bulb temperatures much above 100° F, thus there is a summer cooling problem to consider too.

Figure 1. (above) **Crinum flaccidum** from Salta, in the Flinders Range, South Australia.

Figure 2. (below) **C. flaccidum in situ,** Pichi Richi Pass, near Port Augusta, South Australia. Photo credits to Dr. David Symon, Waite Institute.

The above subtropical listing barely scratches the surface. I've tried a number with varying results. Finally in desperation, I boxed up a collection of the more difficult and sent them to Keith Woolliams. Keith and the Hawaiian climate have done wonders. Practically every *Crinum* finds the volcanic soil and climate near ideal, with one or two exceptions. *Crinum moorei* fails to flower, which may be due to the lack of a seasonal rest. The same problem occurs with a number of *Hippeastrum* species.

Ed.—Copies of the 1972 Issue of *Garden Crinum,* with master index of *Crinum* species are still available from the author, Les Hannibal, for $6.25 each.

A Report on Amaryllis Bulb Cuttage

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This is a comparison of five methods of cutting *Amaryllis* bulbs. I have tried all five of them and will report on them in reverse order of preference; i.e. the least liked first.

The first method is cutting the bulb just above the base and using just the base. This was a disaster, showing little or no growth. I planted in four pots. In the first pot, I planted the base in sphagnum moss using a fresh cut base. I left just the top of the base showing. This one did best, making a small amount of roots and small buttons of bulblets that might have been all right if the base hadn't rotted. In the second pot, I let the base dry for a week and then potted as in the first. Results were no better than the first. In pots three and four, except for using potting mix, bases were planted the same. Results were not any better. These pots were watered only when the soil looked dry on top. These and all other pots were placed under a green, fiberglass-topped patio and received only 2-3 hours of morning sun, plus filtered light the rest of the day.

The second method was the rather standard one of cutting the bulb into 16 slices. I planted half of these in sphagnum and half in potting soil. The sphagnum pots gave the best yield and results were reasonable in both but the tiny bulblets had to be handled like seedlings.

The third method began to show somewhat better results. A band of base was left across the center of the bulb, about two-thirds the diameter of the bulb. From each side of this band one sixth of the base was re-

moved, as in the first method, and planted. The results from these base pieces were the same, but the parent bulb also produced a flower, which was removed as soon as it cleared the bulb to induce offset production. It also produced four large offsets which were left in the pot until repotting 9 months later. This method retains the parent bulb and, since the flower bud in the bulb isn't cut, it may bloom. However, I do suggest removing it to conserve the bulb's strength.

The fourth method also produced both flower and large offsets, but the flower may be lost due to cutting into the top of the bulb. Six slices were removed as in the second method but care was taken not to cut above the shoulder of the bulb. As in the slice method, these were planted with their bases in both sphagnum and soil with the same results. The parent bulb was planted as if to flower in potting soil and a flower scape was produced. After removing the bloom, the bulb produced 4 large offsets which remained until repotting.

The fifth method, by far the best, produced 14 large offsets, again as large as 2 year or more growth of seedlings. All methods were done in early January and repotted in September. This method was reported by Leon Boshoff-Mostert of Balfour, Transvaal, South Africa (*Plant Life* 21:130-134. 1965).

In this method, a large dormant bulb is used. After cleaning and disinfecting, the top neck is cut off to remove foliage only. The bulb is placed bottom-up on the table and with a sharp knife the center of the base is removed, leaving a rim of three-eighths inches. A sharpened teaspoon is used to dig out the center of the bulb to a depth of 1½ inches. With the bulb still upside-down, a sharp knife is used to cut up to 16 slices to a depth of one-third the bulb. I made only six slices but 16 can be made easily. To prevent cuts from closing and healing, wedges made from tongue depressors are inserted into the cuts. It will help to insert your finger into the hole and press the cut open to insert the wedge.

To pot, place a thin layer of small gravel in the bottom of the pot and just cover this with sand. Next put in potting mix up to the level where base of the bulb would be if potted normally. Press the soil mix down to compact and place a small mound of sand in the center of the mix. Fill the hole in the bulb with damp sand and place on a mound of sand right-side-up. Press into the sand but not into mix. Fill the pot to the top of the cuts with sand and, finally, to the top of the bulb's shoulder with potting mix. Handle the bulb like any other expected to flower but do not expect too much as you have probably dug out the bud.

This method, because most of the bulb is intact with stored food for growth, gives the most success.

FRANK LEACH AND THE BURBANK CRINUM

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I became acquainted with Frank Leach in 1936 or 1937. We were both members of the Mount Diablo Men's Garden Club at Walnut Creek, Calif. I brought in some Ismene to show one evening and he spotted them at twenty paces. He knew his Amaryllis, and I came to find out he and his brother Abe had both worked occasionally for Luther Burbank prior to 1906. He often said: "My being short-sighted was a big aid in his pollination work, I could sneak up on the blossoms!" He had crossed the Crinums for several years. In fact, every possible combination was tried, with *Hippeastrum, Hymenocallis, Canna,* and you-name-it. Apparently a lot of the *Crinum* seed was parthenogenetic, which neither he nor Burbank could explain. But since Burbank had a score of species from van Tubergen, Arlington Worsley, Henry Nehrling and others, they did obtain a number of crosses. Preference was given to the larger blossoms, like *C. moorei, C. yemense,* and *C. macowanii,* since they made good garden background plants. The hybrids were not named, but were sold as a numbered type, with some few exceptions.

Since both Frank and Abe were dyed-in-the-wool plantsmen, they tried about everything that Burbank had. Frank's eyesight was such that he was in office work during World War I, then went to work for the Pacific Gas and Electric Company offices where he worked into public relations. Upon retirement he relocated out near Walnut Creek where I met him. His acre garden was quite a place. In addition, he could quote L.H. Bailey's *Cyclopedia of Horticulture* by memory. And he still liked *Crinum.* So between Frank and Willie Mae Kell, I became exposed to 'Crinumitis'. Most of my Burbank material came from Frank including a *C. abyssinicum,* which was only re-recognized a year or so back. In the past I've used Frank's nomenclature which he picked up from Burbank; in fact, he often visited with Burbank until the latter passed on. Around 1965 Frank's hearing went bad and he finally had to give up his home and garden. I visited him occasionally at his daughter's. He's probably still crossing *Crinum* upstairs now. He was a grand old chap.

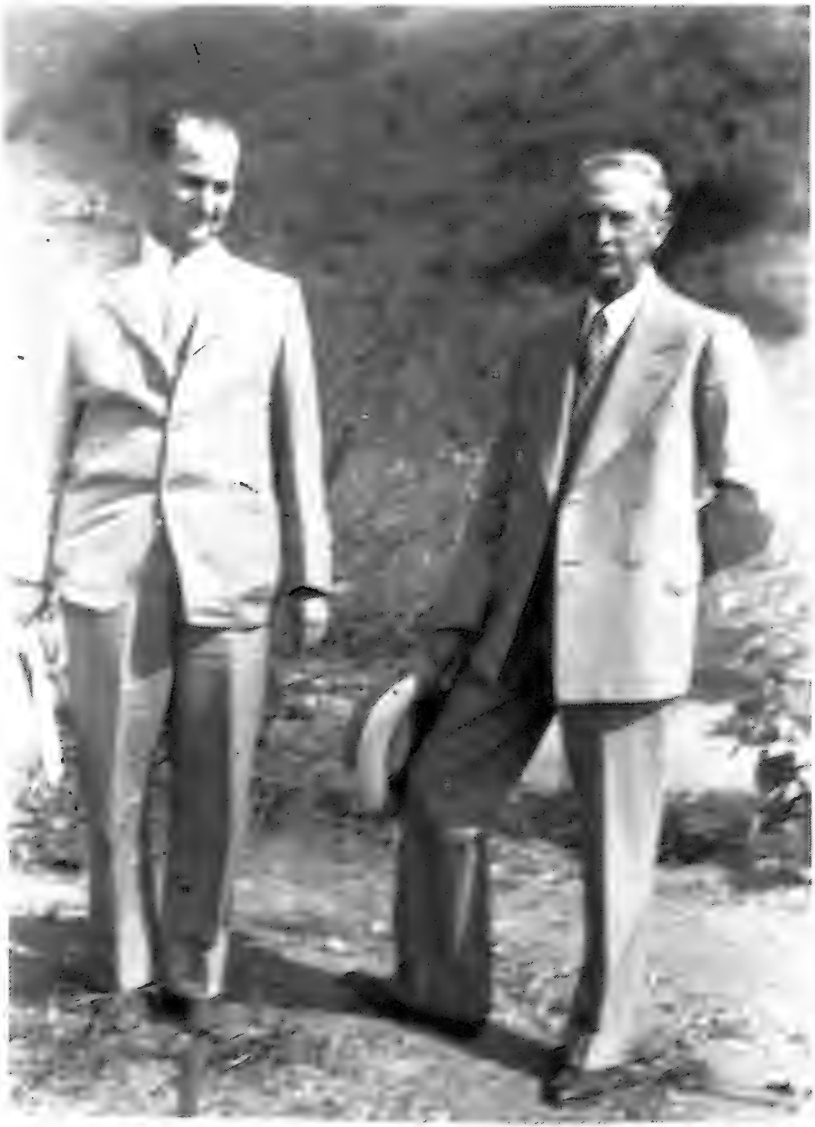

Figure 1. Hamilton P. Traub (left) and Frank Leach. Autumn of 1942. Photo credit: Les Hannibal.

Figure 2. Hannibal (left) and Frank Leach, 1943. Photo credit: Les Hannibal.

PARENTAGE OF H.B. BRADLEY'S CRINUM HYBRIDS

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Early in this century, H.B. Bradley of Sydney, Australia produced three of our most beautiful *Crinum* hybrids: *C.* 'George Harwood', *C.* 'Bradley Giant', and *C.* 'Bradley'. *Crinum* enthusiasts have speculated for years about the possible crosses that could have resulted in these fine plants. With additional knowledge gained this year from personal experience, I will try to explain what the crosses probably were. Proof of course can be had only by duplicating the crosses; but, due to clonal variations of both parents and offspring, exact duplication is not to be expected.

Dr. Thad Howard has maintained for years that *C. flaccidum* was involved in the *C.* 'Geo. Harwood' and *C.* 'Bradley' crosses. *C. moorei* characteristics are obvious in *C.* 'Bradley Giant' in bulb, foliage, and inflorescence. The *C.* 'Bradley Giant' that I refer to was sent to me by William Morris of New South Wales, Australia. This is not the plant described by L.S. Hannibal as a *Stenaster* X *Codonocrinum* cross resembling *C.* 'Ellen Bosenquet' with 25-30 light red blossoms. My plant is low and spreading with 5-8 wide-tepaled blossoms of the purest pink. There is not a hint of *Stenaster* genes in it.

This year for the first time I saw *C. flaccidum* flower. At the same time *C.* 'Geo. Hardwood' and *C.* 'Bradley' were also flowering. Observing the three it was obvious that Dr. Howard was right; *C. flaccidum* characters are present in these hybrids. The flower buds are bluntish and the tepals rather wide relative to their length. *C. flaccidum* has narrow leaves with finely serrated margins and a small flower with tepalsegs about one inch wide and two inches long, a width to length ratio of one to two. It should be pointed out here that all three of Mr. Bradley's hybrids have wide tepals relative to their length, a character enhancing their beauty. There are of course other *Crinum* species that share this character; for example, *C. macowannii* and *C. jagus,* but these species have flower shapes so distinctive that they can be discounted as possible candidates for parents of the hybrids in question. Since *C. flaccidum* is native to Australia we can assume that Mr. Bradley had access to it for use in his breeding program. As a matter of fact, this point has never been questioned. The next point is that *C.* 'Bradley Giant' looks so much like a superior *C. moorei* there should be no question about *C. moorei* in one of

its many forms including the white *C. schmidtii* being used in his breeding program.

Having established the fact that Mr. Bradley used *C. flaccidum* and *C. moorei* in his breeding program, let us now take a look at *C.* 'Geo. Harwood'. The flowers of *C.* 'Geo. Harwood' open well as is the usual case of hybrids between the sub genera *Platyaster* and *Codonocrinum*. The flowers and buds have a definite *C. flaccidum* look to them, but they are a medium dark pink. This color could not have been contributed by *C. flaccidum* because it exists only in white to yellow with possibly some brown-red forms. The leaves of *C.* 'Geo. Harwood' are similar to those of *C. moorei* in shape, rather narrow at the base, getting wider near the center, then tapering to a point. They are as wide as *C. moorei* leaves but a little longer. *C. flaccidum* has very narrow, strap-like leaves. I know of no colored *Crinum* other than *C. moorei* that could have contributed the leaves to *C.* 'Geo. Harwood'. The color of the *C.* 'Geo. Harwood' flower is well within the range of colors of other *C. moorei* hybrids. One last point: the leaf margins of *C.* 'Geo. Harwood' are less scabrous than *C. flaccidum* but more scabrous than *C. moorei* which has smooth margins. *C.* 'Geo. Harwood' having characters of both *C. flaccidum* and *C. moorei* and others intermediate, the conclusion is inescapable that it is a cross between the two.

Having concluded that *C.* 'Geo. Harwood' is a cross between *C. flaccidum* and *C. moorei* it now is easy to understand the parentage of *C.* 'Bradley Giant'. Remember that *C.* 'Bradley Giant' looks like a superior *C. moorei*. In leaf and bud it does not appear superior because the leaves are similar and the buds are smaller and somewhat blunt. But when the buds break the flowers open widely revealing the purest, clearest pink; the pink of the wax crayons little girls so deftly used in art class when I was a child. The wide-opening characteristic greatly contributes to its beauty. This character can be attributed to the platyaster genes in the cross. While there are these aesthetic differences in the inflorescence, including a slightly taller scape, (probably accounting for its name), the plant still looks like *C. moorei*. The bulb has a neck or pseudo-stem upon which grows a low, broad, spreading rosette of leaves, in keeping with the *C. moorei* character. But what would one expect of a plant that is three-fourths *C. moorei*? If *C. moorei* were pollinated with pollen of *C.* 'Geo. Harwood' (a back cross) a plant like *C.* 'Bradley Giant' would be anticipated. So we can conclude that *C.* Bradley Giant' = (*C. moorei* X *C.* 'Geo. Harwood').

Identifying *C.* 'Bradley' parentage presented some special problems. The flower appeared to contain *C. flaccidum* genes and *C. scabrum* genes, but I was never satisfied that these were all. This spring I flowered a cross

I made in 1976, *C. scabrum* X *C.* 'Bradley Giant'. The flowers in many ways resembled *C.* 'Bradley'. When the plant was one year from flowering, the foliage resembled that of *C.* 'Bradley' causing me to think that I perhaps had duplicated the *C.* 'Bradley' cross. While there were similarities there were differences; the same genes but different proportions. Both L.S. Hannibal (1970) and William Morris (personal correspondence) thought *C.* 'Bradley' was a cross between *C. scabrum* and *C. flaccidum*; Dr. Howard (1982) said it was a complicated mix of *C. flaccidum, C. moorei* (or *C. schmidtii*), and *C. scabrum*. Dr. Howard must have been right because I came close to duplicating it with a plant that was one-half *C. scabrum,* three-eighths *C. moorei* and one-eighth *C. flaccidum*. I believe that if we adjust the genes a little to one-half *C. scabrum,* one-fourth *C. moorei* and one-fourth *C. flaccidum* we would have the right combination for *C.* 'Bradley'. To get this combination, *C. scabrum* could be pollinated with *C.* 'Geo. Harwood'.

Crinum 'Geo. Harwood', being the pollen parent of the other two crosses, was the first of the three *Crinum* hybrids developed by Mr. Bradley. Since this plant produced an especially attractive flower, it seems only reasonable that he would use it in making additional crosses. He no doubt tried using it as seed parent to no avail; it produces no seed. Then he used its pollen and found it viable. Viability of the pollen has now been verified, as I now have seed maturing on *C. flaccidum* produced by *C.* 'Geo. Harwood' pollen. The compatibility of *C. moorei* and *C. flaccidum* was confirmed this year by Dr. Howard. He obtained seed from this cross but unfortunately he lost them due to bacterial or fungal infection; they just melted away.

LITERATURE CITED

Hannibal, L.S., 1970-71 Garden Crinums. **Bulletin: Louisiana Society for Horticultural Research**, III (5).
Howard, T.M., 1982. Advances in Crinum Breeding (Part II) **Plant Life** (38): 78-86.

A Crinum of Unknown Origin

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Since I was eight years old I have been fascinated with the idea of hybridizing flowers—especially, the genus *Crinum*. Not until I was 37, however, did this fascination become an obsession with me. It was then, in 1981, that I decided to collect as many *Crinum* species and hybrids as

possible, and to proceed with a very involved program of hybridizing. Since many *Crinums* must be obtained from rare bulb dealers, collectors, and enthusiasts (many in far-away places), the task I had set for myself was not to be accomplished in a short period of time.

The search began in Fresno, my home town. After digging many old *Crinum* plantings, some dating back 40 to 90 years, and a half-dozen broken shovels later, I had accumulated over 800 *Crinum* bulbs which were heeled in a temporary holding area of my garden.

One day, as I continued my search in an area of homes circa 1900, I came across a curious looking specimen. At first glance, the plant looked to be a *Crinum moorei,* until I uncovered the largest crinum seed I had ever seen. It was, approximately, the size of a tennis ball—actually measuring 7.6cm in diameter when I took it home (Figure 1). Obviously, this was not the seed of *Crinum moorei,* as I was certain that seeds of that species were much smaller. This enormous seed was the outstanding characteristic which prompted me to dig and bring specimens home for further evaluation.

In considering this odd seed development, I would judge that this plant (or parentages involved in its lineage) probably originated in an area subject to long dry spells between growing cycles. The only logical reason, in my opinion, for the development of seeds of this dimension would be one of survival. Large seeds, with their obviously larger storage capacity for nutrients and moisture would be more likely to be viable when favorable growing conditions returned. Smaller seeds, without the capacity for storage, as stated above, would shrivel and die during long dry periods.

I have, incidentally, observed in my own work that seeds 3.2mm to 6.4mm in diameter have, over a period of four years, produced plants as large as those grown from 7.6cm diameter seeds started at the same time. Therefore, since the size of the seed has no relation to the ultimate size of the plant, there would seem to be no other acceptable explanation for this development.

This particular group of Crinums had been growing in the same location for over 60 years under the most adverse conditions possible. The entire clump was so crowded that many were in varying stages of decomposition. The bulbs were of all shapes and sizes with those on the outside being nearest to their true form. They were growing, in fact, barely existing, in almost pure sand; no nutrients; very little water; and in almost total shade.

Removing the clump and planting it in rich heavy clay soil with generous amounts of leaf mold and compost incorporated into the planting bed, which was in full sun, resulted in a striking change in the

plant. As a matter of fact, it was a good thing I had marked the clump clearly when it was planted, as I could not recognize it when my plants emerged from their winter rest that spring. This plant's appearance had completely changed as compared with its appearance when I found and dug the clump originally.

Very often, an abrupt change of conditions of any kind; such as, rich soil, starvation, drought, or any drastic change of environment, can give rise to variations in growth. I had noticed this phenomenon before, and was pleased later, to come across an article written in 1909 by David Starr Jordan (Jordan and Kellogg, 1909) which paralleled, exactly, my own observations.

All of my Crinums under study are provided with a regular regimen of care. Watering is on a daily basis during the growing and blooming periods, especially during the heat of summer. A thick mulch of compost or humus is added to conserve moisture and to help promote a cool root run during the hot summer months. Plants were given osmocote controlled release fertilizer 14-14-14 once every two months. This product releases its nutrients at a constant rate with each watering. *Amway* First Prize Concentrated Plant Food 12-12-12 was also used once every other month as an alternative. Both products gave outstanding results in plant growth, color of foliage, and blooms. This particular *Crinum* is apparently not bothered by any pests or diseases—especially snails and slugs.

RELATIONSHIP OF TEMPERATURE AND HUMIDITY AT TIME OF FLOWERING

When the first scape emerged, I found the buds had much reddish pigmentation, suggesting a pinkish flower would be the result. As the flower grew larger, however, the reddish pigmentation began to fade, almost disappearing, leaving a glistening white, long-tubed flower. I waited with anticipation for this long-tubed bloom to open completely, but to my surprise it did not. In fact, the flower had no more than 5.1cm to 7.6cm of flare across the face.

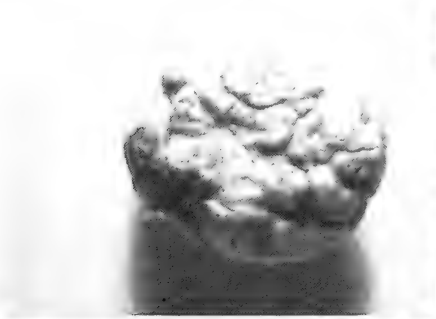
From observations made in 1981, 1982, and 1983, it is clear that temperatures and humidity at time of flowering have a great influence on the flare and color many blossoms will have. In our hot, dry, Central California summers, with low humidity and intense sunlight, many blossoms have very little flare, or refuse to open at all. The intense sunlight also tends to bleach the pigments, very often causing a pink flower to become almost white, whereas a wine red can be bleached to a light pink. When humidities are high and weather is cool, colors are much more intense and blossoms flare widely across the face.

When this crinum bloomed in the summer of 1981 (August 8 & 9), the temperature was 111° F in full sun. Humidity in afternoon was 10%. Blossoms had very little flare (5.1cm to 7.6cm). Most blossoms were destroyed by the sun before the first day was over. Few seeds formed when temperatures were in this high range. Stigma dried quite rapidly thus rendering them unreceptive to pollination.

Figure 2 shows flare of blossoms on July 31, 1982. The temperature at this time in Fresno was 106 °F. Humidity was 13.5% in the afternoon. Blossom flare was identical to those observed on August 8 & 9 of 1981. Again stigma was dry and unreceptive to pollination.

Figure 3 shows flare of blossoms on May 9, 1983 at 8 a.m. Temperatures ranged from 45 °F in the evening and early morning to 71 °F daytime. Humidity was 74% at 4 am in the morning and 39% at 4 pm in the afternoon. Note in Figure 3 that the blossoms have opened to 17.8cm in diameter. Plants at this time were forming seed quite readily.

After consulting several authorities in the Crinum field, I found that



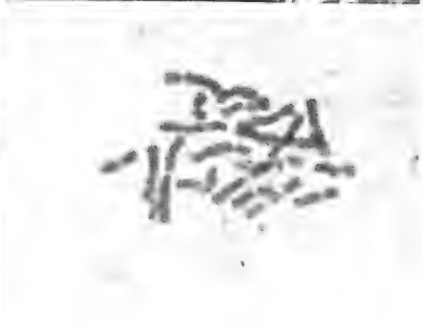


Figure 1. (upper left) Seed of **Crinum** 'Fresno', measuring 7.6cm in diameter. Photo credit to Tom Clark.

Figure 2. (upper right) **Crinum** 'Fresno', 31 July 1982. Photo credit to H. Kelly, Jr.

Figure 3. (lower left) **Crinum** 'Fresno', 9 May 1983, 8 am. Photo credit to H. Kelly, Jr.

Figure 4. (lower right) Photomicrograph of **Crinum** 'Fresno' root tip cell mitotic cell division. Photo credit to Dr. Frank Willingham, Jr.

no one knew the correct identity of this plant, nor had anyone seen anything like it before. One thought it might be a form of *Crinum yemense*. Another suggested it is a hybrid with yemense as one parent; yet, another stated it was a latifolium . . . then changed to *C. abyssinicum*, and finally that it was definitely a *C. zeylanicum* var. *album*.

Is this plant a hybrid or a species? Could this *Crinum* be a dry climate or desert type species? Is it a hybrid with one parent a desert species? These are the questions most frequently asked by those who have examined it.

Let's review the characteristics of the four species mentioned above:

CRINUM ABYSSINICUM

Description: *Bulb* ovoid, 7.6cm diameter, neck short. *Leaves* about six to a bulb, linear, suberect, 30.5cm long, 1.3cm to 2.5cm broad, narrowed gradually to a point, closely veined; edge scabrous. *Peduncle* moderately stout; 30.5cm to 61cm long. *Flowers* 4-6 in an umble; pedicels none or very short; spathe-valves green, ovate-lanceolate, 5.1cm long. *Perianth-tube* slender; curved 3.8cm to 5.1cm long; limb horizontal or suberect, 5.1cm to 7.6cm long; segments oblong, acute, 1.3cm to 1.9cm broad. *Filaments* 1.3cm to 1.9cm long; anthers linear-oblong, 6.4mm to 1.3cm long.

Hab: Mountains of Abyssinia first gathered by Schimper in 1838. Distinguished by its short stamens and short perianth-tube (Baker, J.G., 1888).

CRINUM LATIFOLIUM

Description: *Bulb* subglobose, 15.2cm to 20.3cm diameter; neck short. *Leaves* numerous, thin, lorate, bright green, 61cm to 91.4cm long, 7.6cm to 10.2cm broad; edge slightly scabrous. *Peduncle* 30.5cm to 61cm long. *Flowers* 10-20 in an umbel; spathe-valve deltoid, greenish, 7.6cm long; pedicels very short. *Perianth-tube* curved, greenish, 7.6cm to 10.2cm long; limb horizontal, about as long as the tube; segments oblong-lanceolate, acute, 2.5cm broad at the middle, faintly tinged with red in the center outside. *Filaments* declinate, 6.4cm to 7.6cm long; anthers linear, 1.9cm to 2.5cm. Style finally overtopping the anthers. Ovules 5-6 in a cell, superposed.

Hab: Widely spread in Tropical Asia.

C. longistylum Herb.; *C. moluccanum* Roxb., *Bot. Mag.* t. 2292; *C. speciosum* Herb., *Bot. Mag.* t. 2217; *C. insigne* Schultes (*Amaryllis insignis* Gawl., *Bot. Reg.* t. 579) seem all slight varieties of this species (Baker, J.G., 1888).

CRINUM YEMENSE

Description: *Bulb* ovoid 10.2cm to 12.7cm diameter; neck sheathed 30.5cm to 61cm long, 3.8cm to 5.1cm in diameter; bulb slow offsetting; *leaves* twelve to eighteen semi-erect, spreading, lorate, 5.1cm to 8.9cm wide by 61cm to 91.4cm long, unchanneled tapering from midpoint to an acute tip; and have a depressed midrib; scape 61cm to 81.3cm high; *umbel* six to twelve flowers, nearly sessile; *tepal-tube* is curved 10.2cm to 12.7cm long; flowers are well reflexed, waxy-white, trumpet-shaped, and are quite long lasting. *Seed* is quite large, 3-8cm to 6.4cm in diameter. The plant flowers in late summer and requires partial shade as foliage burns badly in full sun (Kelly 1983).

CRINUM ZEYLANICUM

Description: *Bulb* globose, 12.7cm to 15.2cm diameter; neck short. *Leaves* 6-10 to a bulb, thin, lorate, bright green, 61cm to 91.4cm long, 7.6cm to 10.2cm broad; edge slightly scabrous. *Peduncle* stout, about as long as the leaves, tinged with red. *Flowers* 10-20 in an umbel, fragrant; spathe-valves lanceolate-deltoid, reddish, 7.6cm to 10.2cm long; pedicels very short. *Perianth-tube* curved, usually 7.6cm to 10.2cm, rarely 12.7cm to 15.2cm long, tinged with red or green; limb horizontal, 7.6cm to 10.2cm long; segments oblong-lanceolate, acute, 2.5cm broad, bright red outside in the central third. *Stamens* declinate, about 2.5cm shorter than the segments; anthers linear, 1.3cm to 1.9cm long. Style overtopping the stamens. Ovules 5-6 in a cell. Fruit subglobose, 3.8cm to 5.1cm in diameter.

Hab: Widely spread in Tropical Asia and Tropical Africa. The commonest species in this section in cultivation, figured first by Commelinus in 1697. Var. *reductum* Baker, *Gard. Chron.* 1883, ii. 618, is a variety sent from Zanzibar by Sir John Kirk, with leaves 30.5cm to 45.7cm long; under 5.1cm broad low down, and a perianth-tube nearly twice as long as the limb. A plant from the Usagura Mountains (collected by Mr. Last), that flowered at Kew in June, 1887, does not differ materially from the Asiatic type (Baker, J.G., 1888).

Many assumptions have been made on the specimen I initially discussed, but to date its identity and origin remain unknown. Therefore, until the time arrives when we can properly identify this plant, I am proposing the name of *Crinum* 'Fresno'.

CRINUM 'FRESNO'

Description: *Bulb* is oblong and columnar with diameters of 10.2cm

to 15.2cm and has a very heavy root system. *Neck* 2.5cm to 5.1cm in diameter by 10.2cm to 17.8cm high. *Foliage* forms a low spreading rosette, is semierect, arching, semi-glaucous with slight undulation along margins. *Leaves* 7.6cm to 11.4cm wide tapering to an acute point and have a depressed midrib. The length is 45.7cm to 66cm. *Spathe-valve* 12.7cm to 17.8cm long, green in color, 10-15 blossoms. *Scape* 45.7cm to 61cm tall, does not flop, is green in color and is about 2.5cm in diameter. Blossoms have a close resemblance to those of *Crinum yemense* including tan coloring on backs. *Tepal-tubes* are also tan 5.1cm to 7.6cm long. Upon first emerging, flower buds have much reddish pigmentation which gradually disappears as flower opens completely leaving it a distinct glistening white. Floral pedicels from nil to 10-12mm diameter. Seed 5.1cm to 7.6cm diameter very similar to seed of *Crinum yemense*. A chromosome count of 2N = 22 was determined by Dr. Frank Willingham, Jr. of Research Farms, Houston, Texas, establishing *Crinum* 'Fresno' to be a diploid. Figure 4 shows chromosome count of *Crinum* 'Fresno', courtesy of Dr. Frank Willingham, Jr. (Kelly, 1981).

The plant has taken summer temperatures of up to 110 °F, in full sun and low humidity, with no adverse effects. It has also taken winter temperatures of between 25 °F and 28 °F for up to 10 days straight with no damage to bulbs.

Very often, when bulbs are subjected to such winter temperatures for prolonged periods, one or both of two things can occur. First, the bulbs will rot and perish; and, second, they can be severely set back to the point of not flowering for a year or two. Overall, bulbs of *Crinum* 'Fresno' appear to be extremely hardy in this area. Many bulbs have been distributed to different parts of the world. A report on their performance will be given at a later date.

Very little is known at present about *C.* 'Fresno's' potential as a breeder. The plant does possess two very good qualities that have already been observed. Its pollen is potent and strikes quite easily on many species as well as seed-setting hybrids and, second, it is free seeding. Many hybridizing experiments with this plant are well under way with over 500 hybrid seedlings now under propagation. Numerous seedlings are exhibiting much hybrid vigor. Several at one year of age already have foliage to 7.6cm wide, and 61cm to 91.4cm long, and trunks 2.5cm in diameter with very heavy root systems. Because of this extreme vigor and size in so short a time span, many of these seedlings are exhibiting traits which indicate they may very well be tetraploids.

Numerous crosses have shown traits exhibiting just the reverse of the above.

They are slow growing, often showing no more than 5.1cm to 7.6cm in a year. Many are extremely weak and perish shortly after germination, probably indicating that genetic incompatibilities are present. It is well known that making wide crosses with species that are far apart often results in very fertile plants; whereas, species that are too closely related may produce sterility or weak growing plants. The progress of this work, and later findings, will be reported in future issues of *Herbertia* when all seedlings now under propagation have flowered.

Acknowledgements

Special thanks and gratitude to Dr. Frank Willingham, Jr. of Research Farms, Houston, Texas for producing the chromosome count of Crinum 'Fresno'; and the staff of the National Weather Service office at Fresno, California for furnishing the statistics needed for this article.

Literature Cited

Baker, J.G., 1888, Handbook of Amaryllidaceae, J. Cramer Reprint 1972.
Jordan, David Starr and Kellogg, Vernon L., 1909. The Scientific Aspects of Luther Burbank's Work, A.M. Robertson, pages 3-15.
Kelly, Herbert Jr., 1983 **Plant Life** 39: 76, Description **Crinum yemense.**

An Introduction to the Genus Boöphane

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The genus *Boöphane* is one of the more interesting genera in the Amaryllidaceae. The name of the genus has been spelled several different ways. However, the authorized spelling is Boöphane, with each "o" being pronounced separately. The genus is not very well known and is in need of revision. *Boöphane* is closely related to *Brunsvigia* and both have their flowers in dense umbels.

In *Boöphane,* the umbels can have up to 100 flowers each and the leaves are usually hysteranthos, that is, they appear after the flowers. In some species, the bulbs are very large and I have seen more than one bulb with a diameter of 30cm. The huge bulbs along with the very interesting leaves, make this a very attractive genus even when not in flower. When the bulbs are through flowering, the pedicels elongate and the infructes-

cence rolls around in the wind like a tumbleweed. This serves to disperse the seed. There have been five species of *Boophane* that have been described from South Africa. Baker (1896) listed three in *Flora Capensis*. These species were: *B. longipedicellata, B. disticha* and *B. ciliaris*. I have never seen another reference to *B. longipedicellata*. Leighton (1947) described *B. haemanthoides*; and *B. pulchra* was described by Barker (1963). The last species to be described, was *B. flava,* which was described by Snijman (1983).

By far the most common and widespread species is *B. disticha* (Figures 1 & 5). This species is found in the summer rainfall region of South Africa and north to Kenya and Uganda. The flowers are red to pink and the leaves are distichous. The size of the bulb will vary depending on the type of soil that it is growing in. The large bulbs are usually found in deep, sandy soils. The bulbs are very toxic and the Bushmen use them for arrow poison. Some of the common names for this species are poison bulb and sore eye flower or gifbol and seeroogbloom in Africaans. The name, sore eye flower, comes from the fact that the flowers of this species emit a compound which will burn the eyes. The Shona of Zimbabwe use the bulb as a medicine to treat wounds, as do the Xosha of South Africa during their circumcision rites. It has also been reported that some tribes use a concoction made from the bulbs in instigate possession during initiation rites of new witch doctors. All of the other species are found in the winter rainfall area of the Western Cape as far north as Namaqualand and Southern Namibia.

Boophane guttata (Figure 2) is a species with small blackish-maroon flowers which is found in the South Western Cape. This species was known as *B. ciliaris* at one time. Unlike *B. disticha,* the leaves of this species lie flat on the ground and have maroon bristle-like margins as well as maroon markings on the undersides.

Boophane haemanthoides (Figures 3 & 4) was described from a small colony growing near Saldanha Bay in the Western Cape. Later a much larger colony was found growing further north near Hondeklip Bay in Namaqualand. In this species the leaves are upright as in *B. disticha* but they are twisted. This species forms large clumps of up to 20 bulbs which can be as large as 30cm each in diameter. The spath valves are red to pink and the flowers are yellow but turn pink with age. I have seen plants from two areas that are vegetatively similar to this species except for the fact that they were solitary, not cespitose. One of these was seen near Langsburg in the Little Karoo where I was looking for *Haworthia pulchella* in the mountains west of the town. The plants were growing among the rocks in very sandy soil on the flats and on the lower parts of the mountain. The bulbs were growing on top of the ground and were a magnificent sight. Some of them were up to 30cm in diameter.

Figure 1. (upper) **Boöphane distichia** inflorescence, light red in color. Photo by Guy Wrinkle.

Figure 2. (lower) **Boöphane** cf. **guttata**, near Drew, Republic of South Africa. Photo by Guy Wrinkle.

When I was in the Eilandia area further to the west, looking for *Haworthia herbacea,* I saw another population of *Boöphane,* again in sandy-rocky soil. These plants were very similar to the ones from Langsburg except for the fact that they were much smaller. Similar specimens have been reported from Swellendam and Bredasdorp.

Further to the east on the farm Zebra, near George, I found another *Boöphane.* Here I was looking for *Haworthia emelyae* and found the bulbs by accident as I had found the previously mentioned species. There was only one small group of about eight plants. The bulbs were quite small, being only 5-7cm in diameter. These bulbs may have been seedlings and a search of the area revealed no other specimens.

Even further east, at Port Elizabeth which gets rainfall all year around, another *Boöphane* was found. This species has leaves which are very blue in color and undulate. This species is very attractive and I can only hope that it will flower someday for me so that it can be identified or described.

Boöphane pulchra was described in 1963 and is one of the most beautiful of the genus. It was found near Garies in Namaqualand on an expedition to look for plants which might contain cortisone. This species appears to be quite rare and has wine red flowers with protruding stamens and red spath valves. The leaves lie flat on the ground, have red to white bristles on their margins and are spotted with purple on their undersides.

The last species to be described was *B. flava* from Namaqualand. This species was described by Deirdre Snijman in 1983. It is related to *B. guttata* and, like that species, has leaves which lie flat on the ground. The leaves have straw-colored bristles on their margins and red speckles on their under sides. The flowers are yellow with maroon anthers and they excrete copious amounts of nectar which attracts bees, ants, and butterflies. The effective pollinator appears to be bees. The plants have been found in various soil types from heavy clay to sand to coarse granitic soils. Unlike any other species of *Boöphane,* the bulbs of this species have a well developed neck of vertical segments with transversely thickened bands.

There is another *Boöphane* from the Nieuwoudvill area to the south of Namaqualand which also has yellow flowers. In this species the leaves are distichous and twisted like those of *B. haemanthoides.* The leaves of this species differ from those of *B. haemanthioides* in that they are wider and the leaves turn a plum color at the base when they are approaching dormancy.

Figure 3. (upper) **Boöphane** cf. **haemanthoides**, Namaqualand, Republic of South Africa. Photo by Guy Wrinkle.

Figure 4. (lower left) **Boöphane** cf. **haemanthoides**, Touws River, Republic of South Africa. Photo by Guy Wrinkle.

Figure 5. (lower right) **Boöphane distichia**, East Cape, Republic of South Africa. Photo by Guy Wrinkle.

In the southern part of Namibia to the north of Namaqualand *Boophane ernesti-ruschii* is found. Like *B. haemanthoides,* this species forms massive clumps. I have not seen the flowers of this species but the bulb scales are very different from those of any species that I have seen. They are very light brown and feel just like silk. I have been told that this species doesn't cross the Orange River (the border between South Africa and Namibia). However I have seen a single bulb in the collection of the Karoo Botanic Garden which is similar to this species. This bulb was collected in the northern part of Namaqualand which is not too far from Namibia.

In his article, Mr. Oliver (1981) states that, "It is almost impossible to remain rational when one discusses a genus such as *Boophane*." As this is a very exciting genus, I could not agree with him more. I find that the plants are very easy to grow as long as their dormancy requirements are kept in mind.

Literature Cited

Baker, J.G. 1896. In: Thiselton-Dyer, W.T. (ed), **Flora Capensis** 6:242-244.

Barker, W.F. 1963. Two New Species of Amaryllidaceae. **Jl. S. Afr. Bot.** 29:163-165.

Leighton, F.M. 1947. Plantae Novae Africanae. **Jl. S. Afr. Bot.** 13:59-61.

Oliver, W., 1981. The Genus **Boophane. Bull. IBSA** 31:5-8.

Snijman, D., 1983. A New Species of **Boophane** Herbert (Amaryllidaceae) from the North West Cape. **Jl. S. Afr. Bot.** 49:243-249.

The Enigma of Hybrid Nerines

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These extraordinary plants have always appealed to the greatest of horticulturists. I hasten to say that although they appealed to me at first sight as a schoolboy some fifty-five years ago, that is not the reason for the above declaration! For it was the author of the great Monograph on

the Genus *Lilium,* and father of so many fine plants, H.J. Elwes, who, at the end of the last century, laid the foundations for the modern development of the progeny of *N. sarniensis.* It was Lionel Rothschild, head of the famous bank of that name and in another branch of life one of the greatest breeders of ornamental plants of all time, who carried this development to previously undreamed of heights. It is recorded of Lionel Rothschild that he personally selected the crosses made in the great garden at Exbury, near Southampton, and that, in fact, he often performed the marriage ceremony himself. A substantial cultivation of hybrid Nerines was also carried out at Borde Hill in Sussex, another great garden where the Stevenson-Clarke family grew a very extensive collection of Rhododendrons, newly introduced from the Himalaya, and still do so. The Borde Hill hybrid Nerines, however, though sometimes of very high quality, were not nearly as numerous as those from Exbury, and the breeding does not seem to have been as systematically carried out. The Exbury Nerine Stud Book, now in my possession, reveals rather clearly the nature and aims of the Exbury programme. If anything similar exists at Borde Hill I am not aware of it.

Nerine bowdenii, the familiar pink Nerine species of the florists' shops, has had a world-wide commercial success. Yet, though beautiful, it is but a coarse thing by comparison with the last products of Exbury. The hybrids descended from *N. sarniensis,* however, have not yet succeeded in establishing themselves in the cutflower trade, and most surprisingly, in ornamental horticulture are still confined to a mere handful of enthusiasts around the world.

The reason for the failure so far of hybrid Nerines in the mass market for cutflowers is not obscure. Hitherto they have been slow to multiply: five to seven years from seed, and slow to increase at the root. Even the modern process of twin-scaling is commercially very slow. At the same time, unlike *N. bowdenii,* they vegetate in winter, and thus require heating in climates where there is frost, while they rest rather dry in summer and thus encounter problems out-of-doors in climates of heavy summer rainfall. In addition to this, their culture has been misunderstood and incorrectly stated in most of the books, and even with correct culture, it is difficult if not impossible to ensure 100% blooming from flowering-size bulbs. In spite of substantial research it is still not clear what triggers growth and flower formation in these plants, and variations of a month or even five weeks in blooming times, affecting the whole range of clones simultaneously, are a common occurrence. None of this is to the liking of commercial horticulture, nor is it likely to change except for the introduction of meristem culture, now being developed by Mr. Norris in

England. Even attempts to breed into the splendours of the hybrids some of the habits of life which have made *N. bowdenii* a commercial success, have so far given disappointing results. Some interest arose in Holland in developing these plants commercially during the last decade, but so far there are no known results of any value.

It is then to the private gardener growing his own plants for the love of them, that hybrid Nerines make their appeal, and it is most surprising that they are not more widely known in this context, in which their merits are as outstanding as their failings for commercial purposes. Their demand for heating is minimal. So long as they can be kept from freezing in winter, all will be well. They require very little space. I grow my specimen bulbs in 3½″ square plastic pots 5″ deep. A bench space 4′ square will thus accommodate about 180 plants, more than enough to provide a wealth of bloom from September to early December, when flowers are scarce. Being almost succulents by nature, Nerines easily forgive a dry spell, and if grown on a capillary bench with thermostatically controlled ventilation, and frost exclusion, they may safely be left alone for considerable periods. For four months in summer they can if necessary be abandoned altogether! The brilliant scarlet and orange colours are particularly welcome at a time of year when Chrysanthemums tend to dominate the scene, and the range of colours through sealing-wax to deep crimson, true pinks and lavenders to purest white, combine well together. They are an ideal plant for house decoration, since in their small pots they can simply be carried into the living quarters when in bloom, and taken out again ten days later. They bloom in succession, beginning with 'Fothergilli Major', often in August, and ending with 'Bennett Poe' in December.

These are essentially plants which demand and repay close individual inspection. The extraordinary brilliance of the colours is enhanced by the crystalline structure of the petals, which in sunlight gives to the scarlets the appearance of being gold-dusted, and to the pinks and whites of being silver-dusted. The elegance of the naked flower stem and inflorescence equally demands to be seen in isolation rather than in the mass. This perhaps explains why Nerines have always attracted the connoisseur who looks with a critical eye at the beauty of the indivdual plant, rather than of the gardener seeking a mass effect with something or other.

The cultivation of these plants took a giant step forward when Mr. Norris visited their native habitat in South Africa to study the conditions of their growth in nature. He established the fact that they grow in some of the poorest soils to be found anywhere. Applying this knowledge has had good results. The books generally advocate a growing medium of 'fibrous loam' and the use of fertilizers. I see that this was advocated by

Borde Hill (*Plant Life* 28:105 1972). This may be safe, though not beneficial, in the hands of an expert grower. However, it was common experience for growers of these plants to lose bulbs from rot and other causes from time to time, with consequent discouragement. When Mr. Norris published his results, I changed my compost to a mixture of sand and peat-moss in equal parts, and nothing else, and ceased to use any fertilizer. The results were excellent and loss of bulbs promptly ceased. I have now modified my mixture by the addition of about 10% poor garden soil and enough vermiculite to penetrate the compost. It is still too early to be sure, but I suspect this is the optimum mix. Foliar feed will do no harm, but all fertilizer at the roots which it is supposed to nourish can do no good and is dangerous.

The books commonly advise that the bulbs be left undisturbed, and this has been copied from one 'authority' to another and the assumption made that they resent disturbance. This is quite incorrect. The bulbs may indeed be left undisurbed for some years, but they may be potted on with impunity at any time if the root ball is not broken, and in the early resting period they may have the soil shaken out of the roots, the dead roots removed, and then be repotted, without any bad effects.

It is also commonly said that the bulbs should be kept absolutely dry during the resting period. They will indeed survive this without damage, but it is probably not the best treatment. My practice is to repot in late May or June, at the beginning of the resting period, in slightly moist soil. Subsequent examination of the plants shows that the roots develop slowly during the early summer, if they are given an absolute minimum of moisture. No doubt the ground in which the plants grow in nature retains minute quantities of water even during the dry season. Provision of a "shower" in summer about every three weeks results in my observation in a marked enlargement of the bulbs during the month of July. In my culture the pots stand closely packed on sand on a capillary bench. The bench is watered at the beginning of the growing season as the flower spikes appear, so that the pots take up water by capillary action. Full scale watering begins when the leaves appear, but although these plants need plenty of water in the growing season, this is conditional upon their having plenty of air as well, and it is advisable to let the surface of the pots become dry from time to time. So far as temperature is concerned they would much prefer to be cold and airy than warm and stuffy. When signs of a wish to rest appear in the form of yellowing of the leaves in April, watering is ceased, though during the four months of the resting season the bench is briefly flooded three times to provide a minimum of humidity. The plants tend to root into the sand, but this does not seem to matter.

The books are indeed right in saying that hybrid Nerines need ample ventilation at all times. A close, damp greenhouse atmosphere, that "tropical" feeling so much appreciated by the gardener on a cold winters day, is the worst thing possible. A fairly low relative humidity and good air circulation are ideal. In the open air and under glass in winter, full sun is desirable. But a baking under glass in summer is not beneficial though the dormant plants will survive it.

Now there is nothing more annoying than to read about interesting plants of fine quality which are absolutely unobtainable, and hybrid Nerines are not to be found in general commerce, except for 'Fothergilli Major', which was introduced to cultivation in the last century, and is worthy of a place in any plant collection. So I shall try to give some account of these plants as at present in cultivation.

Breeding at Exbury virtually came to an end with the death of Lionel Rothschild and the collection was sold in the last decade to Blackmore & Langdon, the English specialists in begonias and delphiniums. At the same time, by extraordinary good forutne, I managed to obtain an almost complete set of bulblets, often no more than pea-size, from a source near Exbury. These have been grown on to form the mainstay of my own breeding, and while a few famous Exbury plants are missing, and probably in fact out of cultivation, this is a near approximation to the best of the Exbury collection, excepting only the lost latest generation of as yet un-named hybrids mentioned below. (Appendix I)

Meanwhile, Blackmore & Langdon, finding like others before and since that these plants are a difficult proposition commercially, offered the Exbury collection for resale as a whole. Interest was shown in Japan, but no sale took place. Mr. Ambrose Congreve, of Mount Congreve near Waterford, Ireland then purchased all of the named hybrids but not the unnamed seedlings. These newest Exbury hybrids remained at the nursery. They were ultimately dispersed here and there in retail sales, and cannot now be traced: a minor horticultural disaster. So ended by far the most important development in hybrid Nerines.

Meanwhile, in New Zealand, Mr. Harrison, working from a very fine Exbury hybrid 'Alice', now lost to cultivation, raised a strain of plants from which he has selected a number of clones for naming. As the selected clones were the survivors of a very large number of bulbs planted in open ground, they are said to be much hardier and more vigorous than plants of English breeding. I cannot yet answer for their hardiness but about fifty of them have been on trial here alongside the Exbury plants. They contain several of very high qualtiy, are rather robust in constitution, and in the whites, which were the results of crossing several Exbury whites, they are

an advance on almost all existing hybrids. I know of no regular commercial source for these plants, but they are probably available in small numbers in New Zealand. In England, Mr. Norris, who is growing hybrid Nerines on a large scale, puts out a catalogue listing a small number of plants, and he is able to supply some others on request. As my own collection grows I am endeavouring to distribute as many clones as meet our standards of perfection to friends in Japan, the U.S.A., South Africa and elsewhere, in the interest of preserving these plants in cultivation, but I am not engaged commercially.

During the dormant season *Nerine* bulbs travel by post with impunity and withstand with fortitude the absurd treatment of Phytosanitary Authorities which exist in some countries.

In Japan, Dr. Shuichi Hirao, well known for his interest in Amaryllids, particularly *Lycoris,* and for his intergeneric crosses, has been raising some hybrid Nerines. The earliest to reach here produced a plant of top quality, rated by me xxxxx, and it is being bred with Exbury and Harrison products.

There are no established standards for evaluating Hybrid Nerines, at least none that I know of, though there is talk of a registration scheme in Europe which would certainly involve standard descriptions. The Royal Horticulture Society's awards, so reliable a guide in most genera, are only fairly useful here. Many of the finest Exbury Nerines never went before the Floral Committee at Westminster, and few members of the Committee had a wide knowledge of Nerines even when they did so. An RHS award, therefore, particularly the prestigious First Class Certificate, indicates a plant of undoubtedly outstanding merit, but it in no way indicates that such a plant is superior to one with no award at all.

For what my view is worth, the following are the points which make for merit:-

1. A well-arranged inflorescence in which the florets all display without gaps or crowding, to give an even hemispherical effect.
2. Broad petals in the floret, recurved and waved.
3. Numerous, but not too many, florets: about 14 is good.
4. Strong stem.
5. Good colour: a matter of taste.
6. Handsome stamens and stigma, sometimes of a contrasting colour, such as white on a pink flower.
7. Regular blooming habit.
8. Particularly early or late blooming.

In my own collection we have grown and evaluated some hundreds of named hybrids, and have ruthlessly discarded any which were superseded

by something better. What remains is about 200 clones which are either possessed of important characteristics for breeding purposes, or else are in their particular way of outstanding beauty and not surpassed by any other similar plant. With this breeding base I am attempting to do two things. First, to continue the Exbury line of breeding aimed at perfection of form, and second to combine the vigour of the Harrison plants, and in certain cases their colours, with the great elegance of form which was an outstanding feature at Exbury. The results of the past seven or eight years are now beginning to be seen, and this year, feeling that I had attained a fairly satisfactory grasp of the likely responses of various crosses, we have made over three hundred new crosses on a systematic basis.

The mechanics of breeding Nerines are extremely simple though patience is required. The choice of parents is carefully made when the plants are in flower. The selected plants are then brought into the living room away from visiting bees which are attracted through the wide-open ventilators of the greenhouse by the faint scent of the Nerines in sunlight. The anthers are then removed from the selected seed parent. An anther is then snipped from the pollen parent and the ripe pollen is applied to the stigma of the seed parent when it is receptive. The seed will ripen in about a month and is sown immediately on a compost of peat and sand, and not covered but just pushed into the mix. They should be sown in very small pots in which they will remain for at least a year without disturbance. In a warm but not hot room - my bathroom does very well - germination will be seen in about four weeks. First a radicle is put down and then a leaf is thrown up. Too much heat is probably harmful and the seedlings seem happy in temperatures of 50-60 F. They may be put undisturbed into the greenhouse and given the same conditions as the mature plants. During the first summer they may continue to grow if encouraged to do so, but thereafter they will take an annual rest. They can be given more space in a larger community pot each year until they are ready to flower. This will probably be five years if all goes well. Such is the quality of the best hybrids that it is unusual for any seedling from a well-selected cross to be downright unattractive. On the contrary, the problem is to harden ones heart to the point of discarding often very beautiful plants. But if the mechanics of breeding are simple, the genetics are not! Extremely little information is available as to the parentage of existing *Nerine* hybrids. The Exbury Stud Book is a great help but only covers a small part of the field. Of Mr. Harrison's breeding lines I know little. A few plants are polyploids, rather easily recognizable by their outsize proportions, and these are correspondingly somewhat reluctant parents. The original wild material from which these plants were bred is extremely limited in range of

colours, and doubtless advantage was taken of certain sports for breeding purposes. Perhaps for this reason wholly unexpected colours, resembling neither parent in any way, are apt to appear. While if the choice of parents is retricted to the very finest clones available it is unlikely that there will be disappointing results, the actual outcome is in the nature of a lottery.

Matters are further complicated by the absence of any standard descriptions of named clones, and there are not enough people with the necessary extensive knowledge of the material for it to be possible to determine which of three different clones under the same name is the "true" plant. Matters are not helped by the inability of existing colour photography techniques to reproduce the subtle and brilliant shades of colour which distinguish one clone from another. I speak with feeling, since, having been awarded two Royal Horticultural Society Gold Medals for my photographs of Tree Peonies, I have failed totally to get satisfactory pictures of Nerines.

Diseases of plants are by convention left to the last. There is probably virus latent in hybrid Nerines, and though it has never been a problem here with our warm days and cool nights, at 1,200′ on the southern slope of the Swiss Alps, it might manifest itself in plants under stress. However, it was a saying of Lionel Rothschild, that he never gave advice to other people on gardening, the reason being that conditions in their gardens were often different from his own. But on the other hand, an eminent authority of Rhododendrons when asked by me about the hardiness of some species of the *Maddenii* series, simply replied 'every plant is hardy until I have killed it myself'. This is sound advice. Plants are full of surprises and the only thing to do is to give them a trial under the nearest approximation that one can devise to the conditions of their native habitat.

Many years ago a substantial shipment of hybrid Nerines was made from Exbury to California to a private grower. I have no knowledge as to the fate of those plants. Possibly they are alive and well and if so are available for propagation. If this is the case it would be useful to know it. But if, as I suspect, it is not the case, and if there is any interest in these plants in the ranks of our Society, I shall be glad to make an annual shipment of bulblets to some central distribution point so that they may be given a trial.

Finally, I feel that it would be useful to know what hybrid Nerines are still in cultivation. I therefore append to this note a list of the hybrids growing here, and a list of new crosses made here. While I appreciate that these lists may not make exciting bedtime reading, for anybody undertaking work with Nerines they would form an invaluable guide for reference purposes.

APPENDIX I—HYBRID NERINES

Index	Variety	Rate	Raiser	Date
22531	Aachen	xxxx	Exbury	10/75
22573	Afterglow	xxx	Exbury	10/75
28500	Amalfi AM44	xxxx	Exbury	9/83
26983	Anne	xxx	Borde Hill?	8/81
26489	Apricot Shimmer	xxxxx	Harrison	2/81
22533	Argonaut	xxxxx	Exbury	10/75
26486	Aristocrat	xxxx	Harrison	2/81
17354	Arnheim AM 44		Exbury	10/71
22561	Athene 'best red'	xxxx	Exbury	10/75
28519	Bach			9/83
23302	Baghdad	xxxx	Exbury	9/76
22578	Balmoral	xxxxx	Exbury	10/75
23261	Belladonna	xxxx		9/76
22536	Ben Hills	xxxxx	Exbury	10/75
17531	Bennett Poe	NR	Poe	10/71
25120	Blanchefleur	xxxxx	Norris	9/79
26491	Bonanza	xxxxx	Harrison	2/81
26195	Bruges		Exbury	9/80
26484	Bushfire	xxxxx	Harrison	2/81
28512	Caliph		Exbury	9/83
26149	Cameo Beauty AM	NR	Norris	8/80
27914	Canasta	xxxxx	Exbury	9/82
23259	Cardinal AM 45	xxxxx	Exbury	9/76
26203	Carita		Exbury	9/80
26188	Carolside AM 60		Exbury	9/80
23260	Caryatid AM 42	xxxxx	Exbury	9/76
26199	Cassio	xxxx	Exbury	9/80
23255	Chantecleer	xxxx	Exbury	9/76
26512	Cherry Ripe	xxxxx	Harrison	2/81
27915	Chorister	xxxxx		9/82
28515	Clarissa			9/83
28513	Cleopatra		Exbury	9/83
26209	Comet	xxxx	Exbury	9/80
26191	Concorde		Exbury	9/80
26492	Crimson Cloud	xxx	Harrison	2/81
26500	Crimson King	xxxx	Harrison	2/81
17355a	Crusader A	xxxxx	Smithers	
17355d	Crusader D	xxxxx	Smithers	
23212	Curiosity AM 76	xxxx	Norris	8/76
23215	Cynthia Chance	xxxx		8/76
26198	Damascus		Exbury	9/80
28514	Dawn		Exbury	9/83
23301	Desdemona	xxxx	Exbury?	9/76
23216	Diana Wharton	xxxxx	Borde Hill	8/76
22568	Dolores f.salmon	xxxx	Exbury	10/75
25111	Dover	xxxx	Exbury	9/79
22538	Dunkirk AM 44	xxxx	Exbury	10/75
26497	Early Snow	xxxxx	Harrison	2/81
22552	Edith Amy AM	xxxxx	Exbury	10/75
26479	Elsje Hart	xxxx	Harrison	2/81
25112	Eve	xxxx	Exbury	9/79
26187	Fairylight	xxx	Exbury	9/80
28510	Falaise AM 47		Exbury	9/83
22553	Firecrest	xxxx	Exbury	10/75
25118	Flame	xxxxx	Exbury	9/79
26495	Flame Sensation	xxx	Harrison	2/81
22392	Fothergilli Major AM 67	xxxxx		9/75
22590	Foudroyant	xxxxx	Exbury	10/75
28509	Fred Wynniatt		Exbury	9/83
26514	Friendly	xxxxx	Harrison	2/81
17369	Glamour			10/71
26493	Glorious	xxxxx	Harrison	2/81

Index	Variety	Rate	Raiser	Date
27909	Guy Fawkes		Findlater	8/82
28171	H. 81 Soft pink		Hirao	11/82
28170	H. 81 Blood red, waved		Hirao	11/82
27035	H. 81a Pink tall		Hirao	9/81
27036	H. 81b Pink/blue late	xxx	Hirao	9/81
27037	H. 81c		Hirao	9/81
27038	H. 81d Rose pink		Hirao	9/81
27039	H. 81e December Pink		Hirao	9/81
27040	H. 81f Pure white		Hirao	9/81
27041	H. 81g Blood red, frilled		Hirao	9/81
27042	H. 81h Purple wide seps		Hirao	9/81
27043	H. 81i Salmon pink		Hirao	9/81
27044	H. 81j November Pink		Hirao	9/81
27045	H. 81k Majenta, frilled	xxx	Hirao	9/81
23210	H. Bright red	xxx	Hirao	8/76
23193	H. Dark red	xxxx	Hirao	7/76
24613	H. Pink large	xxxx	Hirao	8/78
24615	H. Purple, red rib	xxxx	Hirao	8/78
24619	H. Red late	xxxx	Hirao	8/78
24611	H. Rose large	xxxx	Hirao	8/78
24618	H. Rose, dark midrib		Hirao	8/78
23206	H. S.121	xxxxx	Hirao	8/76
23198	H. S.128	xxxx	Hirao	7/76
24620	H. S.128a	xxxxx	Hirao	8/78
23203	H. S.57	xxx	Hirao	8/76
23205	H. S.84	xxx	Hirao	8/76
24616	H. Wine, red midrib	xxxx	Hirao	8/78
28511	Hailstorm			9/83
22537	Hamilton	xxxx	Exbury	10/75
22547	Herga AM 42	xxxxx	Exbury	10/75
23249	Hon. Mrs. Wynne	xxx	Borde Hill	8/76
27916	Imp	xxx		9/82
22569	Inchmery Elizabeth	xxxxx	Exbury	10/75
23257	Inchmery Kate FCC	xxxx	Exbury	9/76
17360	Ingot			10/71
23256	Ispahan	xxxx	Exbury	9/76
26194	Iwojima	xxxx	Exbury	9/80
22595	Jarabut	xxxx	Exbury	11/75
17349	Jenny Wren	xxxx		10/71
26205	Joan	xxxx	Exbury	9/80
26185	Joan of Arc	xxx	Exbury	9/80
26197	Jocelyn	xxxxx	Exbury	9/80
26184	John Woolman	xxxxx	Exbury	9/80
17364	Ken Scott	xxxxx	Smithers	10/71
23221	Killi	xxxxx	Norris	8/76
22601	King of the Belgians	xxxx	Exbury	11/75
23209	Kumadori	xxxx	Hirao	8/76
23222	Lady Cynthia Colville	xxxx		8/76
25119	Lady Montague	xxxx	Exbury	9/79
23298	Leo	xxxx	Exbury	9/76
22571	Lionel AM + SanderMedal 47	xxxxx	Exbury	10/75
9476a	Louvain A	xxxx	Smithers	11/57
26516	Lovely Lady	xxxx	Harrison	2/81
26208	Maiden's Blush		Exbury	9/80
22534	Mariloo AM 54	xxxxx	Exbury	10/75
23226	Mary Tudor	xxxx		8/76
26499	Melody	xxxx	Harrison	2/81
22543	Mertoun	xxxxx	Exbury	10/75
17365	Miss E. Cator AM 24	xxxxx		10/71
23227	Miss Mary Shelley AM 97		Elwes	8/76
22606	Miss Moore	xxxx		1/75
22616	Miss Willmott AM 99	xxxxx	Elwes?	11/75
26190	Mithras		Exbury	9/80
23229	Mrs. Cooper	xxxx		8/76
28516	Mrs. Eddy		Exbury	9/83

Index	Variety	Rate	Raiser	Date
28518	Mrs. Goldsmith		Exbury	9 83
22612	Mrs. H. J. Elwes	xxx	Elwes	11 75
23293	Nan AM 69	xxxxx	Exbury	9 76
26196	Nancy Perth	xxx	Exbury	9 80
22592	Nell Gwynn	xxxxx	Exbury	11 75
22554	Nicholas v. Dawn PC60	xxxxx	Exbury	10 75
26182	Northaw	xxxx	Exbury	9 80
22593	October David		Exbury	11 75
17358	Optimist	xxxx		10 71
22545	Orange & Pink f.v.	xxxx	Exbury	10 75
27917	Orange Queen	xxxx	Exbury	9 82
22567	Pamela AM 60	xxxxx	Exbury	10 75
22597	Pantaloon	xxxx	Exbury	10 75
26511	Peach Beauty	xxxx	Harrison	2 81
28173	Pekin		Exbury	11 82
26201	Peter Barber		Exbury	9 80
26518	Pink Brocade	xxxx	Harrison	2 81
26490	Pink Distinction	xxxx	Harrison	2 81
26480	Pink Ice	xxxxx	Harrison	2 81
26488	Pink Opal	xxxxx	Harrison	2 81
22590	Plymouth AM 60	xxxxx	Exbury	10 75
22591	Pompadour	xxxxx	Exbury	11 75
26192	Rachel PC 53	xxxx	Exbury	9 80
26505	Radiant Queen	xxx	Harrison	2 81
26517	Reflection	xxxxx	Harrison	2 81
22539	Revlon	xxxxx	Exbury	10 75
22528	Rhodora AM	xxxx	Exbury	10 75
22564a	Rodacia A	xxxx	Exbury?	10 75
22564b	Rodacia B AM	xxxxx	Exbury	10 75
26494	Rose Summit	xxxxx	Harrison	2 81
22555	Rotherside AM16FCC68	xxxxx		11 75
26513	Royalty	xxxxx	Harrison	2 81
23232	Rushmere Star AM 66	NR		8 76
26982	Rushmere Victor			9 81
26519	Salmon Decor	xxxxx	Harrison	2 81
26483	Salmon Supreme	xxxxx	Harrison	2 81
26200	Salmon Trout AM 55	xxxxx	Exbury	9 80
22551	Simone	xxxxx	Exbury	10 75
26487	Snow Maiden	xxxx	Harrison	2 81
26186	Snowflake AM 11		Elwes	9 80
22560	Solent Swan	xxxx	Exbury	10 75
26490	Spectacular	xxxx	Harrison	2 81
23292	Spitfire	xxxx	Exbury	9 76
22557	Stephanie AM 49	xxxxx		10 75
22540	Susan AM 65	xxxx	Exbury	10 75
25525	Tangerine	xxx	Smithers	
17357	Timoshenko	xxxx	Exbury	10 71
26206	Tonga		Exbury	9 80
26204	Trafalgar AM 52	xxxxx	Exbury	9 80
26508	Treasure	xxxx	Harrison	2 81
22556	Vestal	xxxx	Exbury	10 75
22559	Victor AM	xxxxx	Exbury	10 75
26502	Virgo	xxxxx	Harrison	2 81
25121	Vivid AM 15	xxxx		9 79
22580	Wavebush	xxxx	Exbury	10 75
23291	Wellington Koo	xxxx	Exbury	9 76
22572	Wisley Bridesmaid	xxxxx	?	10 75
22529	Zambia	xxxxx	Exbury	10 75
22055	bowdeni Hera FCC 70	NR		4 75
22054	bowdenii Fenwich's var.			4 75
22055	bowdenii Hera			4 75
20586	bowdenii Hera			2 74
21559	bowdenii Pink Triumph			10 74
19119	flexuosa alba	NR		2 72
24138	flexuosa alba			10 77

Index	Variety	Rate	Raiser	Date
19119	flexuosa alba			12/72
17368a	salmon & blue	xxxx	Smithers	
19929	sanguinea	NR		4/73
19929	sanguineum			4/73
23160	sarniensis alba			4/76
27440	undulata			3/82
28172	undulata alba	NR		11/82
22549	zAlgarve x Afterglow	xxxxx	Exbury	10/75
22544	zFothergilli x Wellington Koo	xxxxx	Exbury	10/75
27541	zOctober David x Eddy	xxxxx	Exbury	11/75
22542	zTrafalgar x Inchmery Kate	xxxxx	Exbury	10/75
22548	zWellington Koo x Carmenita	xxxx	Exbury	11/75
28766	zzLL A	xxxxx		Coleb
28767	zzLL B	xxxx		
28768	zzLL C	xxxxx		

EXPLANATION OF COLUMN HEADINGS:

The *Index* column is the number in my plant 'day book' begun in January 1930.

Where no rating is given, the plant is still under trial. xxx indicates just sufficient merit to retain for further trial

In the absence of records I cannot be sure of all the *Raiser* attributions. Any corrections would be welcome.

The *Date* is the date of acquisition of the plant.

However, many plants long antedate the given time, since my collection was sent to the Royal Horticultural Society's Garden at Wisley, and offsets were reacquired from it in 1975-6, when I resumed growing these plants after an involuntary interval.

Nerine 'Nicholas v. Dawn', an Exbury hybrid. Photo by Sir Peter Smithers.

REGISTRATION OF NEW AMARYLLID CLONES

JAMES M. WEINSTOCK, REGISTRAR
10331 INDEPENDENCE
CHATSWORTH, CALIFORNIA 91311

1984 REGISTRATIONS

(The following "Amaryllis" registrations will be the last accepted for the South American material and hybrids. In accordance with international botanical consensus, the genus *Amaryllis* sensu Traub, and their hybrids are to be referred to the genus *Hippeastrum*. ed.)

Registered by John Wade Deme, Route 5, Box 236, Kinston, North Carolina 28501

Amaryllis clone **'Janet Nestor'** (Deme, 1983); **A-1052;** Scape height is 24", flower 6" across face, double white with red blotching on upper petals. Four to six blooms per scape above evergreen foliage. Bloom season: winter, spring, summer.

Amaryllis clone **'Fanny White'** (Deme, 1983); **A-1053**; Six-inch wide flowers on 20"-24" scapes. Flowers red and white with wide picotee on petals, to six per scape blooming winter, spring, and summer. Also a double with evergreen foliage.

Amaryllis clone **'Surprise'** (Deme, 1983); **A-1054**; Five inch, dark red double with white center on each petal. Scapes to 24", foliage is evergreen. Bloom season is spring and summer.

Amaryllis clone **'Yock'** (Deme, 1983); **A-1055**; Dark salmon double, 6"-7" across face on 20" scapes. Evergreen foliage. Blooming season is spring and summer but not fully determined. To six flowers per scape.

Registered by Hilda and Walter Latapie, 3737 Elysian Fields Avenue, New Orleans, Louisiana 70122

Amaryllis clone **'Lynn Latapie'** (Latapie, 1984); **A-1056**; Fragrant, 7" white double. Deciduous, April blooming. Vigorous grower with rapid increase. Bulb is globular (2" neck). Leaves are 1 5/8" straps. Spathe valves lanceolate, papery; long pedicel, heavy substance, and creped texture. Scape is 16 inches high.

Amaryllis clone **'Michele Latapie'** (Latapie, 1984); **A-1057**; Red-striped white double, 6-7" across the face, slightly fragrant. Inner throat is green, flower carriage horizontal, three per umbel. Deciduous, but foliage present for April blooming. Bulb is globular, scape 16".

Registered by Albert J. Bauman, 524 Oakdale Drive, Sierra Madre, California 91024

Crinum clone **'Christina Bauman'** (Bauman, 1983); Dull maroon scape arises from side of bulb 20" above ground to height of 50-60". Flowers number 20-26 per scape, deep pink in color, 4-5" across, blooming August to January. Asymmetric with top three tepals recurved and lower three straight. Anthers are yellow, fila-

ments very pale pink, and style wine red. Tunicate bulbs 6" wide at base of leaf whorl. Leaves are 4" wide, 4-5' long with entire margins and sharp points. Offsets one per year. Clone is a hybrid of *C. asiaticum* and *C. moorei* which first bloomed in 1979 from seed of 1967.

Introduced/Registered by Herbert Kelly, Jr., 2193 East Fremont, Fresno, California 93710

Brunscrinum clone **'Born Free'** (Kelly, 1984); Bigeneric cross of *Brunsvigia rosea* (seed parent) X *C.* X *powellii* var. *album* (pollen parent). Scape height range 50.8-76.2 cm, flower size across face 6.4-8.9 cm; evergreen foliage; very sweet fragrance, fine form, excellent substance on 15-20 faint pink to snow white flowers blooming from June to October.

CRINUM BUPHANOIDES WELWITSCH EX BAKER.

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POTEET, TEXAS, 78065

In the early 1970s Dr. T.M. Howard gave me a small bulb which he said was *Crinum buphanoides*. Since he often shared plants with me, nothing special was thought of it at the time. Being only an inch or so in diameter, I thought it was an offset from a mature bulb which I unwarrantedly assumed he possessed. The truth as it turned out was that about ten years earlier he had obtained from Robert D. Goedert, a bulb importer in Jacksonville, Florida, two of these small bulbs. When, after growing the bulbs for ten years they still appeared years away from flowering, he shared one with me. I planted this bulb under overhanging branches on the southwest side of a large live oak tree. This provided a steady supply of leaf mold to nourish the plant in otherwise pure sand. Here, under these conditions and twenty-seven inches of rainfall annually, the plant made steady growth. In June of 1983 the plant flowered for the first time. Note that it took twenty years from acquisition to flower. The age of the bulb at the time it was procured is of course unknown. In all this time not a single offset was produced.

J.G. Baker, in 1875, described the plant as having numerous white blossoms, and, in 1878, as having tepals keeled with red down the back. Imagine my surprise when pink buds began to emerge from the spathe; pink, not white and not keeled red. I wondered if this could be only a transient phenomenon and that these pink buds would open up displaying

white flowers. With Crinums this is not all that far fetched. That was not to be the case; the flowers opened with the same pink color as the buds, but perhaps a shade lighter. The flowers were small but opened wide to present a flat face. Typically, five flowers opened each night and started to decline about noon the next day. The flowers had a span of four inches with tepals one-quarter inch wide; not spectacular as Crinums go but interesting. As the flowers began to decline, they remained flat across the face and the tube remained rigidly straight. The edges of the tepals rolled inwards to form what vaguely resembled hollow tooth picks. It was only on the second day that they began to collapse and lose their rigid stance. Even then the tubes remained rigid. The plant produced two scapes this first season to flower, the first of which had nineteen flowers and the second, twenty-seven. Believing this plant to be rare in this country, I self-pollinated the entire first scape. At the time there was no way to know that a second scape would soon emerge. Within a few days seed pods were forming and in three weeks seeds were harvested. While the seeds were developing on the first scape I was pollinating the second with various pollens. Out of seven pollens tried only two struck. These were *C. scabrum* and *C.* 'Skyrocket', one of my own hybrids (*C. macowanii* X *C. moorei*). The *C. scabrum* cross resulted in many seed and the other only a few. The reverse of these crosses was also successful.

Crinum buphanoides

Over the years I have become quite fond of this rare and unusual *Crinum* with its light, glaucescent green leaves with undulating edges. The most striking feature though is the fact that the leaves are distichous, growing one above the other on opposite sides of the plant (Figure 1). Another interesting thing I have noted is that in the spring and early summer the leaves are pointing north and south, but as fall approaches the neck of the bulb rotates some forty-five degrees to cause all the leaves to point northwest and southeast. This phenomenon is no doubt an effort to re-orient the leaves to receive optimum light as the sun moves south. The puzzling thing though is that the plant does not lean toward the light, but seems happy under the overhanging branches of the tree.

L.S. Hannibal says in his book, *Garden Crinums,* that *C. buphanoides* is native to Angola, the Transvaal, and Kalahari desert. The origin of the plant I have discussed here is unknown. Considering that my soil is pure sand, there is no chance of my plant ever getting wet feet and in fact stays on the dry side. This might indicate that my plant is a desert species. But, since our high humidity and warm summer rains in south-central Texas have not caused any fungus or rot of the leaves, an entirely different origin might be indicated. Whatever its origin, I am glad that I have been able to grow it successfully. One final note: subsequent to giving me my bulb, Dr. Howard lost his; thus the bulb I have of *Crinum buphanoides* may be the only one left in this country, not counting its several seedlings which are just getting started.

CRINUM SUBMERSUM HERBERT AND ITS LOOK-ALIKES

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Confusion reigns concerning the identities of many *Crinum* species and hybrids. L.S. Hannibal (1970) addressed this problem at some length in his book on Crinums, and while he did an admirable job in eliminating much of the confusion, much still remains. This article concerns one of the principal causes, that many of these plants look very similar. *Crinum submersum* Herbert has many look-alikes. Their flowers all have curved tepaltubes and open widely to present a rather flat face of white tepals with a pale pink to maroon-red stripe. Pink stripes predominate but the intensity of the stripe may vary from flower to flower in the same umbel.

Normally the last flowers to open have darker stripes than the first. Foliage tends to light green, is suberect to erect, and succulent to a greater or lesser extent depending on the American parent. Erectness varies with cultural conditions (wet or dry), and crowding. Plants grown wet will be more upright than the same plants grown under dry conditions. A plant growing close to others or surrounded by numerous offsets will be more erect than the same plant when grown alone. Plants grown under good conditions, light, water, and soil will be larger in all parts than those grown under poor conditions. The number of flowers on a scape has not yet been observed to exceed eight, though this is probably not an absolute limit. Flowers last two or three, sometimes more days, standing up well in the heat. Typically, umbels are compact with several flowers open at the same time, extremely beautiful and fragrant.

William Herbert (1824) described his *Crinum* from Brazil, which he named *C. submersum,* as "*hybridum spontaneum*" and went on to state that it was a spontaneous mule from *C. erubescens* (var.) *braziliense* impregnated by *C. scabrum.* He also stated that in fourteen years it produced only one offset. In his description of *C. erubescens* (var.) *braziliense* he wrote, "Certainly the mother of *C. submersum,* which was found in company with it." There is no doubt whatsoever that Wm. Herbert considered *C. submersum* to be a hybrid and not a species. Therefore, until hard evidence is presented to refute Herbert's contention that the plant is a hybrid, it should be considered by all to be a hybrid. To date no such evidence has been presented. On the contrary, considerable evidence exists to support the contention of hybridity.

Crinum submersum Herbert

In the early 1960s Dr. Thad Howard purchased an unidentified bulb from Robert D. Goedert who had imported it from Brazil. The bulb did not thrive in Dr. Howard's garden, so he moved it to a large planter box kept constantly wet by the drip of an air conditioner. There the plant was happy, flowered annually and eventually produced one offset. About twelve years elapsed before the offset was produced. We do not know how many years it took for Wm. Herbert's bulb to offset, but we do know that only one was produced in fourteen years. In 1976 Dr. Howard gave the offset to me. It flowers each year but has not yet produced an offset. To form offsets more moist conditions will probably be necessary. Though brief, J.G. Baker's (1888) description of *C. submersum* fits this plant very well, as does Wm. Herbert's (1824) original description. Taking into account that the parent bulb was imported from Brazil, brings me to the inescapable conclusion that it is a hybrid very closely related to Wm.

Herbert's *C. submersum,* with one parent being *C. scabrum* and the other a native of South America and most likely *C. erubescens* (Figure 1). Since Wm. Herbert identified seven varieties of *C. erubescens* growing along the tropical eastern coast of South America, this is not a far-out guess.

That *C. scabrum* crossed with native American *Crinum* species produce flowers that look like *C. submersum* has now been proven by this writer and others. It takes more than a casual glance at the flowers of the different hybrids to tell them apart. The plant being discussed here and which I believe to be a clone of *C. submersum* can only be distinguished from some of its look-alikes by a combination of characteristics: at first, declinate but spreading stamens with a lateral spread of 1.75-2 inches; second, flowers usually opening two at a time; third, reluctance to produce offsets. No two of these characteristics is sufficient for identification of this plant, all three are necessary. While the spread of the stamens can be useful in identifying some flowers it can be tricky. The spread will vary with both age and tilt of the blossom, therefore it is imperative that this character be checked on a typical flower on the morning of the first day it is fully open.

C. X digweedii

The major imposter of *C. submersum* is an old Florida hybrid, *C.* X *digweedii,* with parents of *C. scabrum* and most likely a variety of *C. americanum,* native to the east coast of the U.S. (Figure 2). This is a very beautiful plant and is deliciously fragrant. *C. submersum* is just one of the pseudonyms it has been distributed under; others include *C. erubescens, C. fimbriatilum, C. kunthianum, C. grandiflorum, C.* 'Royal White', and more recently talked about by *Crinum* enthusiasts as *C.* "Pseudo-submersum". This plant can easily be distinguished from *C. submersum* by the curve in the tepaltube. While the total curve is about the same for both plants, the curve of *C. submersum* is gradual over about one-half its length and that of *C.* "Pseudo-submersum" is rather abrupt occuring in the top 1.25 inch. Other differences are: *C. submersum* seldom offsets and opens only two flowers at a time while *C.* "Pseudo-submersum" offsets prolificly, making a clump in two to three years and opens four or more flowers either the first or second night so that all flowers will be open in either one or two nights. Also, stamens on a freshly opened flower all cluster closely together.

Another *C. X digweedii* has more recently come on the scene with parents of *C. scabrum* and *C. americanum* var. *robustum.* This plant, produced by Dr. Thad Howard, is similar to the others except that it has a maroon-red stripe instead of pink. To date this is the only plant of the

Figure 1 (upper left) **Crinum erubescens** X **C. scabrum** = **C. submersum**

Figure 2. (center left) **C. americanum** X **C. scabrum** = **C.** X **digweedii**

Figure 3. (lower left) **C. loddigesianum** X **C. scabrum**

Figure 4. (upper right) **C. strictum** X **C. scabrum**

Figure 5. (lower right) **C. scabrum** X **C. cruentum**

All photos by Ollene Bundrant

group with a stripe other than pink. A select clone of this cross was named *C.* 'Stars and Stripes'.

C. loddigesianum X C. scabrum

This is the cross that started several of us thinking about and questioning the species status of *C. submersum*. Flowers of this hybrid at times look so much like the pink striped plants described above that by flower alone it would be difficult if not impossible to tell them apart (Figure 3). The plant though is larger, with leaves somewhat more spreading, and more succulent. Stripes may be light pink or dark pink and flowers may appear in spring or fall or both. (*C. submersum* and *C.* "Pseudo-submersum" normally flower only in late summer to fall.) This cross was produced by this writer and dubbed *C.* 'Sundance'. There are nine clones in the group. They vary in vigor, flower size, and intensity of stripe, but flower size and intensity of stripe vary with blooming period, spring flowers are darker than fall flowers. Size varies from a span of five inches to 9.75 inches and tepal width from 0.75 inch to 1.65 inches. While there is some variation between clones, other factors seem to play a larger role. If a bulb fails to flower in the fall it is more likely to produce larger flowers in the spring. Some clones produce offsets at a moderate rate while others have never offset.

C. strictum X C. scabrum

Several years ago Jim Bauml gave me a seedling of this cross. The seed parent at that time had been tentatively identified as a form of *C. americanum*. It was collected by Dr. Howard in southwestern Mexico. The plant was intermediate between *C. americanum* and *C. loddigesianum* and therefore re-identified as *C. strictum* Herbert. The Bauml hybrid seedling flowered in 1983 and, as expected from previous experience with crosses of *C. scabrum* and plants of what might be called the *C. americanum* alliance, it was another look-alike for *C. submersum*. The plant was still small and produced a scape with only four flowers, but they were typical of the group with curved tepal tubes and wide opening flowers with white tepals and pink stripes (Figure 4). The plant will have to grow older before more definitive information can be obtained, but to date no offsets have formed.

C. scabrum X C. cruentum

Another of my hybrids, this one is also a look-alike but can be distinguished by longer tepaltubes and paler pink stripe (Figure 5). Its first

flowering was 1983 so little more is known except that it does offset freely. Because of the longer tepaltubes the umbel on this plant is less compact than the others. This is a beautiful plant, as are all in the group, and as the bulb matures it should improve to become even more striking.

C. loddigesianum X C. "Pseudo-submersum"

Another of my hybrids now of flowering size though yet to flower should be included because the foliage is so similar to that of the pollen parent as to be indistinguishable from it. The leaves are light green, erect, and flop back in the top few inches. Also, this plant fits the group in that it has only American *Crinum* and *C. scabrum* in its heritage. As such it is expected that its flowers will be pink striped to fit the pattern of the others.

In conclusion it should be pointed out that none of the hybrids mentioned above have ever produced a seed. While it is generally believed that the pollen of all these hybrids is fertile, the only hybrid definitely known to have been produced using this pollen is the last one discussed. Since *C. submersum* looks similar to so many hybrids of known parentage it seems obvious that it is one of the group and even though it is a natural hybrid, a hybrid none the less.

LITERATURE CITED

Hannibal, L.S., 1970-71 Garden Crinums, Bulletin: Louisiana Society for Horticultural Research, III (5)
Herbert, Wm., 1837, **Amaryllidaceae**
Baker, J.G., 1888, Handbook of Amaryllidaceae, J. Cramer reprint, 1972
Herbert, Wm. 1824, **Botanical Magazine** t.2463

CLIVIA HYBRIDS

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Some years back I received a yellow-flowered *Clivia* from the Transvaal of South Africa. This clone had relatively narrow *C. miniata*-type foliage. Its propagation has not been easy and it has flowered on only a few occasions when it displayed light butter-yellow tepals. Like several other yellow-flowered forms, the plant is completely self-sterile. However,

it has crossed readily onto several broad-leafed, garden hybrids and a variegated form (apparently *C. striata*) with no difficulty. Seeds have been distributed to a half dozen individuals and, of late, I've received reports back about these F-1 crossed hybrids. Most have grown vigorously.

In theory, the initial F-1 cross either way of a yellow X orange-flowered plant should be a light orange, but some seedlings have been orange-red. On selfing these F-1 hybrids or intercrossing siblings, about 25% should revert to the recessive yellow, or on backcrossing with the parental yellow, about 50% of the seedlings should be yellow. These yellow throwbacks should be self-fertile, and, thus, break the existing breeding barrier for further yellow-flowered forms from seed. The following results have occurred thus far.

John Cage's F-1 plants were particularly free flowering with bright orange-red blossoms and produced offsets quite rapidly. A twelve-inch pot with a half dozen crowns often produced at a time several scapes during the fall and winter. With Cage's retirement, the seedlings were sold along with his show *Hippeastrum* plants. Possibly someone in the Los Angeles area may know of this stock. If so, the material is well worth selfing, as it has excellent potentialities, both for quality flowers of good form as well as for possible yellow flower color.

William Morris, in Australia, reports flowering and selfing several F-1 seedlings. They were obviously deep orange in color but their F-2 seedlings yielded several plants which are red-pigment-free about the leaf base. He has asked if this signifies that they will be yellow-flowered. This sounds plausible, as the yellow parent is pigment free. Mr. Morris now plans to cross all of his seedlings with a second, yellow-flowered clone which is available in Sydney, New South Wales. It may be necessary to store pollen from one or the other source if flowering periods do not match up.

Crosses of my yellow-flowered form onto a variegated *Clivia,* which appears to be *C. striata,* as mentioned, has resulted in an unexpected yield of slightly variegated seedlings. Whereas *C. striata* selfed seedlings have deep, yellow-linear striations on the leaves, most of the seedlings from the crossings merely show mild striations of medium and dark green. These light striations apparently follow Mendel's law, so the variegated parent appears to represent a specific genetic form. Selfing of these hybrid seedlings or backcrossing may regain a few with the deep yellow striations.

Clivia x *cyrtanthiflora* (*C. nobilis* x *C. miniata*) appears to be an easy cross to effect. I have grown the old Van Houtte cross for years but rarely have seed developed. Wallace Lane has made a number of duplicate crosses and has obtained some well-formed, vigorous plants with shorter foliage and light orange blossoms, in lieu of the deep orange-red shadings

Clivia miniata var. **flava,** from an offset from South Africa, probably Mr. Gordon McNeil found the original plant in the wild. Photo from American Plant Life Society collection, photographer or source unknown.

of the Van Houtte form. The Lane hybrids set seed freely and this suggests that there are interesting possibilities of future F-2 or higher hybrids with more diversification. If my memory is right, one *Clivia* parent has 22 chromosomes and the other 18, thus *C.* x *cyrtanthiflora* should have 20. If so, the back crosses would have 19 or 21 chromosomes, which suggests sterile forms; but selfed seedlings circumvent this by having 20 chromosomes which permits some fertility.

Clivia culture can either be difficult or no-effort-what-so-ever. The secret is that the root systems enjoy crowding, but need ample aeration. Neither do they like to be disturbed. So in potting a plant, use a small pot. Fill the pot part with a good loam, work the root tips into the loam, then fill in under the root crown and around the roots with fine gravel or scree sufficient to hold the sheathed stalk upright. Normally a fine moss will form about the semi-exposed or ventilated roots. I suspect that symbiotic soil bacteria are involved which aid the plant growth; thus air circulation and humidity are needed for its benefit. In the wild, most *Clivia* grow over moss covered rocky outcroppings, and in the case of *C. caulescens,* the plants often grow in trees, along with other epiphytes in the cloud-moistened areas. *Clivias* are normally considered shade plants but several hours of morning sun appear beneficial. Frost should be avoided.

If propagation information is desired on seed culture, leaf notching for bud sports or root cuttage for sucker growth, then these methods used by commercial growers will be taken up at a future date. Most *Clivia* growers use these methods but I am not certain if the home gardeners are aware of them. Then too, I hope to have more information on the Gordon McNeil *Clivia* x *Cyrthanthus* hybrids, as well as several other wide bi-tribal crosses which he seems to have been successful in attaining.

Large Yellow Amaryllis Hybrids

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The early part of this work is detailed in an article in *Plant Life* 36:19-23, 1980. Many of the yellow and pastel colored hybrids resulting from 'Senorita' and *Amaryllis evansiae* pollinations make nice additions to any glass house, and are particularly charming in the early winter months when most of them bloom. They have the ability to quickly fill a pot with bulbs which often bloom simultaneously. They make a never-forgotten sight.

One of the crosses resulting from these pollinations is #339-17 which is a four-flowered yellow of acceptable size. Several plants of this clone have been given out and it is liked very much. However, the main object of this hybridization work was to obtain a yellow clone of good vigor with flowers similar to the Dutch types. This was largely realized when 'Yellow Pioneer' was developed, the name 'Pioneer' being chosen deliberately. It is one of the first in its field, but not quite up to the ideal flower we had in mind.

'Yellow Pioneer' (Figure 1) started the season early by blooming in December 1982, a perfect flower; but it left some doubt as to which season the flower really belonged. It was pollinated with some of last season's pollen which had been kept in the refrigerator, but no seeds resulted.

The Aulicas were quite striking this past Fall, and on into February. They grow outdoors at the edge of the patio, and are subject to all of the vagaries of the weather. This past year the weather must have been quite to their liking. They went dormant in September but threw up big rosettes of leaves the last of October, and flower scapes shortly thereafter. The weather was cool in November and the flowers developed slowly, but when they opened, they were seven to eight inches in diameter. They are a mixed lot, all Aulicas, but the coloring ranges from almost all red (very vivid) to almost all green with the different clones. Aulicas are easy to grow and produce some fine hybrids (see Dr. Thomas Whitaker's article: *Plant Life* 38:95-96, 1982.

One of the hybrids is *A. aulica* X *A. yungacensis;* a large vigorous grower that usually blooms early in the year with a large, attractive flower. Several years ago Mr. Robert Goedart of Jacksonville, Florida gave me an Aulica hybrid cross of parentage unknown to me, that has eight inch flowers and wide segs. It is of a fine, dark red color and blooms in December. It has a lot of "hybrid vigor". Mr. Sterling Harshbarger made a cross of *A. aulica* with *A. fragrantissima* to produce a medium size, trumpet-shaped flower with red-tipped segs and a good fragrance. It blooms in November, which of course shows its Aulica inheritance.

A. yungacensis blooms in January or February usually. It has a six to seven inch flower with a chartreuse throat, the green extending out almost half the perigone, at which point there is an area of dark red on each side of the seg, with a narrow line of green running between them on to the tip of the seg. Each seg is colored in this manner, and the segs are fairly uniform in size. It is a very pretty flower and makes some very pretty hybrids, often with the dark red of the tips being the dominant color of the hybrid. Crossed with *A. belladonna* var. *plena* forma *albertii* it gave a very pretty

double of normal *A. yungacensis* size and coloring. *A. yungacensis* would be a good subject for extensive further crossing.

'Yellow Pioneer' bloomed again in March, and had a third scape the last of March, each with three flowers about eight inches across the face, and a nice yellow color with no red showing as the flower aged. The larger bulb produced the best flowers that have been seen so far. However, even though the flowers seemed to be normal in every way, they would not set seed. In the past this clone has been noted for its fertility with almost everything. The crosses were admittedly a little far out, as with *A. brasiliensis* and 'Double Beauty'. This followed the pattern set by other clones, where, despite repeated efforts, few seeds resulted. This was especially true with species, where, in a few cases, pods formed, but when they ripened there was nothing but chaff inside them. It was very cool this Spring in Southern California, frequently cloudy, and rainy. This is quite a different condition than is experienced normally, and may account for the poor results in seed setting obtained. In the normal warm, sunny days, pollination succeeds in a high percentage of cases, and it is quite a shock when so many fail.

A good scape of yellow flowers (R.H.S. Colour Chart 10B—Barium yellow) was obtained from #772-1 (Figure 2) ('Yellow Pioneer' x (*A. evansiae* x *A. papilio*)). Brief mention was made of the *A. evansiae* x *A. papilio* clone in *Plant Life* 1981 page 11, last paragraph. The color was referred to as yellow, almost a gold with heavy red markings. This cross was made in the hope of adding some of this gold color to 'Yellow Pioneer', and some success was evident as the yellow color was intensified and no red lines came through. The scape had four, very stylish flowers about 7 inches in diameter. Barium Yellow is the deepest yellow color that I have ever obtained. The clone is not as robust as 'Yellow Pioneer', but it grows well.

In prior articles on hybridizing yellow amaryllis, those who have read them were asked to offer suggestions about future work on this project. Several persons, including Dr. Traub and Dr. W. D. Bell, have suggested using a large Dutch type with considerable green and some yellow. It was also suggested to use a Dutch type with a yellow throat. A green and yellow clone was obtained from Dr. John Cage which has been registered as 'Irish Summer'. It is a large, lovely flower that opens a deep chartreuse color, and gradually becomes white with some yellow remaining in the throat. It would not accept pollen from 'Yellow Pioneer', but its pollen set seed on 'Yellow Pioneer' and several of its siblings. Large pods with good seeds resulted.

Mr. Daan Barnhoorn of the Hadeco Co. of South Africa visited me

Fig. 1 (upper). **Amaryllis** 'Yellow Pioneer,' #591-1.

Fig. 2. (lower). Barium yellow flowers of Amaryllis seedling #772-1 ['Yellow Pioneer' X (**A. evansiae** X **A. papilio**)].

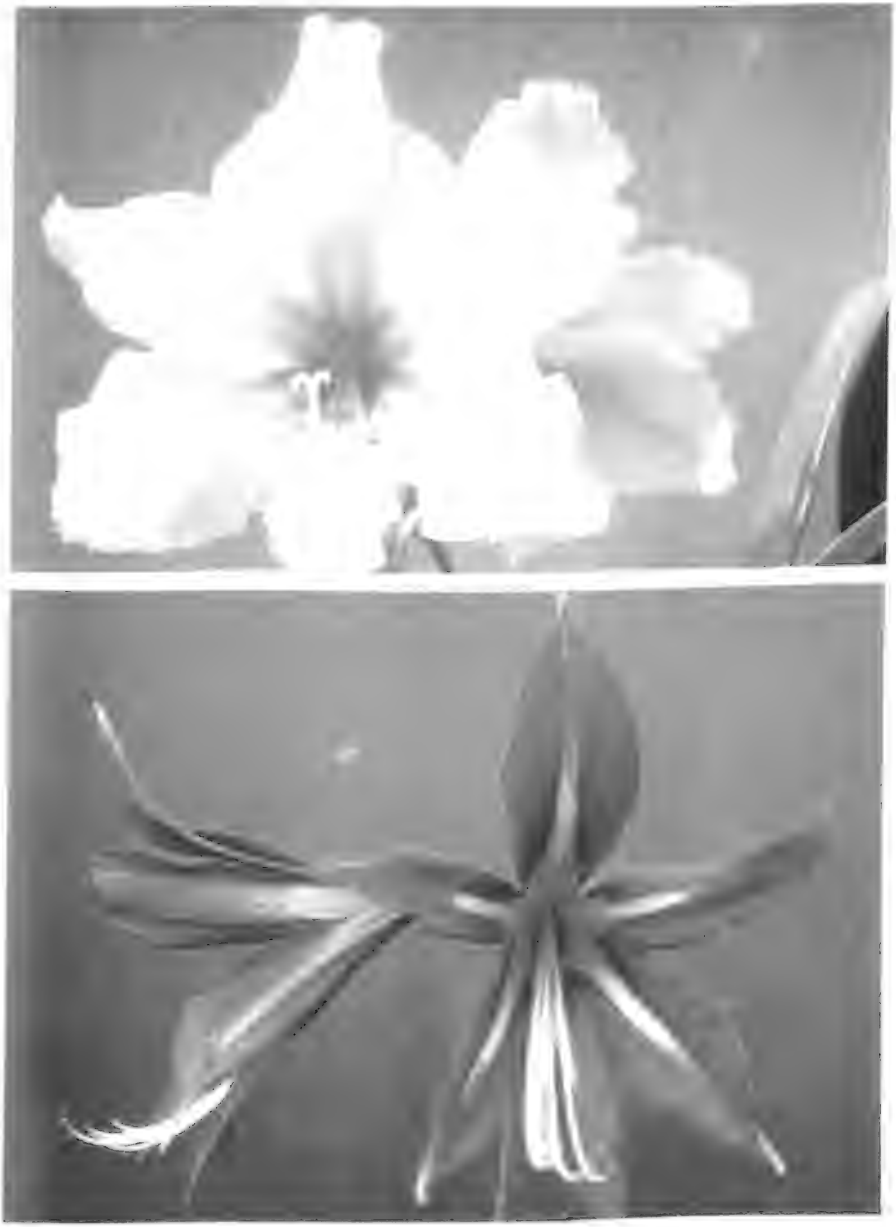

Fig. 3. (upper) Inflorescence from irradiated seeds of clone # 1222-2, having 10 inch diameter flowers of yellow turning to white.

Fig. 4. (lower) **A. cuzcoensis.** Photos by C.D. Cothran.

to talk about Amaryllis, and in the course of the conversation Mr. Barnhoorn suggested that irradiation had been used by them to secure desirable mutations of some bulbous material. On his return to South Africa he sent a procedure for this irradiation. The procedure and seed were sent to Margo Williams, Horticulturist at the U.S. National Arboretum, Glenn Dale, Maryland. She arranged for the irradiation of the seed, grew them for an interval, and then sent the small plants on to me. They had been very well grown and the plants were beautiful. On arrival here they were potted in plastic gallons, three to five bulbs per pot. They were then placed in the glass house.

Margo Williams reminded me that gamma-ray induced mutations do not as a rule show up in the plants grown from the irradiated seed, but rather in the F_1 generation by selfing or crossing among siblings.

A few of these plants bloomed this year, but did not prove to be self-fertile or fertile among siblings. The blooms were a little astonishing, even though they were just reflecting the combination of 'Yellow Pioneer' and 'Irish Summer', and not the effects of the irradiation. Some of the blooms exceeded ten inches in diameter, flat, round (type A) with yellow, green, and a trace of pink. One sibling had four, eight inch flowers on a stout, twenty inch scape. The flowers were yellow with some pink veining, the yellow fading to white as the flower aged (Figure 3). Pollen from this sibling did not set seed on another. Many hybrid Amaryllis will not set seed for a season or more, but will finally set seed freely. It is hoped that this will be the case with these. It is interesting to note that all of these plants have grown much more vigorously than plants from the same seed not irradiated.

The trumpet-shaped, fragrant hybrids were lovely this year. Some of these fragrant hybrids are too robust, taking up a large area in the glass house. Some of the smaller ones are more to my liking. 'Sweet Delight' is one of the smaller ones with fragrant trumpet-shaped blooms of medium size with bright red patches on the bell. It is a cross of a small red Amaryllis hybrid (Doran) and *A. fragrantissima*. A cross of *A. belladonna* ('Tisch') with *A. fragrantissima* produced some fragrant, red marked flowers of medium size. They are slightly difficult to grow, but lovely when they bloom. It is suggested that some of the fragrant species should be crossed with some of the four-flowered *A. belladonna* hybrids to obtain small, four-flowered, fragrant plants.

The colors and markings of some of these trumpet hybrids are quite interesting. A few have come pure white, like their *A. fragrantissima* pollen parent, and others are almost completely red. Some have red only on the outer part of the bell. Some 'Sumac Pinini' hybrids have purple,

reticulated veining, varying from very strong to barely visible. Fragrance, in general, varies from none to as much as the parent (*A. fragrantissima, A. braziliensis*). The fragrance is best, and can be appreciated most, in a warm, humid atmosphere as in a glass house. When the plants are in bloom and the door of the house is opened, the fragrance is immediately perceived.

Most of these clones go dormant, losing all of their leaves, and usually blooming from bare bulbs. After the leaves die down the plants are often very slow to start growing after they have bloomed, so slow in fact that one begins to wonder if they are ever going to start again. This is a characteristic of *A. fragrantissima* also. It sits dormant for weeks until one is sure that it is going to die, but it finally makes a beautiful rosette of leaves and grows well.

Quite a few of the trumpet-shaped flowers were pollinated, but very few seeds resulted. Many days were cloudy, and the thermostat was set for a minimum of 52° F. to save fuel, and I have observed before this year that seed set is often poor in cool, cloudy weather.

For several years all of the pollen available from 'Double Beauty' has been used on large red and white Dutch Amaryllis. Some good red doubles have appeared, and also some good white doubles. Some of these have been almost as good as "Double Beauty", but they have been very slow in producing offsets. More doubles are expected over the next few years, and it is anticipated that there will be good doubles in a range of colors from dark red to pure white.

A species new to me bloomed this year; *A. cuzcoensis* Vargas, as described in *Plant Life* 31:32, 1975. The scape had two flowers of very bright red with a white star in the throat. It is good size and such a bright color that it stood out in the glass house. The bulb seems to be one of those difficult ones to grow. It decides when it will grow and when it will stay dormant. Ending the dormant period, it puts out a leaf for a few inches and then stops growing for days or weeks. The only sign that anything is happening is that a tiny offset may push out and grow vigorously, and then finally the main bulb starts growing.

Several new species of Amaryllis have recently come from Peru and Chile, and other areas, and we await their distribution and blooming with great interest. We should have some lovely new species hybrids in the next few years, and these should give great impetus to the Amaryllis hybridizing hobby. Caryn Ecker, Fred Myers, Bill Gielow, and Bill Baker have collected Amaryllis in South America, and among the species collected is *A. bukasovii,* and others not presently known. Reports on their collections, and hybrids from them should be very interesting.

THE PERUVIAN SPECIES OF THE GENUS AMARYLLIS (AMARYLLIDACEAE)

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"Though I have not devoted my efforts to the discovery of gold mines, dear reader, nor have I searched for treasure of silver, commodities so desired and sought after, which would have made my country prosperous; nonetheless, I hope my contributions in the discovery of the sound treasure of herbs, trees and other plants that nature offers free of violence for our most necessary uses will be beneficial in other ways."

J. GERARD

Since the last valid publication of *Amaryllis belladonna* by Linnaeus in *Species Plantarum* in 1753, more than one hundred *Amaryllis* species have been published. Macbride (1936), in his monumental work on the flora of Peru, points out nine species for Peru. This paper documents the presence of twenty, three of which are described herein as new.

INTRODUCTION

My botanical explorations, most of which have been carried out over 40 years in southern Peru, have given me much satisfaction, with very interesting and valuable findings which have helped clear up several confusing issues. In regards to the genus *Amaryllis,* I have been collecting living material for about 15 years for a research project on the genus.

Numerous field observations have cleared up several points on distribution, as in the case of *A. leopoldii.* The discoverer of this species, Pearce, incorrectly cited its locality as Peru. Its type locality is in Bolivia, where, after more than one hundred years, it has been rediscovered by several collectors, among them, the late Dr. Martin Cardenas, of Cochambamba, Bolivia. I found it for the first time in southern Peru in the area around San Juan del Oro, Prov. Sandia, Dpt. Puno. Conversely, I have not yet found *A. pardina* Hook. f., which has not yet been collected in Peru, but has in Bolivia. For the purposes of this paper I must dismiss the validity of any citations of *A. pardina* from Peru, as cited by Macbride (1936). Similarly, *A. elegans* Sprengel. (syn. *A. solandriflora* Lindley.), to date has not been collected in Peru, in spite of my repeated searching in

the regions cited for it by Herrera (1941). This lead me to believe that it had been under cultivation when collected and has since disappeared. *A. elegans* is frequently mentioned in relation to regions north of Peru, i.e., Brazil, Venezuela, Colombia and the Guianas. It has not yet been found in Bolivia.

Finally, another species cited by Macbride (1936) and Traub (1958), *A. vittata* L'Herit. var. *vittata,* has not been located in Peru, but in Bolivia. However, *A. vittata* var. *tweediana,* has been found in the northernmost part of Peru.

METHODS AND MATERIALS

The classical method of morphological comparison has been followed in the preparation of this paper, using the latest principles of taxonomy. Material deposited in the Vargas Herbarium (CUZ) has been consulted as well as material borrowed from various institutions. Regarding these bulbous, geophyte plants, living material has been collected as often as possible from which a cultivated collection has been gathered and appropriately labelled in my garden at Urubamba, situated at 2850M, north of Cuzco, in the Holy Valley of the Incas, i.e. Willcamayu. Thus, data have been collected in opposite periods of the year, between May and September in consecutive years. Moreover, there is an organized collection of colored photographs which are included in my photo collection. Hence, using living vegetative and floral material, it has been possible to obtain useful data regarding the variability of populations of more than 40 or 50 plants. Likewise, experimental research has been carried out, the results of which have clarified concepts as to intraspecific variability. In this way, hybridization and the raising of progeny have been conducted, especially with species of *A. variegata,* the results of which will be discussed later in this paper. Finally, pollen observations have been made by Mr. Thanikaimoni of the French Institute, Pondichery, India. My observations of pollen were based upon material supplied by Mr. Thanikaimoni.

GEOGRAPHIC AND ECOLOGICAL DISTRIBUTION

The Peruvian species of *Amaryllis* are distributed througout Peru, with a marked concentration in the southeastern region, diminishing rapidly toward the north (Figure 1). The Neotropical region and the Amazonian Domain are havens for *Amaryllis* species. In general terms, the genus is concentrated in Brazil, Bolivia, Argentina, Chile and southern Peru. Very few are found in Central America. The species, *A. belladonna*

and *A. reginae* are widely distributed in Peru, the latter from as low as 500M in the forest zone, up to 3400M with the former. These prefer rocky soils, rich in humus, and good drainage. Other species, such as *A. forgetii, A. miniata, A. leopoldii, A. intiflora, A. machupijchensis,* and *A. traubii* occur as high as 2300M.

Figure 1. Distribution of **Amaryllis** in Peru.
A - **A. belladonna**, B. - **A. bukasovii**, C. - **A. cuzcoensis**, D - **A. leonardii**, F - **A. ferreyrae**, G - **A. forgetii**, H - **A. hugoi**, I - **A. argentina**, J. - **A. miniata**, L - **A. leopoldii**, M - **A. macbridei**, N - **A. intiflora**, O -**A. oconequensis**, P - **A. machupijchensis**, R - **A. reginae**, S - **A. fusca**, T - **A. traubii**, V - **A. vittata**, Y - **A. variegata**, Z - **A. condemaita.**

ECONOMIC AND ETHNOBOTANICAL USES

From the time of the Incas, flowers generally had a very important place in many different activities. Plants were always present not only as simple ornamental or aesthetic elements but as symbols of respect, submission, eulogy, etc. Flowers played a significant role both in life and in death. On the "Keros", ceremonial vases of the Incas used to initiate agricultural customs, are illustrated offerings of various flowers including the *Amaryllis,* to the kings, high authorities, the sun and to the mother "Pacha", etc. Likewise, other species were involved, such as *Cantua buxifolia,* the sacred flower of the Incas; *Salvia biflora,* Nujchu; *Fuchsia,* etc. It is important to note that the family and other social events, such as the ceremony recognizing the arrival of puberty, or in "Warachico", wherein winners were crowned with flowers of that time, as symbols of victory; and in "Mallcoy", a ceremony designating a change of age, distinction or rank.

In the specific case of the Amaryllis, its vernacular name in some regions of Dept. Cusco is "Aputojto", which translates as a person of superior rank. In Prov. Calca it is called "Aputika", flower of God, and finally in the neighboring Dept. Apurimac, the term "Guayanay" is used, to be translated as "flower of lovers."

Presently, due to their large flower size and brilliant colors, Amaryllis are appreciated as decorative and enjoy considerable commercial exploitation. Hundreds of varieties, mostly developed through hybridization, have been cultivated or are now available commercially. For this reason the Amaryllis have gained considerable preference, leading to the large increase in their cultivation in Europe, as well as in the American continents. While their cultivation and propagation are relatively easy when bulbs are used, propagation is very difficult by means of seed or hybridization, which requires more than two years to produce the first flower.

SYSTEMATIC TREATMENT

The morphological features used in this paper are among those already known. However, it is convenient to point out other infrequently used terms, such as the form, size and color of the star (aster), which can be observed inside and outside the tepals or, better yet, in the entire perigone which makes up such segments. I consider the length of the tepaltube to be of taxonomic importance. At this point it should be pointed out that long tube length is uncommon in the Peruvian species, the majority having short tubes of 6mm or less in length. Using the interspecific classification proposed by Traub (1983) the following key is proposed, including that to the subclasses:

KEY TO THE PERUVIAN SPECIES OF **AMARYLLIS**

A. Perigone trumpet-shaped, (Subgenus **Macropodastrum** Baker.)

B. Tepaltube 7-15cm long, inflorescence 4 to 9 flowered (Group Longitubae) ..... 1. **A. argentina**

BB. Tepaltube 2.5-6cm long, inflorescence 2 flowered (Group Brevitubae) ..... 2. **A. condemaita**

AA. Perigone not trumpet-shaped

B. Paraperigone absent or, if present, rather inconspicuous and not incurved; consisting of hairs, bristles, or scales at the throat.

C. Stigma trifid, the limbs 2mm or longer (Subgenus **Lais** (Salisb.)Baker.) ..... 3. **A. vittata var. tweediana**

CC. Stigma trilobed, 2mm or shorter or capitate ..... (Subgenus **Aschamia** (Salisb.)Baker).

D. Stamens distinctly fasciculate, leaves 2-4.5cm wide

E. Tepaltube 6cm or longer

F. Tepals 4-5cm wide ..... 4. **A. miniata**

FF. Tepals 3cm wide ..... 5. **A. reginae**

EE. Tepaltube 4cm or shorter

F. Pedicels 8-9.5cm long, paraperigone absent ... . 6. **A. ferreyrae**

FF. Pedicels 5-7.6cm long, paraperigone absent ... . 7. **A. belladona** var. **belladonna**

DD. Stamens somewhat spreading, leaves 1.5-1.7cm wide..... ..... 8. **A. traubii**

BB. Paraperigone present, incurved, partially or wholly closing the throat

C. Stigma trifid, the limbs 2mm or longer ..... (Subgenus **Omphalissa** (Salisb.)Baker.)

D. Tepaltube 8-12mm long

E. Perigone 12-14cm long, white star in throat ... . 9. **A. hugoi**

EE. Perigone 10-12cm long, segs dark red

F. Star large, 2-3cm of tepaltips white, inflorescence 2 flowered 10. **A. bukasovii**

FF. Star essentially lacking, flower orange-red, inflorescence 4 flowered .... 11. **A. intiflora**

DD. Tepaltube to 6mm long ..... 12. **A. forgetii**

CC. Stigmas three-lobed, the limbs 2mm or shorter or stigmas capitate (Subgenus **Cephalaeon** Traub.)

D. Perigone with obscure dark netting ... 13. **A. fusca**

DD. Perigone without netting

E. Perigone white or rose

F. Perigone rose-colored 14. **A. oconequensis**

FF. Perigone white, suffused with rose .... 15. **A. macbridei**

EE. Perigone red, crimson, vermillion or ochre predominantly

F. Perigone regular with white aster in throat . ..... 16. **A. leopoldii**

FF. Perigone irregular, aster greenish

G. Tepaltube 8-10mm long ..... 17. **A. machupijchensis**

GG. Tepaltube less than 8mm long

H. Style shorter than the tepalsegs . ..... **18. A. leonardii**

HH. Style as long or longer than the tepalsegs

I. Tepalsegs 9-10cm long, 2.5-3cm wide, star large, encompassing almost the entire perigone ..... 19. **A. cuzcoensis**

II. Tepalsegs 12cm long, 3-4cm wide, star small, flower color variable, from solid red to mostly red dotted ..... 20. **A. variegata**

SYSTEMATIC TREATMENT

I. Subgenus **Macropodastrum** Baker.

1. **Amaryllis argentina** (Pax)Ravenna.

Synonyms: *Crinum argentinum* Pax.
Amaryllis immaculata Traub & Moldenke. Amaryllis Manual, Traub (1958)
Hippeastrum candidum Stapf, Bot. Mag. 153, Pl.9184, 1927
A. candida (Stapf.) Traub & Uphof, Herbertia 5:123-4, 1938
H. tucumanum Holmberg. Anal. Mus. Nac. Cienc. Buenos Aires, Ser. 111, 5:153, 1905

Description: Leaves numerous, 55cm. long, 4.6cm. wide; scape 50cm. in length and 1.8cm. thick, glaucous; umbel of 9 flowers, perigone white, pendant, tepaltube 10cm. long; androecium inserted, anthers yellow, 7 mm. long at dehiscence; style about as long as the tepals, stigma trifid and white.

Material Examined: Peru, Prov. Tarma, Dpt. Junín, Vitoc at 1400M, Vargas 4802. The specimen was obtained from the Botanic Garden, Lima, Peru from bulbs which were collected at Vitoc.

Distribution: The first and only known locality for this species in Peru, which otherwise ranges to Tucumán, Argentina.

2. **A. condemaita** Vargas et Perez, sp. nov.

Floribus longe buccinatis, perigonio 14cm longo, tubo tepalorum 2.5cm longo, atrorubro, segmentis tepalorum 11.5cm longis, virineis, stigmate trifido.

Description: Bulb round, 6cm. in diameter; leaves 4 or 5, appearing after the flowers, apparently petiolate, glaucous-green, 22mm. wide at the base and 35 mm. wide at the center, 55cm. long, lanceolate, obtuse at the apex, typically thick and erect; umbel of 2 flowers, each 14 cm. long; perigone pure white; tepaltube 25mm. long, dark red; stamens inserted, shorter than the gynoecium, pollen pale yellow; gynoecium longer than the stamens, almost 20mm. long; ovary dark red; stigma trifid with lobes 2mm. long, and suboval (Figure 6.)

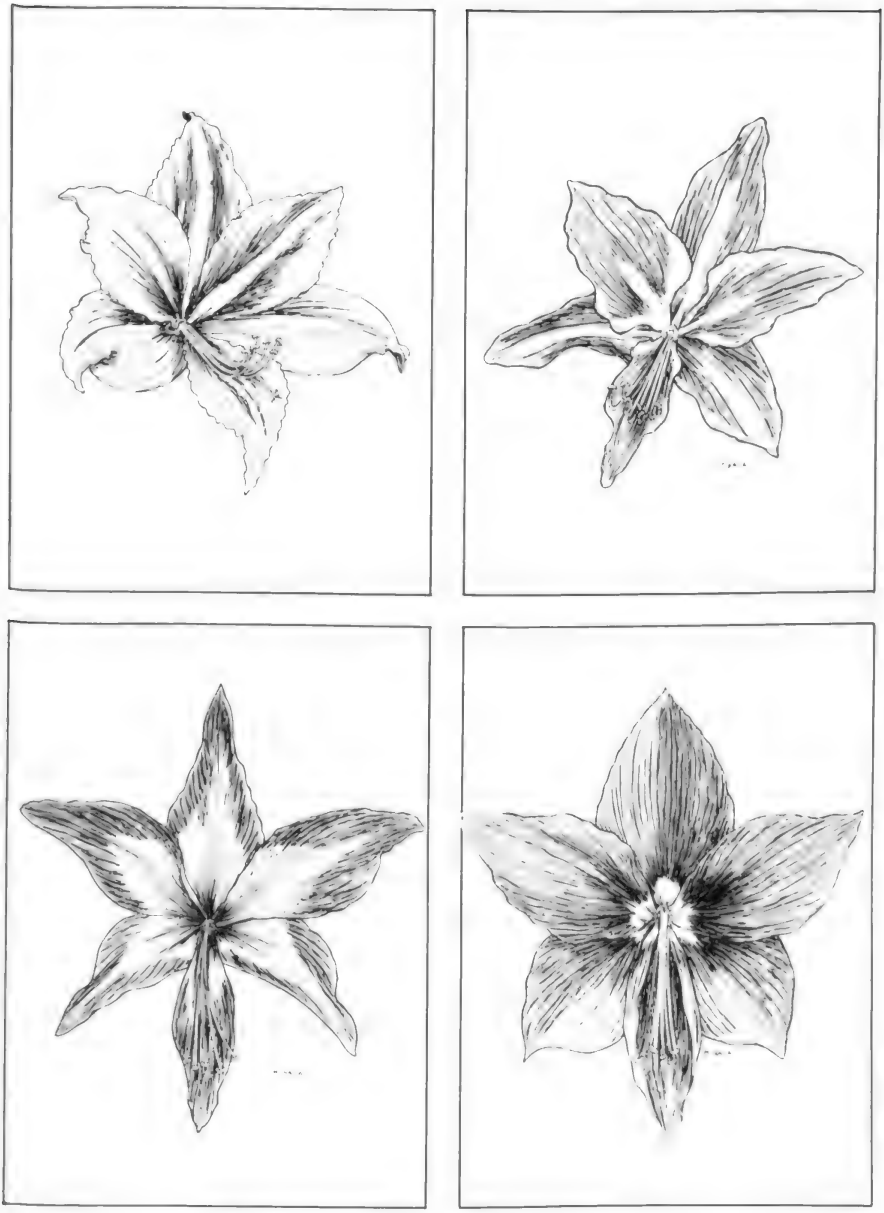

Figure 2. (upper left) **Amaryllis hugoi**; Figure 3. (upper right) **A. leonardii**; Figure 4. (lower left) **A. cuzcoensis**; Figure 5. (lower right) **A. variegata**. Miguel Baca Jara, Chihuampata #587, San Blas, delineatus.

Figure 6. (upper left) **A. condemaita** from near Acos, Cusco, Peru. Photo by C. Vargas.

Figure 7. (upper right) **A. vittata.** Photo by C. Vargas.

Figure 8. (lower left) **A. miniata** from Chincheros, Apurimac, Peru. Photo by C. Vargas.

Figure 9. (lower right) **A. hugoi** flowered at Urubamba from material collected by Hugo Vargas at Bambamarca, De La Libertad, Peru. Photo by C. Vargas.

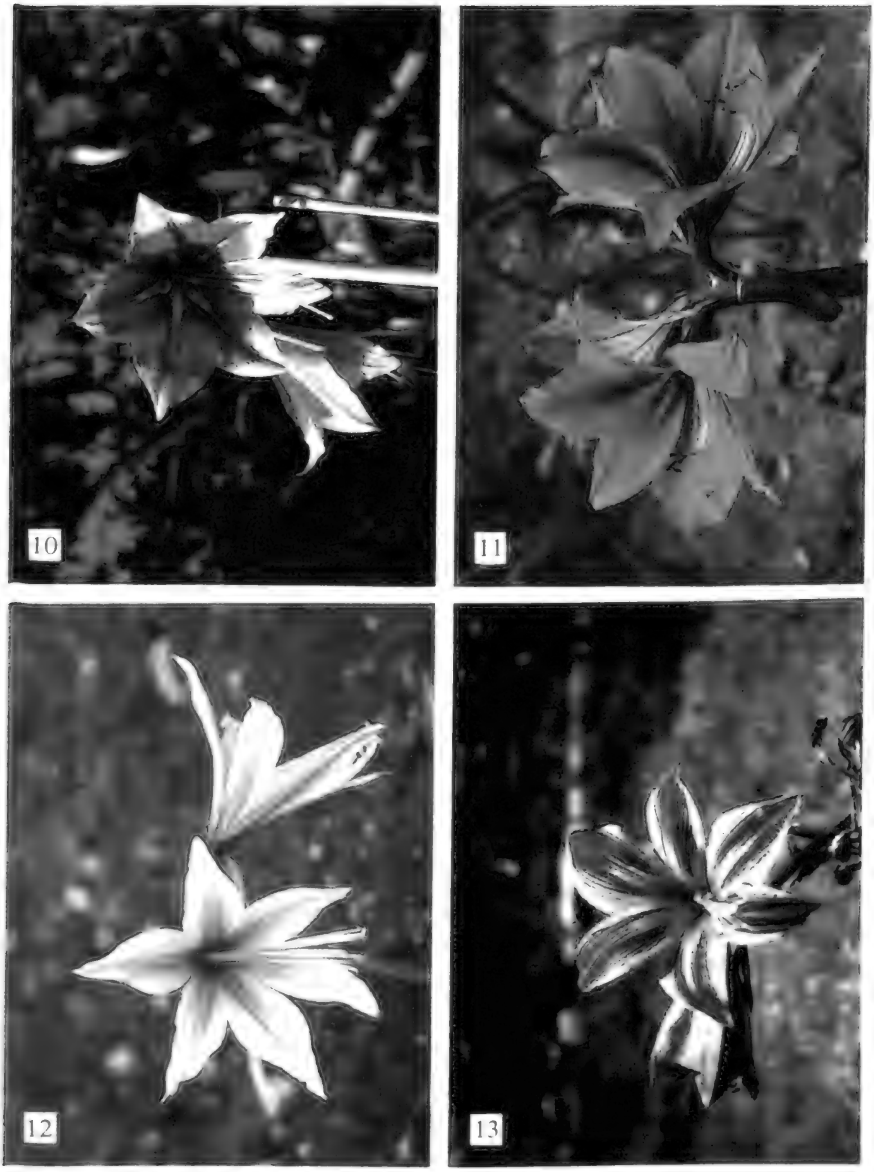

Figure 10. (upper left) **A. bukasovii** from Puente San Jose, Sandia, Peru. Photo by Fred Meyer.

Figure 11. (upper right) **A. intiflora** flowering at Urubamba, Cusco, Peru. Photo by C. Vargas.

Figure 12. (lower left) **A. macbridei** from Cuyo-Cuyo, Sandia, Peru. Photo by C. Vargas.

Figure 13. (lower right) **A. leopoldii** from San Jose, Sandia, Peru. Photo by C. Vargas

Material Studies: Peru, Dpt. Cusco, Prov. Acomayo, antes de Acos, 3100M, Dr. Francisco Perez 23474 (CUZ), the type specimen flowered in cultivation during the first part of October 1980. This beautiful species is dedicated to the Cacique de Acos, Dona Tomasa Tito Condemaita, who was mercilessly sacrificed in 1780 by the Spaniards for having aided the emancipation movement of the Inca Tupac Amaru.

II. Subgenus **Lais** (Salisbury) Baker

3. **Amaryllis vittata** L'Herit. var. **tweediana** (Herb.) Traub, Amaryllis Manual p.268, 1958.

Synonym: *Hippeastrum ambigum* var. *tweedianum* Herbert, Amaryllidac. p. 137, 1837.

Description: Leaves variable, apparently petiolate, 38-40cm. long, 3.5cm. wide at the base; scape 36-40cm. long, 1cm. wide; spath bracts 2, whitish, lanceolate, 11.5cm. long, 1.6cm. wide at their base; umbel of 2 flowers, pedicels 2.5cm. long; ovary 1.8cm. long, 8mm. wide; perigone to 17cm. long, 12cm. wide, tepaltube to 3.5cm. long, greenish; tepals white with red striations toward the center, oblanceolate, the lower tepals narrower and whiter, the upper ones, i.e. the central and the laterals, with undulate edges, aromatic; stamens shorter than the tepals almost by one-third, white, maturing yellow and slightly oblique; the gynoecium longer than the androecium, white; stigma trifid and 4mm. long. (Figure 7)

Material Examined: Peru, Prov. Chachapoyas, Dpt. Amazonas, Vargas 22607 from cultivated material taken from a forest area, living collection data: 26-A-11-12-1971. Flowered in Urubamba, Peru at 2800M. from bulbs sent by Mr. Leonard Doran, USA. Known distribution: Brazil and Bolivia; this collection being the first known from Peru.

III. Subgenus **Aschamia**

4. **Amaryllis miniata** Ruiz et Pavon, Fl. Peruv. et Chilensis. 3:57, 1802

Synonyms: *A. atamasco* Blanco, Fl. Filip., ed. 1, 254, 1837.
Hippeastrum m. Herbert, App. Bot Reg. 31, 1821.

Description: Bulb round-oval, 7-8cm. in diameter at maturity with usually 4 or 5 leaves 55-80cm. long and 4cm. or more wide, ensiform, glabrous,

bright green; scape 1 or 2 per bulb, 40-45cm. long, 1.2cm. wide, usually bright green and lightly pigmented with purple; umbel of 2, 3 or 4 flowers, with pedicels 5-6cm. long; bracts green or whitish-purple, acute, lanceolate, marcescent; perigone brilliant red, thin or fleshy; tepals broadly ovoid, 10-11cm. long, 4-5cm. wide, with a basal aster which is whitish-green and wide but reaches to only a third the length of the tepal, the labellum is narrower than the other tepals; tepaltube 6-8cm. long; paraperigone evident with long, transparent laciniations; stamen shorter than the tepals, anthers 6mm. long and yellow at dehiscence; style as long as the tepals, stigma capitately trilobed. (Figure 8)

Material Studied: Peru, Dpt. Cusco, Prov. Paruro, Araypallpa, 3300M, Vargas 2981 (CUZ) taken from cultivated material; Dpt. Cusco, Prov. Quispicanchis, Valle de Marcapata, Yuncawaro, Vargas 5192 & 6203 (CUZ); Prov. Urubamba, Vargas 18637 from cultivated material; Dpt. Puno, Prov. Sandia, Wayrapunchinta, Vargas 14811; Cuyo-Cuyo, Vargas 21717, 21869; Dpt. Apurimac; Prov. Andawailas, Chincheros, Vargas 22394. Living material data -22-A-17010-1969; Dpt. Amazonas, Rio Utucubamba, P.C. Hutchinson 1454; W.S. Flory and R.O. Flag, 1968 (USM).

Note: With these latter two species, i.e., *A. reginae* and *A. miniata,* I have examined numerous wild collected and cultivated specimens, observing a close relationship between the two, suggesting a single taxonomic entity. The variation in color, size of petals, stamens and pistil are also suggest a close relationship. These data are from material collected near Yuncawaro, Valle de Marcapata, where hundreds of plants have been observed in full bloom. The perigone star is the only feature showing low variability, in that the star of *A. reginae* is larger and narrower than that of *A. miniata*. The colors are variable, from bright red to pink. In this situation an analytical cytogenetic study seems necessary to reach any credible conclusions on the relationship of these two plants.

5. **Amaryllis reginae** L., Sp. Pl., ed. 2 & 10, 2:977, 1753.

Synonyn: *A. spectabilis* Lodd., Bot. Cab. 2: pl. 159, 1818.
Hippeastrum r. Herb., Append. Bot. Reg. 31, 1821

Description: Bulb globose, 7cm. in diameter; leaves 60cm. long, 3.5cm. wide; flowering in cultivation while in leaf; scape 30 to 50cm. long; umbel of 2 to 4 flowers, lanceolate bracts surpassing the ovary, reddish-green toward the base; perigone dark to clear red, the aster whitish-green toward the base, becoming narrow toward the tips, almost reaching the ends of

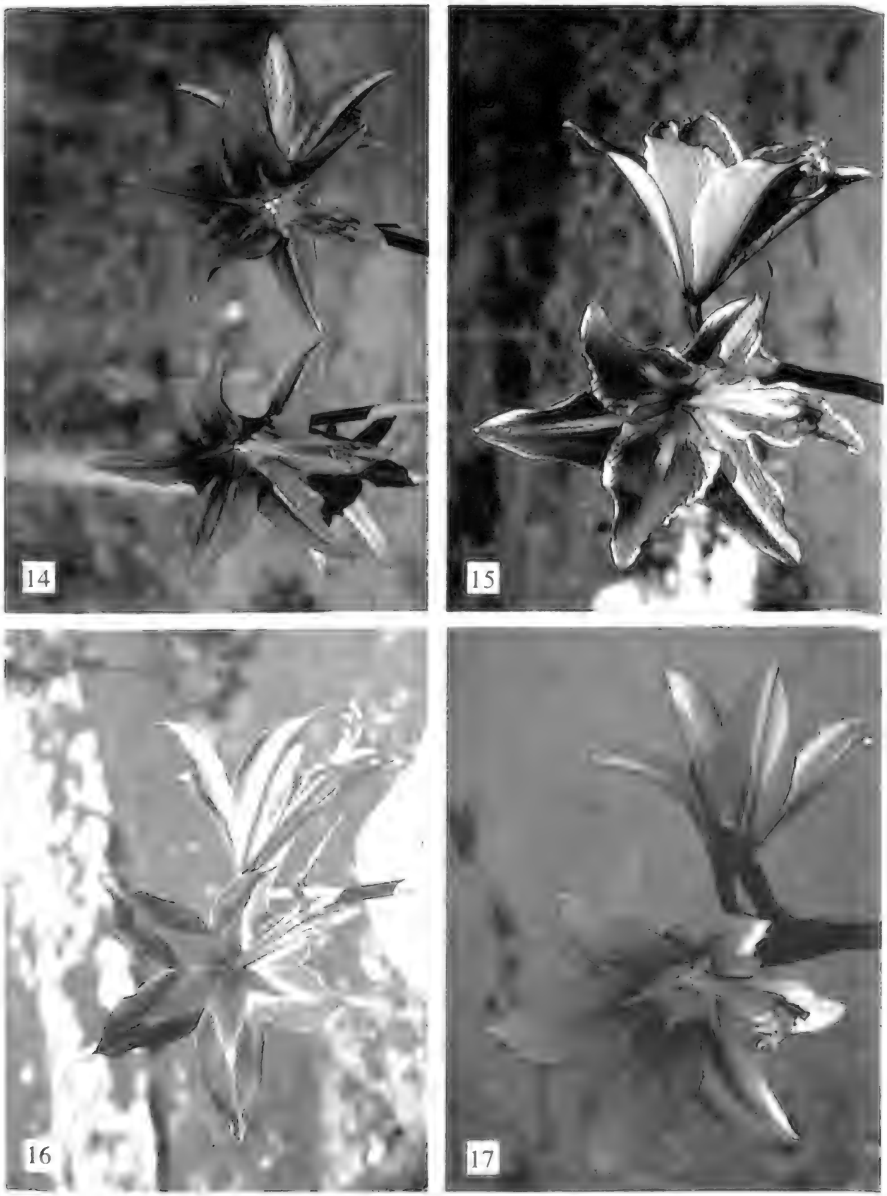

Figure 14. (upper left) **A. machupijchensis** from Pampacawa, Cusco, Peru. Photo by C. Vargas.

Figure 15. (upper right) **A. leonardii** from San Juan del Oro, Sandia, Peru. Photo by C. Vargas.

Figure 16. (lower left) **A. cuzcoensis** from Vilcabamba, Cusco, Peru. Photo by C. Vargas.

Figure 17. (lower right) **A. variegata** from Oconeque, Sandia, Peru. Photo by C. Vargas.

the tepals; tepaltube 8mm. long; tepals oval-oblong, 3cm. wide, the lower one, or labellum, narrower; stamens shorter than the tepals or almost as long; anthers 6mm. long, yellow; style generally as long as the tepals or slightly longer; stigma capitately trilobed.

Material Studied: Peru, Dpt. Cusco, Prov. Quispicanchis, Valle de Marcapata, Yuncawaro, 1200-2800M, Vargas 22797 (CUZ); Dpt. Junín, Huancayo, Pariawanca, 3000M, O. Tovar 7309; Dpt. Puno, Prov. Sandia, Wayramayo, 1800M, Vargas 22396; Dpt. Junín, Pariawanca, Mathews, s.n.

Distribution: The species enjoys a wide geographic distribution, ranging from Mexico through the American continents to Bolivia. My collections of this plant have shown, in various populations, forms intermediate with *A. miniata,* growing between or under rocks, in humus-rich soil of shady areas, as well as on shady, humus-covered slopes. Also it occurs on brushy hillsides with good drainage.

6. **Amaryllis ferreyrae** Traub, Pl. Life 6:62, 1950.

Description: Leaves 2-4 in number, lanceolate, 46cm. long, 22-24mm. wide, plants flowering when in leaf; scape to 20cm. long, 16mm. wide; umbel of 2-4 flowers, rosey-purple lanceolate bracts 7.5 to 8cm. long; pedicels 8-9cm. long, total perigone length 12cm.; tepaltube 3.5cm. long; ovary 12mm. long, 5mm. wide, with no apparent paraperigone; stamens shorter than the style and tepals, anthers to 7mm. long; style shorter than the tepals, stigma capitately trilobulate.

Material Studied: Peru, Dpt. Loreto, Prov. Alto Amazonas, Yurimaguas, Isla de Santa María, 150-170M, Ferreyra 4997 (USM). Other collectors, such as Leonard Doran, have attempted to find this species at the type locality without success. This may be due to the intense plundering by people inclined to destroy the natural forest habitat.

7. **Amaryllis belladonna** L., Sp. Pl., ed. 1, 293, 1753, var. **belladonna**

Synonyms: *A. punicea* Lamarck, Ency. Meth. Bot. 1:122, 1783
A. equestris Alton, Hort. Kew 1:417, 1789
Hippeastrum e. Herbert, Append. Bot. Reg. 31, 1821
H. p. (Lam.) Voss., Villmorin's Blumeng. ed. 3, Sieb. & Voss 50:1033, 1895

Description: Bulb globose to subglobose (depending upon age), variable

according to the longitude of its locality; leaves 4-7 in number, lanceolate, 40-70cm. long, 3-4cm. wide; scape terete, bright green or glaucous, to 45cm. long; umbel of 2 flowers at times; bracts lanceolate, membranous, whitish, green, reddish to dark red, according to form and variety; pedicels 5-8cm. long; perigone 9-12cm. long, 8-13cm. in diameter; tepaltube variable to 2cm. or more in length; tepal color varies according to form or variety, i.e. bright red, dark red, pink, salmon, etc.; aster generally small, white, greenish or yellowish; the lower tepal or labellum always narrower than the others and, at times, undulate, stamens shorter than the tepals, anthers small; ovary 1cm. long, ovulate, style shorter than the perigone, capitate.

Material Examined: Peru, Dpt. Cusco, Prov. Convención, Hda. Potrero, Vargas 2151; Ichiquiata, Vargas 2167; Hda. Calca, Kukipata, Vargas 10981; Valle de Lacko, Vargas 11096; Valle de Lares, Vargas 22391; Hda. Paucartambo, Santa Isabel, Vargas 5148; Atallaya, Vargas 14882; Hda. Quispicanchis, Cadena, Vargas 6204; 15 mil, Vargas 13337 and 13449; Dpt. Madre de Dios, Prov. Tawamanu, Vargas 22550; Dpt. Puno, Prov. Carabaya, Ollachea, Vargas, 17554; Prov. Sandia, San Juan del Oro, Vargas 16400, 1680, 20389, 2239; Dpt. Huánuco, Prov. Huanuco, Pte. Durand, Vargas 5284; Dpt. Junín, Prov. Tarma, La Merced, Ferreyra s.n.; San Luis, Ferreyra 4803.

8. **Amaryllis traubii** Moldenke, Amaryllis Manual p. 286, 1958.

Description: Bulb 3.6cm. in diameter with 6 narrow leaves, 25cm. long and 1.7cm. wide, apices obtuse; scape 25-28cm. long, reddish below, slightly compressed; umbel of 2 to 4 flowers (2 in the specimen examined), bracts lanceolate; pedicels of variable length, up to 2.5cm.; tepaltube 2-3cm. long; paraperigone slightly noticeable and whitish-green; tepals lanceolate, reddish-carmine, stamens slightly exserted relative to the perigone, stigma exserted, capitate.

Material Examined: Peru, Dpt. San Martín, Prov. San Martín, near Tarapoto, R. Ferreyra 9698 (USM).

IV. Subgenus **Omphalisa** (Salisbury) Baker.

9. **Amaryllis hugoi** Vargas sp. nov.

Bulbous subsphaericus 7cm. diam, collo 4cm. longo. Folia 4-5 suberecta crassiuscula glaucoviridia oblongo-lanceolata 50-60cm. longa, ad medium 4-5cm. lata. Scapus 30-45 x 1.2cm.; umbella 2-3 flora, bracteis

angustis roseosuffusis, altera ovarii basin attingenti, altera breviori, bracteiolis filiformibus albidis, pedicellis 6-7cm. longis. Perigonium 12-14cm. diametro, tubo 1 x 1.2-1.4cm., tepalis omnibus vel praesertim 3 superioribus fimbriatis, stellatim roseo-lineatis; sepala 9.5 x 3.8cm. ovato-oblonga in unguem vix 5mm. longum angustata; petala 10.2 x 4cm.; paracorolla manifesta. Androecium tepalis paullo brevius, filamentis basi viridi-flavis distaliter rubrotinctis, antheris 5mm. longis, polline vitellino. Pistillum staminibus longius, tepala superans, ovario viridi 16 x 8mm., stigmata trifido.

Description: Bulb subglobose, 7cm. in diameter, neck 4cm. long; leaves suberect, thick, bright green, 50-60cm. long, 4-5cm. wide at the center, oblong-lanceolate; scape bright green, 30-45cm. long, 1.2cm. wide; umbel of 2 to 3 flowers, bracts wide, lanceolate, bright green and pink, one overlapping the ovary; bracteoles whitish, filliform; pedicels 6-7cm. long, green; tepaltube 10mm. long; perigone 12-14cm. in diameter; tepalsegs white, 3.8cm. long, 5mm. wide, with a prominent tip 5mm. long, undulate on the border of the upper three tepalsegs and the labellum, with parallel striations radiating from the aster; aster wide and white, extending to the apices of the tepalsegs; petalsegs 10.2cm. long, 4cm. wide, oval-oblong; androecium shorter than the tepalsegs, stamens and filaments yellowish-green at the base, becoming white and red, anthers 5mm. long, pollen cream-colored; pistil longer than the stamens but not surpassing the tepalsegs, stigma trifid, 8mm. long; ovary green, 16mm. long, 8mm. wide. (Figures 2 & 9)

Material Studies: Peru, Dpt. de la Libertad, Prov. Bolivar, Dist. de Bambamarca, 2800M, Vargas 22651 (CUZ), the type. Cultivated at Urubamba, Dpt. Cusco, 2800M from bulbs sent by my son, A. Hugo, for whom this species is named.

Distribution: Known only from the type locality where also collections were made by Leonard Doran of California, USA.

10. **Amaryllis bukasovii** Vargas, Pl. Life 31:31, 1975.

Description: Bulb subglobose, 6-8cm. long; scape 36-40cm. long, 1cm. wide, subterete with 2 bracts which surpass the ovary; umbel of two flowers; pedicels 4.5-5cm. long; perigone 10cm. long, 12-14cm. wide; tepaltube 8-10mm. long; paraperigone not very visible; aster long, whitish; tepalsegs oval, acute, thin at the base, dark red, becoming greenish-yellow at their tips; stamens shorter than the tepalsegs, anthers yellow,

6-7mm. long, ovary purple with a style as long as the perigone, stigma very trilobulate. (Figure 10)

Material Examined: Peru, Dpt. Puno, Prov. Sandia, San Jose, Vargas 21882 (CUZ), the type.

11. **Amaryllis intiflora** Vargas, Bol. Fac. Ciencias Univ. Nac. Cusco 1:2, 1960.

Description: Bulb subglobose with a robust neck; leaves 4 to 5, occurring with the flowers, lanceolate, 40cm. long, 22mm. wide; scape glaucous, 46cm. long, 12mm. wide at the base; pedicels wide, 7.5cm. long; perigone fiery red and velvet-like, 10-12cm. in diameter; tepaltube 8-11mm. long, stamens shorter than the style, red; anthers reddish, 7-8mm. long; ovary green, 18mm. long, 8mm. wide; style red like the trifid stigma. (Figure 11)

Material Examined: The type specimen from material cultivated at Urubamba, bulbs collected at Hacienda Cadena, Valle de Marcapata, Prov. Quispicanchis, Dpt. Cusco, Vargas 12985 (CUZ). The specific epithet, Inti, is derived from the Quechua name for the sun, referring to the color of the perigone.

12. **Amaryllis forgetii** (Worsley) Traub et Uphof, Herbertia 6:154, 1940

Synonym: *Hippeastrum f.* Worsley, Gard. Chron. p. 108, 1912.

Description: Bulb small, flowering while in leaf in cultivation as well as in it snative habitat; leaves few, bright green, reddish toward the base, 40-45cm. long and 22-25mm. wide; scape narrow, 25-35cm. long, bright green, reddish toward the base; bracts surpassing the ovary, reddish; umbel of 1 to 2 flowers; tepalsegs dark red to grenadine with the centers white and variable as to length; paraperigone noticeable with transparent appendages 8mm. long; tepaltube 4-6mm. long; androecium and gynoecium of stamens and pistil of variable lengths, in some cases shorter than the tepalsegs, whitish-green and rusty, in other cases the stamens are as long as the tepalsegs, the pistil 1cm. longer than the tepalsegs.

Material Examined: Peru, Dpt. Apurimac, Prov. Abancay, Quebrada de Matara, Chirway, Vargas 12451 & 16592 (CUZ), Dpt. Cusco, Prov. Urubamba, Machupijchu, Vargas 16620 (CUZ) and living material.

Note: The specimens made from bulbs collected in the area of Machupijchu show major variation in size, particularly in the size of the aster,

when compared to those cultivated in Chirway. Only the leaves are similar, i.e. shorter and narrower. This species should be considered as closely related to *A. fusca* and *A. machupijchensis,* which are also quite variable; hence, it is my opinion that they have a common genetic origin.

V. Subgenus **Cephalaeon** Traub.

13. **Amaryllis fusca** (Kraenzl.) Traub et Uphof, Herbertia 5:130, 1938.

Synonym: *Hippeastrum f.* Kraenzl., Engl. Bot. Jahrb. 40:237, 1908.

Description: Bulb globose, 5-6cm. in diameter when mature; leaves, which die back after flowering, lanceolate, 36-46cm. long, 3.5-6cm. wide; scape 20-32cm. long, subterete, purple on the lower half, the remainder dark green; bracts lanceolate, reddish, surpassing the ovary; umbel of two flowers, pedicel 4-5.5cm. long, dark green, tepaltube 3-4mm. long; paraperigone slightly noticeable, green with a few appendages; perigone narrow, 9-10cm. long; tepalsegs oval-lanceolate, the lower one narrow; aster whitish green inside, wide at the base gradually narrowing above; dorsal side of the tepalsegs with a whitish rachis almost to the apex; stamens white, shorter than the tepalsegs, style surpassing the tepalsegs by almost 1cm., stigma capitate.

Material Examined: Peru, Dpt. Puno, Prov. Sandia, Cuyo-Cuyo, Vargas 17512 & 19982 (CUZ).

Note: The material of this species, originating in Cuyo-Cuyo, has been collected on more than one occasion at various elevations, permitting the cultivation of numerous populations which show a very close relationship with *A. miniata* and less with *A. forgetii* and *A. machupijchensis.*

14. **Amaryllis oconequensis** Traub, Pl. Life 7:33-35, 1951.

Description: Bulb globose with a short neck and flowering with 9-11 leaves; scape to about 9cm. long, compressed; umbel of 4 flowers; perigone bilaterally symmetric, 10.5cm. long; aster green; tepaltube 8mm. long, green; paraperigone green, 2mm. long; stamens and gynoecium exserted.

Distribution: Peru, Dpt. Puno, Prov. Sandia, Oconeque (TRA).

Note: I have not seen pressed or living material of this species, only illus-

trations published by Traub, who described this species from material sent by the collector, Dr. R. M. de Schauense.

15. **Amaryllis macbridei** Vargas, Biota 8:1, 1970.

Description: Mature bulb subglobose, more or less compressed at the base, 8-9cm. in diameter; roots fasciculated and dense, 20-25cm. long; scape 1 to 3 per bulb, 26cm. long, 12mm. wide; umbel of 2 flowers, rarely with 3; pedicels bright green, 75mm. long, with 2 lanceolate bracts which are longer than the ovary; bracteoles 2, shorter, whitish; perigone white with thin, barely perceptible lines of red pigmentation; tepaltube 2mm. long; aster internal, wide and short, bright green; paraperigone laciniate, 1mm. long, whitish; tepalsegs oval-lanceolate, 10cm. long, 4mm. wide, the lower or labium very narrow; stamens as long as the tepalsegs, filaments greenish-white, anthers oblanceolate, 6.5mm. long after dehiscence; gynoecium longer than the tepalsegs by 20mm., tigma trifid; ovary subtriangular, green, 20cm. long. (Figure 12)

Material Examined: Peru, Dpt. Puno, Prov. Sandia, Sandia, Vargas 16422 (CUZ).

Note: Variation in the tepalseg width has been observed; the type specimen having wider ones than any others seen.

16. **Amaryllis leopoldii** T. Moore, Gard. Chron. 1:733, fig. 140, 1870.

Synonym: *Hippeastrum I.* Dombrain, Fl. Mag. 9: pl. 475-476, 1870.

Description: Leaves variable, pendant, to 45cm. long and 3cm. wide; scape almost cylindric, glaucous with 2 lanceolate bracts surpassing the ovary; umbel of 2 flowers, perigone is the most regular in the genus, being 11cm. long and flaring to 13 or 14cm.; tepaltube short, being 8mm. long, without a noticeable paraperigone; tepals oval with an aster, greenish-white, becoming rich purple laterally then white on the margins; stamens white, shorter than the tepals, anthers yellow with a purple edge, 6mm. long; gynoecium surpassing the tepals, style white, becoming reddish near the stigma, which is capitate. (Figure 13)

Material Studied: Peru, Prov. Sandia, Dept. Puno, 1250M., San Juan del Oro, Vargas 16405, (CUZ), 22401 & 22388. Flowered at Urubamba, Peru from bulbs collected at San Juan del Oro. Living material data: 15-A-14-6-1969, 4-A-13-6-1969. Distribution is in Bolivia with the only Peruvian site being San Juan del Oro.

Note: This species of *Amaryllis,* which has served as the basis for many hybridization experiments, was first collected by the English explorer, Richard William Pearce, ca. 1865 in an, until recently, unknown site, Apolo, Peru. Since the time of the initial collection, no one has collected this species. In recent years explorations led by the late Dr. Ira Nelson, USA and the late Dr. Martin Cardenas, Bolivia, were successful in rediscovering the species. The success was founded, in part, by discovering that Apolo was in Bolivia, rather than Peru. Later, efforts to develop a collection of living material of the species in order to carry out a complete review of the genus in Peru, led to the discovery in August 1965 of the San Juan del Oro site in Peru. This second re-discovery of this beautiful *Amaryllis* has cleared up a century of substantial doubt about the species, whose germ-plasm has served as a stock for the creation of many hybrids, mainly in England and Holland.

17. **Amaryllis machupijchensis** Vargas, Pl. Life 31:30, 1975.

Description: Bulb subglobose, 6-8cm. in diameter, neck 6-10cm. long; scape 1, 2 or 3 per bulb, according to the maturity of the bulb, 20-80cm. long, bright green, and at times reddish; umbel of two flowers in the type specimen, but reported with 3 or 4 flowers; tepaltube 8-10mm. long; perigone opening to 18cm. wide, dorsal side yellowish-green; speckled with minute red dots, corolla face whitish-green, transparent, similar in color to the stamens; paraperigone whitish, transparent, slightly laciniate; stamens as long as the tepalsegs, whitish-green, mottled red, anthers curved and 6mm. long, pollen yellowish; gynoecium with the style longer than the tepalsegs, stigma trilobulate. (Figure 14)

Material Examined: Peru, Dpt. Cusco, Prov. Urubamba, Pampacawa, Vargas 17652, the type; Prov. Convencion, Vargas 21818; Prov. Calca, Laras, Vargas 22272. Also occurs in the lowlands about Machupijchu.

Note: This is also a variable species, showing more consistency in the color of the small aster and tepals. Nonetheless, the perigone size and red spots vary.

18. **Amaryllis leonardii** Vargas, sp. nov.

Bulbous subsphaericus 5-6cm. diam, collo 4-5cm. longo. Folia 5-6 lanceolata petiolata 42-45cm. longa, ad medium 3-3.5cm. lata. Scapus laete viridis 36cm. longus; umbella 2-flora, bracteis 2 lanceolatis roseis ovarium superantibus. Perigonii tubus 4-5cm. longus, laciniae forma ir-

reuglares ovato-oblongae ± retroflexae, sepala saturate rubra albomarginata 13.5 x 0.5cm. tepala albidula subtus laete viridia; paracorolla manifesta, albido-hyalina. Androecium per tertiam partem usgue laete viride, distaliter albidum, atheris 8mm. longis margine purpureis, polline auero. Pistillum brevius album ad apicem purpureum, stigmate capitato.

Description: Bulb subglobose, 5-6cm. in diameter, neck 4-5cm. long; leaves 5-6, lanceolate, slightly petiolate, 42-45cm. long, 30-35mm. wide at the center; scape bright green, 36cm. long; bracts 2, pink, lanceolate, surpassing the ovary; umbel of 2 flowers, tepaltube 4-5mm. long; perigone with a bright green base, exceeded by the arms of the aster; tepalsegs irregular in form, somewhat reflexed, dark red with a white border, oval-oblong, dorsal side bright green and white; sepalsegs, 13.5cm. long, 5cm. wide; paraperigone evident, white with appendages 3-4mm. long; androecium bright green, the lower third later becoming white; anthers with a purple border, 8mm. long, pollen golden-yellow; gynoecium dark purple; pistil 2mm. longer than the stamens but shorter than the tepalsegs, stigma capitate. (Figures 3 & 15)

Material Examined: Peru, Dpt. Puno, Prov. Sandia, San Juan del Oro, Vargas 21654 (CUZ), the type. The name of this species is dedicated to my good friend, Mr. Leonard Doran, of California, USA.

Distribution: Known only from the type locality.

19. **Amaryllis cuzcoensis** Vargas, Pl. Life 31:32, 1975.

Description: Bulb subglobose, 5cm. long, neck 5.5cm. long; scape subterete, 32cm. long, reddish-green at the base, with two bracts which surpass the ovary by 30mm.; umbel of 2 flowers, dark red; pedicels 2.5-4cm. long; perigone widely opening to 13 or 14cm.; aster characteristically whitish-green, wide at the base, becoming acute at the tip; tepalsegs with a green border, oblong-lanceolate, 9-10cm. long, 2.5-3cm. wide, tepaltube 3-4mm. long, stamens shorter than the tepalsegs in the type specimen; anthers 4mm. long, yellow; style as long as the tepalsegs, stigma trilobulate. (Figures 4 & 16)

Material Examined: Peru, Dpt. Cusco, Prov. Calca, Vilcabamba, Vargas 22395 (CUZ), the type from the only known locality.

Note: This species has been observed in cultivation having variability in the form of the tepalsegs as well as the length of the aster.

20. **Amaryllis variegata** Vargas, Pl. Life 31:29, 1975.

Description: Bulb subglobose, 4-6cm. long, 3-4cm. wide, scape greenish, 35-41cm. long, bracts exceeding the ovary; pedicels green, 6-6.5cm. long; umbel of 2 flowers; perigone 15-16cm. long; tepalsegs 12cm. long, tepaltube 3-4mm. long; paraperigone slightly visible; aster short, whitish-green, tepalsegs ovulate, or lanceolate (depending upon the form), acute, 3-4cm. wide, the lower tepal narrower, the three lower tepals brilliant red, red, and white-speckled; stamens shorter than the perigone; anthers yellow, 7mm. long; ovary purple, 20mm. long, 8mm. wide; style longer than the perigone; stigma noticeably trilobulate. (Figures 5 & 17)

Material Examined: Peru, Dpt. Puno, Prov. Sandia, near Oconeque, Vargas 16423, the type.

Note: This species is found in numerous cultivated populations, permitting observation of the variability of the species, not only in the form of the tepalsegs, but also in the intensity of the white speckles, especially on the lower tepalseg. This great variability suggests a possible hybrid origin. Seed from this species produce abundant progeny when planted. The flowers of these progeny show a noticeable segregation, but it was not possible to further pursue the putative parents. This would require more in-depth study.

ACKNOWLEDGEMENTS

I would like to express my gratitude to those who have helped in the development of this paper and offered support in other ways, especially Mr. Leonard Doran and the late Dr. H. P. Traub. Also the late Dr. Martin Cárdenas shed much light on my numerous questions on various occasions. The same thanks go to my enthusiastic assistants who accompanied me with fervor during my expeditions in collecting living material. These include Manuel Velasco Q., Felipe Marin M., Francisco Pérez, Efrain Carrillo, Octavio Nuñez, Efrain Moleapaza and Réne Chávez. Also I thank friends who, knowing my needs, took advantage of their trips to collect valuable material on my behalf. Likewise I express my gratitude to the curators and directors of the following Institutions for assisting me in consulting herbarium materials: Kew Gardens, London (K); Muséum National d'Histoire Naturelle, Paris (P); Herbarium, Madrid (MA); Herbarium, Geneva (G); and Museum of Natural History "Javier Prado", Lima (USM). A special acknowledgement to my good friend, Dr.

C. Boelcke of Argentina, for photocopying valuable material while on a trip to Europe. These were very helpful in the process of comparison and classification.

LITERATURE CITED

Herrera, F.L. 1941, Sinopsis de la Flora del Departmento del Cuzco, p. 180.

Macbride, J. F. 1936 Flora of Peru, **Field Mus. Nat. Hist., Bot. Serv.**, 13:683.

Traub, H.P. 1958. **The Amaryllis Manual**, Macmillan Co., N.Y. 338pp, 1983, The lectotypification of Amaryllis belladonna L. (1753), **Plant Life** 39:24-26.

Monte Montevideo, Uruguay.

MEIOTIC STUDIES IN SOME CHROMOSOMAL RACES OF **HEMEROCALLIS** L.

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Hemerocallis (Liliaceae) is a genus of beautiful day lilies, which form an important element of temperate and sub-tropical gardens. The genus has a wide distribution from central Europe to China, Siberia and Japan. It has been in cultivation in France and Belgium as early as 1570 (Fosler and Kamp, 1954). During its recorded history a wide array of forms have arisen, both in the wild and through the efforts of gardeners in United States and England. It is apparent that most of the varieties that have been registered and are being grown in gardens all over the world are of hybrid origin. Studies on somatic chromosome number and karyomorphology of 52 cultivars of *Hemerocallis* revealed the occurrence of diploid, triploid, tetraploid and aneuploid races (Zadoo *et al.*, 1976), which exhibited a good deal of heterogeneity in gross chromosome morphology. Based on

the male meiosis of representative taxa of different cytotypes, the nature and/or origin of polyploid and aneuploid races and basic chromosome number for the genus is discussed in the present report.

Material and Methods

Thirty diploid cultivars with somatic chromosome number 2n = 22 and one cultivar each of 2n = 33, 44 and 29 of *Hemerocallis* grown at N.B.R.I., Lucknow have been used in the study. Young flower buds were fixed in 1:3 acetic-alcohol mixture and smeared in 1% aceto-carmine solution. The pairing behaviour of chromosomes at meiotic metaphase in PMC's was studied, from temporary slides. Representative cells of different chromosomal races were photographed using an Olympus ECTr microscope with a PM-6 photographic attachment.

Results and Discussion

All the thirty cultivars with 2n = 22 had regular eleven bivalents at metaphase I followed by normal subsequent stages. Bivalents were arranged at random and no secondary association of bivalents was observed (Figs. 1-2). Perfect centromeric activity was observed in telocentric chromosomes. The meiotic behaviour of chromosomes indicated true diploid nature. This is in tune with the observations made by Zadoo *et al.* (1976) on the karyomorphology of these cultivars.

The cultivar with 2n = 33 showed trivalents, bivalents and univalents at metaphase I. The range of trivalent associations per cell was found to be 5-10 and on an average 7.5 III's + 3.75 II's + 3.0 I's (Fig. 3; Table 1) were observed. A high frequency of trivalents indicates an autotriploid nature of the cultivar. Karyotypic studies of this cultivar also supports the autopolyploid origin, as the somatic complement can be arranged in groups of three chromosomes each, on the basis of chromosome morphology and size (Zadoo *et al.*, 1976). Triploids can arise in nature through chance hybridization between diploids and tetraploids and/or by union of unreduced and reduced gametes in a diploid. Natural tetraploid taxa have not been reported in the genus. Until such time that tetraploids are reported in natural populations, the origin through crossing of tetraploid and diploid race can be ruled out. It is most likely that the triploid clone has arisen through production and effective functioning of an unreduced gamete in a diploid race, which is also supported by autotriploid behaviour of chromosome pairing. After their production, triploids might have been unconsciously selected by keen gardeners and maintained by the efficient mode of vegetative propagation so prevalent in the genus.

Table 1. Associations in some representative cultivars of **Hemerocallis.**

TAXON	Chromosome number 2nd	ASSOCIATIONS							
		Quadrivalents		Trivalents		Bivalents		Univalents	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean
Cv. 'Cinnabar'	22	—	—	—	—	—	11	—	—
H. Fulva 'Europa'	33	—	—	5-10	7.5	1-7	3.75	1-5	3.0
Cv. 'Mrs. David Hall'	44	5-11	8.25	0-1	0.25	0-9	3.50	0-10	3.25
Cv. 29	29	—	—	0-2	0.66	7-10	8.66	5-15	9.66

Typical autotetraploid meiotic behaviour was observed in cv. 'Mrs. David Hall' (2n = 44). At meiosis the maximum possible association of 11 quadrivalents was observed. The mean chromosomal association per cell were found to be 8.25 IV's + 0.25 III's + 3.5 II's + 3.25 I's (Figs. 5-6; Table 1). The somatic complement of this cultivar could be regulated into eleven groups of four chromosomes each (Zadoo *et al.*, 1976), thus confirming the autopolyploid origin. The source of this tetraploid cultivar is not known. It could well be a derivative of induced polyploids produced in *Hemerocallis* by Traub (1951), which found their way to Europe and later to India.

The average associations per cell in cv. 29 (2n = 29) was 0.66 III's + 8.66 II's + 9.66 I's (Figs. 7-8; Table 1). Its somatic complement could be grouped into seven sets of three chromosomes each and four sets of two chromosomes each (Zadoo *et al.*, 1976). Out of the possible association of seven trivalents expected on the basis of chromosome morphology only 0-2 trivalents were actually observed. It is thus apparent that this cultivar might have originated from a wide cross involving a triploid and diploid clone. In fact aneuploid seedlings have been produced experimentally in the genus by reciprocal crosses involving triploids and diploids by Stout

Figs. 1-2. Metaphase of cv. 12 and cv. 19 showing 11 II's.

Fig. 3. Metaphase I in triploid **H. Fulva** 'Europa' 10 III's + 1 II + 1 I.

Figs. 4-5. Metaphase I in tetraploid cv. 'Mrs. David Hall'.

Fig. 4. 5 IV's + 1 III + 9 II's + 3 I's.
Fig. 5. 10 IV's + 2 II's.

Figs. 6-7. Metaphase I, in cv. 29.
Fig. 6. 10 II's + 9 I's.
Fig. 7. 2 III's + 9 II's + 5 I's.

Microphotographs by T.K. Sharma.


1
2
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4
5
7
6

(1932) and Matsuoka (1972).

Stout (1932) believed that haploid number n = 11 in *Hemerocallis* might have been derived from a lower basic number of 6. Mookerjea (1956) reported the occurrence of secondary association of bivalents in some cultivars and based on the studies she suggested 5 as the original basic number from which 11 was derived. In the present study no evidence was, however, found to support the secondary origin of basic number from either 6 or 5. The study of karyomorphology of different cultivars by Zadoo *et al.* (1976) also gave no evidence which could warrant a change in basic number of 11 for the genus *Hemerocallis*.

Summary

Meiotic studies of four cytotypes of *Hemerocallis* with 2n = 22, 33, 44 and 29 have been carried out. Cultivars with 2n = 22 showed a regular occurrence of 11 bivalents. The pairing behaviour of triploid and tetraploid cultivars points toward their autopolyploid origin, whereas the associations at meiotic metaphase of aneuploid 2n = 3x - 4 = 29 indicate toward its origin from a wide cross involving a triploid and diploid clone. The study does not warrant any change in the basic number of 11 for the genus *Hemerocallis*, as has been suggested by some earlier workers.

Acknowledgements

Sincere thanks are due to Dr. T. N. Khoshoo, ex-Director, N.B.R.I. for encouragement during the course of study and to Mr. T. K. Sharma for photographs illustrating the paper.

References

Fosler, G.M. and Kamp, J.R. 1954. Day-lilies for every garden. Circular 716. Univ. Illinois.

Matsuoka, M. 1972. Cytological studies on hybrids between diploid and triploid Hemerocallis. *Jap. J. Breed.* **22**: 168-271.

Mookerjea, A. 1956. A cytological study in several members of Liliaceae and their interrelationships. *Ann. Bot. Soc. Vanamo.* **29**: 1-44.

Stout, A.B. 1932. Chromosome numbers in **Hemerocallis** with reference to triploidy and secondary polyploidy. *Cytologia* **3**: 250-259.

Traub, H.P. 1951. Colchicine induced **Hemerocallis** polyploids and their breeding behaviour. *Plant Life* **7**: 83-116.

Zadoo, S.N., Roy, R.P. and Khoshoo, T.N. 1976. Variation of karyotype in **Hemerocallis.** *La Cellule* **71**: 253-271.

KARYOTYPE EVOLUTION IN THE AMARYLLIDACEAE

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INTRODUCTION

The chromosome cytology of the Amaryllidaceae has been a favored subject for investigation, largely due to the large size of the chromosomes and availability of material (Sharma and Bal, 1956). Mitotic studies have dominated the literature. Microsporegenesis occurs almost completely inside the bulb, and numerous bulbs must therefore be sacrificed for meiotic analysis without guarantee that necessary stages will be obtained (Ponnamma, 1978; Nagalla, 1979; Williams, 1981).

The concept of the family followed herein is that circumscribed by Traub (1963). Pending resolution of the controversy concerning the proper application of the generic name *Amaryllis* L. (see Traub, 1983), the name *Hippeastrum* Herb. is used herein in reference to the neotropical genus. Traub's (1963) subfamilies Hemerocalloideae, Ixiolirioideae and Alliioideae have since been recognized at the familial rank (Huber, 1969; Dahlgren, 1975), hence the subject of this review concerns only the genera encompassed by Traub's (1963) infrafamilies Amarylloidinae and Pancratioidinae. All are perennial herbs with tunicate bulbs, umbellate inflorescences subtended by membranaceous bracts, and inferior ovaries. The majority of genera are tropical and subtropical in distribution.

The first part of this paper will summarize salient features of chromosome cytology found within the Amaryllidaceae; the second part will discuss trends and possibly pathways of karyotype evolution suggested by this data and some of their applications towards a phylogeny of the family.

I. FEATURES OF AMARYLLIDACEOUS KARYOTYPES

Chromosome Number

As might be expected in a family encompassing close to 100 genera, somatic chromosome numbers express great variability. Traub (1963) provides a fairly complete summary of reports through 1963. Lowest $2n$ numbers in the family are reported for the Asian genus *Lycoris* Herb. ($2n = 12$) by Inariyama (1937) and Bose (1958). *Narcissus* L. and *Leucojum*

L., two temperate Eurasian genera, contain species with $2n = 14$ (Fernandes, 1942; Neves, 1939).

Within two of the largest genera in the family, *Crinum* L. and *Hippeastrum* Herb., $2n = 22$ predominates (for *Crinum*: Inariyama, 1937; Sato, 1938; Sharma and Ghosh, 1954; Sharma and Bhattacharyya, 1956; Jones and Smith, 1967; Raina, 1978; for *Hippeastrum*: Naranjo and Andrada, 1975; Flory and Coulthard, 1981; Arroyo, 1982). Both genera are placed by Traub in the infrafamily Amarylloidinae.

Most taxa of the genus *Eucharis* Planch., ca. 25 species of neotropical distribution, exhibit $2n = 44$ (Meerow, unpubl.). *Hymenocallis* Salis., a large and taxonomically difficult neotropical genus, most frequently exhibits somatic numbers of 46 and 40 (Flory, 1976) though the genus as a whole is extremely variable, ranging from $2n = 38$ to 110. The situation in *Hymenocallis* is discussed in greater detail in the second part of this paper. Both *Eucharis* and *Hymenocallis* are placed in the infrafamily Pancratioidinae (Traub, 1963). It is interesting to note that the paleotropical genus *Pancratium* L., which morphologically bears close resemblance to *Hymenocallis,* contains species with $2n = 44$ (Sato, 1938; Zamen and Nessa, 1974) and 46 (Inariyama, 1937), even though $2n = 22$ is the most common somatic chromosome number reported in the genus (Ponnamma, 1978).

If any generalization can be made concerning the distribution of somatic chromosome numbers in Amaryllidaceae, it is that higher numbers on the whole are more characteristic of the Pancratioidinae than the Amarylloidinae, and further, of neotropical genera (in both infrafamilies) than paleotropical genera.

The consensus of most karyological surveys of the Amaryllidaceae has been that the base number for the family is $x = 11$ (Inariyama, 1937; Sato, 1938; Goldblatt, 1976). The frequency of $2n = 22$ or polyploid derivatives thereof in the family, particularly within the largest genera, and the presence of eleven morphological types of chromosomes, even where aneuploid $2n$ numbers are exhibited (Lakshmi, 1978) gives credence to $x = 11$ as base number.

Nonetheless, a sizable number of species within the family exhibit a range of somatic chromosome numbers seemingly unrelated to an eleven series (Traub, 1963). Consequently, some workers have assigned multiple base numbers to genera exhibiting such somatic variations (Traub, 1963; Raina and Khoshoo, 1971). Traub (1963) went so far as to assign $x = 6$ as the base number for the entire family, a decision few have accepted. From the evidence suggested by the cases discussed in the second part of this paper, secondary derivation of these base numbers from the ancestral

$x = 11$ seems unlikely.

Polyploidy and Aneuploidy

Polyploidy has no doubt been an important factor operative in the evolution of the Amaryllidaceae (Mookerjea, 1955; Sharma and Bal, 1956). Sharma and Bal (1956) suggested its central importance in the origin of the pancratioid genera which on the whole exhibit tetraploid or tetraploid-derived somatic chromosome numbers in relation to a base number of eleven.

Grant (1971) cites three primary factors which in conjunction promote polyploidy in plants: 1) taxa are long-lived and possess means of vegetative propagation 2) speciation is frequently accompanied by chromosomal rstructuring and 3) inter-specific hybridization in natural populations is of frequent occurrence. The Amaryllidaceae, being bulbous plants, fulfill the first requirement quite readily. In regard to the latter factors, the genera of the Amaryllidaceae are considerably variable. The nature and origin of polyploidy in the family are influenced greatly by the degree of karyotypic stability and the evolutionary processes at work within each genus. In genera exhibiting relative karyotypic stability such as *Hippeastrum* (Naranjo and Andrada, 1975) and *Crinum* (Jones and Smith, 1967; Raina, 1978) polyploidy is of relatively low occurrence and autoploid in nature. Raina (1978) indicates that only about 21% of the taxa in *Crinum* are polyploid whether at the intra- or inter-specific level. Ploidy ranges from 3x to 8x. Naranjo and Andrada noted the relative scarcity (16%) of polyploidy in *Hippeastrum,* where ploidy levels ranged from 3x-6x. For *Pancratium,* infra-specific polyploidy has been reported in *P. verecundum* L. (Zamen and Nessa, 1974) with both tetraploid ($2n = 44$) and pentaploid ($2n = 55$) clones, and in *P. triflorum* Roxb. (Ponnamma, 1978) and *P. lutea* (Battaglia, 1949) with both diploid ($2n = 22$) and triploid ($2n = 33$) clones. Preliminary study (Meerow, unpubl.) suggests the presence of a single octoploid ($8x$) taxon of *Eucharis.* A somatic number of $2n = 44$ is otherwise common in the genus. Two accounts of the karyotype of *E. amazonica* Lind. ex Planch. (as *E. grandiflora* Planch. & Lind.), that of Sato (1955) and Nagalla (1979) report $2n = 68$.

In genera such as *Hymenocallis,* exhibiting great karyotypic variation in both number and morphology (Flory and Schmidhauser, 1957; Flory, 1976; Lakshmi, 1978), allopolyploidy has been implicated as an important process in speciation. This is discussed in greater detail below.

Polyploidy has also been reported for *Lycoris* and *Nerine* (Inariyama, 1938) and *Zephyranthes* (Flory, 1959). Perhaps the most extreme case of polyploidy in Amaryllidaceae is found in the monotypic *Sprekelia for-*

mosissima for which Mookerjea (1955) reported $2n = 112$.

On the basis of the data compiled by these and other workers, it would appear that frequency of polyploidy in the family can be correlated with departures from the ancestral base number of $x = 11$.

If a base number of $x = 11$ is conceived as ancestral to the Amaryllidaceae as a whole, it follows that aneuploid increase and decrease of this base number has occurred among various genera in the family. The *modus operandus* of aneuploidy in the Amaryllidaceae would best be described by the term "meroaneuploidy" of Jackson (1971), i.e. aneuploidy derived by increases or decrease of parts of normal parental chromosomes via "Robertsonian" changes (Robertson, 1916). Cases of possible meroaneuploidy in Amaryllidaceae are discussed in the second part of this paper.

Sharma and Bhattacharyya (1956) and Sharma and Bal (1956) reported high incidence of aneusomaty (intra-plant variation in chromosome number) for *Hymenocallis* and *Crinum* respectively. Jones and Smith (1967) found little evidence of aneusomaty in their investigations of the same species of *Crinum*. Occurrence of aneusomaty in *Hymenocallis* has, however been substantiated further by Raina and Khoshoo (1971) and Lakshmi (1978).

Chromosome Morphology

Inariyama (1937) and Sato (1938) both noted the large variation in size of chromosomes among genera of the Amaryllidaceae, an observation corroborated by Sharma and Bal (1956) and correlated with differences in ploidy level.

Jones and Smith (1967) and Raina (1978) found underlying uniformity of basic karyotype in both diploid and polyploid *Crinum*, with a basic formula of 1 long median-submedian; 6 medium subterminal and 4 short median-submedian chromosomes. Naranjo and Andrada (1975) assigned a basic karyotype to *Hippeastrum* of 4 median + 4 submedian + 3 subterminal chromosomes. Chromosome size was unfortunately not correlated with morphology. In these two genera, karyotype morphology is not a terribly useful character for delineating taxa.

Alternatively, differences in karyotype morphology is an important character by which I have recognized three subgenera in *Eucharis* (Meerow, 1984, in prep.). Profound intra-generic variation in karyotype morphology is exhibited as well by *Lycoris* (Inariyama, 1937; Bose and Flory, 1963) and *Hymenocallis* (Flory, 1976).

The presence of telocentric chromosomes has been reported for *Hymenocallis* (Flory and Schmidhauser, 1957; Flory, 1976) but are otherwise

rare in Amaryllidaceae. Telocentrics were found in a single species of *Crinum, C. ornatum,* with the uncharacteristic somatic chromosome number of $2n = 24$ (Jones and Smith, 1967). Both cases are discussed below.

Supernumary or B chromosomes have been reported in *Crinum* (Jones and Smith, 1967), *Pancratium* (Zamen and Nessa, 1974) and the African genera *Hessea* and *Strumaria* (Goldblatt, 1976). Their origin and behavior in meiosis are unknown in these genera.

A slight degree of heteromorphism between homologs has been observed in diploid species of *Crinum* (Jones and Smith, 1967; Raina, 1978) in regard to size. Naranjo and Andrada (1975) found marked heteromorphism in one clone of *Hippeastrum argentinum* for one pair of the 22 pair complement. In this case, the two homologs were metacentric and subtelocentric respectively. This was interpreted as a consequence of pericentric inversion. Baldwin and Speese (1947) encountered a similar phenomenon in material of *H. solandriflorum.*

Sato (1938) provided an analysis of amaryllidaceous karyotypes with particular reference to nucleolar chromosomes. Variation in the position of the secondary constriction, or differing morphologies of the SAT-chromosomes among species of the same genus (e.g. *Haemanthus, Narcissus*) was attributed to translocation of segments of the SAT-chromosomes or of the satellites themselves. In some cases (species of *Galanthus* and *Narcissus*), the satellite appeared to have been eliminated.

Number of SAT-chromosomes with the same morphology has been utilized as evidence of autopolyploidy in *Pancratium* (Zamen and Nessa, 1974). Pentaploid ($5x$) clones of *P. verecundum* exhibited five chromosomes with terminal secondary constrictions, all five of which constituted one of eleven morphological groups in the complement.

Accounts of secondary constrictions seemingly unrelated to the nucleolar organizing region have been reported for *Pancratium* (Ponnama, 1978), *Hymenocallis* (Lakshmi, 1978), and *Eucharis amazonica* (Nagalla, 1979).

II. PROCESS OF KARYOTYPE EVOLUTION IN THE AMARYLLIDACEAE

Sato (1937) readily conceived a complex of karyotype alterations at work in Amaryllidaceae and attributed the variation evident among and within genera to eight processes functioning at various levels within the family: 1) fusion of chromosomes 2) fragmentation of chromosomes 3) duplications 4) translocations 5) inversions 6) elimination 7) deficiency 8) size alteration. These processes could as well be declared universal in angiosperm cytogenetics (see Stebbins, 1950, 1971; Jones, 1978). Sharma

and Bal (1956) expressed reservations concerning Sato's wholesale attribution of these processes to the Amaryllidaceae. Several studies, however, stand out as clear exemplars of processes of karyotype evolution in the family, and it is reasonable to presume that these same mechanisms have been functional elsewhere in the family. Most, if not all, of Sato's processes have been implicated in these case studies. Two of these accounts involve genera which exhibit relative karyotypic stability, while two others investigate genera showing great variation in both chromosome number and morphology.

Crinum

Crinum, as pointed out earlier, is a genus in which substantial karyotypic stability has been demonstrated (Jones and Smith, 1967; Raina, 1978). Despite the uniformity of chromosome number and basic karyotype in the genus, the few successful meiotic studies (Khoshoo and Raina, 1968) indicate the presence of structural differentiation in some taxa. Most interspecific hybrids in *Crinum* are sterile (Hannibal, 1962), indicating strong genetic differentiation between taxa. Raina (1978) concludes that unequal segmental interchanges, deletions, peri- and paracentric inversions, misdivision and above all, gene mutation, are the active mechanisms of chromosomal change in the genus. The evolutionary consequences of polyploidy, however, are conceived as negligible.

Jones and Smith (1967) describe the interesting situation involving *C. ornatum* ($2n = 24$), the only species exhibiting a diploid base number other than $x = 11$. In place of the large metacentric chromosome characteristic of $x = 11$ species, *C. ornatum* possesses two telocentrics. In addition, instead of four pairs of small chromosomes, only three are present. The species exhibits instead a pair of markedly subterminal, almost telocentric, medium-sized chromosomes. The authors conclude that the two telocentrics represent the disassociated arms of a former large metacentric chromosome, having arisen through centromere misdivision (Darlington, 1939; Marks, 1957). The origin of the shortly acrocentric chromosome is less clear. One possibility is a pericentric inversion in a metacentric chromosome, accompanied by loss or translocation of an acentric. The unusual karyotype of this species is correlated with an ecology novel for the genus as a whole.

Eucharis

In the course of systematic work in the genus *Eucharis,* I have recognized three subgenera: *Eucharis, Caliphruria* and *Heterocharis* (Meerow,

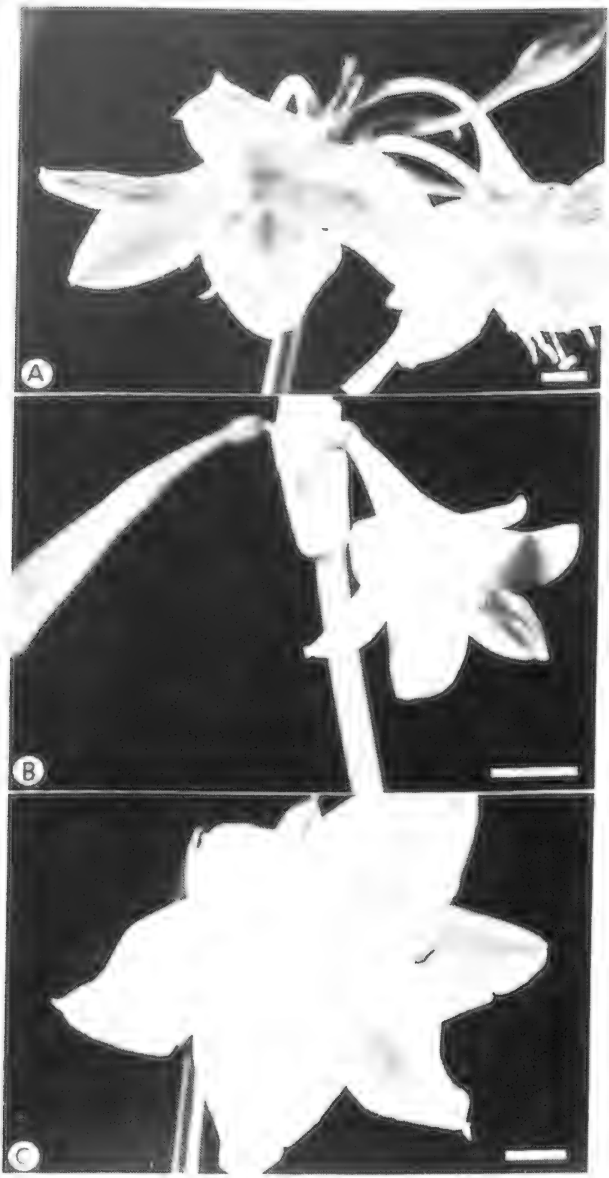


Figure 1. The three subgenera of **Eucharis** (sensu Meerow 1984, in prep.). A. **E. amazonica** (subg. **Eucharis**). B. **E. fosteri** (subg. **Caliphruria**). C. **E. mastersii** (subg. **Heterocharis**). Scales = 1 cm

1984, in prep.). In this same work, *Eucharis* is established as distinct from *Urceolina* Reich. The discussion that follows is adapted from Meerow (1984, in prep.). Differences in karyotype between the subgenera were utilized as an important character in their delimitation. Representative taxa of each subgenus are illustrated in Figure 1. Morphological features of the three subgenera are summarized in Table 1.

Unfortunately the only species of *Eucharis* studied in any detail cytologically has been *E. amazonica* (as *E. grandiflora*; Sato, 1938; Mookerjea, 1955; Nagalla, 1979). The first and last reports agree with each other on somatic chromosome number ($2n = 68$) and basic number ($x = 11$) for this taxon. Mookerjea (1955) reported $2n = 44$ which suggests either tetraploid forms ($4x$) exist for this taxon or else Mookerjea's plant was not referable to *E. amazonica*. Due to confusion over nomenclature and identity of *E. amazonica* and *E. grandiflora* (Meerow and Dehgan, 1984, in press) as well as among other taxa, the latter possibility is likely. Diploid number of clones of *E. amazonica* in my research collection (Meerow, 1984, in prep.) agrees with Sato (1955) and Nagalla (1979). These clones, however, stain only 50% pollen fertile and consistently fail to set seed, whether out-crossed or selfed. Nagalla reports that her clone displayed 65% pollen stainability and failed to set seed. Other taxa of *Eucharis* in the author's collection appear to set seed quite readily without mechanical pollination. Williams (1983, pers. comm.) reports inducing seed set on *E. amazonica* with pollen of *Hymenocallis amancaes* (Herb.) Nichols, and polyploid *Hippeastrum* but seed failed to germinate. Pollen of Ecuadorean material referable to this taxon (Dodson 5527, SEL) stained 100% with Alexander's (1969) stain. Living material of this clone will hopefully be available for future karyological study. On the basis of personal observation and inquiry it appears that all or most of material of this taxon in cultivation is referable to one or few clones.

On the basis of meiotic study, Nagalla (1979) considered *E. amazonica* an aneuploid with a $6x + 2$ constitution. At metaphase I she observed 62.6% univalents, 23.3% bivalents, 4.4% trivalents, 4.4% quadrivalents, 2.2% pentavalents and 3.1% hexavalents. Occurrence of bridge fragment configuration at anaphase I suggested inversion heterozygosity. Nagalla (1979) concluded that the species is a segmental allo-hexaaneuploid. The unusual cytogenetics of this species may be indicative of an hybrid origin. *Eucharis amazonica* in this regard may not be characteristic of the genus. Karyological work in progress towards a revision of the genus reveals $2n = 44$ in most taxa studied, and pollen stainability of 100%. *Eucharis* aff. *bakeriana* (Figure 2; Table 2) is representative.

The three subgenera studied do exhibit a fair degree of similarity in

Table 1. Comparative morphology of the 3 subgenera of **Eucharis** (sensu Meerow, 1984 in prep.)

CHARACTER	SUBG. EUCHARIS	SUBG. CALIPHRURIA	SUBG. HETEROCHARIS
Relative leaf size	Variable, mostly large, 15-50 cm	Small, 10-18 cm long	Large, ca. 30 cm long
Leaf surface texture	Variable, mostly plicate	Smooth	Plicate
Leaf color	Variable	Dark green	Bright green
Leaf margin	Variable, mostly undulate	Nonundulate	Undulate
Flower habit	Pendulous	Perpendicular to scape or declinate	Ascendant below, +/− declinate above
Pedicel	Pedicellate	Pedicellate, often long	Subsessile
Floral fragrance	Variable, mostly unnoticeable	Unnoticeable	Strong
Relative flower size	Variable	Small	Large
Perianth shape	Hypocrateriform	Funnelform-campanulate	Campanulate-crateriform
Perianth color	White	White, tube green below	White, tube green below
Tube morphology	Cylindrical below, dilated near throat	Funnelform, dilating gradually from base	(Sub)cylindrical below, dilated in upper ½-⅓
Tube habit	Strongly curved	Straight, occasionally slightly cernuous at apex	Curved
Limb habit	Spreading widely from throat	Imbricate below, spreading in upper half	Imbricate below, spreading in upper half
Staminal cup	Conspicuous, inserted at throat of tube, variously marked green or yellow at base	Rudimentary	+/− conspicuous, variously adnate to upper portion of tube, striped green within
Free portion of filament	Subulate or otherwise petaloid	Narrowly subulate	Linear
Pollen morphology[1]	Exine coarsly reticulate, grain large	Exine finely reticulate to tectate-perforate, grain size medium	Exine coarsly reticulate, grain medium to large
Stigma	3-lobed	3-lobed	3-lobed
Ovary length	Variable, less than 12 mm	3-5 mm	15-20 mm
No. ovules per locule	Variable, most often 2-4	2-7	15-20
Color, mature capsule	Orange	?	?
Seed color	Black, blue	Black	Black?
Relative seed size	Large	Medium	Large?
No. seeds per locule	1-2	1-2	1-2?

1. Size class according to Walker and Doyle, 1975.

karyotype (Table 2). All show a diploid number of $2n = 44$ and similar degree of range in chromosome size. Additionally, complements of both *Eucharis* aff. *bakeriana* (Figure 2), *E. subedentata* (Figure 3) and *E. mastersii* (Figure 4) separate into 11 morphological types of chromosomes (Table 2). This supports the consensus of Sato (1938) and Nagalla (1979) that $x = 11$ is the basic number for *Eucharis*.

Eucharis mastersii (subg. *Heterocharis*, Figure 4) exhibits the most symmetrical karyotype with regard to relative length of the chromosome arms. This taxon has an average arm ratio of 1.14. *Eucharis subedentata* (subg. *Caliphruria*, Figure 3) possesses 2 pairs of very long near-metacentric chromosomes (Table 2). *Eucharis* aff. *bakeriana* exhibits the most asymmetrical karyotype with 4 pairs of sub-telocentric chromosomes and average arm ratio of 2.16 (Figure 2 and Table 2). Preliminary studies of other taxa of subg. *Eucharis* (Meerow, unpubl.) show similar morphology. The karyotype of *E.* aff. *bakeriana* also shows great similarity to that described for *E. amazonica* (as *E. grandiflora*) by Mookerjea (1955).

Chromosomal and karyotypic symmetry have classically been cited as evidence of karyotypic evolution, i.e., karyotype of greatest symmetry in a particular phylogeny is the most primitive, and that of least symmetry, more derived (Levitsky, 1931; Stebbins, 1950, 1971). Recently, this tenet has come under strong challenge (Jones, 1978), though the evidence for the reversed process is intimately connected to accompanying changes in chromosome number (i.e. Robertsonian changes). In *Eucharis*, no such change in number is in evidence. Thus, pericentric inversion would be the most likely causative factor generating the transformation of metacentric chromosomes to submetacentric or subtelocentric. The karyotype of *Eucharis mastersii*, on the basis of number of metacentric chromosomes and average arm ratio, is most symmetric of the three taxa (Table 2). The karyotypes of *Eucharis subedentata* and *E.* aff. *bakeriana* are most asymmetric (Table 2). *Eucharis subedentata*, however, shows greatest asymmetry in karyotype size, with chromosomes ranging from 3.00-20.25 μm. Reduction in chromosome size is likewise considered a derived character in karyotype evolution (Levitsky, 1931; Stebbins, 1950, 1971).

Levitsky (1931) and Stebbins (1950) postulate a hypothetical ancestral karyotype for any phylogeny where evidence exists for trends of karyotype evolution. Such a hypothetical karyotype would exhibit great symmetry from which less symmetrical karyotypes would be derived. If such a prototype existed for *Eucharis*, subg. *Heterocharis* shows the least divergence in terms of this single character. Subgenera *Eucharis* and *Caliphruria* show the greatest degree of divergence in chromosomal symmetry from a hypothetical prototype. The karyotype of *E. subedentata* (subg. *Caliphruria*),

Table 2. Karyotypic data, the three subgenera of **Eucharis** (sensu Meerow, 1984, in prep.)

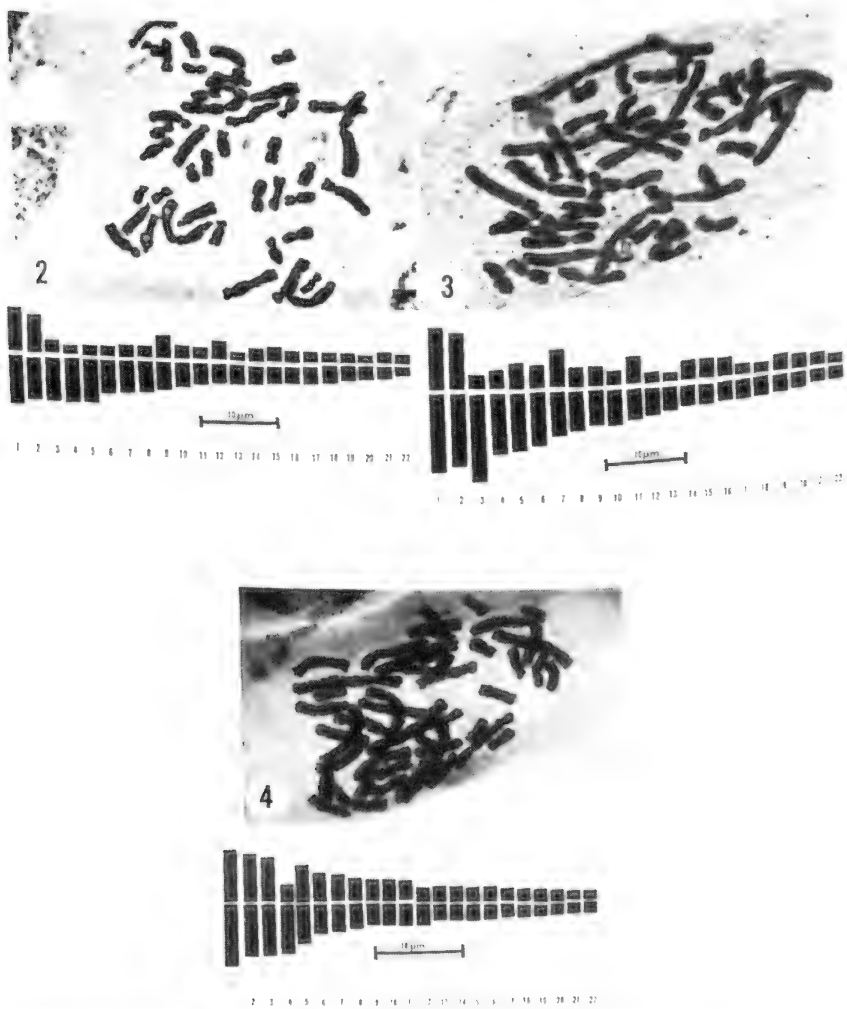
TAXON	CHROMOSOME NUMBER	CHROMOSOME SIZE RANGE (*um*)	AVERAGE ARM RATIO	CHROMOSOME SIZE[1] GROUPS VL/ L /ML/ M / S	CHROMOSOME[2] MORPHOLOGY VL/ L /ML/ M / S	NUMBER OF MORPHOLOGICAL TYPES
Eucharis aff. **bakeriana** (subg. **Eucharis**), Figure 2 Accession no. 825	44	3.00 - 14.00	2.16	4 12 10 18	m: 2 2 nm: 4 2 2 6 sm: 4 4 10 st: 6 2	11
E. subedentata (subg. **Caliphruria**) Figure 3, Accession no. 801	44	3.00 - 20.25	1.88	4 10 8 14 8	m: 6 2 nm: 4 2 2 4 sm: 4 6 4 6 st: 2	11
E. mastersii (subg. **Heterocharis**) Figure 4, Accession no. 842	44	3.25 - 14.65	1.14	8 6 8 22	m: 4 4 8 14 nm: 4 4 sm: 2	11[3] (1, 2 & 3, 4, 5, 6 & 7, 8, 9-11, 12, 13-16, 17-20, 21 & 22)

[1]**VL** = very long, **L** = long, **ML** = moderately long, **M** = medium, **S** = small

[2]**m** = metacentric, **nm** = near-metacentric, **sm** = submetacentric, **st** = subtelocentric

[3]Numbers in parentheses refer to chromosomes in haploid idiogram (Fig. 4)

Figures 2-4. Mitotic metaphase configurations and haploid idiograms. 2. **Eucharis** aff. **bakeriana** (subg. **Eucharis**). 3. **E. subedentata** (subg. **Caliphruria**). 4. **E. mastersii** (subg. **Heterocharis**).



however, exhibits the largest chromosome size of all four taxa. Levitsky (1931) and Stebbins (1950) correlate asymmetry with a high degree of phenotypic specialization, a character suggested by the floral morphology of both subgenera *Eucharis* and *Caliphruria* (Meerow, 1984, in prep.). Conversely, subg. *Heterocharis* exhibits morphological characters in common with other "primitive" taxa of the pancratioid Amaryllidaceae (Mee-

row, 1984, in prep.).

Thus in *Eucharis,* there appears to be a situation halfway between that exhibited by *Crinum* and that discussed below. Chromosomal repatterning has resulted in a degree of morphological divergence sufficient to warrant recognition of subgeneric taxa. Within these subgenera, however, karyotypic stability has been maintained, as it is suggested by the comparative cytology of species in subg. *Eucharis,* the largest of the three (Meerow, unpubl.).

Lycoris

Inariyama (1931, 1933) analyzed the karyotypes of five species of *Lycoris* utilizing the morphological terminology of Robertson (1916). He observed that the karyotypes vary in such a manner that they may be regarded as derived from 1) the karyotype of *L. sanguinea* Maxim. ($2n = 22$ rod or "I" chromosomes) via fusion of some rod chromosomes (centric fusion) or from that of *L. aurea* Herb. ($2n = 12$; 10 "V" chromosomes: 2 rod or I chromosomes) by fragmentation of some V chromosomes (centric fission). Inariyama (1937, 1951) and, most recently, Bose and Flory (1963) continued these studies in *Lycoris* which now account for sixteen taxa in the genus. Diploids and triploids are both present in the genus. Proportions of V and I types vary between the extremes of $2n = 22$ I and 10 V + 2 I at the diploid level and from 22 I to 4 V + 25 I at the triploid level. If a V chromosome is conceived as the product of centric fusion, a "fundamental number" (Matthey, 1945) of 22 or 33 (i.e. $x = 11$) is generated.

While Inariyama (1937, 1951) strongly implicated centric fusion as the process responsible for the karyotype heteromorphism in *Lycoris,* Bose and Flory (1963) were reluctant to accept the idea that acrocentric (I type) chromosomes could be ancestral in the karyotype evolution of any plant genus. Levitsky's (1931) concept of "one-way" karyotype evolution, i.e., symmetry progressing towards asymmetry, which has become rooted in cytotaxonomic thought (Stebbins, 1950, 1971), has only recently come under strong challenge (Jones, 1978).

In the case of *Lycoris,* centric fusion seems the more likely possibility, considering the ubiquity of $x = 11$ as base number in Amaryllidaceae. Inariyama's (1931, 1933, 1937) studies of meiotic configurations further established hybridization as a second factor of importance in the evolution of *Lycoris.*

Hymenocallis

Hymenocallis exhibits the widest range of unrelated somatic chromosome numbers in the family. *H. quitoensis* Herb., an isolated species found in central South America, has the lowest number recorded, $2n = 24$ (Snoad, 1952, 1963), while the highest numbers, $2n = 104$-110, are found in *H. narcissiflora* and *H. pedunculata* (Schmidhauser, 1954). The scarcity of meiotic data has impeded the establishment of a base number for the genus, as well as obscured the possible pathways accountable for such variation.

Sato (1938) and Snoad (1955) regarded $x = 23$ as the base number for the genus since $2n = 46$ is the most common somatic number in the genus. Sato (1938) believed this number to be secondarily derived from an ancestral base number of $x = 11$ through the duplication of one chromosome in a primary diploid ($2n = 22 + 1$) followed by polyploidy ($2n = 46$) and secondary balance. Snoad (1963) considered $x = 23$ dibasic in origin, the two numbers involved being 11 and 12. Schmidhauser (1954) considered $x = 23$ as one of several base numbers. Sharma and Bal (1956) considered both 22 and 23 as possible base numbers, since both $2n = 46$ and 44 were found in species studied by them. Traub (1962) declared the basic number to be 12, solely on the basis of the somatic chromosome number of *H. quitoensis* ($2n = 24$) which he conceived as the most primitive species in the genus. While *H. quitoensis* may indeed be a relict taxon in the genus, a derived origin for its karyotype can not be precluded. Flory and Schmidhauser (1957) reported the most frequent somatic chromosome number to be $2n = 46$ with $2n = 40$ next in frequency. Telocentric chromosomes are found in the complements of many taxa in the genus but are noticeably absent from those in which $2n = 40$, 46 or 69. The latter would be triploids based on $x = 23$. The authors also found that most numbers other than 46 (or 69) or 40 reduce to one of these if half the number of telocentrics is added to the number of chromosomes with interstitial centromeres. Despite this discovery, Schmidhauser and Flory (1957) shied away from implicating centric fission as active in the genus, a likelihood which Flory (1975) has only recently supported without ambivalence. Raina and Khoshoo (1971) suggested three basic numbers, $x = 10$, 11, and 12, for the genus. Taxa with $2n = 40$ were therefore conceived as being derived from an $x = 10$ series, while taxa with $2n = 46$ and 69 were regarded as secondarily derived polyploids arising from hybridization between $x = 11$ and $x = 12$ species. Lakshmi (1978) supported the view that $x = 11$ is at least one of the basic numbers in *Hymenocallis*. The two species studied (*H. littoralis* and *H. tenuifolia*) exhibit 11 morphological types of chromosomes.

Considering that *Eucharis* and *Pancratium,* two genera allied with *Hymenocallis,* exhibit base numbers of $x = 11$, there would appear to be good evidence supporting Sato's (1938) duplication/polyploidy hypothesis as the origin of $2n = 46$ species. Loss of a chromosome or centric fusion may in turn be responsible for $2n = 40$ species. However, two small Andean genera, *Pamianthe* Stapf and *Paramongaia* Velarde, which both bear strong morphological resemblance to *Pancratium* and *Hymenocallis,* exhibit somatic chromosome number of $2n = 46$ (Williams, 1981). This same chromosome number is also found in the Andean genera *Stenomesson* Herb., *Eucrosia* Ker-Gawl and *Phaedranassa* Herb. (Traub, 1963; Meerow, unpubl.). Thus the nature of a base number $x = 23$ may be more fundamental than has been conceded, at least for neotropical genera of the Pancratioidinae.

It is therefore apparent that *Hymenocallis* is an evolutionary dynamic genus in which speciation has been rapid. Chromosome fragmentation, inversions and interchanges, coupled with hybridization and polyploidy appear to have been (and perhaps are still) common phenomena generating evolution in the genus.

Karyotype evolution (and corollary, speciation) in the Amaryllidaceae would appear to have taken two major courses, each represented independently and recurrently within the family. In genera such as *Hippeastrum, Crinum* and *Eucharis* which demonstrate, for the most part, karyotypic stability, gene mutation has perhaps been of greater significance in generating diversity than has any major (and cytologically visible) chromosome repatterning. In these genera, polyploidy is of low frequency. In genera exhibiting karyotypic instability (e.g. *Lycoris* and *Hymenocallis*), the evidence suggests that Robertsonian change, other forms of large-scale chromosomal repatterning, hybridization, and polyploidy have played major roles in the evolution of each group.

LITERATURE CITED

Alexander, M. P. 1969. Differential staining of aborted and non-aborted pollen. **Stain Technology** 44: 117-122.

Arroyo, S. 1982. The chromosomes of **Hippeastrum, Amaryllis** and **Phycella** (Amaryllidaceae). **Kew Bull.** 37: 211-216.

Baldwin, J. T. and B. M. Speese. 1947. **Hippeastrum solandriflorum**: its chromosomes. **Bull. Torrey Bot. Club** 74: 250-254.

Battaglia, E. 1949. **In**: Chromosome Atlas of Flowering Plants. Eds.: C. D. Darlington and A. P. Wylie. Allen and Unwin, London. 1955.

Bose, S. 1958. **Pl. Life** 14: 33.

_____. and W. S. Flory. 1963. **Nucleus** 6: 141-156.

Dahlgren, R. M. T. 1975. A system of classification of the angiosperms to be used to demonstrate the distribution of characters. **Bot. Notiser.** 128: 119-147.

Darlington, C. D. 1939. Misdivision and genetics of the centromere. **J. Genet.** 37: 341-364.

Fernandes, A. 1942. **Herbertia** 9: 126.

Flory, W. S. 1959. Chromosome number and phylogeny in **Zephyranthes. Proc. Inter. Bot. Cong. Montreal** 9: 116-117.

_____. 1975. Chromosome numbers for several species of **Hymenocallis. Pl. Life** 31: 56-63.

_____. 1976. Distribution, chromosome number and types of various species and taxa of **Hymenocallis. The Nucleus** 19: 204-227.

_____. and R. F. Coulthard, Jr. 1981. New chromosome counts, numbers and types in genus **Amaryllis**. **Pl. Life** 37: 43-56.
_____. and T. F. Schmidhauser. 1957. Mitotic chromosome numbers in **Hymenocallis** with a consideration of factors possibly affecting numbers and karyotypes. **Genetics** 42: 369-370.
Goldblatt, P. 1976. Chromosome cytology of **Hessea, Strumaria,** and **Carpolyza** (Amaryllidaceae). **Ann. Missouri Bot. Gard.** 63: 314-320.
Grant, V. 1971. Plant Speciation. Columbia Univ. Press, New York.
Hannibal, L. S. 1962. Notes on Crinum breeding. **Pl. Life** 18: 88-92.
Huber, H. 1969. Die Sammenmerkmale und verwandtschafts verhaltnisse der Liliiflorae. **Mitteil. Bot. Staatssamml. Munchen** 8: 219-538.
Inariyama, S. 1931. Cytological studies in the genus **Lycoris**. **Bot. Mag. Toyko** 45.
_____. 1933. Phylogeny of **Lycoris** from the karyological point of view. **Report of Jap. Sci. Cong.** 8.
_____. 1937. Karyotype studies in Amaryllidaceae I. **Sci. Rep. Tokyo Univ. Sect. B** 3(52): 95-113.
_____. 1951. **Scient. Rep. Toyko Bumike Daigaku** 7: 103-157.
Jackson, R. C. 1971. The karyotype in systematics. **Ann. Rev. Ecol. and Syst.** 2: 327-368.
Jones, K. 1978. Aspects of chromosome evolution in higher plants. **Adv. Bot. Res.** 6: 119-194.
_____. and J. B. Smith. 1967. Chromosome evolution in the genus **Crinum**. **Caryologia** 20: 163-179.
Khoshoo, T. N. and S. N. Raina. 1968. Cytogenetics of tropical bulbous ornamentals I. Heterozygosity in **Crinum latifolium**. **Cytol.** 33: 209-219.
Lakshmi, N. 1978. Cytological studies in two allopolyploid species of the genus **Hymenocallis**. **Cytol.** 43: 555-563.
Levitsky, G. A. 1931. The karyotype in systematics. **Bull. Appl. Bot. Genet. Plant Breed.** 27: 220-240.
Marks, G. E. 1957. Telocentric chromosomes. **Amer. Nat.** 91: 223-232.
Matthey, R. 1945. **Experientia** 1: 50-56 and 78-86.
Meerow, A. W. 1984. Genetic delimitation of **Eucharis** Planchon (Amaryllidaceae). Submitted to **Systematic Botany.**
_____. **and B. Dehgan. 1984. Re-establishment and lectotypification of Eucharis amazonica** Linden ex Planchon (Amaryllidaceae). **Taxon** 33: in press.
Mookerjea, A. 1955. Cytology of amaryllids as an aid to the understanding of evolution. **Caryologia** 7: 1-71.
Nagalla, L. 1979. Cytological studies in **Eucharis grandiflora** Planch, and Linden. **Microbios. Letters** 4: 89-94.
Naranjo, C. A. and A. B. Andrada. 1975. El cariotipo fundamental en el genero **Hippeastrum** Herb. (Amaryllidaceae). **Darwinia** 19: 566-582.
Neves, J de B. 1939. **Bol. Soc. Bot.** 13: 547.
Ponnamma, M. G. 1978. Studies on bulbous ornamentals I. Karyomorphology of diploid and triploid taxa of **Pancratium triflorum** Roxb. **Cytologia** 43: 717-725.
Raina, S. N. 1978. Genetic mechanisms underlying evolution in **Crinum**. **Cytol.** 43: 575-580.
_____. and T. N. Khoshoo. 1971. Cytogenetics of tropical bulbous ornamentals. V. Chromosomal variation and evolution in **Hymenocallis**. **La Cellule** 68: 239-259.
Robertson, W. R. 1916. Chromosome Studies I. Taxonomic relationships shown in the chromosomes of Tettigidae and Acrididae: V-shaped chromosomes and their significance in Acrididae, Locutidae and Gryllidae: chromosomes and variation. **J. Morphol.** 27: 179-279.
Sato, D. 1938. Karyotype evolution and phylogeny. IV. Karyotype in Amaryllidaceae with special reference to SAT chromosomes. **Cytologia** 9: 203-242.
Schmidhauser, T. F. 1954. Cytotaxonomic studies in the Amaryllidaceae. PhD Diss. Univ. Virginia.
Sharma, A. K. and A. K. Bal. 1956. A cytological study of a few genera of Amaryllidaceae with a view to find out the basis of their phylogeny. **Cytologia** 21: 329-352.
_____. and N. K. Bhattacharyya. 1956. An investigation of the karyotype of the genus **Crinum** and its phylogeny. **Genetica** 28: 263-296.
. and C. Ghosh. 1954. Further investigation on the cytology of the Amaryllidaceae and its bearing on the interpretation of its phylogeny. **Genet. Iber.** 6: 71-100.
Snoad, B. 1952 and 1963. cited in Chromosome Atlas of Flowering Plants. Eds.: C. D. Darlington and A. P. Wylie. Allen and Unwin, London.
_____. 1955. Somatic instability of chromosome number in **Hymenocallis calathinum**. **Heredity** 9: 129-139.
Stebbins, G. L. 1950. Variation and Evolution in Plants. Columbia Univ. Press, New York.
_____. 1971. Chromosomal Evolution in Higher Plants. Addison-Wesley Publ. Co., Reading.
Traub, H. P. 1962. Key to the subgenera, alliances and species of **Hymenocallis**. **Pl. Life** 18: 55-72.
_____. 1963. Genera of the Amaryllidaceae. American Plant Life Society, La Jolla.
_____. 1983. The lectotypification of **Amaryllis belladonna** L. (1753). **Taxon** 32: 253-267.
Walker, J. W. and J. A. Doyle. 1975. The bases of angiosperm phylogeny: palynology. **Ann. Missouri Bot. Gard.** 62: 664-723.
Williams, M. D. 1981. Chromosome count for **Paramongaia weberbaueri** Velarde. **Pl. Life** 37: 83-89.
Zaman, M. A. and L. Nessa. 1974. Meiotic behavior in $2n = 44$ and karyotype analysis in $2n = 55$ chromosome **Pancratium verecundum** L. (Amaryllidaceae). **Caryologia** 27: 395-402.

JUDGING AMARYLLIS

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A considerable amount of confusion exists about using the Scale of Points in judging Amaryllis. The following analysis and comments may be helpful in fostering more uniform judging and better understanding for using this guide. This *Scale of Points* was adopted in 1977.

QUALITIES	SINGLE (CUT) SPECIMEN	POTTED PLANTS 1 SCAPE	POTTED PLANTS 2 OR MORE SCAPES
Perfection of floret shape (form)	20	20	15
Conformity to floret color Standards	30	30	25
Floret size	15	15	15
Pose (Symmetry of florets in umbel)	10	10	10
Scape (Length and character)	5	5	5
Number of florets per scape	6	6	6
Number of scapes per plant	—	—	10
Fragrance	2	2	2
Foliage	—	2	2
Condition of exhibit	12	10	10
TOTAL	100	100	100

PERFECTION OF FLORET SHAPE (FORM) **20 20 15**

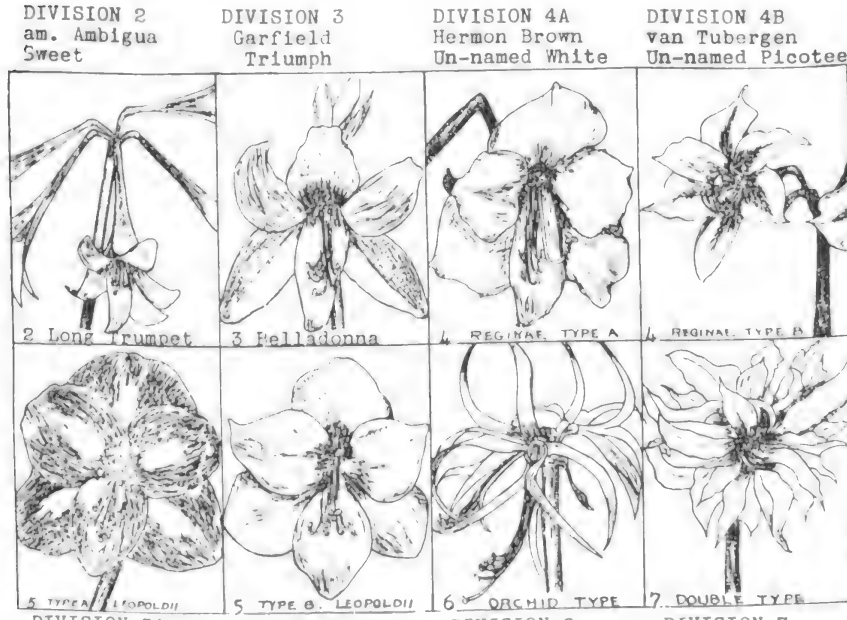
Form varies from Division to Division so the ideal form for a given Division is the basis for evaluation of this quality. The individual florets should be at the peak of maturity, that is, fully expanded but not yet losing substance. All segs should be perfectly formed (for cv.) with the style and filaments centered down the lower pet seg. Any variation from the ideal for the clone (cv.) is a fault and should be penalized in proportion to the degree of deviation. The lower seg is usually narrower than the other segs. All segs should conform in size, form and placement according to the ideal for the clone. This applies to all the florets in the umbel. All should be uniform.

CONFORMITY TO FLORET COLOR STANDARDS **30 30 25**

The color should be typical for the cultivar or clone. This includes intensity of color as well as hue. To develop perfect color, the specimen must have had the optimum light (and shade), moisture, temperature, and

fertilizer, showing cultural perfection. If substance or texture is thinning, color will be less than typical for the specimen at its prime. The Fischer Color Chart is generally satisfactory for color reference. The Munsell Color Fan is also useful in making color comparisons. Inadquate light results in weak color. Growing and attending shows are helpful in development of color recognition.

DIVISION I -- Cultivated Wild Amaryllis (45 species).



DIVISION 8 -- Miniature Type Hybrids and Graceful, Gracilis.

DIVISION 9 - - Unclassified

FLORET SIZE **15 15 15**

Size of the floret is determined by the characteristics of the Division in which the specimen is classified. Size also is determined by the individual clone. Some within each Division are larger or smaller than other clones. Larger than average is usually favored, especially for Division 5 specimens. Overfeeding can result in larger blooms, but it may also result in abnormal texture. Only a few clones are normally crepe-like in texture.

POSE (SYMMETRY OF FLORETS IN UMBEL) **10 10 10**

Pose is how the scape presents the umbel of the individual florets in relation to the scape. There should be 4 florets, each at a right angle to the adjacent floret in each umbel. (Exceptions are those species or other clones which normally do not produce 4 florets such as Striata.) The length of the pedicel determines the angle of the floret in relation to the scape. Division 5 specimens with the shortest pedicels should look you straight in the face while Division 4 specimens with longer pedicels will droop slightly. The Belladonna droop more than Division 4 specimens. The florets should always drop to their characteristic position, never face upward. Florets or buds beyond the desired number of 4 will destroy symmetry and should have been removed before they developed enough to destroy symmetry. These additional buds or florets are a fault and should be penalized. Specimens which normally have 2 florets should develop such that the florets are opposite each other.

LENGTH AND CHARACTER OF THE SCAPE **5 5 5**

The length and size (diameter) of the scape should be in proportion to the size of the florets which make up the umbel. It should be adequate to support the umbel gracefully. Example: A large, long scape (15-20, perhaps 22 inches) would be in proportion to an umbel of Leopoldii blooms which usually measure 7 to 10 inches in diameter. The smaller size should have a slightly smaller scape. A Gracilis or miniature specimen should have a shorter and thinner scape. The scape should be straight and free of blemishes or damage. Its color should be well developed. A rubber band should be used to bind the cut end of the scape such that it does not "frog". Cut specimens may be propped or secured in the bottle to hold them in the best position for presentation of the umbel. Any such mechanics should not be especially noticeable. A short scape or one which is too long should be penalized in relation to the umbel size and the diameter of the scape. Any mechanical or other damage to the scape should be penalized.

NUMBER OF FLORETS PER SCAPE **6 6 6**

Only scapes with 3 or 4 florets are eligible for competition. Two florets only are not adequate for the larger hybrids. Two of the 4 (or potential 4) florets must be fully expanded; the others may be partially expanded or still in bud. If 2 florets are fully expanded allow 3 points, for 3 florets expanded allow 5 points and if all 4 are fully expanded allow the

full 6 points. In miniature type hybrids (Division 8) the scape is usually quite slender and 2 or more flowered scapes are eligible. That is, 2 florets per scape is eligible. For these miniatures allow 4 points for 2 fully expanded florets and 6 points for 3 or more blooms. Two blooms are not adequate for the large hybrids if there are no buds or unexpanded blooms. They should not be entered in competition with scapes having 3 or 4 florets (or promise of this many). They may be exhibited in separate classes, but it is preferable that they be displayed only. They can add to the beauty of the show even though they may not be eligible for any high award. Large hybrid 2 bloomers will do well to score over about 85 to 90 at the most if they are judged.

NUMBER OF SCAPES PER PLANT — — **10**

This quality applies only to potted plants. Allow 8 points for one scape, 9 points for two scapes, and 10 points for 3 or more scapes. Any scapes with faded blooms which have been removed are counted. Example: One scape has been removed due to faded flowers, 2 scapes are in bloom; allow all 10 points. Faded florets should be removed from such scapes as many times some are past prime when there are 2 or more scapes.

FRAGRANCE **2** **2** **2**

If the judge can detect a pleasing fragrance, which is a desirable quality, 2 points are allowed. All hybrids have at least a very slight fragrance which is sometimes scarcely detectable to our olfactory senses. The Belladonna Division has a distinctive fragrance.

FOLIAGE — **2** **2**

Foliage applies to potted plants only. It is never displayed or shown with cut specimens. Allow 2 points for well developed foliage. If foliage is entirely absent deduct 2 points. If foliage is present but rather short allow 1 point. Foliage should have good substance, rich color and be free of damage or dirt.

CONDITION OF EXHIBIT **12** **10** **10**

Specimens in prime condition and properly grown should receive the full number of points. Spent flowers or scapes should have been removed. The segs should be free of pollen stain or other soil. Evidence of insect injury must be severely penalized. Over-potting of bulbs should be penal-

ized in this quality. Mechanical injury such as torn straps or segs or broken straps or segs are penalized less severely than insect damage. Staking is permissible (sometimes advantageous). The stake should be green and not as high as the umbel. Green twist-ems should be used to hold the scape to the stake. If the stake is conspicuous or out of proportion a deduction must be made. The tie or twist-em should be inconspicuous. Cultural perfection is considered under this quality. Has this specimen been grown to its greatest potential?

Additional Information and Comments:

The anthers may be removed and the specimen will not be penalized if their removal is permitted by the schedule. Removal of the anthers prevents pollen stain on the segs, and unauthorized removal of pollen, too. However, a specimen with its anthers would be given preference over a specimen with anthers removed if all other qualities were equal. Never remove the filaments or style.

Never remove the bracts when grooming the specimen. Such a specimen should be disqualified by the Classification. It might, however, be placed on display or used in designs.

Individual florets may be displayed in orchid tubes (or some such manner). Each floret should be identified as to Division and Clone. Such a display would be primarily for educational purposes and to enhance the over-all beauty and interest of the show.

Classification should be by Division and their sub-divisions as D 5A and D 5B.

Points should be removed in proportion to the degree of the fault which exists. Example: Condition — 12 points. If one floret is beginning to lose its substance, there is pollen on the segs of 2 florets, the scape is slightly curved and shows evidence of slight mechanical damage, and the stake is taller than the scape. Three florets are fresh and fully expanded. If the panel feels that the exhibit is half at fault, then 6 points would be deducted. But with three prime florets, the more likely deduction would be less than six points; perhaps three to five points.

Every exhibitor should evaluate his/her exhibit when considering entering it in competition. If it does not measure up to exhibition standards it might be put on display or used in designs. A faulty specimen can add to the beauty of the show.

Two bloomers may be judged in a separate class, but it is preferred that they be displayed only. As they have only two blooms and no evidence of more either to come or spent blooms, they should receive less

than 3 points for number of blooms. Points would have to be removed under pose, for symmetry would be at fault. It is rather unlikely that a 2 bloomer could be worthy of a blue ribbon. What to do about these specimens causes a lot of misunderstanding.

DOUBLE AMARYLLIS (Division 7) are those cultivars and clones which normally bloom with two or more complete sets of pet segs. These segs are quite ruffled in some clones while some will be rather straight or not ruffled. They are judged by the same Scale of Points as other Amaryllis.

Tepaloids, sometimes called "ears", are characteristic for some clones usually in Division 5. They are ruffled portions of the pet segs and occur in the throat of the floret. Do not confuse these with double Amaryllis. They are not faults, either, as they normally occur in given clones.

At its best, judging is subjective, but be as objective as possible. Never let personal preferences enter into judging. Practice Point Scoring at some of your meetings so everyone is knowledgeable. You should be familiar with a rather large range of Amaryllis Divisions and clones. You gain this knowledge by growing and by observing those grown by others. Descriptions also help to let you know what constitutes a typical specimen of a given clone.

RECENT LITERATURE OF INTEREST TO READERS

(Please advise the Editor of interesting literature you encounter)

Adinolfi, M. *et al.* 1983. Triterpenes from bulbs of *Muscari comosum*, 1. **Journ. Nat. Prod.** 46: 559-562.

Aker, Charles L. 1982. Spatial and temporal dispersion patterns of pollinators and their relationship to the flowering strategy of *Yucca whipplei* (Agavaceae). **Oecologia** 54:242-252. Aug. 1982.

Ali, A.A., S.A. Ross, A.M. El-Moghazy & S.A. El-Moghazy. 1983. Clivonidine, a new alkaloid from *Clivia miniata*. **Jour. Nat. Prod.** 46:350-352. July 1983.

Arroyo, Silvia C. 1982. Anatomía vegetativa de *Ixiolirion* Fisch. ex Herb. (Liliales) y su significado taxonómico. **Parodiana** 1:271-286. Mar. 1982.

_____, _____. 1982. The chromosomes of *Hippeastrum*, *Amaryllis* and *Phycella* (Amaryllidaceae). **Kew Bull.** 37(2):211-216.

Bedel, Hollis & James L. Reveal. 1982. A synoptical review of a revised classification of Liliopsida (Magnoliophyta) as proposed by Dahlgren and Clifford. **Phytologia** 52:179-183. Nov. 1982.

Chouinard, C. A. 1982. Ultrastructural associations of the chromatin-containing lacunar spaces in the vacuolar component of the interphase nucleolus in *Allium cepa*. **Canad. Journ. Bot.** 60:2624-2628. Dec. 1982.

Cox, Paul Alan. 1982. *Cordyline* ovens (umu ti) in Samoa. **Econ. Bot.** 36:389-396. 1 Nov. 1982.

Diggle, Pamela K. & Darleen A. DeMason. 1983. The relationship between the primary thickening meristem and the secondary thickening meristem in *Yucca Whipplei* Torr. I. Histology of the mature vegetative stem. **Am. Jour. Bot.** 70: 1195-1204.

_____, _____ & _____. 1983. II Ontogenetic relationship within the vegetative stem. **Am. Jour. Bot.** 70: 1205-1216.

Freeman, C. Edward, William H. Reid and John W. Zaua. 1983. Nectar amino acids in four species of *Agave* (Agavaceae). **Southw. Nat.** 28:113-115. 18 Feb. 1983.

Gentry, Howard Scott. 1982. Characters of *Agave*. **Saguaroland Bull.** 36:139-143. Nov. 1982.

Goldblatt, Peter. 1982. A Synopsis of *Moraea* (Iridaceae) with New Taxa, Transfers and Notes. **Ann. Mo. Bot. Gard.** 69(2):351-369.

_____, _____. 1982. Corm Morphology in *Hesperantha* (Iridaceae:Ixioideae) and a Proposed Infrageneric Taxonomy. **Ann. Mo. Bot. Gard.** 69(2):370-378.

_____, _____. 1982. Notes on *Geissorhiza* (Iridaceae): The Species in Madagascar. **Ann. Mo. Bot. Gard.** 69(2):379-381.

_____, _____. 1982. Revision of the southern African genus *Freesia* (Iridaceae). **J. S. African Bot.** 48:39-91.

_____, _____. 1982. Chromosome cytology in relation to suprageneric systematics of Neotropical Iridaceae. **Syst. Bot.** 6:186-198.

_____, _____. 1982. *Gynandriris pritzeliana* (Diels) Goldbl. **Fl. Pl. Africa** 47: tab. 1851.

_____, _____. 1983. *Anomatheca viridis* (Ait.) Goldbl. **Fl. Pl. Africa** 48: tab. 1867.

_____, _____. 1983. *Babiana lobata* Lewis. **Fl. Pl. Africa** 48: tab. 1866.

_____, _____. 1983. Geography of Iridaceae in Africa. **Bothalia** 14:235-240.

_____, _____. 1983. The species of *Geissorhiza* (Iridaceae) in Thurnberg's Herbarium (Uppsala, Sweden). **Nordic J. Bot.** 3:437-442.

Grau, J. 1982. Eine neue *Alstroemeria* aus Nordchile. **Mitt. Bot. Staatssam. Munchen** 18:213-217. 15 Dec. 1982.

_____, _____ & E. Bayer. 1982. Zwei unbekannte Alstroemerien aus Chile. **Mitt. Bot. Staatssam. Munchen** 18:219-229. 15 Dec. 1982.

Holmes, W. C. and C. J. Wells. 1982. The distribution of *Habranthus tubispathus* (L'Her.) Traub. in South America and North America—Texas and Louisiana. **Sida** 8(4):328-347.

Ieven, M., A. J. Vlietnick, D.A. Vanden Berghe, J. Totte, R. Dommisse, E. Esmani & F. Alderweireldt. 1982. Plant antiviral agents III. Isolation of alkaloids from *Clivia miniata* Regal.(Amaryllidaceae). **Journ. Nat. Prod.** 45:564-573. 8 Nov. 1982.

Jarvis, C.E. 1984. *Amaryllis belladonna* L.—Further Comments on Lectotypification. **Taxon** 33(1):82-84.

Khaleel, Tasneem F. & Becky B. Mitchell. 1982. Cytoembryology of *Allium textile* Nels. & Macbr. **Amer. Jour. Bot.** 69:950-956. 29 July 1982.

Koelling, Alfred C. 1982. Please don't eat the daffodils, or the datura, or the dieffenbachia. **Living Mus.** 44:36-38.

Langdon, K.R. 1983. Simpson's zephyr lily, *Zephyranthes simpsonii,* an endangered species. **Fla. Dept. Agr. Bot. Circular** 20:2. July 1983.

Lantz, Peggy S. 1982. Henry Nehrling, pioneer Florida horticulturist. **Palmetto** 2(3):1-3. Aug. 1982.

Leonard, S.W. & W.W. Baker. 1983. Additional populations of *Harperocallis flava* McDaniel (Liliaceae). **Castanea** 48:151, 152. June 1983.

Luck, B.T. & J.G. Lafontaine. 1983. An ultracytochemical study of the nucleoplasm in meristematic plant cell (*Allium porrum*) interphase nuclei. **Canad. Jour. Bot.** 61: 2554-2565.

McCollum, Gilbert D. 1982. Experimental hybrids between *Allium fistulosum* and *A. roylei.* **Bot. Gaz.** 143:238-242. June 1982.

Meerow, Alan. 1984. Two new species of pancratioid Amaryllidaceae from Peru and Ecuador. **Brittonia** 36(1): 18-25.

Mitich, Larry W. 1982. Parry's nolina (*Nolina parryi*). **Cact. Succ. Jour. Great Brit.** 44:67, 68. Sept. 1982.

Nesom, Guy L. 1983. New species of *Calochortus* (Liliaceae) and *Linum* (Linaceae) from northern Mexico. **Madrono** 30: 250-254.

Nicolson, Dan M. 1982. Schott's New Taxa Published in the Wiener Zeitschrift fur Kunst, usw. (1829-1830) **Taxon** 31(3):549-550. (Publication of *Alstroemeria affinis.*)

Ornduff, Robert. 1983. Studies on the Reproductive System of *Nivenia corymbosa* (Iridaceae); an apparently androdioceious species. **Ann. Mo. Bot. Gard.** 70(1):146-148.

Patrick, Thomas S. 1984. *Trillium sulcatum* (Liliaceae), a new species of the southern Appalachians. **Brittonia** 36(1): 26-36.

Pollard, Clifford J. 1982. Fructose oligosaccharides in monocotyledons: A possible delimitation of the order Liliales. **Biochem. Syst. Ecol.** 10:245-249. 20 Oct. 1982.

Raschert, 1982. Nomina Nova Generica et Combinationes Novae Spermatophytorum et Pteridophytorum. **Taxon** 31(3):554-563. (Proposes *Neostricklandia* for *Stricklandia* and *N. eurosioides* for *Leperizia e.* Baker.)

Ravenna, Pierfelice. 1981. Revisional Studies in the Genus *Sisyrinchium* —I. **Wrightia** 7(1):1-9.

_____, _____. 1981. On the Presence of the Genus *Orthrosanthus* (Iridaceae) in the Argentina Flora. **Wrightia** 7(1):10-11.

_____, _____. 1981. The Tribe Trimezieae of the Iridaceae. **Wrightia** 7(1):12.

_____, _____. 1981. Eight New Species and Two New Subspecies of *Cypella* (Iridaceae). **Wrightia** 7(1):13-22.

_____, _____. 1982. New Combinations in the Genus *Fortunatia* (Liliaceae). **Wrightia** 7(2):51. 15 Feb. 1982.

_____, _____. 1982. New Species and Miscellaneous Notes in the Genus *Trimezia* (Iridaceae)—I. **Wrightia** 7(2):90-95. 15 Feb. 1982.

_____, _____. 1983. A New Species and New Subspecies in *Ennealophus* (Iridaceae). **Wrightia** 7(3):328-338.

_____, _____. 1983. Revisional Studies in the Genus *Urceolina* (Amaryllidaceae)—II. **Wrightia** 7:251-253. 31 Jan. 1983.

Stark, Dixie Sue Patten. 1982. Anatomical and physiological studies of floral tube elongation of *Crocus vernus* (Iridaceae). **Am. Jour. Bot.** 69:1476-1482. 27 Oct. 1982.

Stearn, William T. 1982. Maria Sibylla Merian (1647-1717) As a Botanical Artist. **Taxon** 31(3):529-534.

Takayama, Shinsaku & Masanaru Misawa. 1983. The mass propagation of *Lilium* in vitro by stimulation of multiple adventitious bulb-scale formation by shake culture. **Canad. Journ. Bot.** 61:224-228. Jan. 1983.

Takhtajan, Armen. 1983. A revision of *Daiswa* (Trilliaceae). **Brittonia** 35: 255-270.

Traub, Hamilton P. 1982. The Lectotypification of *Amaryllis belladonna* L. (1753). **Taxon** 32(2):253-267.

Velazquez Martinez, A. & Lorence F. Gomez. 1981. Aprovechamiento de la palmilla, *Nolina* sp. en el noreste del estado de Sonora. **Chapingo** II 27-28:10-14. Jan.-Apr. 1981.

Woodhouse, Robert M. and John G. Williams & Park S. Nobel. 1983. Simulation of plant temperature and water loss by the desert succulent, *Agave deserti*. **Oecologia** 57:291-297. Mar. 1983.

CORRIGENDA
PLANT LIFE VOL. 39, 1983

Page 11, 7th paragraph, line 6, change "husband and I" to "husband and me"

Page 25 under Subgenus Macropodastrum
delete reference to *A. hookeriana* Traub & Doran (1983)
delete reference to *A. tweediana* Traub (1983)
change *A. condemaita* Vargas (1983) to *A. condemaita Vargas* (1984)
under Subgenus Omphalissa
change *A. hugoi* Vargas (1983) to *A. hugoi* Vargas (1984)
delete A. *harryi* Traub (1983)
under Subgenus Cephalaeon
delete *A. cardenasiana* Traub & Doran (1983)
Page 26 delete *A. warscewieziana* (A. Dietr.) Traub (1983)
change *A. leonardiae* Vargas (1983) to *A. leonardii* Vargas (1984)
delete *A. paraguayana* Traub (1983)
(These changes in names and dates are due to the indeterminate interruption in reprinting *The Amaryllis Manual*)

Page 29, Figure 5, line 2 should read "Hermann, Plate 194, Parad. Bat. (1698)

Page 30, Figure 6, line 2 should read "Merian, Metamorphosis Insectorum Surinamensium"

Page 33, line 3, change "provisons" to read "provisions"

Page 40, under Planned Genus Crinum L. Atlas, 2nd paragraph, line 3, "wook" should read "work".

Page 66, 1st paragraph, line 3, after "C. yemense)" omit "C. X clone 'Grace Hannibal' (Herbert Kelly, 1983)".

Page 68, 1st paragraph, line 1, omit "*Crinum* species", should read "Crinums".

Page 73, 4th paragraph, line 2, after "creation" add "(Delkin, 1945;".

Page 74, 2nd paragraph, last sentence, "Howard, 1928).", should read "Howard, 1982).".

Page 75, under Part II, line 2 after "C. yemense)" on first line, omit "Clone 'Grace Hannibal' (Herbert Kelly, Jr., 1983)".

Page 77, 1st paragraph, line 3 after "*Crinum* X *prainianum*", omit "X clone 'Grace Hannibal' (Herbert Kelly Jr., 1983) in honor of the originator's wife.".

Under References Cited, 2nd reference, line 2, after "page 22", add "listing *yemense* X *moorei* cross of 'White Queen' to the trade (*Crinum prainianum*)."

3rd reference, omit "listing yemense X moorei cross of 'White Queen' to the trade (Crinum prainianum)."

Page 79, Figure 23, line 2, "(Subgenus Stenaster (Baker); type species Crinum asiaticum L.", change to "(Subgenus Platyaster (Baker); type species Crinum americanum L.)".

Page 84, under Clone 25, 'Aries', line 3, change "Macropodustrum" to "Macropodastrum"

Page 121, 4th paragraph, line 2, change "Bassera" to "Bessera".

A NOTE CHIEFLY ON **BRUNSVIGIA ROSEA**

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Delving in old horticultural and botanical books can be frustrating, as may be seen in the essay on Phillip Miller's inconsistencies in dealing with three well-known amaryllids (*Archiv. of Nat. Hist.* 11(1): 153-158. 1982.) I wrote that essay before I saw, at a *Royal Horticultural Society* show on October 6 1981, an exhibit by a bulb-specialist firm, Jacques Amand, Beethoven Street, London W 10 4LG, which had a number of vases of two noticeably different forms of the Cape Belladonna Lily, *Brunsvigia rosea*. Both forms were labelled 'Amaryllis belladonna' a name still used in English horticulture for the South African bulb.

I obtained specimens of each sort at the end of the show and made some measurements. To assist comparison I also made or copied measurements from those given by the South African botanist, Dr. R.A. Dyer in *Flowering Plants of Africa* Plate 1200, Vol. 30, 1954-55 (*FPA* 1200) for a range of plants from habitat; from the Clifford Herbarium specimen reproduced in *Plant Life 37:* 16, 1981 and again in *Taxon 32*:257, 1983; and from photographs and data by Dr. Traub of Traub Herbarium specimens #811 and #834 also in this *Taxon* issue.

Brunsvigia rosea comparisons (measurements in centimetres)

Source	Scape length	Diameter at base.	Pedicel length	Perigone length	Width at mouth	Number of flowers	Colour of flowers
FPA 1200	30 to 45	—	3 to 6	7 to 11	—	6 to 12 (16)	Rose pink to white
Amand 1	50	1.7 x 1.2	2.5	11	9	9	RHS Colour Chart 68A (deep rose)
Amand 2	45	1.5 x 1.1	2.5	8	6	9	ditto 65B (pale pink)
Clifford Herbarium	—	.5	2.5	8.2	6.6	4	—
Traub #834	—	1.3	3.0	10	9	9	Deep pink
Traub #811	—	1.3	3.5	9.2	9	13	Deep pink

Dyer states in *FPA* 1200 that the flowers show considerable natural variability both in size and colour, and hence from field observations definite botanical ranks are not justified for variations. Note also that the Amand specimens had a curved, not straight scape, and were not uniformly round. Amand 2, unlike Amand 1, did not become noticeably redder as it aged. Cultivar names are needed to distinguish the forms in horticulture.

The form recorded in the table above as Amand 2 has, I am sure, been shown at Royal Horticultural Society shows in past Septembers and early Octobers by other firms. From this I infer that it has been long in cultivation. Unfortunately I have found no record of it in recent or in 19th century writing, and the great 18th century gardener, Philip Miller, is of no help in the various editions of his *Gardeners Dictionary*. The distinction between the two forms shown by Amand may, however, have been described as long ago as 1633 by G.B. Ferrari in *De Florum Cultura*, republished in Italian in 1638 as *Flora,ovvero Cultura di Fiori*. Ferrari stated that his first form, called 'Donna Bella', had twenty flowers on a scape, it flowered early in September, the flowers were white slightly tinged with red. In opening the flowers blushed with some more coloured lines lengthways on the flower-segments, and as they became older they became more coloured. The scape was round and as thick as one's finger. The leaves were like those of the common narcissus. His second form, called, he said, 'Donna Bella falsa', had a narrower bulb, a thinner scape less than a foot high and not equally round, and it carried fewer, smaller and paler flowers, as if a degenerate form of the first. Amand 2 with paler flowers with a narrower cone than Amand 1 ('trumpet-shaped' rather than 'funnel-shaped') and a sub-rotund smaller and thinner scape, fits Ferrari's 'Donna Bella falsa' rather well.

It will also be noticed that the perigone measurements of Amand 2 are close to those of the Clifford Herbarium specimen, both being 'trumpet-shaped'. Dr. Traub pointed out the depauperate nature of the Clifford specimen, especially noticeable in the fewness of its flowers (four), and the thinness of its scape. This may be due to it being an exceptional scape on a young plant, rather than to disease. Dr. Traub's contention that Ferrari's second form, 'Donna Bella falsa', is the biological type of *Brunsvigia rosea* as we know it, is faced with two difficulties. Traub shows that his specimen #834 (cited as *B. rosea*) and his #811 (cited as *B. major*), have the same relatively large, funnel-shaped flowers of the same colour. He equates his specimen 811 to J. Barrelier's Pl. 1039 in *Plantae per Galliam, Hispaniam et Italiam observatae* . . . (1714), but Barrelier referred that plate to Ferrari's illustration and description of his first form, 'detto

Donna Bella'. Likewise Barrelier referred his Pl. 1040 directly to 'Donna Bella falsa', and both his illustrations are simply adapted from Ferrari. The latter states, as already noted, that his second form had smaller, paler flowers than the first.

There is also a small difficulty in equating Traub #811 (*B. major*) with Ferrari's first form 'detto Donna Bella'. He stated that it flowered (in Italy) in early September (which would be late in that month or in early October in southern England). Dr. Traub stated that his #811 flowered in late July into August. In short, the historical problems involved in the identification of variations of *Brunsvigia rosea* are not all resolved, and any other evidence is to be welcomed.

NEW PUBLICATION ON **CYRTANTHUS** AVAILABLE

The American Plant Life Society is publishing a review of the Genus *Cyrtanthus,* prepared by C. Reid and R. A. Dyer of the Botanical Research Institute, Department of Agriculture, Pretoria, Republic of South Africa. This soft cover-bound publication of about 85 pages contains descriptions of southern African species of *Cyrtanthus,* distribution maps, line drawings as well as color photographs of many of the species in flower. The publication, "The Southern African Species of Cyrtanthus—A Review" is available from the Society for $12 postpaid. Non-Canadian foreign orders add $2 for postage.

WHITHER PLANT LIFE?

(Text of a speech by R. Mitchel Beauchamp, Editor, American Plant Life Society at the 1983 Amaryllidaceae Symposium)

I've heard reports of many asking "Who's the new kid in town?" I am R. Mitchel Beauchamp. I was born in 1946 in National City, California, where also were born my mother and her father. I've been married 15 years and my wife, Martha, and I have two daughters, Vanessa and Nolina. I was influenced at an early age by the gardening activities of my maternal grandmother, particularly by her curious refrigerator-chilling of tulip bulbs to prepare them for our coastal Southern California growing conditions. She was one of the first people in our region to have *Agapanthus,* but knowledge of how she obtained them has gone with her passing. Along with her beautiful blue *Agapanthus,* which we dutifully picked and placed on the graves of relatives on Memorial Day, she had the usual, neglected rows of Cape Belladonna and a clump of pink *Crinum.*

During the Vietnam Conflict, I served as a Naval Officer and saw the cultivation of *Clivia* and *Crinum* in Japan. I also saw the nursery of Shuichi Hirao in Zushi, but at the time I was more interested in his brother's, Hiroshi Hirao, neighboring cactus and succulent nursery.

I received a Bachelor's Degree in Botany from San Diego State College in 1968 and a Master's Degree in Biology in 1972. I pursued postgraduate work at the New York Botanical Garden under Arthur Cronquist, one of several botanists who can trace their scientific genealogy through to Linnaeus.

During my undergraduate years, I contributed popular articles to a local horticultural magazine, *California Garden.* I was editor of the quarterly newsletter of the California Native Plant Society for several years. It was due to my editorship of this newsletter that Dr. Traub became aware of my potential to assist him with *Plant Life.*

I attended my first American Plant Life Society Director's meeting in 1977. I had been aware of the Society since 1968 when I obtained from a bookstore a set of early issues of *Plant Life* and *Herbertia,* previously owned by Dr. Stout of *Hemerocallis* fame. In 1978 I was elected a Director and pressed into service as Society Secretary. My involvement with the yearbook was principally to proof-read and edit galley proofs during the past 5 years. I did not become involved with correspondence of authors. The controversial *Amaryllis* typification issue was presented to me by Dr. Traub on numerous occasions before I had the opportunity to research the problem myself.

With the death of Dr. Traub at 2 a.m. 14 July 1983, just 12 hours after I had formally interviewed him for writing of his biography, I found myself responsible for a lot of unpublished manuscripts, a divided group of Amaryllid afficionados and an international botanical journal. I also had the reassuring local support of Dr. Whitaker, as well as numerous Amaryllid workers and hobbiests around the world.

With the passing of our renowned editor Traub, upon whom much of the Society's work had focused, it is time for an appraisal of our predicament. The journal, which he essentially founded, is in its 50th year, but the scope he envisioned, to include the entire plant kingdom, must necessarily be circumscribed about the groups which interest those who pay for the journal. I had thought to rename the journal *Traubia,* but this might be confused with the Dutch journal, *Treubia,* from Indonesia, so I opted to restore the original name, *Herbertia,* which had been maintained in a rather vestigial manner with the yearbook.

Communication within the Society is not served well by the yearbook frequency. Toward improving communication opportunities, I plan to publish a quarterly newsletter. In so doing, I will remove certain categories of material from the yearbook, *Herbertia,* that are not of a scientifically referential nature. Also, papers published in *Herbertia* will be examined by a panel of reviewers. In these ways I hope to restore the credibility and renown of *Herbertia* as the international reference for information on Amaryllidaceae and allied monocot families.

The initiation of a quarterly newsletter will mean a greater cost to the Society. I plan to recover some costs by using paid avertising, both classified and display. Through the use of advertising I hope to encourage commercial development of amaryllid sources for hobbiests and other commercial growers, especially for the floricultural trade. The success of the newsletter will depend partly upon timely contributions.

A look at yearbook costs is perhaps now in order. The earliest records I've yet found show production of *Herbertia* in 1942 to be $748.45. The 1983 issue had a printing cost of $6,700.00. When comparing the same run size and number of pages, it is obvious that cost control must be carefully monitored. The printers, J.W. Stowell, produced the Society's yearbook from inception until 1982. They were bought out by Dover Litho-Printing Co., our present printer in Delaware.

The Society's stock pile of back issues is being maintained by the printer. There are approximately 172 complete sets of back issues of *Herbertia/Plant Life,* as well as many single issues. This represents a tremendous asset of the Society, not only in cash but usable research reference material. The selection of a more cost effective printer must include

the disposition of these back issues. For a more cost effective yearbook and newsletter, the subscription base must be broadened. Currently there are about 550 subscribers. A goal of 2,000 subscribers can be obtained with the cooperation of Society members.

Well, enough of the boring details of the finances of publication. There are several items of policy that should be cleared up.

Paramount in my mind is conservation of Amaryllids, whether in the wild or in cultivation. Field collections of rare species should not be considered unless as a salvage from imminent destruction. Offerings for sale of such material will be critically reviewed.

The editorial policy in future issues will be to interpret the Linnaean genus *Amaryllis* to be an Old World group.

The responsibility of judge certification will not be a function of the editor, and must be assumed by another individual. The Society, however, will still serve judging interests by publishing criteria, results of shows, etc.

To encourage research in the biosystematics of the Amaryllidaceae (i.e. *Lineagics,* fide Dr. Traub) by established workers and new students, the journal is especially open toward receiving preliminary study proposals, and study results. There are currently no page charges for authors in *Herbertia.*

Finally, the use of color in the Society's publication is anticipated. The use of color can only be cost effective with a large subscription base and support from the commercial sector.

In summary, I see a new destiny for the Society, one that requires the active participation of more scientists and amateurs interested in amaryllids and allied petaloid monocots. As editor, I am here to serve members in their personal quest for fulfillment in growing and studying Amaryllids. I look forward to another successful 50 years for the Society.

R. Mitchel Beauchamp.

DATE OF PUBLICATION
PLANT LIFE VOL. 39 WAS PUBLISHED ON 21 JULY 1983