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Cover photographs. Front: *Pitcairnia grafii*, a new species from Venezuela. The 50-cm tall specimen collected by Enrique Graf is described by Dr. W. Rauh on pages 161–163. Photograph by Dr. Rauh. Back: *Aechmea multiflora* specimen grown by Roberto Burle-Marx. Please see back cover for description. Photograph by E.M.C. Leme.

CONTENTS

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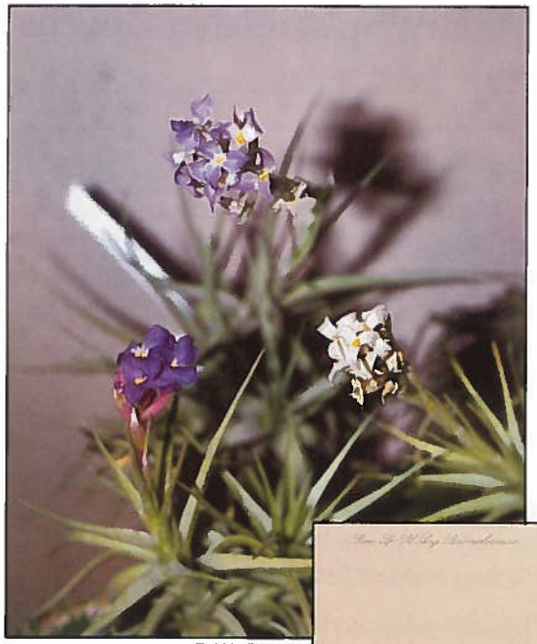
Tillandsia bergeri, a Many Splendored Species

Robert W. Read

A sizeable collection of plants of *Tillandsia bergeri* was imported from Argentina during the summer of 1981 (December and January in Argentina). The variation observed as they came into flower effectively illustrated a point that I have often stressed: variability among individuals of a single species over the range of population. This condition is clearly illustrated in the accompanying photograph (fig. 1). These three plants represent a cross section at selected points in the variation, with numerous intermediates blending form and color throughout the collection. They also represent a random sampling of the population, since the plants were not in flower when originally collected. Large clumps of *T. bergeri* were found growing on and between granitic rocks protruding from a dusty, reddish soil 400 km northeast of Buenos Aires. Although *T. bergeri* is reportedly from Argentina only, *T. aeranthos* is widely known through southeastern Brazil, Paraguay, Uruguay, and northeastern Argentina.

Tillandsia bergeri is a member of the subgenus *Anoplophytum* in a group of species distinguished by the fact that the stamens are included deep in the throat of the flower, with the style slender and much longer than the ovary; the stamens about equaling the claw of the petal, and the filaments strongly pilcate in many species. *T. bergeri* keys out next to *T. aeranthos* (Loiseleur) L.B. Smith on page 689 of Smith and Downs (1977) where it is distinguished solely on the color of the floral bracts ("pale rose" in the former, "dark red" in the latter) and the petals ("dull blue to white" in the former, "dark blue" in the latter). However, in the text description, *T. bergeri* (p. 837) is said to have stamen "filaments faintly plicate," while *T. aeranthos* with its nine synonyms of species and varieties has stamen "filaments plicate." In the three specimens illustrated here I found no indication of plications immediately after full anthesis, with only a suggestion of plications in a couple of buds. In his new book on tillandsias, Paul Isley (1987) also makes a point of stressing how indistinguishable these two species are in the vegetative or nonblooming state.

Of particular interest here is the extreme variability of *Tillandsia aeranthos* and *T. bergeri* whose ranges overlap. Plants with pale bracts, narrow white petals and nonplicate stamen-filaments show one extreme; plants with dark red bracts, deep blue, broad-bladed petals and faintly plicate stamen filaments display another. Could this represent another case of putative hybridization and resultant hybrid swarm over a large area? Are *T. aeranthos* and *T. bergeri* really distinct species, or does the former merely extend the range of variability of the latter? These questions might be answered best by someone living in the region where they grow so that random collections and measurements could be made and perhaps other more sophisticated research could be undertaken.



R.W. Read

Fig. 1.
Three individuals of *Tillandsia bergeri* illustrate the variability that can occur in a random sample.

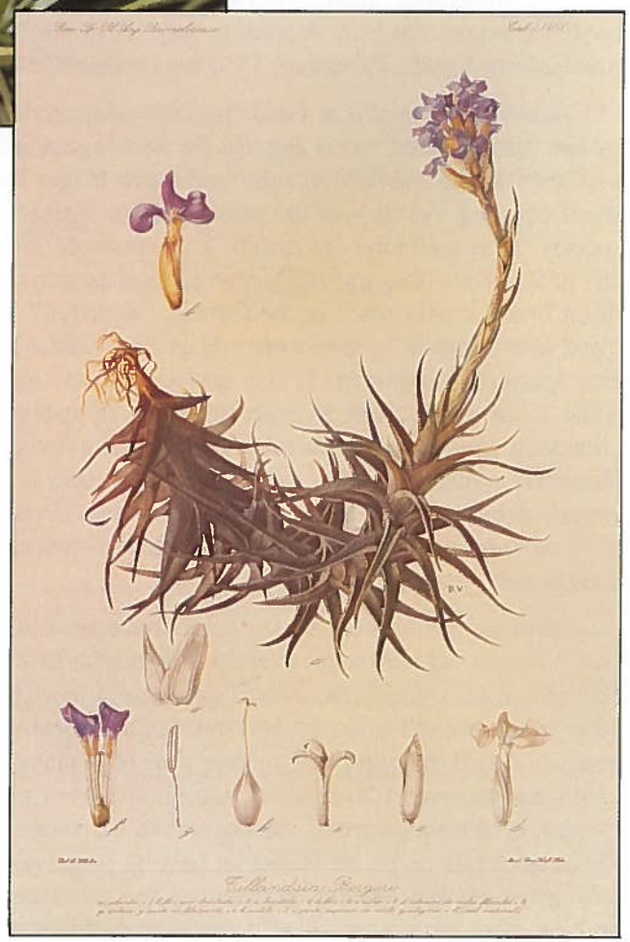


Fig. 2.
T. bergeri (from Genera et Species Plantarum Argentinarum, vol. 3, plate 89.) The plate size is 36 x 22 cm.

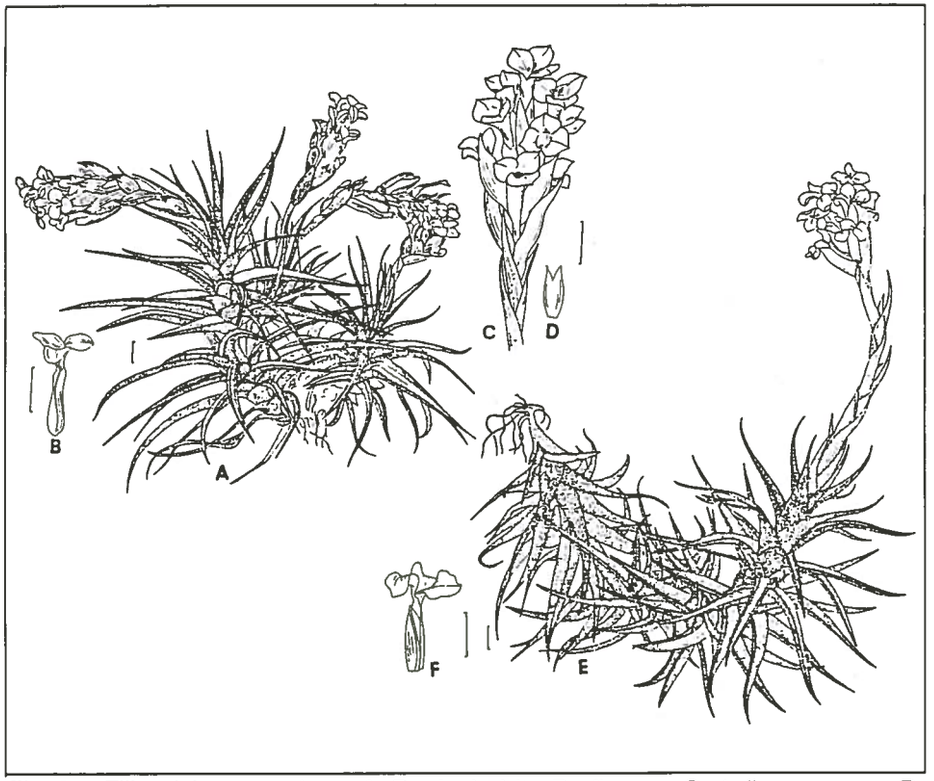


Fig. 3. *Tillandsia aeranthos,* A–D: A, habit; B, flower; C, inflorescence; D, posterior sepals. E–F: *T. bergeri,* E, habit; F, flower (from Smith & Downs, Tillandsioideae, 1977: fig. 264).

Michael Rothenberg, who supplied the plants for this study, suggested that a comparison of the wavy versus rigid character of the petals of the two species might provide some useful information.

Both *T. aeranthos* and *T. bergeri* are illustrated in the book of Alberto Castellanos (1945) (fig. 2). Adaptations of these marvelous paintings were reproduced in Smith and Downs (1977) in fig. 264, along with an example from Botanical Register (pl. 1338) (fig. 3).

REFERENCES:

Castellanos, A. Genera et Species Plantarum Argentinarum. Buenos Aires: G. Kraft; 1945: vol. 3, pls. 88 & 89.

Smith, L.B.; Downs, R.J. Tillandsioideae. Flora Neotropica. Monograph 14, pt. 2. New York: Hafner Press; 1977.

Isley, P.T. Tillandsia. Gardena, CA: Botanical Press; 1987:12, 24.

Curator, Department of Botany,
Smithsonian Institution, Washington, D.C.

A New *Aechmea* from Southeastern Brazil

Elton M.C. Leme and Harry E. Luther

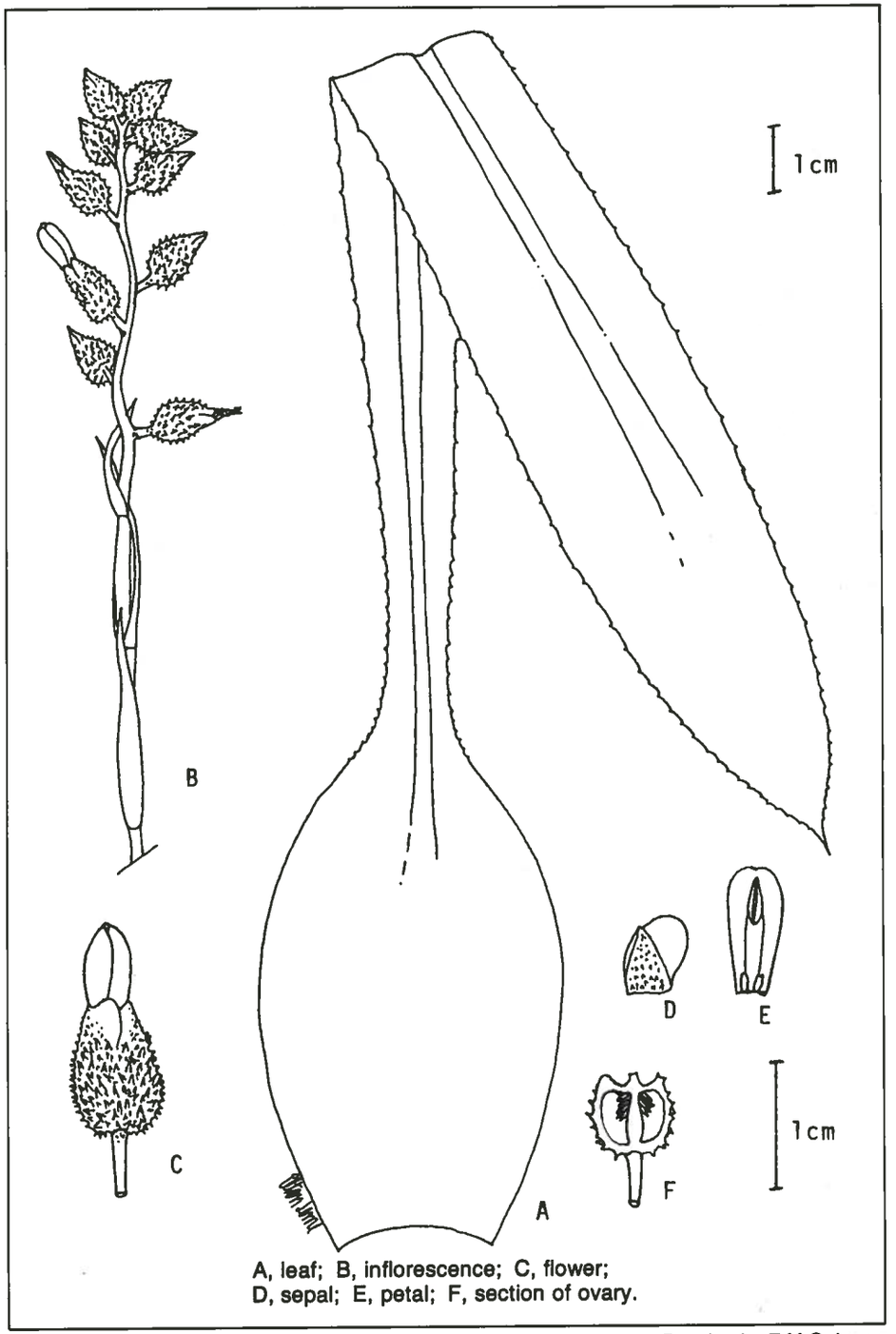
Aechmea pedicellata, a species very delicate in appearance, is found in the state of Espírito Santo, Brazil, growing on hilltops 800-900 m high and covered with a low Atlantic forest. This new species, according to the key presented by L.B. Smith and R.J. Downs,[1] is closely related to *Aechmea podantha* L.B. Smith. It differs in the well developed pedicels and the tuberculate ovary (in *A. podantha* the ovary is not more than verrucose). It also resembles, although superficially, *A. racinae* var. *erecta* L.B. Smith, except that the leaf sheaths form an ellipsoid tank, the scape is shorter than the leaves, the sepals and petals are shorter and the latter are solid blue, and the ovary is tuberculate.

Aechmea pedicellata Leme et Luther, sp. nov. Subgen. *Lamprococcus* (Beer) Baker.

Aechmea podantha L. B. Smith, cui affinis, inflorescentia simplicissima, pedicellis 3–5 mm longis, ovario tuberculatis differt.

Plant epiphytic, flowering about 30–35 cm high, stoloniferous. *Leaves* about 11, suberect, rosulate, ligulate, forming an ellipsoid water reservoir at base of 4–5 cm in diameter; *sheaths* elliptic, 7–8 cm long, 4–5 cm wide, pale green or with sparse red spots, inconspicuously and subdensely brown-lepidote; *blades* 20–25 cm long, about 3 cm wide, strongly narrowed and canaliculate toward the base, subdensely and minutely serrulate, spines less than 0.5 mm long, apex acute and apiculate, subglabrous, green or reddish near the margins. *Scape* erect, about 2 mm in diameter, red, glabrous, 20–25 cm long, sparsely verrucose near the apex; *scape bracts* narrowly lanceolate, apex acuminate, 35–45 mm long, about 8 mm wide, entire or remote spinulose at apex, sparsely and inconspicuously brown-lepidote on both sides, erect, longer than the internodes and not completely hiding the scape. *Inflorescence* simple, laxly flowered, 4–6 cm long, slightly shorter than the leaves; *axis* flexuous, red, inconspicuously verrucose; *floral bracts* from about equaling the pedicel to minute, 0.5–1 mm long, triangulate, apex acute. *Pedicels* 3 mm long. *Flowers* 9–12, 17 mm long, subspreading, polystically arranged; *sepals* strongly asymmetric, apex acute, 4 mm long, connate for 1 mm, basally tuberculate, glabrous, red or slightly bluish at apex. *Petals* obovate, apex emarginate, 11 mm long, about 5 mm wide, free, blue, bearing two lanceolate scales at base, 1 mm long, with entire or subdentate apex. *Stamens* shorter than the petals; *filaments* complanate, the epipetalous filaments basally adnate to the petals, the others free; *anthers* sublinear, base obtuse, apex acute, 4 mm long. *Ovary* subglobose, red, glabrous, tuberculate; *epigynous tube* inconspicuous; *placentae* apical; *ovules* apiculate.

1. Bromelioideae: 1979.



A, leaf; B, inflorescence; C, flower;
D, sepal; E, petal; F, section of ovary.

Drawing by E.M.C. Leme

Fig. 4. Aechmea pedicellata Leme & Luther.

E.M.C. Leme

Fig. 5. A distinguishing character of *Aechmea pedicellata*, newly described here by E.M.C. Leme and H.E. Luther, is the well developed flower stem clearly shown in this photograph.

Type: BRAZIL. Espírito Santo: County of Domingos Martins, Boqueirão, elevation 800 meters. Leg. *Roberto A. Kautsky, A. Entringer* and *V. Schunk, 937,* September, 1986 (cultivated by Elton M.C. Leme, 976), (holotype, HB; isotype, RB, SEL).

Paratype: Brazil. Espírito Santo: County of Alfredo Chaves, Maravilha. Leg. *Roberto A. Kautsky 923.* Flowered in cultivation January 1986 (also cultivated by Elton M.C. Leme, 851, (HB, SEL).

Herbarium Bradeanum, Rio de Janeiro
M.B. Foster Bromeliad Identification Center,
Marie Selby Botanical Gardens, Sarasota, Florida

Announcement

The United States Post Office machinery removed labels from dues notices for several members whose memberships expire in June and July 1988. If you, or someone you know, did not receive notice that your membership was to expire in these months, please send these dues to the membership secretary: Linda Harbert, 2488 E. 49th Street, Tulsa, OK 74105. In these cases, any missing back issues will be sent at no additional cost.

Solar Bromeliads

John Atlee **Illustrations by the author**

A bromeliad grower living in an area whose history includes over a thousand years of solar technology cannot easily ignore the past. The native Americans of the southwest built their cliff dwellings facing south under an overhang so that winter sun warmed their homes and summer shade cooled them. This understanding of the sun helps to account for their ability to prosper for over a thousand years.

New Mexico regularly records 300 solar days a year meaning that there is an average of 300 days in which more energy strikes the surface of the earth than is lost. The bromeliads in my collection seem to be well aware of this energy as they spend the winter in their greenhouse—a passive solar geodesic dome.

The greenhouse is a simple structure based on concepts developed by Buckminster Fuller. Detailed plans for the construction of the greenhouse came from the book *Building and Using a Solar-Heated Geodesic Greenhouse,*[1] which resulted from a research project at Fordham University, New York. The research design was for vegetable production and aquaculture. I have, with a few adaptations, converted its primary use to growing, maintaining, and propagating over 150 different species and varieties of bromeliads, a collection of more than 300 plants in 200 square feet.

Technically described, my greenhouse is a 16-foot diameter, two-frequency icosa alternate (figures 6 and 7).[2] More simply, it is a 16-foot wide, circular dome, constructed of only two lengths of supporting struts connected at intervals around the surface in either pentagonal or hexagonal hubs.[3]

I constructed the greenhouse in Albuquerque in the spring of 1985, siting it on the north side of the yard with three, large, deciduous trees to the south. In winter, the bare trees let in sunlight, and in summer, their leaves provide shade. I trap as much of the sun's energy as possible collecting the heat in standard, black, 55-gallon steel drums filled with water and spaced under the bench on the north side of the greenhouse (figure 8). I must be careful not to shade the collecting surfaces of the barrels when moving the plants in for the winter. The spaces between the barrels are stacked with as many two-liter, plastic, soft-drink bottles as I could squeeze in. They are also filled with water, their black bases facing the sun.

All of the heat storage is located in the northern two-fifths of the dome, which is insulated with fiberglass batts covered with reflective mylar (figure 6). As the sun drops during the winter its light strikes the exposed surfaces of the barrels warming the water inside. In summer, when the sun is higher, the barrels are shaded and remain cool.

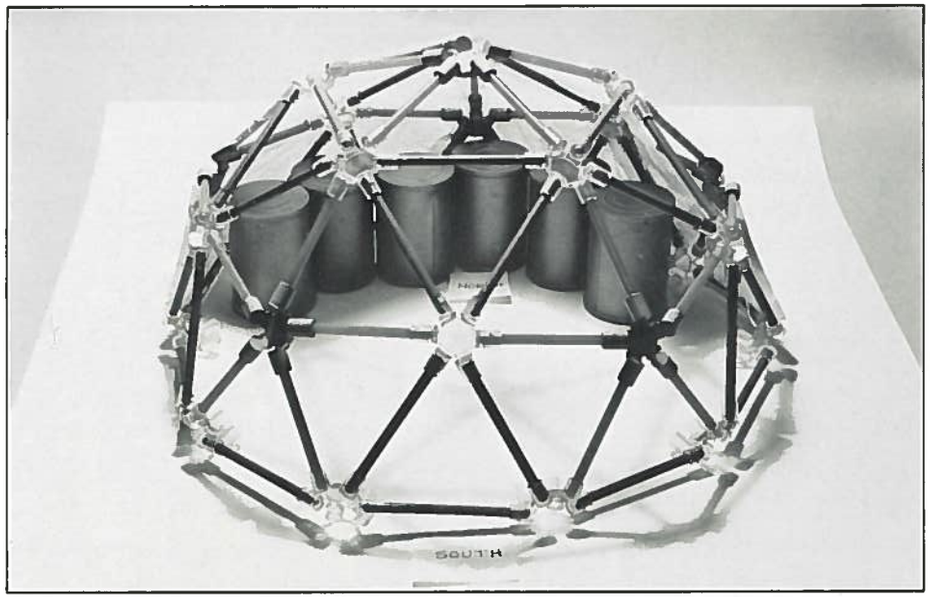


Fig. 6. A model of the dome, seen from the south, showing placement of barrels. Insulation covering the north wall can be seen. The hexagonal face is toward the reader and two pentagonal faces are also visible.

Fig. 7. My greenhouse from the south. Compare with model in figure 6. Struts are joined at hexagonal or pentagonal hubs, pre-drilled using a template and bolted through. The dome rests on a ground-level cinderblock foundation, but can be lifted off. It has withstood 80-m.p.h. winds.

Fig. 8.
Black, water-storage barrels under potting bench, shaded from summer sunlight. Insulated north wall behind bench is covered on the inside with mylar film. Small tillandsias hang from struts above bench. A small oscillating fan circulates warm air.

The bench over the barrels serves as a potting area and holds the smaller plants. At the back of the bench, under the cover of the insulation, I place the more shade-tolerant plants such as catopses, guzmanias, small neoregelias, and vrieseas. The middle part of the bench is covered with a heating mat.[4] I use this area for rooting pups because it receives moderate indirect sunlight and controlled heat. Near the front edge, I place a number of plants with maturing pups along with others that require maximum sunlight and controlled water. The latter group includes abromeitiellas, canistrums, dyckias, hectias, orthophytums, and puyas. Raised above the ground they remain well drained and receive maximum air circulation and sunlight.[5] The plants on the bench have the added advantage of being gently warmed by the heat-storage water, especially at night.

The south half of the dome consists of raised beds heated by soil heating cables.[6] I use a soil mixture of one part sewage sludge (mostly sharp sand but containing nutrients and trace elements), one part garden soil, and one part Canadian peat. This mixture is excellent for the cryptanthus and porteas and is acceptable for large neoregelias and large aechmeas, some of which are permanently planted

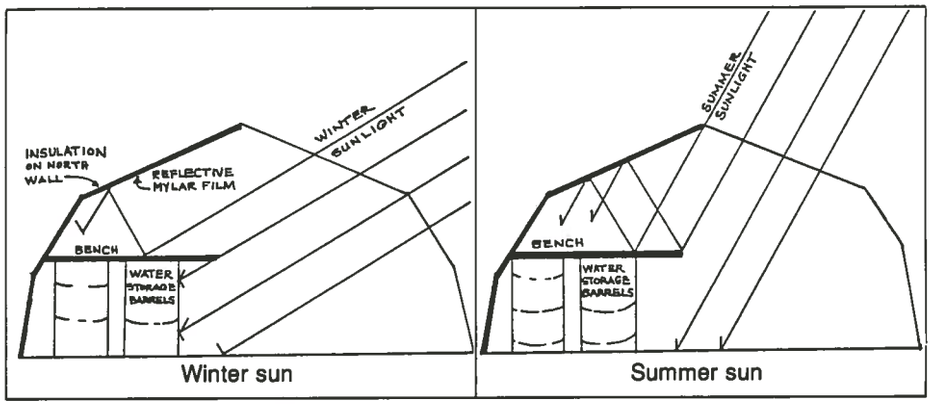
in the greenhouse. Parts of the floor are planted with tomatoes, onions, and winter vegetables, and I set the pots of aechmeas, ananas, billbergias, porteas, quesnelias, and streptocalyx among them. The pots drain well on the soil surface but are kept moist and warm by the soil and heating cables. Hanging from the struts around the top of the greenhouse are tillandsias mounted on bits of bark, wood, or fern slabs.

I maintain air circulation in the greenhouse with two fans. One six-inch sits under the bench on the ground at the north side to move the air surrounding the barrels. That air movement evens out water temperature differences. It also promotes heat transfer between the water storage and the air. Because the greenhouse is circular, there is air movement at ground level for the full circumference. A 12-inch oscillating fan sits on a corner of the bench (figure 8) and circulates the air across the top of the bench and the open parts of the greenhouse.

I am now in my third winter with this greenhouse. Either bromeliads are the toughest plants in the world, or I must be doing something right. In January of 1987, Albuquerque hit a record low of one degree above zero [F.], and the nighttime temperature inside the greenhouse dropped only to 38 degrees—the lowest temperature I have recorded in these three winters. The next day, with two feet of snow outside, the high temperature in the greenhouse was 73 degrees. My average daily temperature range inside the greenhouse four weeks before and four weeks after the winter solstice is between 45 and 68 degrees, depending on clear or cloudy skies.

The solar energy principles used in my bromeliad culture are simple, efficient, and adaptable. They are not limited to dome greenhouses. Solar technology depends on the position of the sun at solar noon. The solar year can start at any time, but I prefer to start with the winter solstice, December 21st, because that is when the dormant plants begin to grow again. At this point, the sun has reached its lowest point in the sky [in the northern hemisphere]. You can check this by recording where the long shadows are cast at noon of that day. The next day and each succeeding day, the hours and minutes of sunlight increase. Toward the end of January, the amount of daylight is sufficient to induce new plant growth. The reaction is most noticeable among my neoregelias and billbergias which begin their bloom cycle over the next two to three months. At about this time, I begin feeding the plants with my normal-strength fertilizer to encourage new growth, slowly and sparingly at first, but by mid- to late March on a regular basis.

By the time of the vernal equinox the shadow you measured in December will be one-half the length it will be on the 21st of June, the date of the summer solstice. With days and nights of equal length, all of the bromeliads will resume their normal growth. I have observed that during the three weeks before and following the first of spring the gray tillandsias begin to leap forth from their slabs with new growth and blooms. By this time I am feeding the plants every two weeks to promote growth.



In late March and early April I must be careful to see that the greenhouse does not overheat. When the days and nights are warm I leave the door open. In late April or early May, about half way between the spring equinox and the summer solstice, the outside temperatures become stable enough for me to leave the door open all of the time, to release the vent from its automatic closure and leave it wide open, also.

Four or five weeks before the summer solstice, the heat-storing water barrels are fully shaded by the slight overhang of the potting bench and the overhanging roof insulation. Although they do not gain heat from the sun during the day, they absorb heat from the air, cooling the greenhouse. At night, they give up some of that daily heat gain to moderate the nighttime temperatures of our high desert. During this time, most of the plants have been moved outside to a slat shed, but some such as cryptanthus and a few of the larger neoregelias and several porteas remain, permanently planted in the greenhouse floor.

As the autumnal equinox approaches, the thinner-leaved guzmanias are returned to the greenhouse along with dozens of newly potted pups from the summer's abundance. As each plant is returned to the security of the dome I check for insects and snails, repotting as necessary. I add Osmocote time-release fertilizer to the potting mix, which seems to be sufficient to carry the plants through the winter. I has surprised me that most growth has ceased by the end of September, shortly after the equinox. The plants clearly have a built-in clock, and it is a solar clock. I also find that if a variety did not bloom in the spring after the equinox, it is now in full bloom, catching the diminishing light or sending up bloom stalks for a final burst of autumnal color.

By late October, about halfway between the equinox and the winter solstice, the plants are all back inside for winter. The guzmanias and vrieseas are in the warmest areas, but shaded, the aechmeas and billbergias are placed to receive the most light possible, and the neoregelias are scattered in between.

The plants in the greenhouse are cared for not according to the normal calendar but according to the solar calendar. They live their lives according to the energy that the sun provides and with only a little assistance. The rewards of a solar greenhouse become evident with the brilliant colors of blooming billbergias while snow covers the ground just outside the coor.

NOTES:

1. Fontanetta, John; Heller, Al. Charlotte, VT; 1979.

2. For a detailed discussion of domes see *Domebook 2*, Bolinas, CA: Pacific Domes, 1971.

3. A geodesic dome covers the greatest amount of space with the least amount of materials. My dome is built of common pine 2" x 2" furring strips stained with a wood preservative. It is covered with Monsanto '703' ultraviolet-resistant polyethylene, inside and out (double glazed). It is available from Greenhouse and Garden Supply, 4930 Jefferson NE, Albuquerque, NM 87109, or ask Monsanto for name of a local distributor.

4. I use "Flexwatt Agritape Root Zone Heaters" manufactured by Ken-Bar, Products for the Grower, 24 Gould St., Reading, MA 01867 and available from Greenhouse and Garden Supply (note 3).

5. I generally follow sunlight recommendations found in Jack Kramer's *Bromeliads*, pages 157-158. I have found, however, that our direct sunlight, at 5,280 feet above sea level, causes leaf burn in vrieseas.

6. Electric soil heating cables are listed in garden supply catalogs such as Park's, Gurney's, and Henry Field's. I found the cables that I use at a local garden center.

Albuquerque, New Mexico

THE BROWARD COUNTY BROMELIAD SOCIETY (FLORIDA) and the **OREGON BROMELIAD SOCIETY** have again contributed very generously to the color fund. Color separations for the *Journal* continue to be a major expense. The total cost for Fiscal Year 1988 (July-August 1987–May-June 1988) was $4,515.00 with only a minor portion having been spent for black and white reproductions. Gifts from affiliates and individuals to help offset this cost are greatly appreciated. – TUL

I have heard bromeliads called all sorts of names (or, I should say the pronunciation of the word "bromeliad") but the following must surely take the prize:

Two ladies were looking at some bromeliads and one remarked how lovely they were and wondered what they could be.

"Oh," said the other, "I've seen them before and I can tell you their names. They're called bromides."

You don't believe it? It's perfectly true.

From the Bromeliad Society of New Zealand Bulletin
November 1987

A States Visit

Geoff and June Bennett

With our bromeliad collection growing rapidly and so many plants carrying doubtful names, we thought, like many other Australian BSI members, that something must be done about nomenclature. If we are to class ourselves as serious collectors we must know just what it is that we are collecting. The Bromeliad Society of Queensland took the initiative by arranging for Mr. Harry Luther from the M.B. Foster Bromeliad Identification Center at the Marie Selby Botanical Gardens in Sarasota, Florida to speak at Bromeliads III, the world conference of Australian Bromeliad Societies held early in April 1985 in Brisbane. That invitation was a step in the right direction.

We, however, would miss the conference as we had previously arranged to spend our annual vacation in the United States. There, we hoped to meet other BSI members and get their help in sorting out some of the problems confronting the Australian members. In addition to the matter of confused and confusing names, a major problem is that we do not have the large commercial nurseries where one can spend hours checking out the latest hybrids and newly collected species. Another problem is that when buying by mail order we cannot pick and choose amongst individual plants, but must take what we can get, sometimes paying, as our eventual comparison of price tags showed us, more than the quality of the product seemed to warrant.

We are all aware of the big variation in both hybrids and species, and as we are collectors and breeders we are after top plants. We imagined that by visiting a person we would be able to locate and purchase high quality plants of new species and select clones of the old species to send to Australia. We also wanted to check out some of the latest hybrids because, here again, it was our impression that a large number of the hybrids on the market today should not be there; they just are not up to standard.

Knowing Harry's plans, we headed for Sarasota before he left for Australia. I must say that our visit to Selby Gardens was one of the highlights of our trip. The setting of the gardens is delightful. While the functions of the Bromeliad and Orchid Identification Centers are well known, the facilities and collections must be seen to be appreciated fully. They are available to serve scientists, hobbyists, and commercial growers. The primary object of research on the part of the scientific staff is to collect, study, classify, propagate, and display the endangered plants of the fast disappearing tropical forests of the Western Hemisphere.

With Harry's help in going through the bromeliad collection *[Journal* 35: 219-221] we were able to find legitimate names for some of our collection and to

record them in our travelling file. We arranged an exchange of plant material and with Selby plants and others purchased along the way, we sent home quite a varied collection of species and some very nice hybrids. Unfortunately, many failed to survive the transition from the United States to our garden by way of quarantine, but the survivors will help to boost the material available to Australian collectors. That was another part of our mission accomplished thanks in no small measure to the hardihood of the surviving plants.

Our trip was more than a delightful experience; we made many friends. It is really amazing how the world of plants brings people so close together. While still in Florida, we enjoyed a visit with the members of the Bromeliad Society of South Florida in Miami, and the hospitality of Libby Besse in Sarasota. In Orlando we visited Tom and Marguerite Lineham who arranged for us to explore the nurseries of Eloise Beach, Carol Johnson, and Bert Foster. We also spent a pleasant morning chatting with Racine Foster about the early days of the BSI.

Before leaving Australia I had suggested to Geoff that it would be a special event if we could meet Dr. Lyman Smith. That meeting was arranged. Dr. Smith gave us some of his very precious time, showed us around the botany department and bromeliad collection of the Smithsonian Institution, and answered my request by showing us a specimen of *Pitcairnia feliciana,* the one bromeliad found in Africa.

To round out our excursion, we also travelled to London and met David Philcox at the Kew Royal Botanical Gardens. Mr. Philcox, in spite of his schedule, showed us the collection of Morren paintings and the bromeliad collection. It will be hard to top those experience in our future travels.

We would like to think that there may be several results of this nearly 'round-the-world trip. Certainly we met a great many well informed and generous people who took time to chat with us and show us around, answering our many questions. Another is that they may have become more aware that there is a big following of bromeliads in Australia and that the collectors are both aware of developments and anxious to cultivate only the best. We think that awareness is very important because we are so greatly dependent on foreign nurseries for our stock and because the cost of plants is greatly increased by our unfavorable exchange rate and the high mortality rate. We have already mentioned two other results: improvements in naming plants, and our hardy group of newly acquired plants.

We hope to return before long. There are so many things to do and see, and people to meet, things to learn, and plants to select.

Cairns, Queensland

Pitcairnia grafii, a New, Attractive Plant from Venezuela

Werner Rauh

Pitcairnia platypetala Mez similis, sed ab ea differt characteribus sequentibus: Laminae basi serratae, nec omnino itegrae, subtus albae, nec brunneo-lepidotae. Inflorescentia laxa multiflora, nec dense et pauciflora. Pedicelli usque ad 25 mm longi, nec breves. Sepala carinata, nec ecarinata. Petala non obtusa, sed breviter apiculata ligula distincte parva numquam magna.

Patria *Pitcairniae platypetala* Brasilia (sine loca natali) esse dicitur.

Holotypus: B.G.H. 64 680, leg. *Enrique Graf,* Caracas, Venezuela *s.n.* (27.2.1983), in herb. inst. bot. system. univ. heidelb. (HEID).

Patria et distributio: Venezuela. Estado Tachira: inter El Capacho et San Antonio, circa 1,000 m.s.m., iuxta cascaden.

Pitcairnia grafii Rauh, sp. nov. is related to *P. platypetala* Mez but differs from it in the following characteristics: *Leaf blades* serrate at the base, not completely even; beneath white, not brown lepidote. *Inflorescence* laxly and richly flowering, not dense and few flowering. *Pedicels* not short, up to 25 mm long. *Sepals* carinate, not ecarinate. *Petals* acute, not obtuse, with a small and not a great appendage.

The habitat of *Pitcairnia platypetala* is Brazil (without exact locality). It is unfortunate that the flowers are missing in the holotype (*Peters,* Brazil), deposited in Leningrad, USSR.

Holotype: B.G.H. 64 680, leg. *Enrique Graf,* Caracas, Venezuela, *s.n.* (227.2.1983), in Herb. Inst. System. Bot. Univ. Heidelberg (HEID).

Locality and distribution: Southern Venezuela. Estado Tachira; between El Capacho and San Antonio, about 1,000 m.s.m., near a waterfall.

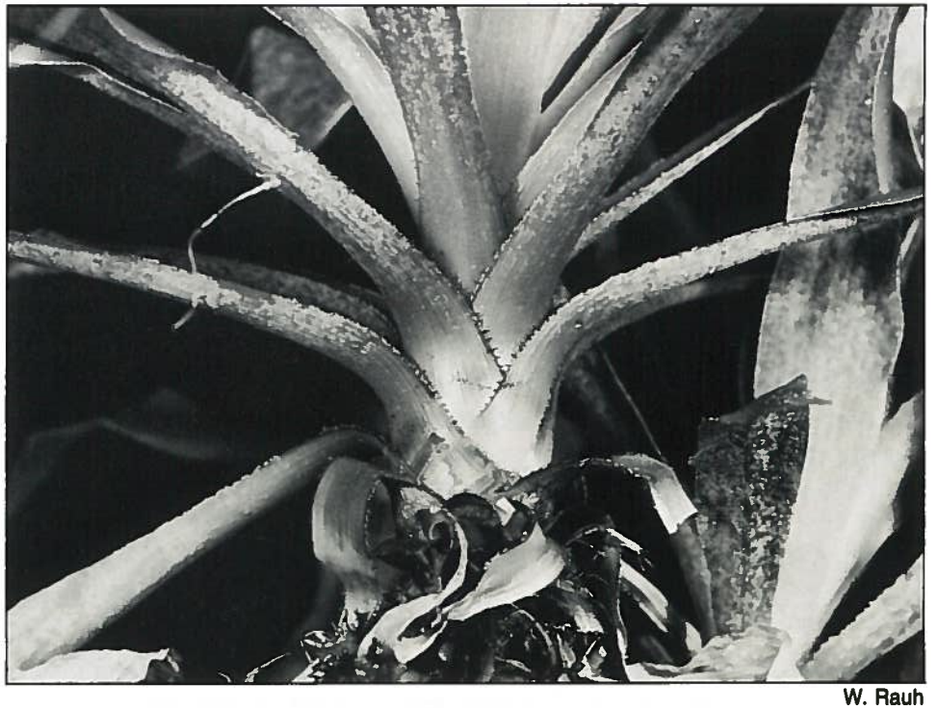
Plant forming clusters, with a short stem, flowering up to 50 cm high. *Leaves* dimorphic: the outer (basal) reduced to short (2 cm long), black, thorny leaves; the normal leaves numerous, forming a dense, spreading rosette, up to 10 cm high and 50 cm in diameter. *Sheaths* 2 cm wide, 1.2 cm high, thin, pale green, even at the margin. *Blades* very soft, yellow-green, lanceolate, attenuate, up to 30 cm long, in the middle of the blade 3 cm wide, narrowing at the base, but not petiolated, with stiff brown spines, glabrous above, lepidote only at the tip, laxly white woolly beneath. *Scape* erect, round, reddish, 3 mm thick, laxly woolly, longer than the rosette leaves. *Scape bracts:* the basal ones subfoliate, imbricate; the middle ones narrow-lanceolate, acute, longer than the internodes; the upper

W. Rauh

Fig. 9.
Pitcairnia grafii, a new species from Brazil. The inflorescence is approximately a foot (25 cm) long with about 25 brightly colored flowers.

Ch. Dannenbaum

Fig. 10.
Scanning electron microscope photograph of trichome of the upper side of the *Pitcairnia grafii* leaf (100 microns).



W. Rauh

Fig. 11.
Pitcairnia grafii leaf rosette with dried leaves at base.

ones shorter than the internodes, membranaceous, woolly lepidote at the margin. *Inflorescence* simple, up to 25 cm long, pyramidal with about 26 laxly arranged flowers. *Rachis* erect, straight, thin, bright red, glabrous. *Floral bracts* triangular-acute, pale green to red, laxly lepidote, much shorter than the divergent 1.5–2 cm-long, thin, red, laxly lepidote pedicels. *Flowers* at anthesis divergent, postfloral erect, slightly zygomorphic, to 5.5 cm long. *Sepals:* the posterior ones carinate, narrow triangular, acute, up to 22 cm long, nearly glabrous, dark red. *Petals* ligulate, rounded but apiculate, 5 cm long, orange-red in the upper part, pale carmine at the base, with a small scale. *Stamens* shorter than the petals, with yellowish filaments and 6 mm-long anthers. *Style* longer than the petals, with spiral, papillate stigmas. *Ovary* 6 mm long, ¾ superior. *Ovules* obtuse, not caudate; therefore, *P. grafii* must be put into the subgenus *Pepinia.*

Pitcairnia grafii is a very attractive plant with soft leaves as in *P. tabuliformis.* It grows like this species at about 1,000 m altitude near a waterfall. With age, the old, basal leaves die but they are not thrown off at a transverse line.

I thank Enrique Graf, who discovered this beautiful species, for sending living plants which have flowered in the Botanical Garden at Heidelberg.

Institute for Systematic Botany and Botanical Garden
of the University of Heidelberg, West Germany

"Overgrown"

Sam Smith

Being a relative newcomer to the world of bromeliads, I'm still learning some of the key words that apply to bromeliads and bromeliad culture. During show and tell at one of my first meetings I heard someone whisper in a derogatory tone, "overgrown." To me the plant in question seemed large and beautiful. Later at my first show, I again saw large, beautiful plants with red or yellow ribbons. When I turned the score card over, there was that dreaded word: "overgrown." The explanation given was that the plants were too large.

For months I have pondered this question losing great amounts of sleep trying to solve this apparent anomaly. First, I consulted the standard books of Padilla and Rauh. Nothing listed in the index. Reading through the section on culture one learns how to grow bromeliads but not how to overgrow them. Maybe it's a disease. *Fusarium* fungus is mentioned, mealybugs, a *Gymnaspis* and a couple of *Diaspis,* but no "overgrown." Since the show was sanctioned by the Bromeliad Society, Inc. perhaps the answer lies in the *Cultural Handbook.*

Instead of "overgrown" I find and I quote: "Better coloration, larger plants, more rapid propagation, timely flowering, and that robust and handsome health so much admired by all who grow plants, will be the reward of any good supplemental feeding program faithfully attended to."

After receiving no help from *A Bromeliad Glossary* and Walter Richter's *Bromeliads,* I could no longer put off reading David Benzing's formidable *Biology of Bromeliads.* Having thoroughly comprehended this work I am left with only one conclusion: a bromeliad may be well grown but NOT "overgrown."

There are many factors that control the size of individual plants. If the plant does not receive sufficient nutrients, it will be stunted. Improper light also causes stunting or deformity, the long, strappy, green leaves we are all familiar with. In epiphytes, the stability of the mount can cause marked variation in plant size. I have two specimens of *Tillandsia utriculata* from the same gene pool, grown under identical conditions except that one was attached to a 1 cm twig while the other was attached to a 30 cm live oak trunk. The plant sizes are proportional to the size of their supports. The maximum size a plant can achieve is controlled by its genetic makeup. In isolated populations there is considerable intraspecific variation in genetic makeup. For example, the Florida *Tillandsia pruinosa* is a rather small plant; however, its Mexican counterpart is several times larger. The Jamaican *T. bulbosa* is likewise several times larger than its Mexican cousin. Individuals in some species vary considerably even in the same population under identical conditions. *T. variabilis* in south Florida is a good example of this statement.

There are many ways in growing plants to obtain a desired effect. One can vary the soil pH to control flower color in some plants. One can limit the available nutrients to obtain the desired results, bonsai being an obvious example. A well grown 30-year old pine tree would not be bonsai, but lumber.

To grow those enviable plants referred to in the *Cultural Handbook* several ingredients are required. Light is necessary for all bromeliad growth. Too little and the plant tries to compensate by elongating its leaves and getting rid of all pigment except chlorophyll. Too much and the leaves burn. Supplemental nutrients help the plant grow to its full potential. Too much fertilizer concentrated either in the cup or about the roots will dehydrate the plant and frequently cause death. A firm mount is important particularly for epiphytic growth. No bromeliad can grow without water. If good air circulation and well drained medium are provided most plants can take a surprisingly large amount of water.

By following these few simple rules you can grow large, well formed, beautifully colored bromeliads, but they will grow only as large as they are genetically programmed to grow.

What about "overgrown?" After learning only the very basic plant genetics and growth physiology, I can now sleep at night knowing there is no such bogeyman.

Fort Myers, Florida

Clarification

The short illustrated note on *Tillandsia ionantha* in the March-April *Journal* requires a clarification. Both figures 7 and 8 represent *Tillandsia ionantha* var. *ionantha.* This is a quite variable taxon ranging in size from 2 to nearly 15 cm in height. *Tillandsia ionantha* is distributed over a wide area from northeastern Mexico south to central Costa Rica in hot, seasonally dry habitats. The greatest range of variation seems to occur in Mexico and several odd types have been given cultivar names.

In addition to the typical variety, a long, caulescent, lithophytic population has been described as var. *vanhyningii.* It is restricted to the state of Chiapas in southern Mexico.

A third variety characterized by a scapose, occasionally compound inflorescence has been described as var. *scaposa.* As this plant has little in common morphologically with *T. ionantha* and occurs at much higher elevations in pine-oak cloud forests perhaps a better designation is *T. kolbii* described by Till and Schatzl in Plant Systematics and Evolution 138, pages 259-262, 1981. *Tillandsia kolbii (T. ionantha* var. *scaposa)* has, to the best of my knowledge, never been illustrated in the *Journal.* Collectors who acquire this plant (under either name) should be advised that conditions suitable for *T. ionantha* may be fatal to *T. kolbii.* Keep it damper and much cooler.

Harry E. Luther, *M.B. Foster Bromeliad Identification Center*
The Marie Selby Botanical Gardens, Sarasota, Florida

Aechmea aripensis, Nature's Pincushion

Racine Foster

In Lyman Smith's "Key to Species of Subgenus *Aechmea* and Simulators," *A. aripensis* follows immediately *A. orlandiana.* That should tell you that they are morphologically close. However, *A. aripensis* does not have the attractive, embossed, two-toned leaf of *A. orlandiana.* And, *A. aripensis* (fig. 12) differs from *A. orlandiana* with a dense, compact, subglobose head which resembles a pincushion of tightly pressed, upright, red bracts, surrounding blue flowers —an intriguing bromeliad.

Originally, this plant was collected by W.E. Broadway of Kew Gardens on the Cerro del Aripo in Trinidad, West Indies, at 3,000 feet elevation, in January 1922. His type specimen #9917 is deposited in Kew Gardens, England.

In 1926, four years after the original collection, N.E. Brown (a *Sansevieria* specialist at Kew) published in the Bulletin of the Torrey Club (vol. 53) a description of *Gravisia aripensis,* the original name of our *Aechmea aripensis.*

In 1958, Dr. Colin S. Pittendrigh changed the genus from *Gravisia* to *Aechmea.*[1] The full botanical description can be found in Lyman Smith's monograph, part 3, Bromelioideae, pages 1796-1799.

M.B. Foster

Fig. 12.
Aechmea aripensis **was first collected on Cerro del Aripo, the 3,085 ft. peak on the island of Trinidad. The arrangement of the floral bracts resembles a pincushion.**

Dr. Pittendrigh and Dr. Thomas Aitken were colleagues at the Trinidad Regional Virus Laboratory (Rockefeller Foundation) in Port-of-Spain, Trinidad. They were doing research on mosquitoes, a study that lead, inevitably, to their interest in bromeliads, the tank types that harbor mosquitoes.

From the time of our visit to the island in 1940, there was an accelerated interest in the bromeliads botanically and horticulturally. Thereafter, for twenty years we carried on a correspondence and exchange of plants with Dr. Aitken who became very enthusiastic about bromeliads. He tried to interest the local people in their native flora and helped set up a judged exhibition of bromeliads in the Horticultural Club show. (Lucky are the people in Trinidad—they don't have to worry about cold weather).

Dr. Aitken's enthusiasm gave him the impetus to make a drawing of the curious pincushion flower head of *Aechmea aripensis* which he sent to us in July 1957 along with the following description:

> Scape, densely brown-lanate. Scape bracts barely imbricate, broadly ovate, glabrous. Inflorescence dense, subglobose, about 3½ to 4 inches across resembling a very spiny pincushion, bright red bracts with purple tinges as it ages, and tiny pale blue flowers which barely exceed the prickly sepals. Primary bracts, suborbicular, almost entirely exceeding the axillary branches. Floral bracts red with sparse covering of brown-lanate fuzz. A large plant with broad, serrate leaves.

I regret to say that we did not actually collect this fascinating bromeliad, but we intended to do so! We saw the blooming plant in Dr. Aitken's garden in Port-of-Spain in 1940 on our way home from six-months collecting in Brazil.

Of course, we were very covetous of such a curious bromeliad. It was exciting that this was a genus *(Gravisia)* which, at that time, we didn't know. We wanted to see how it grew in its native tropical habitat. So, since the mountain was only an hour's drive away, Dr. Aitken agreed to drive us there. But on the way, he made the fatal mistake of showing us the famous Asphalt Lake,[2] that huge (a mile or two wide and as long), seething mass of almost liquid tar. It is the source of all macadam roads around the world. The people of Trinidad mine this gooey gook, chill it into easily handled chunks, and ship it all over the world.

Well, we were so mesmerized by this phenomenon, unique in our experience, that we never got to the Cerro del Aripo where the *Aechmea aripensis* was awaiting us from a tree or rock. We had to be satisfied with a specimen from Dr. Aitkin's garden because our ship was ready to sail. Although it was a thwarted collecting trip, we retained most enjoyable memories of Dr. Aitken's kind attention in fascinating Trinidad.

NOTES:

1. *In.* Jour. Wash. Acad. 48:316; 1958

2. A good aerial photo of this asphalt lake is shown in the Dec. 1934 *National Geographic,* vol. LXVI, Nov. 6, p. 722.

Orlando, Florida

The Bromeliads: Genera–Species–Hybrids (continued)

Louis Dutrie

[The sixth part of the Dutrie series is concerned entirely with descriptions of Vriesea *species and hybrids. The plant names have not been edited except in minor respects: to change initial letters and case endings, to identify proper names in Roman type face, and the like. The binominals and hybrid names are listed, with few exceptions, in the Smith and Downs monograph cited earlier. The hybrids are listed also in* The International Checklist of Bromeliad Hybrids. *–Ed.]*

THE VRIESEAS

The genus *Vriesea* includes almost 100 species, many of real merit, represented by subjects of all sizes, from a few centimeters such as *V. brachystachys*, to the 2.5–5 m of *V. glaziouana*. Some are remarkable for the richness of their foliage, many others by the brillance and long duration of their flowering; some unite beauty of foliage with the loveliness of their flowers.

We shall describe briefly the principal ones, concerning ourselves chiefly with those which by their culture have produced the beautiful hybrids, often superior to the original species.

We note at first that, contrary to what we have just observed in the *Lindeniana* group of the tillandsias, the flowers themselves are not decorative. They are generally yellow, undeveloped, and very fugitive. By contrast, the bracts that accompany them are adorned with the most vivid colors and keep their brilliance for weeks, even months.

We shall mention first some species cultivated solely for their foliage.

• *Vriesea fenestralis* Linden & André, Brazil. Leaves 40 cm long, 6–7 cm wide, rather soft, curved downward, light yellowish green, marked on both sides with a network of emerald-green cross lines, dotted with brown at the base. Flowers in a single spike, with green bracts; a very beautiful plant.

• *V. hieroglyphica* (Carrière) E. Morren, Brazil. A robust plant, attaining a diameter of 80 cm. Leaves 10 cm or more wide, brilliant green, marked on both faces with irregular, transverse bands, dark brown above, blackish below. Flowers insignificant with green bracts in a branched panicle. When well developed, the plant is magnificent.

• *V. tessellata* E. Morren, Brazil. A superb plant resembling *V. fenestralis*, but much more robust, in a compact rosette with broad, leathery leaves, with pale green background, cross-lined with bluish green, and tinged with violet-blue, black on the sheath. Inflorescence branched, green bracts. A very showy plant.

• Less brilliant is *V. pastuchoffiana* Glaziou ex Mez with green leaves marked by a network of fine, wavy, transverse, dark green lines. The plant is strong and of good appearance, interesting, although frankly inferior to the preceding species.

Among the species with colored foliage of which the flower is worthy of notice may be mentioned *V. guttata* and the superb group of *V. splendens*.

• *Vriesea guttata* Linden & André, Brazil. This is a small plant with erect leaves, broad at the base, compressed in their middle part, ash-green above, light green below, with violet, blood-red spots. Inflorescence a long spike with rose bracts. This interesting little plant, quite delicate, should, in order to produce the best effect, be mounted on a suspended log.

The series of *V. splendens* constitutes the aristocracy of the genus.

• *V. splendens* Brongniart, French Guiana. A very beautiful species with upright leaves, then curved outward, leathery, ornamented on both sides with blackish brown bands, regularly spaced on a green background. The inflorescence is an ensiform, flattened spike 40 cm long, with bracts of a magnificent scarlet.

• *V. splendens major* Hort. This is the same plant, but much stronger in all its parts. However, the transverse bands are of a brown, less dark and less sharply defined than the type. Occasionally among some specimens it may be observed that on the underside of the leaves the space between the bands is tinged with brown. The floral stem attains a length of 80 cm and bears a spike larger than that of the type, but of the same scarlet color.

• *V. splendens mortfontanensis* Hort. Chantrier. The plant is of a size intermediate between the two preceding plants, with leaves more upright, and with black-brown bands. The inflorescence attains a length of 60–70 cm, but the spike is not larger than that of *V. splendens*. The color of the bracts is perhaps a little darker.

• *V. splendens chantrieri*. This superb plant appeared for the first time at the 1939 Floralies in Belgium. Presented by its originator, M. J. Chantrier of Mortefontaine, it was awarded the prize for new plants. It is of a size at least as well developed as that of *V. splendens major*, with the coloration of the foliage of *V. splendens*, and has an inflorescence of 90 cm in length, a spike broader than that of *V. splendens major* and of a more beautiful scarlet. It is probably a hybrid of these first two, a superb addition.

Sometimes, in batches of *V. splendens major* one comes across those in which the inflorescence carries two or three branches. It is unfortunate that these, when poorly developed, present a poor appearance. They may occur too high or too low on the floral stem, and be too erect, giving the appearance of being stuck onto the principal spike so that the inflorescence gains nothing in beauty but even loses in elegance. It is, however, probable that this tendency towards branching will bring forth some day a branched inflorescence that is well formed and more elegant.

M. Lecoufle

Fig. 13.
Vriesea fenestralis has been known for more than a hundred years and is described in the text. Victoria Padilla says that it grows "epiphytically in the forests in southern Brazil from the coast to an altitude of 5,500 feet. [The epithet] refers to the light green, rectangular areas on the leaves, which give the illusion of windows."

Fig. 14.
Vriesea ×*poelmanii* was produced from the crossing of two other hybrids, Gloriosa and ×*van gertii.* The inflorescence can be either simple or branched. It is especially long lasting and very attractive in landscape plantings.

One peculiarity to point out in *V. splendens major,* and, more characteristic still in *V. splendens chantrieri,* is that the offsets are formed at the time of flowering and remain attached to the base of the flowering plant the following year. For this reason it is possible to obtain a year after the first a second flowering giving simultaneously, according to the number of offsets, two or three flowers in this way forming quite remarkable specimens. Let us note that with other vrieseas the flowering of the offsets occurs only after two or three years.

The following species are cultivated only for their flowers.

• *V. amethystina* E. Morren, Brazil. A small species with leaves that are glossy green above, and a beautiful amethyst color below. Single spike with greenish yellow bracts.

• *V. barilletii* E. Morren, Ecuador. Leaves green on both sides, strong floral stem, spike flat, with yellow, navicular bracts, with blood-red spots. A vigorous plant.

• *V. brachystachys.* E. Morren *(V. carinata* Wawra), Brazil. A small species with pale green leaves, almost colorless at the base. Floral stem slender and drooping, carrying a short spike with bracts brightly colored with red at the base and yellow at the top. An attractive miniature.

M. Lecoufle

Fig. 15.
Vriesea ×*mariae,* one of the best known hybrids, is not specifically mentioned by Dutrie although he names its hybridizer Truffaut. This photograph of a large group was taken in Julian Nally's greenhouse in Gotha (near Orlando) Florida, April 1966.

• *V. chrysostachys* E. Morren, Peru. Leaves large, tinted with purple, darker on the lower part. Spike long and narrow, with golden yellow bracts contrasting vividly with the dark foliage.

• *V. conferta* Gaudichaud *(V. ensiformis* Wittmn.), Brazil. Leaves light green. Spike with broad, yellow bracts flushed with red.

• *V. duvaliana* E. Morren, Brazil. Lanceolate, membranous leaves, green above, tinted with red on the reverse side. Stem 25 cm long, carrying a single spike with carinate, red bracts, green at the top. Resembles *V. carinata.*

• *V. glaziouana* Lemaire *(V. reginae* Beer), Rio de Janeiro. A vigorous plant forming an enormous rosette of leaves that may attain a length of 1.5 m and a width of 15 cm, of a brilliant, lively green, widened and marked with black at the base. Panicle branched, attaining a height of 2.5 m, with greenish white flowers and bracts tinted with rose. An imposing plant.

• *V. incurvata* Gaud., Brazil. Leaves of a lively green, enlarged at the base, in a slightly open rosette. Oval bracts, curving in at the top, orange-yellow at the base, red at the top, in a dense, robust spike.

• *V. inflata* Wawra. Loosely resembles the preceding, of which it is probably only a variation. It is distinguished from *V. incurvata* by its bracts which are relatively enormous, swollen, enlarged, scarlet color.

• *V. krameri* Hort. *(V. psittacina rubro-bracteata* Hooker). A small plant with carmine red bracts.

• *V. lubbersii* E. Morren. A vigorous plant; numerous leaves, green, marked with a great quantity of fine, dark green lines. Floral stem 70 cm, strong, branched, with reddish green bracts.

• *V. malzinei* E. Morren, Brazil. A dwarf plant, characterized by its non-distichous flowers, disposed in several rows, or, more exactly, in a spiral between the red-brown navicular bracts. The leaves, broad at the base, are brilliant green above, brown on the underside.

• *V. philippocoburgii* Wawra, Brazil. A rare species. A strong plant with stiff leaves, light green, glossy, marked at the tip with a broad, brown spot. Inflorescence is a pyramidal panicle of broad, bright red bracts. It flowers very rarely.

• *V. platynema* Gaud. *(V. corallina* Regel), Brazil. Leaves bluish green on the upper side, violet on the reverse. Floral stem upright, strong, with large coral-red bracts.

• *V. psittacina* Lindley, Brazil. A small plant with pale green leaves, broad at the base. Floral stem red, erect, height 25–30 cm, carrying the flowers widely spaced, accompanied by a bract bright red at the base, golden yellow at the top.

• *V. rodigasiana* E. Morren, Brazil. Leaves short, loriform, marked with dark, blood-red spots, floral stem branched, short, scarlet bracts.

• *V. saundersii* E. Morren (better known under the name of *Encolirion Saundersi* André), Brazil. Leaves numerous in a compact rosette, recurved, ashy green above, strongly punctuated with brown-red on the reverse. Branched panicle, 50–60 cm high, yellow, navicular bracts.

• *V. violacea.* A small species of which we do not know the origin. Leaves green, floral stem upright, 30 cm in height, carrying a compact spike 12 cm long, with violet bracts; a rare color.

• *V. warmingi* E. Morren *(V. ensiformis* Beer), Brazil. A species of medium size with lanceolate leaves, green, tinted with purple at the exterior base, at times marked with lines of a darker green. Floral stem 50 cm, carrying a single spike with spaced bracts of a greenish white.

The two following vrieseas are hybrids:

• *V. Van Geertii* Hort. Duval. A dwarf plant developing a stem that is quite short, terminated by an oblong, narrow spike formed of bracts that are yellowish at the base and on the interior edge, red on the exterior side.

• *V. retroflexa (V. psittacina-scalaris)* Hort. Floral stem pendent, very long, carrying 12–15 flowers, widely spaced; bracts red at the base, yellow at the top. A plant for hanging containers.

[To be continued]

Regional Reflections

LET US SPRAY TOGETHER

Both the amateur collector and commercial grower have a need to consider spraying their plants at some time with fertilizers, cleansing materials, fungicides, hormones, retardants, vitamin additives, etc. It is a case of finding a problem, looking for the right chemical and then applying it in the correct (you hope!) proportion or dilution.

Of course, if we were to purchase disease-free plants from reputable suppliers, give them the right environment and correct growing space, then a spray programme would not be necessary. Too often, however, we don't plan our collections or even seek advice. Our collections tend to grow uncontrollably without much forethought or realistic planning. For societies to send more experienced members to the beginner's home as he/she starts his/her collection would be a step in the right direction.

Like the collections of other members, ours grew from wherever we could obtain plants. Some purchased, swapped, or imported as individual plants, or purchased as complete collections.

In 1978, we decided to go commercial and moved to our present location at Hurstbridge. Our collection was housed in a temporary igloo 14' × 20'. At that stage overcrowding led to reasonably heavy infestations of scale with random apperances of mealybugs and related pests. As the nursery grew, so did the plant quantities and in the nice, new environment the scale became a prolific pest.

Plants collected in the wild in Mexico and Peru have shown some heavy infestations of scale. Natural scale, not nursery culture introduced! Again we have different forms of scale present on the bushes in Hurstbridge, but not the white or black scale seen on cultured plants.

In order to keep this pest in check we commenced a spray programme using reasonably safe Malathion which has a low LD rating. LD simply means lethal dose 50% and is a statistical estimate of the number of milligrams (mg) of toxicant per kilogram (kg) of body weight required to kill 50% of a large population of test animals. There is a need to know and understand the toxic properties of any pesticide being used so that every practical step is applied in the technique of mixing and applying to minimize the hazard of use to the degree where no ill-efects or accidents will occur.

Examples of some acute toxicity rates follow:

Accepted common name	Trade name	Oral LD mg/kg (rats)	Dermal LD mg/kg (rabbits)
Benomyl	Benlate	5000	1000
Carbaryl	Sevin	400	4000
Demeton-5-methyl	Metasystox	57-106	300
Dimethoate	Rogor or Perfekthion	200-300	700-1150
Maldison	Malathion	1400-1900	4000
Pyrethrin	Pyrethrin	570	1350-5400

To resume, plants were sprayed, scrubbed with a small brush, then resprayed several weeks later.

But the scale has a juvenile stage which has legs and can travel from plant to plant. The faster we sprayed the faster the scale seemed to be winning. Again, it doesn't matter how careful you are the spray drift gets into your system and you build up a level that your body cannot cope with. Malathion is an accumulative poison similar to mercury.

In late 1985 we realised that we were not getting the problem under control and requested advice from our State Garden Advisory Service. We had looked at fogging machines that use dangerous propellants, heavy protective gear, dangerous chemicals, and the like.

Someone recommended that we use a contract sprayer and the chemical he recommended was Folimat (LD 50) a new systemic as dangerous as Metasystox (LD 40) but with a good track record on delicate plants.

The first two applications were very successful with the scale developing a dead spot quickly and mealybugs dropping off the plants.

However, in May 1986 the third application proved to be an disaster. Four days after application the plants developed watery marks similar to frost damage with a subsequent loss of leaf colour. These marks later became scorch or burn marks with some plants totally being destroyed. Other plants took some time to show the progressive impact of the damage.

We had been careful to test the Folimat on sensitive leaf plants including *Guzmania* and were faced with a dilemma. Why the sudden change? What had caused the problem and was there a remedy?

As the damage is the subject of a possible future court case we cannot elaborate in too much detail. However, by much detective work and with the assistance of the State Chemical Laboratories we finally found the problem to be copper levels in the leaf tissue 10 times normal levels. Copper at this level could come from copper hydroxide or copper oxychloride, both compounds being a base for commonly available fungicides.

To quote from Dr. Benzing,[1]

[In discussing the absorption of minerals the author described an experiment with *Tillandsia circinnata* and observed] "Of the micronutrients, which incidentally were provided at concentrations 400 times lower than the macronutrients, Cu levels in tissues increased the most. Provided a daily immersion in a bath containing Cu at only 0.62 ppm, these specimens were dead after 60 days, their tissues bearing over 12 times the normal quantities of Cu. Manganese, Mo and Zn were also luxury consumed, but not quite to the same extent as Cu.

"Preferences for the metallic trace elements can be put to use against the bromeliad. Tree service personnel in the southeastern United States spray orchard and shade trees to selectively kill Spanish moss and ball moss. Lead arsenate is the most common toxin used and one application is sufficient to do the job. Treated hosts remain healthy either because they can more effectively tolerate this material or their leaves are much less permeable to it."

We have seen similar damage where bromeliads have been placed under treated pine benches, frames, and such structures. Treated pine often contains arsenic and also copper compounds.

So here we have a dangerous enemy, copper, and more dangerous than you may think.

In Victoria up to recently many home pipes were copper or copper used to replace galvanised iron. Although plastics have been allowed, copper again is becoming popular. In Adelaide the salt level in the water could cause dramatic corrosion problems with the release of high level of metal oxides including copper. The State Water Authority research station in Victoria advised that it is common to record copper levels at 1 ppm but only when corrosion occurs. The State authorities in Victoria will test for copper free. It is necessary to draw down the water first thing in the morning to obtain a sample for testing.

So where do we go from here? Prevention is better than cure. We now inspect all plants coming into our nursery. Any suspect plants are sprayed with Folimat before release with other plants. Plants taken to shows are sprayed and isolated upon return. Any sick plants are quickly destroyed. At the moment we are unable to locate any scale and cannot remember when we last saw a mealybug.

The main chemical we use is Clensel Insecticide, the chief ingredient being soluble potash soap.[2] We use this on all plants with little regard to dilution rate on application. Plants left in solution will die if left there too long. There are several main spray areas that must be covered:

1) Snails and slugs. These will quickly leave your plants if sprayed with Clensel. For broad coverage we use Baysol soluble powder applied after the leaves have dried—say overnight.

2) Caterpillars. These can be controlled by pyrethrum derivatives, but watch burning on seedling foliage. Many can be destroyed by hand.

3) Scale and mealybugs we have already covered.

4) General cleaning. Clensel or Velvet Soap[3] in warm water will do wonders for your plants. They can breathe after removal of dust layers, central cups are cleared out and even your potting mix and pots are cleansed. HOWEVER, don't mix Clensel with other chemicals. Some have the effect of reconsolidating the soap and you end up pouring soap lumps on your plants.

5) Fungicides. This area is touchy as we have found by default! Of course, copper is out and so many other fungicides could be suspect, e.g. Mancoyeb which contains manganese may be just as fatal if too strong. It would be a good project for clubs to learn what are the different forms of fungal attack and the appropriate spray for each type of fungus or mould.

A general word of warning for all spray applications. Try them on a small batch of plants first before application to your total valuable collection. If you must spray, let's combine our knowledge and spray together!

NOTES:

1. Benzing, D.H. The Biology of the Bromeliads. Eureka, CA: Mad River Press, c1980: 83-84.

2. The product may be comparable with Safer's Insecticidal Soap, "Active ingredients: potassium salts of fatty acids."

3. The author explains, "a Unilever household bar soap used here since the country was founded."

Maurice J. Kellett
Raemaur Plant Farm
Hurstbridge, Victoria

Reprinted by permission of the author from Proceedings of the Bromeliads IV Conference, Adelaide, 1987, *pages 49–54.*

AGROSOKE

Agrosoke water release crystals are fine, white, free-flowing granules which have the ability to absorb 30 to 40 times their own weight of water by swelling to form moist, sticky, gel-like beads. Since Agrosoke was originally developed and patented for plant water maintenance, it has shown a vast number of benefits in the potting of plant materials.

When mixed with planting soil, Agrosoke provides a constant and even distribution of plant available moisture. Plant roots actually attach themselves to the crystals, setting up a permanent feeding system. The result is an even and rapid production of feeder roots in the soil area, minimizing transplant shock.

The major characteristics of Agrosoke are that:
- it has the ability to absorb up to 40 times its weight in water.
- it is nondegradeable physically or chemically.
- it has a small, crystalline size.
- it is compatible with all fertilizers and plant growth aids, and
- it is nontoxic with a neutral pH.

Water absorption capability: The Agrosoke polymer was created to provide a long term reservoir of plant moisture, with absolutely no possibility of competition with the plant for water. Because the water is retained by the expanded crystal, loses through evaporation and soil percolation are not a factor. The water is available to the PLANT. The reduction in watering requirements has both direct and hidden benefits. The savings in water supply cost, including energy, are direct and obvious. The reduced leaching of nutrient and other soil additives over the lifetime of the plant is not quite so obvious, but is equally important. Since Agrosoke provides water at the rate required by the plant, with wet-dry cycles, early root growth and development are greatly enhanced. A strong young plant reduces susceptibility to disease, and produces a superior adult plant.

Degradation: The Agrosoke polymer is not starch based. In its dry form the crystal is as tough as sand. Since the polymer was designed only to absorb 40

times its weight in water, the cellular walls are still quite strong when fully expanded. These factors provide for a physically stable product under normal use conditions. Agrosoke, unlike starch-based and most super-absorbing polymers, is not affected by chemical degradation in the presence of nutrient or other additives. In fact, it absorbs water even more rapidly once the initial expansion has been accomplished. Since it is permanent, it provides benefit to the plant for its entire life cycle.

Small crystalline size: Agrosoke was specifically designed to have a small size and limited absorption capabilities. The expanded crystal provides for increased soil porosity without sacrificing cellular strength. The small size is an important reason why Agrosoke remains physically intact in the soil.

Fertilizer compatibility: Unlike other polymers which release their water and lose the ability to maintain rated water retention in the presence of nutrient salts, Agrosoke is unaffected. The ability of the product to provide for water retention while retaining free ion exchange of nutrient materials is a distinct advantage. Fertilizer ions are retained and available to the plant along with the water. Since Agrosoke provides free exchange, salt buildups within the polymer are not possible. It acts like a ministorehouse for the plant. Along with the reduced flushing of nutrients by reduced watering frequency, this actual storage capability is a real money saver.

Nontoxic—neutral pH: Agrosoke is stable polymer with a pH of 7.0. Application of the crystals in either dry or gel form will not contaminate soils or water. It adds nothing to the soil, neither starches, nor acids. Its use in any soil type is possible. Pure sand or pure peat—it works!

Agrosoke application: A pound of Agrosoke will cover approximately 168 plants in 4-inch containers. A 4-inch pot will use 0.10 dry Agrosoke ounces or .75 dry teaspoons.

Agrosoke is marketed exclusively by Grosoke International, Inc., 7415 Whitehall, Suite 123, Fort Worth, Texas (817) 284-0696.

From Tarrant County (Texas) Bromeliad Society Newsletter *by permission. Flo Adams, editor of the* Newsletter *added the following information: "The Tarrant County extension service agent said that the Texas Agriculture Extension Service at Texas A&M and the Tarrant County Extension Service had not done a report on Agrosoke. He had. . .distributed samples at horticultural shows throughout the Dallas-Fort Worth area and has not had any negative feedback on the product; everyone who has used it seems to like it. In 1985, Agrosoke was made available to the County Extension Service and then to landscape architects and contractors. Last year, Agrosoke was finally released for retail sale in the nursery and garden shops. Locally, the retail price runs from 59¢ for .11 oz. (3 gm) enough for one 5" pot. . .to $16.98 for 1 pound. Larger quantities are available at wholesale rates. The manufacturer's customer assistance hotline number is 800-438-3889, then dial GROSOKE when the tone is heard."]*

THE SHY BLOOMERS

The shy bloomers and those which don't flower at all! First and foremost, *Aechmea ornata.* I have grown it for fifteen years and not once has it rewarded me with a flower. The only one I have seen in bloom was grown by an East Brisbane member of the society. A rather spectacular flower and on the strength of its beauty, I persevered in the hope I, too, would be similarly rewarded. A formidable plant with dagger-like leaves, so to escape its barbs, I put it in a corner of the garden, atop a double brick wall which divides a large block of units from my land. I thought it would deter dogs from walking along this wall, enjoying a feast of bromeliads. *Aechmea ornata* was most successful in this regard, but over the years grew to gargantuan size, spilling over the wall and upsetting the caretaker of the units. One day I found it had disappeared, pot, roots, plant and all. I can't say I mourned its loss.

Aechmea mariae-reginae is another prickly monster. Its serrated leaves are more effective on human skin than any surgeon's scalpel, and painless too. One becomes aware of the wound only when the blood flows! The point on the end of each leaf would do credit to any sharp-pointed instrument of torture. It does flower every four to five years, but, alas, at our hottest time of the year. The heat burns the delicate pink bracts, so after a couple of days of glory, the beauty vanishes. After waiting years, it is an anticlimax. In my opinion it compares most unfavourably with *A. pectinata.* Perhaps *A. mariae-reginae* would withstand the high temperature if grown in a shade or glasshouse with humidity, but mine have to grow in the open garden. Another big aechmea which I have never flowered is *A. gigantea* (in some collections as *sphaerocephala).* I am fond of this plant. Unlike *A. mariae-reginae* it does not spread out and takes up a lot of valuable space, but has an upright growth. In favorable light it is a handsome plant with coloured leaves. Its thick, leathery leaves are susceptible to cold burn and heat burn. For me it grows best in dappled light under the protection of a tree. In spite of its reluctance to bloom, I will always keep it in my collection.

Aechmea distichantha is another plant I have disposed of. It was comparatively easy to flower, but the dagger-like spines inflicted themselves in my flesh, tried my patience, and I was not sufficiently enamoured by its flower to forgive the flesh wounds. *Quesnelia arvensis* and *Q. testudo* no longer grace my garden. They were not difficult of grow but the flowering time was too short. After waiting two or three years and inflorescence should last longer than two to three weeks. Undoubtedly they evoke much admiration, with bright, crepe-like flower heads, but needs must! I have retained *Quesnelia marmorata* and *Q. lateralis* in my collection, considering them well worth a place. *Q. marmorata* for its shape and colour, and *Q. lateralis* for the incredible blue of the inflorescence.

Portea petropolitana var. *extensa* now resides out on the footpath. It is a showy plant, but it grows too big for the confines of the garden. *Aechmea aquilega* keeps it company, as it, too, took up more than its fair share of room.

Vriesea imperalis is a magnificent plant, but I have flowered it once in the twelve years I have been growing it. I wonder if I will see it again! One attribute it does have. There are no spines on the leaves to harass the unwary passerby, but it takes up a vast amount of room, so I think *V. imperialis* and I will be having a summit conference!

Grace Goode
From Bromeletter
The Bromeliad Society of Australia, Inc.

BACK ISSUES (AGAIN). In the May-June issue of the *Journal* I asked you to report any complete volumes or separate issues of 1951 through 1975 that might be available. That request still holds although there is now less of a shortage. Mrs. Racine Foster recently transferred to me the custodianship of a quantity of the *Bulletin* and the *Journal* that she had been managing and safeguarding. As soon as this supply can be inventoried, I shall assemble as many complete volumes as possible, knowing already that there are very few copies of some numbers and none of others. I will try to fill gaps with xerox copies and with copies from readers. I plan to keep one complete unbound set as a record copy from which to make xeroxes. The others will be offered for sale with priority to academic libraries, botanical garden libraries, the libraries of affiliated societies, and then to individuals. The remaining separate issues will be offered on the same priority schedule. I hope to advertise the availability and prices of volumes and separate issues in the *Journal* before the end of 1988. You may, of course, send me non-binding orders at any time but I will not promise delivery until the basic preparation is finished. –TUL

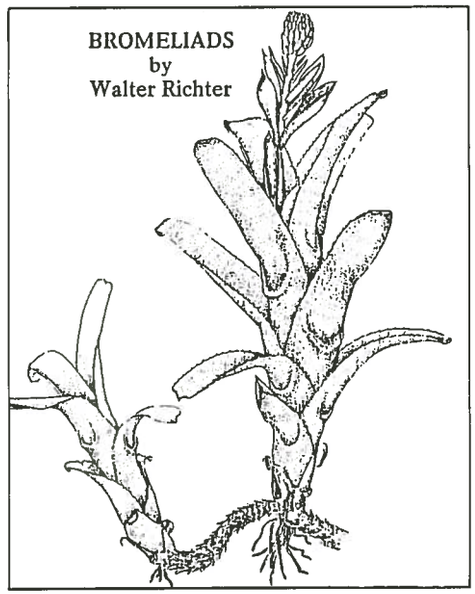
Calendar of Shows *[continued from back cover]*

September 2-4 Bromeliad Society of Central Florida. Florida Mall, Orlando, Florida. Edith Howells (813) 665-7678

September. 3-4 Southwest Bromeliad Guild 17th Annual Show and Sale, "Bromeliad Pow-Wow." Host, Sooner State Bromeliad Study Group, Tulsa Garden Center, 2435 South Peoria, Tulsa, Oklahoma. Saturday, noon - 5:00 p.m.; Sunday, 9:00 a.m. to 2:00 p.m. Hildegard Elliott (918) 749-3602 or Georgia Waggoner (918) 733-4602.

September 17-18 San Diego Bromeliad Society Annual Show and plant Sale. Balboa Park, Casa Del Prado, room 101, CA. Saturday, 1:00 p.m. - 5:00 p.m.; Sunday, 10:00 a.m. - 4:00 p.m. Admission is free. Show Chairman, Jennie Wisely (619) 469-9151.

ALL READERS OF PLANT MAGAZINES know the feeling: "I know that I saw it someplace and I meant to cut it out and save it." "I know that I should get a little more serious about these plants, but. . . ." Members of the Bromeliad Society have heard about Walter Richter for years and they know that he is in his eighties and in poor health. This little essay is directed toward new members who should learn that Walter Richter's words about bromeliad growing are alive and well, full of meaning for them, and available in one booklet.



Just to review the matter, Walter Richter published his book called *House Plants for Today and Tomorrow* in 1965. He had been growing bromeliads since his apprenticeship in 1918 so he spoke with authority. Mrs. Adda Adendroth of Brazil translated parts of the book for publication in *Journal* volumes 17, 18, 19, and 20 and then those excerpts were gathered in a booklet published by the BSI in 1977. There is a great deal of information gathered into this booklet. It is densely packed with words and thoughts. It is not the easiest reading in the world but it is instructive. Most of the information is still reliable and will probably remain so.

The primary emphasis is on bromeliads as house plants. If someone gets fascinated with bromeliads while living in a somewhat less than temperate climate one can't plan on landscaping with bromeliads except within the limits of a house or apartment. At the same time, the basic guidance applies to most growing conditions. As a result, the first 40 pages of *Bromeliads* by Walter Richter are about the general considerations of the plant family, a little botany, climate, habitat, how various species live. Then, there is more specific information about the growth cycle, seed growing, cultivation of the various kinds of bromeliads, a special chapter about tillandsias, what to do about diseases and pests, and the invaluable growing chart.

This little book won't answer all your questions. It doesn't mention pronunciation, where to buy, what to do in your location situation, but it will help you understand the nature of your plants. We recommend it to all hobbyists.

You may get this book from your own society library on loan or you may be able to buy a copy locally if your society has a supply on consignment. You can get a copy in short order by sending your check for $3.60 to Annie Navetta, BSI Publications, 3236 SE Clinton, Portland, Oregon 97202. – Ed.

Questions & Answers

Conducted by Eloise Beach

All readers are invited to send their questions and observations about growing bromeliads as a hobby to the editor. Answers will be sent directly to you and some questions will be published.

Q. I am confused about the correct spelling of a *Cryptanthus* called *C.* 'Pink Starlite' or is it *C.* 'Pink Starlight'? Which is correct?

A. *Cryptanthus* 'Pink Starlite' is the correct spelling of this bromeliad patented and grown commercially by B.L. Cobia, Inc. of Winter Garden, Florida (U.S. Plant Patent #3689).

Q. When I grew the seeds from my variegated *Aechmea tillandsioides,* I ended up with all green plants. Why didn't I get any variegated ones?

A. Seedlings from variegated plants rarely display their parent's stripes. It is not unusual to find all-white seedlings among the green ones, but these albinos eventually die because they lack chlorophyll. Bromeliads that have white or cream-colored stripes in their leaves normally can only be propagated from offsets.

Q. When is the best time to spray my plants that are growing outdoors and in a greenhouse?

A. Be sure your plants are not dehydrated before any chemicals are sprayed on them. It would be a good idea to water them thoroughly the day before. Never spray on rainy days even in greenhouses because the spray won't dry fast enough. Mid-morning is an excellent time to spray while the temperature is rising so that plants have ample time to dry. It is important that the spray dry quickly after application to minimize the possibility of damage to the plants. Try to spray when the temperature is under 85° F and always have good ventilation in the area being sprayed.

Q. When I ask experts at the local meeting how to grow *Dyckia fosteriana* they say they have no problems. I find it a difficult plant to grow. What's the secret to growing this plant and how do you divide it?

A. The secret is water. Grow it in a well-drained mix and try to keep it moist. Dyckias really respond to moisture so don't think you have to keep them dry all the time. Since they are terrestrial, use at least a five-to six-inch pot. Include a small amount of time release fertilizer in the soil and grow in very bright light.

Dyckia fosteriana is difficult to divide. Once the original plant forms two distinct plants, each about half grown, then separating can be considered.

If there are three or more plants in the cluster, it's best not to try this technique until you have more experience. Remove the plant from its pot and shake off excess soil. Peel off dead outer leaves to expose the base. Look for the dividing line. You may need to remove more leaves to clearly show the cutting location between the plants. Insert a sharp, stiff knife into the base between the plants and carefully cut down through the base. Try to leave some roots on each half. The base is very tough cutting so don't despair if you didn't make a perfect cut. Put some ROOTONE F with fungicide (or similar product) on the newly cut surfaces, then allow to dry overnight and pot. In order to encourage proper rooting, you may need to secure the plants down into the pot so that the base remains in contact with the soil. Eventually each half will grow into a symmetrical specimen. Don't try this on your only plant just in case the operation is a failure and the patient dies!

Q. Please explain phytotoxicity.

A. Substances that are poisonous to plants are phytotoxic. Certain fertilizers, insecticides, fungicides and other types of chemicals can damage plants. The plant may be sensitive to the substance or perhaps it was improperly applied. Maybe the chemical was incorrectly applied as a spray rather than as a soil drench or vice versa. Combination sprays of several chemicals may produce injury that would not occur if the formulations were applied separately. Never mix chemicals unless instructed to do so by the label. Sometimes one or two applications may produce no injury, but the third or fourth may result in significant damage.

Aerosol sprays may cause damage if applied closer than 18-24 inches (46–61 centimeters) from the plant, and these should never be sprayed on wet foliage. Dry formulations, even those mixed with water, are generally less phytotoxic than liquid concentrates because they lack the solvents and emulsifiers that can cause plant damage.

Phytotoxicity in bromeliads can be displayed by many types of damage: yellowing, marginal or tip burn, leaf spotting, abnormal growth or a combination of symptoms. Any part of the plant may be affected, but new growth is the most likely to be damaged. Never use any copper or zinc sprays on bromeliads. Small amounts of those chemicals can be deadly. Some oil-based sprays and spreader stickers may also cause damage. Before applying an unfamiliar chemical to your entire plant collection, try it on a few plants and look for symptoms of phytotoxicity. If there are several recommended dosages, use the lowest rate. It would be best to ask fellow growers if they have had any bad experiences with the product in question, since it may take several weeks for symptoms to become visible. Always read the label on all chemicals and follow the instructions in order to minimize injury to you, your plants and the environment.

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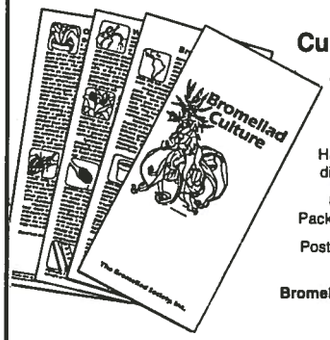

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Mulford B. Foster Bromeliad Identification Center: Send specimens and contributions to Harry E. Luther, at the Center, Marie Selby Botanical Gardens, 811 South Palm Ave., Sarasota, FL 34236.

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Aechmea multiflora. The leaves are up to 6 feet (2dm) long, the inflorescence is sometimes 1 foot (29 cm) long and 20 cm in diameter. A black and white photograph and a drawing of the plant are in the January-February 1988 issue with an account of M.B. Foster's 1948 trip through South America. We are grateful to E.M.C. Leme who took the picture.

Calendar of Shows

July 23-24	Bromeliad Society of Greater Chicago 4th Annual Standard Show and Sale. Chicago Botanical Garden, Glencoe, Lake-Cook Rd., East of Edens Hwy., Glencoe, IL. Saturday, 10:00 a.m. to 5:00 p.m.; Sunday, 9:00 a.m. to 5:00 p.m. Leonard and Inez Dolatowski (312) 526-3693.
August 6-7	Indianapolis Bromeliad Society 10th Annual Show and Sale. Glendale Mall, North Keystone and 62nd St., Indianapolis, IN. Saturday, 10:00 a.m. to 9:00 p.m.; Sunday, noon to 5:00 p.m. Elissa Hafsten (317) 251-3091, Bob Maddox (317) 459-3438.
August 6-7	South Bay Bromeliad Associates 21st Annual Show and Sale. South Coast Botanic Garden, 26300 Crenshaw Blvd., Palos Verdes Peninsula, CA. Saturday, noon to 4:30 p.m.; Sunday, 10:00 a.m. to 4:30 p.m. Plant sales both days 10:00 a.m. to 4:30 p.m. Bromeliad show and sale free, admission charged to Garden. George Allaria (213) 326-4791.
August 26-28	San Francisco County Fair Flower Show. San Francisco County Fair Bldg., 9th Ave. & Lincoln Way, Golden Gate Park, San Francisco, CA 94122. Friday -Sunday, 10:00 a.m. - 6:00 p.m. Preview Aug. 25, 6:30 - 8:30 p.m. Open to all amateur gardeners and non-commercial horticulturists in San Francisco and 9 Bay Area counties. Largest judged flower show in the West. Admission $3.00 general, $2.00 seniors, children under 12 free. Betty de Losada (415) 588-7962.