



# Montgomery Botanical NEWS

Advancing research, conservation, and education through scientific plant collections.

Fall/Winter 2007

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## COLLECTING PALMS *in the* ARIPO SAVANNAS SCIENTIFIC RESERVE

Trinidad and Tobago is an island nation at a biogeographic crossroads. As the Caribbean's southernmost islands and seven miles from Venezuela, the flora is influenced by South American and Caribbean phyto geography. This is seen in its palms. *Coccothrinax*, a prominent genus of the Caribbean, has its southernmost distribution in Trinidad. Trinidad is also the only Antillean site of many more typically South American palms such as *Attalea maripa*, *Manicaria saccifera*, and *Oenocarpus bataua*. Therefore, those are crucial for biogeographic study.

The South Florida Palm Society generously funded the 2007 Montgomery Botanical Center Trinidad and Tobago Expedition. In April 2007, Dr. Larry Noblick and I traveled to Trinidad. Working with Dr. Paul and Mrs. Yasmin Comeau of The National Herbarium of Trinidad and Tobago, we collected in the Nariva Swamp, Radix Point, the Northern Range, St. Patrick's County, the mountains above St. Augustine, The Central Tobago Forest Reserve, and Bloody Bay.

### THE SCIENTIFIC RESERVE

One area we collected was the Aripo Savannas Scientific Reserve. The Reserve encompasses a number of open grass and sedge savannas, surrounded by marsh forest habitat. The broken, sandy prairies host the interesting, prehistoric-looking *Lycopodium* and the insectivorous *Drosera* plants. After obtaining a Trinidad and Tobago Forestry Division permit, we scouted and collected palms in the Aripo Savannas on April 4, 5, and 6, 2007. Trinidad and Tobago's dry season made fieldwork much easier.

Dr. Paul Comeau and Victor Quesnel guided us on April 4th, after fieldwork elsewhere that day. We located *Bactris campestris*, *Oenocarpus bataua*, *Euterpe precatoria*, and *Manicaria saccifera* before dusk. Most prominent in the preserve are magnificent stands of the Moriche Palm, *Mauritia flexuosa*.



Dr. Noblick measures a specimen of *Manicaria saccifera* in the marsh forest.

### COLLECTING THE PALMS

The morning of April 5th, Larry, Paul, and I made contact with Edmund Charles, the supervising forester. Edmund's extensive knowledge was invaluable. We located individuals of Moriche Palm with abundant fresh fruits and collected many for MBC's conservation collections.

Edmund then led us to *Manicaria* and *Euterpe* plants with ripe fruits. Edmund and Paul, busy men both, returned to the Forest Division Office, while Larry and I collected the *Manicaria saccifera*. This palm is abundant in the marsh forests of the Reserve and we obtained seed, specimens, and data.

*Manicaria saccifera* is a true curiosity. The great, broad leaves emerge entire and are dissected irregularly by wind and rain as they age; the peduncular bract is notable for being soft and fibrously reticulate, like a delicate sock woven of coconut fiber; and the seeds within are the so-called "sea coconuts" which float long distances to wash up on the beaches of Florida and elsewhere.

To collect the *Euterpe precatoria*, Larry needed his peia, a climbing device of Brazilian design. We hiked back to our

(continued on page 3)

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To advance science, education, conservation and horticultural knowledge of tropical plants, emphasizing palms and cycads, Montgomery Botanical Center collects seeds from wild plant populations around the world and grows the resulting plants in population-based, documented, scientific collections, for use by botanists, scientists, and educators, in a 120-acre botanical garden exemplifying excellent design.

Montgomery Botanical Center (originally The Montgomery Foundation) is a tax-exempt, nonprofit institution established by Nell Montgomery Jennings in memory of her husband, Colonel Robert H. Montgomery, and his love of palms and cycads.

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Masthead photo of *Veitchia arecina*  
(formerly *V. montgomeryana*)  
by Harvey Bernstein

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F r o m t h e  
**Executive Director**



Montgomery Botanical has seen quite an exciting year thus far.

In March, we had the great opportunity to host the South Florida Palm Society for their Spring Sale and Show — palm enthusiasts, growers, and experts came together at MBC for a great event. The MBC team and I met lots of great people during the Sale and Show, and we enjoyed showcasing the plant collections for which we enthusiastically care. Dr. Larry Noblick helped judge the best palms grown in south Florida and he reports that this was quite competitive! I thank each of you who participated and visited for this special weekend.

The South Florida Palm Society reports the sale was their best in many years, raising significant funds for conservation and research. The SFPS generously supported our fieldwork in Trinidad and Tobago, and I detail part of that work herein. SFPS and MBC share a natural partnership, with deep common interests.

In addition to Trinidad and Tobago, we have also added important conservation material from Guam, Martinique, Panama, and St. Lucia this year. Montgomery Botanical's ongoing work with palms and cycads is critical for conservation and research, but we also value the aesthetic benefits of these living gems. In this newsletter, contributions from Joe Hibbard and Chad Husby interpret botanical beauty at large and small scales. Michael Calonje details important new cycad plantings, and our colleagues from The Institute for Ethnomedicine report on their work using MBC cycad collections.

Live palm and cycad collections are critical for conservation, research, and education, and are aesthetically compelling — these unique treasures remain the undiluted focus of Montgomery Botanical Center. The team and I look forward to sharing them with you.

*Pictured: Dr. Griffith afield in northern Trinidad.*



vehicle, dropped off the specimens, and returned with the peia. The *Euterpe* was just the right conformation for climbing, and Larry, very professionally, obtained specimens and seed in spite of the biting ants which attacked him 12 meters above ground.

Completing this task, we then sought a suitable specimen of *Mauritia flexuosa* to collect. The Moriche Palm does not



A stand of *Mauritia flexuosa* at the edge of the open savanna

develop adult leaf form until the plants are quite tall and most adults had thick trunks, hindering or prohibiting climbing. In addition, Larry had had some uncomfortable encounters with wasps nested in the Moriche foliage on previous collecting attempts and did not wish to repeat the experience. We hiked back without Moriche as the sun dipped below the horizon.

On April 6th, we returned for Moriche. Having scouted these plants for two days, we had a new plan. En route, we selected an eight-meter length of bamboo from a riverbank and hiked this in. Finding the shortest adult Moriche Palm, we then field-improvised a pole saw.

This tool was the least wieldy imaginable — Larry and I struggled for several exhausting minutes of maneuvering as the blade flexed about at the end of the long, heavy cane.

Finally, the blade lay correctly, and with one stroke we felled (and dodged) a huge *Mauritia* leaf. For the necessary duplicate, we repeated the ordeal.

#### PALM CONSERVATION IN ACTION

Palms are the big game of the plant collector. With massive leaves, giant inflorescences, heavy seed — structures held far overhead — they out scale the conventional tools of the botanist, *and* challenge the herbarium cabinet.

We located 21 of 22 native palm species in Trinidad and Tobago, and we were able to collect seeds of 14 species over the three-week period. We collected 14 voucher specimens and 69 seed collections, for a total of 4,884 seeds.



Collaborators Edmund Charles, Larry Noblick, and Paul Comeau (lower right frame) cross the savanna.

Generous funding from the South Florida Palm Society and the significant help and support from the botanical and forestry community in Trinidad and Tobago enabled the success of Montgomery Botanical Center's expedition. Associations developed through this project will lead to further collaborative achievements for all.

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## Montgomery Botanical Receives Grant for Conservation Study

Montgomery Botanical Center was awarded an International Palm Society Endowment Fund Grant. The funding will be used to study the genetics of palm conservation collections. Collaborating on this study are Dr. M. Patrick Griffith of Montgomery Botanical Center, Dr. Javier Francisco-Ortega of Florida International University, and Dr. Carl E. Lewis of Fairchild Tropical Botanic Garden.

# BEAUTY THAT WORKS

Designing the landscape at Montgomery Botanical Center (MBC) involves several dimensions, and success is measured by the degree to which these dimensions can be satisfied simultaneously without compromising each other. The dimensions include horticulture, function, and aesthetics.

The design of a given area may begin with consideration of any one of those factors, but for the design to be well considered, all three must be objectively

Montgomery Botanical, we are particularly fortunate to have a wealth of resident horticultural and plant science knowledge plus years of site-specific experience with the soils, exposures, utility locations, and special conditions at the property. The team approach, which involves tapping MBC's collective experience, is a way of exposing the complexity of a design problem from the outset and revealing limitations and "fatal flaws" of a design decision before it goes too far. Montgomery Botanical's aesthetic goals of simplicity, beautiful vistas, working with the natural features of the site, and celebrating the rich variety of tropical plant forms are achieved only when balanced with an equally powerful commitment to making the plan work at a practical level over the long term.



*Hyphaene*, always a visually strong element, is a species for which spacing standards have been adopted to facilitate reasonable maintenance access. Horticulturally, it is very reliable on the Montgomery property as long as it is granted full sun.

balanced. It is a common pitfall in landscape design to start with an aesthetic idea — "Wouldn't these *Chamaedorea* look stunning silhouetted against the Guesthouse walls!" — and insist upon its implementation without fully examining horticultural and functional conditions that could argue against it. The case of the *Chamaedoreas* at MBC's Guesthouse is a real example of an aesthetic idea for which there was originally great enthusiasm, but which was ultimately rejected after considering functional maintenance — the *Chamaedorea* require regular spraying with a copper solution that will stain the wall.

In another case we were not so foresighted. Years ago, we incorrectly assumed that *Veitchia winin* would be an aesthetic winner in the synoptic cycad beds near Nell's House. That decision, driven by desire for the splendid visual harmony of the cycad and *Veitchia* leaves, proved to be so unworkable from a maintenance perspective (hundreds of germinating *Veitchia* seedlings in the mulch; and delicate cycads bombarded by self-shedding fronds from above) that the *Veitchias* had to be removed. Thus, the decision-making process we call landscape design is a balancing act involving emotion-based aesthetic ideas and experience-based reason.

The process of shaping a balance among horticultural, functional, and aesthetic factors is significantly enhanced by using a team approach to design. At



MBC is experimenting with ground covers that are neat in appearance and also reduce weed trimmer use around tree trunks.

When things go well, the lessons learned are perhaps more subtle than the harsher lessons of rampant seedlings or self-shedding fronds. However, the result is a landscape that feels like it "belongs", in which beauty, function, and horticulture work hand in hand.

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# *Spira Mirabilis* ~ SPIRAL FORM in CYCADS

Patterns abound in the plant kingdom, both in the shapes of plant parts (leaves, stems, flowers, *et al.*) and in how these parts are arranged. Some of these patterns exhibit remarkable mathematical



Circinate vernation of leaf axis in *Bowenia serrulata* at MBC.

exactness. For example, the arrangements of plant organs (*e.g.*, cone scales and leaves) can produce striking spiral patterns related to the Golden Section and Fibonacci Sequence (please see MBC's Fall 2006 newsletter).

The elegant spirals formed by the unfurling leaves of ferns and some cycads constitute another striking expression of mathematical beauty in plants. These spirals closely approximate the "equiangular spiral" long admired by geometers.

A key property of an equiangular spiral is that a line drawn from the

spiral center intersects each curve at the same angle. The shape of such a spiral remains the same as the length of the curve increases or decreases (*i.e.*, as it "grows") and, hence, this type of spiral is often called a "growth spiral". The Swiss mathematician, Jacob Bernoulli (1654-1705), was so impressed by the remarkable properties of this spiral that he called it *Spira Mirabilis*, "Miraculous Spiral". Bernoulli had the *Spira Mirabilis* inscribed on his tombstone along with the words "*Eadem mutata resurgo*" ("I shall arise the same, though changed"), referring to the remarkable persistence of this spiral in the face of attempts to mathematically transform it.

The most familiar manifestation of the equiangular spiral in the plant kingdom is the characteristic unfurling pattern of developing fern leaves, called "circinate vernation" (*i.e.*, "coiled unfolding"). Circinate vernation is also found in the developing leaves of other plant groups, most notably in some cycads and a few flowering plants (*e.g.*, carnivorous plants in the genus *Drosera*). Cycads are the only gymnosperms that exhibit circinate vernation and this is one of the characters that leads botanists to place the cycads in an intermediate position on the tree of life between more ancient plant groups (*e.g.*, ferns) and more recent plant groups (*e.g.*, conifers and angiosperms).

Among cycads, only the genera *Cycas* and *Bowenia* exhibit circinate vernation. In *Cycas*, the leaflets are strikingly circinate and clearly follow equiangular spirals reminiscent of the spirals of unfolding fern leaves. In ferns, the vernations of both the main axis and leaflets are circinate, whereas in

*Cycas* only the leaflet vernation is circinate and the axis vernation is erect. In *Bowenia*, the main leaf axis vernation is circinate but the leaflet vernation is flat.

The equiangular spiral appears not only in plant form, but also in the shapes of many mollusk shells, such as



Circinate vernation of *Cycas tansachana* leaflets at Montgomery Botanical.

the shell of the Chambered Nautilus. This type of spiral even appears in the curvature of tiger claws! Thus, the *Spira Mirabilis*, like the Golden Section, is a remarkable example of the beautiful and strikingly precise mathematical patterns that appear in living forms.

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# Developing Our Collections

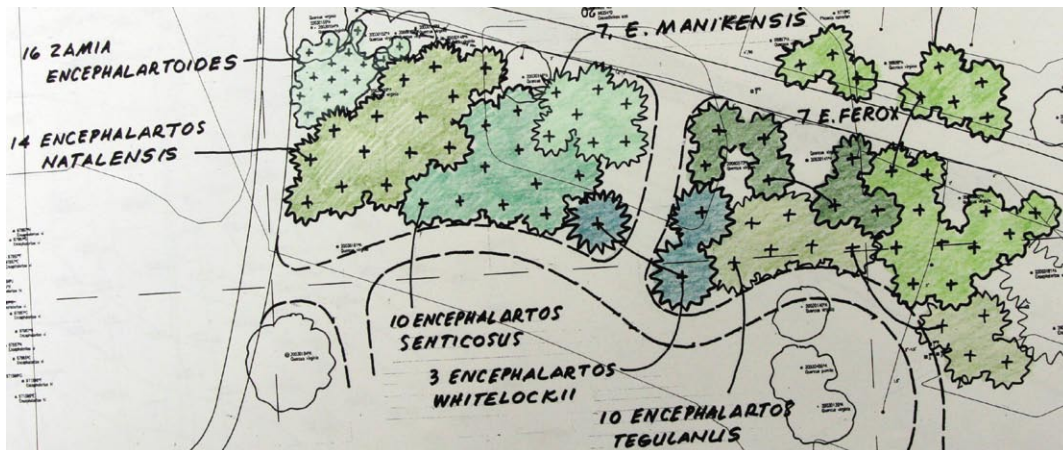
## NEW HABITAT for MONTGOMERY'S CYCAD COLLECTIONS

This year, a major expansion of Montgomery Botanical Center's (MBC) Cycad Ecological Collection took shape with the planting of new beds for cycads from dry, sunny areas such as deserts and savannahs. This area, known as the Cycad Savannah, includes a number of species of *Encephalartos*, as well as a few members of other genera with similar requirements such as *Zamia encephalartoides*.

An important part of this year's plantings were 55 plants of ten different species of *Macrozamia* collected in Australia. This represents the culmination of years of careful study and

measured for the novel design. Analysis of those data in 2006 suggested the experimental beds had much improved drainage profiles and, therefore, increased likelihood of supporting difficult *Macrozamia* collections.\* At the time of this writing, all plants planted in the test bed and test pits are healthy.

After years of planning and a collaborative process involving careful coordination among many MBC team members, advisers, and supporters, this year's Cycad Savannah plantings took less than a week! Where once there was only grass, there are now two beautifully designed cycad



Detail of 2007 Planting Plan for Montgomery Botanical's Cycad Savannah, Sasaki Associates, Inc.

planning. These plants previously had a very low survival rate in south Florida collections because of the region's high summer rainfall. Generous funding from Eileen and Loyd Kelly allowed MBC to explore design and technical strategies for growing these collections during 2003 and 2004. With project funding from The Stanley Smith Horticultural Trust, The Cycad Society, the Central Florida Palm & Cycad Society, and Dr. Tim Gregory, the project team designed and built a raised bed of coarse sand and ceramic engineered for excellent drainage and mulched with granite, as well as a set of similarly-built test pits.

Data collection (via tensiometers and thermometers) was a key component of the project; drainage and temperature were

beds, one carefully constructed *Macrozamia* experiment, and 154 cycads planted. So far, a total of 298 cycads have been added to Montgomery Botanical Center's research and conservation collection this planting season.

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\*A detailed report is available on MBC's website via this address:  
[http://www.montgomerybotanical.org/media/MBC\\_CSAV\\_Report.pdf](http://www.montgomerybotanical.org/media/MBC_CSAV_Report.pdf)

In addition to the cycads planted this year, the Montgomery Botanical Center team also planted 204 palms representing 24 taxa and 19 genera. One palm — *Hyphaene petersiana*, from Zimbabwe — was relocated on the property. And, for the first time, *Veillonina alba*, from New Caledonia, was planted at Montgomery Botanical Center.



**E**thanol has the world's attention. Rising fuel prices and scarcity of oil are driving new thinking about future energy sources. What does this mean for Montgomery Botanical Center's conservation work?

Rising demand for plant-based fuels is raising the price of corn and sugar cane. That motivates widened agriculture, especially in the tropics and subtropics. The acreage needed for fuel production is over and above that already needed for food production. The rate of habitat clearing for agriculture is already quite high — new demand can only increase that rate.

The conservation mission of Montgomery Botanical Center has never been more important. Many palm and cycad populations have already been lost to

habitat reduction. Several species are now extinct in the wild — cultivating those species at MBC is crucial to their survival.

Your support helps ensure that these populations will last for future generations to study. Please consider partnering with Montgomery Botanical Center to advance the conservation and research of these important plants. MBC is a tax-exempt 501(c)(3) not-for-profit institution, and contributions are deductible to the extent allowed by law. Please contact me directly at any time for more information.

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**Steve Chickillo**, with his experience and long-standing interest in cycads, was promoted to assistant cycad curator. Steve started at MBC as a volunteer before working with MBC's grounds team. Now, his efforts are focused on cycads and, with the cycad team, he's helping keep this challenging collection in great shape.

**Stella Cuestas** has been promoted to the position of cycad curator. Stella's long history with MBC's cycad collection made her most deserving of this promotion. She has been with Montgomery Botanical since 2000. Stella studied biology, chemistry, and marine biology, graduating from the University of Bogotá.

**Sandra Rigotti-Santos** has been promoted to collections supervisor. Sandra received a degree of agricultural engineer and a master's degree in agroecosystems from the Universidade Federal de Santa Catarina, Brazil. She also developed research protocols as a visiting scholar at Michigan State University. Sandra has been raising MBC's documentation standards and was a natural choice for promotion to this position.

**Arantza Strader** was promoted to collections database supervisor. Arantza has been a vigilant administrator of MBC's collections database for the past five years; this promotion was well earned. Arantza holds a B.S. degree and is a former volunteer at Fairchild Tropical Botanic Garden's research center.

**Ericka Witcher** has moved from the position of assistant curator to collections specialist at MBC. Ericka has a B.A. in ecology and a B.S. in plant and microbial biology, both from UC Berkeley. While with the National Park and Forest Service, she worked with plant population data collection, GIS mapping, and restoration. That experience and her demonstrated skill as an arborist made her the right choice for this position.

## CYCAD SEEDS: A LINK TO HUMAN DISEASE IN GUAM?

**D**oes the consumption of cycad seed flour cause serious disease? Investigators found that large doses of an unusual amino acid found in cycad seeds — BMAA — causes acute neurological symptoms in primates. However, other researchers reported the free amino acid is effectively removed when the Chamorro people of Guam wash cycad flour in water.

At the Institute for Ethnomedicine, the proteins in washed cycad flour were hydrolyzed and a 50- to 100-fold increase in total BMAA was found. It is now known there are multiple inputs of BMAA into the Chamorro diet, including protein-bound BMAA in cycad flour and that absorbed by animals foraging on cycad seeds.

But, the link between BMAA and disease is far from proven, and other candidate cycad toxins are being investigated. Many more interesting questions remain, which will be difficult to answer

since *Cycas micronesica* populations in Guam have been decimated by the Asian cycad scale insect. Therefore, the well-accessioned *Cycas micronesica* collections at Montgomery Botanical are even more crucial for exploring basic questions about cycad biology.

We are grateful to the outstanding team

at Montgomery Botanical Center who carefully curate these living collections and make them available to the entire scientific research community.

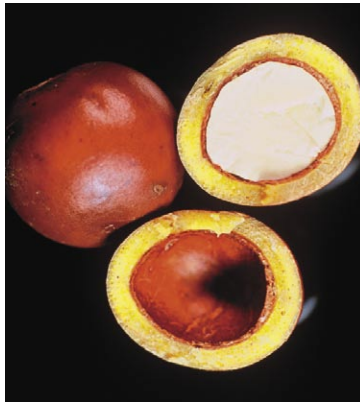


Photo ©2007 Sandra Banack, Patti Stewart, and Paul Cox

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## FROM THE MONTGOMERY ARCHIVE

**P**ictured, Dr. David Fairchild, Dr. Liberty Hyde Bailey, and Col. Robert Montgomery at the Montgomery Estate (*circa* 1949) on the occasion of Liberty Hyde Bailey's birthday. Born in 1858, Bailey would have been 91.

Bailey was a prolific writer, known for the widely used, "*Hortus Third: A Concise Dictionary of Cultivated Plants in North America*". With his daughter, he compiled the original version of *Hortus*, *circa* 1930.

Bailey also traveled extensively as a plant collector. (He, too, went on expedition to Trinidad to collect palms — in 1921.) He spent his 90th birthday collecting palms in the West Indies. Liberty Hyde Bailey died in 1954 at the age of 96.

Montgomery Botanical Center's spirit of collaboration is evidenced even in this early photo. The three institutions for which these men are named — Fairchild Tropical Botanic Garden, the L.H. Bailey Hortorium at Cornell University, and Montgomery Botanical Center — exist in that same collaborative spirit today.

