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Cover photographs. Two examples of the bromeliads of the Chapada Diamantina National Park of Brazil are (front) *Vriesea atra*, a very tall species found growing on bare rock, and (back) an *Orthophytum* species closely related to *Orthophytum amoenum*. E.M.C. Leme and Ruy Funch describe the flora and ecology of the park on pages 3-6, 33-34. Photographs by Luiz Claudio Marigo.

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Bromeliads of the Chapada Diamantina National Park

Elton M.C. Leme and Ruy Funch

The Chapada Diamantina (Diamond Highlands) is the name given to the northern half of the central mountain chain which cuts through the state of Minas Gerais and continues on up almost directly northward through the dry interior of the state of Bahia, Brazil. Nestled into these rugged hills are several small mining towns that still preserve their century-and-a-half-old architecture. Two of them, Lencóis and Mucugê, are protected as national historical monuments.

These cities burst into existence in the early 1840s about the same time California was experiencing its great gold rush. Here in central Bahia, however, the mountains and rivers hid another kind of treasure: diamonds in fabulous quantities. Hence the name Chapada Diamantina.

With the end of the mining boom at the turn of the century, the area sank inexorably into economic stagnation. The resulting blanket of poverty and desolation did, however, serve to preserve the 19th century style of the cities as well as the rich local flora and fauna. Thus, even the areas most severely disturbed by mining activities were able slowly to reconstitute their vegetation and wildlife through natural processes.

The Diamond Highlands is a region of plateaus averaging about 3000 feet in height interrupted by extensive parallel and rugged mountain chains. In terms of geology, the region is composed mostly of hard, Precambrian sandstone and conglomerates although there are numerous outcroppings of older granite and younger limestone.¹ There are numerous, locally important rivers such as the Rio de Contas and Rio Paraguaçu, the latter flowing to Baía de Todos os Santos (All Saints Bay) and the state capitol, Salvador. In the mountains themselves are numerous waterfalls and cascades. The best known is the Cachoeira da Fumaça (Smoky Falls), which has a free fall of over 1,200 feet, the highest in Brazil. The highest point in the state (over 6,000 feet) is found in the Diamond Range, called the Pico do Barbado after the howler monkey which was once common in the region.

Of all the constituent mountain ranges within the Diamond Highlands formation, surely the most beautiful and scenic is the Serra do Sincorá. These mountains, situated on the eastern flank of the Highlands, catch the first clouds which have travelled in from the ocean 300 miles to the east. The result is a regular cycle of heavy rains of about 50-60 inches a year from November to March. The dry season is normally from August until October. In general, the climate is agreeable because of the altitude, and the region is well known for its water resources and exuberant vegetation.



Fig. 1. Typical scenery of the upper elevations of the Chapada Diamantina —the Diamond Highlands—of Brazil with bromeliads, cactuses, and orchids forming natural gardens among the rocks. *Orthophytum burle-marxii*, foreground, is a predominant species.



Fig. 2
Cottendorfia florida is one of the truly endemic species of the Diamond Headlands National Park. This species, flowering 2–4 meters high, is found concentrated in small areas growing among scattered rocks.

Photographs by
Luiz Claudio Marigo

Fig. 3
Of the many *Hohenbergia* species with local variation found in the park, the authors identified one as *Hohenbergia vestita*.



Luiz Claudio Marigo



E.M.C. Leme

Fig. 4
A new form of *Orthophytum burle-marxii* with a dense layer of white scales on bracts and center leaves in contrast with the pink to dark red leaves and bracts of the typical form (as in figure 1).

The Serra do Sincorá, where the Diamond Highlands National Park is located, has three basic kinds of vegetation. At the lower elevation there are semitropical nondeciduous hard wood forests, limited to areas with deep and relatively fertile soils or along water courses. At high altitudes on flat, meadow-like lands with shallow, sandy, and acid soils, the vegetation is composed mostly of grasses and sedges, with scattered low shrubs and stunted trees; this is the "campos gerais." The bromeliad family is not very well represented in either of these two habitats, although a few local ecotypes of more widely spread species such as *Tillandsia stricta* Solander ex Ker-Gawler, *T. tenuifolia* Linnaeus, and *T. gardneri* Lindley can be found.

In the third kind of vegetation, called "campo rupestre,"² the bromeliads really come into their own in a profusion of color and shapes, forming beautiful natural gardens among the rocks, together with cactuses, orchids, and velosiaceae (fig. 1). The vegetation which evolved in this unique environment, is composed mostly of herbaceous plants, low shrubs, and other perennials which grow among the exposed rocks above 1,300 feet.

A great variety of bromeliads, some of which are truly endemic species, are found growing in the peculiar ecosystem of the campo rupestre. A good example is *Cottendorfia florida* Schultes filius (fig.2). This species is found concentrated in small areas growing among scattered rocks or in cracks in the rocky surfaces where organic material has collected. The plants seem to have a certain fire resistance, in fact, the frequent fires in these mountains may actually stimulate flowering. It should be noted that the cultivation of this species is very difficult under greenhouse conditions.

Among the genera which truly stand out in the local flora of the Diamond Highlands are *Hohenbergia* and *Orthophytum*, both growing on rocks under intense sunlight. For those who study closely the massive aggregations of *Hohenbergia* there inevitably arises the question of whether there are several different species of this genera here, or perhaps only a very few (or one!) subject to large local variations. Each local population seems to have its own distinct characteristics of size, form, and leaf color. These groups are seen growing side by side and, as one travels through the area, the discovery of such peculiar specimens is a continual surprise. In fact, while one is initially tempted to collect a sample of each different form, it soon becomes obvious that it is an impossible task. We have identified some as *H. vestita* L.B. Smith (fig. 3), apparently a polymorphic species, but *H. utriculosa* Ule and *H. pennae* E. Pereira³ have also been reported in the area.

A similar situation occurs with the genus *Orthophytum*, which is exceptionally attractive during its flowering period. The predominant species is *O. burle-marxii* L.B. Smith & R.W. Read (shown in the foreground of figure 1).^{4,5}

[continued on page 33]

A New Species from Honduras: *Tillandsia copanensis*

Werner Rauh

Dr. Juerg Rutschmann (Basel, Switzerland) received *Tillandsia copanensis* from the orchid dealer E. Kamm (Tegucigalpa, Honduras) and it flowered for the first time in 1986 in his collection. The plant is very rare in cultivation.

When flowering, *Tillandsia copanensis* is a striking species with the underside of its leaves silvery white (fig. 5) and its spikes densely lepidote. There appear to be no closely related species in Central America. A single spike looks, when flowering, like that of the central-Mexican *T. califanii* Rauh, but there is no relationship between these species.

Tillandsia copanensis Rauh & Rutschmann, sp. nov.

Planta acaulis, florens usque ad 80 cm lata. *Folia* numerosa rosulam usque ad 80 cm diametientem et usque ad 40 cm altam formantia. *Vaginae* distinctae oblongo-ovales, usque ad 9 cm longae, 6 cm latae utrimque alutaceo-lepidotae. *Laminae* angusto-lanceolatae, supra vaginam usque ad 4 cm latae, usque ad 35 cm longae, paulatim in apicem durum se angustantes, solidae, laeviter, succulentae, involutae, subtus dense appresso-argenteo-lepidotae, itaque albescenti-



Fig. 5
A new species from Honduras, *Tillandsia copanensis* is distinguished in part by the silvery white coating of the underside of the leaves and the spike. There appear to be no closely related species in Central America.

Photo by Author



Author

Fig. 6

This detail of the *Tillandsia copanensis* inflorescence shows the floral bracts densely coated with white scurfy scales and the dark blue-violet petals.

virides, supra glabrescentes, lutescenti-virides; lepidotes subtus seriatas centro viridi. *Scapus* arcuatus, crassus, brevior quam folia rosulae, a phyllis subfoliatis dense circumdatus. *Inflorescentia* deorsum curvata simplex vel laxe bipinnata, cum spica terminali 35 cm longa, usque ad 30 cm lata, spicis usque ad 6 rectangulariter patentibus. Axis inflorescentiae glaber, 0.8–1 cm diametens, lucenti-carmineus, angulatus. *Bracteae primariae* triangulo-acuminatae, superiores usque ad 9 cm longae, basi usque ad 3 cm latae multo longiores quam stipus spicarum 1–1.5 cm longus crassus carmineus, pallide carmineae dense lepidotae. *Spicae* lineales acuminatae, usque ad 20 cm longae, etiam spica terminalis, utrimque paulum convexae. *Bracteae florales* dense imbricatae, ecarinatae, tantum apice nervo medio prominulo, 5 cm longae, 2 cm latae, acuminatae, densissime lepidotae, basim versus glabrescentes, prophylla ambo sterilia acute carinata. *Flores* subsessiles. *Sepala* oblongo-lanceolata, 2.2 cm longa, 0.5 cm lata, acuminata, posteriora indistincte carinata, usque ad basim libera, apice pallida, basim versus virescentia. *Petala* anguste lanceolata, usque ad 6.5 cm longa, apices paulum revoluta, atro-violaceus, basim versus albescencia. *Stamina stylusque* longe exserta; filamenta violacea, valde undulata. Stylus cum stigmate antheras paulum superans.

Holotypus: B.G.H.; 68 087, leg. E. Kamm, Tegucigalpa (Honduras), 1972, in herb. inst. bot. system. univ. heidelb. (HEID).

Patria et distributio: 20 km in directione occidentalia S. Rosa de Copan, Cordillera del Merendon in parietibus rupium et in arboribus generis Pini, Prov. Copan, Honduras.

Plant stemless, flowering up to 80 cm high. *Leaves* numerous, forming a rosette of 80 cm in diameter and 40 cm high. *Sheaths* conspicuous, lanceolate-ovate, 9 cm long, 6 cm wide, leatherbrown lepidote on both sides. *Blades* recurved, narrow, lanceolate, ± 4 cm wide above the sheaths, up to 35 cm long, tapering into a hard tip, somewhat succulent, canaliculate, densely white lepidote beneath, becoming glabrous above with age, pale green; trichomes beneath arranged in rows with a green center. *Scape* curved, 1.5 cm thick, shorter than the leaves. *Scape bracts* subfoliate, imbricate. *Inflorescence* rarely simple, mostly laxly bipinnate, curved, up to 3 cm long (the terminal spike included) and up to 30 cm wide. *Spikes* up to 6, horizontally spreading. *Inflorescence rachis* glabrous, 0.1–1 cm thick, bright carmine, angled. *Primary bracts* triangular, acute, the upper ones up to 9 cm long and 3 cm wide at the base. *Spikes* short (1.5–3 cm) stipitated, linear, acute, ± 20 cm long, 2 cm wide, slightly convex on both sides. *Floral bracts* imbricate, ecarinate, with a thickened midnerve at the tip, acute, 5 cm long, 2 cm wide, densely white lepidote, becoming glabrous at the base (fig. 6); the two basal floral bracts (= *prophyllae*) sterile and sharply keeled. *Flowers* subsessile. *Sepals* oblong-lanceolate, much shorter than the floral bracts, 2.2 cm long, 0.5 cm wide, acute, the posterior inconspicuous, crenate, nearly free, pale at the tips, green at the base. *Petals* narrow-lanceolate; up to 6.5 cm long, erect, their tips somewhat recurved, dark blue-violet, white to the base. *Stamens* and *style* long exserted. Filaments violet, strongly plicate. Style and stigmas somewhat longer than the anthers.

Holotype: G.B.H. 68 087, leg. E. Kamm, Tegucigalpa (Honduras), 1972.

Distribution: 20 km west of S. Rosa de Copan, Cordillera del Merendon (Prov. Copan), Honduras, on rock cliffs and epiphytic on pine trees.

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

How (and Why) to Prepare BIC Specimens

Harry E. Luther, Director

The Mulford B. Foster Bromeliad Identification Center was established nearly a decade ago as a service to hobby and professional growers as well as to scientists who need accurate and reasonably rapid identification of bromeliads. A fee of \$5.00 was established and it remains unchanged. For readers unfamiliar with the service I will describe how to go about using BIC:

1. A specimen of the plant is required. It should be in flower. If the blooming plant is small, send the entire plant (fig. 7). Before packing, you should shake the water from the reservoir and pick out insects and other extraneous matter. If the plant is large, or if you have only one specimen, send the cut inflorescence with the scape plus two or three complete leaves including the leaf sheath. Dried and pressed specimens are entirely acceptable.

2. Enclose all possible information regarding the origin of the plant. If collected in the wild, please list the country, province, or state, the elevation, the collector's name, and the date collected. If from a horticultural source, please give



Fig. 7.

Specimens as received at the Bromeliad Identification Center. The entire, living plants wrapped loosely in newsprint are being unpacked from a box.

Photographs by
Bob Wands for Selby Gardens



Fig. 8. Some of the specimens sent to BIC are prepared for the herbarium as shown here. When dried, the plants will be mounted on herbarium sheets. A label with information about color, name of the collector, and date received will be added.

the name of the grower or the nursery. It is very important to include notes about the colors of the inflorescence. The more complete the material and the information supplied, the more confident the identification will be.

3. Please include \$5.00 to help cover the cost of the identification.

4. All material should be sent airmail or blue label UPS.

Most identifications are made very quickly; at times, difficult or poorly prepared specimens will require much more time.

There are several ways of making an identification. These include making an immediate match with living or preserved material at Selby or keying-out the characters and matching the specimen with live or herbarium material. A search of recent literature may be required as several hundred species have been described since Dr. L.B. Smith's monograph of the family was published. It may be that I will need additional material. Even with a whole plant and a complete



Fig. 9. A completed specimen ready for insertion into the herbarium. Selby Botanical Gardens has about 57,000 such specimens including 2,400 bromeliads.

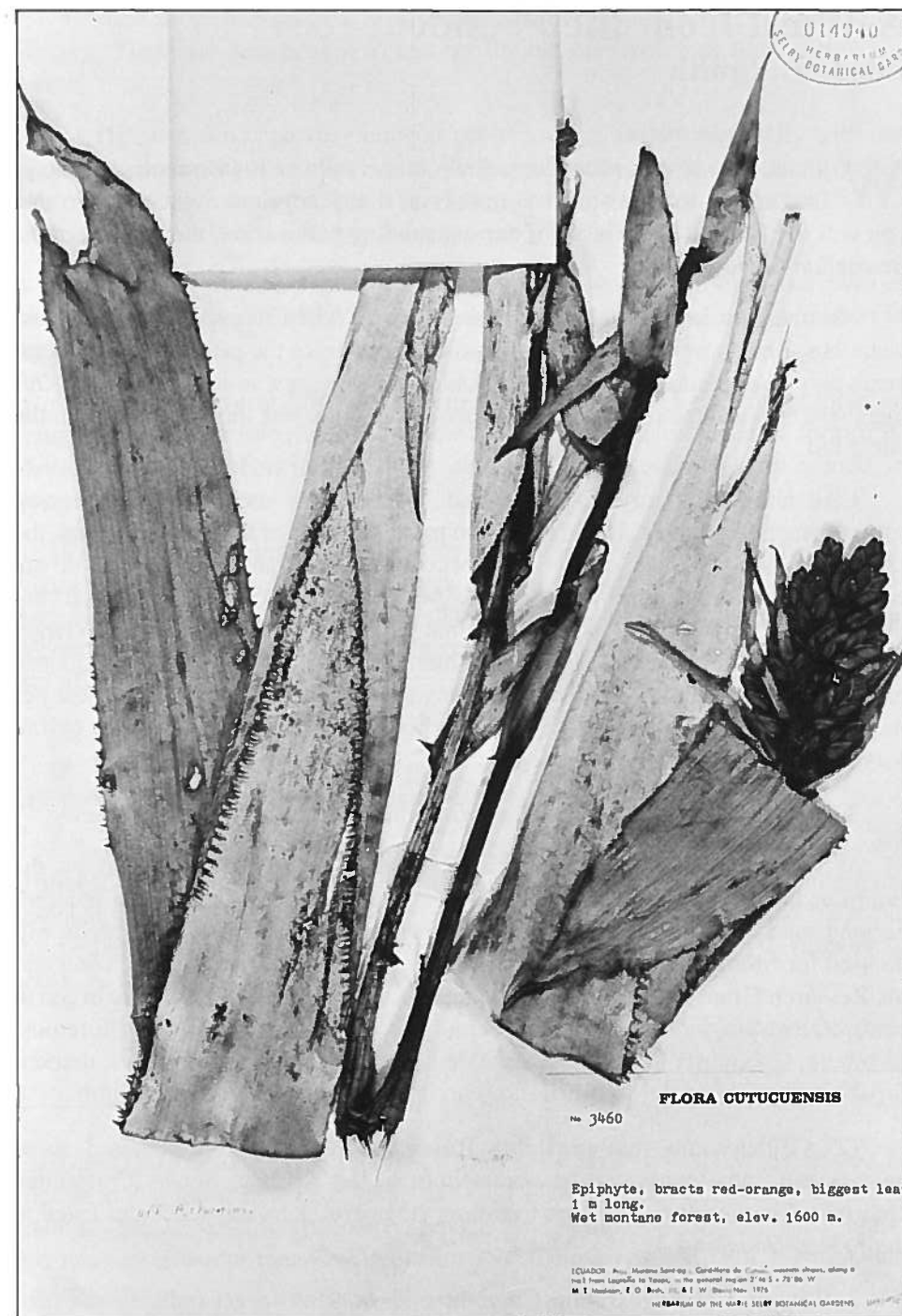


Fig. 10. Specimen from a professional collector representing a probable new species. This example shows two leaves and the inflorescence. The label records collection data.

[continued on page 29]

A Word from the President

Edgar L. Smith

With the arrival of a new year many memberships in the Bromeliad Society, Inc. are up to renewal. It is important that you renew right away so that you will not lose out on an issue of our outstanding publication, the *Journal of the Bromeliad Society*.

Membership in the society has been holding fairly steady for the past few years but, like many organizations, it has declined from the peak reached several years ago when plants were "in" and bromeliads were new to many growers. Our members now are the more dedicated growers and not just those interested in the latest fad.

Like many other organizations (and families) our society is experiencing some financial problems. It costs \$2.50 to print one copy of the *Journal*. Thus, the six issues cost \$15.00 per year—the exact cost of membership. *Journal* ads do not cover the cost of printing by any means. Membership dues could be raised, but the Board of Directors has not favored that action. So what can you do to help? Each member should try to get one new member and affiliates should urge more of their members to join. With a great many more members, the average cost per member could be reduced. It is imperative that we get more members or curtail some of the activities.

There are some programs and activities that I want to talk about briefly:

1) The Victoria Padilla Memorial Research Fund was established by the Board at its meeting in Dallas in 1987. We plan for this to become an income-earning fund to be augmented as possible from general funds. The proceeds will be used for bromeliad research and will be distributed by Dr. David Benzing and his Research Grant Committee. Individuals, as well as organizations, are urged to contribute to this fund to honor the memory of one of our original and foremost members. Checks should be made payable to the Bromeliad Society, Inc., marked for the Victoria Padilla Memorial Research Fund and sent to the treasurer.

(2) Affiliates are reminded that Bromeliad Society, Inc. standard show awards and entry cards can be obtained from the Affiliate Shows Committee chairman Charlien Rose. Be sure to follow the instructions and schedules listed in the judges *Handbook*.

3) The Hybrid Registration Committee is working to get policies and procedures ready for publication. A list of hybrids registered in 1986 is in the November-December *Journal*. Anyone whose applications have not been acknowledged is urged to write to Brian E. Smith, chairman.

4) Slide programs may be obtained by affiliates from Slide Librarian Mary Massey. These are new programs and not the old ones you may have seen years ago.

5) The seed fund is a very popular project of the society especially with our overseas members as chairman Harvey Beltz will verify. Seeds may be purchased from or donated to the seed fund. You may send for a current list by enclosing a long, stamped, self-addressed envelope.

6) Affiliates are urged to send accounts of newsworthy activities and dates of future shows to the Affiliated Societies chairman Stan Oleson for publication in the *BSI Newsletter*.

7) We have several fine publications for sale. Affiliates may order these on consignment at bulk rates and resell them to members and to the public for profit. More information about this may be obtained from Annie Navetta who is in charge of publications.

8) Dr. Mark Dimmitt of the Arizona-Sonora Desert Museum and his Conservation Committee have completed their "Conservation Goals and Code of Conduct for Growers and Collectors." These statements were published in the September-October 1987 *Journal*. The code should be observed by all members and affiliates.

9) All members are aware of the Mulford B. Foster Bromeliad Identification Center and the fine work being done by Harry Luther. This project needs and deserves the continued support of and use by the members.

These are some of the programs and projects available to you as members and affiliates. Addresses for individuals and activities are listed on the inside back cover of the *Journal*. Please use and support these programs. With your help, the Bromeliad Society, Inc. will grow and its programs will continue to support its goals.

4415 Vandelia
Dallas, Texas 75219

THE BROMELIAD SOCIETY, INC. MEMBERSHIP CHAIRMAN wishes to announce that the leaflet BROMELIAD CULTURAL TIPS is again available in quantity (please see advertisement on page 39). Many organizations have found this handout a useful means of recruiting for themselves and for the Bromeliad Society, Inc.

The Bromeliads: Genera—Species—Hybrids (continued)

Louis Dutrie

[Dr. Lyman B. Smith classes *Canistrum*, *Neoregelia*, and *Nidularium* as genera of the subfamily Bromelioideae whereas Carl Mez considered them a special subtribe. Since Louis Dutrie follows the Mez classification we shall adhere to his outline while keeping the differences in mind. Individual plant names have been changed to agree with the Smith and Downs monograph,¹ as in the preceding sections, and synonymous names appear in parentheses. Names not found in Smith and Downs and hybrid and cultivar names not registered are enclosed in quotation marks. —Ed.]

THE NIDULARINAE

According to Mez, the Nidularinae include three genera: *Aregelia* Kuntze [now *Neoregelia* L.B. Smith], *Nidularium* Lemaire, and *Canistrum* E. Morren.

In the first two genera, the densely capitulate inflorescence is sunk deeply into the center of the rosette. In *Nidularium*, it is divided into many heads, one in the center, the others forming a crown among the bracteate leaves. As for *Canistrum*, the single inflorescence, a flat-topped floral cluster, is borne on a stalk which rises slightly above the center of the leaves.

In these three genera, the flowers are, to tell it straight out, of little interest since they are not particularly decorative nor do they last very long. The attractiveness of the plants is concentrated in the inner leaves when the plant is in bloom. At that time they take on vivid colors.

There are numerous species; we shall mention only the most interesting.

Neoregelia.

• *Neoregelia concentrica* (Vellozo) L.B. Smith (*Aregelia concentrica* [Vellozo] Mez), Brazil. A sturdy plant, reaching 1 m in diameter. Leaves 10 cm wide, rounded at the tip and terminating in a straight thorn on a black spot, edged with strong, black teeth, and pale green with dark brown, almost black, blotches. Bracteate leaves shorter, violet or pale wine-colored. In many specimens it is a notable plant. This description applies to the variety "*proserpinæ*"² since there is another one as well:

• *N. concentrica* var. "*plutonis*" E. Morren.³ A variety of the preceding, but of smaller size and with the bracteate leaves dull red.

From these two one can go on to:

• *Neoregelia coriacea* (Antoine) L.B. Smith (*Aregelia coriacea* [Antoine] Mez), closely related to *N. concentrica* var. "*plutonis*," but with inner leaves dull metallic violet. The deep green leaves are more or less light purple tinted and have black spots.

The *Neoregelia carolinae* group includes more brilliantly colored plants:

• *N. carolinae* (Beer) L.B. Smith (*Aregelia carolinae* [Beer] Mez), better known as "*Nidularium meyendorffi* Regel," Brazil. The leaves are 25–35 cm long, 3–4 cm wide, brilliantly bright green on both sides and forming a dense rosette; the bracteate leaves range in color from rose-carmine to bright red.

• *N. carolinae* ("*marechali*" Hort. Makoy).⁴ Closely related to the former, but forming a more beautiful plant thanks to its shorter and wider leaves. The bracteate leaves show a great diversity of colors from rosy red to vermilion or a reddish purple, the most valued being cardinal red or orange. The latter is still rare and sought after for hybridizing.

• *N. princeps* forma *princeps* (*Aregelia princeps* [Baker] Mez), southern Brazil. This is a squat plant which has a dense rosette with leaves 4–5 cm wide, bluish green above, densely lepidote beneath, rounded and mucronate, slightly toothed. The bracteate leaves are bright rose-red. A character which I have not noticed in any other description: the sepals and the small floral bracts are reddish orange, while in other species they are dull green. Since they have the appearance of petals, the inflorescence looks like a round, reddish orange skull-cap set in the bottom of the rosette formed by the leaves, thus adding to the plant's charm. It should be noted that this characteristic is transmitted to its hybrids.

• *N. cyanea* (Beer) L.B. Smith (*N. elegans*) Mez.⁵ Leaves erect, gracefully arched, uniformly green above, paler and strongly banded with silvery zebra stripes beneath. Base sheathed, brownish green and marked with green spots. The inner leaves do not take on any color; it is a foliage plant.

• *N. binotti* (Antoine) L.B. Smith (*Aregelia binotii* [Antoine] Mez), Brazil. Short leaves, 6–8 cm wide, green, decorated with transverse gray bands, especially beneath, and bordered with strong, black spines, rounded and mucronate, marked at the tip with a bright red spot. The inner leaves are not colored.

The following species have colored leaves.

• *N. marmorata* (Baker) L.B. Smith (*Aregelia marmorata* [Baker] Mez), southern Brazil. A beautiful species with leaves 35–40 cm long, 5–6 cm wide, pale green, with fine teeth, erect, both sides lined and marbled with red-brown splotches and with a bright red spot at the tip. In order for the leaf coloration to reach full intensity, the plant must be grown near the greenhouse glass or, better, mounted on branches.



Marcel Lecoufle

Fig. 11

Neoregelia carolinae forma *tricolor*

- *N. chlorosticta* (Baker) L.B. Smith (*Aregelia chlorosticta* [Baker] Mez), Brazil. A small plant with leaves in an erect rosette, utriculate, tight, and marked with bright green spots on a brownish orange background. This coloration can be intensified to bright red if the plant is grown near the light. Hanging shelves suit it very well. Valuable for mounting on branches.

- *N. spectabilis* (Moore) L.B. Smith (*Aregelia spectabilis* [Moore] Mez), southern Brazil. Erect leaves, 30 cm long, 4–5 cm wide, mucronate, with a bright rose-carmine spot at the tip, brownish green above, brownish red with transverse whitish bands beneath, slightly spiny. The center leaves do not change color. It does not require the light intensity of the others.

Finally, two variegated varieties:

- *N. "meyendorffi foliis variegatis."*⁶ Developed by M. A. Ghyselinck of Meirelbeke. The leaves are adorned with a broad central band of bright yellow becoming pale and then white towards the tip of the leaves. At the time of flowering, they become tinted with red fading to rose, progressing from the center.

- *N. "marechali tricolor."* Produced by M. Declercq van Ghyseghem of Ledeberg. Leaves wider and shorter than in the former. The same variegation, but the yellow is deeper; the inner leaves are bright red.

These are two very beautiful plants. The first is the more brilliant, its coloration being brighter; the end has a more perfect shape. The difference is, however,

so slight that the uninitiated might easily confuse the two. There is, in short, a divergence between *N. "meyendorffi"* and *N. "marechali."*

Nidularium.

- *Nidularium fulgens* Lemaire, southern Brazil. Better known in horticulture as "*N. pictum*." Plant of variable dimensions, generally somewhat small with a dense rosette of 15–20 spreading leaves, very light green blotched and marbled with deeper green spots and rounded at the tip. Bracteate leaves short, brilliantly scarlet. Reproduction by seeds is variable. I succeeded, however, after numerous attempts to obtain some pure samples from seeds and gathered seeds from them which I sowed in December 1942. I have never seen the flowers.

- *N. innocentii* Lemaire, southern Brazil. Leaves in a short rosette, lanceolate, green tinted with brownish red hue above, darker beneath and edged with fine and closely spaced teeth. The inner leaves are colored red-orange. Like *N. fulgens*, *N. innocentii* produces few seeds and does not reproduce faithfully from seed; plants obtained are often less beautiful than the type.

- *N. "lubbersianum"* Hort. Leod. Leaves erect, narrow, brilliantly dark green above, strongly tinged with brown beneath. The inflorescence, raised on a floral stalk 15 cm tall, is surrounded by inner leaves 8–10 cm long, tapering to a point, reddish green at the base, red at the tip. Although of the same shape, but less vividly colored, it reminds one of *Guzmania lingulata* [var.] *splendens*.

And here are three variegated species:

- *N. "makoyanum* Hort. Makoy non Regel."⁷ This is a rather small plant with soft leaves, wide at the base, pointed at the tip, bright green, striated along their length with white lines of variable width, sometimes covering two-thirds or more of the leaf, in other cases there are no more than a few lines, often poorly spaced and changing the appearance of the leaf in an unpleasing manner. It is difficult to obtain a perfect plant; for that reason it is of little interest.

- *N. innocentii* var. *striatum* Wittmack (*N. striatum* Hort. Bull.) The variegation of this very beautiful plant is completely different. It consists of a wide central band, frequently accompanied by finer lines, golden yellow against a background of bright green. The leaves are wide, rounded at the tip, spreading and with few spines. The general aspect of the plant, which reaches 50–60 cm in diameter, and the variegation are like that of *Dracaena massangeana*. It is one of the most beautiful of the variegated bromeliads and has a perfect shape.

- Bellair and Saint-Légér in *Les Plantes de serre* describe a variety of "*N. innocentifoliis luteo-variegatis*" with smooth-edged leaves, striped in yellow along their length. It is very similar to *N. innocentii* var. *striatum*, but with bronze-colored leaves.

Canistrum.

Wittrockia amazonica (Baker) L.B. Smith (*Canistrum amazonicum* [Baker] Mez). Leaves in a rosette, 30 cm long and 5 or 6 cm wide, soft, edged with thin and closely spaced teeth, reddish green above, bright mahogany beneath. The bracteate leaves do not change color. According to Bellair and Saint-Léger there is a tricolored variety in horticulture with a pleasing blend of red, yellow, and green leaves.

- *Canistrum lindenii* var. *roseum* forma *procerum* Reitz (*C. roseum* E. Morren), southern Brazil. Leaves in a very open rosette, 40 cm long, 7-8 cm wide, leathery, slightly arched, smooth and glossy on both surfaces, bright green marbled with dark green spots having a rosy iridescence, bordered by coarse spines, and tipped with a recurved, hard, sharp point. The inflorescence is capitulate, flat, 8 cm in diameter, raised slightly above the leaves, and surrounded with prickly bracteate leaves, brightly rose colored. A beautiful plant. The sepals, long and recurved, and the little bracts between the flowers are covered with bright reddish brown woolly down. Before the petals appear, the head is covered completely with this rather unexpected color. This is done so well that a client, to whom I had given two plants just ready to bloom, sent them back expressing his astonishment that the plants were in an advanced state of decay. It really is the impression given to the uninitiated by the plant, and there are many who have made this mistake.

- *C. lindenii* var. *lindenii* forma *lindenii* (*C. eburneum* E. Morren), southern Brazil. Plant close to the preceding in respect to appearance and height; green leaves with darker marbling. The inflorescence is surrounded by ivory colored bracteate leaves. A beautiful plant.

- *C. ×Leopardinum* Hort. Makoy. A very beautiful species, the sturdiest of the genus. Leaves numerous, thick, leathery, in a short rosette, strongly sheathed, 70-80 cm long, 7-8 cm wide, erect, spreading, edged with strong, black spines, and brilliantly bright green—flecked with irregular dark green or brownish spots. Rarely blooms. M. Declercq van Ghyseghem managed to obtain seeds about 1935.

- *C. "sallieri"* Hort. Similar to the preceding, but the dimensions are smaller. On the other hand, the dark green markings stand out more vividly against the very bright background of the leaves. A superb plant.

- *C. cyathiforme* (Vellozo) Mez. Leaves 70-80 cm long, 4-5 cm wide, the bracteate leaves erect, spotted with brown, the outer ones reflexed, strongly spined, green, tinted rusty red beneath, spotted at the tip, tapering to a long point with sharp edges and with a large, red spot. A beautiful and unusual plant.

Hybrids of *Nidularinae*

As great a seed producer as Léon Duval was, he seems to have neglected the hybridization of the "Nidularinées." He stated that the results were sometimes

disappointing, the hybrids were not as good as the parents. That is, indeed, often the case in respect to some crosses such as *Nidularium fulgens* by *N. innocentii* of which many of the hybrids are inferior to the types. But it turns out that some are notable. For example:

- *Nidularium ×Chantrieri* André, obtained by the famous seedsman M. J. Chantrier of Mortefontaine, France, by crossing *N. fulgens* and *innocentii*. It is one of the most beautiful of the nidulariums. Leaves 30-35 cm long, 4 cm wide, lustrous green and dotted with black, violet underneath, bordered with purplish violet. The bracteate leaves, brilliantly vermilion along almost their entire length, contrast admirably with the dull background. The plant is not generous with seeds. I got some, however, which I sowed in 1936. They produced some interesting specimens but none rivaling the mother.

Fifteen years after M. Chantrier made this hybrid, M. R. Morobé of Gentbrugge obtained from the same cross a superb plant which he named *N. × Mme. Robert Morobé*. This plant, presented at the meeting of 6 August 1944, was given a Certificate de Mérite, first class, with congratulations; a well deserved reward because the hybrid is truly superb and frankly superior to *N. ×Chantrieri*, which in itself is very beautiful. The appearance of the plant is perfect; the numerous leaves, strong but without stiffness, well displayed, are of a beautiful bright brown color above, lustrous and dark brown beneath. At blooming time, the center leaves become scarlet over a diameter of 25 cm. Notable in every respect.

On his part, M. A. Ghyselincx produced a very beautiful hybrid from seeds gathered from *N. innocentii* var. *striatum*, probably pollinated by *N. fulgens*. He gave it the name *N. ×François Spae*. Leaves up to 45 cm long, 5-6 cm wide, erect, very open, brilliantly bright green on both surfaces, spotted with deep green and similar to those of *N. fulgens* from which it gets its toothed margins. The inflorescence is raised somewhat above the center in the manner of var. *striatum*; the bracteate leaves are of a beautiful, fresh, and rosy color. This is an excellent plant, still available in cultivation.

A cross between *Nidularium rutilans* E. Morren and *Neoregelia carolinae* "marechali" gave to M. Morobé *N[eolarium] Souvenir de Casimir Morobé*. The appearance of this plant is that of *N. rutilans* with the inflorescence standing well above the center. The bracteate leaves become colored with a beautiful bright cerise shade and retain their brilliance for a long time. The plant obtained a Certificat de Mérite by acclamation at the 5 August 1945 meeting.

Trying again to produce a hybrid which I had made in the past, M. Morobé obtained from *Neoregelia "marechali"* pollinated by *N. concentrica* var. "proserpinae" a plant with very short and very wide leaves (20 cm by 6), set in a perfect rosette with many leaves, bright green, rounded at the tip and with a hard, sharp point on a rosy spot; the leaf shape is that of the father. The center leaves are a

bright red. The plant, named *Nidularium* ×Glory, was presented to the jury in June 1944 and was awarded a Certificate de Mérite by acclamation. The correct name should have been *Neoregelia*.

[To be continued]

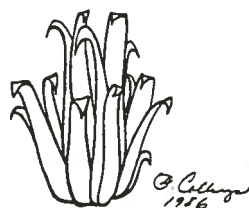
NOTES:

1. Smith, Lyman B.; Downs, Robert J. Bromelioideae (Bromeliaceae). Flora Neotropica, monograph no. 14, pt. 3; 1979.
2. The author refers frequently to this undescribed variety, also known as a cultivar.
3. Listed in Smith and Downs (p. 1584) as a parent of *N.* ×Decora, but not otherwise identified. We shall show this name also in quotation marks.
4. Smith and Downs (p. 1553) list *Aregelia marechali* Mez as a synonym of *Neoregelia carolinae* forma *carolinae*. Kew Index states, "*Aregelia Marechali* (Hort. ex Baker) Mez. l.c. 43: *Nidularium Marechali*." Mr. Harry Luther observes, "Material that I have seen of *N. Marechali* is *N. carolinae*." Lacking definite identification, we shall employ quotation marks.
5. Kew Index.
6. For further discussion, please see *J. Brom. Soc.* 35:197-199, 205; 1985.
7. Not listed in Smith and Downs (p. 1614) but *Nidularium makoyanum* E. Morren ex Baker appears as a synonym of *N. innocentii* var. *striatum* Wittmack.

M. MARCEL LECOUFLE, BROMELIAD AND ORCHID GROWER of Boissy Saint-Léger, France, an honorary trustee of the society, has given a collection of 517 excellent color slides of bromeliads to the society library. This most generous and thoughtful gift arrived neatly boxed, arranged in classification order, and with a complete index. It will be an invaluable asset to be made available to the members through the pages of the *Journal*.

We thank our colleague M. Lecoufle for this gift. We greatly appreciate the time and effort he expended in selecting, arranging, and indexing this magnificent collection.

—TUL



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

Racine Foster

[In the first installment of Mrs. Foster's account of her husband's 1948 trip, he had travelled to Puerto Rico, Surinam, and parts of Brazil including the state of Bahia. His collections in Bahia included *Cryptanthus* collection number 2466, which later produced *Cryptanthus* 'It'.]

Just after finding *Cryptanthus* #2466, Mulford found the *Pseudananas sagenarius* (Arruda) Carmargo which, of course, reminded him of our very happy meeting of Senhor Camargo in 1940. He was a forceful character who gave us to understand that the name was not *Pseudo-ananas*, as evidently we had mistakenly stated. *Não, senhor*, it was *Pseudananas*, a pineapple without the leafy top. Leaves of this plant grow to be eight feet tall.

I, personally, know how difficult it is to make a herbarium specimen of the big aechmeas, dyckias, hohenbergias, so I marvelled that Mulford, alone, could make a successful specimen of this bulky and very juicy *Pseudananas*. He was overly busy and pressed for time, I am sure. He, nevertheless, bothered to make pollen specimens for Dr. Erdtman in Sweden. Collecting pollen in tiny vials is probably one of the easiest of all collecting jobs. But Mulford, on this trip, had no



M.B. Foster

Fig. 12
Aechmea multiflora shown growing on a Cocos palm, its round head protruding from its own leaves.

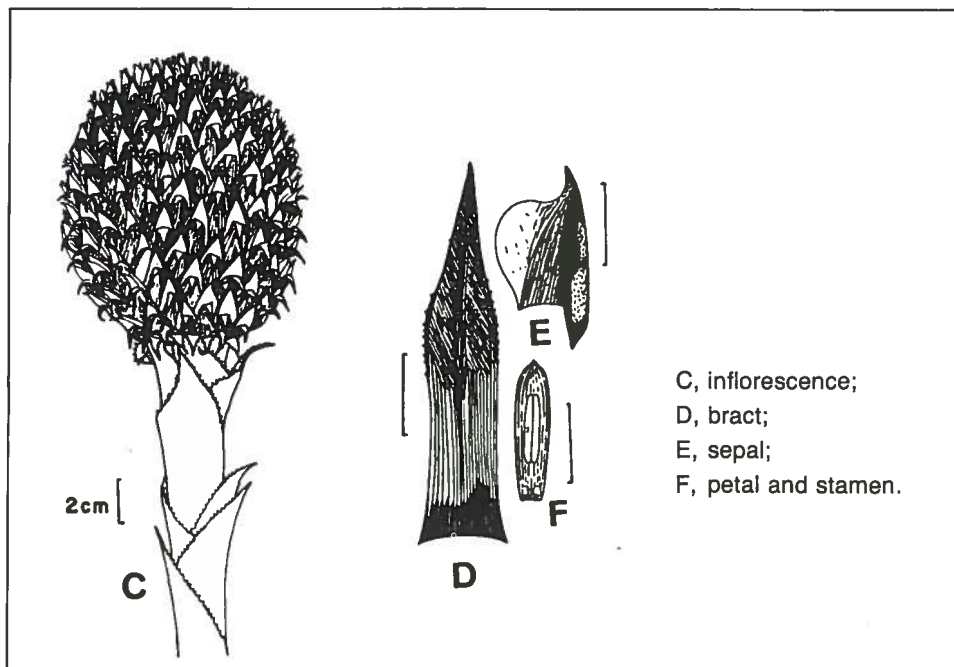


Fig. 13. *Aechmea multiflora*

help for all the pressing, drying, cataloging, and note-taking jobs that are demanded for proper botanical records. So, gathering pollen and preparing all the related notes was, as I viewed it, one more thing to do on an already limited time schedule.

Very near the pseudananas populations were huge plants of *Aechmea lingulata* whose leaves were up to four feet long. They grew in such large and compact masses that to extricate a specimen for pressing meant the person's arms were inevitably wounded by the unusually sharp, black spines on the margins. This is one of the reasons that my husband always wore long-sleeved, khaki shirts, even in the hot sun.

Another giant aechmea was collected in three different localities in the state of Bahia, *Aechmea multiflora*. It was a curious plant, often growing high up in the boots of a Cocos palm, its round, compact head very conspicuously protruding out from its own leaves and exceeding the entire foliage of the host palm (fig. 12). Coloring did not make it conspicuous; it was the round head (fig. 13) made up of tan to reddish bracts surrounding bronze-red sepals that attracted attention. The natives had discovered the delight of this bromeliad in its sweet fruits called "Chupa-chupa." You pull the rather large seed out of the globular head and eat the delicious flesh clinging to it.

At first, Lyman Smith thought it was another new species for Mulford and gave it a most appropriate name, *Ae. globosa*, because its head was as round as



M.B. Foster

Fig. 14.
The harbor at Bahia, Brazil - 1948.

a ball. A pity that *that* name had to be dropped in favor of the original name by H.M. Curran who found it and named it *Ae. multiflora** in 1915.

While his eyes were sensitized for spotting bromeliads, Mulford didn't miss a dry field full of *Habranthus* flowers (commonly called rain lily), dressed in rich, light pink. It was an unexpected sight to be sure, but no record was made of its identity (it may have been *H. robustus*).

More important was the new variety of *Billbergia*, *B. euphemia* var. *saundersioides* L.B. Smith (type) along with the new species *Orthophytum maracasense* L.B.S. (type) with salmon-colored leaves which distinguishes this one from the light green phase; both growing here in close proximity on the rocks in definite, segregated patches. This was a curious situation, a color line among the orthophytums!

Across the bay from the city of Bahia, a handsome, new bromeliad was waiting for Mulford. Neither the plant nor Mulford knew then that his name was on it: *Canistrum fosterianum* (fig. 15). The embossed, two-color leaves reminded him of *Aechmea fosteriana* which we found in 1939 and 1940 further south in the Espírito Santo area. However, he later learned that there was no similarity in the

*L.B. Smith, R.J. Downs, Bromelioideae, Flora Neotropica monograph, part 3 (New York: New York Botanical Garden, 1979), pp. 1941-1942. Fig. 13 from the same source, p. 1942.



Racine Foster

Fig. 15
Canistrum fosterianum collected
by M.B. Foster across the bay
from Bahia, 22 October 1948.

flower head. Unlike the aechmea, the canistrum had more of a tulip-shaped head which emerged out of the tubular plant on a fourteen-inch stem. The showy head was formed as a rosette of salmon-red bracts in which nested white flowers. A lovely bromeliad, but not too durable in Florida's climate.

Mulford's enthusiasm for finding bromeliads in their native setting never diminished. After one exhausting five-day trip in a jeep, covering over 850 miles of Bahian rock, sand, dust, mud, rain, and rocks and rocks—mountains of thorns, scratched legs and hands, with a very stubborn driver, he could write: "How I wish we could have seen these beautiful Bahian mountains together, but I'm glad you didn't have to stand the broken exhaust pipe. You and I must come back here some day."

After a very detailed letter about this difficult trip, he worked all night to clean, to label, and to write notes in order to send the plants and specimens to me. I dried them properly, typed the notes, and sent the batch to Lyman Smith.

Mulford was elated about what had been collected. He said, "I've taken almost as many numbers here in Bahia as we did in 1939, and I've hit the jackpot on orthophytums.* I found out the original place for the *Cryptanthus bivittatus* but

*Bulletin 8:25-27; 1958.

I could not get there; it grows in sand right near the Bahia Bay, but in a far distant place from the city of Bahia.

"Am sending bulbs of an amaryllis with a three-foot tall inflorescence of six flowers. I've never seen its equal and I wonder if it has been collected before? (It turned out to be a new species named by Dr. H. Traub for Mulford, *Amaryllis fosteri*).

"I know one thing—I would like to spend at least three months in the state of Bahia. The bromels are really here. We did not even scratch the surface in 1939.

"Hohenbergias must have been born in Bahia. There are countless millions of them, growing mostly on ground and rocks.

"I'm going to take back my prophecy about Colombia. Brazil is tops for bromeliads, I believe. Collecting has been made a little easier because there are certainly a lot of new roads now; one could cover a lot of the area in a jeep.

"The city of Bahia has changed but little since our 1939 visit. More active, of course. The road from the airport is thirty kilometers to the city; it is a marvelous work of engineering, but unbelievable in its convolutions. It goes just like this:

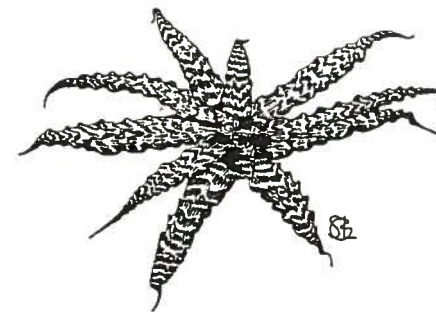


Our American men built it during the war.

"You will be amused at the big publicity I've had since arriving. They want permission to translate our book into Portuguese and reprint it here. One of the state officials said they would do it." (However, nothing came of it.)

Many officials and friends whom we met in 1940 welcomed Mulford again. They asked him if the Senhora was with him? His answer was, "*Sim, Senhor, aqui,*" and then with a big smile he would point to his heart.

Botanically speaking, his eight days in the state of Bahia was a successful expedition. He collected 54 numbers, most of them bromeliads of which eleven were new species in the genera *Canistrum*, *Orthophytum*, *Aechmea*, *Cryptanthus*, and *Billbergia*.



[To be continued]

Regional Reflections

NUTRITIONAL NOTES

Investigations into the nutritional requirements of pineapples have shown the importance of potassium in relation to growth and fruit yield. Ornamental bromeliads share this need of adequate potassium for good growth, flowering and offset production.

Field trials of pineapples have shown that adequate potassium levels improve the plant's resistance to light frosts. In one instance, plants with leaf potassium levels of 1200 ppm showed frost damage while plants with the recommended level of 3000 ppm showed no damage at all. From this it should not be interpreted that high potassium levels will prevent frost damage; rather that adequate potassium will increase the plant's resistance to light frosts.

If you are using extra potassium in your nutrition programme, or using an N.P.K. mixture which is high in potassium, then you probably should be adding some magnesium as well. High availability of potassium tends to suppress the uptake of magnesium with a subsequent slowing of plant growth. Potassium sulphate is the preferred source of potassium for bromeliads, and magnesium sulphate—Epsom Salt—at approximately one-tenth the amount of potassium sulphate or potassium in the fertilizer is an appropriate addition rate.

*Peter Paroz
Brisbane, Queensland*

SOAP SPRAYING

The new miracle insecticide, "Safer's Insecticidal Soap," isn't new, or a miracle cure. What it is, though, is an added weapon in the on-going battle with insects.

Insecticidal soap is fatty acids, or both plant and animal. These simple, biodegradable fatty acids make soap bubbles which cover insects' breathing apparatus and, essentially, suffocate them. It is not something that the insects can become immune to. It is also almost harmless to human and pet life. Simply soapy water. Although, I'm sure if one drank enough of it, one would become as sick as if soapy water had been consumed. (Use common sense and keep this "chemical" and all others locked up where children and pets cannot get to them.)

Another benefit of insecticidal soap is that the soap won't bother a variety of beneficial insects. Ladybugs aren't bothered by the soap and when they eat other insects killed by or contaminated with soap it still poses no proven secondary effects. The soap does kill scale, mealybugs, some ants, and some mosquitoes, all of which are primary bromeliad pests.

What the soap doesn't do is hunt down its prey. It must be applied directly onto a pest to get results. The soap is not systemic, and it is safe. Since it is only soap, it is very easy, convenient, and simple to use.

I recommend keeping a quart made up for daily spot spraying. Every time any mealybugs or scale are found, immediately spot spray with the soap.

Insecticidal soap rarely is the final and complete answer. I still recommend a regime of alternating chemical sprays—Malathion and then Diazanone the next month—Cygon or Durisban the following month. The point is to not repeat sprays of the same chemical. To do so causes the immunity effect. Repeated sprays reinforce the survival of insects not killed by a single chemical. Rotating the chemicals eliminates this as a problem. Using the soap as a daily use spray can mean having to suit up in protective wear only once a month, or so.

*Timothy "Lanky" Morrill in
Hawaii Bromeliad Society Newsletter, May 1987.*

How (and Why) to Prepare BIC Specimens *[continued from page 13]*

statement of collection data I might need to borrow specimens from another herbarium. Over the years, several plants have defied positive identification.

There really is a motive beyond the identification process and that is to look for the unusual. It might be a species reported found in Place Y when it had never been seen beyond the limits of area X. It might be a completely new plant, a new variety of a described species, or even a form of a species. Often, these newer collections are more complete or represent different stages of maturity than the older collections. Many bromeliads are known only from a single collection and all additional material is helpful in understanding the type and range of variation present. Such new material is preserved in the Selby Herbarium in the manner shown in figures 9 and 10.

To return to my original outline, BIC is supported solely by fees, grants, and contributions. Any individual or group interested in this service is encouraged to help with its financial support. Society contributions are treated as prepayments for specimen identifications sent in by their members. Please send specimens and contributions to me at the address shown below. Anyone visiting the west coast of Florida is invited to visit BIC. Please notify me at least a day in advance so that I can arrange to be here to meet you.

*The Mulford B. Foster Bromeliad Identification Center
The Marie Selby Botanical Gardens
811 South Palm Avenue
Sarasota, Florida 34236*

Bromeliad Arrangement No. 19: Arrangement Using *Canistrum aurantiacum* and *Neoregelia compacta* May A. Moir



Jim de la Torre,
Honolulu Academy of Arts
Fig. 16

Striking contrasts of dry fern fronds, silver pads of platycerium, with *Canistrum aurantiacum* heads ("I hated to cut them") and small, new growth of *Neoregelia compacta*.

When I recently was on the small island of Lanai we drove up the mountain to an area of native forest. Along the side of the road were sadleria ferns, some with dry fronds which were very dark brown with a silver sheen. Knowing that it would not harm the plants we gathered a few undamaged dry fronds. When I had them back home in Honolulu I started looking in the garden for material that could be used with the fern. With help I was able to harvest the silver satin pads of a platycerium. All this muted brown needed a splash of bright

color, so, much as I hated to cut them, I gathered six heads of *Canistrum aurantiacum*. I also cut some tall, dark green aspidistra leaves and some small new growths of *Neoregelia compacta*.

To put this all together I used a pair of 16-inch copper dishes, large kenzans (needle holders), heliconia stems for support. The fern fronds were first pinned to the heliconia stems to establish the height of the arrangements in relation to the size of the dishes. Next the aspidistra leaves were used as a backing for the fern, then the platycerium was pinned into place. The canistrum into the kenzan, then more platycerium, a few small rocks to support the *Neoregelia compacta*. Water in the well of the neos and water in the dishes.

Honolulu, Hawaii



1988 World Bromeliad Conference

Connie Johnson

The excitement is mounting. New ideas, new plants and other new delights will make the 1988 World Bromeliad Conference a truly unforgettable experience. Continental/Eastern, the official airline for the World Conference, is offering attractive discounts on travel from all cities served by either airline, plus a special \$25 fare for a stopover in Orlando to visit Disney World/Epcot Center if you wish.

A ten-day collecting trip to Guatemala will be conducted by Kurt Meyer of Bromelifolia Nursery. Collecting is planned for three different bromeliad zones: a dry thorn forest, the cool, wet cloud forest, and a warm, humid tropical rain-

forest. On May 19, the day before the Conference opens, there will be an all-day trip to Everglades National Park led by our noted naturalist, Roger Hammer. Details of other collecting trips, travel discounts, and tours will be sent to registrants as soon as they are available.

Local garden tours will have a new concept, being conducted on a round robin basis, with continuous shuttle bus service. If you would like to stay for a little longer at one spot you can do so—just catch the next bus. For a small additional charge you may also visit beautiful Parrot Jungle or Fairchild Tropical Garden.

If you are driving to Miami, you will want to visit many of the friendly Floridians whose collections will be open for our post-conference tours, including Selby Gardens in Sarasota, where your conference badge will give you free admission.

Hotel Inter-Continental, located on Biscayne Bay, will be the hub of all conference activities. Visit Miami's outstanding new shopping and restaurant center, Bayside. Enjoy seeing many thousands of bromeliads in the show, in exhibits, and offered for sale. Attend the banquet, rare plant auction, seminars, and local garden tours. Come and join us, May 20—May 22, 1988 for MIAMI MAGIC, the ultimate bromeliad experience.

Registrar:

Elaine Mills, 9735 SW 138 Street, Miami, FL 33176 (305) 235-3036

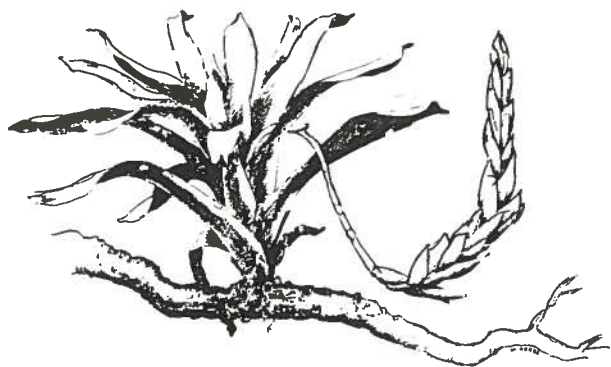
Hotel reservations:

Hotel Inter-Continental 100 Chopin Plaza, Miami, FL 33131 (305) 577-1000

Out of state toll free: 1-800-327-3005, Florida toll tree: 1-800-332-4246

For other information:

Bromeliad Society of South Florida, 13075 SW 60 Avenue, Miami, FL 33156



Bromeliads of the Chapada Diamantina National Park

[cont. from page 6]

This plant has extremely variable leaf dimensions and shows variation in the coloration of the primary and floral bracts at anthesis. We observed small groups, each with its own peculiar characteristics, flowering simultaneously side by side. But, in spite of this mosaic of local variation, a study initiated by Gustavo Martinelli makes possible the classification of one distinct and well defined local variety. While the base of the leaves and bracts of the typical *O. burle-marxii* is pink to dark red, this new bromeliad has these same leaves and bracts covered with a very dense layer of white scales with well defined limits in contrast with the red or green color of the other parts of the leaves (fig. 4). This trait makes it distinct and easy to identify throughout its range. Also occurring through the Diamond Highlands, although in less abundance, are *O. humile* L.B. Smith, growing in small clumps in humid and shaded rock crevices, and a species closely related to *O. amoenum* (Ule) L.B. Smith.

One of the fine rarities of the Highlands is *Vriesea lancifolia* (Baker) L.B. Smith, which has already been reported in some detail in the *Journal*.⁶ This species is sparsely distributed throughout the region, growing on bare rock. Another representative of the genus is *V. atra* Mez, a more common species which also grows on the bare rock surface (front cover).

Near the city of Mucugê we observed an interesting species of *Vriesea*, although it has not yet been identified precisely. The ligulate leaves grow about 16 inches in height and have a purplish cast. They form a neat rosette. The flower spike is simple and green-yellow with distichous flowers. The most striking aspect of its appearance, however, is the size of the spike which extends about four and one-half feet above the leaf rosette in distinct disproportion to the plant itself. We believe that this plant, which grows as individual specimens, is perhaps *V. bituminosa* var. *minor* L.B. Smith although there are still important questions to be answered before it will be possible to identify it accurately.

Some interesting bromeliad discoveries have been made in the dryer region of the Highlands, more towards the interior or western, semiarid part of Bahia where a chaparral-like vegetation called "caatinga" dominates. Most notable are *Orthophytum lemei* Pereira & Penna and *Bromelia gurkeniana* var. *funchiana* Pereira & Leme.⁷ The latter would seem at first glance to be hardly a bromeliad at all. Its leaves are up to 32 inches long and less than one-half inch wide at the base, narrowing gradually to the tip which is subulate. The leaf bases show a bulb-like form which remains almost buried in the stony soil of its favored habitat. The plant is difficult to distinguish among the brush, since its leaves blend in with the rest of the vegetation. The inflorescence is not very ostentatious, barely rising above the leaf sheaths. A typical variety of *B. gurkeniana*,⁸ which occurs much to the north in the state of Pará (Amazon Region), has highly connate sepals and white petals; the var. *funchiana* has free sepals and violet-tinted petals.

Also of interest in this same region are populations of *Tillandsia polystachia* (Linnaeus) Linnaeus, with its simple inflorescence, vigorous clumps of *Encholirium hoehneanum* L.B. Smith, as well as the showy *Neoregelia bahiana* (Ule) L.B. Smith forma *bahiana*. Although this last plant mentioned is rather small (about six inches high), it stands out at great distances on the rock surfaces because of its bright red coloring. In other parts of the Diamond Highlands, *N. bahiana* forma *viridis* (L.B. Smith) L.B. Smith totally dominates, being found in small local groupings.

For many years, the Diamond Highlands have suffered greatly from human abuses, principally the local habit of unlimited and uncontrolled burning. As if that were not bad enough, the area is also regularly frequented by collectors and commercial plant gatherers who do systematic sweeps looking for the rare and valuable species endemic to these mountains. This selective and intensive collecting has contributed to the decline of these local populations and, even, to their local disappearance. The plants most affected are the orchids, especially *Laelia sincorana* and *Cattleya elongata*. We must also mention, to complete this sad picture of abuse, the problem of poaching and the persistence of small "sourdough" mining operations which use erosive techniques to wash the few remaining precious stones from the hills.

There is, nevertheless, a ray of hope in all of this. On September 17, 1985, the Brazilian government created the Chapada Diamantina National Park. The new park will help preserve about 900 square miles of beautiful mountains, valleys, waterfalls, and clean mountain rivers, as well as a vast treasure of rare and endemic plants. It will be a true genetic bank in the open air, as we have tried to show through this simple example of the bromeliads.

While the park was designed to help preserve these rare and interesting ecosystems, the park administration cannot yet guarantee the integrity of most of the land under its jurisdiction because of a series of economic and social factors. But, since there now exists at least the legal framework, perhaps the tide will begin to turn against those who treat the natural heritage of such places as if they were some kind of huge supermarket where you can just pick up whatever you like without having to pay when going out. These unscrupulous people do not pay. The bill, unfortunately, will be presented in the near future to the next generations if these abuses cannot be brought under control.

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NOTES:

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Questions & Answers

Conducted by Bob Heer and Tom Montgomery

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. During a recent tour of a nursery that raises bedding plants commercially several references were made to something called "bottom heat." What is it and what is its purpose? Do people use this in growing bromeliads?

A. It has been a long time since I have seen the system, and new and better ways may have come into use since then, but this is the way it used to be set up. A six- to eight-inch deep sandbox was placed on a bench. About two inches of sand was laid in and smoothed. Next, a long heating coil (sometimes encased in copper tubing) was snaked back and forth from side to side until the length was covered with undulations about three to four inches apart. The coil was then covered with another three to four inches of sand, smoothed and tamped before being thoroughly dampened. After the electric coil was turned on it took a couple of days to produce a nice, even heat of about 70° F over the entire sand bed. Then, seedlings or cuttings were placed on top of the sand with the pots packed as tightly as possible. Something about the warmth at the bottom stimulates the root development, and consequently growth, as nothing else seems to do. Of course, a regular feeding and watering program is maintained. Have you ever bought bedding plants and noticed the roots coming out of the bottom of the pots? Bottom heat seems to draw them down and no other method of growing seems to do as well, not a warm house, or any combination of nutrients.

As to the use of this method of growing bromeliad seedlings or stimulating the root growth of offsets, I have not found any reference in the *Cumulative Index to the Bulletin and Journal of the Bromeliad Society*, nor do I recall ever having seen this method used by commercial bromeliad growers. It would seem, from observing the growth of bedding plants so treated, that six to nine months could be taken from the time required to mature bromeliad seedlings. Perhaps someone will write and let us know if this has been tried on bromeliad seedlings and whether or not it was successful. In many areas, offsets removed after the onset of cool weather do not seem to root well or grow much until spring. Perhaps the use of bottom heat is the answer to this problem. Maybe it is not cost effective for commercial use. We would welcome any comments on this subject (*in care of the editor*).

Q. What is the purpose of using rocks or other ingredients to make an all nonnutritive medium for growing bromeliads?


- A. Control. If a single word sums this answer up it is surely control. The first requirement of a growing medium is that it provide stability. Bromeliads simply do not seem to do well if not secure. Using a pea gravel, lava rock and the like as a major part of the medium or as a topping will usually be effective in creating this stability.

The second most important function of the mix for epiphytes, and to a lesser degree for terrestrials, is quick drainage to allow air to reach the roots. The free flow of gases around the viable roots seems to be quite important to their continued health. Unless the material is too fine, most inorganic materials contribute to root circulation because of their irregular shape. When using perlite or vermiculite in the mix, never pack, but simply shake, tap, and then water until firm.

The third is moisture retention. You can vary the mix to create a very dry or a very moist condition. The use of pea gravel will result in very quick drying. Lava rock, with its rough surface, dries more slowly. Perlite and vermiculite add a sponge-like quality thus, according to the proportion added, extending the drying time to a considerable extent. Unless these spongy ingredients are packed, or if they are too fine, they can hold only so much water before swelling and becoming mushy or soggy. From this standpoint the plants can be grossly overwatered without serious damage. This is the reason why some commercial growers, who depend on employees to water, use this kind of mix.

One inorganic material I believe should not be used is the so-called plastic peanut. Many growers use this in the bottom of the pots to insure good drainage. In doing so the pot is more likely to be top heavy, and a better home for slugs has never been found.

Finally, you can maintain exact regulation of the nutrients received through the roots. If you choose no nutrients, that is what you will have; all sustenance must be foliar in origin. Low nitrogen, high potassium and phosphorus are easily achieved through the soluble fertilizer chosen. High nitrogen for quick growth of seedlings or terrestrials uses the same method, only a change in fertilizer. It is interesting to note that most inorganic material has a surface rough enough to support the bacteria colonies so necessary for the conversion of some nutrients into a form that can be absorbed and utilized by the plant. Lacking that kind of surface, the fertilizer would be completely wasted and it would simply wash through the pot. It has also been found that growing in this manner, the fertilizer should be very weak and applied often for best results.

Some question has been raised concerning the free fluoride found in vermiculite. It seems that bromeliads are not fluoride-sensitive and no adverse results can be observed from the use of this material. 

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The ballots were counted by five members of the Bromeliad Society of Central Florida under the supervision of the vote tally chairman at a meeting held on 20 September 1987.

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RECOMMENDED NEW BOOKS. *Tillandsia*, by Paul T. Isley III. Botanical Press, P.O. Box 5592, Gardena, CA. \$50.00 + \$2.50 freight U.S., \$4.50 overseas. Dr. Rauh's statement (*Journal* Nov.-Dec. 1987) that the book is "directed toward the amateur" should not be interpreted as meaning that it is for beginners only. We hope for a more detailed review with illustrations soon.

Garden Plants of the Tropics (Venezuela), by Francisco Oliva-Esteva. Order from Mrs. Jeffrey Andrews, 159A Grant St., Framingham, MA 01701. Introduction by Dr. Julian A. Steyermark. A fine compilation of tropical plant (including bromeliad) descriptions and pictures. Reviewed in *Journal* Nov.-Dec. 1987. Mrs. Andrews has notified us that the correct price is \$50.00 postpaid.

A Review of *Cryptanthus bromelioides* var. *tricolor*

J. G. Baker in his *Handbook of the Bromeliaceae*, published in 1889, listed *Cryptanthus bromelioides* and attributed the authorship to Otto and Dietrich, 1836. He noted that this species was "introduced into cultivation by Sello in 1831," and that it was "scarcely more than a variety of *C. undulatus* [now *C. sinuosus*]. Of this also there is a form with reddish brown leaves." As a matter of incidental interest, the *Handbook* listed only 12 *cryptanthus* species.

In 1953 Mulford Foster described *Cryptanthus bromelioides* var. *tricolor* in the *Bromeliad Society Bulletin* 3:30; 1953 as follows:

Cryptanthus bromelioides var. *tricolor* M.B. Foster var. nov. A var. *bromelioides* foliis rubro albo virideque longitudinaliter pictis differt. Cultivated in Orlando, Florida. M.B. Foster No. 2832 (Type in U.S. National Herbarium).

This new variety of *Cryptanthus bromelioides* is a dramatic departure in color variation from the many interesting species in this genus in that the three colors of white, rose, and green are in longitudinal streaks in the leaf and shows a very marked contrast to the bronzy-green and red of the typical *Cryptanthus bromelioides*.

This new variety is delicately colored with purer, clearer colors than most of the other species in the genus and the colors range from pure white to cream; from delicate to dark pink; and light to dark green, reminding one somewhat of a highly colored *Dracaena*.

While this new variety has been grown for the past ten years by the author, but very few plants have ever produced flowers. The caudex or stem may grow to be one to two three feet in length unless the plant is cut in pieces and re-rooted. This habit of growth is quite rare in the Bromeliaceae, and particularly in *Cryptanthus* species, as most of them mature in one to two years, producing a flowering head and then sending out offshoots from the base of nearly every leaf.

The typical species *Cryptanthus bromelioides* has been sold commercially under the unlawful name of *Cryptanthus terminalis* both in Europe and the United States for a number of years.

Fig. 17

Cryptanthus bromelioides var. *tricolor* from M.B. Foster's original photograph.



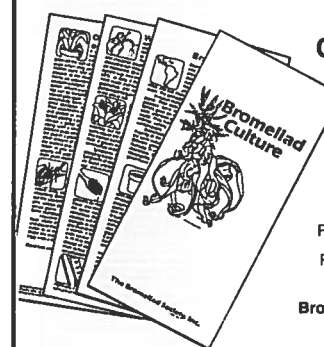
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Luiz Claudio Marigo

An *Orthophytum* species closely related to *Orthophytum amoenum* (Ule) L.B. Smith found in the Chapada Diamantina National Park, Brazil. Please see pages 3-6, 33-34 for discussion and more pictures of the bromeliads of the park.

Calendar of Shows

May 20-22 World Bromeliad Conference, "Miami Magic." Host: The Bromeliad Society of South Florida. Descriptive article with addresses is on pages 31-32. Advertisement on page 41.