

Journal of The Bromeliad Society



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Cover photographs. Front: Professor Dr. Werner Rauh with *Tillandsia fendleri* in Ecuador. Photograph by A. Hirtz. Back: 1988 World Bromeliad Conference poster by John Barbie. Photograph by H.B. Hargraves.

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GREETINGS TO PROFESSOR DOCTOR WERNER RAUH ON THE OCCASION OF HIS 75TH BIRTHDAY



Fig. 1. Werner Rauh

We dedicate this issue of the *Journal* to Professor Dr. Rauh as a birthday gift because he has lived most of his 75 years in especially useful service to botanical science. He has received international recognition and many honors and awards, but remains a courteous, friendly, and very human gentleman, curious about his environment and happy to share his knowledge. He writes postcards to friends while on vacation to let them know his whereabouts; he volunteers material instead of waiting to be begged. He sends photographs of himself that are both amusing and instructive. He is not puffed up.

Werner Rauh was born in Bitterfeld, Germany, on the 16th of May 1913. He completed his graduate work at the University of Halle in 1937 with highest honors. From then, with the exception of wartime service as a meteorologist in the German navy, he has been a faculty member of the University of Heidelberg. He became professor emeritus in 1981 but continues as a member of the Institute of Systematic Botany and Plant Geography. He served the institute as provisional director during 1981-1982.

Professor Rauh is known to both amateurs and experts through his many publications. He has written about plant systematics, succulents, and bromeliads, among other subjects. Many of his articles in the *Journal* have also appeared in his *Bromelienstudien*, a publication that has been part of the serial *Tropische und subtropische Pflanzenwelt* of the Mainz Akademie der Wissenschaften und der Literatur since 1973. His bromeliad descriptions are published also in *Die Bromelie*, the journal of the German Bromeliad Society.

Since 1950, Dr. Rauh has made at least 26 expeditions to a great many countries, frequently with his wife Hilde, and at times with others. One might think this a good time for him to slow down and write his memoirs. Instead, he is now (January-February 1988) off to Venezuela and Peru. We hope to catch glimpses of him at the Miami World Bromeliad Conference in May.

On behalf of the Bromeliad Society, Inc., we wish Dr. Rauh good health and many more happy and productive years.

—TUL

Icones Bromeliacearum V: Two Puyas from Chile

In Honor of Professor Doctor Werner Rauh
Robert W. Read

The two species illustrated in this article characterize the two subgenera of the genus *Puya*. Subgenus 1. *Puyopsis*, with the inflorescence fertile throughout and lacking sterile apices, is represented by *Puya coerulea* (fig. 2). Subgenus 2, *Puya*, with the branches of the compound inflorescence in large part sterile toward the apex of each branch, is represented by *Puya berteroniana* (fig. 3). The illustrations also characterize the two principal methods used in the reproduction of color pictures published in Curtis's Botanical Magazine over the years.

From 1787 until 1948 all plates in the Botanical Magazine, except for a few chromolithographs in 1921, were hand colored. The new series, begun in 1948, introduced printing in four-color halftone on smooth, glossy paper. But, sub-



W. Rauh

Fig. 2
Puya coerulea var. *coerulea* as
Puya violacea in Curtis's Botanical
Magazine Tab 8194 (1908).



W. Rauh

Fig. 3. *Puya berteroniana* Mez. Photograph of Tab 495,
Curtis's Botanical Magazine (new series, 1967)

sequent volumes used a four-color gravure process, and the illustration of *Puya berteroniana*¹ reproduced here is an example. The color on the plate of *Puya coerulea*,² by contrast, had the paint applied by hand after the printing was done.

According to Smith and Downs³ the plant depicted in Plate 8194 of the Botanical Magazine as *Puya violacea* (fig. 2) falls within the scope of *P. coerulea* var. *coerulea* because the floral bracts exceed the centers of the sepals. This character can be seen in the lowermost flowers on the inflorescence branch. Hence, *P. violacea* sensu W. Watson, non Mez. The illustration was prepared from a plant presented to the Royal Botanic Gardens, Kew, in 1879 by Mr. J. Anderson Henry, Hay Lodge, Trinity, Edinburgh. It flowered in the rockery at the south end of the Mexican House in June of 1907. Because of the great variability of the species and its four varieties, *P. coerulea* appears in the Smith & Downs monograph keys at least five times (on pages 69, 70, 72, and 74). *P. coerulea* var. *coerulea* occurs naturally on dry, open, rocky terrain, 500–2,000 meters elevation in central Chile.

The plant of *Puya berteroniana* illustrated here (fig. 3) was raised from seed collected by Mr. Clarence Elliott in December 1927 at Baños de Cauqueros, Chile. It was awarded a Lindley medal at the Royal Horticultural Society Show in 1953. It was then presented by Col. J.F. Harrison of Kings Walden, Bury, Hitchen, Herts., to the Royal Botanic Gardens, Kew, where artist Ann V. Webster painted it. The accompanying text in Botanical Magazine pointed out that although the flowering stem died, another stem developed and the plant eventually

produced a second vigorous stem four and one-half feet high. It had shown no indication of blooming again, even after 13 years. This species occurs on dry, rocky slopes at 90–2,000 meters elevation in central Chile.

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

Notes:

1. Sealy, J.R. Botany Magazine. Vol. 176, N.S. Tab. 495; 1967.
2. Watson, W. Bot. Mag. Vol. 134, Tab. 8194; 1908.
3. Smith, L.B., Downs, R.J. Pitcairnioideae. Flora Neotropica. Monograph 14, pt. 1: 85-87, 88, fig. 21 C-G; 186, 188, fig. 63; 1974.

Bromeliad Internship Applications Are Invited

The Bromeliad Society, Inc., in cooperation with the Marie Selby Botanical Gardens, invites applications for internships involving intensive study of bromeliads. College-level students who have demonstrated an interest in pursuing a career in horticulture, botany, or a related field are encouraged to apply.

Bromeliad Society and Selby Gardens representatives will screen applications for this work-and-study program consisting of 14, 40-hour weeks at the gardens in Sarasota, Florida. Successful candidates will be awarded a stipend of \$10.00 per day and living quarters. Intern sessions begin in February, May, and September.

The work portion will be assigned and supervised by the director of the Bromeliad Identification Center. The study portion will be devoted to a project mutually agreed upon by the intern and the director. The study proposal will accompany, normally, each application, and must be approved within the first two weeks of the program.

In order to complete the program satisfactorily, the intern is expected to prepare a project report of general interest and acceptable quality. The report will be forwarded to the *Journal* editor for possible publication.

The director of the Bromeliad Identification Center continues to welcome suggestions from society members for relevant projects.

Harry E. Luther
Director, M.B. Foster Bromeliad Identification Center
Marie Selby Botanical Gardens
811 South Palm Avenue
Sarasota, Florida

Glückwünsche zum Geburtstag!

Happy birthday, dear Werner, and many happy returns. How it awakens memories to go through my file as I visualize our contacts since 1974. Do you remember our first meeting in Houston at Dr. Jack Staub's? The female element was represented by your Hilde, my Hilda, and Jack's Alice, while we three discussed the various bromelias in the garden under the big live oak and talked about collecting them in nearby Mexico. Jack gave me a specimen of the giant form of *Tillandsia circinnata*. It has propagated well and serves as a constant reminder of that friend.

Remember the first time you came to stay with us, all too briefly? We made an excursion to the Casabito mountain pass to get *Guzmania ekmanii*, *Vriesea sintenisii*, and *Tillandsia hotteana*. We were accompanied by my mentor in things botanical, Dr. José Jiménez and collected *Tillandsia jenmanii*, the first time it had been collected in this country. Our friend Alfred Blass was so happy to get a piece of it to add to his magnificent collection of tillandsias! But, now both Alfred and José have gone and I have stopped those happy bromeliad hunting expeditions in our woods.

During all this time I have read with gusto your publications in the *Journal* and admired the marvelous photographs taken by you of so many bromelias found in your expeditions to South America.

Werner, accept a good, strong abrazo from Hilda and me on your 75th birthday and may you keep finding new bromelias forever!

Luis Ariza Julia
Puerto Plata, Republica Dominicana

A New *Guzmania* from Northwestern Ecuador

Harry E. Luther

The wet forests of the northern Andes continue to produce attractive novelties. Dr. Werner Rauh has discovered more than his share over the first two decades of intensive field work but did miss this one. This ornamental, new *Guzmania* species (fig. 4) is dedicated to him.

Guzmania rauhiana Luther, sp. nov.

A *G. victoriae* Rauh affinis sed foliis concoloribus et partibus floribus majoribus differt.

Plant flowering to 70 cm tall. *Leaves* numerous, spreading, to 40 cm long, finely and inconspicuously appressed lepidote throughout, bright green, sometimes tinged with purple. *Leaf sheaths* elliptic, to 12 cm long, 7 cm wide, dark castaneous toward the base. *Leaf blades* ligulate, acuminate, 4 cm wide, slightly undulate. *Scape* erect, to 15 cm long, 1 cm in diameter. *Scape bracts* foliaceous, densely imbricate, green or tinged with red. *Inflorescence* laxly bi-



Bob Wands, Selby Gardens

Fig. 4.
This new species from Ecuador has been named *Guzmania rauhiana* in honor of Professor Dr. Werner Rauh by the author.

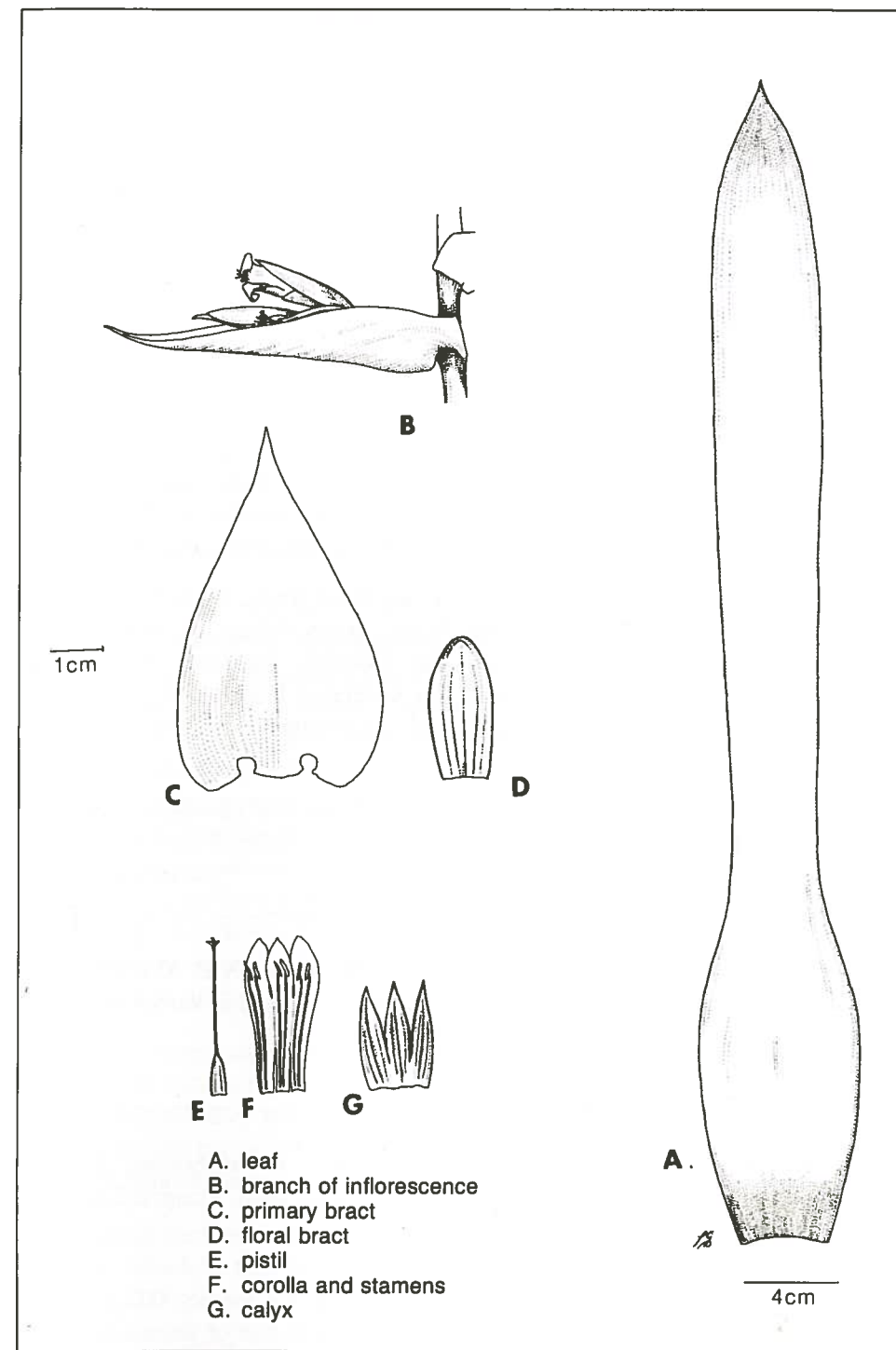


Fig. 5. *Guzmania rauhiana* Luther

Drawing by S. Dalstrom

pinnate, to 40 cm long. *Primary bracts* elliptic, acute, 4–13 cm long, 2-cm wide, the lowermost much exceeding the spikes, the uppermost exceeded by the spikes, green-tipped red or entirely red. *Spikes* to 7 cm long including a 1-cm long, flattened stipe, polystichously 4- to 10-flowered. *Floral bracts* elliptic, obtuse to acute, to 28 mm long, 12 mm wide, nerved, slightly carinate, red-tipped yellow or entirely yellow. *Flowers* sessile. *Sepals* elliptic, acute, ca. 2 cm long, carinate, connate 3–6 mm. *Corolla* to 33 mm long, spreading apically, bright yellow. *Petals* basally and apically free, fused in the middle for ca. 1 cm at ca. 7 mm above the base, naked.

Type: ECUADOR. Carchi: vicinity of Chical, 1100 m. elev., Nov. 1985, Luther, Besse, & Halton s.n., sterile plant later flowered in cultivation at SEL, Jan. 1988, *H. Luther 1150* (Holotype, SEL; isotype HEID, US).

Guzmania rauhiana is to be expected in the adjacent Colombian province of Nariño. It is sympatric with *Guzmania wittmackii* (André) André ex Mez, *Tillandsia narthecioides* Presl, and *Pitcairnia dracaenoides* Luther, but is restricted to the more moist and shady areas of the forests, especially along rivers.

Guzmania rauhiana is related to *G. victoriae* Rauh from eastern Peru, but can be easily distinguished because it has bright green foliage, a bipinnate inflorescence, and much larger bracts and flowers. Budding (pre-anthesis) specimens bear a great resemblance to the unrelated *Vriesea rubro-bracteata* Rauh, but are easily separated by the polystichous arrangement of the flowers and floral bracts.

M.B. Foster Bromeliad Identification Center
Marie Selby Botanical Gardens
Sarasota, Florida

CONTRATULATIONS ARE OFFERED TO DR. LYMAN B. SMITH on his recovery from a broken hip. Dr. Smith is reported to be back at work daily at the Smithsonian Institution.

THE BROMELIAD SOCIETY/HOUSTON, Inc. is celebrating its 20th anniversary this year having been formed on 19 March 1968. Congratulations to the officers and members of the society.

Subfamily Tillandsioideae

Amy Jean Gilmartin

Most of this subfamily's 800 species are epiphytic. Many of these species are desired by bromeliad growers though only a few are represented in the trade. Tillandsioideae is the largest of the three subfamilies of Bromeliaceae. It is closest to Bromelioideae, while subfamily Pitcairnioideae appears to be the closest to the common ancestor of the family.¹

The subfamily was described by Harms in 1930 in Engler and Prantl's *Natürlichen Pflanzenfamilien* (Engelmann). The group, in part, was called subfamily Tillandsieae by Reichenbach in 1828. Mez in 1896 termed this group Tribe Tillandsieae. Today, it is known as subfamily Tillandsioideae and includes six genera: *Catopsis*, *Glomeropitcairnia*, *Guzmania*, *Mezobromelia*, *Tillandsia*, and *Vriesea*.² The apparently neat allocation of all 800 species into one of six genera is misleading. There remain many problems.

Some species that are described by *Guzmania* may belong with *Mezobromelia*. *Glomeropitcairnia* may not belong in the subfamily. The allocation of species between *Vriesea* and *Tillandsia* is notoriously tenuous and unsatisfactory.³ Thus far, only a single, unique character is used to distinguish the two genera. Species with petal scales (flaps of tissue that may contain nectar) are placed in *Vriesea* not *Tillandsia*.⁴ Often, species initially placed in the genus *Tillandsia* may have to be transferred to *Vriesea* on the basis of presence of petal scales. In addition, the limits between the two described *Vriesea* subgenera and their sections are fuzzy and poorly understood. The same must be said about the seven subgenera of *Tillandsia*.⁵ More research needs to be done in order to understand the pattern of relationships among the members of the subfamily. That is to say, we still have much to learn about its phylogeny. (The same situation exists among species of the other two subfamilies, but this note concerns subfamily Tillandsioideae.)

Many more collections are necessary than were available to Smith and Downs, the monographers of the family. Fortunately, species of subfamily Tillandsioideae have been collected with increasing frequency in recent years. The collections provide new information which can help to unravel relationships within Tillandsioideae.

Gaps in our understanding have been the result of the paucity of collections in the past, which in turn relates to the geographic distribution of this interesting group of 800 species. Geographic distribution of natural populations of the subfamily is similar to that of the entire family in that species of this subfamily grow through most of the New World tropics, i.e. Mexico, Central, and South America.

Many species had been collected only once because of their isolation and distance from cities served by transportation facilities. All this has been changing over the past several decades. Because of the diligence of present-day collectors, and improved access to collection sites, species have been relocated, and second, third, or fourth collections of some little-known species have been made, providing essential information about the species' variation in its native habitat. The excellent collecting and documentation is beginning to provide the data that will make it possible to reconstruct the phylogeny, the pedigree of the subfamily, so to speak.

Two factors are essential to reconstruct phylogenies in such a way that the constructions will stand the test of time: the data obtained from specimens and the analytical procedures. The latter became readily available about 10 years ago with computerized cladistic analysis. New data are being assembled from both herbarium and living specimens.⁶ The collecting is a long-term and continuing process, a multinational endeavor, and there has been a quantum leap in terms of both quantity and quality of collections.

The excellent collecting and thorough documentation being provided by modern collectors of members of subfamily Tillandsioideae, and certainly foremost among these persons for at least the past two decades is Professor Werner Rauh, will make it possible soon to understand species and generic relationships within this large subfamily to a degree that hitherto simply was impossible. The publications of Professor Rauh in which he describes the specimens he has collected are extraordinary in terms of quantity and quality.

Not the least of the significant enhancements being provided by modern collectors is the custom of maintaining the plants in culture. Additional information is available from a living plant that may not be easily obtained from an herbarium specimen. This is not to disparage the absolute necessity of vouchering all plant collections with permanently preserved, i.e., dead, herbarium specimens. Plants in culture may die. The information obtained from both living plants and herbarium specimens is permanently documented in the best possible way by the herbarium specimen. Such herbarium vouchers are available for researchers of the future for direct study and dissection.

The living collections of Professor Rauh, for example, and his documentation of these collections with detailed photographs and herbarium specimens, can provide the crucial data that current researchers require for discerning relationships among species, i.e., for reconstructing phylogenies. At the same time and equally significant, the permanent physical record (that the herbarium specimen is) assures access to the information for centuries to come.

From the new collections of old species and collections of new species, including field notes, photographs, and the permanent record of an herbarium

specimen, data are being assembled that can test earlier hypotheses about relationships and generate new hypotheses. These in turn can be tested with even newer data that biotechnology facilitates. For so many years, the bottleneck for understanding this plant family, including subfamily Tillandsioideae, was the scarcity of collections. Modern explorers, plantsmen of all types, have made a significant leap in recent years. The Tillandsioideae still require years more of research but the route is clear, and with time, using as a springboard earlier research results, especially those of the monographers Smith and Downs, an end is in view.

This note is warmly dedicated to Professor Werner Rauh, exceptional botanist, plantsman, and explorer, for his magnificent labors.

*Marion Ownbey Herbarium
Washington State University
Pullman, Washington*

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2. Smith, L.B.; Downs, R.J. *Tillandsioideae*. *Flora Neotropica*. Monograph 14, part 2. New York: Hafner Press; 1977.
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6. Brown G.K.; Gilmartin, A.J. *Brittonia*. 36:364-374; 1984, and *Selbyana*. 9:88-93; 1986.

THE CALOOSAHATCHEE BROMELIAD SOCIETY, Fort Myers, Florida, and the **GOLDEN TRIANGLE BROMELIAD SOCIETY**, Beaumont, Texas, have made generous contributions to the color fund. Their gifts are gratefully acknowledged. —TUL

BACK ISSUES OF THE BULLETIN AND THE JOURNAL are always in demand by members including botanical garden and university libraries. The problem is that we have no complete volumes or even individual issues for the years 1951 through 1975 in stock. Tell the editor if you have any of these issues available and we may be able to work out some arrangement to your satisfaction. Do not let your collection of this publication be scattered or discarded. Plan ahead. —Ed.

The Bromeliads: Genera—Species—Hybrids (continued)

Louis Dutrie

[In this fifth part of the Dutrie series we conclude his discussion of the guzmanias and present his very brief description of tillandsias. He wrote this material only 40 years ago but the contrast between his knowledge of tillandsias and ours is noticeable. The genus was known then to include about 250 species while the count today is nearly 400. —Ed]

GUZMANIA HYBRIDS (continued)

- Under the names of *G. lingulzahni insignis* and of *G. lingulzahni purpurea*, I submitted for examination by the jury at the meeting of February 5, 1939, two plants more developed in all their parts than is normal for *G. lingulata splendens*, itself larger, stronger than *G. zahnii*, with foliage bronze-green to reddish brown. The inflorescence was upright, standing well above the foliage on a rigid stem with scarlet bracteate leaves with *G. lingulata insignis*,¹ dark purplish red in *G. lingulata purpurea*. It was composed of several short spikes, golden yellow, slightly separated one from the other, and underlined with wide, light red bracts in *insignis*, dark red in *purpurea*, these colors contrasting vividly with the dark foliage. Each of these newcomers was awarded its Certificat de Mérite, first class.
- At the meeting of May 7, 1939, I displayed *G. lingulzahni "Chevalieri,"* dedicated to the sympathetic contributor-in-chief of the *Bulletin Horticole* of Liège, who presides at the monthly meetings. The plant differed from the preceding ones in the form of the bracts and by the disposition of the spikes which, instead of being grouped at the top of the floral stem, rise in tiers around it, one above the other to a height of 10 cm as they do in *G. zahnii*. The bright red leaves at the heart of the plant stand up vertically surrounding the flower stalk. From this stand out still higher the scarlet bracts of which the scarlet floral bracts in the form of a pointed spoon surround more than half of the golden yellow spike. A magnificent plant of 80 cm, or more, in diameter. Certificat de Mérite, first class.
- Lastly, the 6th of August 1939, two new hybrids each obtained their Certificats de Mérite, first class, with congratulations. This time it was *G. lingulzahni puniceifolia* and *G. lingulzahni victrix*.

The first was distinguished by the richness of its foliage, of a brilliant reddish purple, the leaves of the heart almost as colorful as the bracts. These, broad and solid, surrounded the compact group of short, yellow spikes and, underlining each one of them, was a reddish purple color, shining and rich. The plant had a diameter of 80 cm.

But the gem of the series is incontestably the hybrid to which, because of its imposing aspect, the exceptional development of the plant (one meter and more in diameter), the inflorescence, and the intensity and richness of the coloring I gave the name *victrix*. Whoever has been privileged to see this magnificent plant, of which the good French painter, Dervaux, has made a very successful and very exact reproduction, agreed that it deserved this stately name.

The leaves, very numerous, are brownish green to brown. The flower stalk, which rises about 30 cm above the leaves, is adorned its full height with bracteate leaves, with the bracts of an intense red. The inflorescence is composed of 12 to 15 compact spikes, short, stout, golden yellow, some in tiers around the stem to a height of about 15 cm, the others grouped at the top, each in the axil of a broad, bright red bract. The group of spikes at the top measure 9 cm in diameter, 15 cm with the bracts. Under the spike, and lower down, the span of the bracts is 25 cm, and lower still, 30 cm. The whole ensemble of the inflorescence is of a volume that is quite exceptional. It is the most beautiful of the guzmanias. No other bromeliad surpasses it in brilliance nor in beauty.

The guzmanias with their elegant appearance, their smooth-edged leaves, the brilliance and long duration of their bracts are not cultivated as much as they deserve to be. The seeds which have not been available until recently should aid in their propagation. It is to be hoped that someone will be able to obtain the seed of the *lingulzahni* hybrids since I was able to harvest personally some seeds of *G. lingulata* "Chevalieri."

THE TILLANDSIAS

The genus *Tillandsia* comprises about 250 species distributed among several subgenera. Very few are in cultivation. Many of the species are epiphytes of very small size such as: *T. usneoides* Linnaeus, *T. duratii* Visiani, *T. pulchella* Hooker, etc., and are of a purely botanical interest only.

Let us note among them, however, *T. bulbosa* Hooker, a native of Jamaica and Guatemala. It is a very curious miniature. The leaves, enlarged at the base, form a sort of bulb, attaining the size of a small nut. They narrow abruptly, rolling their edges, and becoming cylindrical. They reach a length of about 25 cm, and are green, striped with brown. This pretty, little plant is cultivated on logs, or, better, on a piece of cork bark with sphagnum and hung in the hothouse. It produces seed and divisions readily.

- *T. leiboldiana* Schlechtendal. Mexico. Leaves outspread, with blood-red spots, stem 30 cm long, violet flowers in groups of 3 or 5 in the axil of a long, orange-red bract, green at the top. A pretty plant, in a class by itself.
- *T. fasciculata* Swartz. A very ornamental species, not widely distributed. Narrow leaves, rigid, wide at the base, scaly, numerous, in a dense rosette. Petals brilliant lilac in a cylindrical tube, red bracts.

- *T. foliosa* Martens & Galeotti. A robust species with numerous leaves, ensiform, wide at the base, attaining a length of 60 cm, tough, leathery, channeled, green above, scaly on the underside, in a compact rosette. Multifloral inflorescence, forming a short panicle of numerous, dense spikes, distichous, with violet flowers, each one accompanied by a scarlet bract, oblong, pointed, long in the lower part, shorter and imbricated in the upper part of the inflorescence.

- *T. grandis* Schlechtendal (*T. macropetala* Wawra).² A large species, quite rare, with delicate leaves at the base, 40–60 cm long, 5–6 cm wide, quite soft, terminating in a point, forming a dense rosette. Spike of green bracts, open flowers, about 8 cm in diameter, with white, ribboned petals. Produces seed easily.

It is the group of *Tillandsia lindeniana*³ that offers the most interest. It comprises:

- *T. lindeniana* Regel. Peru. The plant is of less than medium size, leaves narrow, outspread, curved downward, slender to some length, enlarged at the base. Flower stem shorter than the leaves, carrying a flat, oval spike, formed of imbricated bracts between which appear the large, blue flowers, with wide limb, opening successively. Different forms, often much alike, are found in cultivation:

- *T. lindenii* E. Morren possesses a larger spike, oval, with bright rose bracts, with violet flowers, almost black near the base.

- *T. lindenii vera* Hort. Form more dwarf, more thick-set than the preceding. Spike bright rose, wide and short. It has the advantage of flowering when quite young.

- *T. lindenii intermedia* Hort. Intermediate between *T. lindeniana* Regel and *T. lindenii* Morren. The stem is longer than that of the latter, the bracts green, flushed with red, the flowers light blue with a white spot at the base.

- *T. lindenii regeliana* E. Morren. Peru. Leaves rose on the reverse side, the stem exceeding in length many of the leaves, rose spike, smaller than those of the type, flowers blue, with a white eye.

- *T. lindenii duvaliana* Hort. Leaves bronze-green, spike quite robust, green, tinted with rose, flowers blue.

- *T. lindenii tricolor* (André). Ecuador. Leaves bronze-green, streaked with purple at the base, stem short, spike broad with rose bracts. Flowers large, violet blue, with a broad white eye.

- *T. lindenii major* Hort. Veitch. Flowers bright azure-blue, with white center, larger than those of the type.

- *T. lindenii luxurians* Hort. Distinguished by the simultaneous production of several rather long axillary floral stems. Flowers violet blue, lightly marked with white on the throat.

[continued on page 129]

The “rauhii’s” Among the Bromeliads

Elvira Gross

Professor Dr. Werner Rauh now is celebrating his 75th birthday and we all hope that he will have many more that we can announce.

On his many excursions to South America, Werner Rauh has collected so many bromeliads (and also species of other plant families) that the Botanical Garden of the University of Heidelberg has one of the greatest collections of living bromeliads in the world. Of these, Prof. Rauh has described and continues to describe many new species of the bromeliad family. But only a few—exactly five—have been named in his honor. I would like to introduce four of them in words and pictures.

Puya rauhii L.B. Smith was the first, described in 1956. The plant is up to 1.5 m high and the rosette leaves are laxly serrate with very coriaceous spines. The simple inflorescence is densely cylindrical and up to 15 cm long. The floral bracts exceed the 22-mm long sepals. The latter are densely cinereous lanate, and the blue-green petals are 35 mm long.

The plant was collected in the Quebrada Yanganuco (Cordillera Blanca, Ancash, Peru) and grows between rocks at an altitude of about 4,000 m. Like the famous *Puya raimondii* Harms, which also grows in the high Andes, *P. rauhii* has not acclimated to our European climate and low altitude and has never reached the flowering state.

A good, but very slow grower is the big *Tillandsia rauhii* described by Dr. Smith in 1958. The rosette is 1–1.5 m high and nearly 2 m in diameter. The inflorescence is curved down and laxly bipinnate. The spikes are linear, about 70 cm long and 4 cm wide, complanate and many-flowered. The densely imbricate floral bracts are coriaceous and ecarinate, with a thin, waxy layer. The dark violet petals are 55 mm long and the stamens are exerted. The flowers open successively so that flowering time takes many months. The plant seems to be self-fertile and sets many seeds, but then the big plant dies. Vegetative propagation takes place by adventitious shoots at the base of the rosette long before the flowering state is reached. *Tillandsia rauhii* grows on vertical cliffs in the Río Saña valley, Piura, Peru.

Vriesea rauhii L.B. Smith, 1958, is also native to Peru from the region of Cajamarca. In contrast with *Puya rauhii* and *Tillandsia rauhii* it is epiphytic. The plant is flowering up to 60 cm high and the leaves are covered with minute, gray, closely appressed scales. The sheaths are 6–8 cm long and dark castaneous. The scape is slender, curved, and the red, imbricate scape bracts enfold it. The inflorescence is digitate and the branches are suberect. The floral bracts exceed the



Fig. 6.
Puya rauhii L.B. Smith, 1956. Col-
lected in Peru at an altitude of
4,000 meters.

Photos by W. Rauh

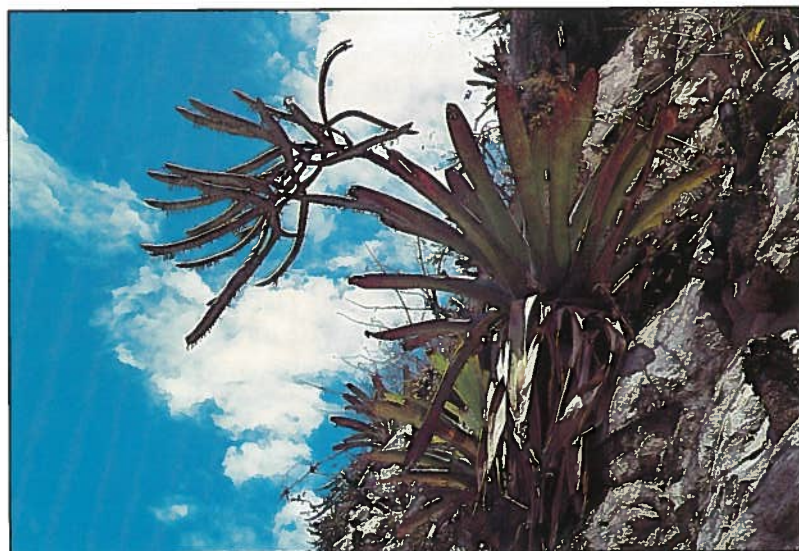


Fig. 7. *Tillandsia rauhii* L.B. Smith, 1958, grows on vertical cliffs in
the Río Saña valley of northwest Peru. The flowers open
successively so that flowering time takes many months.



Fig. 8. *Vriesea rauhii* L.B. Smith, 1980, is one of the gray vrieseas.
It is also native to Peru and from the northern Department
Cajamarca.



Fig. 9.
Puya werneriana R.W. Read, L.B.
Smith, 1986, is another very high
altitude bromeliad from Peru.
The leaves form a dense rosette
and have brown, leathery spines.

sepals and are ecarinate and subcoriaceous. The dark violet petals bear two large scales at the base. Related to *Vriesea rauhii* are *V. cereicola* (Mez) L.B. Smith and *V. hitchcockiana* (L.B. Smith) L.B. Smith, which belong to the so-called "gray vrieseas." In cultivation, these plants need a great deal of light but very little water.

Puya werneriana, described by R.W. Read and L.B. Smith in 1986. The plant makes 10–15 cm long rooting stems and for that reason has a cushion-like appearance. When flowering it reaches 1.5 m in height. The densely rosulate leaves are serrate with brown, coriaceous spines. The scape is erect and up to 60 cm long and 2 cm thick. The bipinnate inflorescence is curved downward, cylindrical, 25 cm long and 8 cm wide. The ± 10 branches are arranged very densely at the apex. The floral bracts are imbricate, have a hooked mucro, and are of black-violet color. The sepals are blue to dark violet, coriaceous, and shorter than the floral bracts. The blue-violet to yellow-green-violet petals bear no scales. The next relative to *P. werneriana* is *P. depauperata* L.B. Smith. *P. werneriana* grows on rocky grass slopes in the valley of Satipo, Junin, Peru, at an altitude of 3,900 m.

All of these plants are very rare in their hard-to-reach habitats and correspondingly rare in cultivation. They are surely worthy of the attention of all bromeliad enthusiasts.

To complete this list of bromeliads named for and in honor of Professor Rauh, we must note the contribution of Harry E. Luther who has described *Guzmania rauhiana* in this issue (pages 104–106). That plant is close to *G. victoriae* and was collected in Ecuador.

Heidelberg, West Germany

Errata

Please note the following corrections to the March–April 1988 *Journal*:

Page	For	Read
50, 52	B.F. Holst	B.K. Holst
54, line 1	<i>Bromeliaceas</i>	<i>Bromeliaceae</i>
line 10	director	a curator



Bromeliad Collecting in Paraguay

Text and Photographs by Sam Smith

Paraguay is a California-size country approximately the same distance south of the equator as south Florida is north, i.e. 26 degrees latitude. The country is bisected by the Paraguay River, the western part is sparsely populated and composed of marsh and scrub called the Chaco. In the central portion of the eastern half are rolling hills with elevations of less than 2,000 feet. The elevation drops and the land flattens along the bordering rivers to become savannahs dotted with hardwood hammocks.

After an eight-hour airplane ride from Miami, we arrived in Asunción about sunrise. We boarded a bus and headed south to a small village of Ayolas on the Paraná River. From there we collected in the hardwood hammocks of the savannah land (fig. 10). These hammocks range in size from less than an acre to several hundred acres. Most of the bromeliads were in the outer rim of the woods where the light was bright and air circulation good. *Tillandsia meridionalis* was the most common bromeliad. Also common was *T. didisticha*. We were surprised to find that the latter was found also well inside the forest cover. There, naturally, the leaves were much elongated, soft, and with less scale. Climbing over the outer branches facing the outer edge of the savannah were the elongated *T. duratii* held firmly in place by their prehensile leaves. In one small hammock of no more than 200 yards in length we found *T. lorentziana*. That species was in large clumps of 20 to 30 plants growing high in the treetops. *T. usneoides* was also common in this single hammock but rare elsewhere. Inside the hammocks there were two billbergias, one in bloom and identified as *B. nutans*, the other was not in bloom, but we considered it typical of *B. braziliensis*. *Aechmea bromelifolia* was noted growing both epiphytically and terrestrially.





Fig. 10.
Bagging plants collected in the
hardwood hammocks of the
savannah land near Ayolas,
Paraguay.

On our return trip to Ayolas we stopped just outside of town at a dry scrub area. The trees here were stunted and thorny with very few leaves but covered with epiphytes. Besides bromeliads there were resurrection fern (*Polypodium polypodioides*), the epiphytic cactus *riphsalis* sp., and the orchid *brassavola fragrans*. The only bromeliads were tillandsias. All had heavily scaled leaves and included *T. duratii*, *didisticha*, and *meridionalis*. In only two trees we found large clumps of the miniature, *T. loliacea*. These were found singly or in groups of two or three.

Leaving Ayolas we travelled east to the border town of Encarnación. We stayed just outside of town in the low foothills at Tirol de Paraguay. In summer this gave some welcome relief to the 90 degree heat of Ayolas. However, in June we arrived there at the same time that a cold front was approaching. The rooms were without heat and we spent the evening huddled around a small hair dryer. We were greeted the next morning with an ice-covered bus and a heavy frost.

After our usual "continental breakfast," dry bread and cup of coffee, we drove through the browned countryside to a small river. The woods here were very dense and only the outer trees contained bromeliads. This was the only area



Fig. 11. In the vicinity of the town of Encarnación, the Smiths found *Tillandsia vernicosa* accompanied by *T. recurvata* on this one tree.



Fig. 12. This is an example of a slash and burn field, an area being cleared for soybean cultivation, where the native plants are being destroyed by the ton.

where we found *T. vernicosa* and here it was limited to one large tree (fig. 11). It was in large mats accompanied by *Aechmea recurvata*. After lugging our collecting bags around for several hours we returned to the bus to preclean the plants before lunch. My wife was using her fingers, as usual, as probes to remove debris from the clumps. There was considerable commotion caused when, instead of leaves and sticks, she extracted a small viper which we later learned was very poisonous.

The road from Tirol to Puerto Stroessner winds northwest through low hills covered with luxuriant, rather damp, forest. Two forms of *Tillandsia tenuifolia* were found as well as *T. geminiflora*, *T. meridionalis*, and what appeared to be a natural hybrid. *Billbergia nutans* and *Aechmea recurvata* were also common. Approaching Puerto Stroessner we noted large clumps of bromeliads encircling the tree trunks extending eight to ten feet in some areas. On close inspection this turned out to be the very thorny *Aechmea distichantha*.

We stayed in a nice hotel directly on the bank of the Río Paraná. No collecting was done, instead we played turistas. Our first stop was the Itaipu Dam, the world's largest. It is over 55 stories high and extends nearly six miles. When completed it will generate more electricity than any other dam. Shortly after entering Brazil we stopped at a buffet restaurant for an excellent lunch and floor show.

We continued on to the Iguassu Falls at the junction of Paraguay, Brazil, and Argentina. This is truly a spectacular sight. A boardwalk runs along the canyon for nearly a mile with an excellent view of 270 individual falls. A lush jungle with many epiphytes clings to the canyon walls. Many shops were at the falls and along the road. There were particularly nice geodes and fossils.

The next day, we headed due west to Asunción stopping occasionally to collect. *Tillandsia geminiflora* was found in large, open trees near the road. Also present were a few plants of the large variety of *T. tenuifolia*. Most trees were, however, devoid of epiphytes. Stopping on a side road, we climbed a barbed wire fence to enter a cow pasture. Two small trees were in the open pasture and every limb was thickly covered with the miniature *T. loliacea*. A marshy area along a small stream was present in the rear of the field. The only examples of *T. pohliana* were found here. Our last stop was in a dry sunny area where orchidists were collecting a small *encyclia*. The only bromeliad was a small dessicated plant resembling *T. streptocarpa*. Several had, however, previously bloomed suggesting that this may represent *T. reichenbachii*. We found a few *T. meridionalis* mainly on the bare trunks of palm trees as we entered Asunción. Very few bromeliads were seen in the city itself.

The next day, the plants underwent final cleaning and packing for the trip home the following day. On the morning of our departure, however, we received

[continued on page 128]

Mulford Foster's 1948 Flight Around South America (continued)

Racine Foster

[This is part 3 of Mrs. Foster's account of the Flight. Part 2 appeared in the January-February issue.]

The success of any collecting expedition is very much dependent on the local people who generously give assistance in many ways. Mulford was indebted to many people besides those mentioned specifically.

Sr. Gregor Bondar, a Russian specialist in Brazilian palms, was wise in the names and uses of the northern palms; he specialized in *Copernicia cerifera*, the wax palm, which grows extensively in the dry cerrado of the states of Pernambuco, Paraíba, and Ceará.

Dr. Bruno Reitman, a Swiss dermatologist who had the most beautiful garden in Bahia, was a true plant lover and a kindly gentleman in all respects. He was a helpful friend in smoothing out problems that, to a foreigner, were troublesome; he handled them masterfully. Several years later we had the pleasure of hosting him at our Orlando home as well as showing him the tourist features of Florida such as Cypress Gardens, Silver Springs, and Weeki-Wachee.

Sr. Lauro P. Xavier, director of the Servicio Florestal in Campino Grande, Paraíba, had been most helpful in 1940 in gathering photos and information concerning the fiber bromeliad (*Neoglaziovia variegata*) which was featured in two articles in the *Bromeliad Society Bulletin* of March-April 1958, vol. VIII, no. 2. Dr. Lyman Smith wrote "Caroa, Nature's Gift to the Nordeste" and Mulford Foster wrote "Collecting in Caroa Country." Dr. Xavier's book, *O Caroa*, is part of the Fosters' bromeliad library.

Sr. Alphonse Buenzli (as Mulford said) "became a very good friend because of mutual rapport for the great out-of-doors. He has three ranches near Ilheos in Espírito Santo where he has planted thousands of cacao trees bordering a rain forest primeval. Now would be the time to collect there as the roads are just being built. It is truly virgin territory."

Sr. Buenzli was a big help in getting packages of plants and herbarium specimens through the red tape at Pan Am Airways. Also, the use of his jeep and two helpers was a magnificent gesture of friendship. During the next twenty years Sr. Buenzli was a long-time correspondent, even after he moved to Singapore in Malaya.

In a letter Mulford wrote: "The distinguished Padre Torrend came to see me on my arrival in Bahia. He was hospitality personified, giving me copies of his publications as well as an album of old botanical drawings in color with detailed descriptions by a deceased friend of his; it was a touching gift from one botanist to another across the years."

With reluctant farewells to these helpful people and to the "happy hunting grounds" of Bahia, Mulford flew to Rio on Oct. 25th. He wrote: "It was a smooth flight except the last fifteen minutes before we reached Rio when we had to go very high. The downdraft between mountains was quite noticeable and scary with the city in heavy cloud cover. It was the first cloudy, mean, cool day on my trip in tropical Brazil thus far; one more paradox that is Brazil. At first it seemed that because of the very thick, soupy sky and low ceiling we would have to go back north to Victoria or on south to São Paulo, but our skillful pilot found a hole in the overcast and we came down safely. The plane, however, did not continue its intended flight to São Paulo."

Dra. Bertha Lutz (the frog specialist), who had helped us so generously in 1939 and 1940, now cordially greeted Mulford by telephone early on Oct. 26th and then stopped by the Pax Hotel to drive him to the Museu Nacional and Jardim Botânico. She had the interesting news that Dr. Lyman Smith was still in Brazil and would be stopping in Rio again on Nov. 11th, two weeks ahead. While Mulford wanted very much to meet Lyman there in the great collecting field that is Brazil, it turned out that Mulford missed him by one day in São Paulo.

With the problems of several holidays, all in a row, and a change of time tables, Mulford's patience was building up to a slow boil!

From Rio, he flew south to São Paulo where he met again Dr. F.C. Hoehne, director of the Departamento de Botânica do Estado of São Paulo. He had a stack of mail for Mulford plus the regrettable news that Lyman Smith had left only yesterday!

The next day was absorbed in arranging for the visa and other permits needed to enter Boliva. While waiting for this process to be completed, he fulfilled his dream of getting acquainted with the state of Santa Catarina, south of the state of Paraná. Lyman Smith had made many trips into this fascinating state; indeed, it was a collector's paradise. As Mulford described it: "I left São Paulo for Curitiba via air where I spent the night. It was raining and unbelievably cold at the end of their winter season." Curitiba is the capital of Paraná where we had enjoyed immensely the collecting in 1940.

From his letter of Monday, Nov. 8th: "I'm feeling especially happy today. Yesterday was such a red-letter day! I was all alone in the mountains of Paraná. I talked with you out loud, all day, up there. You must have heard me!



M.B. Foster

Fig. 13. A characteristic scene in southern Brazil in 1948: horse-drawn carriages alongside a modern bus from Curitiba, Paraná to Brusque, Santa Catarina.

"I saw enough *Philodendron bipinnatifidum* to fill a freight train and, strange to say, it grows down to the ocean's edge, believe it or not! It will be a marvelous landscape plant for Palm Beach and Miami areas, in fact, for all of South Florida.

"From there I took a bus to Joinville, expecting to continue to Itajai, but I just missed that bus, so it was an opportunity to visit Sr. Schmalz, the orchid man. We had quite a conversation on orchids in a mixture of German, Portuguese, and English. I felt very much at home when Dr. Schmalz explained that it became cold enough on some nights that he had to cover his large collection of orchids. On the map, it appears that Joinville is on the ocean front, but it is actually about 30 kilometers from the littoral.

"Proceeding south by bus again, gave me the opportunity to stop in Blumenau where I located the lovely miniature *Amaryllis blumenavia* growing wild in this area (fig. 14). (This charming, small amaryllis grows well as a pot plant in central Florida; it blooms every year!)

"By Sunday evening, I arrived in Brusque, another quaint German town or rather a small city about 12,000 population. There are few cars, but many horses and carriages. It is clean and orderly, not a policeman in sight. I don't think I've ever been in any section where there are so many flowers blooming. Every nook and corner, every balcony is bursting with flowers. Flowers everywhere! Of course, the seasons are reversed here: south of the equator it is spring, now in November. And the signs of spring are exhilarating!



Fig. 14.
The lovely, pink and white
Amaryllis blumenavia growing
wild in Paraná, Brazil.

M.B. Foster

"Contrary to most other South American cities, no one speaks English here, only German and Portuguese. So between my limited knowledge in both languages, I'm getting along fairly well.

"I made immediate contact with Padre Raulino Reitz and we will be collecting together tomorrow.

"I haven't done much real collecting since I left Bahia, so it was good to have two days of cutting and climbing through dense growth with Raulino Reitz. The country looks as innocent as a cat after it has eaten the gold fish, but, oh boy! when you leave the highway, its yours to explore if you have the time, energy and good facão (machete).

"Padre Reitz is a very able collector in the jungle, but I have to climb the trees! (Mulford was 60 years young!) Incidentally, I climbed up my first tabebuia tree today and procured my first seeds. Only a few were ripe. I am sending them to Bert. (Bert is Mulford's son who raised the seedlings successfully into the small trees that were given to the city of Orlando park system where they can be seen today blooming glorious sulphur yellow flowers each spring.)

"Yesterday was a tough day. However, it was nothing compared with today. We climbed to the top of the highest mountain in this section, right to the very peak. In both days of hunting, I didn't find a bromel that we hadn't collected when you were with me in 1939.

"Tomorrow morning I will visit the malaria station. This is where Dr. Thomas Pittendrigh (our bromel friend in Trinidad) was stationed for a while. They say that in this area malaria is carried only by mosquitoes (*Anopheles bellator* D & K) that live exclusively in bromeliads."

The brief explorations in southern Brazil resulted in few bromels and no new ones. But some interesting observations were made. For example: *Vriesea rodrigasiana* E. Morren, found at 2,000 feet elevation, was "growing in high, open trees in windy locations. The new offsets appear next to the axis of the inflorescence; they do not appear on the base side; it is not stoloniferous.

"*Neoregelia laevis* is a very common plant on the littoral at Itajai. All were showing their white flowers which was a lovely contrast to the red-tipped leaves—leaves without spines.

"*Vriesea philippocoburgii* var. *vagans*¹ was everywhere as were *Aechmea blumenavii* and *A. cylindrata*. Around Itajai, *A. recurvata* was the most common bromel on the coast; it almost smothers trees and makes solid mats on the rocks.

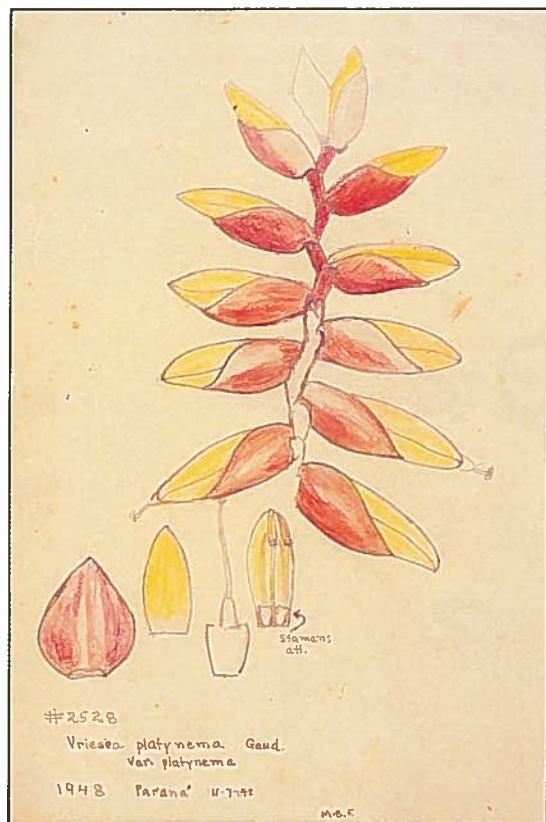
"Also, *Aechmea nudicaulis* var. *cuspidata* was very common in this area which is called Praia Praba, the seaside."

Vriesea paludosa L.B. Smith was one of our new species found in 1939 in the same area (described in Hoehne's *Arquivos Novas* II, 1943) but was reduced to a variety of *V. friburgensis* nine years later (in the *Anais Herb. Barbosa Rodrigues* 4:68; 1952). "It was a curious vriesea growing in an aechmea-hohenbergia kind of habitat in the first growth of scrub next to the sea. It was a sandy area almost covered with this vriesea. The trees above were seldom over eight feet tall and were sparsely spread. These small trees were thick with *A. recurvata*, *A. nudicaulis* var. *cuspidata* as well as the orchid *Cattleya intermedia* at the base of the trees.

"Just back of the first growth is the dense secondary growth where, in moist shade and in wet ground, *Nidularium procerum* grows in great masses. It is not stoloniferous but develops a caudex to two feet."

Nearby in this dense shade grows a philodendron like *P. bipinnatifidum* which Mulford named 'Seaside'. It has had considerable success as a decorative garden plant in south Florida.

¹ *Vriesea vagans* (L.B. Smith) L.B. Smith, *Phytologia* 13:118.1966.



Drawing by M.B. Foster

Fig. 15.
Mulford Foster made this crayon drawing of *Vriesea platynema* var. *platynema* from a specimen collected in Paraná.

"*Vriesea platynema* var. *platynema* is a bromeliad distributed widely in the Caribbean area (Cuba, Jamaica, Venezuela, Trinidad) and eastern seaboard of Brazil; its locations are well documented by the dozens of collectors who made specimens. Mulford had collected it several times before in areas north of Paraná, so now it seemed like an old friend speaking to him as he was about to depart from the eastern side of the continent. How he could find the time to produce a botanical drawing of the inflorescence and its parts (fig. 15) can only be explained that he liked it very much. It was *vriesea* form, but in an open pattern that pleased him. The reddish bracts covering yellow flowers made a striking contrast against its bluish green whorl of leaves each of which displayed a chestnut blotch on the apex.

The area around Joinville was the source, not only of the miniature *Amaryllis blumenavia*, but of the lovely *Vriesea guttata*, and *Quesnelia imbricata*. He had collected *Q. imbricata* as a new species in 1939 and on this trip collected it again. A second collection, as Lyman Smith often said, is very important because it verifies the first collection as a new species.

Monday, November 8, 1948: "I arrived back in São Paulo this morning. I really have kept in fine shape with all my bruises, scratches, mountain climbing etc., etc. I don't think I've put on much weight, but then, after all, I haven't much to lose, either!"

Mulford returned to São Paulo laden with seeds and seeds and more seeds of rhipsalis, palms, cacti, and philodendron. He also had cuttings of various plants, bulbs and fern spores, as well as forty vials of pollen, live plants of bromeliads and orchids, plus many herbarium specimens.

As the explorations on the eastern side of the South American continent came to a close, Mulford reviewed all that had pleased him. He was satisfied that he had made the several bromeliad pilgrimages: checking the genus *Bromelia* in Surinam, surveying orthophytums and cryptanthus in northern Brazil; ascertaining that the four-acre site of *Dyckia fosteriana* had not been disturbed.

And, aside from bromeliads, the collection of plants and seeds of philodendron, tabebuia, amaryllis, etc. which were to be shared with others, gave the first half of the 1948 Flight a happy fulfillment.

[To be continued]

Book Review

How to draw plants; the techniques of botanical illustration, Keith West; foreword by Wilfrid Blunt. New York: Watson-Guipil Publications, 1983. 1152 p., illus (including 8 pages in color). \$24.95.

Botanical illustration is an accepted art form combining the technical ability of the artist and his knowledge of botany to produce essential characters while omitting distracting details. This book is by a botanical artist and for anyone with basic drawing and painting skills who wants to work toward this goal. The author provides a brief history of the art, describes the equipment needed, and then leads the student through an analysis of plant structure. He explains the use of pencil, ink, scraper board, watercolor and gouach, and acrylics. A very detailed and instructive book, in part an illustrated glossary of botanical terms and for that reason of possible interest to hobbyists willing to work on vocabulary development. Includes a glossary, bibliography, and index. —TUL



Bromeliad Collecting in Paraguay [continued from page 120]

word that none of the Lineas Aereas Paraguayas vast fleet of four, thirty-year old airplanes was able to fly. That gave us an extra day to shop in Asunción. The most popular items were leather jackets and \$15.00 Rolex watches. It also gave us a whole day to think about the flight home. We did leave the next day only five hours late and arrived safely in Miami with only a minimum of inflight excitement.

It is bad to end on a sad note but it seems that both wild plants and plant collectors are vanishing breeds. Everyone is very familiar with the worldwide destruction of rain forests, but there is a big difference between reading about it or seeing it on TV and actually walking through a slash and burn field (fig. 12). Much of the collecting is done in these fields. The destruction is appalling. The emphasis in the news media is on the permanent loss of habitat, but the thing that is most striking as one walks through these fields is the immediate destruction of epiphytes. One of the most common epiphytes of upland trees in areas being cleared for soybeans is the orchid *Miltonia flavescens*. This plant is not being destroyed by the hundreds or thousands but by the ton. All of this destruction is occurring at the same time that well meaning environmentalists are making it almost impossible for the amateur collector to save some of these plants.

Fort Myers, Florida



The Bromeliads: Genera—Species—Hybrids [continued from page 112]

The fertilization of many tillandsias meets with great difficulties because of the position of the reproductive organs which are deeply recessed in the tube formed by the corolla and difficult to reach. I have obtained seed of *T. complanata*, a small likeness of *T. lindeniana*, of *T. bulbosa* and of *T. grandis*, but have not been successful in obtaining seed from *T. lindenii*. Now, M. Morobé has notified me recently that he has harvested some seed of *T. lindenii intermedia* without having done anything to bring about the fertilization of the plant, of which all the flowers were, naturally, self-pollinated.

A HYBRID TILLANDSIA

Only one hybrid between tillandsias is known. It was obtained by M. J. Maréchal who named it *T. chevalieri*. It was the result of crossing *T. fasciculata* with *T. foliosa*. A dense rosette of leaves, very broad at the base, short, rigid, attractively arched, dull green above, scaly on the underside. Flower stem 35 cm high, adorned with leaves and long, narrow, green bracts, brownish red on the sheath. Inflorescence in a panicle formed by 6 or 7 spikes, with reddish, distichous bracts. Flowers tubular, light blue.

I had succeeded in harvesting some seed that I sowed on April 8, 1944, but they did not even have time to germinate.

[To be continued]

Notes:

1. Figure 5, *Journal* 38:71 may be of *G. Insignis*, cf. Padilla, V. *The Colorful Bromeliads*: 61, fig. 15, and Rauh, W. *Bromeliads for Home, Garden and Greenhouse*, plate 57.
2. Dr. R.W. Read suggests that Dutrie obviously intended *T. viridiflora* (Beer) Baker in keeping with the synonymy cited and the fact that *T. grandis* and *T. viridiflora* have been much confused in the past.
3. As an exception to the practice in earlier installments, plant names are stated as in the original except for the corrected case endings and initial letters in the section on tillandsias.

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. Occasionally I find a thick, gelatin-like substance around the base of some of my bromeliads. What causes this and is it harmful?

A. Damage to the base of a plant, such as when several leaves are removed, can cause the production of that gelatin-like substance. It acts as a protective coating to seal the wound and helps prevent the entry of undesirable organisms, so it is not harmful. If removal is desired, simply wipe off the excess.

Q. I recently moved my bromeliads into a slat house and now many plants are developing rotten centers and burned spots at the base of the leaves. This looks like spray damage, but I haven't sprayed. What is happening?

A. Your bromeliads are being damaged by the chemicals in pressure-treated wood. The roof slats have been pressure treated with special chemical preservatives to prevent wood rot. Rain or other irrigation water is dripping from the slats into the water-holding cups of the bromeliads, and the plants are absorbing those deadly chemicals. It is very important to protect bromeliads from water dripping over unpainted treated wood. Treated wood usually has a greenish tint and is sometimes known as "Wolmanized." Outside the United States and Canada boron compounds may be used as wood preservatives. Those compounds do not produce the greenish tint and may also be toxic to bromeliads. Redwood and cedar are good choices for bromeliad greenhouses because they withstand rotting and are not normally pressure treated.

Q. Can you tell me a simple way to remove damaged or unsightly leaves, especially inner leaves?

A. The entire leaf can be removed easily by splitting it lengthwise all the way down to the base. Then, while firmly holding the base of the plant, gently pull each half sideways one piece at a time. If you need to remove inner leaves, only take out one or two at a time because you might accidentally pull out the entire center of the plant.

Q. Is it all right to repot my plants into used containers?

A. Yes, but you should sterilize the pots before reusing them. This will reduce the chance of spreading unwanted insects and diseases throughout your collection, plus it will kill algae and moss, too. Clay and plastic pots can be

sterilized using common household bleach. Mix 1 part bleach with 9 parts water. An old plastic 5-gallon paint container works fine. Just put in half a gallon of bleach and fill with water, then cover to keep animals out. Soak the pots for at least 30 minutes. Soaking them longer will clean them more thoroughly. After soaking, remove the pots and rinse them with fresh water. Plastic pots can be used immediately. Clay pots should be allowed to dry first so that any remaining bleach can dissipate. This cleaning and sterilizing solution can be reused and should last several weeks depending on how many pots are cleaned. When the bleach odor diminishes and it takes much longer for the dirt to loosen, then it is time for a new mixture.

Q. Given a pair of year-old *Aechmea fosteriana* pups in clay pots, same medium, side by side, and one is strong and apparently healthy while the other one rotted off at the base. What went wrong?

A. Perhaps the plant was somehow damaged near the base and a fungus entered causing the rot. If the potting medium was too dry for an extended period of time, this could also cause it to rot off. Maybe something dripped or fell into the central cup. It is really impossible to give an exact reason for what happened.

Q. My variegated *Aechmea fasciata*s have some type of fungus problem. Black, mushy areas formed in the center of the leaves near the base and spread up and down the leaves. As time passed, more leaves were affected and some started to wilt. If there were small pups growing near the base, then they also turned black and died. A few plants even rotted off at the base. What can I do?

A. It is very difficult to identify diseases by the symptoms alone because many diseases have similar symptoms. The best way is to have a laboratory grow cultures for positive identification of the pathogen, but this is not very practical for the hobby grower.

The problem you describe could be *Fusarium*. The best chemical to use would be benomyl (also known as Benlate or Tersan (1991) in a 50% WP (wetable powder) formulation. Benomyl is a good, broad spectrum fungicide that controls *Fusarium* and *Rhizoctonia*. Spray affected foliage and drench the soil as directed on the label until controlled. Spray every 10-14 days and soil drench every 2-4 weeks (use the shorter times in warmer weather.) Be sure to use the correct chemical concentration for sprays or drenches and apply at the proper time intervals. A one-time application will not fix the problem.

Often, fungus problems occur because of poor growing conditions. Try to keep the plants uncrowded, with good air circulation, and grow them in well-drained soil. It is very important to keep water off the leaves as much as possible. Water will spread the fungus. High humidity will also encourage the spread of fungus. Be careful about tools and scissors carrying the infection to healthy plants. Disinfect tools using bleach or other disinfectants.

Q. What does "saxicolous" mean?

- A. Living upon or growing among rocks. Some dyckias, hechtias, and orthophytums have a saxicolous habit of growth in nature. *Orthophytum saxicola* even got its name from its rocky habitat.

Q. Are any bromeliad growers using "bottom heat?"

- A. This technique was discussed briefly in the Jan.-Feb. 1988 issue of the *Journal*. Roger E. Annable from Glenwood, Maryland has the following experience to share:

"Here in Maryland at Bromel Exotics we are using bottom heat in the colder months to grow offsets and to help push pup production of our stock plants. Our beds are five inches deep and a mixture of super coarse peat and perlite. To maintain a bed temperature of between 75° and 80° F (about 24-26° C) we circulate 100-120° water through vinyl tubing along the bottom of the beds. The beds are one-inch thick styrofoam for insulation. Initially, we began experimenting with these beds with two purposes in mind: (1) we wanted to stimulate root growth of our offsets and consequently push foliage growth, and (2) rather than heat the entire greenhouse, put the heat just in the direct vicinity of the plants and save on fuel consumption.


"I had hoped that with the plants' direct contact with the heated bed, their foliage would stay relatively warm without auxiliary heat. This was not the case, however, and when the difference between the bed and the surrounding air temperature reached 30° or more (i.e. bed temperature 75°, air temperature 45°) for any length of time, we began to see a lot of pigmentless foliage which soon became damaged. To remedy this temperature difference we constructed mini double-poly canopies for each 50-foot long bed, making them easy open on one side to make the beds accessible for inserting or removing pups. We made our poly inflation blowers do double duty. They take air from under the canopy at one end of the bed, blow it between the two layers of plastic (4 mil, clear) giving us our insulation space, and it is returned to inside the canopy at the opposite end of the bed through a hole in the inner sheet of poly. This provides a constant flow of air from one end of the bed to the other, and that air movement also helps pick up some of the heat on the surface of the bed. In the coldest weather a small electric heater warms the air returning to the bed from within the poly sheets to keep the air temperature at a 60° minimum at night.

"While this system may seem complicated, it is actually fairly simple. Our bottom-heated beds gradually evolved into mini greenhouses using materials which weren't costly and techniques which were just scaled down to fit our needs.

"The results, once we got our beds enclosed, have been worth the effort. We have good root development throughout the winter on our offsets. Foliage growth is continuous through the season though slow in December and most of January. Still, it is much better than in our small display house (with no bottom heat) in which we maintain a night temperature of 55°.

"We have also met our second goal of minimizing fuel consumption. Our four mini greenhouses within our larger house take up only about one-fifth the space and that is all we are heating. Beautiful patterns of heavy frost form on the inside of the glass on cold nights, but inside the canopies with bed temperatures of 75-80° and the air temperature at 60° we are seeing good growth and color on our neoregelias, aechmeas, and vrieseas.

"Though our particular system suits our needs well, we do realize that a similar system or even just plain bottom heat may only work for a small percentage of bromeliad growers. Here, where we heat for almost six months, we need all the extra advantages we can get.

"We are also searching for others' experiences with the use of bottom heat and welcome assistance. We are relatively new bromeliad growers and are always happy for tips for growing the perfect plant. [Please address responses to Mr. Annable's report and any other question and answer material to the editor.] 

Bromeliads, The Other Type of Care

Mark E. Mishanie

How to make bromeliads grow, thrive and bloom their little heads off, that is the question. Good suggestions have been made at our meetings about watering, fertilizing, potting and light requirements. Yet, you could add another ingredient to the stew, that is, good old stability.

What do I mean?

I think a lot of us growers have the shaky hand syndrome—we can't help playing with our bromeliads, moving them around, fussing them from one window to the next, even packing them up and taking them on vacation. Wrong!, or at least, not-so-right.

What do bromeliads really need? They're not so different from people. Bromeliads need stability. They like to be left alone and not played with much. I've had aechmeas, neoregelias, crypts and guzmanias on a northeast exposure and they've thrived. I've left them to themselves, ignoring them except occasionally remembering to water them once in a while and they've prospered, grown and sometimes bloomed.

With some other bromels I've had more involvement, standing over them, feeding them all the time, repotting them, and moving them according to the light rays. What did I get for my trouble? Barely a surviving plant. My experience tells me that it sometimes takes many months for a bromeliad to adapt to a new environment, by which I mean not only a location but also a new pot or a new medium. Give them time to adjust.

Reprinted from Bromeliana 23(4): April 1986. The New York Bromeliad Society, Inc.

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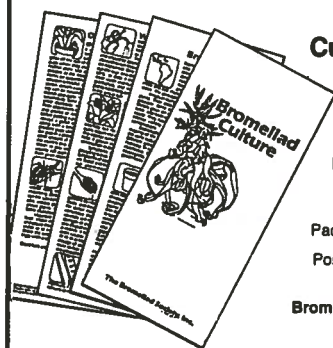
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City _____ State _____ Zip _____

Name and location of affiliate to which you belong _____

Name and address of affiliate president _____

How did you find out about the BSI? _____

Checks should be made payable to The Bromeliad Society, Inc. Members outside the United States should remit by International Money Order or cashier's check payable in U.S.A. funds on any U.S. bank. Personal checks not drawn on U.S. banks will not be accepted.

☐ If money order is to come under separate mailing, please indicate and include a copy, or the number and type of order.

_____ Money Order _____



Harold B. Hargraves

Bromeliads superimposed on the Miami skyline celebrate the 1988 World Bromeliad Conference, "Miami Magic." John Barbie's mixed media poster includes collage, acrylic, and color pencils.

Calendar of Shows

- April 30-May 1** La Ballona Valley Bromeliad Society's annual show and sale. Culver City Veterans Memorial Auditorium, 4117 Overland Ave. at Culver Blvd., Culver City, California. Saturday, 12:00 noon to 4:30 p.m.; Sunday, 10:00 a.m. to 4:00 p.m.; Potting demonstration both days at 2:00 p.m. Admission is free. Alan D. Levy (213) 836-3177.
- April 30-May 1** Morris Henry Hobbs Bromeliad Association Annual Show and Sale. Cleary Playground Gymnasium, 3700 Civic St., Metairie, La. 70001. For information call Al (504) 887-3190.
- May 20-22** World Bromeliad Conference, "Miami Magic." Host: The Bromeliad Society of South Florida.
- May 28-29** Greater Dallas-Fort Worth Bromeliad Society 17th Annual Show and Sale, Dallas Civic Center, Fair Park, Dallas, Texas. Saturday and Sunday. For information call Ellen Hough (817) 429-4507.
- June 11-12** The Baton Rouge Bromeliad Society 13th Annual Show and Sale, Baton Rouge Garden Center, 7950 Independence Blvd., Baton Rouge, La. Contact Michael Young, 4364 Sycamore Dr., Baton Rouge, LA 70805 (504) 355-5408.