PLANT LIFE

AMARYLLIS YEAR BOOK 1981

EXCERPTS FROM LINNAEUS, HORTUS CLIFFORTIANUS, AMSTERDAM. 1737
AND ANNOTATIONS

From Linnaeus (1737) BIBLIOGRAPHY: No. 61. Douglas(1725), No.234. Miller(1731) and No. 242. Bradley(1731) served as the basis of Linnaeus' conception of the Guernsey Lily and the Belladonna Lily. At the end of the five entries, under Amaryllis, he stated that all the flowers of the genus were very beautiful, but singled out the Guernsey Lily as having no equal.

61 DOUGLAS *James*
- Lilium Sarmienſe.
- - Londini 1725 fol angl p. 35. t. 2.
Docte deſcribit Amaryllidem 2dam.

234. MILLER *Philip*
- Dictionarium hortulanorum.
- - Londini. 1731. fol angl.

242 BRADLEY *Richard*
- Improvements of Planting of gardening.
- - London 1731 8vo p. 608. anglice.

Described in Douglas treatise solely devoted to the Guernsey Lily.

Linnaeus intended to place the American Belladonna(Amaryllis belladonna) ahead of the Guernsey Lily (Nerine sarniensis) in the text(see note under No. 61. Douglas.) Heavy work load responsible for not making shift.

AMARYLLIS. *g. pl.* 289.

1 AMARYLLIS ſpatha multiflora, corollis æqualibus patentiſſimis revolutis, genitalibus longiſſimis.
Lilio-Narciſſus japonicus, rutilo flore. *Moriſ. hiſt.* 2. *p.* 367. *Boerh. lugdb.* 2. *p.* 147.
Narciſſus japonicus, rutilo flore. *Corn. canad.* 157. *t.* 158.
Lilium ſarmienſe *Dugl monogr. t.* 1, 2.
Seki ſan *Kæmpf jap* 872.
Creſcit in Japonia. *Radices ex Japonia allatæ & ex nave naufraga ejectæ in littus arenoſum inſulæ* Sarniæ *(Guernſay) inter ſpartia maritima & vento fortiore arenam eo appellente, qua demum prædicti bulbi tecti poſt aliquot annos ſumma cum incolarum admiratione, flores dedere. Moriſ.*

Intended No. 2.
Docte describit Amaryllidem 2dam.
= Nerine sarniensis Herb.

2 AMARYLLIS ſpatha multiflora, corollis campanulatis æqualibus, genitalibus declinatis.
Lilio Narciſſus polyanthos, flore incarnato, fundo ex luteo albeſcente. *Sloan. flor.* 115. *hiſt.* 1. *p.* 244. *Tournef. inſt* 386 *Boerh. lugdb* 2. *p.* 147. *Sib. thef.* 1. *p* 25. *t.* 17. *f.* 1.
Lilio Narciſſus americanus, puniceo flore, bella donna dictus. *Pluk. alm.* 220.
Lilium americanum, punicco flore, bella donna dictum. *Herm. parad.* 194.
Lilium rubrum. *Mer. ſurin.* 22. *f.* 22.
Creſcit in Caribæis, Barbados & Surinama.

Intended No. 1.
= Amaryllis belladonna Linn.

For the full revelation of the definitive evidence, see Tjaden, Soc. Biblphy Nat. Hist. 9:(3): 251-256. 1979.

NOTE.- No. 2 (intended No. 1) quoted under Amaryllis belladonna Linn. (Sp. Pl. 1753). Hence the Cape Belladonna was omitted.

Sealy(1939)and Dandy & Fosberg(1954)misread "most beautiful" which tags the Guernsey Lily (Nerine sarniensis and not Amaryllis belladonna Linn. (1753), the America Belladonna. Thus, the Cape Belladonna (Brunsvigia rose (Lam.) Hann.) was omitted from Species Plantarum(1753)

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl. HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl. HERBERTIA, THE AMARYLLIS YEARBOOK.

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PLANT LIFE

VOLUME 37

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1981

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

Printed in the United States of America

Library of Congress Catalog Card Number: 51-23475

Address correspondence and send membership dues to:
Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
Box 150, La Jolla, California 92038

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AMARYLLIS
YEAR BOOK
1981

Year Book of
The American Amaryllis Society
48th Issue

AMARYLLIS BELLADONNA Linn.
EDITION

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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(AMERICAN AMARYLLIS SOCIETY, continued on page 161.)

PREFACE

An unnecessary and time-wasting International Controversy was set off in 1939, when Sealy mistakenly proposed that the name, *Amaryllis belladonna* L. (1753), be transferred from the AMERICAN PLANT, native to the West Indies, Mexico (?), Central America (?), and South America, to the SOUTH AFRICAN CAPE BELLADONNA, *Brunsvigia rosea* (Lam.) Hann.

W. L. Tjaden, of Kent, England, in the JOURNAL OF THE SOCIETY FOR BIBLIOGRAPHY OF NATURAL HISTORY, pp. 152-256. 1979; TAXON (Febr. 1981, and PLANT LIFE (1981), the present issue), has at long last shown that this untenable proposal is based upon superficial research, leading to specious arguments which obviously are without substance. The reader should consult the evidence as presented in the publications cited.

Fully 95 percent or more of the literature on the Family Amaryllidaceae, since 1939 (over more than 4 decades), has been published in PLANT LIFE, recognizing the correct application of the name, *Amaryllis belladonna* L. to the AMERICAN BELLADONNA, thus corrections necessary due to the invalid Sealy 1939 proposal, *have been greatly minimized.* The present Edition of PLANT LIFE has been designated *"The Amaryllis belladonna L. Edition."*

This very brief summary about the settlement of an outstanding International Controversy serves as an explanation why the 1981 William Herbert Medal has been awarded to the eminent authority in the field of plant nomenclature, who went to the root of the matter and found that Sealy's arguments are without substance. Thus, the MEDAL was awarded to him for removing an international cancer in the field of Amaryllid research. For this truly important public service, the members of the SOCIETY especially owe him a debt of gratitude. He has also been elected an HONORARY MEMBER OF THE AMERICAN PLANT LIFE SOCIETY.

Mr. Tjaden also contributes an interesting Autobiography; Dr. Whitaker reports on his search for *Amaryllis* species in Argentina; Dr. Bell writes about his *post 1978 success* in partly replacing some of his *Amaryllis* losses due to fire.

There are reports about the 1980 Amaryllis exhibitions from New Orleans; Corpus Christi, Texas; Houston, Texas; and Los Angeles County, California.

Dr. Flory and Mr. Coulthard report on chromosome numbers in the Genus *Amaryllis;* Prof. Ravenna reports on *Amaryllis* L. and other Amaryllid species from South America; Dr. Howard describes a new species of *Hymenocallis* from Mexico; Mrs. Williams reports on chromosome counts in *Paramongaia,* Mr. Hannibal contributes several interesting articles on *Crinum* species; and Mr. Weinstock reports on *Amaryllis* clones registered in 1980.

Marcia Wilson reports on some fine Doran hybrid *Amaryllis;* Sam Caldwell writes about his quarter-century long *Lycoris* breeding project; Shri Prakash reports about the Amaryllis project in India; Mr. Cothran

gives further details about his yellow-flowered *Amaryllis* breeding projects; and Mr. Allerton reports on *Amaryllis* breeding in Hawaii.

Mr. Manning contributes his usual interesting folksy report from the North Midland Region, Dr. Howard reports on swamp culture of Amaryllids; Mr. Bennett presents his usual interesting General Amaryllid Report; Mr. Duncan writes about Alstroemerias, Marcia Wilson contributes the usual interesting Zephyrantheae Report, and Mr. Hirao writes about his experiences with Clivias in Japan.

Contributors to the 1982 issue of PLANT LIFE are requested to send in their articles by August 1, 1981, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations are requested to have black-white prints made, and to submit these with their articles.*

January 15, 1981 *Hamilton P. Traub*
2678 Prestwick Court,
La Jolla, California 92037

CORRIGENDA

PLANT LIFE 1980

Page 26, Under REFERENCES, Dandy & Fosberg, after 231-232, add, 1954.
Page 112, 9th and 10th lines from bottom, after Vol. XL, omit t. 1884, and insert, 1884, t. 6778.

AWARD OF MERIT, etc., continued from page 32.

For the convenience of the show Chairpersons at the Regional Amaryllis Shows, the form for the **Award of Merit** and **Preliminary Commendation** awards is reproduced on page 32 so that as many xerox copies as may be needed for **National Honors** awards at the Regional Amaryllis Shows may be made. Thus, it is no longer necessary to write to headquarters for copies.

THE AMARYLLIS BELLADONNA EDITION

Dedicated to
William Louis Tjaden

WILLIAM LOUIS TJADEN - WILLIAM HERBERT MEDALIST

WILLIAM LOUIS TJADEN

An Autobiography

I was born on 26th April 1913 in Islington, London, the son of London born parents themselves. My father was a journeyman silversmith who eventually became foreman in Mappin & Webb's workshop. He died at the early age of 43 in 1931, an obvious misfortune for me at the age of 18. His father had come to London from Haarlem in Holland about 1880 and soon afterwards had married an Englishwoman. His father in turn had migrated from East Friesland to Haarlem in the 1850s, probably to escape conscription into the Prussian Army. The Frieslanders had no love for the militaristic Prussians. Anyway, that is how I got my surname, Tjaden being in origin a Friesian name. My mother's maiden name was Goldsmith and as a further coincidence, she worked in gold-leaf before she married, a skilled trade in the making of shop signs. However, she came from Sussex yeoman stock in the distant past, and was the daughter of a postman and grand-daughter of a police-inspector in Hornsey, a north-London suburb.

At the outbreak of the 1914 war my father, a skilled metal-worker, was drafted to Woolwich Arsenal to make shells, and the family had to move to nearby Eltham, ten miles from central London. I have lived in Eltham and immediately adjacent Welling all my life except for 18 months after the 1939-1945 war, so that I can claim to be a quintessential suburban Londoner. After an excellent London County Council elementary schooling in Eltham from 1918 to 1924, I went with a scholarship to Aske's Hatcham School at New Cross for seven years. New Cross is half-way to London, so I started life as a London commuter quite early. From 1931 to 1934 I was lucky enough, again with a scholarship and help from the London County Council, to go to the London School of Economics (L.S.E.), one of the colleges of the University of London. I studied a broad range of subjects for my Bachelor of Science (Economics) degree (B. Sci.) which I obtained in 1934, including 19th century political history and logic, but my major subjects were modern economic history and (less-advanced) economics.

In the early 1930s the 'L.S.E.' had a galaxy of lecturing talent. I owe a special debt of gratitude to the lecturers there, and may especially mention Professors R. H. Tawney, M. M. Postan, and Lionel Robbins who, I believe, persuaded Friedrich von Hayek to come to L.S.E. The 'School' in the 1930s had the reputation in the popular press of being a communist 'hot-bed', mainly perhaps because of Harold Laski who was Professor of Government. For me, however, it was a centre for expounding the fundamental merits of liberal thought and private enterprise, and the importance of critical methods of thought. To their credit the students of the School voted in 1933 to march with the Polish Marshal Pilsudski from Warsaw to Berlin to over-throw Hitler. What a deal of woe the world would have been saved if that had been done!

I must emphasise that I was no brilliant student likely to gain a First Class honours degree, and I was pleased enough to get an 'Upper

Second.' After that it was a question of a job, in days when jobs were far from easy to get. I opted, without a great deal of enthusiasm, for the civil service. From 1934 to 1942 I was an Officer of Customs and Excise, making contact at a modest level indeed with the country's trade, and working mainly in the Port of London. In 1942 my Economics Degree led to a move to the centre of government in Whitehall, where I worked almost all my time until I retired at age 60 in 1973. At first I worked in a special war-time Department and then from 1945 to 1947 in the Control Office for Germany and Austria. My chief recollection of that period as far as the work was concerned, was the wasted effort in 'de-nazifying' the Germans: they had de-nazified themselves the moment Hitler died, if not well before. From 1947 onwards my service was in the Treasury, mainly on civil service establishment matters. I was not very successful, and in retrospect I was unlikely to be, because I had imbided too much 'laisser-faire', anti-bureaucratic teaching at L.S.E. I constantly felt that the absorbtion in Whitehall of so much administrative talent, so often devoted to matters of trivial importance but apparently important to our politicians, was not to the country's true economic advantage. It was nevertheless a constant stimulation, trying to maintain my critical approach to subjects with intrinsically more able colleagues and superiors. To this constant spur I owe what little I have achieved in criticising botanical papers on plant-naming.

Turning now to my home, I have always had the advantage of a small garden. My house is on a plot of one-eleventh of an acre, the back-garden being 28ft. by about 70ft. I first became keen on gardening at the age of 16, and did quite a lot of work in my mother's garden until she died in 1966. Gardening became my principal hobby, however, only when I married in 1945 and had my own home. My wife, née Madge Goodfellow, whom I had met at L.S.E., was also by then a civil servant. As we had no children our spare-time soon revolved around a shared interest in horticultural pursuits. In 1949 I helped form a local Gladiolus and dahlia society, which affiliated itself to the *North American Gladiolus Council*. It held several brilliant shows until 1954 when it ceased for lack of a secretary. No-one wanted to do the clerical work. Also in 1949 I joined a recently formed local carnation and chrysanthemum society. It had been an ambition of mine to grow late-flowering, greenhouse chrysanthemums since the 1930s when I had seen them in a neighbouring garden. In 1948 I had erected a greenhouse of my own, an aluminum and glass structure 12ft. by 9ft. which has stood the years remarkably well. I bought a 'Dutch-light' wooden green-house 10ft. by 8ft., and had a 9ft. square conservatory built on the back of the dwelling house. So by then I had a good deal of glass-house space, all of which I filled in the autumn with my chrysanthemums, but I also grew greenhouse annuals such as schizanthus, calceolarias and cinerarias. The 1950s were for me great years of amateur competition at flower shows. I also put on small exhibits of cinerarias and calceolarias at the Royal Horticultural Society's shows in its halls at Vincent Square at Westminster, and in 1952 I even managed to stage a 6ft.

square exhibit packed with calceolarias at the Chelsea Flower Show. The real thrill of the gardening year was the late show of the *National Chrysanthemum Society* held in the R.H.S. Hall at Westminster about the first of November. Our local society, of which I was chairman from 1951 to 1964, always entered the classes for affiliated societies, and on occasions managed to win the premium award. There were, of course, the individual classes, and the standard was always so high that it was exciting to win a 'red card.' After the show our friends were given quantities of exhibition blooms to enjoy for a fortnight or so. The local hospitals also benefited.

By the 1960s, however, my interest in chrysanthemums was beginning to wane. There was not enough variety in them and they did not keep my greenhouses full all the year. I had started to collect a few of the easier cacti and other succulents in the 1950s, and gradually they increased in size and especially in number. There had been a flourishing cactus society in Eltham since 1952 and so it was only a matter of time before I resigned from the chrysanthemum society and joined the cactus 'fans'. In the same year I also joined a near-by branch of the *Alpine Garden Society,* not so much because I had become keen on growing rock-plants, but because my wife and I had taken to spending our summer holidays in the European Alps and were fascinated by the variety of alpine flowers. It was exciting to find plants new to us and to take colour-slides of them. Slide-shows have, of course, become a staple feature of all plant-society meetings, especially of our *Alpine Garden Society.* Once a month throughout the winter it is almost as if we are taken on other people's alpine holidays, nowadays further and further afield.

I do grow a variety of shrubs and herbaceous plants in the garden and other plants in the greenhouses. I have always had a few Amaryllis cultivars, especially 'Apple Blossom', a remarkable plant. Once I spent several years raising *Amaryllis* from some reputedly good commercial seed. It proved a big disappointment, as none of the flowers matched those from bulbs available in the shops.

My special interest is in those cacti grown mainly for their flowers 1-1 the Crab cacti, which flower in late autumn, and in the Christmas or Candlemas cacti, which brighten the darkest months. With the aid of a number of varieties I have a good show of bloom from November to February in the conservatory which we can enjoy from our living room. No cultivar, however, matches in vigour the old favourite, the magenta Christmas cactus.

One thing that the dedicated British gardener does is to join the *Royal Horticultural Society,* and this I did in 1948. My great luck was that for much of my civil service my office was only ten minutes walk from the R.H.S. halls in Westminster, so that I missed scarcely one of their famous 'fortnightly' shows except when we were on holiday. I was able to visit the Society's *Lindley Library,* and a combination of growing and showing plants, and access to the library eventually stimulated me into delving into plant-naming.

My interest in nomenclature, which has taken up much of my time

since I retired from the civil service, started in 1959 when I submitted a plant of the Christmas cactus to the R.H.S. for an award as a worthwhile plant. Strangely, I found that it had not been given an award before. It was, indeed still widely is, known as *Zygocactus truncatus,* but the literature soon showed that that was the wrong name. With the aid of the great range of 19th and 20th century journals in the R.H.S. library I was eventually able to prove that the Christmas cactus was a hybrid raised in London in the 1840s between the Crab cactus, or rather, a variety of it, and a closely related species only in cultivation a short time. The former is now *Schlumbergera truncata* according to the Code of Nomenclature, the latter is *S. russelliana.* What then, should the hybrid be called? I ended with a collective name to cover all hybrids with characters intermediate between the species involved as parents, because more than one cultivar had been raised at the same time and I could not be certain which was not which. Also, originally, awkward Latin names had been given to the cultivars as if they were wild plants. This 19th century habit has long ceased but it annoyed the botanists of the mid-century and later. The name I chose was *S. x buckleyi* to commemorate the raiser, William Buckley, but inevitably the 'x' indicating that it is a collective name, is omitted. The result is not satisfactory for the gardener.

My next nomenclatural problem was the identity of *Sempervivum globiferum* Linn., an interest started by finding sempervivums on holiday in the Alps. I soon found that the Hen and Chickens houseleek should be called *S. globiferum* L., but Linnaeus's contemporaries and all succeeding botanists bar one, who was ignored, had failed to study the references that he had given. The name had been bandied from plant to plant, until it is even now in one flora applied to a true *Sempervivum* of north-west Iran. My lengthy account was published by a notable English succulent plant enthusiast, Cyril Parr (1902-1977) in the Bulletin of the now disbanded *African Succulent Plant Society.* It led to a dispute with botanists on both the historical facts and on the correct application of the Code of Nomenclature. That in turn led me to make a thorough study of the Code in its application to flowering plants. As a result I soon came across the *Amaryllis belladonna* dispute. My interest in it was stimulated by the, to me, incredible assumptions made in the paper published in the Kew Bulletin in 1939. I was also interested because I had tried to grow the Cape Belladonna, *Brunsvigia rosea,* without any success in getting it to flower, either in the open or in the greenhouse. I simply lack a suitable site for it.

During the last ten years a number of other nomemclatural puzzles have interested me, and have resulted in small published articles. For instance, I have shown in the *Journal of the Royal Horticultural Society (The Garden)* for 1978 that the names of two greenhouse bulbs should be maintained, *Veltheimia viridifolia* and *V. glauca,* both attributable to N.J. Jacquin, and should not be supplanted by *V. bracteata* and *V. capense* respectively. In *Taxon* (1979-1980) I have argued that *Solanum sodomeum* Linn. is not to be rejected, and that the correct name of the Chinese Golden Larch is *Pseuoldarix kaempferi* Gordon. The Code

of Nomenclature is indeed unnecessarily lengthy and complicated, but it can be applied consistently. Botanists seem to find it hard to do this, veering between trying to maintain names that cannot be made to stand up, and shooting down others which can quite reasonably be defended.

Apart from nomenclature I write short articles on my cacti from time to time for British cactus journals, and in the past have contributed illustrated articles on a notable cactus collection on the continent. I have also contributed short accounts of alpine holidays to the *Alpine Garden Society Bulletin*, and a note on the botanical artist G. D. Ehret to the R.H.S. Journal, and one on another 18th century botanical artist, Simon Taylor, to the *Kew Bulletin*.

Shortly after I left the civil service my wife died suddenly. In September 1977 I had the great fortune to marry another cactus and succulent enthusiast and keen gardener. Elsie Austin-Smith, the widow of a very good friend who had been chairman of the Eltham Cactus Society until his death in June 1976. We count ourselves as lucky indeed.

AMARYLLIS BELLADONNA AND THE GUERNSEY LILY: AN OVERLOOKED CLUE

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Between 1938 and 1954 there occurred probably the best-known dispute on the application of a plant name.[1] It started with the assertion by an American botanist, J. C. Th. Uphof, that the relevant entry in Linnaeus's *Species Plantarum*, 1753, applied not in its generally long accepted sense to a bulbous plant from the Cape of Good Hope, but to a generically distinct although superficially similar Central and South American plant, long known as *Hippeastrum equestre*, or more recently with a prior epithet as *H. puniceum*. If Uphof's contention had been accepted, the name *Hippeastrum* would have been replaced by *Amaryllis* and the Cape plant would have become known as *Brunsvigia rosea*.

The generic name *Hippeastrum* was published by William Herbert in 1821 and was soon adopted by most botanists. At that time it comprised a number of the species of Linnaeus's wide genus *Amaryllis*. Herbert retained the Cape bulb as the type species of this genus under Linnaeus's name *Amaryllis belladonna*. *Hippeastrum* species, however, have always been of greater horticultural importance, being much hybridised in the 19th century to produce the showy spring-flowering greenhouse and house plants of commerce. As late as 1890 influential British gardeners protested against the substitution of *Hippeastrum* for *Amaryllis* as the generic name of these hybrids. 'Are we wrong', said Harry Veitch 'in continuing to call these grand flowers after the name of the Virgilian nymph, and should we therefore drop the pleasing appellative with which they have been almost indissolubly connected

from our earliest memory, and substitute the rougher Hippeastrum for the softer Amaryllis?'[2] While British horticulture accepted *Hippeastrum* from that time, the bulb trade did not. Each autumn the bulbs are still exported from Holland in boxes labelled 'Amaryllis (Hippeastrum)'.

Figure 1. The Clifford Herbarium specimen of the Cape belladonna lily. (Reproduced by permission of the Trustees of the British Museum (Natural History).)

The reason why Uphof's challenge to long-established usage was made only comparatively recently, lies in the fact that Linnaeus's contemporaries and the following generations of botanists accepted his innovation of binomial names, but did not spend time investigating the literal meaning of each of his names, nor did they go back to his definitions in his first general use of binomials in 1753. Only in the present century has the *ad hoc* scrutiny of these binomials taken place.[3] It is not therefore altogether surprising to find that Uphof apparently had much in favour of his contention. The synonyms and statement of habitat quoted for *Amaryllis belladonna* all identify it with the American bulb, *Hippeastrum equestre*, not the Cape bulb. A former Keeper of Kew Herbarium, O. Stapf, had indeed written in 1929 that none of Linneaus's species of *Amaryllis* in 1753 was 'identifiable with our, that is, Herbert's *Amaryllis belladonna*'.[4]

It might therefore have been better to have relied on established usage, and to have ignored Uphof's paper. In 1939, however his conclusion was challenged by J. R. Sealy supported by several British botanists. He asserted that Linnaeus's short description or phrase-name applied only to the Cape plant and that there was a herbarium specimen of the Cape plant (Figure 1) on which Linnaeus presumably relied, but none of the American plant. It was admitted there was no evidence that Linnaeus had actually studied this specimen. Linnaeus took his 1753 entry almost intact from one he had made for *Hortus Cliffortianus* (1738), a sumptuous account of the plants and herbarium specimens owned by his then employer, George Clifford, a Dutch banker. At the end of his five entries under the new name Amaryllis, which replaced the existing 'Lilio-narcissus', Linnaeus stated that 'The flowers of this genus are very beautiful: I do not know that the second species has an equal . . . despite its bitter root it is called Amaryllis instead of Amarella by certain gardeners'. This second species was the one he later called *Amaryllis belladonna.*

Basing himself on this statement, Sealy pointed out that the species concerned must have been fairly well-known in cultivation, since it had already received the name Amaryllis in gardens, and Linnaeus had said it was outstandingly beautiful. He contended that 'Both remarks apply to the Cape Belladonna—no-one would dispute that its flowers are exceedingly beautiful, and it was certainly well-known in gardens in Linnaeus's time . . . but one could scarcely claim that *Hippeastrum equestre* had no equal in beauty of flowers, and it was certainly *not* well-known in cultivation in Linnaeus's day, in fact it was very rare.'[5] Uphof rejected this contention, but neither he nor his supporters noticed a telling piece of bibliographical evidence.

While 'belladonna' was the second species under Amaryllis in *Hortus Cliffortianus,* the first was the Guernsey lily, named *Amaryllis sarniensis* in 1753. In the early 1700s it was grown in and exported from Guernsey on a considerable scale. James Douglas published a detailed description of 'the Guernsay Lilly' in 1725 and a lengthier second edition in 1737.[6, 23] 'Whoever', he wrote, 'will but give themselves the

trouble to walk out to Hoxton in the months of September or October and view it in Mr. Fairchild's garden, in its full prime and beauty, will readily agree that it richly deserves to be taken pains about . . . I therefore heartily invite all lovers of flowers to the culture of the Guernsay Lilly, the great Empress of the whole flowery world, I am sure the noblest plant that England can boast of. . . .'[7] Douglas noted that Richard Bradley, our first horticultural journalist, agreed with this opinion, saying that it 'had hardly its equal for beauty among the flowering race'.[8]

In the catalogue of Clifford's botanical works in *Hortus Cliffortianus* Linnaeus entered 'No. 61 Douglas, James—Lilium sarniense 1725 fol. angl. p. 35 t. 2—Docte describit Amaryllidem 2dam', *not* 'primam' to agree with the actual place occupied by the Guernsey lily in the text. Thus, Linnaeus had reversed the intended order of his first two species, but failed to alter the catalogue entry for Douglas's monograph. The immediate inference is that the footnote referring to the unequalled beauty of the second species was meant for the Guernsey lily, not for the 'Belladonna'. Not only was Bradley's work quoted above, catalogued as in Clifford's library, but so was Bradley's *Dictionarium Botanicum* of 1728 in which he had noted that 'the Guernsey Lilly in my opinion excels all other flowers for beauty'. These words follow immediately after 'the Belladonna from Portugal or Damascus Lilly which besides its beautiful flower is very sweet scented', so Bradley's preference for the Guernsey lily over the Cape belladonna is clear.[9] This was, indeed, the first mention in English horticultural literature of the Cape plant as 'Belladonna.' In 1731 Philip Miller devoted two columns to the cultivation of the Guernsey lily in his *Gardeners Dictionary*, but only a third of a column each to the rival belladonnas from Italy and Portugal, and another third to the American plant later named *Hippeastrum equestre*.[10] He noted the large annual exports from Guernsey, and stated that 'the flowers of this plant will continue in beauty if rightly manag'd a full month, and though they have no scent for the richness of their colour they are justly esteem'd in the front rank of the flowering race'. Of the 'Belladonna' from Portugal, Miller's seventh sort of Lilio-narcissus in several editions, he said that 'the flowers of this plant are always produced about the same time as the Guernsey Lilly but are not near so beautiful'. There can be no doubt therefore that Linnaeus was enthusing about the Guernsey lily. He had met Miller in 1736 and respected him as an outstanding gardener. Had his praise really been intended for either the Cape or the American belladonnas he would have had to state a disagreement with eminent gardeners to make such a view credible to informed readers. His statement reads, in fact, like a borrowed opinion. Linnaeus produced the large *Hortus Cliffortianus* in record time, and it would have been quicker in the winter of 1736—1737 when he wrote most of it, to copy from books that he believed reliable, than to reconcile dried specimens with the literature or rely on his memory, good although that was.[11]

There being no evidence that Linnaeus used the specimen of the Cape plant in the Clifford herbarium, the argument that he was de-

scribing it in 1738 and hence in 1753, but confused himself with the literature relating to the American plant, rested on the contention that his phrase-name, *Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis,* could apply to the Cape plant only. This phrase-name was, however, only a short general description and the contention cannot be sustained. The words used in it were used in a broader sense in the eighteenth century than they are today. The name itself was indeed applied by Linnaeus's contemporaries to *Hippeastrum equestre.* Thus Patrick Browne cited it as a synonym for his *'Flore croce nutante scapo nudo unifloro'* in the account of Jamaican plants he published in 1756: *H. equestre* grows in the West Indies as well as in the Guianas and may have very few flowers on a scape.[12] 'Sir' John Hill used the phrase-name as a synonym for another *Hippeastrum, H. reginae.*[13] Fusée Aublet applied the name and quoted 'Belladonna' as the epithet for *H. equestre* in his account of French Guiana plants in 1775.[14] A sketch by the artist G. D. Ehret of *H. equestre* made in the 1740s is entitled with the phrase-name, after one referring to the Cape plant.[15]

It may be wondered how Linnaeus came to choose the epithet 'Belladonna' for *H. equestre.* His main authority was the botanist Paul Hermann (1646-1695) who mistakenly called it *'Lilum American punicea flore, Bella donna dictum'.*[16] Hermann had no support for the last two words, and was unaware, as was Linnaeus, that the Italians, around Florence especially, who had grown the Cape plant since early in the seventeenth century for cut flowers, had called it 'Donna Bella.'[17] When the English took to growing the Cape plant, at first in greenhouses, probably not much before 1720, its Italian and Portuguese popular name came with it and it was soon known as the belladonna lily.[18] When Philip Miller adopted Linnaean phrase-names in the 1750s for his *Dictionary,* he simply assumed that Linnaeus had described the Cape plant because it was better known and was the 'Belladonna' of gardeners.[19] Later, the phrase-name was even attributed to Miller, no doubt to get round the difficulty posed by the irrelevant synonyms. When *Amaryllis equestris* was published in 1789 (*A. punicea* had been published in 1783 but did not get the same publicity) the way was clear to accept *A. belladonna* for the Cape plant with the exclusion of the synonyms.[20] In 1837 William Herbert gave the following fanciful account,[21] persuading himself that Linnaeus had really intended the Cape plant:—

> It was the exquisite blending of pink and white in that flower, as in the female complexion, that suggested the common name in Italy, and to those lovely tints Linnaeus referred, when he assigned to it the name of a beautiful woman. To suppose he would have alluded to a bright orange flower would be perfectly absurd. It is therefore quite indisputable that Belladonna is the type of the Linnaean genus **Amaryllis,** and it would be an idle insult to the memory of Linnaeus to remove it without any cause.

Alas, it was Dean Herbert who was being 'perfectly absurd.' If

the Cape plant is intended when *Amaryllis belladonna* is mentioned, it would be accurate to quote 'L' Heritier non Linn' as author, L'Heritier being the first to apply the name unequivocally to the Cape plant.[22] This paper, however, is not concerned with proposing changes in plant names.

I have not traced the source of Linnaeus's remark that some gardeners had called the Guernsey lily, *Amaryllis*. It may have been the comment of Dutch gardeners. In the second, enlarged edition (1729) of his monograph, James Douglas stated [23] that it was given to the 'Botanick Professor' at Leyden by a Guernsey student. This Professor was Pieter Hotton, who died in 1709. Douglas said that he had given a public lecture on the plant in consequence of the gift and that the Guernsey lily had thriven in the Netherlands in a number of gardens. 'M. la Cour an ingenious gardener and nurseryman in that city (Leyden) has a great number of them in flower every season.'

NOTES AND REFERENCES

1. DANDY, J. E., & FOSBERG, F.R., 1954. The type of Amaryllis belladonna L. **Taxon** 3:231-232. This, the last paper in the dispute, lists the preceding papers.

2. VEITCH, H., 1890. The Hippeastrum (Amaryllis). **J. Roy. Hort. Soc.** 12:243f.

3. The International Botanical Congress held at Vienna in 1905 agreed that 1753 should be the starting point for plant names. It has, however, always been left to individuals to propose changes in plant names on the alleged grounds that they do not conform to the Code of Nomenclature as approved and amended at each Congress. The **Amaryllis belladonna** dispute is the only one so far argued at a Congress, and that was done in a special committee, not in full session of the relevant nomenclatural committee.

4. STAPF, O., 1929. X Crinodonna corsi, footnote. **Curtis Bot. Mag.t.** 9162.

5. SEALY, J. R., 1939. Amaryllis and Hippeastrum. **Bull. Misc. Inf. Kew:** 54.

6. HENREY, B., 1975. Nos. 662, 663. **British botanical & horticultural literature** 3:36. London.

7. DOUGLAS, J., 1725. **Lilium sarniense: or a description of the Guernsay-lilly:** 30, London.

8. BRADLEY, R., 1717. Lilio-narcissus. **New improvements of planting & gardening.** London. Pp. xvi+70.

9. The name, Damascus Lily, did not persist. It may be due to the importation of the bulb on a Levant (Tureky) Company galley returning from Acre or Iskenderun, but calling at Leghorn and possibly Lisbon for extra cargo.

10. MILLER, P., 1731. Lilio-narcissus. **The Gardeners Dictionary** Ed. I.

11. BLUNT. W., 1971. **The compleat naturalist,** London, and STEARN, W. T. 1957. **An introduction to the Species Plantarum &c,** Ray Society, London, are the sources for accounts of Linnaeus's life and work. My statement, however, is my own inference.

12. BROWNE, P., 1756. **The civil and natural history of Jamaica:** 195. London.

13. HILL, J., 1758. **Outlines of a system of vegetable generation.** London. Pp. 46.

14. AUBLET, F., 1775. **Histoire des plantes de la Guiane Francoise:** 304. Londres.

15. CALMANN, G., 1977. **Ehret, flower painter extraordinary.** Oxford. See Plate 85.

16. HERMAN, P., 1689. **Paradisus Batavi prodromus:** 348 (produced

with TOURNEFORT, J. P., **Schola Botanica,** by 'S. W. A.' (W. Sherard)). Also HERMANN, P., 1698. **Paradisus Batavus:** 194 with a good illustration entitled 'Lilium Bella Donna'.

17. Botanists relied on the Latin editions of FERRARI, G.B., 1633 (also 1646, 1664) **De florum cultura libri IV,** which gave a passable illustration of the Cape Belladonna and a poetical but convincing account of its flowering with no mention of 'Donna Bella' The Italian edition, 1638, **Flora, overo cultura di fiori:** 118, 377 and Index (p. Yyy) alone gave this common name ('e chiamasi da alcuni Donna bella'). Hermann noted in **Paradisus Batavus** (Note 16) that his 'Lilium Americanum . . .' came from the Caribbean isles, and that it was hitherto unknown to him. There is no earlier record of **H. equestre** being called Bella Donna or Donna Bella: later authors quoted Hermann. He was a painstaking botanist and if he had known of the Italian common name he would not have used it. He was presumably misled by Dutch gardeners at that time unfamiliar with the Cape plant.

18. BRADLEY, R., 1728. Lilionarcissus in **Dictionarium Batanicum,** 2, and ANOV. (text by Bradley?) 1732. No. XIX Belladonna Lily in **The flower garden display'd . . . from designs by Mr. Furber . . .**

19. MILLER, P., 1752 Amaryllis, 5th. species in **Gardeners Dictionary,** 6th edition.

20. AITON, W., 1789. **Amaryllis Belladonna,** 9th species in **Hortus Kewensis.**

21. HERBERT, W., 1837. **Amaryllidaceae: 144-145.**

22. L'HERITIER, C. L., 1788. **Sertum Anglicum:** 12.

23. DOUGLAS, J., 1737. **A description of the Guernsay lilly. The second edition:** 19. London, second issue. It has recently been shown by BROCK, C. H. (**J. Soc. Biblphy nat. Hist.** (1979) 9:139) that the first issue of the second edition was in 1729.

AMARYLLIS BELLADONNA LINN.—AN UP-TO-DATE SUMMARY

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I came across this problem some ten years ago when reading early numbers of *Taxon,* the journal of the *International Association for Plant Taxonomy and Nomenclature.* In volume 3, 1954, are several papers arguing that *Amaryllis belladonna* should apply to a Cape of Good Hope plant, and one against this by Dr. H. P. Traub. I had just obtained facsimile copies of Linnaeus's *Species Plantarum* and of his earlier work, *Hortus Cliffortianus,* and could thus follow the arguments more easily.

I admit to surprise at the one-sidedness of the Dandy & Fosberg (1954) paper on the subject in *Taxon,* which purported to record an 'international decision'. It declared a British paper of 1939 by Mr. J. R. Sealy to be faultless, despite the errors already revealed in it by Dr. Traub. The *Taxon* paper then proceeded to rely solely on a specimen which perhaps - and it is only 'perhaps' - Linnaeus *should have* described. Using minor additional points to support Traub's arguments, I tried at that time without success to persuade botanists to re-consider the 1954 'decision' The matter had to rest until three years ago when

Fig. 3. **Amaryllis belladonna** Linn. This is a black and white reproduction, greatly reduced, of the beautiful colored plate 22, in Merian's "Metamorphosis insectorum surinamensis," 1705 (Edition in Dutch). This is one of the three illustrations of the **American Belladonna** cited by Linnaeus in "Species Plantarum" 1753, under **Amaryllis belladonna** Linn. **The Cape Belladonna is not cited by Linnaeus.**

I came across a direct proof that two of Sealy's main points had no substance.

When Linnaeus referred in the footnote to his genus *Amaryllis* in *Hortus Cliffortianus,* to his second species as being unequaled in beauty,

EXCERPTS FROM LINNAEUS, HORTUS CLIFFORTIANUS, AMSTERDAM. 1737
AND ANNOTATIONS

From Linnaeus (1737) BIBLIOGRAPHY: No. 61. Douglas(1725),No.234. Miller(1731) and No. 242. Bradley(1731) served as the basis of Linnaeus' conception of the Guernsey Lily and the Belladonna Lily. At the end of the five entries, under Amaryllis, he stated that all the flowers of the genus were very beautiful, but singled out the Guernsey Lily as having no equal.

61 DOUGLAS *James.*
- Lilium Sarmienſe.
- - Londini. 1725 fol. angl. p. 35. t. 2.
Docte deſcribit Amaryllidem 2dam.

Described in Douglas treatise solely devoted to the Guernsey Lily.

234. MILLER *Philip.*
- Dictionarium hortulanorum.
- - Londini. 1731. fol. angl.

242. BRADLEY *Richard.*
- Improvements of Planting of gardening.
- - London. 1731. 8vo. p. 608. anglice.

Linnaeus intended to place the American Belladonna(Amaryllis belladonna) ahead of the Guernsey Lily (Nerine sarniensis) in the text(see note under No. 61. Douglas.) Heavy work load responsible for not making shift.

AMARYLLIS. *g. pl.* 289.

1. AMARYLLIS ſpatha multiflora, corollis æqualibus patentiſſimis revolutis, genitalibus longiſſimis.
Lilio-Narciſſus japonicus, rutilo flore. *Morif. hiſt.* 2. *p.* 367. *Boerh. lugdb.* 2. *p.* 147.
Narciſſus japonicus, rutilo flore. *Corn. canad.* 157. *t.* 158.
Lilium farmiente. *Dugl. monogr. t.* 1, 2.
Seki fan. *Kæmpf. jap.* 872.
Creſcit in Japonia. *Radices ex Japonia allatæ & ex nave naufraga ejectæ in littus arenoſum inſulæ* Sarniæ *(Guernſay) inter ſpartia maritima & vento fortiore arenam eo appellente, qua demum prædicti bulbi tecti poſt aliquot annos ſumma cum incolarum admiratione, flores dedere. Morif.*

Intended No. 2.

= Nerine sarniensis Herb.

2. AMARYLLIS ſpatha multiflora, corollis campanulatis æqualibus, genitalibus declinatis.
Lilio Narciſſus polyanthos, flore incarnato, fundo ex lutco albeſcente. *Sloan. jam.* 115. *hiſt.* 1. *p.* 244. *Tournef. inſt.* 386. *Boerh. lugdb.* 2. *p.* 147. *Seb. thef.* 1. *p.* 25. *t.* 17. *f.* 1.
Lilio Narciſſus americanus, puniceo flore, bella donna dictus. *Pluk. alm.* 220.
Lilium americanum, puniceo flore, bella donna dictum. *Herm. parad.* 194.
Lilium rubrum. *Mer. furin.* 22. *f.* 22.
Creſcit in Caribæis, Barbados & Surinama.

Intended No. 1.

= Amaryllis belladonna Linn.

For the full revelation of the definitive evidence, see Tjaden, Soc. Biblphy Nat. Hist. 9:(3): 151-256. 1979.

NOTE.- No. 2 (intended No. 1) quoted under Amaryllis belladonna Linn. (Sp. Pl. 1753). Hence the Cape Belladonna was omitted.

Fig. 4. Excerpts from Linnaeus, **Hortus Cliffortianus,** 1737 and annotations, showing that Linnaeus referred to the **Guernsey Lily, Nerine sarniensis,** and not the **Cape Belladonna,** as alledged by Sealy (1939) and Dandy & Fosberg (1954), when he singled out the first named and not the latter, in **Hortus Cliffortianus,** 1737 as the most beautiful of all the **Amaryllis** species. Thus, their claim to the contrary has no substance, and Linnaeus based his description of **Amaryllis belladonna** on **the literature cited** which all refers to the **American Belladonna. See also front cover, and the preceding paper.**

The reference "No. 232 Bradley—**Dictionarium Botanicum.** tom 2, 1728, etc." should be added since the words **"Belladonna Lily"** are first used there, followed immediately by Bradley's remark that the **Guernsey Lily "excels all other flowers for beauty."**

Fig. 5. The Cape Belladonna, **Brunsvigia rosea** (Lam.) Hann., native to South Africa. Reproduced from Barrelier, No. 1039, "Plantae per Galliam, ispanicam et Etaliam" (1714). This is a good portrait of the Cape Belladonna and is to be **compared** with the **unannotated depauperate** specimen [see Fig. 1] **cited in the previous paper.** It raises a question of the identity of the species represented by the unannotated specimen.

with the further implication that it must have been common in cultivation, he in fact intended to extol the then popular Guernsey Lily, *Nerine sarniensis,* and did not intend either the Cape plant or the American plant defined by all the synonyms and habitat which he quoted for his *Amaryllis belladonna.* Sealy thus had produced no evidence to show that the Cape plant was common enough in Holland, from 1735 to 1738, when Linnaeus was in that country, to make it probable that he would have described it Sealy's third main argument, that Linnaeus's descriptive name for *Amaryllis belladonna* applied to the Cape plant, but not to the American, had already been refuted. Indeed, contemporary botanists such as Patrick Browne and Fusée Aublet did apply the name to the American plant. Again, when Linnaeus was relying on the synonyms he quoted to identify a plant, as was the case in most of *Species Plantarum* his descriptions or phrase-names were brief and designed to provide contrasting features from the other species he was describing at the same time. Such descriptions did not have to fit one species and no other. Further, it can be shown that the description for *Amaryllis belladonna* was not based on the specimen of the Cape plant, but was certainly *drawn up from the literature relating to the American species.*

Sealy did not assert that the *unannotated specimen* (see Fig. 1 in preceding reprinted paper) of the Cape plant in the Clifford Herbarium was of prime importance, but he made it a secondary support to his contention. It is indeed a *poor thing, a depauperate form.* If that was the best that Clifford's gardeners could grow, how could a claim be advanced on the superior beauty of the Cape plant? Again, the florets are not campanulate as the word is now used, but funnel-shaped or trumpet-shaped. Most significant, however, is the fact that as far as the evidence of the specimen is concerned, Linnaeus simply could not have derived the third part of his description from it, 'genitalibus declinatis' or declining stamens and stigma. While this is, of course, no true diagnostic feature being common to the rival plants, it is not to be seen in the specimen without dissection and Linnaeus did not do this. Nor did he quote any figures of the Cape plant although they were available to him. (See Fig. 5.) In one of his references to the American plant on the other hand, M. S. Merian's *Metamorphoses* . . . , there is a beautiful plate (See Fig. 3.) showing the feature clearly. This is the most likely source of his 'genitalibus declinatis', because we know that he looked closely at the plate. (Fig. 3) He translated the words used to name it by Merian (or by the Dutch botanist C. Commelin on her behalf), 'Deeze roode Lelien', as 'Lilium rubrum'.

In conclusion, it is not disputed that after 1753 Linnaeus never made a clear distinction between the rival plants. It is a fair inference that he did not appreciate the differences before then. However, he unquestionably followed the eminent botanist, Paul Hermann, in giving the epithet 'belladonna' to the American plant later known (wrongly) as *Hippeastrum puniceum (H. equestre).* Whether he *ought to have described* the Cape plant *is not relevant.* The course pursued by the

American Amaryllis Society since 1938, in using the generic name *Amaryllis,* and in rejecting *Hippeastrum* as an unjustified substitute, has been the correct one according to the *International Code of Botanical Nomenclature.*

SEARCHING FOR AMARYLLIS IN ARGENTINA

THOMAS W. WHITAKER

On October 3, 1980, my wife and I left San Diego at 9:20 PM for Argentina. After 15 hours in the air and 1 hour stops in Mexico City and Lima, Peru, we arrived at Buenos Aires, Argentina, at 8:45 PM, October 4. We were met by our hostess, Prof. Dr. Elsa Zardini [1] of the Facultad de Ciencias Naturales and Museo, and taken to a hotel in La Plata. La Plata is a port city on the Rio de La Plata about 30 miles south of Buenos Aires. It is the administrative capital of the Province of Buenos Aires, and seat of the Universidad Nacional de La Plata, of which the Museum is a part.

The Commision de Investigaciones Científicas (the Commision is roughly comparable to our National Science Foundation) of the Province of Buenos Aires, invited me, at the suggestion and urging of Prof. Zardini, to give a series of lectures on various aspects of the geographic origin, domestication, genetics, improvement, and uses of the cultivated *Cucurbita.* The Commision paid for my transportation from San Diego to Buenos Aires and return, along with our subsistence expenses while in La Plata. The remainder of the trip was financed by grants from FAO and the Facultad Ciencias Agrarias of the Universidad Nacional de Cuyo at Mendoza.

The lectures were presented at the Museum of National Sciences at La Plata. Incidentally, the Museum has a worldwide reputation. It is the finest Museum of its kind in South America. The collection of fossil mammals is unsurpassed, and the herbarium is one of the best in the country for the flora of Argentina, and the best in Latin America for Compositae.

The lectures (5) were well received. The attendance was good (50-60 people) and held up well throughout the series. They were given much publicity throughout the entire country. As a result, I was pleased to see people in the audience from Mendoza (La Consulta), Santiago del Estero, Rosario, and from several of the institutions that ring Buenos Aires. The scientific community in Argentina is eager for new information and outside contacts. Furthermore, Argentine scientists are quite willing to discuss and demonstrate their research. Scientists from other countries traveling in Argentina are given a red-carpet reception, and treated royally.

1. This is a good opportunity to thank Dr. Zardini for her patience and skill in arranging the details of the trip. Dr. Zardini is one of the best of the young crop of plant scientists in Argentina. She has combined her scientific expertise with a talent for administration. The success of my lectures was largely due to her efforts as a translator.

Before traveling to Corrientes we spent a day visiting with Ing. Osvaldo Boelcke and his wife Nemi at San Isidro, a suburb of Buenos Aires. Both are accomplished botanists. Ing. Boelcke works with Cruciferae, and his wife is an authority on orchids. On October 15, Ing. Boelcke drove me to his farm located about 50 miles north of Buenos Aires. It was spring on the Pampas. This beautiful area of prime agricultural land was covered with a variety of cereal and other crops in the younger stages of growth.

On October 15, 1980, we went via airplane to the City of Corrientes, where we were met by Prof. Ing. Antonio Krapovickas and his botanist wife, Prof. Dr. Carmen Cristobal. Ing. Krapovickas is an outstanding botanist, and a world authority on the genus *Arachis* (the peanuts). His wife is well known for her work on the Sterculiacene. We were given work space in the herbarium, and we made several trips to the markets for cucurbits. On Sunday, October 19, we were taken on a collecting trip, north of Corrientes. We had lunch at a lovely little fishing village at the junction of the Paraná and Paraguay Rivers. On the return trip to Corrientes we botanized extensively. Spring flora was in full bloom and we saw many species new to me. On the porch of one of the better houses in a small village we saw a beautiful red *Amaryllis*. Dr. Traub tells me it is a form of *A. vittata*.

After 5 days in Corrientes we went by airplane to the Iguazu Falls, located on the border of Argentina, Brazil and Paraguay, about a 2 hour flight from Corrientes. We stayed at the beautiful Hotel Cataratas, located within walking distance of the Falls. The grounds of the Hotel are handsomely landscaped. Among the plantings we noticed a brilliant, slightly peach-colored species of *Amaryllis*. Dr. Traub informs me it is most likely a form of *A. striata*.

The next day we visited the Falls. We were lucky, there was no rain on this particular day. The tropical, jungle-like, virgin forest surrounding the magnificent Falls gives one an eerie, out-of-this-world feeling. The amount of water flowing over the Falls is enormous. Their height produces a permanent cloud-like mist which rises to a height of several hundred feet. The blazing sunshine playing on the mist creates beautiful, but ephemeral, rainbows. After 2 days at the Iguazu Falls we returned to Buenos Aires, and traveled immediately to the City of Mendoza.

I rate the City of Mendoza as one of the cleanest, most beautiful cities in the Western Hemisphere, perhaps in the World. It is essentially an oasis of parks, street trees, deciduous fruits, and vineyards fed by the waters of the melting snow from the nearby Andes. The Andes at this point form a blue-black perpendicular wall topped with snow-capped peaks, hovering over the City. They make a beautiful, but awesome sight. The Andes in this area dwarf the Alps, and even our own Sierra Nevada. This forest of high peaks is crowned by Mt. Aconcagua (22,834 ft.), on the border between Argentina and Chile.

The climate of Mendoza is similar to that of the great Central Valley of California. Wine, deciduous fruits, and vegetables are the main agricultural products. Argentines are very proud of their wines, and

I am told they compare favorably with those of California and European wines.

I gave several lectures at the Facultad Ciencias Agrarias [2] located at Chacras de Coria, a suburb of Mendoza. We also visited the INTA (Instituto Nacional Technologia Agropecuaria) Station at La Consulta, about 50 miles south of Mendoza.

One of the highlights of our visit to Mendoza was the opportunity to examine the garden of Dr. Carlos A. Gomez-Ruppel, a well known collector of the Amaryllidaceae of South America, and a recipient of the Herbert Medal for 1971. Dr. Gomez-Ruppel is known to many members of this Society. Before making the journey to Argentina, we heard rumors that Gomez-Ruppel was gravely ill. Unfortunately, these rumors proved to be true. He has been bedridden for months, and at the time of our visit was in extremely poor condition. His illness has affected his brain and impaired his speech. Nevertheless, I was sure he recognized me, as we had become acquainted during the short time he was in La Jolla in 1975.

The Gomez-Ruppel garden is a marvelous show place.[3] At the time of our visit it was dominated y peonies in full bloom. Dr. Gomez-Ruppel was evidently an avid collector, and his interest spread among many groups. The Amaryllidaceae, however, appeared to be his chief interest. It is very difficult for Sra. Cecira Gomez-Ruppel to care for her bedridden husband, and devote the needed attention to the garden. Nevertheless, while not the spectacular show place of former years, there were only minimum signs of neglect.

Senora Cecira Gomez-Ruppel kindly permitted me to take sample bulbs of any material in the garden. The plants were poorly labeled, but I tried to take an assortment of all of the Amaryllidaceae in the garden during the time available. I gathered approximately 25 samples. These were sent to Plant Quarantine in Beltsville, Md. After they cleared Quarantine, they were forwarded to James A. Bauml at the Huntington Library and Botanical Gardens, San Marino, CA, for increase, and hopefully, distribution at a later date. Unless a knowledgeable person is found with access to the garden and with a mandate to collect, many of the rare and beautiful plants assembled by Gomez-Ruppl will be lost to gardeners and to science. We hope this unhappy event will not take place.

On October 29, after 5 days of hectic activity, we reluctantly left the lovely City of Mendoza for Buenos Aires. At Buenos Aires we arranged, through the American Embassy, to forward our seeds and bulbs to Plant Quarantine, Beltsville, MD. After 2 days of shopping

2. I am indebted to Ing. Agr. Pablo Gomez Riera, La Consulta (INTA) for a superb job of translating the lectures at the Facultad Ciencias Agropecuarias.

3. A good friend and fellow cucurbitologist, Ing. Agr. Ruben Oliva, is related by marriage to the Gomez-Ruppel's. We are indebted to him for making arrangements to visit the garden and to obtain bulbs.

and visiting friends we departed Argentina for San Diego on November 2, 1980.

THE QUEST FOR THE PURE WHITE DOUBLE AMARYLLIS CLONE

The breeding of double hybrid Amaryllis in the United States was started by the late J. J. McCann in Florida (see HERBERTIA 1937, pp. 185-186, & Plate 65 on page 164). It was continued by his son E. J. McCann (see PLANT LIFE 1950, pp. 107-108, Fig. 22).

Since 1940, Walter R. and Hilda S. Latapie, of New Orleans, have specialized in breeding Double Amaryllis hybrids, particularly white clones. Walter R. Latapie reported on a near white double hybrid (in PLANT LIFE 1966, pp. 47-49, Fig. 13) a cross between 'Captain McCann' (red double) x 'Maria Goretti' (white). At the 1979 Greater New Orleans Official All Horticulture Amaryllis Show, the Latapies won the Jerome Peuler Trophy for a beautiful *all white* double hybrid Amaryllis clone (see PLANT LIFE 1980, p. 33), thus reaching a milestone after almost four decades of breeding double Amaryllis.

This brief review serves as an introduction to the announcement that the Latapies, for their persistent and successful quest for the pure white double hybrid Amaryllis clone during the past four decades, will receive the WILLIAM HERBERT MEDAL for 1982.

—Hamilton P. Traub

A NOTE OF APPRECIATION

Last November (1979), a fire completely gutted a small greenhouse containing some of my most valuable Amaryllids and hybrids. I would like to thank Dr. Traub for printing the letter I wrote him about the loss and for the resulting response from readers of PLANT LIFE who have since helped me to rebuild that collection.

About 5% of the bulbs in the greenhouse survived the fire to varying degrees. Of course these no longer had any labels, but the recovery of the survivors was very interesting and deserves noting. Most plants were in black plastic quart or gallon pots. Those in the gallons were the ones which survived, the rate being far better there than in the quart plastic or various clay pots.

Bulbs which were baked from the top survived if the heat injury did not reach the basal plate. Within 2 days of the catastrophe, cooked tissue was removed to the point where the bulb was still firm and crisp. Allowed to air dry, such bulbs were then placed with only the basal portion in potting medium in shallow flats. The only treatment provided was a drench with a benomyl fungicide.

Several of the bulbs have since regenerated sufficiently to flower.

I was pleased to be able to identify the latter from flowering characteristics. Those coupled with replacement plants have re-established my breeding program very nicely.—*William D. Bell, P. O. Box 12575, Gainesville, Florida 32604, October 13, 1980.*

IN MEMORIAM—SALLY FOX

We are saddened to report the death of Mrs. Sally Fox, who as Corresponding Secretary, was one of the shining lights of the *Greater Houston Amaryllis Club* (organized 1962), and since 1964 reported the *Annual Amaryllis Shows* staged by that organization. Her cheerful outgoing personality is revealed in a group picture which appeared in the 1967 PLANT LIFE, on page 25. The Memoriam Tribute to Mrs. Fox will appear in the 1982 PLANT LIFE.

IN MEMORIAM—MRS. SAM FORBERT

We are saddened to report the death of Mrs. Sam Forbert, an outstanding member of the Amaryllis Society at Hattiesburg. Miss., and Judging Instructor. A Memoriam Tribute to Mrs. Forbert will appear in the 1982 PLANT LIFE.

CITATION FOR MR. DE WITT COTHRAN

(See Fig. 7 on page 39.)

Mr. De Witt Cothran was presented with the Herbert Medal of the American Plant Life Society by Dr. Thomas W. Whitaker, Executive Secretary, at the Los Angeles State and County Arboretum. The occasion was the regular spring meeting of the Southern California Amaryllis and Hemerocallis Society, April 19, 1980. Mr. Cothran was awarded the prestigious Herbert Medal for his outstanding research as a contributor to the development of yellow-flowered *Amaryllis* cultivars. Mr. Cothran is a living model of how to enjoy a successful career in two areas. After a career as a chemist, working with the post-harvest preservation of fruits, Mr. Cothran has been equally successful as a plant breeder.

EDITOR'S MAIL BAG

Mr. Alan Meerow, Dept. of Ornamental Horticulture, University of Florida, Gainesville, Florida 32611, is working on the nature of the chromosomes and taxonomy, of the species of the Genus *Urceolina* (including *Eucharis*), and would be pleased to receive seeds and/or bulbs for use in his researches. It is hoped that the members will be able to help Mr. Meerow.

"OH! SWEET DAYLILY; YOU SEEM SO SILLY;
TO BLOOM FOR JUST ONE DAY!"

So mused the flower loving poetess, in *Park's Floral Magazine*, in my childhood days, in the long, long ago, in the early 1900's, and continued,-

"FOR IN YOUR BEST; ONE DAY BE DRESSED,
AND THEN TO FADE AWAY!"

More recently, the Editor has received cries for help from members of the Society to do something in breeding for longer lasting Daylilies - *Hemerocallis* hybrids. Easier said than done! To say the least.

He was reminded that the *species* is an interbreeding population in nature (Traub, Lineagics, 1964, p. 99). By this criterion, the so-called diploid *Hemerocallis* had not evolved in nature above the diploid 2n=22, level; so that when the various *geographical Hemerocallis* L., species from China, were brought together in the Western World under cultivation, all interbred and thus gave rise to the numerous diploid *Hemerocallis* hybrids.

Again, they reminded the Editor, that he had utilized the diploid 2n=22, *Hemerocallis* hybrids to create the new tetraploid, 2n=44, species, *Hemerocallis washingtonia* Traub, by treating the diploid, 2n=22, hybrids with a dilute solution of colchicine (Traub, *Colchicine Induced Hemerocallis polyploids and their Breeding Behavior,* Plant Life 7 : 83-116. 1951.).

This is a *true species* since it is reproductively isolated from all the diploid *Hemerocallis* species, which are in fact *geographical* species only since they interbreed when brought together in nature or under cultivation.

And now, the Editor was reminded, could not the *Hemerocallis* species, diploid and tetraploid, be treated in some way to increase the durability of the *fugative* Daylily flowers, "that last for just one day"?

The Jester's reply would be that "this is a horse of a different feather." But seriously, a different technique will have to be employed which, unfortunately, has not as yet been perfected, called *genetic engineering,* that is the introduction of the gene or genes for *flower durability* from such a plant as *Alstroemeria* species (in which the flower lasts for ten days to two weeks, or even longer) into the *Hemero-*

EDITOR'S MAIL BAG, continued on page 119.

THE AMERICAN AMARYLLIS SOCIETY affiliated with

THE AMERICAN PLANT LIFE SOCIETY

Founded 1933 *Incorporated 1944*

The Society has Awarded _____

_____

to _____

_____

for a most meritorious exhibit of _____

_____

at _____

No. _____ Signed _____

Date _____ Office _____

THE AMERICAN AMARYLLIS SOCIETY affiliated with

THE AMERICAN PLANT LIFE SOCIETY

Founded 1933 *Incorporated 1944*

The Society has Awarded an AWARD OF MERIT

to Mrs. Lolita Blank, 456 Blank Street, Dallas, Texas

for a most meritorious exhibit of Amaryllis clone "Doris Lilian"

at the Official Amaryllis Show at Dallas, Texas

No. 1 Signed _____

Date 4-15-56 Office Show Chairperson
Dallas Amaryllis Society

Fig. 5a. From for the **AWARD OF MERIT** and **PRELIMINARY COMMENDATION** certificates, for xerox copying, trimming, and use by the show chairpersons in awarding **NATIONAL** honors at Regional Amaryllis shows: **(upper)** blank form; **(lower)** Form filled in for the **AWARD OF MERIT.**

AWARD OF MERIT, etc., continued on bottom of page 8.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1980 AMARYLLIS SHOW SEASON

The 1980 Amaryllis Show season began with the New Orleans Intra-Club Show on April 12th; the 1980 Corpus Christi, Texas Amaryllis Show on April 12th and 13th, and the 1980 Houston, Texas Amaryllis Show on April 13th.

The 1980 Amaryllis Society of Alabama Show, scheduled for April 19th and 20th had to be canceled due to the 22° F. freeze in March.

The 1980 Greater New Orleans Official All-Horticulture Amaryllis Show was held on April 19th, and the Southern California Hemerocallis and Amaryllis Society held its show on April 19th and 20th.

1980 NEW ORLEANS INTRA-CLUB AMARYLLIS SHOW

L. W. Mazzeno, Jr.

944 Beverly Garden Drive, Metairie, La 70002

On April 12, 1980, the Men's Amaryllis Club of New Orleans, Inc., staged its eighth annual Intra-Club all-horticulture Amaryllis Show. Although the Club changed its meeting place this year to a more suitable location, the East Jefferson Community Health Center, the elements prevailed against us. Not only did we have a *most* unusual winter, but on the day of the Show, and continuing into the night, we had a torrential rainstorm. Seven brave souls ventured out and exhibited seventeen specimens. Our President, Emile P. J. Flauss, won the 4-floret specimen award with a 'Minerva', and the 2-floret specimen award with a 'Beautiful Lady'. The 3-floret award went to A. T. Diermayer with a 'United Nations-type' seedling. Our special thanks go to the three judges who also braved the elements to judge our Show.

The Club's regular annual Show, open to the public, was held on April 19, 1980, and is reported separately.

THE 1980 CORPUS CHRISTI (TEXAS) AMARYLLIS SHOW

Mrs. Carl C. Henny, *P. O. Box 3054,*

Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit on April 12th and 13th, 1980, in conjunction with the Council

of Garden Clubs "Festival of Flowers".

We had very changeable weather this year—some weeks were like spring had arrived—causing many fruit trees, flowering shrubs and early plants to put forth their buds. Then came a heavy freeze which damaged these early blossoms. We also have had only 3 inches of rain since the first of January, which has delayed the growth of plants and bulbs. Despite all this freeze and drought, our Amaryllis Society was fortunate in having 56 entries for our Exhibit. In fact, those who attended our Festival of Flowers remarked that it was more lovely and well planned than it had been for the past several years.

In our "Pot Grown Section of Amaryllis" Mr. J. M. Mabe, club member, entered seven specimens, among which were Apple Blossom, Summer Time, United Nations, Violetta, Kalahri, Cardinal and Happy Memory. His Apple Blossom scored 95 points and his Summertime scored 98 points. *Mr. Mabe* received a *"Special Keeper's Trophy"* for his many *"Blue Ribbon"* entries.

In the "Garden Grown Section" Mrs. Bill M. Miller entered "Zenith" which scored 98 points, and also Bouquet—which scored 98 points. Mrs. Sheriton Burr entered Ludwig's *Goliath* which scored 94 and *"Trixie"* which scored 96 points. Mrs. Carl Henny entered "Symphony" which scored 90 points.

In our new *"Challenge Class"* Mrs. Bill M. Miller won a blue ribbon for her "Collection Display of 5 Florets".

Other named and registered specimens entered were: Royal Dutch, Belinda, Amethyst, Picture, Constant Comment, and Fire Fly.

Mrs. Bill M. Miller received the "Silver Bowl Trophy" for her entry of Zenith and Bouquet—each scoring 98 points. Mr. J. M. Mabe received the "Council of Garden Clubs"—*Award of Merit* for his entry, of Summertime, which also scored 98 points.

The "Special Trophy Award" given to non-club members was received by Mrs. Hal Wasson for her entry of "Royal Dutch," which scored 95 points.

"AWARDS OF MERIT" presented by the American Amaryllis Society and American Plant Life Society—were awarded to: Mr. J. M. Mabe, Mrs. Sheriton Burr, Mrs. Bill Miller, Mrs. Hal Wasson and Mrs. Wilbur Bunselmeyer.

1980 AMARYLLIS SOCIETY OF ALABAMA SHOW

Mrs. H. R. (Mittie) Young,

303 Hillside Dr., Chickasaw, Al. 36611

The Amaryllis Society of Alabama, Inc., planned our show for April 19th and 20th, 1980. But due to 22 degree weather in March we weren't going to have too many flowers. Then on Thursday April 17th, we had hail which ruined most of the few blooms we had. So, at the

last minute we canceled the show, since most of our amaryllis are grown outside in our gardens.

Anyway, we'll be planning for a show and hoping for good weather in 1981.

1980 GREATER NEW ORLEANS OFFICIAL ALL—HORTICULTURE AMARYLLIS SHOW

L. W. Mazzeno, Jr.

944 Beverly Garden Drive, Metairie, La 70002

When one writes this report year after year it becomes increasingly difficult to find new ways to begin, to say nothing of trying to change the format of presentation.

Fig. 6. 1980 Annual Amaryllis Show, New Orleans, La., from left, A. T. Diermayer, Show Chairman; G. L. Drake, Jr., winner of "Best in the Show", and L. W. Mazzeno, Jr. Co-Chairman.

The Men's Amaryllis Club of New Orleans, Inc. presented its 21st Annual Show on Saturday, April 19, 1980 at the Lakeside Shopping

Center in Metairie, Louisiana.

I'm beginning to believe amaryllis growers are similar to college football coaches. Just as coaches, at the beginning of every season, can't see how their teams will defeat *any* opponent, the amaryllis growers cannot see how they will have even one flower ready for the annual Show. But, when the season ends its an 11 - 1 record for the coach, and when the Show rolls around there's always enough flowers for a fine exhibition. So, in spite of a terrible winter, bulbs that bloomed too soon, bulbs that would bloom too late or not at all, a multitude of 2-florets instead of four, malformed florets, a hailstorm the night before the Show, and on and on, we still had a total of 148 entries by Club members and 21 from non-members. Again the quality was spectacular.

For the first time in the history of the Club, a non-member won the "Best-in-Show" award. Mr. George L. Drake, Jr., with a beautiful pink seedling, was awarded the honor rosette and the Susan B. Flauss Trophy. His specimen also merited the Reuter Seed Company, Inc. award for best unnamed and unregistered hybrid. I might add, at this point, that Mr. Drake has since become a member.

Our perennial winner, Mr. A. T. Diermayer, again carried off the major share of awards. First, he took the Robert Diermayer Memorial award for best breeder's hybrid. To this he added the Edward F. Authement Memorial Trophy for runner-up to the best unnamed and unregistered hybrid; the Oscar J. Robert, Sr. Trophy for best potted three-floret hybrid, 'Summertime'; the Gautier Family Trophy for best registered two-floret specimen, 'White Christmas'; the Mark Pannell Memorial Trophy for runner-up in the two-floret category with a 'Grand Mist'; the Albert Touzet, Jr. Trophy for best unregistered two-floret, potted specimen, a "Picotee Seedling"; the Holly Bowers, Jr. Trophy for best cut flower; the Jerome E. Peuler Trophy for best unregistered single floret; the T. A. Calamari, Jr. Trophy for most blue ribbons won by a Club member; and, the Sweepstakes ribbon for most blue ribbons in registered specimen categories.

Several years ago we instituted an award in honor of one of our honorary members, the Milo C. Virgin Award, this year donated by Mr. Emile P. J. Flauss. This is the only trophy *not* awarded by the official judges but rather by vote of the Club membership. This year the trophy went to Mr. Ed. M. Beckham, a Club member from Baton Rouge, Louisiana. His 'Maria Goretti' was also looked on with favor by the judges who awarded it the James Mahan Memorial Trophy for best registered and named hybrid, and the George Merz, Jr. Trophy for best registered and named large specimen. Ed is usually one of our best exhibitors, bringing in from 20 - 40 flowers every year. This year he had to settle for the 'Maria Goretti' and a few single florets. The Friday evening hailstorm got the rest.

Other winners and awards were: L. W. Mazzeno, Jr. - the Susie Mazzeno Trophy for runner-up to the best registered and named hybrid, "Minerva". Jerome E. Peuler - the Amaryllis, Inc. Trophy for best amaryllis species. T. A. Calamari, Jr. - the Vincent J. Peuler Trophy

for best registered single floret, "Apple Blossom". S. P. Gasperecz - the George L. Drake, Jr. Trophy for the best single floret, double specimen. Albert Touzet, Jr. - Sweepstakes ribbon in the unregistered categories.

Blue ribbons were also won by: Emile P. J. Flauss, Lester L. Laine, Walter R. Latapie, Sr., L. W. Mazzeno, Sr., George Merz, Jr., Vincent J. Peuler, O. J. Robert, Sr., J. T. Schmidt, and Mrs. Catherine van Geffen.

Chairman of the Show was Mr. A. T. Diermayer. I was honored to serve as Co-Chairman. We were ably assisted by all members of the Club. Our sincere thanks go to all of them. In addition to serving as Chairman, Mr. Diermayer also handled all publicity on the Show with national magazines, local newspapers, radio and TV stations.

To the judges, God bless them, our thanks again for a fine job. These nine ladies really are enthusiastic, dedicated and highly qualified for their assignment. Each year they give unselfishly of their time and effort on our behalf.

Again we are indebted to the merchants of the Lakeside Shopping Center for making the Mall and some properties for the Show available to us.

And last and very importantly, we thank the donors of the trophies. Each year they add so much to the success of the Show.

1980 HOUSTON AMARYLLIS SOCIETY SHOW

Mrs. A. C. Pickard, *Amaryllis Judging Instructor & Official Show Chairman,*

1909 Alta Vista, Alvin, Texas 77511

The annual Spring official Amaryllis Show was delightful, and my sincere thanks to everyone who had a part in making another page in the history of Amaryllis shows.

The garden Dutch Amaryllis were too sleepy to open due to variable weather conditions. This gave the Johnsonii types a chance to show their graceful charm.

The many awards won were indeed the results of interest, determination, and many long hours of special attention for new bulbs in trying to hold them dormant to bloom for the show date of April 13th.

Official Show Chairman, Mrs. A. C. Pickard, Honorary Chairman, Mrs. Troy Weight, President, Flower Show Chairman, Mrs. R. L. Culpepper, Vice Pres., Staging Chairman, Mrs. R. L. Culpepper, Vice Pres., Assistant Chairman, Mary Nell Partin, Classification and Entries. Mrs. L. E. Morgan, and Mrs. William Birch, Artistic Chairman, Mrs. E. E. Blankenship, Awards Chairman, Mrs. W. Blair, Education and Conservation Chairman, and Mrs. A. F. Lagatski, Plant Sales, Mrs. A. L. Hammond, Publicity Chairman, Mrs. A. A. Britian.

High awards were given to Mrs. L. E. Morgan for 'Apple Blossom' in the cut specimen class. This was Queen of the Show with 98 points.

The Award in the potted plant class with 96 points was 'Beautiful Lady' entered by Mrs. L. E. Morgan.

'Picotee', in the reginae Division, potted plant class, earned 95 points and was entered by Mr. Duncan Thomas.

Also, 'Leading Lady' with 95 points was entered by Mrs. A. L. Hammond in No. 1 class.

Many blue ribbons were given within the two seperate classes, No. 1, bulbs in possession one year, no. 2, bulbs in possession more than one year.

The Sweepstakes award went to Mrs. L. E. Morgan.

One exciting and outstanding exhibit in the miniature Division was the Graceful hybrid. A bulb from this hybrid has been growing for many years by a member of the Society. The bulb was originally purchased by the late Dr. Pickard from Van Meeuween, Inc., in Holland in the early 60's and has small velvety red flowers. No clones of this variety have been on the market from Van Meeuween for many years.

A Gracillis miniature in a range of colors from scarlet, dark red to salmon striped was developed by Ludwig & Co., and has been very popular as a pot grown amaryllis.

Guest class, judged but not in competition with the Society included cut specimens and put plants with only 2 florets per scape, received ribbon awards but this does not count toward prize awards.

Single florets were displayed in orchid tubes and were a very spectacular and interesting addition to the show.

As this years blooming season is closing, it is always a challenge that we start a new year for the many promises of 1981 Amaryllis shows.

Don't forget, let us continue to interest those around us in the study of Amaryllidaceae in knowing, growing, showing and sharing.

SOUTHERN CALIFORNIA HEMEROCALLIS AND AMARYLLIS SOCIETY SHOW, 1980

KENNETH MANN AND NINA BEYT, *Co-Chairpersons,*
2195 E. Orange Grove, Pasadena, Ca. 91104

The sixteenth annual show of the *Southern California Hemerocallis and Amaryllis Society* was held at the Los Angeles State and County Arboretum Lecture Hall in Arcadia on April 19 and 20. There were not a large number of named hybrids in bloom at the time of the Show this year. However, there was an outstanding group of seedlings supplied by members who specialize in hybridizing. Entries were provided by C. D. Cothran, Ed Pencall, Herman Mathias, Alma Seger, Henry Meyers, Jim Bauml, Gladys Williams, and Kenneth Mann. (See Fig. 7, lower).

As for the past several years, D. Cothran supplied over half of the flowers entered in the Show. Featured this year were a large number of hybrid doubles. One of these doubles was awarded the Judge's

Fig. 7. 1980 Southern California Hemerocallis and Amaryllis Society Show, Los Angeles and County Arboretum. **Upper,** from left, Mildred Cothran, Dr. Thomas W. Whitaker, Executive Secretary, The American Plant Life Society, who awarded the 1980 WILLIAM HERBERT MEDAL to C. D. Cothran.

Lower, part of exhibits at the show. Photo by Phil Rosoff.

Fig. 8. 1980 Southern California Hemerocallis and Amaryllis Society Show, Los Angeles and County Arboretum. C. D. Cothran's award winning Double Amaryllis hybrids: **Upper,** 'Double Beauty'; **lower,** unnamed double seedling, Photos by Phil Rosoff

Award for the Best Flower in the Show, the Quinn Buck Award for the Best Overall Seedling, and the Popularity Poll Award for the most popular flower in the Show. (See Fig. 8, upper)

D. Cothran also won the Sweepstakes Award for the most blue ribbons in the Show. Among his entries was a stunning hybrid Double Beauty. (See Fig. 8, lower)

Awards were also made to Ed Pencall for the Best Leopoldii Seedling, to Herman Mathias for the Best Reginae Seedling, to Alma Seger for the Best Gracilis Seedling, and to Kenneth Mann for the Best Small Leopoldii Seedling. Judge's rosettes were given to Helen Ruby for flower arrangements and to Herman Mathias for background flowers. A rosette was also awarded to the Huntington Botanical Gardens in acknowledgement for the large number of seedlings and species amaryllis. The Huntington's entries were selected by Jim Bauml.

It was with great pleasure that the Society welcomed Dr. Thomas Whitaker, Executive Secretary of the *American Plant Life Society*, who awarded the William Herbert Medal of the American Amaryllis Society to C. D. Cothran for his achievements which are described in this issue, (See Fig. 7, upper). The Society has been very fortunate to have D. Cothran as a very active member who has provided large numbers of flowers to each of the Shows and has generously supplied plants to the Society at regular meetings for many years. The authors wish to convey personally to D. Cothran their appreciation of his friendship for the past several years. D. Cothran is the fourth member of the Society to have received the William Herbert Medal. Other members so distinguished are, Quinn Buck, Emma Menninger, Leonard Doran, and John Cage.

The Co-Chairs would like to express special thanks to Gladys Williams for her help and encouragement in conducting this Show.

HORTICULTURE ONLY

Mrs. A. C. Pickard, *1908 Alta Vista, Alvin, Texas 77511*

Suggested rules applicable to *American Amaryllis Society* Judging Instructors.

All Amaryllis Judging Instructors are automatically accredited Amaryllis Judges. To qualify for appointment, a candidate must have been a member of the *American Amaryllis Society* for no less than three years.

A thorough knowledge of the Amaryllidaceae (family) is a basic responsibility of every Amaryllis Instructor.

True knowledge of *Amaryllis* comes only by growing. It is an obligation of all Instructors and Judges to maintain a representative collection of *Amaryllis* and add new varieties each year. By so doing, they can observe important variations in growth habits of different clones.

The Instructor should, by invitation, speak to horticultural groups on the subject of *Amaryllis* and assist willingly in the organization of local Amaryllis Societies.

It is most important to learn the accessory parts of the plant and suggest strongly the use of the diagram that is included in the study course.

An Instructor must know and follow the *American Amaryllis Society* rules as set out for an Official Amaryllis Show and be especially careful to follow the procedure for judging.

Emphasize the use of "Point Scales" in judging. The evaluation of all characteristics have to be combined before a valid decision can be reached.

Practice judging of specimens preceding the examination if possible, even in eliminating specimens with the most noticable faults. The "Scale of Points" can be effectively used as a guide to prevent going overboard on a particular characteristic.

Flower Arranging classes are not a requirement for an Amaryllis Judging Certificate.

After following these general rules, the Instructor is dependent on his own knowledge, experience and perception.

AMARYLLIS JUDGE'S CERTIFICATES

Since the last report in the 1980 PLANT LIFE (page 43), the following numbered Amaryllis Judge's Certificates have been issued:

No. 218. Mrs. E. R. Trussell, 1910 Evergreen Lane, Hattiesburg, Miss. 39401 Horticulture only.

No. 219. Mrs. Rex Herring, Napoleon Ave., Petal, Miss. 39465. Horticulture only.

No. 220. Mrs. Dan McLeod, Jr., P. O. Box 237, Petal, Miss. 39465. Horticulture only.

No. 221. Mrs. D. L. Lauder, 103 Miller St., Hattiesburg, Miss. 39401. Horticulture only.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

NEW CHROMOSOME COUNTS, NUMBERS AND TYPES IN GENUS **AMARYLLIS** [1]

WALTER S. FLORY AND ROBERT F. COULTHARD, JR.[2]
Wake Forest University

When Linnaeus published *Species Plantarum* in 1753 nine species were placed in the *Amaryllis* genus. No particular species was indicated as the generic type. In 1819 Herbert validly treated *Amaryllis belladonna* L. (under the synonym *A. equestris* Ait.) *as the type for this genus.* The other eight species listed under *Amaryllis* by Linnaeus in 1753 subsequently were placed in other, and separate, genera. Traub and Moldenke (1949) have presented the history of *Amaryllis* both prior and subsequent to 1753. This account included a good review of the nomenclatural confusion and errors caused by Herbert successively applying the names *Coburgia* (1819), *Leopoldia* (1819; 1821), and *Hippeastrum* (1821, 1837) to species of *Amaryllis.* This nomenclatural history will not be dealt with further in this paper. Traub and Moldenke (l.c.) state that "Baker (1888) admitted 35 species (of *Amaryllis*), and since that date the number has more than doubled." Traub (1963) indicates that *Amaryllis* includes "55 species ranging from the West Indies, Mexico, Central America, and South America to Argentia; one species extending to Prince's Island, off the coast of West Africa."

A number of additional species have been described in recent years. The late Professor Martin Cardenas of Bolivia, the late Professor Gomez C. Ruppel of Argentina, Senor Perfelice Ravenna, recently of the University of Chile—and a collector in Argentina and Brazil as well, and other South American plantsmen have introduced a number of native *Amaryllis* species in recent decades. Mr. J. L. Doran of Burbank, California has made extensive trips for the purpose of collecting *Amaryllis* in South America (see Plant Life 28:5-17. 1972). Dr. H. P. Traub and Dr. T. W. Whitaker have stimulated the introduction of newly known species into the United States, and Dr. Whitaker has visited South America on several occasions to collect, and also to contact South American collectors and encourage their efforts. The persons mentioned by no means exhausts the list of people interested in the collection of *Amaryllis.*

Amaryllis species have been reported from at least 10 South American countries (Table 1), in addition to the other known distributions

[1] Work supported by a grant from the Research and Publications Fund of Wake Forest University.
[2] Present address: Department of Biology, University of Virginia, Charlottesville, Virginia.

noted in the Table. Species of the genus are especially prevalent in Chile, Brazil, Bolivia, and Argentina, with a significant number of species being known from Peru also.

Table 1. Distribution of **Amaryllis** species as listed in **Index Kewensis** and its Supplements.

Country	Number of species	Country	Number of species
Argentina	23	Mexico	2
Bolivia	27	Paraguay	5
Brazil	31	Peru	12
Chile	34	Uruguay	8
Columbia	2	Venezuela	1
Guiana	2	West Indies	1

[1] Species extends to Prince's Island, off of West Africa, apparently introduced.

A couple of taxa which are especially interesting cytologically have apparently been collected in an area comparatively near Rio de Janeiro. An inquiry concerning these taxa, and their probable point of collection, was directed to Mr. J. L. Doran who has made several *Amaryllis* collecting trips to South America. Mr. Doran has sent pertinent information (by letter of 7/15/80) which I do not believe he would mind sharing. One, of the two, especially interesting forms referred to was sent to us as *A. atibaia*. It is possible that this name should be *A. itibaia*. Mr. Doran states that there are two somewhat confusing places in an area roughly west of Rio which he has "crisscrossed" several times. One of these places is "Itibaia, 64 km due north of Sao Paulo (and hence about due west of Rio). The other place referred to, with a confusingly similar name is "Itatiaia, about 100 km northwest of Rio. The two places are 260 km apart." These places are in an area which Mr. Doran describes as being some "300 or 400 miles long, 100 miles in from the Atlantic" in which there are many places rather difficult to reach and where "almost always an *Amaryllis* can be found." While varying, many of these taxa "blend from one to another" with no clearly "distinct separate" characters. The two species which we have received and are here treated, under the names of *A. atibaia* and *A. moreliana*, respectively, have apparently grown and been collected from locations in the sizeable area described by Mr. Doran. As we describe below, these two species have 24—rather than 22—somatic chromosomes. While the taxa are treated in this paper under the names of receipt, corrections of nomenclature may have to be made when flowering takes place and more is learned about these entities.

MATERIALS AND METHODS

In this paper results from preliminary studies of the somatic chromosomes of 18 taxa are described. These include 16 named species, 1 unnamed species, and 1 interspecific hybrid. Most of these taxa have not been subjects of previous cytological studies.

As indicated in Table 2 a majority of the bulbs used in this study have been sent to us by Mrs. Marcia Wilson from material originating with Mr. Doran. Dr. W. D. Bell has furnished several bulbs, and an-

other bulb has been sent by Dr. James Shields. We here express our indebtedness, and keen appreciation, to each of these colleagues for their generosity in sharing materials.

Table 2. Somatic chromosome numbers, plant sources, and figure numbers for chromosome drawings of **Amaryllis** taxa studied.

Species or taxa	Accession number	Bulb source	2n	See Figure
aglaiae	823	Wilson [1,2]	22*	9
atibaia	836	Bell [4]	24*	16
belladonna	795	Wilson [1,2,3]	22	9
cybister	826	Wilson [1,2]	22*	10
escobaruriae	827	Wilson [1,2]	22*	10
evansiae	796	Wilson [1,4]	22	11
fragmatissima	829	Wilson [1,2]	22*	11
fusca	830	Wilson [1,2]	22*	12
miniata	719	Shields [5]	22*	12
mini-**stenopetala X fosteri**	622	Bell [4]	22*	16
moreliana	791	Wilson [1,2,3]	24*	17
nelsonii	831	Wilson [1,2]	22*	13
neoleopoldii	832	Wilson [1,2]	22*	13
papilio	835	Bell [4]	22*	14
striata-type	793	Wilson [1,2,3]	44	17
tucumana	834	Wilson [1,2]	22*	14
vittata	792	Wilson [1,2,3]	22	15
sp.-Doran's	790	Wilson [1,2,3]	22*	15

[1] Mrs. Marcia C. Wilson, Brownsville, Texas.
[2] Mrs. Wilson's material came from Mr. J.L. Doran, Burbank, California.
[3] Mr. Doran's collection numbers: 795=1341; 791=1271; 793=1525; 792=1307; 790=1863.
[4] Dr. W.D. Bell, Gainesville, Florida (Mrs. Wilson's seed of **evansiae,** from W.D. Bell).
[5] Dr. James E. Shields, Indianapolis, Indiana.
* Chromosome numbers reported here for first time.

All cytological studies were made on mitotic chromosomes secured from rapidly growing root-tips of potted plants grown in the greenhouse. Tips were collected about noon of a sunny day, following a sunny day. The tips were first pretreated in aqueous solutions of .2% to .4% colchicine for approximately 4 hours. Following the pretreatment tips were either squashed directly in 1% Gurr's acetic-orcein, or were fixed overnight in freshly mixed Carnoy's solution (3 parts 95% ethyl alcohol: 1 part glacial acetic acid). When tips were firm enough to make it difficult to secure good chromosome spreads, treatments for different time periods with various HCl concentrations, and at varying temperatures, were experimented with until good spreads resulted.

Good spreads of the chromosomes of each of the 18 taxa were studied, with one of the better spreads of each taxon being drawn with a camera - lucida while being observed at an initial magnification of X900 (90X oil objective: 10X compensating ocular). Figures 9 and

17 each have a line drawn on them, representing 10 microns which apply only to these two figures, respectively. The resulting camera-lucida drawings have a somewhat greater magnification than X900, of course. Chromosome counts and comparisons of chromosome types can be made readily from the drawings. Sizes of chromosomes in the several figures

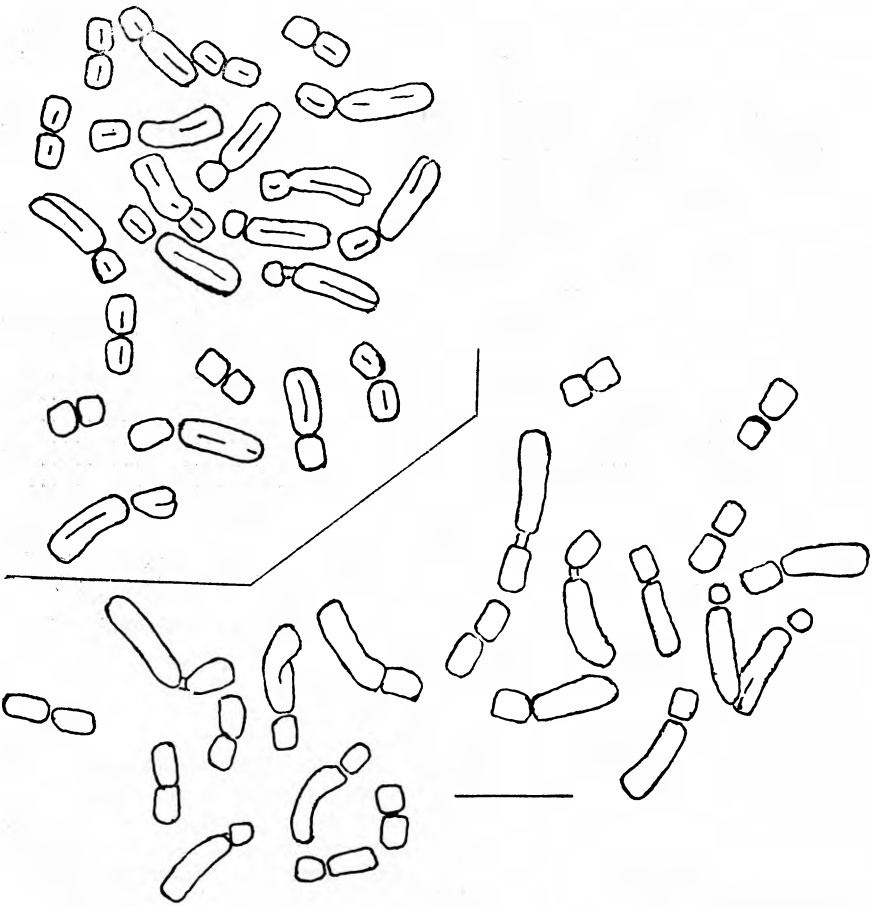

Fig. 9. Genus **Amaryllis** L. Root-tip chromosomes: **Lower, Amaryllis aglaiae** Castellanos, 2n=22; **Upper, Amaryllis belladonna** Linn., 2n=22.

as drawn *are not always representative of chromosome size differences between the taxa*, because some of the preparations were pretreated with colchicine solutions of different concentrations and of varying freshness, thus resulting in variations in chromosome contractions. Also, while most figures selected were at fully contracted metaphase stages, in other

cases the best spreads were of earlier mitotic stages, where the chromosome coils were not completely tightened and contracted. This, of course resulted in chromosomes being longer, and unusually narrower, and they

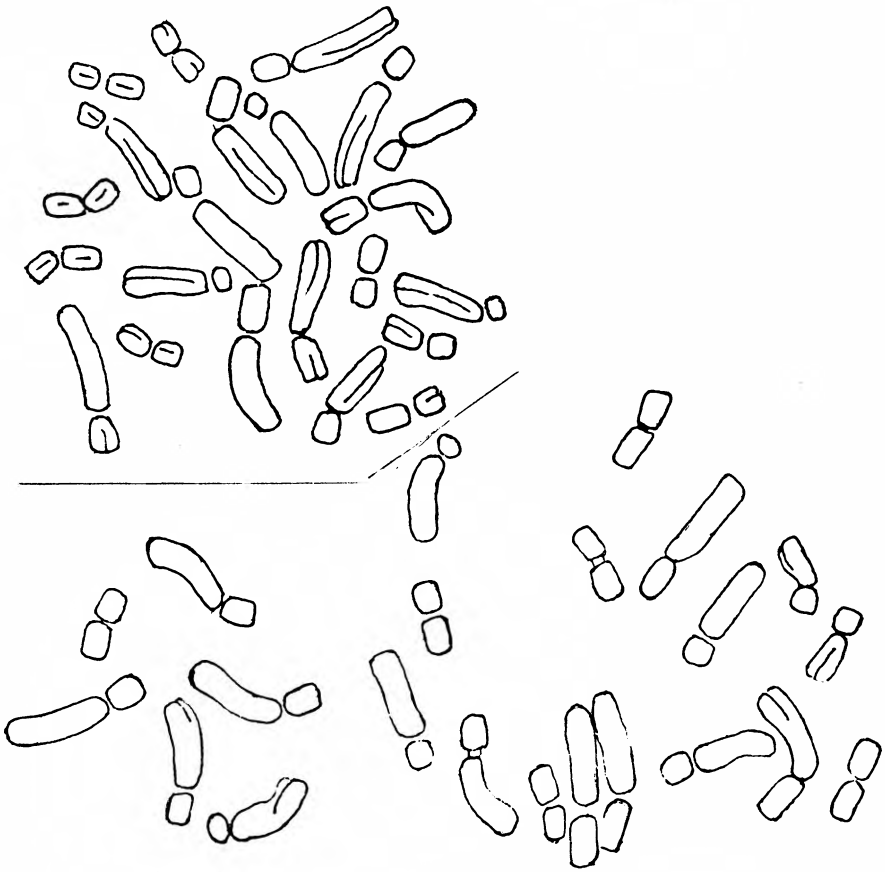

Fig. 10. Genus **Amaryllis** L. Root-tip chromosomes: **Lower, Amaryllis cybister** (Herb.) Traub & Uphof, 2n=22; **Upper, Amaryllis escobaruiae** Cardenas, 2n=22.

are so drawn.

PREVIOUS CHROMOSOME STUDIES OF **AMARYLLIS** TAXA

Beginning in 1929 Fernandes dealt (in several papers) with the chromosomes of *Amaryllis belladonna* L., at first reporting 2n=20 for the species from the sectioned preparations he used at that time. Sato (1938; 1942) soon published cytological data on several species of

Amaryllidaceae, including representatives of *Amaryllis.* The 1969 Russian chromosome compilation summary (through 1967) of Bolkhovskikh, Grif, Matvejeva, and Zakharyeva, lists chromosome numbers for 23 species of *Amaryllis,* although a few of these are for the "narrow-leaved *Amaryllis*" species which have now been moved to the genus *Rhodophiala.* A few more recent reports on *Amaryllis* chromosomes have been made, including recent papers by Burnham, et al, (1971); Flory, Cicero and Smith (1976); Flory and Smith (1976); and Narain (1977); among others.

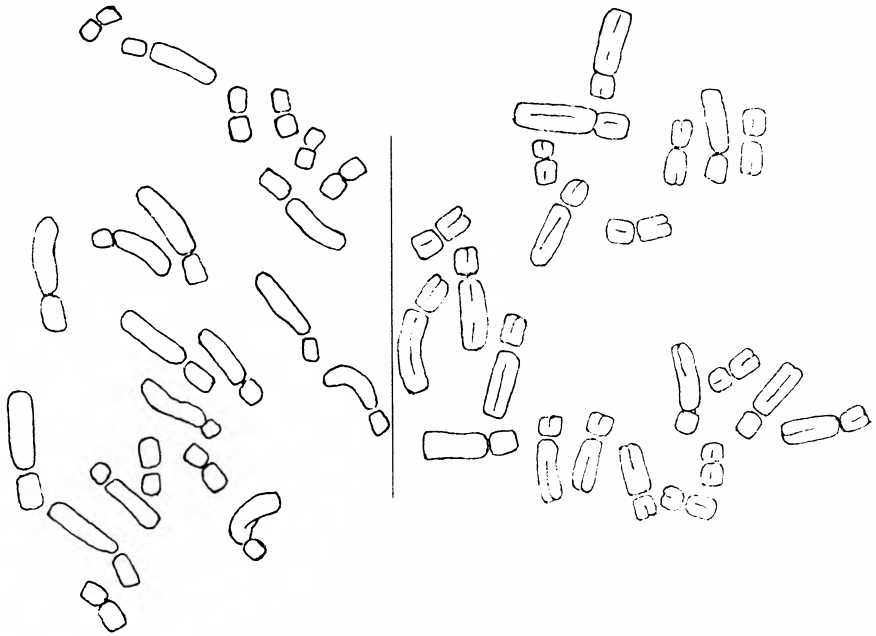

Fig. 11. Genus **Amaryllis** L. Root-tip chromosomes: **Left: Amaryllis evansiae** Traub & Nelson, 2n=22; **Right: Amaryllis fragrantissima** Cardenas, 2n=22.

Of the *Amaryllis* species previously studied cytologically, in at least 18 2n=22; a form of *A. reginae* has a 2n of 33; Schmidhauser found types of *A. belladonna* with 2n=33 as well as the more usual 2n=22; at least three species have 44 somatic chromosomes, or varieties with 44; and 2n numbers of 55, 66 and 77 are each known for at least one *Amaryllis* species. Also, there are other taxa besides *A. belladonna* exhibiting polyploid, as well as diploid, numbers. In addition to the *A. vittata* forms with 2n=44 reported by Inariyama (1937), Sato (1938), Schmidhauser (1954) and Narain (1977)—both Narian, as well as the present workers, have encountered diploid forms of the same

species. In the hybrid X *A. Johnsonii (A. Reginae* x *A. vittata)* Mookerjea (1955) found plants with varying numbers: in some 2n=22; in others 2n=44, or 2n=66. There are other known cases of polyploidy within certain *Amaryllis* species, and Narain *(l.c.)* has cited a number of hybrid cultivars which are tetraploid.

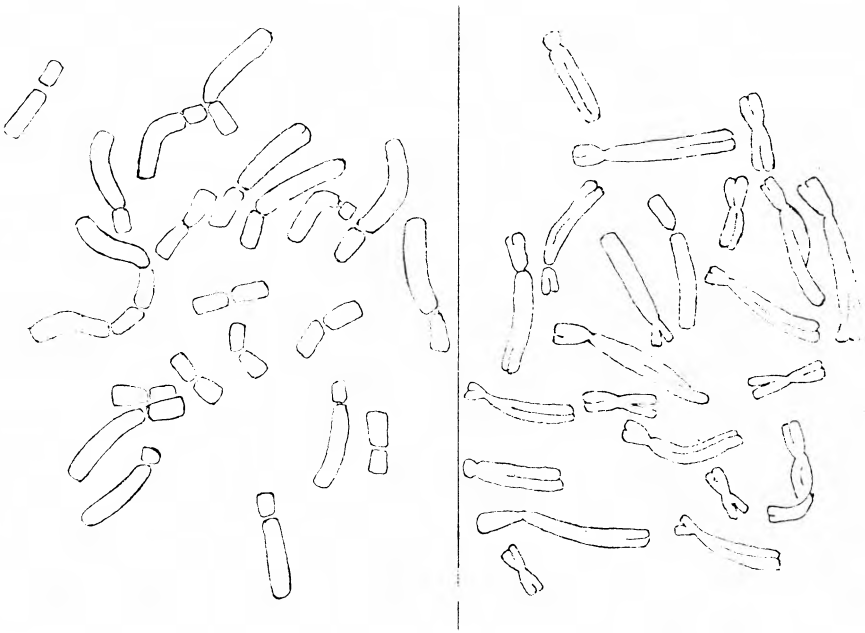

Fig. 12. Genus **Amaryllis** L. Root-tip chromosomes: **Right: Amaryllis fusca** (Kraenzl.) Traub & Uphof, 2n=22; **Left Amaryllis Miniata** Ruiz & Pavon, 2n=22.

Until the present work, however, all cytological studies on *Amaryllis* taxa using modern techniques have reported the species studied to have a base number of 11 chromosomes, with the preponderance of species being 2n=22 diploids, while a few taxa are known in which 2n=33, 44, 55, 66 or 77.

STUDIES ON ADDITIONAL **AMARYLLIS** TAXA

In Table 2 are listed 16 named species, one interspecific hybrid, and one as yet unnamed species. Chromosome counts for only four of these taxa apparently exist in previous literature, these species being *belladonna, evansiae, striata,* and *vittata.* In the present investigation chromosome counts (as shown in Table 2), and also initial typing studies have been carried out on all 18 taxa dealt with. The general types of chromosomes of the complements of the 18 taxa are indicated in Table 3.

Table 3. Numbers of chromosomes of the various types encountered in the several Amaryllis taxa studied.[1]

Species or taxa	Long SM .33	Long SM .30	Long ST .15	Medium ST .20	Short M .50	Short SM .43	Shortest SM .36
Diploids—2n=22							
aglaiae	6	8			6	2	
belladonna	6	8			8		
cybister	6	8			6	2	
escobaruriae	8	6			4	4	
evansiae	6	8			6	2	
fragmatissima	2	12			6	2	
fusca	4	10			6	2	
miniata	8			6	6	2	
mini-**stenopetala** X **fosteri**	7		7		3	2	3
nelsonii	6	8			6	2	
neoleopoldii	4	10			6	2	
papilio	4	10			6	2	
tacumana	4	10			6	2	
vittata	4	10			2	6	
sps. Doran's	4	12			4	2	
Aneuploids—2n=24							
atibaia			8	6	4	4	2
moreliana	6	8			8		2
Tetraploid—2n=44							
striata-type	8			14	14	8	

[1] Abbreviations used: SM=submedian centromere; ST=subterminal centromere; M=median centromere.

Figures expressed as decimal fractions are index figures to indicate position of the centromere. The index figure is secured by dividing length of the shortest chromosome arm by the total length of the chromosome.

1. DIPLOID SPECIES

Of the taxa listed in Table 2, 15 have been determined to be diploid with 2n=22. The somatic chromosome number of 22, so far as we can determine, is being reported here for the first time for *Amaryllis* species: *aglaiae, cybister, escobaruriae, fragmatissima, fusca, miniata, nelsonii, neoleopoldii, papilio, tucumana,* and also for the apparently undescribed *Amaryllis* species—Doran's No. 1863. The same is true for the mini-*stenopetala* X *fosteri* interspecific hybrid supplied by Dr. Bell—which has 22 apparently well-paired somatic chromosomes.

Diploid chromosome complements of *Amaryllis* species can typically be divided into two groups of 14 longer, and of 8 considerably shorter chromosomes. Among the longer chromosomes there are—depending upon the species concerned—usually 2, and sometimes 4, or even more—which are observably, and measurably, longer than the remaining 12, or 10, etc., of the longer group. In most taxa these longer chromosomes have proportionally longer short arms, than do the shorter chromosomes of the long group.

Among the *Amaryllis* taxa known cytologically there are apparently always two, even more sharply demarcated groups among the 8 shorter chromosomes of the complement. Four of the shorter group have centromeres which are median, or very near median, in position and thus dividing—usually the 4 shortest chromosomes—so that the two arms of these are very nearly equal in length. The other—and usually longer—4 of the shorter group, have centromeres which are nearly always just submedian in position, thus dividing each of these chromosomes so that one arm is slightly longer than the other.

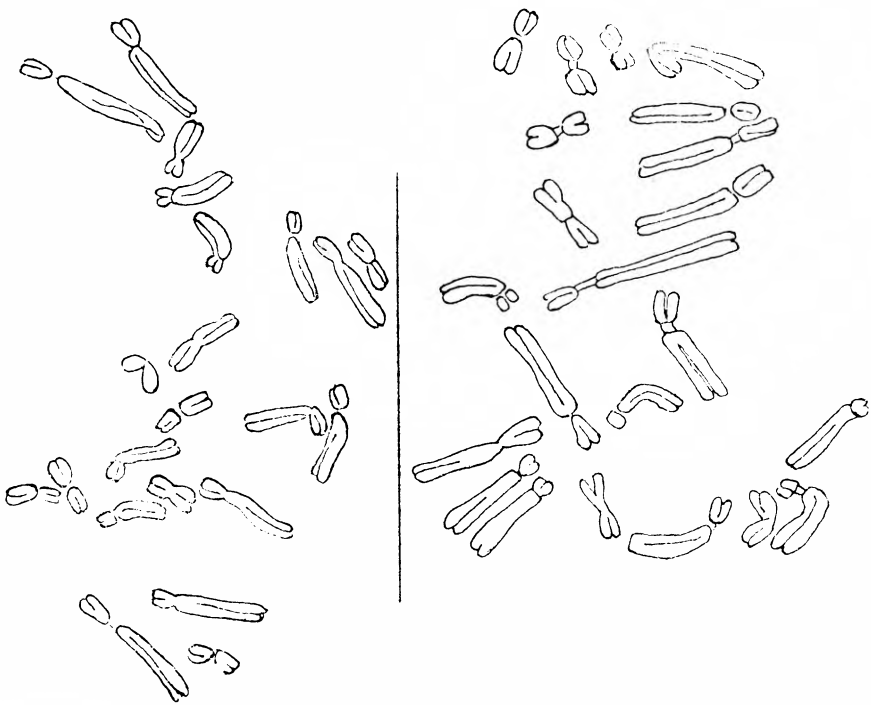

Fig. 13. Genus **Amaryllis** L. Root-tip chromosomes: **Right: Amaryllis nelsonii,** 2n=22; **Left: Amaryllis neoleopoldii** Cardenas, 2n=22.

Minor exceptions to the generalities just described result in slight variations in the chromosome complements as they occur from species to species. Such variations probably result from small translocations tending to promote some evolution of the chromosomes. With subsequent genic changes responsible, in part at least, for the specific differences encountered. Examination and brief study of sub-figures, 1 through 14, shown in Figures 9 through 15, will enable the 14 longer and 8 shorter chromosomes to be rather easily recognized, as well as the subgroups among the longer 14, and also the shorter 8, chromosomes of

the diploids. The small differences encountered between the karyotypes of certain species are indicated in Table 3. A number of such variations can be discerned by close study of cytological preparations, and of the figures drawn from such preparations.

2. **AMARYLLIS** SPECIES IN WHICH 2N=24

As listed in Table 3, and earlier pointed out in the text, the two accessions received as *Amaryllis atibaia* and *A. moreliana,* respectively, both have 24 somatic chromosomes, rather than the 22 of usual *Amaryllis* diploids. In both accessions there is a 12th pair of chromosomes

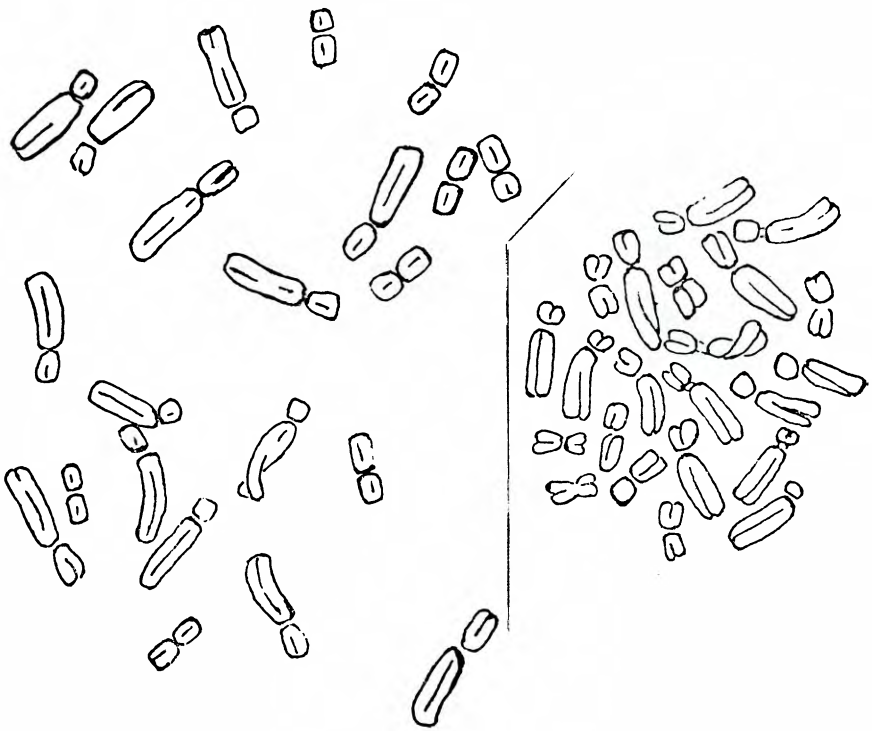

Fig. 14. Genus **Amaryllis** L. Root-tip chromosomes: **Right: Amaryllis papilio** Ravenna, 2n=22; **Left: Amaryllis tucumana** (Holmbera) Traub & Uphof, 2n=22.

(Figs. 16 and 17), which in both cases is a 5th pair of small chromosomes. But this extra pair does not duplicate any of the other pairs. Chromosomes of the 12th pair are smaller than those of any of the other 22—which appear quite similar to the 22 chromosomes occurring in most *Amaryllis* diploids. In other words, tetrasomy is apparently not involved here. In the smaller, additional, pair of chromosomes the centromere is slightly submedian, with one arm being a fraction longer

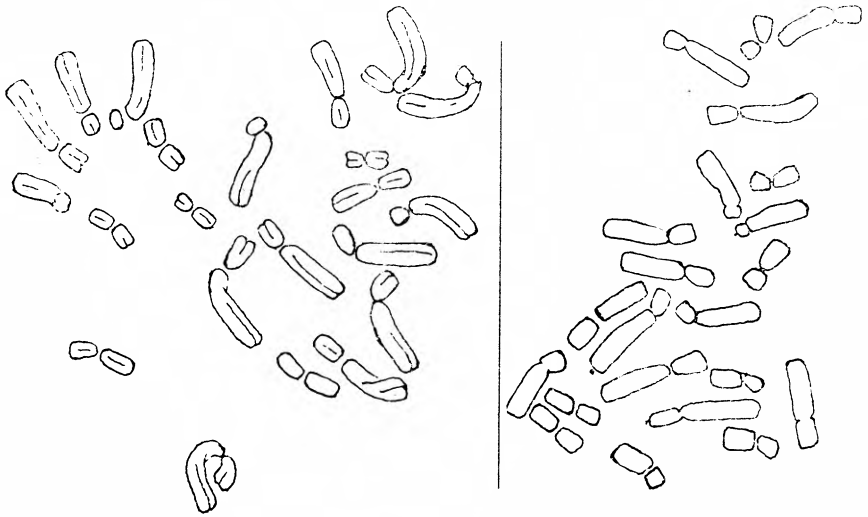

Fig. 15. Genus **Amaryllis** L. Root-tip chromosomes: **Right Amaryllis vittata** L'Herit., 2n=22; **Left: Amaryllis** species (unidentified), collected by Mr. Doran, No. 1863, 2n=22.

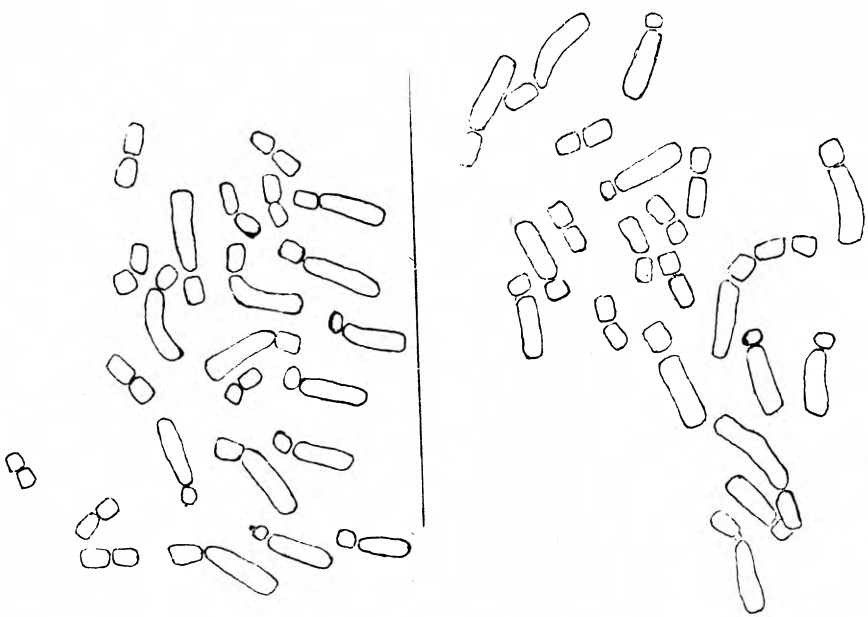

Fig. 16. Genus **Amaryllis** L. Root-tip chromosomes: **Right, Amaryllis** "mini-stenopetala" x **A. fosteri,** from Dr. Bell's material, 2n=22. **Left,** Amaryllis **atibaia,** 2n=24. Note 2 smaller, slightly submedian chromosomes.

than the other. This is true in both accessions, which at first suggests that the two accessions, although received under different names, might actually belong to the same taxon.

In *A. moreliana*, however, 8 of the shorter chromosomes appear to have essentially median chromosomes, with only the 2 shortest, and apparently "new type," chromosomes having somewhat submedian constrictions. In *A. atibaia* at least 4 of the usual 8 shorter chromosomes, as well as the shorter extra pair, appear to have attachment constric-

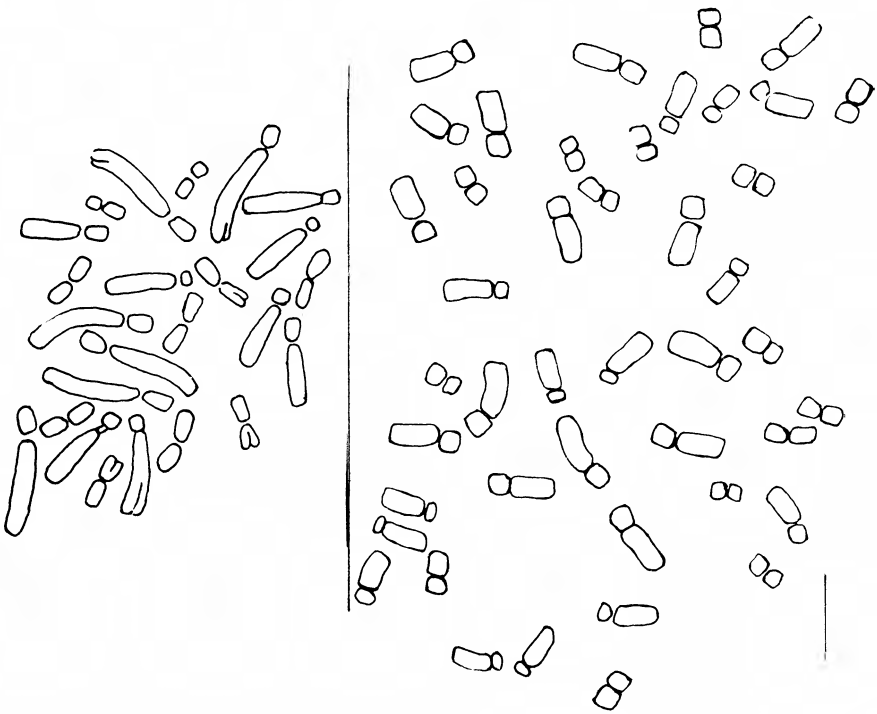

Fig. 17. Genus **Amaryllis** L. Root-tip chromosomes: **Right,** Amaryllis moreliana (Lemaire) Traub, 2n=24. Note 2 smallest chromosomes, with submedian centromere constrictions. **Left, Amaryllis striata** forma **striata** (type), 2n=44.

tions just slightly off-center, and thus slightly submedian in position. All 14 longer chromosomes of both taxa appear similar in type to those found in the 2n=22 species investigated. No evidence has been observed of deletions, or other abnormalities, which might possibly account for the origin of new chromosomes, or of the arms of an extra chromosome pair.

It is of interest that of the more than 400 species in the Amaryllidaceae for which chromosome numbers have been reported that a basic

chromosome number of x=11 is the most frequent one, with x=6 (2n=12, 24, 36, etc.) being the next most frequently known basic chromosome number (Flory, 1977). The possibility of a 2n=24 (n=12, x=6) *Amaryllis* being an evolutionary link between n=11 and n=6 species of the family merits consideration. The two 2n=24 accessions discussed here need further careful cytological and morphological analysis.

3. AN **AMARYLLIS** SPECIES IN WHICH 2N=44

Our accession No. 793, *Amaryllis striata*-type, was found to have 44 somatic chromosomes (Fig. 17, left). This is the only taxon examined in the present study which proved to be a tetraploid. The karyotype of this accession contains 8 longer chromosomes with centromeres located near the dividing line between those considered submedian and subterminal, and which are designated as submedian in Table 3. There are 14 chromosomes somewhat shorter than the longest 8, and these have subterminal constrictions. In addition there are 22 short chromosomes, of which 14 have median and 8 have submedian centromeres. This taxon quite apparently has a greater proportion of short chromosomes than occur in most diploid species. In addition, all chromosomes types of this tetraploid are somewhat shorter than the corresponding types in diploids. Otherwise, (except for chromosome number) the overall karyotype of this tetraploid is quite similar to that for the diploids.

SUMMARY

The diploid chromosome number of 22 is here reported for the first time for 10 named species of *Amaryllis,* the chromosome numbers of which are marked with an asterick (*) in Table 2. This same number of 22 is also reported for the first time for an unnamed *Amaryllis* species of Mr. Doran's (his collection No. 1863), as well as for a first generation hybrid between mini *stenopetala* and *fosteri,* plants, from the cultures of Dr. W. D. Bell. Confirmation is also made of 22 being the diploid chromosome number for *Amaryllis* species *belladonna, evansiae* and *vittata.*

In our two accessions of South American *Amaryllis* taxa received under the names of *A. atibaia* and *A. moreliana,* respectively, 2n=24, rather than the 22 occurring in most diploid *Amaryllis* species. Both of these taxa have, in addition to the usual complement of 22 chromosomes, an extra pair of quite small chromosomes with submedian attachment constrictions. While no explanation is presently given for the presence of these 2 extra chromosomes, *the encountering of these is probably the most significant finding of this work.* With an apparent and probable base number of x=6, these *Amaryllis* accessions could prove to be evolutionary links between the numerous *Amaryllis, Crinum,* and other Amaryllidaceous species in which x=11, and the almost as numerous species in the family which trace to a basic number of x=6.

Initial karyotype studies have been made on each of the 18 taxa investigated, with preliminary data summarized in Table 3. It is evident that at least the majority of cytologically known diploid *Amaryllis*

species exhibit 14 longer, and 8 shorter, chromosomes. The former may be divided into those which have near submedian centromeres, and those which have subterminal centromeres. Among the shorter chromosomes there are often 4 with median, and 4 with slightly submedian centromeres. Roughly this same karyotype is found in the *A. striata*=type tetraploid, with exceptions in the proportions of the different types of chromosomes.

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CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE VII

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ABSTRACT

Nine new species of Amaryllidaceae, namely *Amaryllis pilcomaica, A. paradisiaca, Habranthus millarensis, Phycella scarlatina, Ph. australis, Placea davidii, Crinum amazonicum, C. surinamense,* and *Rauhia decora,* are described. *Amaryllis glaucescens* Mart. ex Schult. f., and *A. illustris* Vell. are recognized as previous, valid names, respectively for *A. maracasa* Tr. and *A. restingensis* Rav. A specimen belonging in *A. papilio* Rav., supposedly a native of the south of Santa Catarina, Brazil, was detected in the herbarium of the Museum of Montevideo (MVM) as collected near Pelotas, state of Rio Grande do Sul. *A. anzaldoii* Cárd. is reduced to synonymy of *A. evansiae* Tr. & Nels. *A. argentina* (Pax) Rav. is recorded for the first time in the Bolivian flora, and *A. fragrantissima* is suggested as a probable synonym of this species. *A. monantha* Rav. is reduced to subspecies of *A. belladonna;* and the status of two varieties is modified to the subspecies rank; a tentative key to the subspecies of *A. belladonna* is given. —*Habranthus chacoensis* Rav. is reported in the flora of Paraguay. *H. nullipes* Rav. and *H. leptandrus* Rav. are illustrated. The application of the binomial *H. pedunculosus* Herb. is reconsidered (see Ravenna 1974), and *H. concordiae* is identified with it and placed in its synonymy; in this connection, a neotype for *H. teretifolium* (C.H. Wr.) Tr. is proposed. —Reasons for segregating the Chilean populations previously included in *Famatina herbertiana* (Lindl.) Rav., as *F. andina* (Phil.) Rav., comb. nov., are exposed. —The new combination *Stenomesson chihuanhuayu* (Cárd.) Rav. based in *Haylockia chihuanhuayu* Cárdenas (1973), is established. A misinterpretation of the identity of *S. callacallense* Rav. and *S. splendens* (Herb.) Rav. is disclosed; consequently, it seemed better to validate *Pancratium trichromum* De la Llav. & Lex. in *Stenomesson;* the latter specific epithet had already been typified by Herbert (1841) in *Coburgia* (a synonym of *Stenomesson*). Finally, diagnostic figures of *S. miniatum* (Herb.) Rav., and *S. microstephium* Rav., treated in a previous part of this work (Ravenna 1974), are given.

I. Studies in the genus **Amaryllis**
II. Studies in the genus **Habranthus**
III. New species of **Phycella**
IV. An additional **Famatina** species
V. A new **Placea** species
VI. Studies in the genus **Stenomesson**
VII. A new **Rauhia** species from North Peru
VIII. Studies in the genus **Crinum**

I. STUDIES IN THE GENUS AMARYLLIS

Amaryllis pilcomaica Rav. *sp. nov.* (Fig. 18)

Species ab *Amaryllide crociflora* affinis sed inflorescentia 4-8-flora perigonii tubi obsoleto et floris colore differt.

Planta usque 90 cm alta. Folia lorata leviter canaliculata vel subplana fusco viridia ad 19-25 mm lata. Pedicelli teretes 18-20 mm longi. Ovarium oblongum superne leviter ampliatum nitide viride. Perigonium declinatum cinabarinum ad 49-52 mm longum circ. 49-55 mm latum in diam. verticale et 42-47 mm in diam. horizontale. Tepala anguste oblanceolata e teriora usque 12 mm lata. Filamenta stricte fasciculato-declinata ad apicem incurva. Stylus declinatus ad apicem leviter arquatus usque 50 mm longus. Stigma purpureus breviter trifidus vel trilobatus.

Fig. 18. **Amaryllis pilcomaica** Rav., plant as cultivated by the writer from bulbs collected on the rugged banks of the upper Pilcomayo river, dept. Cochabamba, Bolivia. Photo P. Ravenna.

Plant up to 90 cm high or very often smaller. *Bulb* subglobose to 4.4-5.4 cm long, 4.7-6 cm wide; pseudoneck short. *Leaves* lorate, spreading, to 18-40 cm long, 19-25 mm broad, dark green, slightly channelled to almost flat. *Scape* cylindrical, palely ash-green, pruinose, becoming purplish downwards, to 29-80 cm long, the base slightly compressed, 9.5-11 mm wide, the ape 7.5 mm wide. *Spathe* marcescent; valves lanceolate, to 30-35 mm long; inner bracts subfiliform, to 15-28 mm long. *Inflorescence* 4-8-flowered. *Pedicels* to 18-20 mm long. *Ovary* oblong, slightly wider above, bright green, to 7.5 mm long, 3.7 mm wide. *Perigone* declined, scarlet, to 49-52 mm long, 49-55 mm in its vertical

diam. and 42-47 mm in the horizontal diam. *Tepals* narrowly oblanceolate, *joined at the base for 3-4 mm,* apiculate; the outer lateral-pair approaching to the upper outer-one, and the outer lateral-pair to the lower inner-one; the outer to 57 mm long, moderately recurved above, the upper 14.7 mm broad, lateral-pair 12 mm broad. *Filaments* closely fascicled, declined, incurved at the apex, scarlet; lateral-episepal to 24-25 mm long, upper-episepal 26-27 mm long, lateral-epipetal 35-36 mm long, lower-epipetal 32-33 mm long. *Anthers* reniform-oblong, to 3.2 mm long (linear-oblong, 10 mm long, before dehiscence), pale yellow. *Basal crown,* fimbriate, whitish, 0.5-0.8 mm long. *Style* declinate, slightly curved toward the apex, scarlet, to 50 mm long. *Stigma* shortly trifid or trilobed, purple; lobes spreading or very slightly recurved, 1.3-1.5 mm long.

Habitat.—On rugged slopes along the upper Pilcomayo river, between Boston and the old Quioma silver-mines, in the Dept. of Cochabamba, prov. Midque, Bolivia. It sometimes grows in ditches of rocks, under partial shade of semideciduous woods.

Specimens: Culta in Santiago ex bulbis in praeruptis secus fluminis Pilcomayo inter Boston et Quiomae argentifodinam prov. Midque civit. Cochabamba Boliviae collectis; leg. Ravenna 3043, 1-1978 (typus in Herb. Ravenna, isotypus TRA).

Amaryllis pilcomaica appears to be allied to *A. crociflora* (Rusby) Tr. & Uphof, which grows on the banks of the Guerratuma river, also in Bolivia. It differs from it in the several-flowered inflorescence, the obsolete perigone-tube, and the flower color, which is scarlet instead of rosy-purple.

Amaryllis paradisiaca Rav. *sp. nov.*

(Subgen. Omphalissa, Series Aviflorae)

Planta circ. 1.30 m alta. Bulbus ovatus ad 11 cm longus circ. 8 cm latus. Folia lorata canaliculata. Inflorescentia uniflora. Flos viridis rubro-aurantiaco venatus ad 13.5 cm longus circ. 11 cm latus. Tepala oblanceolata inferne circ. 13-15 mm connata quadriseriata; exteriora lateralia assimetrica contigua apice breviter curvatus; interius inferius minore horizontale fasciculum staminum subtendens. Stamina prominentia arquato-ascendentia. Stigma trifidus lobis circ. 1.2-1.3 mm longis.

Plant up to 1.30 m high. *Bulb* large, ovoid, to 11 cm long, 8 cm wide; pseudoneck 5 cm long. *Leaves* strap-shaped, present at anthesis, to 40-50 cm long, 16-25 mm broad. *Scape* circ. 7 mm wide at the apex. *Spathe valves* narrowly lanceolate, to 8.7 cm long; inner bract single, membranous, 4.5 cm long. *Inflorescence* two-flowered. *Pedicel* to 10.8-11 cm long. *Ovary* oblong, 15 mm long, 5 mm wide. *Flower* cernuous, green with orange-red veins, to 13.5 cm long, 11 cm wide. *Tepals* oblanceolate, of four different types, *joined below for 13-15 mm;* the upper outer 12.5 cm long, 47-50 mm broad, with a 2 mm long apicule; lateral outer ones contiguous, assimetric, with a slightly curved apex, apiculate; lateral inner pair to 11 cm long, 3 cm broad, subacute; lower

inner to 10.2 cm long, 15-17 mm broad, horizontal, subtending the stamen fascicle. *Filaments* white, arched, ascending, the upper episepal to 8.8 cm long, lateral episepal pair 9 cm long, lateral epipetal pair 9.8-10 cm long, the lower epipetal one 10.4 cm long. *Anthers* reinform-oblong, after dehiscence 6.5-8 mm long; green; pollen yellow. *Style* to 13.3 cm long. *Stigma* shortly trifid, its lobes 1.2-1.3 mm long.

Habitat.—The plant was growing in sandy soil, in rock a crevice of sandstone outcrop on the east facing steep-slope of layered sedimentary rock, about 5 km east of Alto Paraiso, Chapada dos Veadeiros, State of Goiás, Brazil.

Specimens: Brazil, Goiás, Chapada dos Veadeiros, 5 km E of Alto Paraiso, 14° S, 47° W, 1500 m; leg. Gates & Eastbrook 74, 26-I-1979 (UB, type).

The present is an additional species of subgenus Omphalissa, Series Aviflorae. It appears to be closely allied to *A. rubropicta* Rav. (see Ravenna 1971, p. 65), a species native to the states of Parana and Santa Catarina. The latter, however, has a one-flowered inflorescence, and the tepals are red-tinged only toward the margins.

2. *Amaryllis glaucescens,* a previous valid name for *A. maracasa*

Amaryllis glaucescens Mart. ex Schulte. f.

Schultes f., in Schultes & Schultes, Linn. Syst. Veg. 7 (2): 855, 1830.—*A. maracasa* Traub, Pl. Life 8: 55, 1952.

Amaryllis glauscescens Mart. ex Schult.f. had been collected by Martius in the region of Río das Contas, in south Bahía, Brazil. Due to my revisional work in the South American Amaryllidaceae, I requested a phototype of the species from the Botanische Staatssammlung of München (M). Photographs of two sheets were kindly sent to me. One of them, which is the type, bore the following locality data: "Habitat inter rupes locis irriguis prope V. do R. das Contas . . . (illegible) Provinciae Bah. Dr. Martius Iter Brasil. Oct." On the other sheet, it was written: "Habitat in sylvis ad Almada Provinciae Bahiensis". The specimens are beautifully preserved and identifiable as the species lately described as *A. maracasa.* The town of Maracas is placed at nearly 50 km from the banks of the Río das Contas.

Personally, I have found the species on the hills near Senhor do Bonfim (the ancient "Vila Nova da Rainha"), and also on several hills of Minas Gerais, such as Serra do Cabral (near Cattoni), do Grão Môgol, and Botumirim. The plants of the latter place have more wider flowers with the inside light orange-yellowish veined dark orange; it may well be considered as a distinct subspecies. *Amaryllis kromerii* Worsley is probably assignable to the same species.

Specimens: Brasil, inter rupes locis irriguis pr. V. do Río das Contas; leg. Martius 1964, Oct. (M type, phototype seen). Idem, in sylvis ad Almada; leg. ipse (M, photograph seen, and F Nr. 18962).

3. Resurrection of *Amaryllis* illustris, as a valid name antedating *A.* restingensis

Amaryllis illustris Vell.

Velloso, Fl. Flumin. 3: tab. 118, 1827.—*Amaryllis restingensis* Ravenna, Pl. Life 25: 70, fig. 18, 1969.

Amaryllis illustris was illustrated by Velloso; he gave no description of the plant, nor of the habitat. The species name was neglected until Traub & Moldenke (1949) placed it in the synonymy of *A. psittacina* Ker.

Fig. 19. **Amaryllis evansiae** Traub & Nelson, as cultivated by the writer, from a bulb gathered by the enthomologist A. Martinez near Parapeti, dept. Santa Cruz, Bolivia. Photo S. Magno.

Ravenna (1969), proposed *A. restingensis* as a new species, upon a specimen collected in the restinga near Yacarepaguá, Rio de Janeiro. The peculiar sinuosity of the tepal-veins, giving a squared effect to the tepals, has been noted. Velloso's figure appears as fairly accurate,

showing well the latter feature. Hence, there is no alternative than to reduce *A. restingensis* to synonymy of *A. illustris.* The species is related to *A. glaucescens,* differing mainly in the flower color.

4. On the native habitat of *Amaryllis papilio*

Amaryllis papilio was described by me (see Ravenna 1970, p. 83, fig. 21) upon plants cultivated at Santa Ana do Livramento, Rio Grande do Sul, Brazil, and supposedly gathered in the south of the State of Santa Catarina. I was unable to verify the latter assumption. Nevertheless, during one of my inquiries in the herbarium of the Natural History Museum of Montevideo, I found a specimen (a single flower) dried near Pelotas, Rio Grande do Sul. This seems to be, so far, the only reliable datum on the natural habitat of this beautiful plant.

Prof. José da Costa Sacco, of the Instituto Agronômico do Sul, informed (personal communication) that only two *Amaryllis* species grow naturally in the region of Pelotas. One surely is *Amaryllis papilio;* the other may well be *A. vittata* L'Her. (see Ravenna 1969, p. 73, fig. 20).

Specimens: Brazil, Río Grande do Sul, Pelotas; leg. ? (MVM).

5. Amaryllis anzaldoii, reduced to synonymy of A. evansiae (Fig. 19)

Amaryllis evansiae Traub & Nelson

Traub & Nelson, Baileya 4: 86, 1956. —*A. anzaldoii* Cárdenas, Pl. Life 28: 48, fig. 16, 1972.

Amaryllis evansiae Traub & Nelson was described upon plants cultivated in the United States from bulbs collected in the eastern foot hills of the Andes of Bolivia.

In 1959, I received a grown plant from the enthomologist Antonio Martinez, gathered at Parapetí in the department of Santa Cruz, Bolivia. This flowered in the spring of the same year, and was identified as *A. evansiae* Tr. & Nels.

Cárdenas (1972, p. 48), proposed *A. anzaldoii* upon plants collected at the "Yatibigua canion, on the way from Charagua to Camirí". This author stated that the flowers of *A. evansiae* are "light purple or pink tinged" which obviously is a mistake. The flowers in the latter species were originally described as creamy-white. Since all the flower characters of *A. anzaldoii* are assignable to *A. evansiae,* the former must be treated as a synonym of the latter.

Specimens: Culta in Bonaria ef Parapetí civit. Sancta-Crucis Boliviae a enth. A. Martínez invenit; leg. Ravenna s.n., I-1959 (Herb. Rav.)

6. Amaryllis argentina, recorded in the Bolivian flora (Fig. 20)

Amaryllis argentina (Pax) Rav.

Ravenna, Pl. Life 25: 71, 1969.—*Crinum argentinum* Pax, Engler Bot. Jahrb. 11: 324, 1890.—*Hippeastrum tucumanum* Holmberg, Anal. Mus. Nac. Cienc. Nat. Buenos Aires, ser. III, 5: 153, 1905.—*Hippea-*

strum *candidum* Stapf, Curtis' Bot. Mag. 153: tab. 9184, 1927.—*Amaryllis candida* (Stapf) Traub & Uphof, Herbertia 5: 123, 1938.—*A. tucumana* (Holmb.) Traub & Uphof, loc. cit. 5: 124, 1938.—*A. immaculata* Traub & Moldenke, Amaryll.—tribe Amaryllideae: 108, 1949.—*Hippeastrum argentinum* (Pax) Hunziker, Kurtziana 4: 13, fig. 2, 1967. —Pro syn.: *A. fragrantissima* Cárdenas, Pl. Life 16: 32, 1960.

Fig. 20. **Amaryllis argentina** (Pax) Rav., as cultivated by the writer from bulbs collected near the top of Cerro Sajrapato, dept. Cochabamba, Bolivia. Photo P. Ravenna.

Plant up to 45-60 cm high. *Leaves* not completely developed at anthesis, lorate, channelled, a pale glaucescent green, to 17-25 cm long, 20-30 cm broad. *Scape* to 35-50 cm long, slightly compressed, elliptical in cross-section, pale green, 15 mm wide at the base, 11-12 mm at the apex. Inflorescence mostly 2-flowered. *Spathe-valves* joined below for 5 mm, 60-62 mm long. *Pedicels* 58-62 mm long, 4-5 mm wide. *Ovary* oblong, green, often slightly curved 13-14 mm long, 6 mm wide. *Flowers* trumped-shaped, very fragrant, to 15 cm long, 7-8 cm wide; *the tube green, 53-55 mm long,* the tepals then shortly connate. *Tepals* oblanceolate, white except for the green base, the outer to 92 mm long, 33 mm broad, apiculate; the inner lateral pair, 85-87 mm long, 24-25 mm broad; the lower inner as long as the lateral ones, straight, acute, 19-20 mm broad; both series with wavy sides. *Filaments* closely fascicled, white, except for the greenish base; the upper episepal 60 mm long,

lateral episepal 61-62 mm long, lower epipetal 77 mm long, lateral epipetal 79 mm long. *Anthers* after dehiscence oblong-reniform, grayish-yellow, 6-6.3 mm long. *Style* almost straight or very slightly ascending at the apex, white, to 13-14 cm long. *Stigma* trifid, the branches spreading, 3 mm long.

Habitat.—Andes of Argentina and Bolivia. In the latter country it was found among large rocks, near the top of mount Sajrapato, in the upper Pilcomayo river region, dept. of Cochabamba, Bolivia.

Specimens: Culta in Santiago ex bulbis pr. cacuminem Cerro Sajrapato prov. Mizque, civit. Cochabamba Boliviae collectis; leg. Ravenna 3160, 19-XII-1979 (Herb. Rav.).

In February, 1976, I have been for the second time on Cerro Sajrapato, in the upper Pilcomayo river region, Bolivia, and was able to collect again several bulbous plants. One of these was an *Amaryllis*, which flowered in my experimental collection at Santiago, in December, 1979. The species proved to be *Amaryllis argentina* (Pax) Rav., in its white typical form, not recorded as yet in the Bolivian flora. The complete list of synonymies is included. *A. fragrantissima* Cárd. seems to be an additional synonym for the species.

7. THE **AMARYLLIS BELLADONNA** COMPLEX

Amaryllis belladonna L. has the largest distribution area in the genus. *A. reginae* L. is said to have a similar range as the former, but this assumption may be the result of misidentifying some material of *A. belladonna* for this species. The existence of several populations that depart from each other in certain morphological aspects, in *A. belladonna,* seems therefore natural. These variations from the type were in the past designated as "varieties". But the concept "variety" had an ambiguous origin, since it has been used for setting what ever departed from the type, including variations of different taxonomical value. Artificial hybrids, subspecies, or mere forms, arbitrarily grouped under the mentioned artificial rank, lacked a proper biological status. Today the use of "variety" tends to be rejected. In its place, *subspecies* and *forma,* are being universally accepted as two different ranks, or *taxa.*

Amaryllis belladonna Linn.

ssp. *monantha* (Rav.) Rav. *comb. nov.*

Amaryllis monantha Ravenna, Pl. Life 25: 69, 1969.

In March, 1976, I was in the Serra de Natividade for the third time after a period of thirteen years. This amazing hilly belt is located in the State of Goiás, Brazil. It was there possible to collect again certain interesting plants, including *Amaryllis monantha* Rav. While on re-examination of the latter, it seemed evident that it actually should be better placed as a subspecies of *A. belladonna.*

Amaryllis belladonna Linn.

ssp. *quentiniana* Traub

Traub, Pl. Life 27: 46, 1971.

This apparently is a miniature type of *A. belladonna*. It is endemic of the Nor-Yungas, in Bolivia.

Amaryllis belladonna L.

ssp. *major* (Ker.) *stat. nov.*

Amaryllis equestris Ait. var. *major* Ker, Edwards' Bot. Reg. 3: tab. 234, 1817.—*Hippeastrum equestre* (Ait.) Herbert var. *major* (Ker) Herbert, Append.: 31, 1821.

A native of Costa Rica, the West Indies, Guiana, and Brazil. I have collected bulbs in the region of Linhares, State of Espíritu Santo, where it grows along some roads, and in Santa Catarina (near Morro do Baú), Brazil. In both places the species appeared to be an escape.

Amaryllis belladonna Linn.

ssp. *haywardii* (Tr. et Uphof) Rav. *stat. nov.*

Amaryllis haywardii Traub & Uphof, Herbertia 5: 124, 1938.—*Hippeastrum soratense* Rusby, Bull. New York Bot. Gard. 4: 319, 1917.—*Amaryllis belladonna* Linn. var. *haywardii* (Tr. & Uphof) Traub & Moldenke, Amaryll. tribe Amarylleae: 123, 1949.

Traub & Moldenke (1949) say that the perigone-tube is about 3 cm long, and the flower limb a clear pink. The latter feature, however, was taken from the type-specimen, and might be doubtful. The assignation of this subspecies of plants collected in the upper Río Beni (see Tr. & Mold. 1949, p. 124), must be considered with caution, since the latter is an ecologically quite different and distant area.

Amaryllis belladonna Linn.

ssp. *barbata* (Herb.) Rav. *stat. nov.*

Hippeastrum barbatum Herbert, Amaryll.: 138, pl. 21, fig. 1, 1837.

This subspecies is a distinct one from Surinam having large, white flowers with a green throat.

TENTATIVE KEY OF THE SUBSPECIES

1a. Inflorescence 2-4 flowered
  2a. Flowers bright scarlet, pink, or vermilion.
    3a. Flowers 7-14 cm in diam.
      4a. Flowers 7-9 cm in diam. leaves dark green.
        5a. Flowers scarlet to vermilion ..... ssp. *belladonna*
        5b. Flowers clear pink ..... ssp. *haywardii*
      4b. Flowers 10-14 cm in diam., scarlet. Leaves green, glaucescent ..... ssp. *major*

3b. Flowers 5-6 cm in diam. .....spp. *quintiniana*
2b. Flowers white, with green throat .....spp. *barbata*
1b. Inflorescence 1-flowered .....ssp. *monantha*

NOTES.—*Amaryllis espiritensis* Traub, collected in the same region where I found ssp *major,* apparently is a synonym of the latter; I have examined a phototype. *A. traubii* Mold., probably belongs to the complex.

II. STUDIES IN THE GENUS **HABRANTHUS**

1. A new species from Bolivia

Habranthus millarensis Rav. *sp. nov.* (Fig. 21)

Fig. 21. **Habranthus millarensis** Rav., inflorescence, as cultivated by the writer from bulbs gathered at Millares, dept. of Potosi, Bolivia. Photo P. Ravenna.

Species a *Habrantho niveo* affinis sed floribus minoribus stigmae lobii breviores, a *H. steyermarkii* qui magnitudine et colore floribus similes foliis cinereo-viridibus differt.

Plant up to 10-12 cm high. Bulb ovoid to 3.5-4 cm long, 23-25 mm wide, prolonged into a pseudoneck. Leaves serotine, absent at anthesis, linear, ash-green, purple below, pruinose, moderately channelled, about three, to 11-18 mm long, 5-7 mm broad. Scape slender, ash-green except for the purplish base, pruinose, to 55 mm long, 2.5 mm across. Spathe tubular for 19 mm, the bifid portion 9-10 mm long, pinkish-green below, dirtily greenish upward. Pedicel cylindrical, greenish, to 36 mm long. Ovary oblong, brownish-green, to 6.3-6.4 mm long, 2.4 mm wide. Perigone well expanded only at full sun, to 35-38 mm long, 37 mm in its horizontal diameter, 41 mm in the vertical diam. Tepals oblanceolate, greenish below, the rest white, joined for 3.8-4 mm, the outer to 42.3 mm long, 11-12 mm broad, externally with a pale-green streak on a very light pink area; apicule 1 mm long, tubercled at the base; the inner 41 mm long, 7.8 mm broad, acute, externally light pink at the apey. Filaments whitish, the upper episepal 5.5 mm long, lateral episepal 8.5 mm long, lower epipetal 14 mm long, lateral epipetal 16.5 mm long. Anthers yellow, those of the episepal stamens oblong 5.7 mm long, the other three semilunate or twisted, 4-4.3 mm long. Style almost straight, whitish, to 22.3 mm long. Stigma trifid, white, the divisions recurvely spreading, to 4-4.5 mm long.

Habitat.—Plants grow wedged among flat philitic stones, on the low hills just beside the village of Millares, in the dept. of Potosí, Bolivia. The region is rather warm, and with xerophytic vegetation.

Specimens: Culta in Santiago ex bulbis in lapidosis philiticis collibus Millares civit. Potosi Boliviae; leg. Ravenna 3062, XII-1978 (typus in Herb. Ravennae).

Habranthus millarensis appears to be related to *H. steyermarkii* Rav. and *H. niveum* Rav., both having white flowers. The former bears not distinctly pruinose, dark green leaves; the latter has much larger flowers, and longer stigma divisions.

2. *Habranthus chacoensis,* reported in the flora of Paraguay

In 1970, I described *Habranthus chacoensis* from the eastern part of the Chaco province, in Argentina (see Ravenna 1970 and 1972). The flower of the plant is a very pale carmine-pink, whitish within, and greenish or pale carmine below; the inner-tepals are distinctly narrower than the outer; the stigma divisions are 7 mm long.

Recently, I detected a specimen of this species in the herbarium of the New York Botanical Garden, collected long time ago by Hassler in Paraguay. The new location of the species, also has a Chaco-type vegetation.

Specimens: Paraguay, Loma Clavel, 24° 11' S; leg. Hassler 2496, XI-1903 (NY, G ?, P ?, AS ?).

3. *Habranthus nullipes* and *H. leptandrus,* illustrated (Fig. 22)

Fig. 22. A. **Habranthus nullipes** Rav., side view of inflorescence and flower (X2); B. upper view of flower of the same (X2); C. **Habranthus leptandrus** Rav., side view of inflorescence and flower (X2); flower with tepals removed showing androecium and gyneceum (X5.5). P. Ravenna del.

In 1978, I proposed *Habranthus nullipes* and *H. leptandrus*, both as new species from Bolivia (see Pl. Life 32, pp. 86-89). An illustration was sent to the editor, though too late for publication; it appears now.

4. New evidence on the identity of *Habrantrus pedunculosus*

Current revisional work in the genus *Habranthus*, and additional morphological data from dry specimens, leads to reconsideration of the application of the binomial *H. pedunculosus* Herb.

Ravenna (1970, p. 98) proposed *Habranthus concordiae* upon dry specimens from cultivated plants (at SI) originally collected by the late Prof. A. Burkart in the vicinity of Concordia, prov. of Entre Ríos, Argentina. The species was at that time distinguished from *H. pedunculosus* Herb. by the very short spathe, and from *H. longipes* Bak. by the often several-flowered inflorescence.

After the publication of *H. concordiae*, I was able to examine more material of the species which showed a pretty well developed spathe. It was then disclosed that actually, the latter trait as well as the long pedicels and the narrowness of the tepals, were characters assignable to *H. pedunculosus*. *H. concordiae* appears, therefore, as a synonym of the latter species.

As a subsequent step, it is necessary to typify the species known as *Habranthus teretifolius* (C. H. Wr.) Tr. & Mold. A neotype is proposed below.

Specimens: Inter Paso de los Libres et Monte Caseros prov. Corrientes Argentinae; leg. Ravenna 449, III-1965 (neotype in Herb. Rav., isotype K).

III. NEW SPECIES OF PHYCELLA

A revision of the Chilean Amaryllidaceae, revealed the existence of two new species of *Phycella* Lindl. Before an illustrated monograph of the genus could be completed, the descriptions of both are advanced.

Phycella scarlatina Rav. *sp. nov.* (Fig. 23)

A caeteris speciebus tunicis bulbus pluribus in pseudocollo firmo distincte productis, foliis intus aerenchima lamelloso, floribus gracilibus scarlatinis, basi filamentorum simplici sine appendicibus differt.

Plant up to 10-35 cm high. Bulb ovoid to 26-34 mm long, 25-30 mm wide covered by several corrugate ash-brown dry coats that are prolonged into a 5-6 cm long pseudoneck. Leaves linear, weak, often prostrate, dark green, not at all pruinose, the edges rounded, internally with a lamellous aerenchima, to 15-50 cm long, 2-4.5 mm broad. Scape cylindrical, a pale green, often somewhat pruinose, up to 13-28 cm long, 3.8-4.5 mm across at the base, 2.8-4.2 mm at the apex. Spathe valves lanceolate, membranous, marcescent, a pale greenish-brown before drying, the valves joined at the base for 1-3 mm, then 20-34 mm long, inner bracts 3-4, weak, filiform, 11-18 mm long. Pedicels green, narrowly cylindrical, 18-34 mm long. Ovary obovoid to elliptical-oblong, bright green, 5.8-6.5 mm long, 3 mm wide. Perigone narrowly tubular for

much of its length, light scarlet, to 33-45 mm long, 13-15 mm wide at the apex; the tubular portion 30-37 mm long. Tepals narrowly lanceolate, joined at the base for 2-4 mm; the outer series 31-42 mm long, 5 mm broad, with a slightly thickened, tubercled at the base, 0.8-1 mm long apicule; the inner 30-42 mm long, 5.5-5.7 mm broad; both series marked internally and externally by a central yellowish-white or green-

Fig. 23. **Phycella scarlatina** Rav., inflorescence; as cultivated by the writer from bulbs collected at Portezuelo Tres Cruces, prov. Coquimbo, Chile. Photo P. Ravenna.

ish-yellow streak. Filaments closely fascicled, mostly yellowish-white, gradually turning orange-yellow at the very slightly ascending apex; lateral episepal pair to 21-45 mm long, upper episepal 25-46 mm long, lateral epipetal pair 28-50 mm long, lower epipetal 29-51 mm long. Anthers linear-oblong, 8-8.2 mm long before dehiscence, laterally ovate-reniform or almost elliptical to 1.7-2 mm long after dehiscence; pollen yellow. Style straight, yellowish-white except for the reddish apex,

placed below or among the filaments, to 46-55 mm long. Stigma capitate. Capsule globose-tricoccous, grayish-brown or reddish-brown 15-20 mm wide. Seeds flat, black, almost elliptical.

Distribution and habitat. Rare among bushes along stony or rocky creeks, in the Andes above Ovalle, prov. of Coquimbo, Chile; especially in the areas of Hurtado and Tulahuén.

Specimens: Chile, prov. Coquimbo, dep. Elqui, Portezuelo Tres Cruces, a 33 km al S de Vicuña, 2000 m; leg. R. Wagenknecht 314, 19-IX-1948 (Herb. Ravenna, Herb. Gunckel). Idem, Tulahuén, cerro; leg. Jiles (Herb. Ravenna, Herb. Jiles). Culta in Santiago ex bulbis in convalle Tres Cruces dicta supra Hurtado prov. Coquimbo Chiliae; leg. Ravenna 2061, IX-1973 (typus Herb. Ravenna, isotypus SGO).

This pretty species is unlike its congenerics by the fact of the bulb being densely covered by dry coats, that are prolonged into a distinct and firm pseudoneck, and by the gracefulness of the whole plant, including the flowers. It might be mistaken, however, with *Ph. angustifolia* Phil., a rather stouter plant whose leaves are featured by a spongious aerenchima.

Phycella australis Rav. *sp. nov.*

A *Phycella attenuata* Herb. valde affinis sed foliis angustioribus perflaccidis interne spatii aerei inter textos cellulares lamellosos distincti, inflorescentiae 1-3-florae; a *Ph. scarlatina* habitu robustiore, foliis saepe pruinosis, floribus majoribus et appendicibus duobus ad basin filamentorum sepalini recedit.

Plant up to 20-71 cm high. Bulb ovate to 30-35 mm long, 20-23 mm wide, prolonged into a lax, 40-55 mm long pseudoneck. Leaves often two at anthesis, linear, very flaccid, channelled, with round edges, pale green, glaucescent, pruinose, the apex subacute, internally with a lamellose aerenchima, to 30-60 cm long, 3.9-8.4 mm broad, sometimes reaching 3 mm in thickness. Scape cylindrical, fragile, up to 11-66 cm long, 7-10 mm across at the base, and 4-6 mm at the apex. Spathe reddish, marcescent; valves lanceolate, 23-37 mm long, 3-9 mm broad; inner bracts filiform. Inflorescence 1-3 (-4)-flowered. Pedicels cylindrical or subtrigonous, to 26-39 mm long. Flowers red, or sometimes the lower half bright yellow, to 41-56 mm long, 20-30 mm across at the apex. Ovary trigonous-oblong, to 6-8.5 mm long, 2.9-4.9 mm across. Tepals narrowly oblanceolate, joined at the base for 3-6.7 mm; the outer 35-48.5 mm long, 8.5-10.5 mm broad, the inner to 39-51 mm long, 9.5-10 mm broad. Filaments yellowish-white below turning reddish or pink in the upper third, the episepal series furnished at the base with a pair of short subulate appendages; the upper episepal 26-40 mm long, lateral episepal 27-41 mm long. Anthers versatile, reniform, yellow, to 2.3-2.5 mm long. Style mostly yellowish-white, the apex red, to 33-50 mm long. Stigma capitate. Capsule globose-tricoccous, to 12.5-16 mm long, 18-24 mm wide, brownish green. Seeds almost D-shaped.

Distribution and habitat.—Slopes above the Maule river, in the province of Talca, Chile. It grows there among bushes, near *Alstroemeria* sp., *Sisyrinchium graminifolium* ssp., *Miersia myoides, Adian-*

thum aff. *sulphureum*, *Coliguaya odorifera*, and others. Also collected in the area of the Bío-Bío river estuary, in the provinces of Concepción and Arauco; near Constitución, prov. of Maule, near Yaquil in the prov. of O'Higgins, and in the first slopes of the Andes at the Bullileo dam, in the prov. of Linares.

Specimens: Chile, prov. Concepción, San Pedro, en arenales cerca del río; leg. A. Pfister, 25-IX-1946 (CONC 7000). Idem, Península de Tumbez, Playa Blanca, cerca de la desembocadura del estero; leg. Gunckel 2902, 30-VII-1934 (Herb. Ravenna, Herb. Gunckel). Idem, Concepción, Cerro Chepe; leg. Gunckel 2507, X-1923 (Herb. Ravenna, Herb. Gunckel). Idem, lomas del Cerro Burna Vista; leg. C. Junge, 19-X-1935 (CONC 5502). Idem, Isla Quiriquina; leg. C. Junge, 15-IX-1942 (CONC 6883). Idem, Tomé; leg. Germain, XI-1895 (SGO 47161). Prov. Maule, Constitución; leg. C. Reiche, X-1909 (SGO 61744). In decliviis secus flum. Maule ad La Cantera pr. pagum Maule prov. Talca Chiliae; leg. Ravenna 2070, IX-1974 (typus Herb. Ravenna, isotypi SGO, K, TRA, U, C, NY). Prov. O'Higgins, Yaquil; leg. F. Philippi, IX-1862 (SGO 47160).

Closely related to *Ph. attenuata* Herb., the species is readily distinguished by the extremely flaccid leaves, internally with a lamellous aerenquima, and the one to few-flowered inflorescence. It is rather curious that it has been not recognized so far as new. This sole fact shows the nomenclatural chaos in which *Phycella* is still immersed. A revisional study of the genus will be finished soon.

IV. AN ADDITIONAL FAMATINA SPECIES

In the forth part of this work (Ravenna 1974, pp. 57-58, fig 16 left & 17) a species of *Famatina* was treated under the binomial *F. herbertiana*. The application of this binomial to the plant under consideration, appears now as an unfortunate mistake. In 1979, I had the opportunity of examining again living plants in the Andes of Santiago and San Fernando, Chile, and to compare pressed samples with the type-material of *Rhodophiala andina* Phil. (SGO 37174). The specimens mentioned matched the latter species.

On the other hand, during a short time I spent in Argentina, I scrutinized once more the material of this country previously cited

Table 1. Main differences between *Famatina herbertiana* and *F. andina*

Character	*Famatina herbertiana*	*F. andina*
Leaves	green, to 8 mm broad	glaucescent, rather pruinose, to 13 mm broad,
Basal ring	whitish or translucent, to 3-3.5 mm long	reddish, to 1.5-2 mm long
Stigma	always capitate	capitate-trilobed to shortly trifid

(Ravenna 1972). The critical review disclosed that the material from both countries are assignable to different, though related species. The main distinctive characters are exposed in Table 1.

Famatina andina (Phil.) Rav., comb. nov.

Rhodophiala andina Philippi, Anal. Univ. Chile 43: 543, 1873.—*Hippeastrum andinum* (Phil.) Philippi, loc. cit. 93: 158, 1896.

Some features as bulb size, robustness vs. slenderness of plant, and perigone length, although difficult to quantify, usually distinguish at first glance both species. *Famatina andina* is, most frequently, in every respect coarser than *F. herbertiana.* The size of the basel ring was ranged, in the alluded description (Ravenna 1974), between 1.5 and 3 mm. These extreme measurements correspond respectively to *F. andina* and *F. herbertiana.*

Two specimens quoted under *F. herbertiana* (Ravenna 1972) as "Chile, prov. Aconcagua, Portillo", and "Portillo, side of Mendoza" have to be referred as: Argentina, Paso del Portillo, side of Mendoza. There is no connection with the Chilean locality of Portillo.

The genus is therefore formed by four species, none of them being found alternatively in both sides of the Andes.

Specimens: Chile, Cordillera de Santiago; leg. Philippi (SGO 37174, type). Ad Loma del Viento pr. Farellones in Andibus supra Santiago; leg. Ravenna s.n., XI-1979 (Herb. Ravenna, SGO).

V. A NEW PLACEA SPECIES

Placea davidii Rav. *sp. nov.* (Fig. 24)

A caeteris specibus Placeae habitu pumilo floribus pulchre albis erubescentibus vel roseo-tinctis appendicibus basis filamentorum profunde bifidis lobis lineari-subulati prater apices roseo-purpureous albis recedit.

Plant up to 10-34 cm high. Bulb ovoid, to 24-38 mm long, 12.8-25 mm wide (sometimes wider if compressed), covered by dark-broun coa prolonged into a 35-55 mm long paseudoneck. Leaves arising in early spring narrowly linear, with rounded edges, dark green, the mesophile occupied by a lamellous aerenchima, 10-15 cm long, 1.5-2 mm broad. Scape cylindrical or slightly compressed, to 4-27 cm long, 2.8-4.5 mm wide at the base, and 2.2-3.8 wide at the apex. Inflorescence 1-4-flora. Spathe-valves marcescent to 17-28 mm long; inner bracts filiform ca. 4-14 mm long. Pedicels stiff greenish-brown, 10-32 mm long. Ovary clavate-oblong, or elliptic-oblong, green or brownish green, 3.8-7.5 mm long, 2.5-3.5 mm wide. Perigone mainly carmine-pink or pinkish-white flushed with carmine-pink, central part white and greenish with dark-purple streaks, ca. 30-58 mm in diameter. Tepals lanceolate recurvely spreading, joined for 1.7-2.4 mm at the base, then 24-43 mm long; the outer 6-11.5 mm broad; the inner 6.5-13.5 mm broad; apicule of the outer ones 0.35-0.7 mm long. Filaments incurvely declined, whitish at the lower third or half, turning gradually to a light purplish-red toward the apex; the upper episepal 10-16 mm long, lateral episepal 12-19.5 mm

long, lower epipetal 14-25 mm long, lateral epipetal 14.5-27 mm long. Anthers versatile, after dehiscence reniform, to 2.2-2.9 mm long; pollen yellow. Basal appendages six, joined for two thirds or only at the base, bifid or trifid, less frequently entire, lanceolate, or the apex indentate, white, greenish-white, or tinged pink in the upper half or only at the apex, to 4-8.5 mm long. Style declinate-incurved of the same color as

Fig. 24. **Placea daviddi** Rav., two inflorescences with flowers differing a little in the size and stripes of tepals; as photographed in its native habitat. Photo P. Ravenna.

the filaments or entirely whitish, to 22-36 mm long. Stigma capitate, with diminutive oblong glands. Capsule deppressely globose-tricoccous. Seeds elliptic or ovate-elliptic, black.

HABITAT.—At the top of the first Andean hills, above the Maipo river valley, Chile; e.g., at Las Torrecillas. It is mainly found in small stony and chalky areas, near *Sisyrinchium arenarium* ssp., *S. filifolium* ssp., *Calandrinia* sp., *Oxalis* sp., a tiny *Alstroemeria, Quinchamalium* sp. (Santalaceae), *Lathyrus subandinus*, and *Astragalus* sp. (''yerba loca'').

Specimens: In cacumine Las Torrecillas dicta supra vallis fluminis Maipo prov. Santiago Chiliae; leg. Ravenna 2032, XI-1972 (Herb. Ravenna type, F, K, S, TRA, U, US, isotypes).

The citation of *Placea amoena* Phil., a native of the prov. of Coquimbo, for ''Cajón del Maipo'' by Navas (1974), should probably be referred to the present species. *P. davidii* is easily distinguished by the flower color, and the peculiar and variable shape of the staminal appendages; these are often erroneously defined as part of a paraperigone or ''corona''.

The species is dedicated to my son David Leonardo, whose interest in Nature is already in evidence. *Placea davidii* is, no doubt, the most pretty species in the genus.

VI. STUDIES IN THE GENUS STENOMESSON

Haylockia chihuanhuayu Cárd. is recognized as belonging in *Stenomesson,* subgenus *Clitanthes,* and the transference is made. A misinterpretation involving the identity of *Stenomesson splendens* (Herb.) Rav. and *S. callacallense* Rav., is elucidated. Diagnostic figures of *S. miniatum* (Herb.) Rav., and *S. microstephium* Rav., are given.

1. *Stenomesson chihuanhuayu* (Card.) Rav. *comb. nov.*

Haylockia chihuanhuayu Cárdenas, Pl. Life 29: 44, fig. 12 & 13 A, 1973.

Cárdenas (1973, p. 44) described *Haylockia chihuanhuayu,* as a new species from near Laguna San Sebastián, in the Dept. of Potosí, Bolivia. His description, and figure of the androeceum leaves no doubt that the species belongs in *Stenomesson,* not in subgenus *Haylockia* of *Zephyranthes.*

A species that I collected in leaf on Cerro Potosí, above the town of Potosí, might be the same. The narrow, dark-green leaves, were sprawling on the ground as a rosette; under culture, however, they were almost distically arranged, showing long tubular sheaths above the soil. Plants were found in a dark clayish soil, near *Cardenanthus boliviensis, Turnera* sp., and *Nothoscordum andicola.*

2. On *S. callacallense* and the validation of *Pancratium trichromum* in Stenomesson

Some years ago (Ravenna 1974, p. 76), I proposed *Stenomesson callacallense* as a new species. This was based upon a specimen collected

by Prof. A. Sagástegui in the mountain belt called Calla-Calla, above Leymebamba, dept. of Amazonas, Peru. In 1973, during a collecting trip to Peru, I visited the area, and gathered a *Stenomesson* species that was lately associated with *S. splendens* (Herb.) Rav. (see Ravenna 1978, p. 71, fig. 15). Notwithstanding, an ulterior re-examination of the type of *S. callacallense*, which is scanty and poor, disclosed that the plants found by me in the field agree with the latter species.

Stenomesson trichromum (De la Llav. & Lex.) Rav. *comb. nov.*

Pancratium trichromum De la Llave et Lexarza. Nov. Veg. Descr. 1: 20, 1824—*Coburgia trichroma* (De la Llav. & Lex.) Herbert, Curtis' Bot. Mag. 67: tab. 3867, 1841.

The true *S. splendens* as it appears in a phototype received from Kew Gardens may be associated with *Pancratium trichromum* De la Llav. & Lex., as interpreted by Herbert (1841). The description by De la llave and Lexarza is rather inconclusive and could fit in any of the *Stenomesson* species belonging in subgenus Fulgituba. However, Herbert (loc. cit.) typified it with the species that is found in some places of the departments of Cajamarca and Le Libertad, in Peru, and gave a good illustration of it. Lemaire (1868), states that the species was discovered by Maclean in ravines and rocky cliffs of Peru, and sent from Lima to W. Herbert. Additionally, he says (sic!): "Elle parait avoir été introduite et cultivée au Mexique car Llave et Lexarza I'ont décrite sous le nom de *Pancratium trichroma* (lisez *trichromum*) comme provenant du Michoacán". For the benefit of fixing the application of existing binomials, it seems better to follow Herbert, and to designate a neotype for *S. trichromum.*

The specimens from above Leimebamba (Calla-Calla belt) cited before (Rávenna 1978) under *S. splendens,* actually correspond to *S. callacallense* Rav.

Specimens: Peru, dept. Cajamarca, Llama, 2200-2700 m; leg. F.W. Pennell, 17-VII-1948 (USM neotype, US ?, G ?, F ? isotypes). Idem, Cutervo, 2700-2800 m; leg. R. Ferreyra, 24-VIII-1963 (USM). Idem, between Cutervo and Cochabamba; leg. Ferreyra and E. Acleto 15348, 24-VIII-1963 (USM). Dept. La Libertad, prov. Huamachuco, Hda. Yanazara, 2800 m; leg. F. Pinillos, 26-III-1961 (TRP 3656). Culta in Mus. Javier Prado; leg. Ferreyra, 14-IX-1971 (USM).

3. Diagnostic figure of Stenomesson miniatum and *S. microstephium* (Fig. 25)

In 1977, an illustration of internal features in the flowers of *Stenomesson miniatum* (Herb.) Rav. and *S. microstephium* Rav. was sent to the Editor, but it reached too late for publication in the 1978 PLANT LIFE. It is presented here.

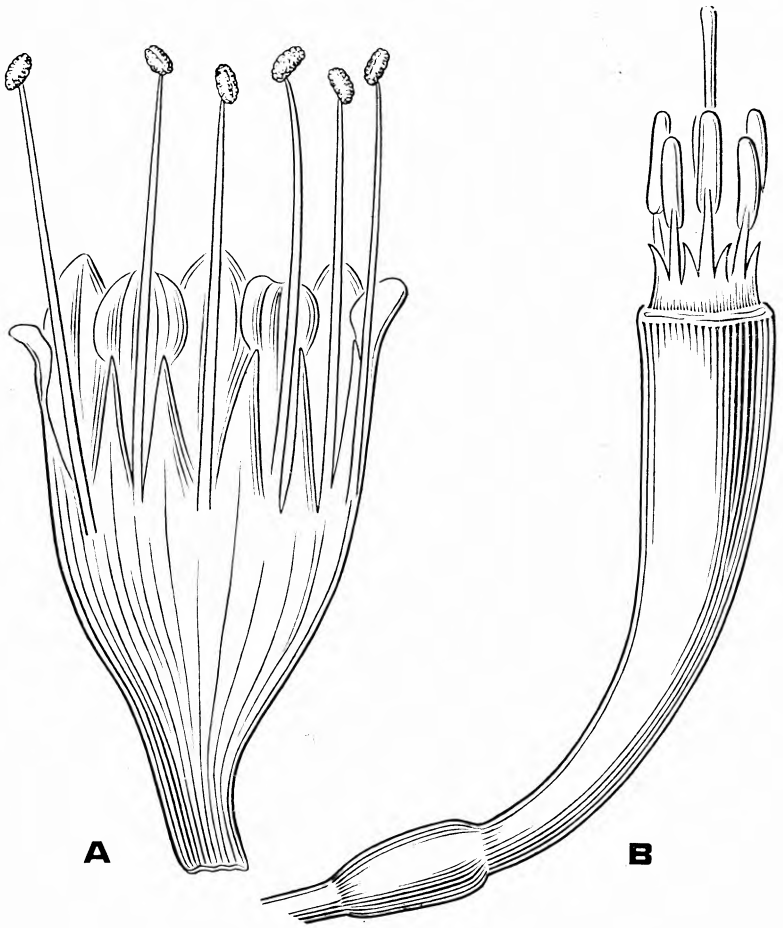

Fig. 25. **A. Stenomesson miniatum** (Herb.) Rav., perigone cut up, and extended, showing staminal cup adnate to its interior (X 1.5); B. **Stenomesson microstephium** Rav., flower with tepals removed showing and roecium and gyneceum (X 3.5). P. Ravenna del.

VII. A NEW RAUHIA SPECIES FROM NORTH PERU

Rauhia decora Rav. *sp. nov.*

A caeteris speciebus generis lamina foliorum patentia vel oblique patentia fusco-viridia haud pruinosa semina oblonga distincte et unilateraliter alata.

Planta perennis usque 41 cm alta. Folia ad anthesin 2-6 breviter vel modice petiolata; lamina areis pallidioribus cellulis crassioribus notata

ad 8-12 cm lata. Inflorescentia 3-6-flora. Perigonium pallide viride albiuscule variegatum textura crassa. Stamina fasciculata ex perigonio longe exserta.

Plant up to 46 cm high. Bulb subglobose to 55 mm wide, covered by brown, cartilagineous coats; pseudoneck short. Leaves succulent, rigid, fragile, 2-6 at anthesis, appearing two each year and sometimes lasting for three years; petiole 5-6.5 cm long; blade widely elliptic, rarely nar-

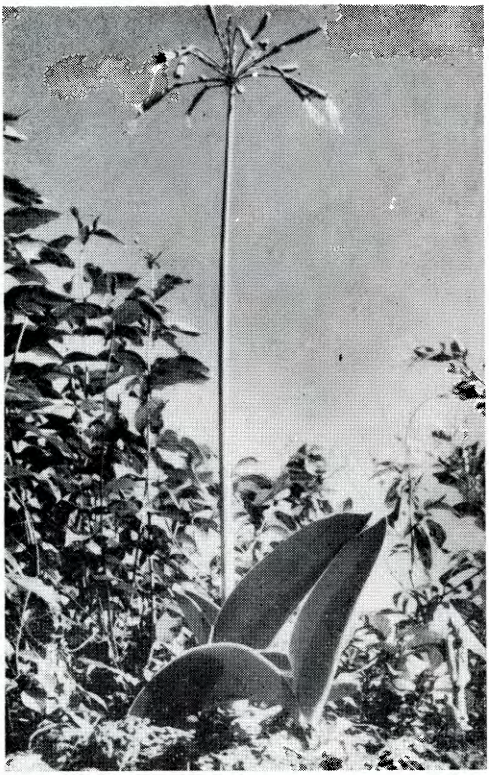

Fig. 26. **Rauhia staminosa** Rav., as found a few Km south of Bagua, Dept. of Amazonas, Peru. Photo P. Ravenna.

rowly obovate, dark green, covered by diminutive, paler, opaque areas of thicker-walled cells. Scape solid, cylindrical, pale-green, pruinose, 20-34 cm long, 11-3 mm wide at the base, 6.5-8.8 mm wide at the apex. Spathe bivalved, marcescent; valves free to the base, ca. 38 mm long, lanceolate, at first pale green, becoming brownish in drying; inner bracts five, the larger lanceolate, the rest almost linear-attenuate, 25-32 mm long. Inflorescence 3-6-flowered. Pedicels cylindrical 65-75 mm long, 3-3.8 mm wide, a pale ashy-green, pruinose. Ovary elliptic-oblong,

obtusely trigonous, ashy-green, pruinose, ca 9-10.5 mm long, 5-5.5 mm wide. Flowers horizontal or sometimes slightly declined. Perigone mostly greenish outside, whitish inside, of a thick texture., 40-50 mm long, 34-37 mm wide at the apex. Perigone tube funnel-shaped, 8-12 mm long. Tepals oblanceolate, the outer face pale green, white with a few green veins at both sides, the inner face whitish with pale green streaks, 38-42 mm long, with the upper half recurved; the outer 6.5 mm broad, with a short, thick apicule; the inner 9.5 mm broad, slightly and minutely fimbriate at the apex. Stamens fascicled, declinate-incurved, much exceeding the perigone; filaments whitish, the lateral episepal 62 mm long, upper episepal 64 mm long; lower epipetal 65 mm long, lateral epipetal 67 mm long. Anthers oblong-reniform, pale yellow, 3.5-3.8 mm long. Style filiform, pale green, straight or slight 1 declined, to 83 mm long. Stigma capitate-trilobed, white, velvety, 2.7-2.9 mm wide.

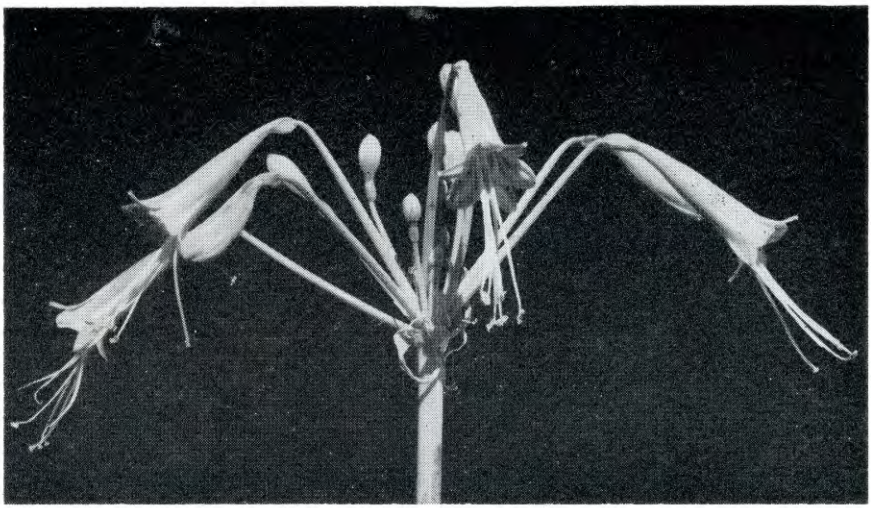

Fig. 27. **Rauhia staminosa** Rav., inflorescence, as photographed in its native habitat. Photo P. Ravenna.

Habitat.—In semideciduous woods, at the warm Utcubamba river valley; apparently it only grows on the west side of the valley. Its range almost overlaps with that of *Rauhia staminosa* Rav. One of the plants has been found near another peculiar amaryllid, probably an unnamed *Pucara* species.

Specimens: Culta in Santiago ex bulbis in valle fluminis Utcubamba pr. Tingo inter Bagua et Chachapoyas civit. Amazonas Peruviae collectis; leg. Ravenna 3060, 30-X-1978 (Herb. Ravenna, type, K, isotype).

Rauhia decora is a peculiar, ornamental, but unfortunately seriously endangered species. Man is quickly destroying its natural habitat. No doubt that the species will soon dissapear (if it has not already dissappeared), unless we could save it for horticulture. It requires a

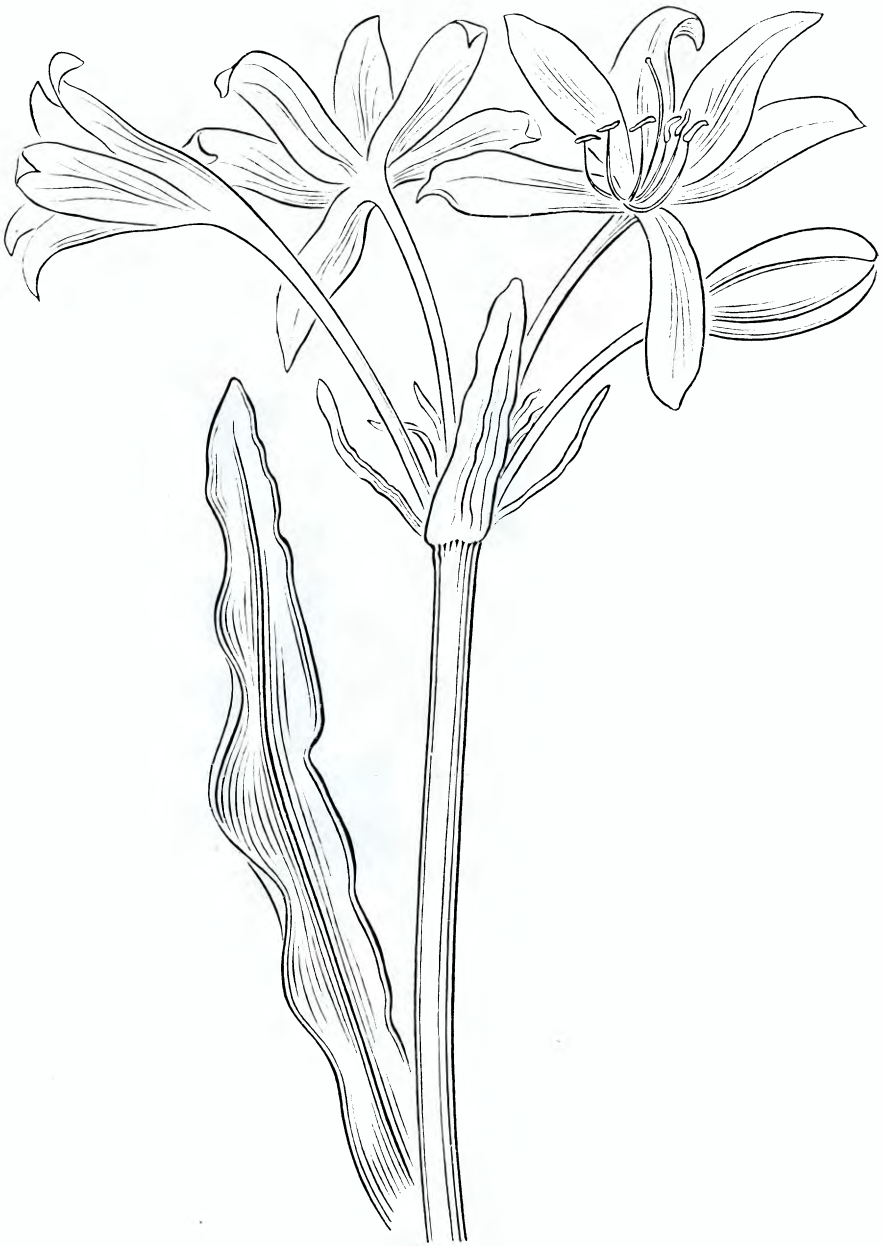

Fig. 28. **Crinum surinamense** Rav., inflorescence and leaf (X ½). Drawing by P. Ravenna after a sketch of W.H.A. Hekking.

warm and moderately light place in the greenhouse.

Rauhia stamenosa. In 1977, illustrations of the whole plant and the flower umbel of *Rauhia staminosa* Rav., were sent to the Editor, but they reached him too late for publication in PLANT LIFE 1978. These are presented here: Figures 26 and 27.

VIII. Studies in the genus Crinum

1. Two new species from Brazil and Surinam

Crinum amazonicum Rav. *sp. nov.*

Planta usque 1 m alta. Bulbus non vidi. Folia anguste oblanceolata viridia acuta in plantae maturae circ. quinque ad 78-92 cm longae circ. 5-6 cm latae basin versus e medium gradate angustata et probabiliter inter se vaginantia ad margines scabra minute ciliolato-denticulata. Scapus teres circ. 80-90 cm longus. Flores (fide coll.) virides. Semina rotundata facie concava notata ad 25-34 mm longa circ. 20-23 mm lata.

Plant up to 1 m high. Bulb not seen. Leaves narrowly oblanceolate, green, acute, about five in grown plants, to 78-92 cm long, 5-6 cm broad, gradually narrowed below from the middle, probably vaginating each other. Scape cylindrical, to 80-90 cm long. Flowers green (acc. to collectors). Seeds thick, round, with a concave face, to 25-34 mm long, 20-23 mm wide.

Habitat.—Marshy forest of the Purus river, near the Marranhã lake, municipe of Lábrea, province of Amazonas, Brazil.

Specimens: Brazil, Amazonas, Río Purus, mun. Lábrea, Lago Marranhã Seringal São Clementa; leg. D. G. Campbell et al. P. 21213, 22-VI-1974 (Herb. Rav. type, NY isotype).

According to the collectors, the plant has green flowers, a feature that aside from the leaf morphology, leaves no doubt about the distinctness of the new species. My inquiries in order to trace a specimen in flower, from NY, INPA, and other herbaria where duplicate collections may be deposited, were not successful.

Dr. D. G. Campbell, a zoologist and senior plant collector of the expedition to the Rio Purus, writes to me that the indians are now hiding the access to the area of *Crinum amazonicum.* So, the possibility of collecting additional and eventually living material of the species appears as obscure.

Crinum surinamense Rav. *sp. nov.*

(subgen. Codocrinum) (Fig. 28)

Species a *C. virgineum* Mart. proxima sed folis longioribus ad marginis minute denticulatis floribus viridi-venatis recidit.

Bulb not seen. Leaves oblanceolate to 57-62 cm long, 4-4.5 cm broad, channelled and gradually narrowing to 8-10 mm at the base; the midrib apparent although less on the blade; the edges distantly and minutely denticulate. Scape stout, to 55-60 or more cm long, 15-20 mm thick below. Spathe valves lanceolate subacute, subequal, to 7.3-13 cm

long, 14-20 mm broad, the edges involute. Inflorescence often 4-flowered. Flowers sessile. Ovarium 9-10 mm long, 4-5 mm wide. Perigone-tube cylindrical tinged green, to 12.5-16.5 mm long, 2.5 mm wide, widening to 7-8 mm at the recurved apex. Perigone cernuous, white, veined with green, 6 cm long in herb., probably shorter when fresh, 10-13.5 cm wide. Tepals oblanceolate; the lateral inner ones approximate to the upper outer one; the lateral outer ones spreading horizontally; the lower inner one spreading downward; outer series 6.5-7 cm long, 2.3 cm broad; inner series as long as the outer, ca. 25 mm broad. Filaments white, fascicled, declinate ascending; the upper episepal ca. 45 mm long, lateral episepal 47-48 mm long, lateral epipetal 52-54 mm long, lower epipetal 57-60 mm long. Style filiform to 70 mm long from the perigone base. Stigma minutely capitate.

Specimens: Sorinam, distr. Marowijne, Albinia; leg. W.H.A. Hekking 1072, 10-XI-1961 (type Herb. Ravenna, isotypes U. TRA).

The following are the already described South American species of the genus:

Crinum erubescens Ait. (subgen. Crinum), from the Amazon basin and commonly found in the warm areas of South America as an escape or cultivated.

C. undulatum Hook (subgen. Crinum), according to Hooker from Maranhão, Brazil. Macbride describes it from NE Peru.

C. kunthianum Roem., gathered by Humboldt and Bonpland in Colombia and seemingly identical to *C. erubescens.*

C. graciliflorum Kunth (subgen. Crinum) from Maracaibo, Venezuela.

C. commelynii Jacq. (subgen. Stenaster), from Brazil.

C. virgineum Mart. ex Schult. f. (subgen. Codocrinum), found by Martius in the state of Rio de Janeiro, Brazil (see photograph in *Plant Life* 23, under *Crinum brasilense* Tr.).

C. brasilense Traub (subgen. Codocrinum); this apparently is a synonym of *C. virgineum* Mart. ex Roem.

From the list of above, it appears that the only close relative of *C. surinamensis* is *C. virgineum.* The latter bears oblanceolate, almost petioled leaves, with smooth margins, and pure white tepals; I had the opportunity of examining the type-specimen (at M).

ACKNOWLEDGEMENTS

I am particularly indebted to Dr. Angel Días Celis, Universidad "Pedro Gallo", Lambayeque, Perú, who in 1973 obtained facilities and accompanied me on an expedition to the eastern slopes of the Andes of North Perú; and to the following herbaria for their cooperation: CONC, Herb. Gunckel, Herb. Jiles, K, LP, M, MICH, MVM, NY, SGO, TRP, U, and USM.

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CHROMOSOME COUNT FOR **PARAMONGAIA WEBERBAUERI** VELARDE

Margot Williams *

Paramongaia weberbaueri Velarde is a member of the Amaryllidaceae. It has a fragrant flower which resembles a large (15-23 cm wide) yellow (RHS 12A) jonquil in gross morphology. The scape, which measures from 60-80 cm long, bears one or two flowers. The linear leaves are glaucous blue-green, and equal the length of the scape at maturity. This monotypic genus is native to Peru, specifically to the Department of Ancash, where its habitat is the steep, rocky slopes of the Andes (Siebert, 1967).

Under pot culture in the greenhouse at the U. S. Plant Introduction Station, Glenn Dale, Maryland, flower scapes are produced in January and February. Tips of the leaves emerge with the scapes, but the leaves do not attain their full size until flowering is completed. The leaves remain green for 3-4 months, and then start to yellow at the tips. When yellowing begins, water is withheld. The plant becomes dormant, losing its leaves, and is kept dry until December, when the tips of the new

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scapes are seen emerging from the bulb. Under this regime, flowering is reliable every year. The plants at Glenn Dale have been observed to be self-sterile, but set seed readily when crossed.

TABLE I

Measurements in Microns, R Values, and Centromere Position of Somatic Chromosomes at Metaphase in Root Tip Mitosis of **Paramongaia weberbaueri**

Chromosome Number	Long Arm	Short Arm	r Value (long/short)	Total Length*	Centromere Position**
1	8.31	7.21	1.15	15.51	M
2	7.65	6.99	1.09	14.69	M
3	8.47	6.28	1.35	14.91	SM
4	8.69	5.46	1.59	14.15	SM
5	7.05	5.68	1.24	12.73	SM
6	6.56	4.97	1.32	11.75	SM
7	8.69	3.77	2.30	12.46	SM
8	8.14	3.06	2.66	11.86	ST
9	6.17	5.36	1.15	11.64	M
10	6.12	5.25	1.17	11.37	M
11	5.96	5.57	1.07	11.53	M
12	5.74	5.57	1.03	11.37	M
13	7.38	4.32	1.71	11.69	SM
14	6.67	3.28	2.03	9.95	SM
15	6.39	4.48	1.43	11.42	SM
16	5.57	4.37	1.27	9.95	SM
17	6.34	4.04	1.57	10.38	SM
18	5.90	3.55	1.66	9.45	SM
19	5.68	5.46	1.04	11.15	M
20	3.93	3.83	1.03	7.76	M
21	4.48	2.90	1.54	7.54	SM
22	4.37	2.90	1.51	7.32	SM
23	3.77	3.33	1.13	7.10	M
24	3.77	3.33	1.13	7.10	M
25	4.10	3.22	1.27	7.43	SM
26	3.77	2.68	1.41	6.61	SM
27	4.21	2.68	1.57	7.05	SM
28	4.32	2.46	1.76	6.78	SM
29	3.50	3.33	1.05	6.89	M
30	3.55	3.28	1.08	6.83	M
31	4.21	2.84	1.48	7.10	SM
32	3.50	3.06	1.14	6.23	M
33	5.08	1.53	3.32	6.67	ST
34	5.52	1.04	5.31	6.56	ST
35	3.66	2.40	1.52	6.07	SM
36	3.66	2.40	1.52	6.07	SM
37	3.50	2.84	1.23	6.45	SM
38	2.79	2.62	1.06	5.41	M
39	3.33	2.13	1.55	6.17	SM
40	3.22	1.91	1.69	5.19	SM
41	2.35	2.02	1.16	4.75	M
42	2.35	1.97	1.19	4.70	M
43	2.46	2.30	1.07	4.81	M
44	2.13	2.13	1.00	4.37	M
45	2.13	1.15	1.85	3.55	SM
46	2.08	1.15	1.81	3.22	SM

* Includes centromere.
** M=median; SM=submedian; ST=subterminal.

MATERIALS AND METHODS

Several accessions of *Paramongaia weberbaueri* currently growing at Glenn Dale were acquired as flowering-size bulbs. These include:

PI 390760 - Received 9/3/74. Collected in the wild from the Instituto Nacional Agropecuaria, Yautan, Casma, Ancash Department, Peru, by H. F. Winters, Germplasm Resources Laboratory, Agricultural Research Center, Beltsville, Maryland and R. L. Clark, Regional Plant Introduction Station, Ames, Iowa.

PI 393984 - Received 1/30/75. Collected in Chaccan area, along

Casma-Huaraz Road, Ancash Department, Peru, at the request of H. F. Winters. Bulbs presented by Agricultural Attache, American Embassy, Lima, Peru. This accession displays symptoms of virus infection.

PI 429310 - Received 9/17/74 from Felipe Rodrigues Veramendi, Cruz Punta, Yautan, Ancash, Peru. Collected from the wild at the request of H. F. Winters near Huaraz, Ancast Department, at an elevation of 3091 meters.

Root tips were collected from a population of about 200 two-year-

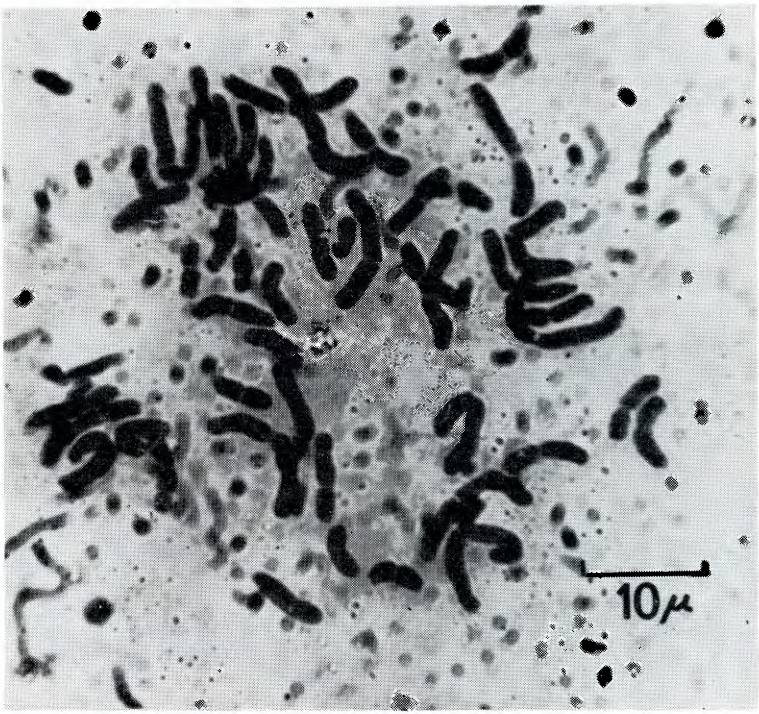

Fig. 29. **Paramongaia weberbaueri** Velarde. Photo micrograph of root-tip chromosomes, 2n = 46.

old seedlings resulting from random pollinations among the *Paramongaia* accessions listed above. Seedling root tips were used because mature plants had roots with very large diameters which proved difficult to pre-treat adequately with chemicals for chromosome shortening.

Fresh root tips were immersed in a saturated aqueous solution of para-dichlorobenzene for 4-½ hours. The root tips were rinsed in clear water, placed in a fixative solution consisting of a 3:1 mixture of 95% ethanol and glacial acetic acid, held at room temperature for 12 hours, and refrigerated. Root tips were macerated in a 1N solution of HC1 for 7 minutes. Satisfactory staining was obtained using the acetomarmine smear technique. Photomicrographs (Fig. 29) were made of the best chromosome spreads.

Chromosomes were measured from glossy prints of known magnification (1830 x). Paper-tape-coated wire was used to duplicate each chromosome configuration. Chromosome length and centromere position were marked on the wire with a sharp pencil. The wire was then straightened and measured with a Vernier caliper. The measurements

Fig. 30. **Paramongaia weberbaueri** Velarde. Root-tip chromosomes, matched pairs: Upper, chromosomes; **Lower,** idiogram.

of each chromosome were converted into microns. Chromosomes were identified and arranged in pairs by calculating the r value, obtained by dividing the length of the long chromosome arm by the short one, and measuring the total length of each chromosome. The r value was given more weight than the total length in the matching process, because total length may have been affected by the plane of the chromosome when the photomicrograph was taken. This procedure was followed using photographs of root tip chromosomes of five plants. Measurements were averaged, and descending order of average length of each pair was used to place the chromosome pairs in sequence (Table I and Fig. 30 upper). The same order of matched pairs was used to construct an idiogram (Fig. 30 lower).

Median - r values 1.00 - 1.20
Submedian - r values 1.21 - 2.40
Subterminal - r values 2.41 and upward

Minor variations in length were attributed to the effect of chromosome position on the slide on perceived length. The data suggests that five heteromorphic pairs may be present (pairs 4, 10, 16, 19, and 20). It may be possible to verify the presence of heteromorphic pairs through the application of the Giemsa C-banding technique, which has now been used successfully with plant chromosomes by many workers. Studies of meiotic material, when available, will also be helpful in identifying heteromorphic pairs and clarifying their mode of origin. However, the latter is a procedure that is complicated by the fact that meiosis takes place while the scape is still inside the bulb, necessitating the destruction of a large number of bulbs in order to obtain suitable material for study. Meiotic studies will be possible when the seedlings used in this investigation reach flowering size.

The most frequent basic number in the Amaryllidaceae is 11. A chromosome count of $2n = 46$ is somewhat unusual, having been reported in only four tribes within the Amaryllidaceae to date: the Euchareae, the Eustephieae, the Stenomesseae, and the Zephyrantheae. In the Euchareae, it is the most prevalent number found in the genus *Hymenocallis* (Flory, 1976). In the Eustephieae, one genus has been found to have a representative with this number. In the Stenomessaea, species with $2n = 46$ have been found in every genus with the exception of *Chlidanthus*. In the Zephyrantheae, this number appears only in the form of unusual counts for species which also show the more typical numbers for the tribe. A summary of amaryllids reported to have $2n = 46$ chromosomes is presented in Table II.

RESULTS AND DISCUSSION

Somatic cells of *P. weberbaueri* were found to have 46 chromosomes. No satellites were visible. All of the chromosomes are metacentric or submetacentric, except for three which are subterminal. There is substantial variation in length, with the longest chromosome more than four times as long as the shortest. Chromosomes were classified according to centromere position using the following divisions (Ackerman, 1971):

TABLE II

MEMBERS OF THE AMARYLLIDACEAE WHICH HAVE BEEN REPORTED TO HAVE 46 CHROMOSOMES

Plant	Authority	Reported in
Euchareae		
Hymenocallis amancaes	Snoad, 1955	Traub, 1963
Hymenocallis acutifolia	Flory, 1976	
Hymenocallis caribaea	Flory, 1976	
Hymenocallis cordifolia	Flory, 1976	
Hymenocallis dryandri	Flory, 1976	
Hymenocallis expansa	Flory, 1976	
Hymenocallis floridana	Flory, 1976	
Hymenocallis latifolia	Flory, 1976	
Hymenocallis littoralis	Sato, 1938	Darlington and Janaki Ammal, 1945
Hymenocallis longipetala	Snoad, 1952	Traub, 1963
Hymenocallis Macleana	Flory, 1976	
Hymenocallis mexicana	Flory, 1976	
Hymenocallis Palmeri	Flory, 1976	
Hymenocallis pedalis	Flory, 1976	
Hymenocallis puntagordensis	Flory, 1976	
Hymenocallis riparia	Flory, 1976	
Hymenocallis speciosa	Inariyama, 1937	Traub, 1963
	Sato, 1938	Darlington and Janaki Ammal, 1945
Hymenocallis tenuiflora	Flory, 1976	
Hymenocallis vargasii	Flory, 1976	
Eustephieae		
Phaedranassa carmioli	Snoad, 1952	Traub, 1963
Stenomesseae		
Pamianthe peruviana	La Cour, 1956	Darlington and Janaki Ammal, 1945
Paramongaia weberbaueri	current report	
Rauhia peruviana	Flory, 1966	
Stenomesson sp.	Diers, 1961	
Zephyrantheae*		
Zephyranthes grandiflora	Flory & Flagg, unpublished	Flory, 1968
Zephyranthes longifolia	Flory, 1940; Coe, 1954	Flory, 1968
Zephyranthes macrosiphon	Flory, 1941	Flory, 1968
Zephyranthes refugiensis	Flagg, 1961	Flory, 1968

* Other chromosome numbers have also been reported for the genera listed.

SUMMARY

Root tip chromosomes of *Paramongaia weberbaueri* Velarde were studied, and a somatic chromosome number of 2n = 46 was observed. Chromosomes were measured from photomicrographs of root tip cells of

several plants, and an idiogram was prepared. The chromosome number, and the wide range of chromosome lengths observed in this species, suggest that hybridization and polyploidy played a role in the evolution of this genus.

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HYMENOCALLIS ASTROSTEPHANA T. M. HOWARD, SP. NOV.

Collected as Howard # 57-8, Endemic to Central Guerrero, Mexico, in valleys around city of Chilpancingo, in open fields and meadows in low wet places. Also as 64-71, S of Chilpancingo at El Ocotito. In flower June 29, 1957.

Hymenocallis astrostephana T. M. Howard, **sp. nov.**

Species Hymenocalli harrisiano affinis; a ceteris speciebus Hymenocallis cupula staminali brevi ad instar stellae sexagona differt. Specimen: Traub Herbarium (TRA) No. 1237. Cult. 1980, from plants collected in Guerrero State, Mexico, 1957.

Description: *Bulb* subglobose, with medium-brown tunics, producing offsets slowly. 4.5 cm long and about as wide. *Leaves* deciduous, 6-8 in number, sessile, slightly thickened, linear to narrowly oblong, acuminate, often costate, with each margin having a parallel longitudinal pleat between margin and midrib, with immature leaves folded inward longitudinally near margins, 42 to 60 cm long, 2 to 3.5 cm wide, narrowing slightly towards base, somewhat reclinate, spreading, dark dull green.

Scape: glaucous, slightly compressed, two edged, 32.5 to 42 cm tall, 1.5 cm wide at base and 0.7 cm wide at apex. *Spathe bracts* 5 to 6.5 cm

long, 1.8 cm wide, the largest outer bract encircling the base of the umbel. *Flowers* fragrant, 2.5 in number. *Tepal tube* straight, greenish, 11-14 cm long. *Segs.* not adnate to cup., 7.8 to 10 cm long and .6 cm wide, spreading, slightly incurved near tips, or sometimes ascending at 45 degree angle and slightly incurving at tips. *Staminal cup* Funnelform to sub-rotate, margins nearly erect to slightly spreading, 1.3 to 2 cm long, and 1.8 to 2.5 cm wide with short tubular base, dentate, with dentations .5 cm long, forming a stellate membranous six-pointed cup. *Filaments* 3.5 to 4 cm long, green in upper half, white at base. *Anthers* versatile, 2 cm long. Pollen orange-yellow. *Style* 7-9 cm long, longer

Fig. 31. **Hymenocallis astrostephana** T. M. Howard, native to central Guerrero, Mexico.

than fils. Stigma capitate. *Ovary* sessile .3 ovules per cell. *Seeds* Dull green, 2 cm long and 1 cm wide, angular with flattened sides, acute at base, and rounded at apex. Polyembryonic, floating in water. The name *astrostephana* translates to "star-wreath", an allusion to the form of the staminal cup. Membranous dentations and/or denticulations formed between the filaments by the margins are fairly common in this genus. The "teeth" may be reduced to fringes or hair-like projections as denticulations, or may be larger, exaggerated as "teeth". In the case of *H. astrostephana,* these dentations are exaggerated to the extreme (for Hymenocallis) in that they are a half centimeter long on a smallish cup to create the illusion of a six-pointed star. A few other Mexican Hymenocallis also have cups that are starlike, but without the dentations. *H. azteciana* and *H. leavenworthii* have starry

cups formed by wing-like appendages at the filament base, but these are not true "teeth" formed by the free portions of the cup margins.

The current status of *H. astrostephana* is that of an endangered species due to the intensive pressures of cultivation of its habitat. My last sighting of this species was in 1964, and since then, in spite of several re-visits to its former known range in the past decade, I have been unable to relocate it. Now there are only plowed fields where once it was a prominent part of the landscape.

At first glance, *H. astrostephana* seems to fall into that group of Mexican *Hymenocallis* species that Traub has defined as the Mexicana alliance. Closer study indicates that it actually is intermediate between that alliance and one of the other alliances (Caribaea and Litorallis) found in the same general area. *H. astrostephana* differs from the litorallis alliance in that its cups is not adnate to the segments. It differs from the Caribaea alliance in the much smaller number of flowers per umbel, deciduous habits, leaves more narrow and costate, and *3 ovules per cell.*

H. astrostephana shares its range with several *Hymenocallis* species. . . . *H. glauca, H. Harrisiana, H. Guerreroense,* one member of the litorallis alliance, (unidentified), and an unpublished species in the Caribaea alliance. The new species is somewhat suggestive of *H. harrisiana* in a vague way, particularly in the few, long-tubed flowers with smallish cups. It differs from it in the dark-green, narrow leaves with sessile bases, about twice the number of leaves as *H. harriasiana,* which are nearly decumbent, and nearly twice the length at maturity. *H. astrostephana* is found only in valleys, in low wet places in mucky soil, in full sun, while *H. harrisiana* seeks higher, better drained exposures in sun or partial shade. I have never seen them growing together, or even in the proximity of one another. I doubt if either would survive in the habitat of the other. *H. astrostephana* flowers at least 4-6 weeks later than *H. harrisiana.* The flowers of *H. harrisiana* have segments that are noticeably reflexed in this part of Guerrero, while those of *H. astrostephana* have segs only spreading or often ascending. In Guerrero, *H. harrisiana* is generally found growing singlely in small colonies, while *H. astrostephana* is usually found growing in clumps.

CULTIVATED CRINUMS OF MEXICO—SPECIES AND HYBRIDS

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For over two decades the writer has made regular plant exploration trips into Mexico in search of new bulbous material for cultivation. Among the Amaryllids for garden use, Crinum were high on the list. It was hoped that various new Crinum material would emerge that would not only be of use for cultivation as ornamentals, but for hybridization as well. Mexico has not disappointed me, I was indeed lucky enough to return over the years with several useful new plants

that have proved themselves as ornamentals that might add to the list of Crinum that collectors could enjoy. At the same time, though the list has been highly useful, it has also been curiously limited. And these limitations are not merely a matter of simple choices per se, but are restrictive geographically. To boil it down to the simplest essence: One can expect to find only certain Crinums in any given area, depending on what part of the country one is in. The range for Crinums can roughly be broken down into four areas; *1. Gulf coast, 2. Pacific coast, 3. Central plateau and highlands,* and *4. Northern Mexico.*

Fig. 32. Crinums from Mexico and Guatemala: Left, **Crinum cruentum**, from Oaxaca, Mexico; Right, Crinum "Maya Moon" cultivated, Guatemala.

There are at least two species native to Mexico: *C. cruentum,* (which sometimes has been considered synonymous with *C. erubescens*), and *C. loddigesianum* (sometimes considered only a form of *C. americanum*). Both species are distinguished from their counterparts by having much longer tepal-tubes. The writer has found *C. cruentum* growing wild only in the highlands of Oaxaca, though it had previously been surmised as being only a coastal species. This writer won't bore the reader with some of the controversial fantasy that has been offered as absurd rebuttal of the known facts by others. Suffice it to say, as far as the facts allow, we know this species to be an upland plant from the state of Oaxaca, growing at ca 6000 feet elevation, alongside mountain streams fed at intervals from the frequent summer rains. These

occur in the western mountain slopes that drain toward the Pacific Ocean. Any officinonado of Crinums that is not happy with this factual observation is free to travel as many times as possible to Oaxaca (as I have) and search for other habitats more to the likings of his (or her) imagination . . . and good luck! (A bird in the hand is worth two in the sky).

So far I've only found *C. cruentum* in cultivation in two different gardens, one in the state of Michoacan, near the Pacific coast, in what is near, or part of the "Tierra Caliente", at Quatro Caminos, and the other location was in the state of Jalisco (which is adjacent) at the little town of La Huerta. At Quatro Caminos, *C. cruentum* grew alongside an irrigation ditch as a garden escape, and had been ruthlessly

Fig. 33. Crinums from Mexico: Left, **Crinum zeylanicum,** cultivated; Right, **Crinum loddigesianum,** Vera Cruz, Mexico.

hacked back to prevent its clogging the ditch. But it was so prolific that it was more than holding its own. Never-the-less, I fell in love with it. It has much the same overall habits as *C. americanum,* save that the flowers are a wee bit smaller, with slightly more slender segments, but noticeably much more colorful. The flowers open out flat, with recurving segs, and look to be a faint pinkish-white on the surface, but the exterior is markedly pigmented with a dark maroon, especially nearest the tips. This wine color sort of dilutes a bit along the backside nearer the middle, and from a short distance makes the flowers appear to be pink . . . an illusion of sort. *C. cruentum* needs a lot of warm days and nights to really get into high gear, so it is a flower that one expects to find in flower from midsummer until fall. It sets seed freely and may be of some use as a hybrid parent. Its only fault is that it is more tender than most Crinums and thus is best grown as a pot or tub plant as a semi-aquatic. Vegetative reproduction is by stolons.

The plant is mildly fragrant.

In the Oaxacan wilds, from any distance, a large colony of *C. cruentum* in flower looks like a bunch of pink flowered *Hymenocallis.* Indeed that is what we thought they were when we stumbled upon them.

C. loddigesianum is found on both the Gulf Coast and the Pacific coast. Though they are basically alike, the Gulf coast forms seem to be the better of the two, namely because they are more colorful. The Gulf coast forms are most plentiful in the state of Veracruz, growing both in full sun, along roadsides in knee-deep water and in mangrove thickets in water. The Pacific forms are especially plentiful around San Blas, state of Nayarit. Being slightly less colorful than their Veracruz counterparts, they are likewise a wee bit less distinguished. The Veracruz form has a bit of maroon on the backside near the tips, and this adds a tiny dab of color to an otherwise white flower. In cool weather this can deepen enough to almost become startling. Aside from this subtle coloring, the thing that distinguishes *C. loddigesianum* from *C. americanum* is the much longer tepal-tubes and much higher bud count. A respectable specimen of *C. americanum* might have as many as 6 buds in the umbel (sometimes 8 in forma *robustum*), whereas *C. loddigesianum* can easily go as high as a dozen buds in the umbel. This is not to imply that *C. loddigesianum* is superior to *C. americanum.* It is not. It is only a bit different. Even the fragrance is a bit different, though difficult to explain in what way. Both species, along with *C. cruentum,* have very similar habits and cultural requirements. Already, *C. cruentum* has been useful in hybridizing, and the hybrids are not only interesting in their own right, but a bit different from parallel hybrids of *C. americanum* crossed with parallel plants.

It is reasonable to assume that *C. loddigesianum* would be widely cultivated, but such is not the case. I have found evidence of its cultivation only at two gardens in San Blas. Surely it is apt to be cultivated in Veracruz as well.

Aside from native Mexican Crinums, the Mexican Gulf Coast gardens, though often represented by Crinums, is woefully limited to the variety, though not the quality, or the quantity. Only two "imports" are commonly seen, but they are exotic, sultry, and beautiful. The most obvious is *C. augustum.* It is so common as to be almost everywhere. Indeed this species seems to be found all around the Gulf Coast, from Florida to Yucatan. It is the giant of the genus, as large as, if not larger, than *C. asiaticum.* Oddly, while we would suppose that *C. asiaticum* should be found everywhere too, it is conspicuous by its absence. *C. augustum* thus serves double duty, representing not only itself, but the void left by the absence of *C. asiaticum.* Hopefully, more trips will show up *C. asiaticum,* for it should be there, and in some numbers too. Meantime, everywhere we go on the Gulf coast, we will run into those huge, gorgeous, flopped-over stems of *C. augustum* lying about in front of many a- peasants humble front yard. The immense flowers of *C. augustum* are so impressive, so colorful and so fragrant that one hardly is aware that this one *Crinum* almost says it all for Crinums in this area.

Luckily, we have another very lovely *Crinum* species found along the Gulf coast, particularly in Veracruz, where it is a most common door-yard flower . . . *C. zeylanicum* (Fig. 33). On one trip, (1975) I found enough of them to segregate them into three basic types. There was first the common form, which is much like the one found in Florida . . . a lovely thing in white with startlingly vivid dark cherry-red stripes on the reverse, with only a faint pinkish interior stripe. Then there is a smaller version with a dark rosy-pink stripe. This form is otherwise similar, but the penalty it pays for its lighter variation seems to be a slightly dwarfed habit. Best of all is an even more vividly startling striped version with a barber-pole contrast in which the exterior stripes are not only merely darker, but wider. This is the "king" of the Mexican *C. zeylanicum* forms. This species sets some seed, but not heavily as one might expect. The pink striped form least of all. There really ought to be more Crinum than just these on the Gulf Coast . . . and perhaps hidden in private gardens away from the public eye, there may well be, but these are the two that the ordinary traveler is apt to see with dependability from day to day. Frankly, I believe that *C. zeylanicum* in all its form is very much worthy of bringing back home. The trick is to maintain it in cultivation. It is simply ultra tender and is quickly lost in the U.S. except in lower Florida and the Rio Grande Valley of Texas. Elsewhere it is best maintained as a tub or large pot plant. Also it seems partial to a sandy soil and a lot of humidity and moisture. By shear accident we found it responds favorably to a semi-aquatic culture. That is, the large pot in which it is well-rooted and growing can be emersed into a water-holding container and thusly maintained throughout the summer growing season. The pot can be 25% to 50% in water. *C. zeylanicum* seems to enjoy this fine. Along the sandy coast of Veracruz, rains are more than adequate and this would be redundant.

The Pacific coast of Mexico is another matter. *C. zeylanicum* should be all over the place, but it seems absent. Where is it? Certainly *C. augustum* is here, as on the opposite coast. Indeed, we soon learn that *C. augustum* is plentiful on *both* coasts. Instead of only *C. augustum,* we happily learn that around Mazatlan we find very plentiful numbers of a coppery-red leaved Crinum everywhere. They can be found not only in front of homes, but planted down the median of avenues and boulevards as landscape material. Hundreds, nay, thousands and more. These are one of the coppery-red-leaved forms of *C. asiatcium,* which may be *C. asiaticum* var. *cupprefolium.* How did they all get here, and why so suddenly very many? Take a good look, for you are not likely to see them again in such profusion. This seems to be their population center. Flowers of this variety are pinkish-white, with red filaments, and a winey-pink exterior. Actually the flowers are small and spidery and nothing really to get overly excited about. It is the colorful, erect foliage that steals the show. Offsets are a-plenty. Back home we find they are not so easy to grow. Almost a total failure in San Antonio, if grown out of doors. But as a pot plant they do very

well if given a large pot or tub to grow in. Undoubtedly they hate cold weather and need to be transferred indoors in the winter to maintain their foliage.

Perhaps the nicest surprise of visiting Pacific Mexico is the discovery of large plantings of a gorgeous Crinums having hugely widely-open flowers, white with a narrow strip of red down the midrib. This Crinum seems to have a wide range in cultivation on the Pacific coast, from Mazatlan, to Manzanillo, to Tapachula on the Guatemalan border. Everywhere it is the same . . . stately purplish stems topped with strictly nocturnal widely open flowers with a subtly exotic perfume . . . and always in large clumps. The bulbs seem to grow shallowly, barely beneath the surface, and multiply at a fair clip. Foliage is narrow, quite low, and broadly spreading in darkest bright green. No signs of seed. The stems, so darkly purple, have a bloom to them . . . much like purple grapes . . . and they tower straight and tall above that low spreading foliage. Those flowers, at night so excitingly and startlingly spread open, drop quickly as the sun rises, so that only a hint of their real beauty can be surmised. All the average traveler sees is a few rags of droopy flowers in white with red stripes. Nothing to stir the imagination. But those few who see them at night. . . . Ah, that is quite another matter. The flowers open widely and are simply huge! Not so large as *C. augustum,* but about as large, if not larger as almost any other *Crinum.* And those narrow red stripes are showy, contrasting, and nearly startling. Is it the true *C. kirkii*? This name has been so often mis-applied to so many other Crinum over the years, it is almost like screaming "Wolf." Surely, this Mexican *Crinum* comes closer to the discription than almost anything else this writer has seen. But is that enough? Perhaps it would be safer to say that if this is not *C. kirkii,* then perhaps it is a hybrid of it. Until this plant can be identified by some future *Crinum* Afficionado, I am proposing the name 'Empress of Mexico' for this plant. We have no idea now as to its history or origin. We don't know if it is a hybrid or species, though it sets no seed. The anthers are curiously of cork-screw form, and this is not a character in *Crinum* to be lightly brushed aside. Attempts at hybridizing it, using its pollen, have so far failed, but this does not necessarily prove anything, judging from our past experiences at hybridizing Crinums. I once had a *Crinum* from the late Wyndham Hayward under the name 'Empress of India.' It was somewhat similar, but really not the same. Indeed, we feel that 'Empress of Mexico' is superior. 'Empress of Mexico' is hardier, and has its own subtle characters that make it a fine addition to the garden or greenhouse of any *Crinum* collector. 'Empress of Mexico' flowers later than most Crinum and only begins to hit its speed in late July or August and continues until November in our climate. It seems to revel when the days and nights are hottest. Once our climate begins really cooling here in November, it is apt to remain fully open until noon, and then we can fully appreciate it. Whether it is a true species, or a hybrid between some platyaster crinum and *C. kirkii* matters little. It is a fine aquisition from Mexico.

One final thought. Just as we have wondered about the absence

of *C. zeylanicum* on the pacific coast, we must now speculate as to why 'Empress of Mexico' is not found commonly in door yards on the Gulf side? If it is there (and maybe it is). If not, it certainly ought to be. Strange. If only it set seed, we could build some kind of a case for it being a species from somewhere.

The great interior of Mexico, the central plateau and highlands, while offering plenty of Crinums in the various parks and garden landscapes as far as quantity is concerned, has the least of overall interest to offer. For all practical purposes only one species is grown . . . *C. moorei.* And only a single hybrid strain *C.* x *powelii* in two versions . . . *alba* and *rosea,* with rosea far and away predominating. They grow to perfection in the cool, high atmosphere. I have seen *C. moorei* planted by thousands in parks in Guadalajara and elsewhere. Everywhere at higher elevations (5000 feet or more) you find it in full bloom in July and August. It is lovely. The same goes for the pink form of x *powellii.* It is seen much less frequently than *C. moorei,* but it can be very effective in parks and gardens. The finest pink forms I ever saw in my life were in a park at Amecameca, about an hours drive east of Mexico City. They were tall and stately and flowers were huge. Altitude was roughly around 8000 feet. I brought some bulbs home, after conning the local park gardener out of them. Here they reverted to very ordinary pink *powellii* form with no special character. I suppose the higher elevation with its cooler climate has a lot to do with its special beauty. One can only wonder just how the many other finer forms of x *powellii* might perform down there. They could well be fabulous!

North-Central Mexico is really not the best part of the country to go Crinum-hunting. Yet two Crinums come to mind that occur in gardens there . . . one rather ordinary, and the other an exotic treasure. A very old hybrid betwixt *C. bulbispermum* and *C. zeylanicum, C.* x *gowenii* is a fairly stately hybrid of a "milk and wine" ancestry on both sides of the fence.

Just as the many forms of *C.* x *herbertii* fill the gaps for garden Crinum back home in the Gulf states, so does *C.* x *gowenii* do the same, not only at home, but in the northern parts of Mexico. It can take a lot of heat (and cold), and stands tall and stately in flower. Foliage is very long and tapering to a long slender point, but somehow taller than other crinum of this type. The flowers form a large umbel, making very nice individual trumpets, colored with a deep pink keel on the backside, and the interior being white. Actually, if one takes the time to study the entire plant, one can see that the foliage is typically that of *C. bulbispermum,* but on a much larger scale and greener of course. The flowers are typically formed like *C. zeylanicum,* with strongest coloring on the backside, and with the tips of the segs recurved. Hybrid vigor is there and an unusual amount of heat resistance. Bulbs are huge, as one might expect from such hybrid vigor. One morning as I sat eating breakfast in Matehuala, in north central Mexico, I studied a flowering clump of x. Gowenii by the window of the motel restaurant. At that point it was impossible to see anything

Mexico.'

When I began this article, I was saddened by the fact that we did not really have many Crinum species in enough variety to amount to much for an article . . . only about a dozen. Now it occurs to me that this is really quite a good number. After all, drive through the highways of Texas, Florida, or California and keep a record of the different kinds of Crinums you might spot in gardens. It would be truly remarkable to spot as many as a dozen in any region from the streets. Combine this with coming home with a batch of bulbs obtained from generous gardeners along the way, that include such rare treasures as 'Maya Moon', 'Empress of Mexico,' and 'Maximillian,' and rare species like *C. cruentum* and *C. loddigesianum*. Was it all worth it? You bet.

GENUS CRINUM RESEARCHES AND COMMENTS

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During the past few years several research papers have appeared which suggest that numerous technical revisions are due to appear in the genus Crinum. This is particularly evident amongst the *Crinum ornatum* types and variants occurring throughout the Tropical East African area. I. Nordal, B. Rorslett and M. M. Laane at the Botanical Laboratory of the University of Oslo, Norway, summarized their technical study and numerical analysis results in the Volume 24 #3, 1977 Norwegian Journal of Botany, Pages 179-212. Their work is extremely extensive since it involved a complete examination and morphological reevaluation of some 250 mounted specimens scattered through English and European herbariums plus a study of a large number of collected plants found in Uganda, Kenya and Tanzania.

The resulting morphological studies in conjunction with cytological and palynology examinations have tentatively placed some forty identifiable Tropical East African Crinum species into five recognizable groups. Thus far related Tropical West African, some South African, and Asian *Codono crimum* have not been included in the basic study. Field studies in these areas remain to be done. However, the initial work points up that a majority of species and variants in this area belong to a common *Codono crinum* group having a bell or funnel-form perianth commonly marked with red keels to the tepals. These red-keeled plants are tentatively identified in the study as the *C. ornatum* group. In turn the *Ornatum* group subdivides into four alliances best represented by the following species: *C. macowanii, C. papillosum, C. stuhlmanii* and *C. zeylanicum*. The *C. macowanii* group, as known, extends into South Africa where the blossoms loose their red-keeled tepal coloration. The alliance having the largest population with the greatest diversity is the *C. zeylanicum*. This alliance is best identified by its colorful, near sessile blossoms. It grows from sea level along the Indian Ocean to an inland elevation of 2500 meters under a number

of diverse environmental and ecological conditions which results in a number of transitional or gradiant forms. It will be noted *C. scabrum* and *C. kirkii* fall into this alliance and the writer is of the opinion *C. yemense* is a probable member. The *C. zeylanicum* alliance has two chromosome groups, 2n=22 and 2n=30 with the latter being more of a moist, shade loving unit.

The following is an initial summary of the above cited Crinum alliances and associated species encountered in the study. It will be noted *C. latifolium* is omitted due to confusion over the holo type and correct identity.

1. *Crinum jagus* (Thomps.) Dandy group.

(Footnote) The Oslo report uses the term "species" for Group 1 and the Alliances 5A and 5D. Such terminology would reduce many recognized species to subspecies status. The writer is not a splitter but deems the term "alliance" more fitting since in his experience a number of these plants obviously exceed the morphological limits of what is normally considered a species.

Synonyms and allied forms:

Amaryllis ornata auct. non Ait. var. B Ker-Gawl.
C. petiolatum Herb. var. *spectabile* Herb.
C. giganteum Andr.
C. vanillodorum Welw. ex Bak.
C. podophyllum Bak.
C. laurentii Durand & De Wild.
C. rattrayii Hort.
C. congolense De Wild.
C. suaveolens A. Chev.
C. bequaertii De Wild.

Note, *C. scillifolium* A. Chev. (1912) from Ivory coast may represent a narrow leaf form of *C. jagus.*

2. *Crinum minimum* Milne-Redhead.

Note, *C. humilis* A. Chev. of West Africa bears some resemblance to *C. mimimum.*

3. *C. subcernum* Baker.

Note, *C. subcernum* may be conspecific to *C. crassicaule* sensu Verdoorn.

4. *Crinum* cf. *paludosum* Verdoorn.

Note, the identity of the Verdoorn specimen is merely tentative.

5. *Crinum Ornatum* group.

5A. *Crinum macowanii* Bak. alliance:*

Synonyms and allied forms:

Amaryllis revoluta auct. non l'Herit., Ker-Gawl.
C. pedicellatum Pax.
C. johnstonii Bak.
C. kirkii auct. non Bak., Lugard.
C. gouwsii Traub.
C. macowanii Bak. ssp. *confusum* Verdoorn.

5B. *Crinum papillosum* Nordal.

Note, the last is a new species having a foetid odor like *C. foetidum*

Verdoorn with papillose seed. May be allied to *C. harmsii* Baker, and possibly *C. crassicaule* Baker.

5C. *Crinum stuhlmanii* Baker.

Note, This species shows alliance to *C. delagense* Verdoorn and the latter may be a mere subspecies of *C. stuhlmanii.*

5D. *Crinum zeylanicum* (L.) L. alliance.*

Synonyms and allied forms:

Amaryllis zeylanica L.
Amaryllis ornata L. f. ex Aiton.
Crinum ornatum (L. f. ex Ait.) Bury.

Note, *C. ornatum* = *A. ornata* L. f. ex part.

Amaryllis broussonetii Redoute.
Amaryllis spectabilis Andr.
C. yuccaeflorum Salisb.
C. scabrum Herb.
Amaryllis vittata auct. non Aiton.—Richard.
C. kirkii Bak.
C. zeylanicum (L.) L. var. *reductum* Bak.
Brunsvigia massaiana Lind. & Rod. = *C. massaianum* (L. & R.) Br.
Crinum doriae Hort. Sprenger.
C. tanganyikense Bak.
C. boehmii Bak.
C. toxicarium A. Chev. non Rox. = *C. veneficium* Hann.
C. corradi Chiov.

Note. Hooker united *C. latifolium* L. and *C. zeylanicum* under *C. latifolium* but no holo type exists of the latter, or former. As previously stated the *C. zeylanicum* alliance appears in numerous ecological and introgressive forms over much of tropical Africa and Asia. Two chromosome forms exist having 22 and 30 chromosomes. The former is adapted to open grasslands while the latter is a forest or riverside plant. As previously stated this alliance is most easily recognized by the very short pedicels or near sessile blossoms. Breeding experiments in Oslo indicated most plants were self sterile. No mention of parthenogenetic seed formation was cited. In the writers experience this is quite prevalent in the genus Crinum as in Nerine and allied Cape genera.

A second series of papers by T. N. Khoshoo and S. N. Raina at the National Botanical Gardens in Lucknow, India, deal with the Cytogenetics and Heterozygosity of *Crinum latifolium,* wherein they point up several causes including catinated chromosomes and triploidy which leads to sterilety amongst the plants investigated. They conclude that numerous Indian forms depend largely upon vegetative reproduction for existence. They also cite similar difficulties for *Crinum asiaticum.* This may be true for the specific clones examined about Lucknow. The writers observations in Fiji and Hawaii indicates that many *C. asiaticum* forms bear heavy seed crops.—Some possibly may be parthenogenetic seed. However, some plants are practically self sterile and one very common red leaf form of small stature found in the windward shore

gardens of Oahu is quite sterile. It is readily identifiable by its shabby wind shattered foliage.

During the past forty years the writer has flowered many Crinum hybrids and has established a number of basic observations. In general when crossing subspecies (when possible) or fairly closely related species, one normally obtains intermediate appearing hybrids. Fertility amongst the intra-specific hybrids is spotty while the interspecific hybrids are normally poor. Wider outcrosses often result in one species being overly dominand or practically predominating the hybrid. For example, in *C.* x *powellii (C. moorei* x *C. bulbispermum)* the *C. bulbispermum* features largely predominate, particularly in the bulb, foliage and floral parts. When *C. scabrum* is crossed with *C. bulbispermum* giving the hybrid *C.* x *herbertii,* the 'Milk and Wine' Crinum of Florida, the features are largely *C. scabrum.* But in crossing *C. scabrum* with *C. moorei* the *C. moorei* predominate. As a result the writer has prepared a listing of hybrids showing roughly the degree of dominance of the major species in the F-1 hybrid. In most instances members of the *C. ornatum* grouping show dominance (See Table I) but there are unpredictable exceptions. Anderson and Erickson refer to such unbalanced dominances as Antithetical Dominance. It appears that the ease of obtaining viable pollens or seed rapidly diminishes as one species dominates the other, but polyploid hybrids show a great deal more fertility than diploids. However, in working with tetraploid hybrids it appears that the polyploid gametes tend to divide up on an autosyndetic basis often giving throwbacks to one parent or the other, particularly when backcrossing.

Thus as far as breeding is concerned most of the above diploid hybrids only set seed occasionally. Often it is undersize and aborts. Hardy or viable seedling rarely occur. In all probability much of this seed may be parthenogenetic. In contrast, the polyploid hybrids have some promise as breeders since they show some fertility. Normally F-1 polyploid hybrids are obtained by crossing polyploid forms like *C. moorei* and *C. macowanii.* Then on rare occasions polyploid hybrids turn up spontaneously, as with *C.* x 'Cecil Houdyshel' which if selfed, or even ignored, produces some seed consisting of diploid parthenogenetic and polyploidal. The later are presumably bee polinated and are sexual in origin. Occasionally other hybrid pollens will strike, but normally the plants resulting from *C.* x 'Cecil Houdyshel' are tetraploid throwbacks to *C. moorei.* However, not all are pure line as floral disturbances are often apparent, such as narrow tepals or far deeper coloring. Several semifertile red *C. moorei* have been derived this way, deep pink are quite common. Similarly several tetraploid *C. bulbispermum* forms have appeared which give better opportunities for breeding than the Orange River hexaploid form.

Recently it was found that during the past few years several spontaneously developed tetraploid sports have occurred amongst the various *C.* x *herbertii* hybrids—The most interesting example being the Thaddeus Howard 'Carnival' which the writer believes is androgenetically derived from undivided male gametes. If a sexual cross with the parents specified it would be 75-86% *C. bulbispermum* by chromo-

some composition, but none of the *C. bulbispermum* features tend to show. In a somewhat similar manner the writer obtained three large tetraploid *C.* x *herbertii,* one of which is a very large 'Milk and Wine' show-type of plant with a promising level of fertility.

Any diploid x tetraploid or diploid x hexaploid cross can be ruled out as a probable weakling plant, normally difficult to flower and usually quite sterile. Historically, Iris breeding made little headway until tetraploid forms were recognized and used. The same applies to Crinum breeding, only the problems of incompatability appear more difficult. Its no great effort to produce F-1 generation outcrosses, but seed fer-

TABLE I

Parental dominance in widely outcrossed Crinum Hybrids:

Parental species	Dominant Species F-1 hyb.	
Crinum bulbispermum x. *C. moorei* (syn. *C.* x *powellii,* diploid or tetraploid)	85%	*C. bulbispermum*
C. macowanii x *C. moorei*	60%	*C. macowanii*
C. bulbispermum x scabrum (C. x *herbertii)*	85%	*C. scabrum*
C. scabrum x *C. yemense* (*C.* 'Ellen *Bosanquet')	50%	each
C. scabrum x *C. yemense* (*C.* 'Ellen Bosanwood')	70%	*C. moorei*
C. bulbispermum diploid x *C. macowanii* dip	60%	*C. macowanii*
C. bulbispermum hexaploid x *C. macowanii* tetra	80%	*C. macowanii*
C. moorei x *C. yemense* (*C.* 'White Queen')	50%	*C. yemense*
C. yemense tetraploid x *C. bulbispermum* hex	80%	*C. yemense*
C. americanum x Crinum, African or Asian sp's	15%	*C. americanum*

Above percentage estimate of dominant species is based on bulb, foliage and flowering umbel's morophological features. See Anderson & Erickson's Hypothesis of Antithetical Dominance. It is to be noted the *C. ornatum* grouping is quite dominant.

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tility for F-2 or subsequent hybrids is a major problem unless polyploids are obtained and such must be capable of yielding a working level of functional gametes. Now that several polyploid hybrid clones are at hand and since the Oslo report gives a clue to the existant of high elevation hardy crinum related to *C. scabrum* or *C. yemense,* breeding techniques used in Iris breeding should permit us to make headway: (1) more fertile polyploid hybrids and (2) a series of colorful, cold tolerant, near intraspecific hybrids from Tropical East Africa which should be hardy and have a better level of F-1 fertility than our present wide outcrosses. True we have some hybrids involving *C. scabrum* and *C. zeylanicum* but the *C.* x *herbertii* and 'Ellen Bosanquet'

are the only *C. scabrum* material capable of growing out of the Gulf area, and this drastically reduces breeding activity when one is limited essentially to *C. bulbispermum, C. macowanii, C. moorei* and *C. yemense* hybrids for summer dry heat or winter chill conditions. The high dry inland conditions of Tropical East Africa offers a degree of Crinum hardiness equivalent to that of *C. yemense* and such favorable breeding stock cannot be overlooked for northern Texas or central California where *C. scabrum* rarely grows, let alone flower. The *C. zeylanicum* group other than being clonial self-sterile offer no major difficulties in hybridizing according to the Oslo report. Knowing the genetics involved the use of these bulbs is well worth the effort of procurement.

THE HAWAIIAN AND PACIFIC CRINUMS

L. S. Hannibal, *4008 Villa Court, Fair Oaks, California 95628*

During our trips to Hawaii (1960) and on to Fiji and Australia (1964) I had the occasion to locate and identify a number of *Crinum* species scattered about Hawaii and the mid-Pacific. The following summarizes our finding.

Crinum procerum Carey ex Herbert. Bot. Mag. 53: t2684 (1826). This huge *Crinum* species often develops a trunk some 15-18 inches in diameter and grows heavy eight foot foliage when grown in moist tropical areas. It was considered merely a form of *C. asiaticum* by J. G. Baker since it never grows to normal size outside of the tropics. Even in Florida it seldom exceeds more than half normal size. Recognizing its distinctive size and the growth habits involved, the writer reinstated *C. procerum* to its original species level. See Louisiana Soc. Hort. Research Journal III #3: 259 (1970-71). *Crinum gigas* Nakai of Iwo Jima is simply a synonym of the above. Photos and samples have confirmed that both red-pigmented and non-pigmented forms are identical to the Hawaiian plants common about Kaaawa, Oahu.

Crinum procerum var. *kaaawanum* Hann. This red leafed, red flowered giant form was found about Kaaawa, an old sugar plantation village on eastern Oahu. Examples of the holo type are now grown at the Waimea Arboretum in northern Oahu.

Crinum procerum var. *splendens* Hann. This attractive plant resembles the preceding with the exception that the foliage glistens as if varnished. The form came from a Burmese temple garden and is planted about the Japanese Embassy in Hawaii. Examples are also in the *Crinum* collection grown at the Waimea Arboretum. Haleiwa, Oahu, Hawaii.

Crinum augustum Roxb. This is commonly called the 'Queen Emma' Lily on the Islands. Examples were found at Queen Emmas summer home, now the Allerton Estate on Kauai. Queen Emma was the last of the Hawaiian royalties and was vastly interested in gathering attractive tropical plants. Her garden is a tropical paradise to visit.

Crinum amabile Donn. This species is common about the Hanna Ranch Hotel on Maui. Superficially it resembles a red leaf *C. asiaticum* but the flowering buds open at random across the umbel while *C. asiaticum* and *C. procerum* have compact buds which mature and open centripetally. On searching early descriptions and plates we found that Kunth's *Enumerato* 5:550 (1843) gave a far more exacting description than available in other references.

Crinum xanthophyllum Hann. L.S.H.R. Jour. III #3, 266 (1970-71). This "Golden Leaf Crinum" was introduced when the Polynesian Cultural Center was built on Oahu. The writer first saw it in Fiji and concluded the plant had a virus. Then on seeing it in New South Wales learned the coloring was distinctive and that the plant was common in the South Pacific. Examples were obtained and holo types were filed with the California Academy of Science Herbarium in Golden Gate Park as well as the National Arboretum Herbarium in Washington, D.C. The foliage coloration marks the plant as uniquely distinct, and a group of bulbs can be quite spectacular. Unfortunately the species is tender and is poorly adapted to the mainland U.S.A.

Crinum brachyandrum Herb. This species was first described by William Herbert but no holo type or source was known. William Morris found it growing along the streams near Rockhampton, Queensland, and on checking the plant the Herbert description was found to apply. The species is allied to *C. pedunculatum* but is distinct due to its slender foliage which is uniquely rigid. Being tropical, the plant is quite tender.

Crinum pedunculatum Ker. This species was considered distinct due to the plant developing an elevated basal stump. However, under ideal conditions several variants of *C. asiaticum* commonly form a peduncle. Foliage and floral-wise there are no recognizable distinctions between *C. pedunculatum* and many variants of *C. asiaticum*. For that reason J. W. Hooker considered it no more than a geographically isolated form of *C. asiaticum*. The writer is in complete agreement with this opinion.

Crinum, unnamed. In 1975 Keith Woolliams of the Waimea Arboretun, Haleiwa, Oahu, Hawaii collected a small *Crinum* species growing in Laloki Swamp, Port Morsby, New Guinea. To date no mounted specimen has been taken, thus the proposed name *C. woolliamsii* is being withheld as is the detailed description. However, we can report that the species bears some resemblance to *C. amoenum* or *C. gracile* in general stature, but differs by having very small ovaries and exceptionally slender non-curving tepal tubes. The blossoms remain open less than a half day. When pollinated it failed to set seed which suggests self sterility. Thus far no offsets have developed and failure to be there when the blossoms open has delayed taking a mounted specimen as holo type.

Crinum mauritianum Lodd. This endangered species is found on the Mauritius Islands in the Indian Ocean off Madagascar. Plants have been grown from seed at the Waimea Arboretum and distributions have been made to interested personnel. The plant bears 4-5 sessile blossoms

with linear tepals sometimes tipped a light red. The plant is more of botanical interest than horticultural. Cultivation calls for swamp conditions.

I wish to thank Paul Yamanaka and Keith Woolliams for their interest and diligent assistance in making this study possible.

WAIMEA ARBORETUM, OAHU, HAWAII CRINUM COLLECTION

L. S. Hannibal, *4008 Villa Court, Fair Oaks, California 95628*

About ten years ago when the Waimea Arboretum near Haleiwa, on Oahu, Hawaii was made available to the public the Waimea Arboretum Foundation formulated plans to collect, grow and preserve as many plants from the central and south Pacific as was possible. One of the major groups was Crinum which obviously included *C. asiaticum*, *C. procerum* and other lesser known species and the numerous variants. Many of the original plants came from gardens about Hawaii including the very colorful *C. procerum* var. *kaaawanum* (pronounced Ka-a-a-wa-um) and golden leafed *C. xanthophyllum* from Fiji. Since that date bulbs have been collected from Guam, Japan, Java and several other areas. Several Mexican species have been introduced also. The latter, supposedly swamp plants have made unusual growth due to their spread by underground rhyzomes.

Two presumably undescribed species were recently collected in the Java area. These are currently under study but since the blossoms only last a few hours at best they give ltitle promise of being more than scientific curiosities.

A number of African Crinum species along with a score of hybrids were furnished by L. S. Hannibal. Not all have been overly successful since some like *C. moorei* apparently need a cooler dormant period. Much of their energy is spent in vegetative growth. In contrast *C. mauritianum* from the Mauritius Island off Madagascar is doing well. It is an endangered species and we have been able to distribute seed to several tropical gardens and Crinum collectors.

The Arboretum is also concerned with the collection and propagation of rare Hawaiian flora. Many native plants are on the endangered or rare list due to competition with exotic introductions which are more aggressive. Palmaceae, south Pacific, Bignoniacea and Hibiscus along with Guam flora are all well represented. Several subtropical climatic areas can be represented along the Waimea canyon and the rich volcanic soil is particularly fertile. A large propagation house and enclosed area are used to reestablish and observe new plant introductions since pest and disease control is a major concern. Tour busses from Honolulu make regular stops at the Arboretum. Visitors are welcome.

REGISTRATION OF NEW AMARYLLID CLONES

MR. JAMES M. WEINSTOCK, *Registrar*
10331 Independence, Chatsworth, Calif. 91311

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an international basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton Stuntz and Ballard was published in 1949. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62. 1960; Addendum. PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961: **The Genus X Crinodonna, by Hamilton P. Traub,** PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars, 1799-1963,** by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues. These may be obtained at $8.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. 92038.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine;** and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on, should be sent to Mr. Weinstock at the above address. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1980

Registered by Mrs. H. R. Young, 303 Millside Drive, Chickasaw, Alabama 36611

Amaryllis clone **'Little Orange Bird'** (Young, 1980); **A-1039;** D-8, height of scape, 14"; flower size, diam. across face, 4½"; flower color, deep orange; blooming season, April. Petals are 2⅛" wide and rounded, as are sepals which are 1½" wide. The throat of the four flowers per scape is deeper in color.

Amaryllis clone **'Little Red Bird'** (Young, 1980); **A-1040;** D-8, height of scape, 14"; flower size, diam. across face 4½"; flower color, red with darker veins; blooming season, April; Flower is round with 2½" petals and 1½" sepals also round. Scape has four flowers, throats of which are darker than the rest of the flower.

Amaryllis clone **'Pixie Happy Memory'** (Young, 1980); **A-1041;** D-8; height of scape, 15"; flower size, diam. across face 3½"; flower color, orange and white with red stripes running from a green throat to two upper petals and one sepal. Scape has four flowers.

Registered by Marcia C. Wilson, 255 Galveston Road, Brownsville, Texas 78521

Amaryllis clone **'Corabelle'** (Doran, 1980); **A-1042;** U-4 fld; scape, 41-45 cm; tube, 3 cm; face, 10 cm, wide, flat, and slightly ruffled; HCC Rose Madder, center 3.5 cm white star; bulb, 4.5 cm and up; spring bloom; fertile. A diploid hybrid of A. traubii forma doraniana/A. doraniae.

Amaryllis clone **'Mananita'** (Doran, 1980); **A-1043;** U-4 fld.; scape, 33 cm; tube, 7 cm; flower, 9 cm wide across face, slight ruffle; HCC 64/3 Dresden Yellow; bulb, 4 cm and up; late spring; fertile; Small, pure yellow trumpet. A complex diploid hybrid of four species.

Amaryllis clone **'Pink Ambrosia'** (Doran, 1980); **A-1044;** U-4 fld.; scape, 30-35 cm; tube, 15 cm; flower, 15 cm wide, white with front face completely covered with fine specks of pink (appears blushed); bulb, 9 cm; spring. Perfumed trumpet. A diploid hybrid of A. ambigua from Rio Cuenca Basin in Ecuador) and A. vittata tweediana.

Registered by C. D. Cothran, 1733 N. Gibbs St., Pomona, California 91767

Amaryllis clone **'Irish Summer'** (Cage, 1980); **A-1045;** D-5A; height of scape, 26″; flower size, diam. across face 8-10″; flower length, 3½″; flower color, greenish yellow (154B, RHS colour chart) fading to white shortly after full maturity; blooming season, spring; Deciduous. Clone is a seedling of 'lime A' and inbred 'Oasis', and has a light fragrance.

Amaryllis clone **'Scarlet Hero'** (Cage, 1980); **A-1046;** D-5 A; height of scape, 28″; flower size, diam. across face, 10″; flower length, 3″; flower color, scarlet, front and back; blooming season, spring; deciduous; flower has a light fragrance. Scape has 4 or 5 flowers, and bloom is either in winter or spring after a dormant period. As many as 3 scapes per season.

TRAUB'S AMARYLLIS MANUAL, REVISED EDITION

Traub's *Amaryllis Manual* was published in 1958, and the Edition was sold out after several years, and copies have since, when offered, brought up to $50 and more.

A Revised Edition, edited by Dr. Thomas W. Whitaker, will be published in 1981 or 1982, depending on the readiness of the manuscript. Those interested in obtaining a copy should write to the Publisher, Timber Press, Richard Abel, Editor, P. O. Box 92, Forest Grove, Oregon 97116.

3. GENETICS AND BREEDING

AMARYLLIS HYBRIDS OF J. L. DORAN

MARCIA C. WILSON, *255 Galveston Road, Brownsville, Texas 78521*

A. traubii forma doraniana x A. doraniae. A miniature rose colored belladonna crossed with a white and pink trumpet is bound to be a winner. Flowers are clear unblemished rose with a white star throat and have very broad petals with a flat face. Flowers are about four inches across, but are difficult to measure. They are wide open in bright daylight and close somewhat at night. Older bulbs (all on the small side) bloom with two scapes in the spring and will frequently rebloom in the fall. Scapes bear two to four flowers. 'Corabelle' (Doran G8-3) has a four flowered scape and is named in honor of Mr. Doran's most enthusiastic supporter of his hybridizing experiments, his 95 year old mother. This exquisite flower has a slight pixie ruffle and a distinctive white edge along the lower portion of the two upper segments - delicate and cheerful. Plants are almost evergreen and are of easiest culture.

A. ambigua x A. vittata tweediana. 'Pink Ambrosia' (Doran G2-3) is one of those special and highly unusual hybrids that any hobbiest (or professional) might dream about. By chance combination of genes, this fragrant white trumpet appears blushed: the 6″ diameter face is completely covered with very fine specks of pink. Scape is four flowered, each flower over six inches long. The fanciful name was chosen and voted upon by a trio of youthful admirers. This attention is quite a tribute to a highly novel flower. Bulbs are winter dormant and are of easy culture. The *A. ambigua* used as seed parent is a particularly lovely form collected by the hybridizer in Cuenca del Cuenca, Ecuador.

Amaryllis x 'Mananita'. This product of selection from four chartreuse to yellow species is a four flowered hybrid of small pure light yellow trumpets. 'Mananita' rhymes with 'Seniorita' (the late Ira Nelson hybrid of *A. evansiae* x *A. striata*) and is a word used in our continent to denote break of day. 'Mananita' has been highly fertile with several species and hybrids and it could easily lead to seed production of small sturdy garden hybrids in the yellowish color group. Plants are quite vigorous, easy to bloom and the charming flowers are instantly appealing to the novice as well as the experienced hybridizer.

A. fosteri x A. traubii forma doraniana. This is a cross that should be repeated at every opportunity. Mr. Doran sent a half dozen or so of blooming sized bulbs to me (Doran H32) and they were in bloom off and on all summer. Scapes bore 3 to 5 flowers each and clones are of two color groups: pink and scarlet. While the hybridizer seems to favor the pink flowering clones, I truly prefer what happens to be in bloom at the moment. All flowers are attractive and are among the

most long lasting and heat resistant I have bloomed. The hybrids exhibit typical reduced fertility, but I have a few seedlings coming along. It may also have limited self fertility. Bulbs become fairly large and the foliage is quite attractive. While both parents have rather tall scapes, all of these hybrids have very short scapes. This may change when established.

A. fosteri x A. parodii. Bulbs of this hybrid bloomed in mid and late summer and caught me napping. Without foliage, I presumed the first was another *fosteri/traubii.* When the pale buds grew longer and longer, I checked the label. My excitement grew longer too! Doran K12 (bulb less than 2″) had eight flowers with exerted stamens. This was expected. The color, French Rose or Shell Pink, I did not expect. When I wrote to ask what particular clone of *parodii* was used, the reply was "collected pollen from habitat near Oja de Agua, Argentina." To me, this hybrid opened a whole new book on hybridizing with *parodii.* Clones of this species range from chartreuse to pale yellow - some isolated few have a slight perfume. The species has mainly been used to hybridize for yellows and to increase floret number. Or, to induce trumpet shape. Recessive color genes in *A. evansiae* and other similarly colored species frequently give an unwanted tinge of color to hybrids - rarely a smooth clear tint such as in Doran K12. The two clones that bloomed also gave a graceful, balanced bouquet of flowers: a fairly short scape with no flower droop. Older bulbs may have up to a dozen pink flowers.

CONTINUING QUEST FOR LARGE YELLOW FLOWERING AMARYLLIS

C. D. Cothran, *1733 N. Gibbs St., Pomona, California 91767*

The story of the prior work that has been done to obtain a large, yellow-flowering amaryllis was detailed in PLANT LIFE 1980, pages 19-22. At the time that was written eight siblings of the 591 cross had bloomed, and 591-4 was considered good enough to register and name. The name 'Yellow Pioneer' was suggested by Dr. Traub in one of his communications to me, and it seemed so fitting that I asked him if I might use it. The name describes the flower, not a finished product by any means, but sturdy, and awaiting several more generations to give it the sophistication needed to make it a lasting clone.

Seventeen flowers of the cross have now bloomed. The last nine siblings produced no surprise over what was found in the first eight that bloomed. The entire group has a strong family resemblance, but differ in quite a few details from each other. A *Royal Horticultural Society Colour Chart* was obtained, and as the flowers bloomed their color was compared with the chart. Most of them were found to be 154-C which is called *chartreuse yellow.* It has a slightly greater intensity of color than 154-D, the color found for two other members of the group. *A. evansiae* matched 154-D when the flower was at full

maturity, as did also the hybrid (EAxE) x (EAxE), the latter being one of the progenitors of the 591 group.

The texture of the flowers of several of the 591 siblings was such as to make the color seem a more intense yellow. However, when compared with the chart very closely the color was not intense enough to match the next color chip. The texture did seem to be desirable, however, and crosses were made to try and secure it.

Not any of the flowers exceeded 8 inches in diameter, most of them 6-7 inches. Only two had four flowers per scape, the rest three and two. The scapes varied from 12 to 22 inches tall, and from thin as *A. evansiae* to thick similar to the Dutch hybrids.

When 591-1 first bloomed in February of 1977 one of the flowers was selfed, produced seed, and in February 1980 the first bulb bloomed. It produced 3 flowers per scape, slightly larger than seven inches in diameter, relatively flat, well imbricated, and chartreuse yellow in color. There was no trace of red or pink in the flower at any time. It should be a better flower when the bulb gets larger. Also, there are several siblings yet to bloom.

Last September I obtained several plants from Dr. Cage at Yuba City, California. Most of them were his own originations. One that he had named 'Irish Summer' opened quite a strong greenish yellow, and then gradually faded to white. It is a large flower, very nicely formed. Because of its greenish yellow color on opening, I used it extensively on the 591 group, and then made reciprocal pollinations on it. All of the 591 group set seeds, but after an agonizingly long time all of the pods on Irish Summer aborted. Two other plants were also used, Cage Lime A, and Cage Lime B, both similar to 'Irish Summer'. Again the 591 group set seeds from their pollen, but the reciprocals aborted. One pod of Cage Lime B did set some seed, but since all other pollinations failed, this one could be a self. The pod was small, and the seeds few and poor.

Several years ago a cross was made with *A. papilio* and *A. evansiae,* the latter being the seed parent. When these bloomed they were somewhat larger that *A. evansiae*, but more yellow, almost a gold, and with heavy red markings after the fashion of *A. papilio.*

THE MIYAKI HYBRID AMARYLLIS

C. D. Cothran, *1733 N. Gibbs Street, Pomona, California 91767*

Mr. Isamu Miyaki of Japan wrote an article on *Amaryllis* in the 1979 PLANT LIFE (pages 73-75), wherein he discusses Japanese Amaryllis hybrids as a whole, and then describes a strain that he has developed which has six to eight flowers per scape, and is tall and vigorous. At the end of his article Mr. Miyaki noted that he wished to exchange material with other society members. Mr. Martin Orenstein of Pacific Palisades contacted Mr. Miyaki and together they suggested that I give them some of the yellow material that I have in exchange for

some of the multi-flowered bulbs. This was agreeable to me.

On April 1 the UPS delivery service brought a package to me which contained fifteen bulbs. They had been shipped by air to Dr. Orenstein who then forwarded them to me. They were huge bulbs, as much *as fourteen and one half inches in circumference,* plump and in good condition. Quite a few had a scape and foliage just started. The bulbs were immediately potted, and advanced rapidly because of the warm weather prevailing at that time. This rapid advance was partly at the expense of the roots which did not develop much, the bulbs rocking in the pots even as the flowers began to show.

As the bulbs started to bloom it became apparent that the bulbs had been thoroughly mixed as far as the color notations were concerned. However since the bulbs were not named, the mixed color notations did not matter. As the flowers opened they were compared with color chips of the *Royal Horticultural Society Colour Chart.* This is not exact, rather the personal feelings of the person making the comparison. Four of the flowers were white, *one very exceptional for its whiteness and size.* Then Cardinal red, Union Jack Red, Spinel Red, Magenta, Mandarin Red, Rowan Berry, Dutch Vermillion, and Vermillion Red.

Each of the bulbs had two flower scapes, and *one bulb had three scapes.* One of the whites had eight flowers for each of its two scapes, blooming two flowers at a time. Another two bulbs had six flowers per scape, three had four flowers per scape, two had three flowers, and two had two flowers per scape. Most of the flowers were small, six to seven inches in diameter. However, *one of the whites had four flowers nine inches in diameter, and of exceptional whiteness.* I think the fact that the bulbs had almost no roots prior to blooming contributed to the small size of the flowers. By the latter part of August the bulbs were just getting their roots, and starting to grow in a normal manner. Undoubtedly the shipping and the change in climate upset them a great deal.

The colors of the Japanese flowers are very clear and good. Some of the colors are somewhat unusual as compared to the Dutch hybrids we normally see. Because the bulbs had no time to get established no pollinations were attempted, but next year seed should be available for distribution to those interested. Mr. Miyaki has made a good contribution to *Amaryllis* hybridizing. Reciprocal crosses were made with the 591 members, but only those with the 591 as seed parent succeeded, and those not well. However, some plants were obtained, and are presently growing. It would be nice to bring the almost gold color to the 591 line, but it could also be difficult to eliminate the red of *A. papilio.*

A plant of *A. nelsonii* bloomed for me the first time this year, and since it is not self fertile, I used its pollen to cross both the 591 line, and also the older 339 line (parents of 591). Both set seed, and plants are now growing. There is quite a bit of yellow in *A. nelsonii,* and I am trying to get as much yellow into one line as I can.

A cross of *A. evansiae* and *A. neoleopoldii* has bloomed, but it was not very yellow, and I was crowded, so nothing was done with it this year. If time and space are available, work will be done with it next

year. Also, the same goes for several crosses of *A. parodii.* The yellow in the *A. parodii* crosses is good, but the trumpet shape, rather small flower does not presently fit into the plan.

At the end of last years article on this subject, readers were invited to send suggestions for continuing work on the yellow flower. A number were received. Among the suggestions was irradiation, use of a green flower, self the flower repeatedly, and plant a million seeds (as per Luther Burbank) and from this vast progeny pick the flower you have dreamed of. Selfing quickly leads to sterility, seeds have been sent to others to irradiate, and the city lot will not accomodate a million plants. It seems that I will have to continue stumbling along with my present plan.

BREEDING HYBRID AMARYLLIS IN HAWAII

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Amaryllis grows very easily in Hawaii with little care, either in pots or in the ground.

For Christmas in 1976 I was sent two Hybrid *Amaryllis* bulbs, one pink striped on white, probably 'Apple Blossom' and one a strong red. I crossed the two and got good seed which grew quickly in a flat. In April I transferred the seedlings to the open red alluvial soil where they grew vigorously for two years. They flowered in the summer of 1979. On Sept. 7th I dug the bulbs and dried the bare-rooted bulbs in the open shade until all green disappeared. Then the offshoots were removed from the big fat bulbs and stored under the eaves of the toolshed until March.

On March 1st 1980 sixty-five of the large bulbs were planted in two rows in the garden in well composted soil and 25 days later we had the first bloom. The bulbs were numbered and records kept. The flowers were enormous and were various shades of coral red. A very unusual color from pinkish to lavenderish. I tried to self the ones with tendancy toward blue but no luck. They must be mules. Next year I will try *crossing* the ones with lavender flushing. I must note that one bulb produced *three* flower-stalks with a total of eight blossoms, brilliant red.

There are ninety of the smaller bulbs still growing vigorously but no blooms. Next year we will see what comes of them.

POLLINATION MECHANISM AND HYBRIDIZATIONS IN AMARYLLIS *

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INTRODUCTION

Hybrid *Amaryllis* are very popular cut flowers in India, and are in great demand. Most of the new cultivars came from Dutch and American sources (Narain and Khoshoo, 2). But no systematic attempt has been made in India to raise our own hybrids except by the Late Mr. S. Percy Lancaster (Percy Lancaster, 3). In this Laboratory, attempts have been made to hybridize garden cultivars in order to raise large, double flowered and new colour combinations with more flowers per spike.

MATERIAL AND METHODS

Under Lucknow conditions, flowering season in *Amaryllis* starts from middle of February and conditions up to the end of April and *A. reticulata* flowers as late as August. The floral bud development takes place while the buds together with the scape are hidden underground within the bulb. Nearly a day prior to anthesis the flower is wide open which remains so, for the next 4-6 days. Dehiscence occurs between 8.0 to 10.0 AM through longitudinal splitting of the anthers and stigma becomes receptive 12 to 24 hours later and by 10.0 AM or at the most 3.0 PM next day as indicated by bright shining secretion of sugary fluid on the stigma. At maturity, the style and the stigma point upwards.

Pollen grains are relatively heavy and not carried by wind. In nature, not only the bright colour of the flowers but the presence of nectar and fragrance of the flowers are important to attract insects (and possibly humming birds in their native habitats, (see Traub, 4). Protandry helps in cross pollination by insects.

There are self-sterile and self-fertile taxa in the genus. Wherever, chromosome numbers are known, the self-sterile taxa are more often diploid (*A. belladonna, A. traubii, A. fosteri, A. calyptrata* etc.) while the self-fertile types are polyploid. However, diploid *A. barreirasa* is self-fertile. Further, while diploid taxa like *A. vittata* and *A. belladonna* set seed freely under Lucknow conditions, the species like *A. stylosa* and *A. reticulata* do not set seed unless sufficient pollen is applied. Seed setting has never been observed in triploid and some diploid and tetraploid hybrid cultivars, even after hand pollinations.

Flower colours were noted with the help of Horticultural colour charts issued by the British Colour Council in collaboration with the Royal Horticultural Society, London.

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* N.B.R.I. Research Publication No. 72 (N.S.).

RESULTS AND DISCUSSION

Nearly 184 crosses were attempted and about 200 hybrid seedlings could be raised out of which only 7 hybrid combinations appeared to be desirable.

The selections were made with the specific objective of increasing colour diversity, increased depth of colours and producing large, open faced, early and late blooming clones and double flowered types. Short descriptions of each selected type are presented as follows.

Fig. 34. Large compressed type **Amaryllis** hybrid (cv. 8 **X** cv. **16**, **2n** = 44).

Large flowered hybrids: Size, undoubtedly plays an important part in the selection of new types. In the present investigation attempts have been made to improve size in some small flowered but

otherwise desirable cultivars (cvs. 16, 21 and 25) by crossing them with large-flowered cultivars like cvs. 8 and 9. A substantial success has been achieved in this direction. A few are described below.

In a cross between cv. 8 (4x) cv. 16 (4x) 4 seedlings producing 4-6 large and compressed flowers were obtained. Flowers were 18-20 cm across (Fig. 34). The colour of the flower has dutch vermilion (717/1) and white with marked green throat at the base. There were 6-8 dark self coloured veins radiating lengthwise over the perianth lobes. Morphologically, all the hybrid seedlings fall very near to cv. 8, particularly in the shape of flower.

Four hybrids producing large and Belladonna type flowers have been raised from a successful combination involving cv. 9 (4x) cv. 25 (4x). Plants usually produce 1-2 tall (50-55 cm high) scapes with 4-5 flowers. Flowers were bicoloured being scarlet (19/1) and white with marked green throat. Individual flower was large (19.0 cm across), flat with 6 oblong (10.0 cm long and 4-6.5 cm broad) perianth lobes.

Fig. 35. Multiflorous type **Amaryllis** hybrid (cv. 80 X cv. 35, 2n = 44).

One seedling producing beautiful Leopoldii type flowers has been raised from a cross between cv. 8 (4x) X cv. 25 (4x). This hybrid has produced 2 tall (about 50.0 cm high) scapes with 4-5 currant red (821/2) flowers. The individual flower was large (18.0 cm across) and open faced with wide (6.0 cm broad) and obovate perianth.

Hybrids raised from a cross involving cv. 21 (4x) X 9 (4x) are particularly outstanding as they produce 4-5 large (16-18 cm across) and striped (crimson 22/2) flowers in a scape.

In another combination cv. 8 (4x) X cv. 21 (4x), 2 hybrids producing 4-5 large and open faced (14-16 cm across) flowers were raised.

Flowers were white with 6-8 dark scarlet (19/1) coloured veins spread lengthwise over the perianth. Perianth was wide (4.0 - 6.0 cm broad) with leathery appearance.

Fig. 36. Semi-double type (Note Styles have modified into perianth like structures, cv. 5 X cv. 'Firefly', 2n = 22).

Multiflora hybrids: One of the dreams of the florist is to increase the number of flowers per spike in *Amaryllis* without affecting flower size. One such promising hybrid was raised from a cross between cv. 80 (4x) X cv. 35 (4x). There were usually two flowering scapes in a season 1-1 one bore 6 and other 5 beautiful flowers (Fig. 35). The flowers were large (13.0 cm across) dutch vermilion (717/2) and show marked Leopoldii influence. Outer perianth was about two times broader (8.0 cm broad) than the inner (4.5 cm), the surface of the perianth was rough and leathery, but shining.

Double flowered hybrid: In recent years a considerable interest has arisen in the development of double *Amaryllis*. In the literature (McCann., 1) only two varieties have been recorded to be double, namely, *A. reginae* Linn. var. *albertii* (Lem.) and *A. belladonna* Linn. var. *plena* (Herb.) Traub and Moldenke. However, the later seems to have been lost as it is not known in the present day cultivation. But *A. reginae* var. *albertii* is still popular in American gardens (Traub, 4).

With a view to raise double types cv. 'Firefly' (a semi-double variety) was used in several combinations. However, only 15 seeds from a successful combination using cv. 5 (2x) X cv. 'Firefly' (2x), could be obtained. Out of the total 15 seeds, only 11 have germinated but 8 reached maturity and flowered. Morphologically, all the 'F_1' hybrid seedlings were very vigrous producing 4-6 dark green 3.5 cm broad and 35.0 cm long leaves. Scapes were 45-55 cm tall with 2-3 beautiful flowers each. Flowers were bell-shaped (9.0 cm across) and crimson (22/7) with more deeper veins radiating toward the apex. The base of the flowers was green but white upward. Out of 8 seedlings, 7 bore single flower which in the remaining one flower was semi-double. In this seedling, 3 styles were modified into perianth like structure with stigma attached on the apex (Fig. 36). Sexually, this form is both male and female sterile but offers a noteworthy characteristic of easy propagation by bulblets. The plants spread rapidly through daughter bulblets which are produced very freely, in many cases whenever they are grown in well drained sandy soils.

Since limited success has been obtained in raising *Amaryllis* hybrids, the cytotaxonomic implications of these results must wait till many more crosses are made involving more species in several directions.

SUMMARY

In the present work the pollination mechanism and breeding behavior of garden cultivars of *Amaryllis* have been worked out. Further, with a view to obtaining novelties in *Amaryllis*, about 200 F_1 hybrid seedlings involving a number of garden cultivars were raised, out of which only 7 were found to be promising. These are 5 large flowered,—one multiflora and one semi-double flowered type. All these hybrids have been assessed for horticultural characteristics.

ACKNOWLEDGEMENTS

The author is grateful to Dr. T. N. Khoshoo, Director, National Botanical Research Institute, Lucknow for guidance and encouragements and to Mr. T. K. Sharma, for illustrations.

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Editor's Mail Bags—continued from page 31.

callis species. However, it has to be realized that such a technique has not as yet been perfected for the higher living organisms, the *Eucaryotae.* So far such experiments have been carried out only with the lower living organisms, the *Procaryotae* (For descriptions of these two kinds of organisms, see Traub, *Lineagics,* 1964, pp. 82-85.).

It would appear that species of *Hemerocallis* and *Alstroemeria* would be ideal material for working out the biological engineering technique for the *Eucaryotae.* Workers interested in such a project should contact the Editor, 2678 Prestwick Court, La Jolla, Calif. 92037, who would make arrangements for providing such experimental material.

Mr. Frederick C. Boutin, formerly of Huntington Gardens, had volunteered to construct indices of HERBERTIA and PLANT LIFE, but he has recently taken up a position elsewhere, and the job of making the indices is again open for volunteers who have the leisure time and inclination for such a labor of love in providing these urgently needed indices. The Society will furnish the index cards needed for the making of the indices. Volunteers interested in composing the indices should write to the Editor, Dr. Hamilton P. Traub, 2678 Prestwick Court, La Jolla, Calif. 92037.

Mr. Charles Cunningham, 410 Weaver Drive, Nashville, Tenn. 37217, is in need of information about the availability of the best large-flowering Dutch Hybrid *Amaryllis* clones in the following named colors: *(1)* Deep dark red, bright red, scarlet; *(2)* Light, medium and dark pink; *(3)* Best large white (producing several flowers to the scape); and best fragrant all white; *(4)* Best Bright orange, medium and light; *(5)* Best deep red with white center; *(6)* Best deep orange with white star; *(6)* and best picotee. He also wants to know if there are any fragrant colored hybrid *Amaryllis* clones, other than the whites. It is hoped that members will help Mr. Cunningham.

A SCENTED CLIVIA. In Vol. 105 (Part II), Nov. 1980, The Garden (Jour. Roy. Hort. Soc.), page 453, E. F. Allen, Copdock, Suffolk, England, reports on a *scented Clivia miniata* obtained in a single seedling plant due to the chance dominance of the apparently *recessive gene* or *genes* for scented flowers. All will be interested in breeding for scented flowers in other members of the Genus *Clivia,* and the related Genus *Choananthus.*

Fig. 37. "Haysper" is a large white **Lycoris** Hybrid. It was selected as the best from a number of **Lycoris haywardii** x L.

1980 LYCORIS REPORT

SAM CALDWELL
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One of the nice things about my lycoris hybridizing hobby is that it started a long time ago—in 1954 to be exact. Over more than a quarter century I've never had a seedling to flower in less than five years and one didn't bloom until 12 years old! Had I known about that in the beginning it would have been discouraging. But I just kept making more crosses every year, getting young bulblets started and helping them grow up. After the first hybrid flowered in 1961 I was never conscious of the long seed-to-bloom delay because something of interest was popping up in the lycoris "nursery" every year. And that's the way it is now.

Older readers of PLANT LIFE may recall my occasional reports of progress in this work. While I've contributed notes on other phases of lycoris culture in recent years, no accounts of hybridization results have been published since my "1970 Lycoris Report" PLANT LIFE (1972). During the past decade several things have appeared that I hope may be of interest to other fanciers of these fascinating bulb flowers.

In the descriptions that follow I am unable to supply definite information about hardiness of the new hybrids. That's because I start seed in pots in a greenhouse, then shift two- or three-year-old bulblets to ground in cold frames where they grow on to blooming size. The cold-frames are protected by plastic covered sash in winter which help shield lycoris leaves from damage. As bulb stocks increase I do test them by transplanting some outside to protected garden spots for observation over several years. Thus far there are just not enough bulbs of these new selections to risk outside the nursery frames. I will, however, list their foliage habits which give clues to probable hardiness.

"Fall foliage" lycorises, of which well known *L. radiata* is typical, send up leaves in September or October, then grow all winter and do not die away until mid or late spring of the following year. And while some species can tolerate a surprising amount of freezing, the habit of keeping green, growing leaf blades through the entire winter precludes their culture very far north.

"Spring foliage" kinds—*L. squamigera* is best known—do not actually wait until spring to push up leaves; in my Upper South area most of them start sometime in February, but they, too, die down by late spring. It is a shorter foliage cycle and it misses much of the coldest winter weather. Thus these lycorises usually prove fairly hardy.

Some of the new selections are growing under coined names and numbers, but if they continue to perform well and propagate satisfactorily I'll register them with permanent names. I made all the photographs in my Nashville plantings.

A NEW WHITE

As early as 1958 I began using pollen of the big yellow flowered lycoris from China that we call 'L. Sperryi,' after "discovering" it in a local garden (see "A Hardy Golden Lycoris," HERBERTIA 1958). It is quite fertile and crosses readily with other fertile species. One of the first crosses was on *L. Haywardii,* which has pinkish flowers with segments tipped blue. As seedlings grew I envisioned marvelous flowers blending pink, blue and yellow of the parents. But first bloom in 1964 and more in following years brought disappointment. While a little color is evident in the bud and early opening stages, when fully open

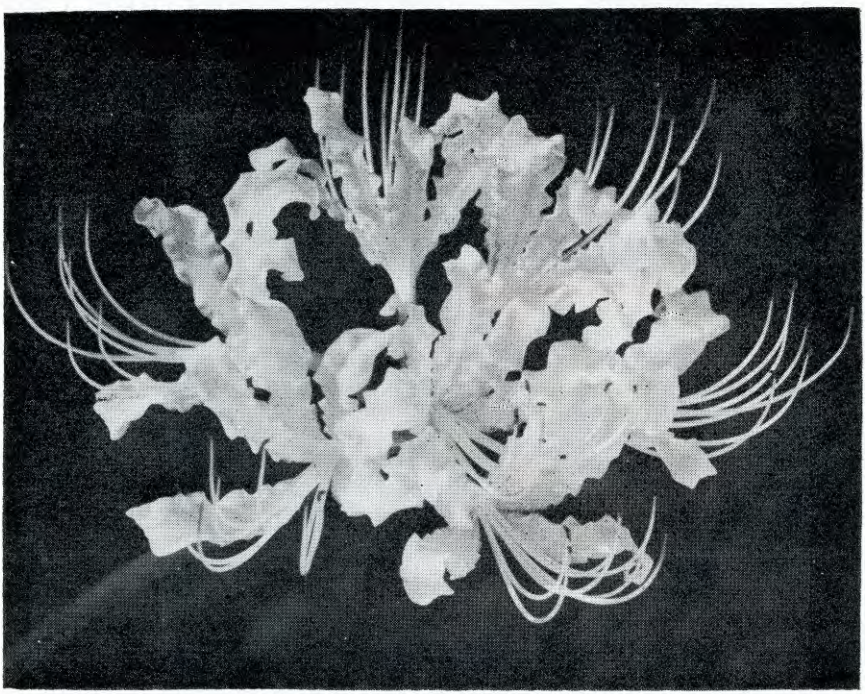

Fig. 38. Soft yellow color and fine flower form distinguish **Lycoris** "Sperad" 1, a hybrid between yellow and red species.

they are for all practical purposes simply white flowers. That isn't too bad, of course, but many have narrow segments and long pedicels, resulting in large, loose umbels. Admittedly these sometimes exhibit an appealing airy grace, but in general I prefer lycoris umbels to be compact, with wide-segmented flowers arranged in a symmetrical radial pattern.

Variations usually occur among hybrid seedlings and I continued making this *Haywardii*-"Sperryi" cross. Just three years ago one flowered that struck me as being very good, so it became Haysper 1

(Figure 37). It has bloomed well each year; in fact, this year there were three scapes in mid August. They run mostly 18 to 20″ tall with six flowers to the umbel. Flowers measure about 3¼″ across with segments up to 9/16″ wide and the entire umbel 8″ across. Early ivory white coloring becomes dazzling snow white in the sun. The photograph shows form well; readers with a file of PLANT LIFE may wish to look back at pictures of earlier seedlings of this cross, page 104 in the 1965

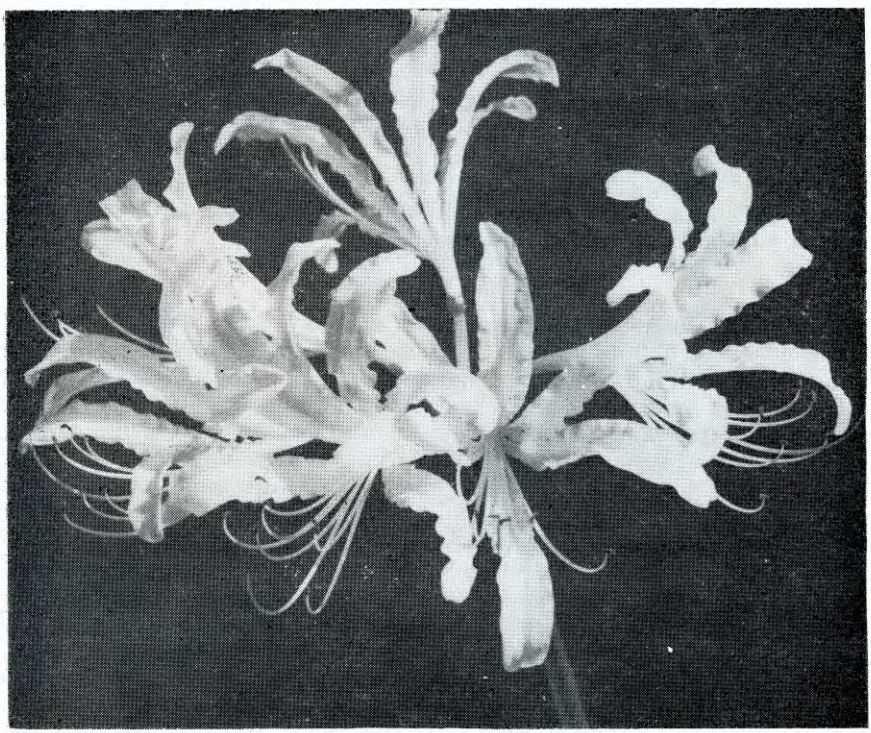

Fig. 39. This large pale-yellow **Lycoris** of uncertain ancestry is appropriately named "Moonlight".

issue and 80 in that of 1972. I hope they'll agree the current selection is an improvement. Incidentally it is a spring foliage type and is fertile.

FIRST CHOICE

My favorite of the new hybrids is Sperad 1 (Fig. 38). Once more the yellow "L. Sperryi" is involved as a parent, this time with a fertile strain of red *L. radiata.* I've made the cross many times, using either species as seed parent, and always get beautiful "children," almost uniform in appearance. All have the nearly perfect form shown in

the picture. Again there is no blending of parents' colors; a few seedlings come creamy or whitish but the majority, including Sperad 1, are soft yellow.

This is not a large lycoris; scapes average about 19″ tall, and umbels some 6″ across carry six or seven flowers, sometimes fewer. Individual flowers measure 2½″ across with heavily ruffled segments about 3/8″ wide.

Unfortunately, natural increase of the bulbs is very, very slow and they belong to the fall foliage class. However, if they can be propagated in quantity by the new tissue culture method, I believe they will become as popular in mild-winter areas as *L. radiata,* the South's widely grown "red spiderlilies."

After pollinating flowers of the "Sperryi"-*radiata* cross for several years with negative results I assumed that this is a sterile hybrid. But there were two scapes on Sperad 1 in 1979 and one of them matured two large, sound seeds, apparently to bee pollination. After planting, one seed germinated and there is now a nice little bulblet which will be watched with interest.

HAPPY ACCIDENT

While I include L. 'Moonlight' (Fig. 39) with the new hybrids, it is not a result of planned crossing but just a chance seedling for which I have no adequate explanation. In one of my coldframes a row of ten bulbs grew, all started back in 1964 from what I thought were self-pollinated seeds of "L. Sperryi." As they started flowering there were the usual orange-yellow blooms typical of the species. But five or six years ago I noticed in the row two flowers somewhat different in form and very different in color from "Sperryi." The two were identical in color—a pale, creamy yellow. One had segments so narrow that there was very little flower to look at but the other really "stood out." After observing that it was blooming consistently with nice big flowers every year, I decided in 1979 to name it 'Moonlight,' suggested by its color.

Scapes about 19″ tall bear mostly six-flowered umbels spreading to 8¼″ across. Flowers are 3⅝″ across with segments up to 9/16″ wide. Like "Sperryi" it makes spring foliage, indicating at least moderate hardiness. Thus far it has produced no seed, while "Sperryi" is fertile.

Over the years I have crossed "L. Sperryi" with all the other fertile lycorises in my plantings and have never got anything resembling 'Moonlight,' so it seems unlikely that this is a chance hybrid for which I may thank the bees. Meanwhile I can enjoy it without knowing how to account for it.

FOR THE RECORD

I report the cross of *L. radiata* and *L. sanguinea* merely to satisfy anyone's curiosity about what a hybrid of this parentage looks like. The flower isn't bad but will not create much excitement among gardeners. The cross had been previously reported from Japan ("Lycoris Hybrids made in Japan", PLANT LIFE 1963).

Lycoris sanguinea—at least the commercially supplied bulbs that I have under that label—is not in my opinion particularly impressive. There are usually only three or four small flowers to the scape, very plain, reddish orange in color and prone to fading. It does have two good characteristics—hardiness and great fertility. *L. radiata,* seen so often in southern gardens, is considered "common" but still beautiful.

Fig. 40. Except for deeper red coloring, this **Lycoris radiata** x **L. sanguinea** flower looks much like the pollen parent.

I first crossed the two in 1968, with fertile *radiata* as seed parent. Resulting seedlings grew along for years, never very vigorous but a few still surviving. In August, 1979 the first scape appeared (Fig. 40), 13″ tall with an umbel 5½″ across made up of five small, neatly tailored flowers of reddish tan color, deeply shaded toward the center. Flowers are 2″ across and segments ¼″ wide. Flower form is very similar to that of the pollen parent, *L. sanguinea,* except for longer exerted stamens and style. The only other traits inherited from *L. radiata* are deeper red coloring and fall-growing leaves; *sanguinea* is a spring foliage species.

A LYCORIS AUREA HYBRID

During World War II I was stationed for three years at an army camp near St. Augustine, Florida and became well acquainted with that ancient city's famous "hurricane lilies," *L. aurea*. Naturally at war's end I brought bulbs home and have had them ever since. I soon learned that they take no frost at all without damage and so have had to grow them in pots or boxes kept over winters in my small greenhouse. Incidentally, they are the only species I've ever had to bloom very well under container culture. Others grow in pots and make plenty of leaves for me but seldom bloom.

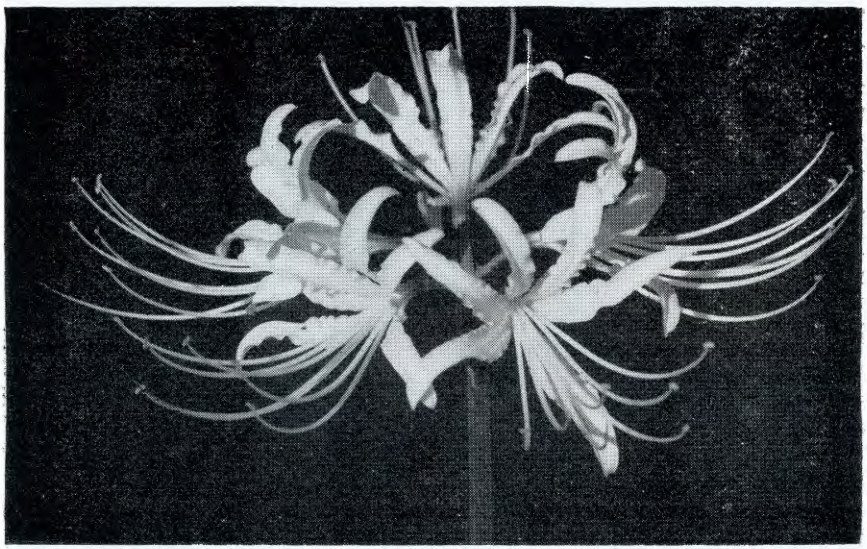

Fig. 41. This **Lycoris aurea** x **L. radiata** flower supports the theory that **L. albiflora** resulted from a similar cross.

In August of 1967 while my fertile strain of *L. radiata* was blooming I gathered pollen, put it in a jar with silica gel and stored it in the refrigerator. Six weeks later *aureas* in the greenhouse were flowering, so I applied the *radiata* pollen. A few seeds resulted which were planted, and eventually there were two small seedlings. Because of their very tender seed parent I felt it best to keep them in the greenhouse, so they were set in a pot and grew slowly. Years passed and they became a sort of greenhouse fixture, transplanted infrequently into larger pots. They also were neglected somewhat during this period. Long before reaching blooming size each seedling made numerous offsets, and I had clumps of bulbs rather than single seedlings.

In the fall of 1977 I turned all the bulbs out and separated them; there were about 20, half of them up to 1¼″ diameter. I gave some away to friends living in very mild climates and planted the rest in a

deep box in the greenhouse. In September, two years later, my reward was the scape shown in Fig. 41. It was 19″ tall and the five flowers with long extending parts made an umbel 8¼″ across. Flowers were 3″ across and segments up to 3/8″ wide. Flowers opened tinted slightly yellow and quickly faded to ivory white with faint pink flushes at segment margins.

Actually this is a pretty lycoris which might be important but for the fact that some of the bulbs we've been getting from Japan for years as *L. albiflora* give flowers that look almost exactly like it, and some are considerably better. The most significant thing that this hybrid does is lend credence to the theory that *L. albiflora* resulted from a natural cross of *L. aurea* and *L. radiata.* (See "Lycoris Hybrids Reported from Japan," PLANT LIFE 1964. It is possible that the "*L. aurea*" used in the Japanese cross was actually *L. traubii.*)

With the flowering of this hybrid I have now crossed *L. radiata* with all of the four known species of yellow lycorises having the "spider-lily" form—*L. aurea, L. chinensis,* "L. Sperryi" and *L. traubii.* (A *radiata-chinensis* cross was made earlier—in 1950—by Dr. John Creech.) The current cross with *aurea* and the *radiata-traubii* cross most closely resemble the *albifloras* in my collection in bloom season, foliage and flower.

(In material above I have frequently used the term, "fertile *L. radiata,*" which perhaps deserves explanation. The *L. radiata* in yards and gardens all over the South is *not* fertile and is therefore useless in hybridizing. At least that is the normal experience; if someone has proved otherwise I would like to hear about it. Although still a bit rare, there are two, and possibly more, fertile forms of *radiata* in this country. They look much like the common ones except for having smaller flowers, and they bloom earlier. They are what the lycoris breeder needs.)

MISCELLANEOUS NOTES

The most discouraging factor ever to affect my long-time interest in lycorises has been the invasion of my plantings during the last four or five years by narcissus bulb flies. It is the large narcissus fly, *Lampetia equestris,* and its attacks in some cases have been devastating. From three bulbs of the beautiful white *L. houdyshelii,* fresh from China and sent to me in 1948 by the late Wyndham Hayward, I had accumulated by natural increase a substantial stock. Now at least three-fourths of them are gone. The big yellow "L. Sperryi," which I have propagated by seed since 1958—with never a seedling blooming in less than eight years—was becoming fairly plentiful until the flies arrived. This year I had 11 scapes. Some promising hybrid seedlings have been wiped out completely.

On a happier note is news that U.S.D.A. Agricultural Research people are now working with lycorises, particularly at the Plant Introduction Station in Glenn Dale, Maryland. There has been sporadic interest in this genus at the station dating back to the 1940s when the late B. Y. Morrison was there. Notable was the acquisition in 1948 from the Nanking, China, Botanic Garden of bulbs that later were

named a new species—the fine hardy yellow *L. chinensis*. Since then their plant explorers collecting in Japan and Korea have often brought back native lycorises.

Currently Mrs. Margot Williams, Horticulturist with the U. S. National Arboretum stationed at Glenn Dale, is actively working with these plants. Her articles in the 1980 PLANT LIFE on tissue culture and shortening the seed-to-bloom interval in lycorises are important. My let-nature-take-its-course method for growing seedlings took 12 years to get a flower on the *L. aurea* X *L. radiata* described previously. Her way of handling the same cross produced a bloom in 27 months!

Mrs. Williams flew down to Nashville in early August this year and we spent three days looking at things then flowering and covering the rest of the season with my color slides. She collected pollen and took copious notes, and we discussed just about everything pertaining to the lycoris genus. It was a delightful experience. Now we have exchanged various bulbs and she is experimenting with tissue culture propagation of some of the new hybrids described in this article.

Finally I'll include an update on my story in the 1979 PLANT LIFE about *L. squamigera* seed. In 1976 and '77 I found that I could get seeds on this supposedly sterile lycoris by applying pollen from *L. chinensis*. The problem was that although some of the seeds germinated, all of the bulblets decayed shortly afterward.

Of course I planned further efforts, but these were blocked when not a single bloom came on *L. chinensis* in 1978 or 1979. So it was exciting to see a *chinensis* bud pushing out of the ground in July of this year. My *squamigeras* were starting to bloom, and altogether I applied *chinensis* pollen to most of the flowers on about 80 scapes. I also mailed pollen to Mrs. Williams.

It was a terrible season for lycoris seed production. We had temperatures in the high nineties and up to 104 degrees, with no rainfall for weeks on end. Most of the *L. squamigera* scapes dried up and fell over, as they did on other species. By going all over my place in September I found four scapes still showing a bit of life and from them I got exactly five seeds—not as plump and shiny as those three years ago but apparently sound.

I planted them by just pressing them into the surface of moist sphagnum moss in a pot which was then covered with glass. This is a technique recommended by Mrs. Williams which I had used successfully with all my lycoris seed last year. As an added precaution the moss had been moistened with a solution of the fungicide Benlate. A month later I was elated to see four of the seeds germinated, but at this writing one is showing signs of decay. Perhaps this will be just another sad episode in the floral saga entitled, "Will the Squamigera-Chinensis Marriage Ever Be Blessed with Children?"

Meanwhile from Maryland Mrs. Williams writes that she used the *L. chinensis* pollen I sent on *L. squamigera* and by coincidence she also harvested five seeds. But with laboratory facilities there at the Plant Introduction Station she has started them under aseptic culture. Stay tuned. There may be test tube babies in the offing. This story could have a happy ending.

4. AMARYLLID CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

NORTH MIDLAND AMARYLLID REPORT—1980

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This year of 1980 has had its share of good things. We were spared the worst of the cyclonic winds, the hail did little damage except to the foliage of the *Paramongaia weberbaueri* which was broken, and its beautiful silvergrey color was marred. The heat and drought hit early in the season and set things back and required much watering to keep plants alive; but later the rains came with cool weather in between times so that just about everything came-out looking great in the end this Fall.

The heat and drought were good for the "rainlilies". *Zephyranthes microsyphon (Clint M-30)* grows so differently outdoors whether in pots or in the soil that the house-bloomed ones wouldn't be recognized as the same species. They are so pale pink indoors but outdoors they become a rhodomine purple color. It appears that a breeder should be able to get a rich "purple" from these by careful selection of seedlings. Above all, it is a faithful rebloomer whether indoors or outdoors. My start came from seeds sent by Paul Williams, Jr., and perhaps he'd done some selective work on them before they made their journey North.

Right-now (September) is the season to search for the early buds on *Amaryllis papilio* and *Amaryllis aulica* which first put-up their leafgrowths before budding. Both species are highly valued more for their hybrids than themselves.

Again this year, the most robust seedlings are those which have *Amaryllis papilio* as a pod parent in both x *A. traubii* f. *doraniana* and x *A. fragrantissima*. *Amaryllis papilio* has been found to be dominant in passing along its good growing habits to the following generations but even in the F_1 generation, in some crosses, the mahogany & green color is so masked as not to be known and the orchid-form becomes scarcely discernable which is sometimes a failing in breeding the "spiderforms". I would say that Dr. Carlos Gomez Ruppel's introduction of *Amaryllis papilio* is his finest gift to us other than his wonderful self.

In 1978-79, a number of us were lucky to be included amongst those who received a collection of Amaryllids husbanded thru by Randy Bennett from Seidel of Brazil. None of mine have bloomed yet altho several other letters were received from others who had bloomed them. Fearful of doing the wrong thing, all were promptly potted-up and given two treatments: (1.) half were given considerable water, sunshine and as much warmth as the cool house could muster; (2.) the

other group were given just barest amounts of water, planted deeper in the soil, deprived of direct sunshine. Rot promptly set-in among some of the 1st group which made it appear to me that the treatment of the 2nd group was the best way after all; but this was not true since only a couple of bulbs survived from the 2nd treatment and virus appeared among the bulbs in both of those pots. One pot was dropped upside down over a cold air return and all were lost down it, and two pots failed to come to life strong enough to make it. This was in a cool house but two of the pots which were in the South windows high-up on the top were the best doers although rot set-in there first but basal sprouting took place on most of them so that the pots now *are thick with growth.*

The two pots with a plant showing virus are kept segregated down in the basement so that the disease may not spread to others. Some of these were coded as those imported by Mr. Goedert many years ago and are therefore known to be outstandingly good . . . but virus is in the pot!

Mr. Bennett sent a rare Amaryllid: *Stenomesson incarnatum* which produced a most elegantly formed and delicately colored bloom imaginable. But if I read Dr. Ravenna rightly, he says that they droop. These arched; a 3″ bloom of four to a cluster of smoothly colored light pink with 6 green blotches of color as in *Leucojum,* and promptly shed the spathe-valves so that the blooms nod marvelously, and beckon to be put in a crystal bud-vase. Selfing was tried; and pollen of an *Eucrosia* syn. *Callipsyche* species, which has green, red and yellow firecracker-like blooms with chartreuse flaired ends, was tried, but neither produced anything.

The *Eucrosia* bulbs (these have a definite bulb and are not a fleshy rootstock as in the case of *Stenomesson incarnatum*) failed to bloom outdoors this year because of our unusual rain and heat pattern which was the reverse of normal. Nevertheless, these will now bloom well during the wintertime in storage from a dry bulb. The coolness of the basement lets these bloom for weeks (even months, if enough buds show) and no light is really needed except to give better color. These readily grow on the rocky clay "fill" soil providing that they are given a cushion of peatmoss about the bulbs when planted and with a generous amount of fertilizer applied at the same time. They do much better with good watering and then the leaves stay a good green which is attractive. In shape, the leaves resemble *Allium tricoccum.*

Surprising was the flatness of the bloom from several primary hybrids such as: (1) from Boutin, *Amaryllis papilio x Amaryllis striatia aracensis;* and (2) from Manning, *Amaryllis papilio x Amaryllis espiritensis* (pollen from Boutin's form of this species) which when they bloomed had unusually flat-type blooms with unusually short tepaltubes. There are unbloomed hybrids of Boutin's *Amaryllis espiritensis x Amaryllis evansiae "amber surprise"* and Manning's *Amaryllis traubii x Amaryllis striata aracensis.* These may show whether the flattening characteristic is carried in these two species or whether it is just with these two with *papilio* since *papilio* has never shown this trait in any

other hybrids.

Another pleasant surprise was the prolific blooming habit of *Amaryllis traubii* which gave 9 bloom-stalks for a total of 18 blooms from a 5″ pot. Evidently, the bulbs must reach maturity before doing well. A highly desired hybrid was obtained from *Amaryllis traubii X Amaryllis evansiae X Amaryllis brasiliana.* Mr. Boutin raved about this Cothran's hybrid *(ev. x brasiliana)* when he saw it; later, when his bloomed, he sent pictures (I now have an unbloomed blooming-size bulb from Mr. Cothran) which has whetted the desire to use it in further breeding. Further, also, I am eagerly awaiting the Cothran hybrid *(evansiae x brasiliana),* a great, fragrant lavender trumpet-form with frilled edges and a pleasing scent to grace my window sill as this hybrid rates high with the best of the Doran, Bell, Harshbarger, Boutin and Korsakoff hybrids. In the miniature group, Mr. Boutin and Mr. Cothran both have outstanding hybrids with *Amaryllis evansiae x Amaryllis traubii.* Mr. Boutin's hybrid has bloomed for me and it is darker in color than *A. traubii* although smaller sized. Dr. Bell has a hybrid of *Amaryllis evansiae x Doran's dwarf white belladonna,* which is a good robust grower in this mini-size which has salmon colored blooms. My bulbs came from Prof. Craft and I kept the most unusual one and sent the excess abroad but still have offsets of all three clones. These offset profusely.

Doran's hybrid: *Dwarf white belladonna E 16 #52 T. f. doraniana* is a real mini although it is so robustly vigorous that it makes so many offsets that it is almost impossible to get a mature bulb. The two clones which bloomed here are rather un-alike in size and color although the bulbs can be told apart by the neck on one and its lack on the other clone. Both clones are barely fertile to hybridization and set a barest amount of seed although the #2 clone which has the larger blooms (2-florets) did set seed to pollen of Dr. Bell's *Amaryllis belladonna "Grand Caymen".* The pot holds a single healthy looking specimen of the cross. Up here, the secret learned how to get a response from it was to give this Doran hybrid rich fare, plenty of water (with excessively good drainage), bright south sun and keep to it evergreen. But this is not the secret for another Doran hybrid which is his: *Amaryllis traubii f. doraniana (#52) x Amaryllis doraniae* (#22, his pink trumpet find in N.E. South America) as this is a full 10 years old and has failed to bloom. One sib-bulb will grow and another go dormant in a ring-around-the-rosy sort of way. Why do I mess with this plant!!! One of this same seed crop's siblings has turned-out to be amongst the very finest of all my hybrids and the *finest rose-pink Amaryllis!* When Doran sent the packet of seeds, he wrote that he was interested in getting these out and spread around; so, I will keep on nuturing these plants until they do do something . . . who knows, another maybe its equal? A mini-miniature hybrid in light yellow, Doran's *#E17-1 x aglaiae* (E17-1 is a complex hybrid) which is rather hard to handle after the offsets get to mature bulb size). But after that, it has failed to bloom. But I send-out offsets as it is really a mini and in yellow, too. Doran

produced another small yellow trumpet known as "Dresden Yellow" which probably has *EAE/EA X parodii* genetic background (it is a guess) but the lucky thing about it is that seedings with it and *Amaryllis fragrantissima* and another cross *x A. aglaiae* are doing well. I'm especially pleased with the *"Dresden Yellow" x A. fragrantissima* as this will be really gilding the lily *with both yellow and fragrance.* More likely though, these will be lavender bloomed as *Amaryllis parodii* sometimes produces lavender colored trumpets in its hybrids. I'm supposed to have just such a bulb (unbloomed as yet for me) of a charming lavender miniature. Another hybrid which should be in the mini-class is that of *Amaryllis traubii x Amaryllis striata aracensis.* This hybrid was made to get the *aracensis* red throat-ring into *Amaryllis traubii* and if it enlarges itself as it does in some hybrids, it should be an attractive feature. Doug Craft furnished pollen for this. This species: *Amaryllis striata aracensis* has attracted a lot of names to itself for such a small plant. Other names are *A. aracensis,* Manchae, #1836 and #1863; #1836 is an error that got spread abroad. This species was collected in South America by Len Doran on one of his expeditions; but where or when its description was published, no one has written me, but I fail to see it in PLANT LIFE as yet. There is another species with this dark red throat color which is a form of *Amaryllis cybister.* It comes in three varieties: Korsakoff's form which has broader petals but is extra hard to grow; Nelson's pigmented *cybister* and the Doran-Bell-Wilson hybrid form which I have also. Its throat is brilliantly red and it makes a huge bulb and is readily fertile both ways, but it must have outdoor Summer growth to do well later indoors during the Winter's time when it blooms. MARCIA'S is the only known source for the last named form of *Amaryllis cybister.* The bulb which she shipped was a huge beauty. These are being used to increase the "spider" or "orchid" type of *Amaryllis,* and also to give a "red eye" to the bottom of the bloom to lighten it up. Some 10 or more years back, Alex Korsakoff and Sterling S. Harshbarger were in a group team which created a large number of "spiders" as they called them in *Amaryllis evansiae.* These were a selected, huge flowered form with an orchid-like flares to the segs. Whilst they were trying to awake my enthusiasm in these, my interest at that time was mainly in large Dutch-type hybrids and the "pure" species. It wasn't until this year when some hybrids, having *Amaryllis cybister* in their blood lines, that I was aroused to their really different beauty when I saw them for myself. Their muted colors and intriguing forms are pleasingly non-standard therefore adding riches to the genus. But an added virtue to some of us is that they are medium-small to small. The subtility of their colors reminds one of the *Paphiopedilum* orchid in the original species colors. There are stoppers though in the use of *cybister* in breeding work as some crosses will not set, others produce plentiful seed but it mildews rather than sprout or else the seedlings are excessively weak. *Amaryllis evansiae, A. papilio* and *A.* "Dudley's Belladonna" do ripen good viable seeds. *Amaryllis traubii x cybister* mildrewed and so there was failure this time around. Cothran's hybrid: *pink Dutch type x*

"Senorita" X A. cybister requires cultural treatment. When Mr. Cothran sent pollen of this hybrid: *pink Dutch-type x "Senorita"*, he wrote of its beautiful pink color and good growing habits but when used with *Amaryllis traubii* as the pollen parent only a single seedling is surviving. It is 1-½" high with 3 leaves and looks more like a pincushion.

Another area of hybridization has been with *Amaryllis reticulata striatifolia* with some 16 or more lots of seedlings. The sources for the most part are from the handiwork of Dr. Bell, Sterling S. Harshbarger and Manning. The two main breeding plants are Harshbarger's "Papillata" and Manning's *Dutch red x A. ret. st.* A new strong growing hybrid is that from the two parents above which is giving highly interesting looking seedlings of good vigor and rich leaf color. From the beginning, an effort to get richly colored leaves with a bold white stripe has been striven for but so far it has eluded all efforts. Dr. Bell has made a search of the stripe of *Amaryllis reticulata striatifolia* and it can be dominant even to the 3rd generation but once in a while it happens to fail in the F^2 generation even amongst sibs such as *Dutch red x A. ret. st. subbed* did for me. Probably one of the choicest hybrids in this group may be with *Dutch red x ret. st. X Amaryllis fragrantissima.* Mostly large monocot-leaves were produced and about half were striped-leaved. Most of Dr. Bell's hybrids have as a base *Amaryllis evansiae, Korsakoff's hybrids, Amaryllis forgetii* or *A. cybister,* at least amongst the hybrids which I have from his workshop. Others should be encouraged to try their hands at *Dutch hybrids x Amaryllis reticulata striatifolia* as these hybrids are rather rare and decidedly out of the ordinary run-of-the-mill hybrids.

There have been sharp disappointments. The "Rhubarb Hybrids" which are the cross: *Dudley's Belladonna x Amaryllis vittata X A. aulia x A. fosteri.* The seedpod parent was my hybrid with a lusty *A. x johnsonii* look about it in a large dark red trumpet type, and Dr. Bell's pollen was used to rollback the petals, which it did but in the two clones which have bloomed no seed sets have resulted. Of the seven seedlings selected, four had shiny red colored leafblades from which the name is taken; and three have all green leaf blades. Of these, two of the "Rhubarbreds" have bloomed, one in 1979 and one in 1980; but, in all cases, the pollens of *A. striata* and of the *A. belladonna* have been withheld as this was to be a new line in which these were to be left-out. Even in the house, where these "Rhubarbreds" are grown, the leaves are brilliantly colored, and they are lusty growers. Evidently they also are going to need large bulbs to do better, and this may be a part of the reason for failure when four main-bulbs are all planted in one 6" or 7" community pot—the large bulb-size has pushed them up with their haunches's sitting on the pot-rim after the likes of orchids. But I fear to repot to a larger size as I know the utter robustness of the seedpod-parent which really looked like a modern corn plant which blanketed the two South-facing kitchen windows, cutting out the sun. It did have one weakness, I had to set it upstairs where it was much cooler and the

first chill sent rot thru the bulb in jig-time. It should be noted that almost all of the seedlings of the cross: *Dudley's belladonna x #49 vittata*, only one was this robust but most were what Dr. Cage is pleased to call "haploids" which just piddle around. Another disappointment has been the failure to bloom "Harshshiana". This is Mr. S. S. Harshbarger's hybid, *Amaryllis aulica x Amaryllis fragrantissima.* In repotting it this spring time, whilst taking off the old tunics, it was found to have clasped to its last solid bulb scale a partially grown *but dead* bloom-stalk! This is a surprisingly robust grower but it is a modest-sized plant with up to 12 leaves at a time, but the bulb size increases at an agonizingly slow growth rate. Semi-evergreen, retaining part of the "old-fush" of leaves while putting forth the new crop, it needs careful watering the year around. Some of these *A. aulica* produce textures like "watered-silk" in their blooms—something for one to wait for.

There were a number of new seed lots from other *Amaryllis* fans that are in the super choice class of hybrids. Some of these include blood lines which have either *Amaryllis fragrantissima* or *Amaryllis brasiliana* in their make-up. Does anyone still have an *Amaryllis fragrantissima x Amaryllis brasiliana?* Is neither still seen or heard of? Special mention must be made of MARCIA'S where such a treasure-trove of good things came-from this year. Such as an offset of Doran's hybrid: *Amaryllis fosteri x Amaryllis brasiliana* which Marcia absolutely raved over in her letters for its fine blooms, and an offset of *Amaryllis traubii f. doraniana*, which is Doran's old #52, and seedpod parent and pollen parent of many of the finest mini-hybrids, and is beautiful in its own right. With all of these lovelies, I had to just dig-out Dr. Traub's AMARYLLIS MANUAL and feast on the frontispiece. I do hope that *Amaryllis x henryae* takes its place in *Amaryllis* collections before it gets lost. A single stroke of bad luck can do such things.

Now to a broader horizon as a new aspect in lineagies has been slowly moving to the fore and that is "Introgressive Hybridization". Which spells the death-knell of the concept of a rigid genetic make-up with absolutely perfectly pure and clean genes in the species. It is slowly moving as it entails long periods of time out in the field collecting and comparing the species in this area with another and again where man may have disturbed the habitat; or even a flood, drought or wild animals. It can range over hundreds or even a thousand miles or center itself along a few hundred feet of patches of ground. Much of this theory (it has been tested in the field and found to be true) deals with a disturbed habitat as then new hybrids of compatible breeding species move in to fill the areas often times with hybrids which are the more adaptable to the new growing conditions than were either parent. Furthermore, these new hybrids tend to backcross to the more adaptable parent until they so closely resemble one or the other that it is hard to tell where one leaves off and another segregation starts. Much of this work was done by Dr. Anderson with the Louisiana *Iris* where a myriad of so-called "species" was reduced down to just 2 primal species. This can be of utmost importance to *Amaryllis* amateurs. Two bulbs of the

same species, collected in a general area, may have rather greatly different breeding potential. The closer the "Introgressive Hybrid" is to the mainline, the greater significance is its "output variability" . . . as Dr. Anderson holds that may be a more powerful innovation than others. Dr. Whitaker has worked with this and probably could give us some really significant news in this regard to our *Amaryllis* species and their various breeding potentials . . . but whether enough work has been done in South America to map this out and digest it may not be known.

To arouse interest in others and to open the eyes and see, I wish to relate what I saw on the 25 September 1980 on the may to Rochester, MN. A most colorful group of wild asters had been catching my eyes as I took the backroads (a bridge was being rebuilt). This day is no big hurry, I stopped and looked. These turned-out to be the finest groups of wild *Aster* which I have ever seen. I rather believe that these may be a splendid example of "Introgressive Hybridization" amongst two *Aster* species. I hesitate to say "*is*" as I dug-out the Wild Flower Book on NE America (2 volumes, in 2nd volume) and some 50 species were listed with the warning that only an expert in *Aster* could sort them out and he had great hardships at times to do so. But only two true species were evident to my eyes: one was the New England Aster *(Aster novae angliae)* and the other a species which after I brought it in, has taken over about 130' in linear fashion and about 3' broad. There are perhaps upto 50 clumps of these hybrids with each slightly variable from some other but from one extreme to the othermost highly variable both to colors in blue, petal width, plant height, leafshape and size. and period of bloom. Some seeds were gathered of a form which was finishing-up its last few blooms and had ripe seeds already. Garden asters are our last big splash of outdoor color and always are blackened by early killer frosts before their season is done. In the right hands. these could be the parents of earlier garden asters.

A few lines are taken to MEMORIALIZE faithfulness onto holding on to a good thing. The realization has come to several of us that the cultivated grape vine which this family has kept and cared-for for over 53 years *is a unique cultivar.* Where it came-from is not wholely known but it probably came from one of two places. and tag it as would indicate its age nigh unto a 100 years. What is good about it? It gives good grapes fit for jam, jelly and juice and even eating when fully ripe. These are big grapes nearly as large as 'Concord' which grows here, but not satisfactory in most areas because of freeze-back and late ripening. But this cultivar *is absolutely hardy* as is the cultivar 'Beta' which is the recommended variety for hardiness but it is small fruited . . . and sour. I should add that this cultivar is a heavy, yearly bearer and needs no pampering.

The 1980 PLANT LIFE brought the good news that the name, *Amaryllis belladonna* belongs to the American plant!

I must confess that I have not answered all letters as yet but give me time this Winter as this late Spring and Summer, I had to enlarge the garden to add to the food crop grown—and more next year, D. V.

If someone's article whets your interest, *Do write* for it, for it will

do you all good for it may stir up enthusiasm like nothing else would. Visitors to Dr. Traub have written me afterwards that they thoroughly enjoyed themselves and he was 90 on 18 June 1980 because he keeps his mind lively and interesting.

SWAMP CULTURE OF AMARYLLIDS

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During the years that the writer has been collecting various Amaryllids in Texas and Mexico, often wading ankle-deep, (or even knee-deep) in water, it became increasingly emphatic that most of us, as growers, were missing the point made by nature. We have been so over-sold on the words "well-drained soil" that we can't conceive that many plants simply don't thrive in such dry conditions, but can get along very well, thank-you, in an aquatic or partly aquatic environment, either part-time or full-time. To be sure, this wet environment does not apply to all Amaryllids, but a surprisingly large number of plants can adapt, in varying degrees to what is more than the acceptable amount of moisture. The more obvious examples are the bulbs found growing in the wild in standing water, such as certain *Crinum* and *Hymenocallis* species but there are other surprises.

The writer also grows various epiphytes . . . orchids and bromeliads . . . in a greenhouse, along with various Amaryllids. These potted plants are placed in large trays containing gravel, which have water added to give extra humidity. Often the water level would be above gravel level, yet many epiphytes reveled in the extra dampness. It seemed that the wet roots mattered little as long as the plant itself remained dry, well above the gravel. Visitors were often shocked when they saw just how much moisture the plants were getting, but even more surprised to see how well the plants thrived in it. Many of the roots of *Amaryllis* would push out the bottom of the drain hole of the pot and then grow luxuriently through the gravel. *Amaryllis evansiae,* for instance, almost seemed to become aquatically inclined. *Amaryllis angustifolia,* a known swamp plant from Argentina, grew lushly in this wet environment and flowered nicely, while sending out a nice family of offsets around the edge of its pot. It was by accident that I discovered that the secret of growing *A. angustifolia* to perfection was simply to treat it as a swamp plant. Eventually I would add other bulbs to this list.

A few years ago, while preparing my garden for my move to a new location, I obtained hundreds of styrofoam boxes to serve as temporary flats or pots for my large collection of bulbs. The boxes were large enough and deep enough to hold many bulbs after punching drain holes in the bottom and adding a good soil mix. Aquatic bulbs were given similar treatment, but minus the drain holes. Here they thrived far better than they ever had in the garden. They had to be watered far less frequently, and weeding was less of a chore. The only problem

was that after a year or so, roots and stolons would push through the styrofoam and thus make drain holes, necessitating repotting. The other problem, unfortunately, were the mosquitos that the standing water attracted.

The most interesting thing we discovered though, was learned unintentionally. A number of potted plants were placed in empty styrofoam boxes to facilitate their care and the eventuality of being moved. Most of the boxes had drain holes punched into them. Some did not. Those that lacked drainage would partly fill up after rains or irrigation from the sprinkler. At first we would pour the water out of them for fear the bulbs would rot. But we stopped doing this soon, as we became fascinated by the fact that these plants actually seemed to outdistance the plants growing in boxes with drain holes! Some potted bulbs of *Crinum zeylanicum* did far better for me with their feet constantly wet, than they did in conventional culture. There were many other things, but I failed to make note of them. Some were bulbs of other families, such as various Irids (Cipura and Eleutherine), Oxalis, Zephyranthes and Habranthus, etc. Even Milla. With this varied group, we made no point to keep them excessively wet, only to see that the pots always sat in at least a little water at all times. Only with *Crinum zeylanicum* and a few other Crinum species did we make a point of keeping at least 20% of the pot in water that summer. They loved it. Indeed it was the best I have ever experienced this species to grow for me. And as far as I know, it is not a swamp plant.

In the greenhouse, not only did we find that *Amaryllis angustifolia* loved swamp conditions, but so did *Hymenocallis traubii*. To this list, later experimentations would add other *Hymenocallis* and *Crinum* species. At first we tried only species known to favor wet environment, but later we also tried hybrids of these species, and they seemed to work equally as well.

In Texas, several rain lilies seem to favor low wet places during at least a short part of their growing season (and flowering season). Such species will grow lavishly while standing in water, but the water will shortly evaporate, leaving the soil hard as brick in the hot sun. This is repeated after our late summer and early autumn rains along the Texas coastal prairies. Many is the time the writer has endured savage attacks in full sunlight by hordes of hungry mosquitoes while wading ankle-deep to a nice colony of *Zephyranthes pulchella, Z. smallii,* or *Z. jonesii.* I am told that *C. traubii* also favors such "swaley" places as well. The point to all of this is that some of these plants don't seem to mind at all that they are temporarily, at least, swamp plants.

In cultivation I have always tried to give *Z. pulchella* an extra wet place to grow in, in order to keep it happy. I always chose a spot that was lower, where water would collect and remain longer after sprinkling. I also gave them extra waterings during later summer and fall when they normally flowered. I found that hybrids of *Z. pulchella* also appreciated this extra soaking.

But it is in our native Texas *Crinum* and *Hymenocallis* species that we really get into true swamp plants. These plants will tolerate,

in varying degrees, what may be termed "ordinary" garden culture, but it is my observation that they never do so well as when they are grown constantly wet. *Hymenocallis liriosme* is nearly always found growing where it is constantly wet for a great part of the year, in roadside ditches, wet meadows, creek bottoms, etc. It will survive dryer garden conditions fairly well, but will not flower nearly so well. *Crinum americanum* var. *texensis* likes it even wetter. All the bulbs that I have collected through the years necessitated wading up to the knees to pull them out of the muck. In Mexico I found the same to be true with two of its related species, *C. cruentum* and *C. loddigesianum.* The lowland growing *Hymenocallis* of Mexico . . . *H. baumlii, H. latifolia,* and the creek-bed growers of the plateau country, *H. riparia,* and *H. acutifolia* likewise favor wet places. These plants don't really require a swamp condition, but they will accept it without fussing.

Later on, we would add various other *Hymenocallis* species from the South Eastern United States to this growing list. . . . *H. floridana* and *H. palmeri.* Probably *H. rotata* as well. With Native north American *Hymenocallis* species, it is very important to determine whether or not a given species grows as a swamp plant or an upland plant. Upland plants, such as *H. galvestonensis* will not tolerate wet culture for long. A clue to how much water a *Hymenocallis, Crinum,* or *Amaryllis* will tolerate can be determined by the method of offset production, though this is not infallible. In general, if the bulb is inclined to throw out long underground stolons or rhizomes away from the mother bulb, chances are the plant favors growing in muck. We have found some wet-loving species that make basal offsets only, and thus we know that this rule of thumb does not always hold true. But still, it is a good rule of thumb. *Hymenocallis liriosme* never (as far as I've observed) makes underground stolons, yet it favors a wet environment. The same is true of *H. riparia, H. baumlii,* and *H. latifolia* of *Mexico.* On the other hand, some of the native *Hymenocallis* of the southeastern U.S. *(H. traubii, H. floridana, H. palmerii)* do send out underground runners from the mother bulb. Apparently all relatives of *C. americanum* are stoloniferous, and they all take to a wet culture.

The wet culture for container grown plants is pure simplicity. The easiest way is to simply grow them in a pot with no drain hole. Bulbs without roots should be started slowly, keeping only damp enough to encourage root growth. Once it is obvious that a good root system has developed, then water can be kept at whatever level one feels (or learns) is safe for that species. Often this can mean an inch or so above the soil level. At other times, it may mean that water might only stand in the lower quarter of the pot. A better method is to pot up the plant in a standard potting mix, with drain hole, and then place the pot in a container, such as a deep dish of some kind. In this way, water-depth can be more easily observed and regulated. Most beginners are apt to be squeamish about this depth, so it is safe if only the lower quarter of the pot is resting in water. The potting media can thus stay constantly wet, satisfying the aquatic needs of the plant, and at the same time, the bulb itself will be above the water level. A little experimentation will

assure the grower that the plant is in no danger of drowning. The writer once experimented along this line by placing a bulb of *C. americanum* in a fish tank and leaving it there for a year. The entire plant was submerged, leaves too, save for a few sprigs that stuck up a few inches above the water level. Under this environment, the plant grew slowly and poorly, but it survived. I think the little light bulb illuminating the tank had a lot to do with this, plus the fact that the gravel in the tank was not nourishing enough for the demands of this type of plant. But it was still a successful experiment none-the-less, in that it proved that these plants are built to endure the extremes of an aquatic existence. Little wonder that many growers have failed with some of these aquatic bulbs through the years! I recall reading an old bulb catalog of the nineteen forties by the late Cecil Houdyshel. In it he had bulbs of our Texas *Hymenocallis liriosme* to sell. He had grown them in his field in southern California in the open, and had commented about how slowly they had adjusted to his growing conditions in four years. He warned prospective buyers that they might run the risk of the same failure, which he admitted was poorly understood. What a shame! The poor plants were swamp plants being forced to exist under open field conditions alongside *Brunsvegia, Crinum* hybrids, and the like. If only he had known how easy it was to snap them into active growth by simply placing the entire stock in tubs minus drainage filled with any old dirt and up to the rims in water! The absurdly amazing truth is that aquatic culture such as outlined above is so ridiculously simple that anyone can succeed. Indeed, it is probably about the easiest form of pot culture that one can imagine. All you have to do is maintain a water level that is adequate. Even if the plant should have the misfortune as to go bone dry, it will not die, for this often happens in nature during dry periods. And if one tends to overdo a good thing and keep them soaked to the brim, that is fine too, as they often stay flooded for extended periods during times of high precipitation.

About the only problems that one will have is mosquito control, and choosing a good fertilization program. For plants in reasonably small containers, mosquito control is simply pouring out the water once or twice per week and refilling. Or one might add a few drops of motor oil to the water to make a film to seal off the oxygen supply of the larvae. Another safe method, as far as we have observed, is to add a few drops of insect dip suitable to use on pets to the water. I've not observed any harm to the plant when this is done in moderation. In tubs, these methods can be used too, but if birds or small pets drink from the tubs, do not use insecticides in the water. We are now experimenting in outdoor tubs by placing a few Mosquitofish (Gambusia) in each tub. These are native creek and river minnows of the southern United States, and are very effictive in mosquito control. Obviously one must never combine the use of fish and insecticides in the same water. I won't go into detail as to various methods of fertilizing these plants. Almost anything sensible might work. Just use any good

fertilizer suitable for pot plants with a bit of common sense. Most aquatic plants can handle fertilizer better than the average pot plant as in nature they get frequent overdoses of it when they are flooded. Since I have a couple of small dogs that run in the backyard lawn, now and then I will simply toss a dog stool into a tubfull of *Hymenocallis* or *Crinum* plants. This quickly dissolves and can be stirred once. This "tea" does no harm to the plants, but I may have to watch my fish to see that it does not harm them either. If not overdone at any one time, it is probably safe. In the past, I have often neglected to keep my water level up in my tubs and evaporation drops below the soil level. This would not only kill off mosquito larvae, but can kill off fish as well, so now I try to remember to keep the water level up at all times.

Certain *Iris* species (and hybrids from them), native to the Mississippi River Delta make fine companions for these *Crinum* and *Hymenocallis* plants, and I might suggest that in the lower and warmer half of this country, one might make up a tub, or several tubs full of bulbous aquatics containing one or more each of *Hymenocallis, Crinum,* and *Iris* specimens. Tubs will last far longer if pre-treated with a sealing material both inside and underneath. Perhaps several extra years can be added to the life of a galvanized tub if so treated. If readers live in areas where Mosquitofish are not available, one might try a few very small goldfish, or mollies, or guppies instead. Any small fish that will eat mosquito larvae will do, provided it is adaptable to rather shallow, still waters.

While we have never had enough *Amaryllis angustifolia* to experiment with, a tubful of them certainly sounds inviting. Meanwhile we can content ourselves with one or more tubfuls of tropical or native aquatic bulbs. If one chooses native species, there is the likelihood that they will prove hardy in the lower half of the country. I have observed my tubs of native Texas *Crinum* species freeze to a solid block of ice at eight degrees farenheit with no harm whatever. Ditto for *Hymenocallis liriosme.* Of course, in our climate this situation does not last for more than a half-day or so before they thaw, but at least it proves that it will take more than a short, but very hard freeze to kill them. I strongly suspect that other native species *H. traubii, H. floridana* can likewise survive short, but very hard freezes with impunity, while frozen solid in a container in the lower South. I'll let others gamble as to just how far north one can safely subject these plants to lethally low temperatures. These plants are too rare and hard to come by to experiment with too carelessly, but still my own experience gives us some idea as to what they will take in San Antonio, Texas. With us, in Central Texas at least, we need not tremble that our native species (and their hybrids) are in darkest peril by sudden news of a norther rushing in and dropping temperatures far below what is considered safe for Crinum and Hymenocallis species.

Finally, most of these bulbs are winter-deciduous in nature. One must not have sudden doubts about aquatic culture when one's apparently healthy bulbs suddenly die back in the fall or early winter after

a good growing season. It is the nature of the little beasties. Foliage will return in late spring or early summer. At this point it is quite safe to dry them off, either partly or completely, if one wishes. I have kept some as full of water while dormant, as when growing, and it seemed to make little difference. Certainly our native U.S. species get rained on while dormant as they do in the growing season, and they seem able to handle it. I am not so sure that aquatic Mexican species can all handle this as well, but certainly *C. loddigesianum* can. Incidentally, the new miniature *Crinum* species described in 1980 PLANT LIFE by Marcia Wilson apparently does very nicely under swamp culture as outlined above.

Crinum *Americanum* and its varieties, *C. loddigesianum,* and *C. cruentum* will stand more shade than most, implying that aside from their fairly large size, they ought to make fine house plants where more shade cannot be avoided. These plants often grow in fairly deep shade in mangrove thickets in knee-deep water, and this pretty well makes them an ideal houseplant.

Hybrids of the aquatic *Hymenocallis* species do very nicely in sub-aquatic culture, and as some of these hybrids are nearly miniatures themselves, this group make a fine addition to this group. We particularly recommend hybrids of *H. traubii,* not only for compactness of growth habits, but for hardiness ease of culture, and spectacular beauty. 'Excelsior' *(traubii* x *Narcissiflora)* is the most impressive, looking like a miniature swamp-Ismene. 'Hispaniola (*traubii* x H. sp. 57-3) is almost as large in flower size, and equally beautiful. A sibling of 'Hispaniola,' we also love and recommend 'Invicta,' which is a little smaller and of lower growth.

In summary, swamp-culture is a new and exciting way to grow certain Amaryllids that formerly were considered difficult simply because their excessive water requirements could not be rationalized. Careful study and experimentation is necessary to define this culture better in its application. It can be usefully used with certain plants which apparently have greater water needs. Some plants will do about as well without it, but none-the-less can survive quite well with wet toes. Many of these potted plants seem to reach a balance where there is sterility, as far as disease goes, and the environment appears to be rather pure. At this point there is little reason to fear bacterial or fungal attacks. I've never been able to disprove or prove it, but I was once told that if such plants living under greenhouse conditions grew a nice healthy, fluffy, coat of sphagnum-like moss around the plant, that they were in a particularly good stage of health. The spahgnum indicating a sterile-like situation that inhibits fungus growth.

So far, nearly everyone exposed to swamp-culture for the first time greets it with many doubts and misgivings. It takes time to overcome fears built up over a long time where "perfect drainage" has been emphasized. Beginners generally start almost too cautiously, but as they see that there is really nothing to be feared, they become almost zealous in their enthusiasm. It is a fun way to garden! It is clean, it is simple, and it is rewarding.

EDITORIAL NOTE.—Your Editor uses "Schultz-Instant" liquid plant food, 10-15-10, 7 drops per quart of tap water in growing the aquatic *Crinum* species from the West Indies, offered by Marcia Wilson, with outstanding success.—*Hamilton P. Traub.*

GENERAL AMARYLLID REPORT, 1981

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NOTES ON SOME ASIAN AND AUSTRALIAN CRINUMS

Crinums related to *C. asiaticum* are characterized by broad, succulent leaves, and star-shaped white flowers with relatively narrow segments. The related species vary in size from the dwarf *Crinum japonicum* (syn. *C. asiaticum* var. *japonicum*) to the huge *Crinum procerum.* Numerous botanical and horticultural varieties exist in this group, and the taxonomy is perhaps more confused than that of the American, and African Crinums. After growing Crinum species from around the world, I decided that the species related to *C. asiaticum* are the most desirable due to the superior overall qualities of these noble plants. Some experiences with several Asian and Australian species in this group follow.

Several years ago a plant of *Crinum amabile* was obtained from a local bulb and exotic plant nursery. It was labelled "var. *cuprefolium*". The single plant, which was growing in a one-gallon container, has since produced many offsets, and there now is a large clump. This form of the species has bronze-colored leaves, especially in their younger stages. Unlike other asiaticum-type Crinums grown in this area, *C. amabile* blooms throughout the year, sending up long scapes with many-flowered umbels. The flowers are frosted red. Fruit is best obtained by hand-pollination. This species does not seem to multiply by division of the basal plate but instead forms numerous lateral offsets.

Crinum asiaticum 'Cuprefolium' was obtained at the same time, and from the same source as the above species. This plant has variously been assigned varietal or subspecific rank. However, its origin is uncertain—it may be of hybrid origin in Hawaii. The above nomenclature is my own. In any case, this is a magnificent plant. It is, as is *C. amabile,* too large for most home greenhouses. These two species are best exhibited in large tubs, since they are true specimen plants. *Crinum asiaticum 'Cuprefolium'* tends to flower only in the summer in this area. Several scapes are produced per plant. As in *C. amabile,* fruit is best obtained by hand-pollination. Flowers are similar to those of the preceding species, although the segments are broader. My original plant grew to immense size before dividing into four plants. It has never produced a lateral offset. Leaves are vivid bronze, especially in the young stages, and they are very succulent.

A plant of *Crinum brachyandrum* was received in 1980 but it will be several years before this one is flowering size. This particular clone

was collected along the Fitzroy River near Rockhampton, Queensland, Australia. This species is closely related to *C. pedunculatum.* It is characterized by narrow, rigid leaves, which stand stiffly erect. In a few years, when this plant flowers, a comparison can be made with the original description (by Dean Herbert). The identity of *C. brachyandrum* has been nebulous since it was first described.

Forms of *Crinum japonicum* were discussed in the 1979 *Plant Life* (pp. 53-55). They will be discussed in more depth when the various forms have flowered. However, some new information has been gathered since the earlier article was written. As mentioned previously, the taxonomy of the Crinums related to *C. asiaticum* is somewhat confused. That certainly is the case with plants that go under the name, *Crinum japonicum.* To begin with, this species is also referred to as *C. asiaticum* var. *japonicum.* In general, the japonicum forms are much smaller than typical asiaticum forms. The leaves tend to be short, broad, and very succulent. *Crinum japonicum* 'Akebono', in particular, has very thick leaves.

Five different "forms" of *C. japonicum* are concerned here. 'Akebono' is a variegated mutant with a form of variegation that has been described as a banding, which suddenly appears on the leaves, and then traverses them. I have not noticed this variegation yet. 'Akebono' flowered in August, 1979. The 12-flowered umbel produced typical asiaticum flowers, only smaller, in proportion to the size of the plant. At the date of writing, nearly all flowers, which were hand-pollinated, were producing fruits. 'Akebono' is a very handsome, compact plant. It is supposed to be extremely rare.

'Shima-ire' is a striated mutant of the species. Two distinct types were obtained under this name. One has thin, glossy leaves, while the other has thicker, non-glossy leaves. Both must qualify as among the smallest Crinums in the asiaticum group. 'Shima-ire' multiplies by lateral offsets, as with *C. amabile.* The leaves tend to be narrow, and long in relation to their width. The striation is difficult to maintain under the growing conditions here, especially in the glossy-leaves form. This difficulty is found in other striated Crinums, when grown under a variety of conditions.

'Han-ire', the spotted *Crinum* remains my favorite amaryllid, even though it hasn't flowered. One plant of this spotted-leaf mutant of *C. japonicum* has divided into two typical of *C. asiaticum.* The 'Han-ire' plants have not produced any lateral offsets. Leaves of this form tend to be highly recurved, often touching the base of the leaf column. They are also undulated. This degree of recurving has not been noted on any of the other Crinums discussed here. In fact, most of the other species have upright, erect leaves.

The plain green form of *C. japonicum* is a handsome plant, which is closest to 'Akebono' in form. Plants of the plain form were all grown from seeds. It was noted that undersized seeds produced smaller plants. Whether this relationship is a constant is still open to research.

The various forms of *Crinum japonicum* are well adapted to tub

Fig. 42. Two **Crinum** species from Kairok Island, Najuro Atoll, Marshall Islands. Photos by James Bauml.

culture. Being of relatively small size, they can be grown in moderate-size greenhouses, if they cannot be grown outdoors. The plain green form is said to naturally occur as far north as Tokyo, and would therefore have a degree of hardiness. The hardiness of the variegated mutants needs further study. 'Han-ire' is said to grow in the Bonin (Ogasawara) Islands, 500 miles S.E. of the Japanese mainland. It may also occur on the Japanese mainland. The natural habitats of 'Shima-ire' and 'Akebono' still need to be determined by the writer.

Several seeds of *Crinum mauritianum* were received in 1979. They germinated quickly, and the sturdy plants are now about a foot tall. This native of Mauritius is supposed to be an endangered species. It is described as having leaves about three ft. long, and not more than 2-2½ in. broad. Naturally, this species has not flowered for me yet. Two observations can be made from the young plants, though. The plants in general habit look very much like young plants of *C. pedunculatum*. The factor that contributes most to this is ratio of leaf length to leaf width; the leaves are rather long in comparison to their width. Also, unlike most of the other species discussed here, the erect leaves of the young plants of *C. mauritanum* have a tendency to curve inward, giving them a bowed appearance. The tips seems to be trying to touch each other at an imaginary line above the crown. This is just the opposite of the growth in *C. japonicum* 'Han-ire', in which the leaves attempt to touch at the soil line.

Two species from Kairok Island, Najuro Atoll, Marshall Islands are pictured in Fig. 42.

Crinum pedunculatum has very long, and narrow leaves. A seedling of this species has continued to grow rapidly. Most of the species related to *C. asiaticum* enjoy a lot of water when the weather is warm. *Crinum pedunculatum* is no exception. In its native east coast of Queensland, Australia, it frequently grows partially submerged on riverbanks (as does *C. brachyandrum*). This species is also found in New South Wales, Australia, and in Pacific Islands adjacent to its Australian range. My plant of *C. pedunculatum* may still be two years away from flowering. Due to its very long leaves, this species needs even more protection from wind than do other Crinums.

A very fine *Crinum* species was collected on Horn Island, in the Torres Strait, off the north coast of Queensland in 1978. This unidentified species (RKB 78-25) was received as *C. pedunculatum*. However, it has leaves resembling *C. asiaticum* but the leaves are more glossy than other plants of that species observed. Also, differences may exist in the leaf column, and other features. It flowered in 1979 and 1980, around June, and is a very attractive flowering plant. An attempt will be made later to key out this species. The only other Australian species that may come close to this plant is *C. douglasii,* which was described from Queensland. However, the description for *C. douglasii* mentions that it does not seem to produce a columnar stem, a fact that seems odd for a species related to *C. pedunculatum.*

Research is still being done by the writer on ***Crinum norfolkianum,***

which was described from Norfolk Island, east of Queensland. It is now almost certain that this species is a form of *C. pedunculatum*. A question remains, though, as to whether the plant from Norfolk Island may be distinct enough from other plants of *C. pedunculatum* to deserve varietal rank. Attempts to obtain plants from Norfolk Island have thus far resulted in failure. Three huge bulbs received from there were later identified as an *Albuca* sp., possibly *Albuca nelsoni!*

A seedling of *Crinum procerum* var. *kaaawanum* has continued to increase in size. This species also produced some offsets shortly after germination. This did not hamper its growth, however. and the main plant, and offsets are healthy. This variety of the species was named for its habitat in the Kaaawa area of Oahu, Hawaii, although it may be found in numerous other areas. It is one of two named, pigmented (red) varieties of *C. procerum*. Variety *kaaawanum* has red leaves and flowers, and approaches the type form of *C. procerum* in stature. That means leaves that may reach seven ft. in length under optimum conditions. The other pigmented variety, *splendens*, does not seem to grow quite as large. Variety, *kaaawanum* has the brightest red leaves of the bronze Crinums discussed here. Like most of the bronze-leaved Crinums, the pigmentation is brightest in the early stages of the leaves. In this variety the leaves tend to retain their red color for a long time, eventually turning to a deep bronze. As in most bronze Crinums, the scape, fruit, and flowers also show the red color.

Most of the species mentioned in this article come from tropical areas but they can be grown in mild, subtropical areas outdoors provided certain environmental factors are met. In relatively dry areas, such as the intermediate valleys of Southern California, they need protection from full sun. They also appreciate a spraying of the leaves with water once or twice a day on clear days. They respond well to a monthly application of fertilizer during the warm months. Mealybugs are the main insect pest but they can be controlled with Malathion or Cygon. Snales seem to feed only on the decaying leaves of these succulent Crinums, while snales can do considerable damage to thin-leaved species not related to these. When our dry fall winds arrive, tub plants need to be moved to protected areas, or else the leaves will be damaged. Plants so damaged will not regain their former symmetry until the summer.

PLANT LIFE LIBRARY—continued from 160.

Publ. Co. 2 Park Ave., New York, New York 10016. 80 pp. Illus. b/w. $4.95 paperback 8½" x 6".

This is a British version of the book originally published in America. It is a quick survey of cacti and succulents including cultural details. Although the publication is very high quality, it does further the possible extinction of many cacti and succulents in the wild. Such publications aid in creating markets for rare plants.

Fig. 43. Dr. Joseph M. Molnar, Director of the Saanichton Research Station, near Sidney, British Columbia, Canada on Vancouver Island, who is inspecting Alstroemerias.

Fig. 44. Dr. Wayne Lin, in charge of the Alstroemeria project, at the Saanichton Research Station, inspecting Alstroemerias.

1981 ALSTROEMERIA COMMITTEE REPORT

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At the end of May I had the pleasure of visiting the 138 acre Saanichton Research Station in Canada. The neat, well maintained Research Station is located near Sidney, B.C., Canada on Vancouver Island. The leisurely ferry trip from the mainland to Swartz Bay on the island was a pleasure in itself. The sky was clear, the water was blue, and the scenery was beautiful.

I was greeted by the Director of the station, Dr. Joseph M. Molnar (Fig. 43). Dr. Molnar has worked with Alstroemerias for a number of years. At the present time however, Dr. Wayne Lin (Fig. 44) is in charge of the Alstroemeria program. Dr. Lin is a graduate of the University of Minnesota at St. Paul where his major academic studies were in the field of plant physiology.

The Alstroemeria plants are growing in beds that are 12 inches deep and filled with a mix of 1/3 each of soil, peat, and sand. The plants are spaced 1½ feet apart and are divided every two or three years. The separating and replanting is done in August or early September. Dr. Lin states that the use of supplemental lighting has extended the blooming period of the Alstroemerias in their experiments. They use high pressure sodium lamps and give the plants a 16 hour day.

They have also found that the plants grow best in a media that has a pH of 6 to 6.5. At a pH of 4.5 or lower, it is very noticeable that the plants have general yellowing of the lower leaves and are obviously not in good health. The plants are fed weekly with a soluble 20-20-20 fertilizer at the rate of 5 to 6 thousand parts per million and are watered once a week with plain tap water.

In addition to his work on Alstroemerias, Dr. Lin is also doing studies on Gerbers, Poinsettias, and Chrysanthemums. I hope to visit the Research Station again next year not only to learn more about their findings on Alstroemerias but also to inspect the new solar greenhouse that was being constructed this summer.

1981 ZEPHYRANTHEAE COMMITTEE REPORT

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The summer of 1980 will be well remembered by all in our area as the time of the Texas Heat Wave that lasted for several months before being shared with neighboring states. While we missed the record breaking temperatures of the rest of Texas, we had four months of daily temperatures over 95° F. and almost no rainfall until the arrival of Hurricane Allen in August. While all vegetation benefited from the hurricane rains, only the taller growing shrubs and trees were damaged by the high winds that blew first from one direction then another as

the hurricane passed over. The amaryllids in the ground were bothered least of all (pot plants were secure in the garage). The rain lily bloom was a particular joy that lasted for almost two weeks. With dry conditions prevailing most of the spring and summer, almost all of the bulbs bloomed at once, many with three or four scapes per bulb.

1979 COLLECTION, NUEVO LEON

Earlier in the summer, our 1979 collection of bulbs from near Mamaulique Pass, Nuevo Leon, Mexico had bloomed. All of Collection 4 closest to the Pass were the yellow Zephyrantheae. A few yellow flowered bulbs bloomed among the other three collections of white *Cooperia.* While plant material previously submitted from this area was bloomed and described by Dr. Traub as *Z. howardii,* all of these yellow flowers exhibit characteristics of *Habranthus.* The yellow flowered *Zephyranthes* discovered by Fred B. Jones some years back in a Laredo garden is also allied to this group of bulbs (general size, growth habit, season of bloom, etc.). This latter could easily have come from this area, perhaps of hybrid origin. A yellow *Habranthus* x *Z. drummondii (C. pedunculata)* would probably classify as *Zephyranthes,* the same as Mr. Jones' Laredo yellow. Are these all natural hybrids, or should *Z. howardii* be reclassified as *Habranthus howardii?*

X ZEPHYRANTHES BIPUERTOROSEA

Julio Cicerco, S. J. of the Dominican Republic has long been interested in studying his native *Z. bifolia* and its relationship with other Zephyrantheae. This beautiful large flowered rain lily is self sterile and rather difficult to maintain away from its habitat. The late Alex Korsakoff once wrote to me: "It comes and goes over here in Florida, but well worth the effort."

The first reported hybrid using *Z. bifolia* was made by my mother, Mrs. Katherine L. Clint, in 1960. This cross, *X Sydneya morrisii,* used *H. immaculatus* as the seed parent. While robust as seedlings, they declined once they had flowered. This was the result of cold damage.

Padre Cicero first tried pollen from *Z. bifolia* on *Z. puertoricensis* and *Z. rosea,* with no success. The same was true with *Z. citrina.* In the meantime, he obtained successful hybrids between *Z. rosea* and *Z. puertoricensis* (pollen parent) in June 1973. The seedlings began to bloom May 29 of the following year. Bulbs of this cross, *X Zephyranthes puertorosea,* multiplied well vegetatively and were self fertile. At the first opportunity, Padre Cicero applied *Z. bifolia* pollen to flowers of his new hybrid. On December 11, 1975, the first flower of this hybrid attempt opened and he knew that he had achieved a trispecific hybrid with *Z. bifolia, Z. bipuertorosea.*

The flowers of *Z. bipuertorosea* are as remarkable as the achievement of their origin. Although quite varied, most are large, nodding, with the heavy stigma of *Z. bifolia.* The clear and bright jewel-like colors range from pure orange to red, with many intermediate shades of pink, rose and lavender. Once established, the bulbs are easy to

grow. They should be started in a moist sandy mix when the weather warms. Water sparingly until they show signs of growth. A bud may appear before leaves in the spring. Reduce water in the fall as growth slows. Bulbs will be dormant to semi-dormant during the winter. All parents of this hybrid are tender. Several of my pots of healthy bulbs were exposed to a late March cold spell of 30° F. for a few hours with no apparent damage.

X Z. bipuertorosea is seed fertile when cross pollinated with sibling clones. What impact this will have on future hybrids is not yet proved; however, I predict that we will one day have sturdy garden hybrids in an undreamed of array of nonfading shades. My own attempts to introduce genes for hardiness have been very limited, but seeds have been obtained. These first few could be maternal, for no attempt was made to deanther flowers considered to be self sterile. I would suggest trying both *Habranthus* and *Zephyranthes* pollen, particularly pollen of the best hybrids—the more complicated, the better.

MY EXPERIENCES WITH CLIVIAS

SHUICHI HIRAO, *3-14-23 Yamanone, Zushi, Kanagawa, Japan 249*

I am a retired biochemist in the field of fishes, and gardening has been my hobby since childhood. Since retiring in January of this year, I am happily devoting most of my time to gardening, and am now the President of the *Japan Iris Society*. I have introduced a large number of Japanese Iris but it seems that I am more interested in various bulbous plants than Iris, particularly Amaryllids.

In Figure 46, a plant is shown that I raised from a seed received from my friend in South Africa several years ago. I have tentatively identified it as *Clivia gardenii*, and I would be pleased to hear from anyone who may recognize it. It has been flowering for me for the past three years in my unheated greenhouse in winter. The plant has produced seeds, and I will be pleased to exchange these with interested persons. Figure 45, shows a fine specimen of *Clivia miniata* forma *aurea* which came to me as a small offset from my friend, Mrs. May van Eeden, of South Africa, many years ago. When pollinated it sets fruit rather reluctantly, only one to three seeds per umbel, while the wild form of *Clivia miniata* sets seeds abundantly when self-pollinated.

I also have a plant of what I believe is *Clivia caulescens* (?) but I am not certain that I am correct in this case. The flower is similar to my plant which I believe is *C. gardenii* but the leaves are a bit wider. I self-pollinated these clivias but so far without success. *Clivia caulescens* has not produced an offset as yet. Comments from readers of PLANT LIFE will be welcomed about these two unidentified clivias.

When I visited my friend, the nurseyman, Mr. Komoriya, the brother of Mr. Isamu Miyake, again this year to see his work, which has been steadily progressing, he showed me his plant of *Clivia miniata*, of unknown origin, and which had been self-sterile for years. However,

Fig. 45. **Clivia miniata** forma **aurea** obtained by Mr. Hirao many years ago from South Africa. It sets seeds sparsely when pollinated.

two years ago, I sent him my "aurea" pollen which took perfectly and he got numerous seeds. Continued fruiting discouraged the growth of his plant and it did not flower this past spring. My self-pollinated "aurea" seedlings are still too small to flower. Mrs. Cynthia Giddy, Umlaas, South Africa, once told me that she had never obtained yellow seedlings from the seeds of her yellow Clivia. I wonder whether the seed had come from bee-pollinated flowers from the ordinary orange-

Fig. 46. A plant raised from a seed received from a friend in South Africa; **tentatively** identified as **Clivia gardenii.**

red Clivias?

My friend, Dr. Takao Matsuno analyzed petals of my "aurea" comparing it with the ordinary red ones. Both contained carotenoids of several kinds in similar proportions with beta carotene as the dominant one, while the "aurea" was lacking in anthocyanidins while in contrast the ordinary ones were rich in it. These data interest me since they resemble the case of *Hemerocallis*. Hybridizers of *Hemerocallis* aim to produce pure white segregates by eliminating carotenoids so as to produce clearer pink, purple, blue and so on. I have noted some garden clivias have white throats, that is, about two-thirds of the outer tepals are orange red but the inner one-third is almost colorless. Perhaps by crossing such individuals with my "aurea" I may produce an entirely white segregate? Only an experiment will answer my question.

I will be pleased to hear from other Clivia breeders, and exchange breeding material.

If I remember correctly, an author reported in a PLANT LIFE article, possibly between the years 1972 and 1975 (I have lent these issues to a friend, who has not as yet returned them), that *Clivia gardenii* is not now grown in the United States? In Fig. 46, a *Clivia* species (unidentified) which I raised from a seed received from a friend in South Africa, is pictured. I have tentatively labeled it *Clivia gardenii*. I would be pleased to hear from anyone who might recognize it.

POLYPLOID ALSTROEMERIAS NEEDED

Hamilton P. Traub

The flowers of *Alstroemeria* species provide the ideal cut flowers, remaining in prime condition for ten days to two weeks or even longer.

So far no polyploids have been produced by the application of dilute colchicine solutions. It is highly desirable that such polyploids be produced in order to enhance the value of *Alstroemeria* cut flowers even more. The production of hybrid Alstroemerias has also been neglected.

PLANT LIFE

VOLUME 37

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1981

GENERAL PLANT EDITION

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

THE MARKET PLACE

(Under this heading, the names and addresses of those who have Amaryllids for sale, retail or wholesale, and brief notes on items for sale, will be listed *when information is sent to the Editor.*)

NERINE NURSERIES, Welland, near Malvern, Worchestershire WR13 6LN, England. Autumn catalogue, August 1980, including *new species for 1980,* and standard cultivated named clones. New species: have all but one of the 30 named species, including the new *N. hirsuta* (Gordon McNeil), which is the first *Nerine* to flower each year during the flowering season from June to February (nine months), and *N. platypetala* (1971); *N. gibsonii* (white flowering, from the Transkei) is offered for the first time.

CULTURAL DIRECTIONS: Temperature—"Generally those with leaves in winter need protection from severe frosts. With increased heating costs, we have reduced our minimum temperature levels to 25° F. (say 2°C.) without detriment. SOIL: Several correspondents have demonstrated the wide range of soils that are acceptable, including loams and even, with *N. bowdenii*—clay. We must however reiterate that it is our experience, very well draining acid sand, with minimal addition of potash and phosphate, gives ideal conditions for flowering bulbs. Any well drained light loams are suitable."—*C. A. Norris and B. Norris, Proprietors.*

MARCIA'S AMARYLLIDACEAE, Proprietor, Mrs. Marcia C. Wilson, 255 Galveston Road, Brownsville, Texas 78521. Phone 512—541-2142. The 1979 Catalog was received and includes an extensive listing of *Amaryllis* species and hybrids; *Ammocharis; Crinum* species and hybrids; Clivias, *Cyrtanthus; Urceolina* (Eucharis), Hymenocallis, etc., etc.

SUDBURY LABORATORY, Sudbury, Mass. 01776. Royal Dutch Hybrid *Amaryllis,* and soil testing equipment.

RANDELL K. BENNETT, P.O. Box 305, Sierra Madre, Calif. 91024: has a limited quantity of *Clivia gardenii* for sale, and will have *Clivia caulescens, C. nobliis, C. miniata* and *C. cyrtanthiflora* for sale, and possibly other amaryllids, in the future.

SCHULTZ COMPANY, 11730 Northline, Maryland Heights, St. Louis, Missouri 63043. Schultz Instant 10-15-10 Liquid plant food.

MISS CASYN B. ECKER, Meadow Place, Carmel Valley, Calif. is interested in trading or selling seeds and offsets of rare *Amaryllis* species.

MR. JOHN GERAGHTY, 94 Avondale Road, South Croylon, Surrey CR2 6JB, ENGLAND, writes that he has for sale the *Crinum* species listed below. They are all of flowering size from the winter of 1979. Price list will be sent upon receipt of 2 international reply coupons *C. amoenum; C. angustifolium; C. asiaticum; C. brachynema; C. bulbispermum; C. defixum; C. flaccidum; C. latifolium; C. longiflorum; C. macowani; C. moorei; C. pedunculatum; C. pratense; C.*

thaianum; C. woodrowi; C. zeylanicum.

ECONOMY LABEL SALES CO., INC., P.O. Box 350, Daytona Beach, Fla. 32015. Complete line of plant labels.

CURRENT STATUS OF SOME ENDANGERED MEXICAN HYMENOCALLIS SPECIES

T. M. HOWARD, *16201 San Pedro Ave., San Antonio, Texas 78232*

In the summer of 1980, the writer once again returned to Mexico to vacation and study various plant material. The country is changing, and many old collection sites no longer have any bulbous plants left. For years, the habitat of many plants has been systematically destroyed by plowing, slashing and burning, and livestock grazing pressures. This particular trip was through what only fifteen years ago had been rich in botanical life with many new Amaryllid species. The route began in San Antonio, Texas and then southward to Saltillo, Mexico, continuing westward through the state of Durango, Sinaloa, and southward through Nayarit and Jalisco.

July was hot and dry in San Antonio, so it was no surprise to find that much of northern Mexico was likewise in a drought. As we neared the City of Durango I had hoped that we would find evidence of more rains, but we did not. It was dry there too. A most unusual and sad situation for this agricultural country this late in July. We did not find any bulbous plants in leaf, much less in flower. The once vast colony of *Hymenocallis Durangoensis* were nowhere to be seen. Where once seemingly millions of bulbs flowered over a great many acres, not a single one could be found. But the drought was not the real culprit. It was the plow. There numbers had been reduced to near extinction in a very few years by intensive plowing-under of their habitat.

After leaving Durango City, the road climbs higher into the mountain range, and there we found that there had indeed been adequate rains and plant life looked more nearly normal with green vegetation and roadside flowers. Later that afternoon, as we crossed into the state of Sinaloa, we again came upon an old friend, *Hymenocallis woelfleana* at the same old collection spots. They seem still to be holding their own, though nowhere nearly so plentiful as they were in 1964. But they cling to some of the hillsides just above and out of reach of livestock on land much too steep for plowing. We spent the night in Mazatlan and then drove southward toward Tepic the next day. Many colonists of *H. sonoriensis* are still alive and well on the roadsides south of Mazatlan. Undoubtedly many millions of these have been destroyed over the past decade and a half, but there are so many and they set seed so heavily that it seems unlikely that they will become endangered anytime soon. After crossing into the state of Nayarit the terrain becomes more hilly and we soon find that *H. sonoriensis* is replaced by another species that is somewhat similar, *H. howardii.* Indeed, *H. howardii* is one of the

dominant roadside plants of Sinaloa. So far, it seems to be fairly secure from the onslaughts of the plow, but a very different danger is threatening it. Large populations seem to have fallen victims of what appears to be a *virus disease.* The disease seems not to be fatal to the plant but does cause serious problems for it. Foliage is mostly healthy appearing, although now and then it may appear stunted and twisted a bit. It is mostly the flowers themselves that are prominently affected and entire colonies may be found having distorted, twisted, stunted flowers that look almost grotesque. I first became aware of this in 1976 and now find that it seems to have spread from isolated colonies to the point of endangering the entire species. We had great difficulty in collecting what looked to be completely healthy specimens of this species in Nayarit and Jalisco. Since the virus does not seem to affect the vigor of the plant, it is likely that the species will continue to exist in nature, but perhaps as a diseased population. Collectors would do well to collect only ripe seed as we presume that the disease will not be transmitted through the seed.

We looked for *H. concinna* (Syn.—*H. mexicana*) in Jalisco, particularly around the south-eastern edge of Lake Chapala, where they once were abundant, and found not a single one. Even in the rockiest places, where they were most plentiful, they were gone. I am sure that overgrazing and cultivation would have taken a high toll, but surely not ALL. It then occurred to me that perhaps the virus that is afflicting *H. howardii* has perhaps wiped out *H. concinna.* It is possible that some species are more resistant than others. Unfortunately I did not have time to spend in seeking other colonies of *H. concinna* in Jalisco and neighboring Michoacan state. *H. concinna* was once a dominant plant of the summer roadsides in that part of Mexico, so unless disease has really spread like a plague, surely there may be isolated colonies that are still safe. This matter requires more study.

As we were driving into Patzcuaro, we spotted a large clump of *Hymenocallis* flowering alongside the railroad track right-of-way. I stopped to investigate and identified this plant as *H. leavenworthii.* They were very healthy and the largest specimens of this species I have seen. Leaves were strongly petioled and nearly three feet long with scapes even longer. I had collected this species before, in 1976, in two other places in Michoacan state, but none approached this colony for robustness.

We saw no other *Hymenocallis* species after that while returning to Texas.

PLANT LIFE LIBRARY

INVESTIGATING CHROMOSOMES, by Adrian F. Dyer. John Wiley & Sons, Inc., New York, One Wiley Drive, Somerset, NJ 08873. 1979. Pp. 138, Illus. $19.95.

This book, actually a manual, will fulfill the needs of anyone wishing to learn to work with chromosomes. The methodology described is simple, yet effective. Well done diagrams and exceptionally clear photomicrographs are interspersed within the text where needed. Highly recommended for those commencing a study of the carriers of genetic information.

DISEASES AND PESTS OF ORNAMENTAL PLANTS, 5th ED. by Pascal P. Pirone. John Wiley & Sons, One Wiley Drive, Somerset, NJ 08873. 1978. Pp. x + 566. Illus. $18.50.

This reference book on diseases and pests of ornamental plants is an official publication of the New York Botanical Garden. The fact that it is in the 5th edition attests to its value for helping many generations of gardeners grow healthy ornamental plants. The information is presented in 2 parts; Part 1 is concerned with control problems, and Part 2 discusses symptoms of diseases and pests on specific host plants. It is beautifully illustrated and highly recommended for use by both the amateur and professional gardener.

TOXIC PLANTS, Edited by A. Douglas Kinghorn. Columbia University Press, 562 West 113th Street, New York, NY 10025. 1979. Pp. ix + 195. Illus. $20.00.

This book offers 8 papers by as many different authors, presented at a symposium in 1977 organized by the Society for Economic Botany. For those interested in the problems involved in the study and recognition of toxic plants this book provides an up-to-date review. There is specific discussion of poisonous plants in the Lilaceae, Solanaceae, Anacardaceae, Euphorbiaceae and Compositae families. There is also a discussion of the toxic effects of mushrooms and mitogens (Pokeweed). Recommended as a good general book on plants toxic to humans.

INTRODUCTION TO PLANT NEMATOLOGY, by Victor H. Dropkin. John Wiley & Sons, One Wiley Drive, Somerset, NJ 08873. 1980. Pp. 293. Illus. $26.00. Teachers of nematology will welcome the publication of **Introduction to Plant Nematology,** the first general text to appear in more than a decade. In its 13 chapters Dropkin deals with the form and function of nematodes, their soil environment, identification of important genera, diseases they cause, population dynamics and principles of control. Also included are chapters on genetic resistance and prospects for the future. The book contains numerous illustrations, some of which are orginal, and with a few exceptions, reproduction of the figures is good. Figure legends, however, frequently precede the figures by as many as 3 pages necessitating considerable page-turning. Lattices for the separation of genera and higher taxa also are awkward and should be replaced by simple keys in future editions. Selected references provide a fair cross-section of the literature.

PLANT HEALTH, THE SCIENTIFIC BASIS FOR ADMINISTRATIVE CONTROL OF PLANT DISEASES AND PESTS. Edited by D. L. Ebels and J. E. King. John Wiley & Sons, Inc., One Wiley Drive, Somerset, NJ 08873. 1979. Pp. xii + 320. Illus. $49.95. This is an important book for plant pathologists and for those charged with the legislative and administrative procedures used by governments to prevent the entry and dispersal of plant pests, and their eradication after entry. The book is the outcome of a 3 day symposium organized by the Federation of British Plant Pathologists to address these problems. It reports the substance of the papers presented at this conference. For those administrators and plant scientists with the responsibility for maintaining the good health of their nation's crop and ornamental plants this book is highly recommended. Unfortunately, the book at $49.95 for 327 pages is excessively priced, even by present day standards.

ADAPTATION OF PLANTS TO WATER AND HIGH TEMPERATURE STRESS. Ed. by Neil C. Turner and Paul J. Kramer. John Wiley & Sons, Inc. One Wiley Drive, Somerset, NJ 08873. 1980. Pp. x + 482; Illus. $40.00. This book is the result of a seminar/workshop held under the auspices of the U.S./Australia Cooperative Science Agreement. The focus of the Workshop was not only on the response to water and high temperature stress, but also on the morphological and physiological mechanisms of adaptation to stress factors. There are 28 chapters contributed by about 50 authors. There is a useful author, and a good subject, index. If you are even mildly interested in stress physiology this book is a good place to satisfy such an interest.

IKEBANA—SPIRIT AND TECHNIQUE by Shusui Komoda and Horst Pointner. Blandford Press, Dorset. Distributed by Sterling Publ. Co., 2 Park Ave., New York, New York 10016. 184 pp., Illus. b/w with 1 sig. color. 7″ x 7″. $15.95 hardback.

The book is a detailed explanation of the Japanese art of flower arranging directed to the western audience. The book has many facets showing the theory, arrangement details and evolution through the centuries of this art form.

THE COMPLETE BOOK OF HERBS AND HERB GROWING by Roy Genders 1980. Sterling Publi. Co., 2 Park Ave., New York, New York 10016. 176 pp. Illus. b/w & color. $14.95 hardback, $8.95 paperback. 6½″ X 10″.

Rather than complete, the book is fairly comprehensive, but what it does cover, it does so well. Word etymologies are elucidated and folklore and facts are clearly distinguished in most of the entries. In Part II the listing by common name is perhaps not as efficient as would be by latin names, but the index is handy. The black and white line drawings, along with an occasional color plate do not detract from the well-written text Cultural details and history of herbal use in Part I are given in a very clear writing style that serves only to further whet interest in herb use.

IVIES by Peter Q. Rose. Blandford Press, Dorset. 1980. Distributed by Sterling Publ. Co., 2 Park Ave., New York, New York 10016. $17.50 hardback. 180 pp. 7″ X 5″ Illus., color.

A monographic treatment of cultivated varieties of **Hedera** and their culture. The color plates allow ready identification of 54 of the 100 or so varieties discussed. Although the text covering each variety is often involved with trite details of botanical nomenclature, the reader's interest is sustained by a very clear writing style. Not a book for everyone but a must for Ivy lovers.

ROSES by Mark Mattock. Blandford Press, Dorset. 1980. Distributed by Sterling Publishing Co., 2 Park Ave., New York, New York 10016. $12.50 hardback. 176 pp. 6½″ x 5″. Illus., color.

A popular guide to cultivated hybrid roses, their culture and history of development. The 88 photographs jade the senses and still cover only about one sixth of the varieties discussed. The introductory section is loaded with facts on rose societies, hybridization, culture and classification schemes.

GARDEN FLOWERS by Bran & Valerie Proudley. Blandford Press, Dorset. 1980. Distributed by Sterling Publ. Co., 2 Park Ave., New York, New York 10016. 236 pp. Illus. color. $6.95 paperback.

A condensed treatment of herbaceous perennials and annuals cultivated in temperate climate gardens. Heavy emphasis is given to named cultivars. The two signatures of color plates plopped into the center of the pocketbook are very attractive but require constant thumbing back and forth to the text unless one is just browsing for inspiration.

CACTI & SUCCULENTS FOR THE AMATEUR by Charles Glass and Robert Foster. Blandford Press, Dorset. 1980. Distributed by Sterling

PLANT LIFE LIBRARY—continued on page 146.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

1. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 6.]

(c) REGISTRATION OF PLANT NAMES

Mr. James M. Weinstock, Registrar, 10331 Independence, Chatsworth, Calif. 91311

Correspondence about the registration of plant names should be sent directly to the Registrar, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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Examinations.—Those desiring to take the examination for the Official Amaryllis Judges Certificate, should preferably apply to the Official Instructors for details, See Plant Life Vol. 35, 1979, Pickard Study Course, pages 34-41.

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE**, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $8.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948**, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $8.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $8.00 postpaid.

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.

COMPLETE SETS **OF HERBERTIA:**

Vols. 1-5 (1934-1938), $45.00, postpaid.
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1-15 (1934-1948), $120.00, postpaid

SINGLE VOLUMES OF HERBERTIA:

Single volumes of HERBERTIA (1934-1948), when available may be purchased at $10.00 per volume postpaid.

Only a very limited number of sets, and odd single volumes are available. The price quotations are subject to prior sale.

(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.**

A limited number of volumes of **Plant Life,** including **Herbertia,** second series, are available, all quotations subject to prior sale.

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Vols. 16—20, (1960-1964), $ 40.00, postpaid.
Vols. 21—25, (1965-1969), $ 40.00, postpaid.
Vols. 26—30, (1970-1974), $ 40.00, postpaid.
Vols. 31—35, (1975-1979), $ 40.00, postpaid.
Vols. 1—35, (1945-1979), $250.00, postpaid.

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.

Make checks payable to the AMERICAN PLANT LIFE SOCIETY, and send orders to—

Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
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