



PRINCIPES

Journal of The Palm Society

January, 1979
Vol. 23, No. 1

THE PALM SOCIETY

A nonprofit corporation engaged in the study of palms and the dissemination of information about them. The Palm Society is international in scope with world-wide membership. All persons interested in palms are eligible for membership, and the formation of regional or local chapters affiliated with The Palm Society is encouraged. Please address all inquiries regarding membership or information about the society to the Executive Secretary.

PRESIDENT: Mr. Donn W. Carlsmith, P. O. Box 686, Hilo, Hawaii 96720.

VICE PRESIDENT: Mr. Paul A. Drummond, 9540 Old Cutler Road, Miami, Florida 33156.

SECRETARY: Mrs. Pauleen Sullivan, 3616 Mound Avenue, Ventura, California 93003.

EXECUTIVE SECRETARY: Mrs. Theodore C. Buhler, 1320 S. Venetian Way, Miami, Florida 33139.

TREASURER: Mrs. Ruth Shatz, 5901 Maggiore St., Coral Gables, Florida 33146.

DIRECTORS: 1976-80: Mr. Donn W. Carlsmith, Hawaii; Dr. John Dransfield, England; Mr. Paul A. Drummond, Florida; Mr. Myron Kinnach, California; Mr. Melvin W. Sneed, Florida; Mrs. Pauleen Sullivan, California; Mr. Ralph Velez, California. 1978-82: Dr. Byron Besse, Florida; Mr. Ernie Chew, California; Dr. Ian Daly, Australia; Mr. DeArmand Hull, Florida; Mr. Warren Dolby, California; Mr. Dial Dunkin, Texas; Dr. Harold E. Moore, Jr., New York; Mrs. Ruth Shatz, Florida; Dr. Merrill Wilcox, Florida.

ADVISORY COUNCIL: Mr. Nat J. De Leon, Florida; Dr. Walter H. Hodge, New York; Mr. Eugene D. Kitzke, Wisconsin; Mr. Dent Smith, Florida; Dr. U. A. Young, Florida.

PRINCIPES

JOURNAL OF THE PALM SOCIETY

EDITOR: Harold E. Moore, Jr., 467 Mann Library, Ithaca, N.Y. 14853.

ASSOCIATE EDITORS: Dr. John Dransfield, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, England. Dr. Natalie W. Uhl, 467 Mann Library, Ithaca, N.Y. 14853.

EDITORIAL BOARD: Walter H. Hodge, Eugene D. Kitzke, Nixon Smiley, Dent Smith, P. Barry Tomlinson.

Manuscript for PRINCIPES, including legends for figures and photographs, must be typed double-spaced on one side of 8½ × 11 bond paper and addressed to the Editor for receipt not later than 90 days before date of publication. Authors of one page or more of print will receive six copies of the issue in which their article appears. Additional copies of reprints can be furnished only at cost and by advance arrangement.

Contents for January

More Palms than Pyramids: Egypt Has a Garden in the Nile	
Melvin W. Sneed	3
An Amateur's Adventures With Palms	
Thomas C. Kelly	13
Notes on the Foraging Behavior of a Leaf-cutting Ant on <i>Oenocarpus bacaba</i> in the Northwest Amazon of Colombia	
Michael J. Balick	26
Live Storage of Palm Pollen	
Robert W. Read	33
Regular Features	
Palm Literature	12
Classified	25
Palm Research	32
Pollen Exchange	35
News of the Society	36
Palm Society Bookstore	41
Letters	43

Cover Picture

A species of *Licuala* adorns a protected portion of the Fairchild Tropical Garden. Photograph by M. V. Parthasarathy.

PRINCIPES

JOURNAL OF THE PALM SOCIETY

(ISSN 0032-8480)

An illustrated quarterly devoted to information about palms and published in January, April, July and October by The Palm Society, Inc.

Subscription price is \$7.00 per year to libraries and institutions. Membership dues of \$12.50 per year include a subscription to the Journal. Single copies are \$1.50 each. The business office is located at **1320 S. Venetian Way, Miami, Florida 33139**. Changes of address, undeliverable copies, orders for subscriptions, and membership dues are to be sent to the business office.

Second class postage paid at Miami, Florida and at additional mailing offices.

Mailed at Lawrence, Kansas
March 26, 1979

More Palms than Pyramids: Egypt Has a Garden in the Nile

MELVIN W. SNEED

8107 S.W. 72nd Avenue, 113E, Miami, Florida 33143

It was 2:30 A.M., 19 August, 1977, when our flight from Malta, which had been delayed, hit the runway in Cairo. Departing earlier from Miami, we had revisited Kew Gardens, then flew on to Malta to see some of our family and friends there, thence to Cairo to satisfy a longtime curiosity. The archaeological attractiveness of Egypt notwithstanding, we also wanted to see its palms, the progenitors of which antedate the tombs and pyramids.

Recovery of our modest traveling gear, and processing, in the unbelievable confusion of the Cairo air terminal, plus finding reliable transportation were time consuming, and we registered in the Nile Hilton downtown about 4:30 A.M., but not before a discussion at the desk regarding the validity of our advance reservation.

We were in our room, and travel-weary, when an unmistakable buzz zoomed in. It sounded exactly like the fly that had greeted us earlier in the Cairo terminal. This nemesis had accompanied us on into the hotel; it never left us in Egypt!

Later that day we contacted acquaintances whose helpfulness was indispensable to our exploration of Cairo and environs. The three Great Pyramids and Sphinx abut the edge of the desert, across the Nile in Giza about ten miles from Cairo, and are partially visible from the upper floors of the hotel. There are no palms at the immediate site. To us, the Sphinx was rather surprising. Instead

of the gigantic, half-human, half-lion eminence usually portrayed in traditional photographs, it is relatively small and could be obscured by a few clusters of *Phoenix dactylifera*, if grown there.

The Nile is Egypt, and very little vegetation is found beyond irrigated reaches of the river. Egypt's almost 400,000 square miles embrace an area larger than Texas and Oklahoma combined, but less than five percent of it (along the river all the way from Abu Simbel to Alexandria) is in cultivation; the rest of it is the Sahara. There is virtually no rain. Cairo gets less than one inch annually! After living and traveling in the tropics for over a decade, in warm, moist air, we had difficulty adjusting to a hot and very dry intake.

So we weren't expecting to find any tropical rain forests or palms, which thrive in such environment. In fact there are no forests of any kind in Egypt, although going along we saw individual trees, clumps, and larger cultivations of *Phoenix* (mostly *dactylifera*) that seemed to defy the idea that a forest couldn't exist in Egypt (see Fig. 1). Of course, all the palms were near the reaches of the river.

Next day, we cabbed across the Nile again to the 70-acre Orman Botanic Garden in Giza, adjoining the Cairo University, where we called at the headquarters and were not only welcomed but given expert assistance in viewing the garden. Our arrival had been expected, thanks to arrangements that had been



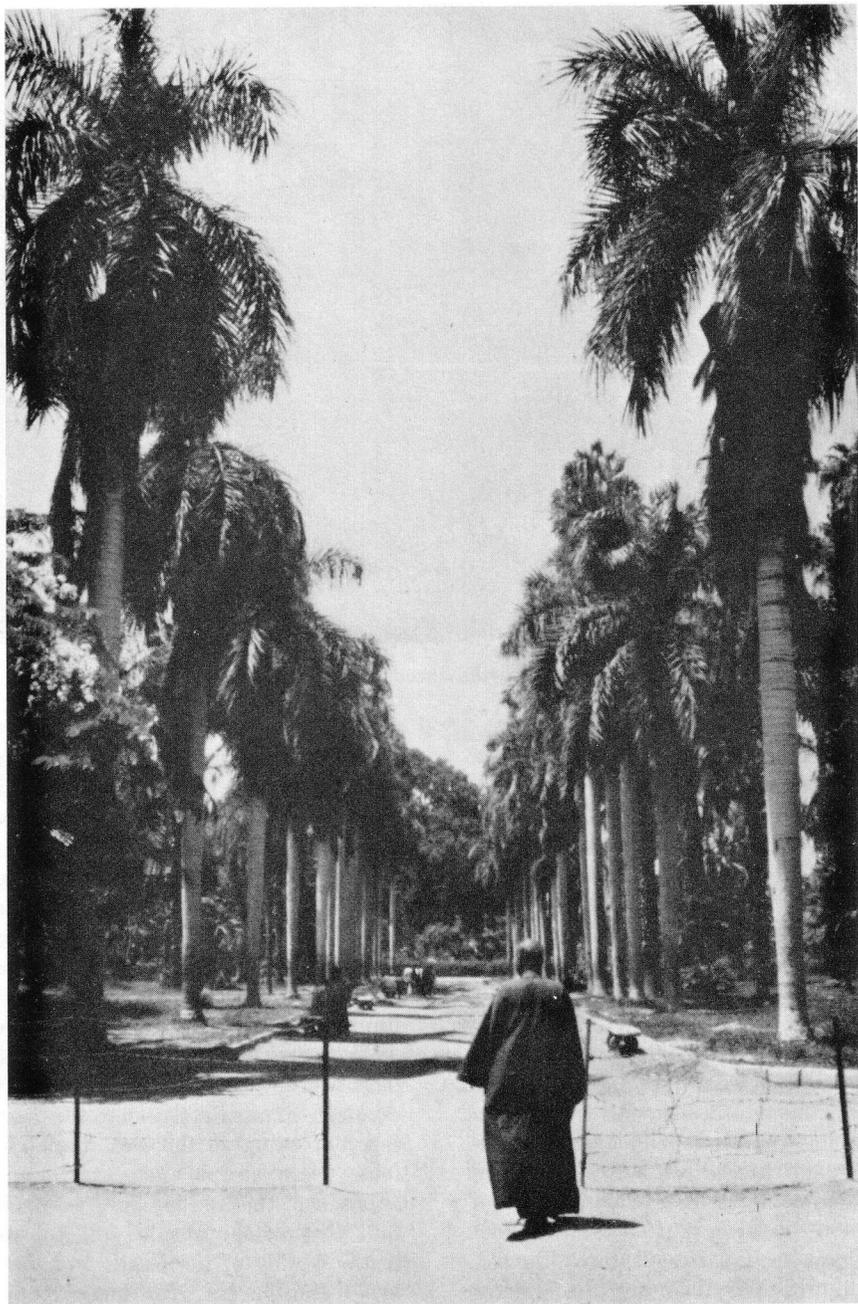
1. Dates galore! *Phoenix dactylifera* in Alexandria.

made by Professor Vivi Täckholm, of the University, with whom we had corresponded. Her works have been fundamental; her contributions and her interest in palms are treasured by members of The Palm Society (see *Flora of Egypt*, Vol. II, Bulletin of the Faculty of Science, No. 28, Cairo, 1950).

Unfortunately, Professor Täckholm had to be away from Egypt at the time of our visit, but Mr. Hosny Kamel, Director of the Herbarium, guided us on a tour of the Garden. There is a fine royal palm avenue (Fig. 2) as well as *Phoenix canariensis*, *Erythea*, *Washingtonia*, *Ptychosperma elegans*, *Lantania*, and others (see Fig. 3). Returning to the Herbarium, we were given some coveted seeds, particularly *Hyphaene thebaica*, which we hoped could be established back in Florida, particularly in Fairchild Tropical Garden, where apparently this species has failed after earlier attempts.

We left our very helpful friends at the garden headquarters to go across a busy intersection and on through turnstiles into the zoological garden, nearby. Despite the paucity of beasts, which we weren't looking for, anyway, the zoo is a "must" for plant lovers. One part of it houses nurseries that supply the botanical gardens, as well as some of the government's landscaping operations. Many palms are cultivated in the nursery, and we toured all the plots under the expert guidance of Mr. Mohamed Farid Allam, the nursery's agricultural engineer.

The zoological garden seemed to contain as many palms as the botanic garden and many of them looked healthier. Going along a walkway we passed a very black, burnt trunk in a row of *Phoenix*. What happened? Our escort explained, "Birds nest in the crowns of these trees. Snakes go up the trees looking for the birds and their eggs. We set fire to the



2. Section of the royal palm avenue in Orman Botanic Garden, Giza.



3. Mr. Hosny Kamel, Phyllis Sneed, and Palms, Orman Garden.

trunks, burning the dead leaf bases, to get rid of the snakes!"

Unlike many avid palm-seed collectors, gardeners and date pickers don't like to take chances. Dates ripen in Egypt in August and September, the time of our visit, and various methods are used, including gun shots into the crowns, to make date harvesting a less hazardous occupation.

A day's trip to Alexandria, about 135 miles north of Cairo, brought us to the Mediterranean seacoast, with rows of resort hotels reminiscent of Miami Beach, and greater humidity. We visited local parks, saw streets lined with palms, and toured the botanic garden there, which for Egypt has a fair collection (Fig. 4). Also in this area we saw the greatest concentration of commercially grown date trees. The fruit clusters, full and heavy in the tree tops, often were encased in bags.

Back in Cairo we made arrangements

to fly up the Nile to Luxor and Aswan, where (besides the monuments, tombs, and temples) we hoped to see *Hyphaene thebaica*, which is indigenous there, and a place in the Nile called "Plant Island."

Circumventing some of the perpetual chaos in the Cairo air terminal, we took a domestic flight on Egypt Air Lines to Luxor, a trip of an hour and a half with impressive views of the Nile and desert expanse. Upon arrival, our two small bags were whisked away and we were escorted immediately onto an ancient ferry crossing to the west bank of the Nile. Here, steeped in perspiration and exposed to the midday sun, we explored the "City of the Dead," and the tombs in the Valley of the Kings and the Valley of the Queens. Nothing we can say here would enhance the antique grandeur of this west bank region. Its environs, and beyond, are desert. There are few living palms to be seen, but one concerned enough about their early exis-



4. Typical view in botanic garden, Alexandria.

tence might find rewards in the diligent study of carvings and paintings in the tombs.

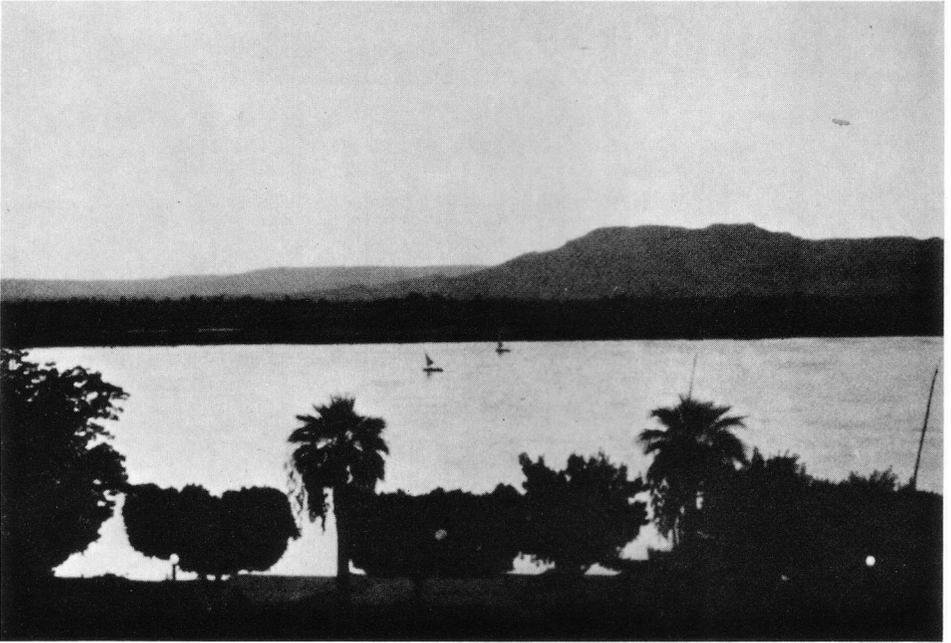
In late afternoon, back across the river, we relaxed in the old Winter Palace Hotel, after a considerable climb up very grand staircases. (The elevator was not in service.) We adored the view of the Nile there, where the cloudless sunset silhouetted palms and river craft and reflected the vast desert expanse beyond the west bank (Fig. 5).

Early next day we departed the hotel for visits to Temples of Luxor and Karnak, a magnificent and awesome group. One could walk the relatively short distance but it's far more interesting to be transported by the traditional horse-carriage, which not only allows one to proceed at a higher elevation, for better visibility, but also imparts the feeling of stepping back into history. Notwithstanding our regrettable lack of Arabic, we managed to stall the procession long

enough for the author to capture the grandeur of it all, which was enhanced by a fine, small group of *Phoenix* in the background (Fig. 6). Such clusters of *Phoenix* were typical of the landscape in the Luxor area, as well as other places visited in Egypt, all of which were close to the Nile.

Egypt Airlines, with an efficient jet flight, took us on to Aswan. The short trip was spectacular, following the Nile, where one can see fertile lands stretching inland from the river wherever irrigated waters flow, and absolutely barren desert abutting the stream where irrigation has not intervened. We registered in the New Cataract Hotel, which we enjoyed even though we were there in August and the place is geared for winter months.

We were privileged to visit the High Dam and some of its precincts, which mean so much to the economy of Egypt. Perhaps it was too much to expect that the landscapers would have made more



5. Sunset on the Nile, Luxor.



6. *Phoenix*, Phyllis and friends near Karnak temples, Luxor.



7. *Hyphaene thebaica* fronts small island near Aswan.

use of palms when decorating the new open areas—especially palms that could survive there with some of the abundance of water available in the enormous reaches of Lake Nasser, above the dam.

This brings us to the heart of our quest in Egypt, which, of course, was neither pyramids, tombs, nor temples. We were looking for palms, and we had seen thousands of them all the way from Alexandria in the North to Aswan in the South. True, Egypt, dry as it is, furnishes no haven for palm species that thrive only in the wet tropics. For some time, however, we had heard mention of a "Plant Island" somewhere in the Nile, near Aswan. We had scant information about it and wanted to see it.

After returning from the dam trip, and a luncheon respite at the New Cataract, we went down steeply tiered steps from the hotel to the river to embark on a felucca for a look at relics, etc., on small islands that dot the Nile just below the old (low) dam. We were not deeply concerned with much of this excursion so made arrangements with our captain to maneuver us on over to "Plant Island."

How they sail these crafts against the wind, or without any wind and against the currents of the Nile, will remain a



8. *Hyphaene thebaica* and *Roystonea* tangle, Plant Island in the Nile at Aswan.

mystery to us. As a crow might fly, the distance from the hotel couldn't be over a half mile, but that sail boat went in all directions, several times, around other little rock islands, back and forth, darting before wind gusts and being oared or poled when wind died down. After what seemed a very long time we arrived at the dock on Plant Island, albeit in late afternoon.

This tiny piece of land in the middle of the Nile at Aswan is boat-shaped, and perhaps one-fourth mile long by 500 feet wide. Irrigation hoses, the size of fire hoses, were stretched along the walkways. The soil appeared fertile. The tendency now, in tourist information, if not official recognition, is to call the place the "Botanical Garden." It also has been called "Kitchener Island," as well as other names. It might well be regarded as a miracle island, for in a



9. *Phyllis* furnishes scale for *Corypha*, Plant Island, Aswan.

land so devoid of rainfall, who would expect to find such a pleasant garden with an interesting collection of plants, even in the Nile?

Phyllis and I had been looking for seeds of *Hyphaene*, especially *H. thebaica*, which is indigenous in the Aswan area. As noted earlier, some seeds had been acquired at the Orman Garden in Giza and that was all we were able to obtain. We had no success in collecting more of them in the Aswan area. There was a nice specimen—not with ripe fruit—on the point of a very small island in the river near “Plant Island” (Fig. 7). *Hyphaene thebaica* was on “Plant Island” too, but it was hard to photograph because of competition given it by close-growing *Roystonea* which were part of a walkway of royal palms that bisected the entire island (Fig. 8).

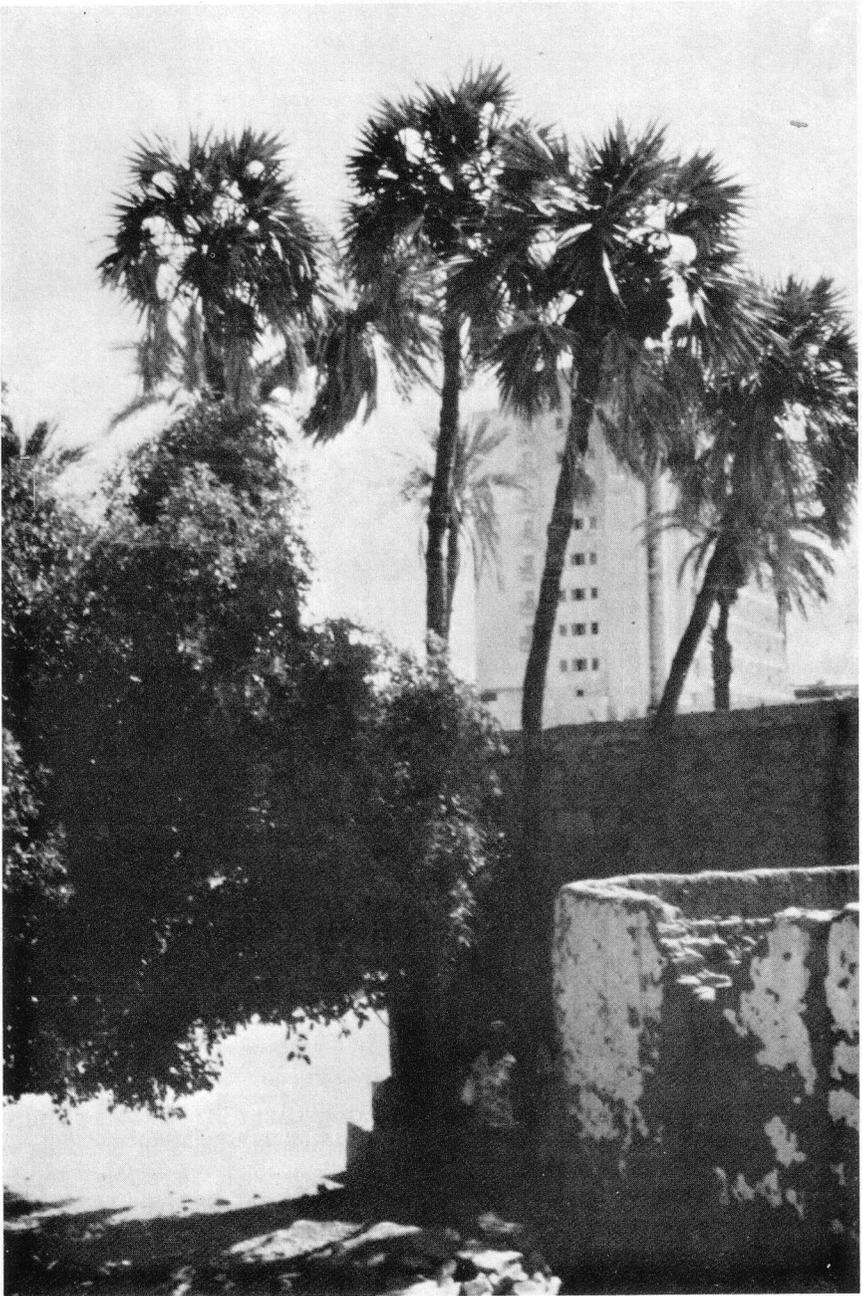
Professor Täckholm advised us that

Plant Island originally belonged to Field-Marshal Viscount Kitchener of Khartoum, who came to Egypt in 1911, when he succeeded Sir Eldon Gorst as British diplomatic agent. The island was generally known as Kitchener’s Island and planted with “palms, bananas, oleanders, pomegranates and roses.” Later it was taken over by the Egyptian Government and has evolved into a small botanic garden. Interestingly enough, according to Professor Täckholm, the island is the only place in Egypt where the coconut palm succeeded and produced fruits, the first of which were presented to the king.

Unfortunately, as we often have found elsewhere during our palm travels, no catalogue of plants was available to help find and identify Plant Island’s flora, nor was anyone in attendance whom we might question. For such a small garden, located where it is, the diversity was surprising. Palms dominated the collection, including the central walkway of *Roystonea*. We only saw three *Hyphaene thebaica*, but other species of *Hyphaene* lined the west side of the garden at the edge of the steep bank some 20 feet above the Nile. *Phoenix* species were there, of course, and we saw attractive clumps and specimens of *Rhapis*, *Attalea*, *Chamaerops*, *Borassus flabellifer*, *Raphia*, *Latania*, *Caryota*, and *Sabal palmetto* from Florida! There was a towering *Corypha umbraculifera* which dwarfed Phyllis at its base as the sun began casting shadows (Fig. 9). The garden had *Livistona*, *Ptychosperma elegans*, *Thrinax*, *Calamus* species, and other palms that we didn’t identify and record.

We left Plant Island, reluctantly, but the sun sets quickly and the captain of our felucca was becoming impatient. Boarding the boat we reached the hotel’s docks just as the sun disappeared behind sand dunes across the Nile.

Within walking distance of our lodg-



10. *Hyphaene* in fruit, near New Cataract Hotel, Aswan.



11. The author indulges in his conception of ideal seed collecting. These *Phoenix dactylifera* fruits were easy to reach and tasty besides!

ings we found *Hyphaene* loaded with fruit (see Fig. 10) but after collecting a few of them, with the help of a climber, we discovered their immaturity and abandoned our quest for viable seeds. However, a young *Phoenix dactylifera* was more than obliging, furnishing not

only easily accessible collecting but a delicious taste-treat as well (Fig. 11).

This ended our palm hunt in Egypt. We flew back to Cairo, then on to Miami via Paris, where, interestingly enough, we saw more palms (in Jardin des Plantes and at Versailles) than follies!

PALM LITERATURE

HARRIES, HUGH C. 1977. Sixteenth-century dissemination of the coconut palm. *Isis* 68: 605-606.

———. Cape Verde region 1499 to 1549); the key to coconut culture in the Western Hemisphere? *Turrialba* 27: 227-231, fig. 1.

These two papers are concerned with the early history of the coconut in Africa and its introduction into the Western Hemisphere excluding the Pacific coast.

KLOTZ, LARRY H. 1978. Form of the perforation plates in the wide vessels of metaxylem in palms. *Journal of the Arnold Arboretum* 59: 105-128, fig. 1-43, table 1-2.

The results of a survey of the form of perforation plates in the metaxylem of palms is summarized. The nature of plates is compared and contrasted in petiole, stem, and root among the taxonomic and ecological groups of palms.

Principes, 23(1), 1979, pp. 13-25

An Amateur's Adventures With Palms

THOMAS C. KELLY

10712 Kennerly Road, St. Louis, MO 63128

Prologue

The sun sinks slowly into the west, illuminating the fan leaves of a magnificent 23-foot *Sabal palmetto* with a golden glow and filtering through the graceful fronds of a pair of *Arecastrum romanoffianum* to highlight two *Washingtonia robusta* with their pineapple trunks. Stately *Roystonea elata* on the left and right rise in perfect columns from enlarged bases, their fronds casting a tropical shadow on the ground. If you glance to the right, you see several banana plants and a small *Pandanus utilis*, while a glance to the left reveals orange, yellow, and red *Hibiscus* and a few multicolored crotons. To the left of these, several anthuriums flower and a few *Spathiphyllum* peek from behind a large stone fountain and waterfall, surrounded by pink and white petunias and some gardenias.

Behind two imposing *Sabal palmetto* about 20 feet high, between two grass huts, is one of three *Ptychosperma elegans*. Nearby, a couple of *Phoenix canariensis* proudly rise from the ground, not yet towering giants, but on their way to being so, and a little to the right a specimen of *Latania lontaroides* unfolds a magnificent leaf eight feet wide. Somewhat removed, several birds-of-paradise are about to unfold their unusual orange flowers, and a calypso-pink oleander, which blooms continuously, nestles among more crotons and another pair of bananas. South of these are a few spiny *Rhapidophyllum*

hystrix, a little further a large clump of *Chrysalidocarpus lutescens* spreads its many fronds, and small date and fan palms snuggle among other plantings in the garden. More crotons line a rock wall to the west, while nearby a majestic young coconut palm sends a healthy new frond fifteen feet skyward. The fronds sway gently in the breeze and lean toward the water. In the background Polynesian music fills the air, and as the tiki torches are lit, another day comes to an end to the sound of Aloha Oe.

The above description is one of the following: A) Waikiki Beach, Oahu, Hawaii; B) Papeete, Tahiti; C) Banana Shout, Negril, Jamaica; D) Walt Disney World, Polynesian Village; E) St. Louis, Missouri. If you guessed A, B, C, or D consider yourself normal, but wrong. If you guessed E, it must have been a wild guess, but you are right. Have you ever considered longshots in horseracing? Here's the way it all started.

The Adventure

Once upon a time many years ago, I can recall my mother daydreaming of a someday trip to Hawaii, a trip that she hoped for but in more than fifty years had not been close to making. I remember her crying when beautiful Hawaiian melodies were played on the phonograph and I can vaguely recall her reply "It's just so beautiful" to my question why.

I didn't know then, but I do now, what the lure of the islands can do to some people. As years passed and I looked forward to my first real vacation in 1968 I chose to spend a week in Tahiti and then a week in Hawaii. From my grass hut on the ocean, I watched the sun rise and set and wandered among the foliage and realized why I could never again be unmoved by things tropical.

That was the beginning. A few years later, my parents made the long-awaited trip themselves, and I like to think that the pictures I took on my trip helped make them realize the dream of their lifetime. From 1968 through 1976, I visited Walt Disney World several times, the West Coast several times, Hawaii again in 1973, Jamaica in 1975, and I dreamed a lot. An interest and fascination was becoming an obsession. In 1973 I bought a large 14-room estate on four acres in South St. Louis County from a dear friend who, ironically, had given me my first real job in 1959 and who loaned me money in 1965 to go into business for myself.

Previously, I had spent eleven years in apartments, continually moving to larger quarters to store my accumulated collections of Walt Disney comic material and phonograph records. But I had never had a plant—not a flower, tree, or green thing in my life. Then suddenly I found myself in the near "country" with rolling hills and literally acres of greenery. I began to appreciate what flowers and trees could do for a home.

My beginnings as a plant collector in 1974 were not noteworthy. The *Dracaena* I watered to death. The marigolds I didn't water or fertilize. The small palm I put in a sunny window and forgot. But eventually I bought my first two six-foot Alexandra palms in 15-gallon containers, dug an 18-inch hole,

and put them in the ground. Humble as they were, they were striking next to a stone fountain I had built until one day early in October when the season's first frost warning sent me speeding home to excavate my two prizes and wheel them inside to safety, extra dirt and all.

Spring 1976 had me thinking tropical again, spurred by my trip to Jamaica, so as a birthday present from me to me I decided to get a new palm or two. Remembering the \$140.00 that each of my six-foot Alexandras had cost, I decided to go to the source, and locating a plantation in West Palm Beach, I flew there to pick out my specimens. After about two hours of wandering in the planting, I had seen what I wanted—everything. During another trip around the premises I rattled off "one of these" and "two of those" and "one of those over there." I watched as the salesman scribbled his notes, and grimaced as he totalled the bill. I gave him a 25% deposit on a bill that reached about \$1500.00, then found out I needed a 42-foot refrigerated tractor-trailer, at a cost nearly equal to my trees, to get them to St. Louis, so that during my flight back I questioned my sanity more than once.

So impressed was I at the variety and beauty of the many palms on this plantation that I failed to think ahead where they were all going to go once the bedazzlement had subsided. Arriving in St. Louis, I scowled at the oaks, and maples, and firs, and evergreens, wondering why this area was not blessed with the likes of the palm family. Before I knew it, the trees I had bought and arranged for transport to a foreign environment were about to arrive.

It was a scorching 95°F in St. Louis the Friday in July that the truck arrived. I had arranged with a local tree firm to have men on hand to help un-



1. Front of house with royal palms and other tropicals in 1977.

load the truck. They were as surprised as my neighbors when green fronds started to emerge from the truck and trees were lowered to the ground by a tractor. Cars stopped in the street and people stared in disbelief at the sight.

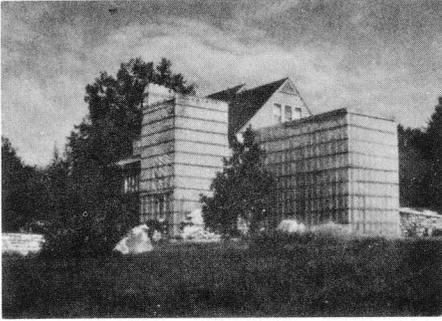
Until this point there had been no preparation. All the trees, balled and burlapped except for *Sabal palmetto*, were unloaded and laid side by side on one area of the lawn. Then I had to decide what went where. For the next three days as I decided, holes were dug, some gravel thrown in the bottom, and a tree placed in the hole and surrounded with a mixture of sand and dirt. (A word of caution at this point. Most of these steps were improper in retrospect and point up the necessity for advance planning for a project of this sort.) The *Sabal* was left until last, due to its size, and therefore was exposed to the hot sun for three days, which affected the root ball no doubt. All the palms were managed by hand except the *Sabal*, which measured about 16 feet, took six of us and the tractor to move, and unfortunately rolled off the tractor bucket so that the root ball hit the pavement. (This is a no-no in palm care.) After it was installed and watered well we drew the support ropes tight and surveyed the situation.

I was now the proud owner in St.

Louis of the following: two 16-foot royal palms, two 16-foot queen palms, one 12-foot *Latania*, one 12-foot *Chrysalidocarpus lutescens*, one 16-foot *Sabal palmetto*, five 6-8-foot *Ptychosperma elegans*, two 9-foot *Washingtonia robusta*, two 3-foot *Phoenix roebelenii*. In addition, I had bought numerous crotons, an orange tree, a large oleander tree, an eight-foot *Parkinsonia*, an eight-foot royal poinciana, and an orchid tree.

Within two weeks the shock was becoming evident. The *Sabal* started losing lower leaves three or four at a time. I kept cutting them off until they were down to three from about 20 when the summer ended. Likewise the *Washingtonia* leaves browned and drooped, and I cut them off. What had been an impressive tree with palmate leaves of green touching the ground in Florida became a chunky pineapple with no leaves except the few at the top just opening. Naturally, being untrained, I thought I was doing something wrong, like underwatering. I compensated by drowning the tree. When the situation failed to improve, I fertilized the tree, then I stopped watering when it still looked bad.

And to make matters worse, at the time I did not even know the correct name for most of the trees, and I also had no reference books. But on the positive side, the two queen palms suffered no shock and continued to look well. The *Latania* also had no shock and kept its four beautiful leaves, each eight feet across. All of the remaining palms except the royals continued growing with no evident shock. The royals experienced browning of lower leaves and of tips on higher leaves, but they did put out new growth, whereas the *Sabal* did not. The poinciana and the *Parkinsonia* lost all foliage but came back, while some crotons lost all leaves,



2. Rear view of house showing both greenhouses. Frank Lloyd Wright would be envious!

some lost none. Notwithstanding all problems, my dream had become as true as I could make it for my first try.

The rest of the summer flew by too quickly. Since I had first started the planting about July 7–10, it left me with fewer than three months enjoyment before winter weather began to set in. Even though plants had some brown leaves and some green leaves, the result was still breathtaking and I savored every moment. I had kidnapped some unwary residents of the land of sunshine and rain and transported them to the Gateway City, with only a minimum of casualties. I had improved the already beautiful landscape that I possessed, adding a bit of the tropics to a stunning view that eliminated all items except trees as far as you could see to the west. I was happy. Of course, my handful of palms, didn't fill up four acres, but it was a start.

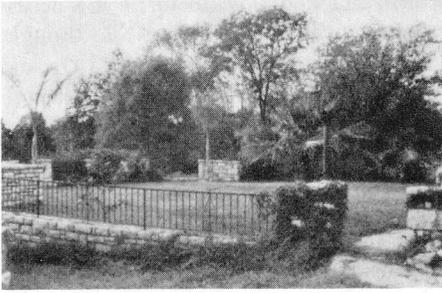
Fall crept up on me very quickly. People started asking silly questions like "What are you going to do with them when it gets cold out?" In early September I inquired of local greenhouses about the availability of storage. Results: nothing. As I looked around for portable greenhouses I saw handy-dandy models up to eight feet, and when I called the local distributor and said I

needed an 18-foot-high greenhouse he failed to impress me with his suggestions.

Build a greenhouse—I had no other choice. So I ordered lumber and built a poor man's Howard Johnson Motor Lodge motel. It took the rest of September to erect and finish a structure 18 feet high by 12 feet wide, by 24 feet long, attached to the house on one end with the opposite end left open until all items were brought inside and then closed in. The structure was all two-by-four construction with the exception of the roof, which was two-by-six. It was totally open on the inside with no cross beams or supports. This framework was covered with a 100-foot by 20-foot roll of clear 6 mil poly sheeting, which is only good for one year when exposed to the elements. This was stapled to the wood inside and out so as to form a 3½-inch air pocket between the two-by-fours. This system proved to be very good in maintaining heat. On top of the slightly sloping roof, 12-foot corrugated fiberglass sheets were placed, caulked, and trimmed with flashing. One-by-two redwood strips were nailed horizontally at 24-inch intervals from top to bottom to stabilize plastic on the outside and dress up the structure architecturally. Result: no prize for art, but it functioned and the cost, excluding a new furnace, was about \$500.00.

A friend installed a gas furnace almost as big as the one in my house for about \$700.00. A lawn sprinkler was installed near the top so it would spray water over the inside, resulting in leaf damage later, as I would find out, but at the time seeming a good idea. Lights were installed and we were ready for the trees. If they could think, I'll bet the palms were wondering, "What am I doing here?"

But they would be saved. The tree company returned and dug up each



3. Rear terrace with *Washingtonia robusta* and *Arecastrum*.

palm, reburlapped the ball, and brought it to the greenhouse. There each was cushioned on a six-to-eight-inch layer of sand, soil, and peat moss. After all were in, more mixture was added to cover all balls up to trunk base. In essence the trees were replanted in the greenhouse. Work was completed when the *Sabal*, saved until last, was placed in the greenhouse with a crane truck. Had I known then it was dead, I would have saved another backbreaking job, but I thought it was still alive at the time. Job completed. Greenhouse closed. First frost warning that night October 4, 1976. Close call, but we made it.

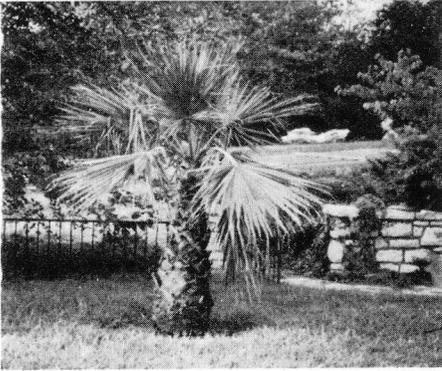
The side of the greenhouse attached to the house had openings on the basement level through sliding glass doors and on the next level up from a dining room porch (also enclosed with plastic and wood). Therefore, from the basement I could walk out into my own illuminated tropical jungle, and from the next level I could look over the tops of the trees. Activating the lawn sprinkler overhead produced a raining effect from below and was nice except that the water was cold (another no-no) and the fact that to keep humidity in the greenhouse (about 50%) it was necessary to make it rain almost daily, which caused spotting and yellowing on numerous leaves after several months. Although none

died from overwatering, the plants would have looked better had I done differently.

About this time I asked a representative of the Missouri Botanical Garden to visit me for helpful hints. The most important suggestion to come from the visit was that of putting palms in containers to avoid constant shock and root damage when moving palms in and out of the greenhouse.

As the winter progressed I kept a close watch on my wards, but all was well and soon I stopped worrying. Then I found out about *PRINCIPES*, subscribed, and bought all back issues. While reading the 1976 issues, I marvelled at the immense effort put into the *Sabal palmetto* series by Dr. Kyle E. Brown of Florida, and though I understood little of it then, I did call Dr. Brown, sent him some photos of my trees, and also questioned him on my *Sabal* problems. Applying his test on the center bud, I tugged and it came out, still damp. Thereby I learned that my *Sabal* had died. I was sad at having uprooted this noble tree only to kill it with errors of care and treatment so far from home. But it was the only casualty, and thanks to the immense help Dr. Brown gave me, I felt I could only go up from here. In other words I had things in the palm of my hand.

Even when temperatures dropped to -13°F it was warm and cheery inside the greenhouse. In fact I had no trouble getting 70° even though it stayed 55° on average. We did have a solid month from late December until late January when the temperature did not rise above freezing here. The pink oleander brightened the greenhouse with color almost all winter, though the royal poinciana left outside died. The orange tree ripened oranges, which I ate, and from the seeds subsequently grew new orange trees. The *Parkinsonia* produced its



4. *Washingtonia robusta* planted in the ground for the winter.

pretty yellow flowers and all the palms were still green. The master has provided. All is well and all has been taken care of. Nothing can go wrong . . . go wrong . . . go wrong . . . go wrong.

It was a March morning early, just barely light, when I awoke to the sound of a strong breeze. I got up and walked to the living room as it started to rain, but by the time I crossed the sliding glass doors the rain became torrents. I walked to the dining room porch and went out. At that moment a gust of wind, and the 16-foot-long, 8-foot-high section enclosing the porch (*not* connected to the main greenhouse) blew in. I caught it, or rather it caught me, and I stood there in my underwear, soaking wet, pushing against 50-mile-per-hour winds for what seemed an eternity, but was only a few minutes. I waited until the first break in the wind, ran downstairs, got my hammer and nails, and replaced the wall as well as possible. I braced it with a couple of boards and it seemed okay. That was only the beginning, for the greenhouse started to sway, and I ended up by chaining it to a column on the porch. I went to work that day extremely worried, but no further problems had occurred by evening. I was in for several more days of high

winds, but had time to make the necessary repairs. For a little while though, I had visions of The Wizard of Oz and saw my giant box kite sailing through the air with me riding a royal palm in my night clothes.

Throughout the winter I could open my sliding basement doors and stroll through the foliage brushing back the fronds with my make-believe machete and looking up in awe at these magnificent trees. By now spring had nearly arrived, and even though we had no freezing temperatures that I can recall after the first part of March, I first opened a little side section for outside air in April. I remembered too late to allow for pollination of my orange tree, so I had no oranges in 1977. The worst was over and all the trees save my *Sabal* were alive and, excuse the term, "kicking," despite the fact that I fertilized them in the early spring, another no-no for palms.

It was time now to look for containers. Locally no luck at all. Through one nursery however, a lead developed and I located 45-, 65-, and 95-gallon containers in black fiberglass from a place called Lou Cans in Hialeah, Florida. I ordered a bunch and they arrived a couple of weeks later. I was getting ready for my best year ever. I could envision all my lovely "children" occupying their respective spots happy and healthy again.

Shortly after May 1, 1977, the big day arrived. I climbed up the ladder and dismantled the far wall, and with some help lowered it and let the sunshine in. Since my greenhouse was clear plastic all around, the plants did get optimum light all winter, were in reasonably good condition, and needed little adjustment when put back outside. The dead *sabal*'s midsection became a permanent post for my little-grass-shack mailbox. At least I can maintain its memory in an attrac-



5. Moving plants into the greenhouse, October 1977.

tive setting for a long time. All in all, the project had not been a total disaster, considering my background.

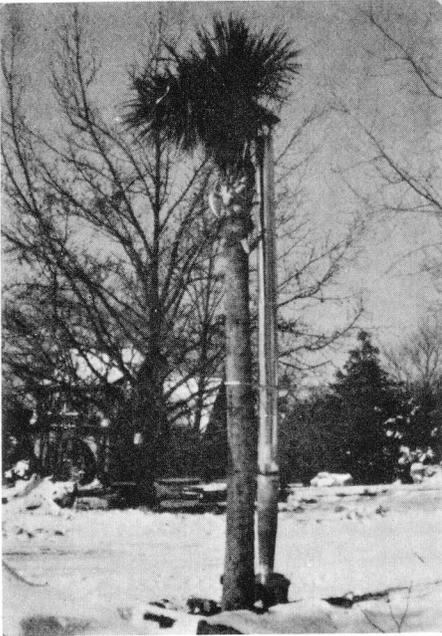
Project 1977 was almost anticlimactic. I decided to plant the two *Washingtonia* permanently in the ground because of their size and the enormous shock they had experienced, using a system I had developed in my mind and on paper to build a sturdy, efficient, yet easily removable protection for them during the winter.

The first step was to provide for bottom heat to keep the roots from freezing. I purchased six heavy-duty underground soil-heating cables made by General Electric and installed them in a circular pattern slightly sloping upwards from a depth of about 16 inches deep to four inches from the surface, whereupon the plug exited to be inserted in a thermostat, in turn plugged into an outdoor electric box installed next to each tree.

Holes were enlarged to 40 inches wide and deep with the lower half filled with good sandy soil mixed with cow manure, peat moss, and an application of Upstart poured over the ball as it was put carefully into the hole. Then the good sandy soil mixture was added and the cable unrolled as we filled the hole, keeping about four to six inches between layers of cable so it would not touch itself accidentally. When this chore was completed, the hole was top-dressed with some white sand mixed with soil to give a "Florida" sand look to the area.

Palms to be put in containers were treated differently. Holes were also enlarged and containers placed in the holes resting on a sling. This was made of $\frac{5}{16}$ -inch chain running through three two-by-fours with holes cut in the center and looped to return through another hole on the other end of the two-by-four, then rejoined at the surface with the original end. The two-by-fours serve merely to keep the chain in place under the container during moving. The two closed and loops of chain were brought to about a foot higher than the surface on both sides and tucked into the top soil layer after the tree and container were in the ground with the soil and mulch covering the top rim of the container so as to look "planted." The chains were therefore not noticeable yet were easy to scoop out later. When plants are to be brought in, a forklift, tractor, or several persons can raise the pot to the surface, attached by a car chain or iron bar between the two loops, for removal to the greenhouse. The system was tested with one of the royals and worked well.

Arecastrum and *Latania* were put in 65-gallon containers, *Phoenix roebelenii* and *Ptychosperma elegans* in 45-gallon pots, and *Roystonea* and *Chrysalidocarpus lutescens* in 95-gallon containers, all in holes enlarged to suit slings and con-

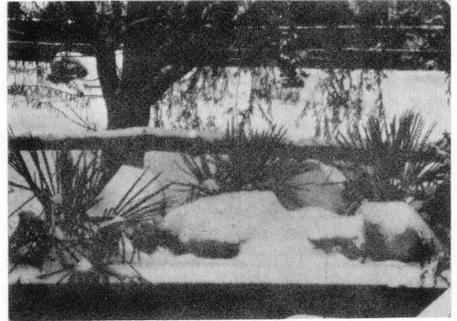


6. *Sabal palmetto* with smudge pot. I did my best, but mother nature wouldn't let me fool her.

tainers. Most recovered nicely and grew well outdoors.

I had had bad luck with one *Roystonea*, which was put aside to recuperate from lack of water occasioned by deflection of "rain" in the greenhouse by the large leaves of the *Latania*, and thus needed another royal to make a pair by the front porch. I therefore decided to order another truckload of palms from Jim Menge of Jacksonville, who had been very helpful over a three-month period of answering my endless questions, correcting my mistakes, and offering constructive criticism in encouraging my quest for Paradise in St. Louis.

After much thought, soul-searching, and consultation, I chose the following for my 1977 order. (I don't know why I said consultation, since I always get what I want first and worry about it later.) The large items were one 16-foot

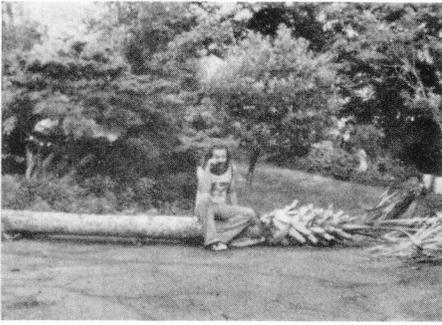


7. *Rhipidophyllum hystrix* in early February, still undamaged.

royal, two 18–24-foot *Sabal palmetto*, one 12-foot Malayan coconut (I knew I'd get one sooner or later), two 8-foot *Phoenix canariensis*, and one 12–14-foot fishtail (*Caryota mitis*). I also got 20–30 smaller items to fill the truck, including several *Butia capitata*, *Rhipidophyllum hystrix*, small *Phoenix canariensis*, *Livistona chinensis*, and several other species, most noteworthy being a splendid *Licuala grandis* which, though still in the greenhouse, is doing very well. In addition I ordered several more crotons, bird-of-paradise, bananas, oleanders, hibiscus, a mango, several large cycads, and a nice six-foot *Trachycarpus fortunei*.

I also arranged for help when the truck arrived, including friends and relatives and men from another nursery—and just as well, for in the shipment from Jim was a 23-foot clump of seven trunks of *Caryota mitis* sent inadvertently in place of the smaller one ordered. Handling that was a real problem: it ultimately ended up in a little cove just inside the gate to the rear terrace between a stone wall and the basement porch where I can build a shelter around it and heat it from the dining room porch.

I wasn't going to be caught being a dummy again so I had two large 60 × 60 × 48-inch holes prepared for the two



8. A sad moment for a palm lover.

Sabal palmetto which, with the large *Phoenix canariensis*, were to be planted permanently like the *Washingtonia*. I had read in *Palms of the World* about the importance of a well prepared hole, so I chose a spot for each directly across the drive from my front porch on each side of a railroad-tie retaining-wall enclosure, which had actually been chosen, planned, and dug in late April, anticipating the arrival of these trees. In late May, holes were dug for all others to be put in the ground except the fishtail and the coconut, which I had chosen to pot and leave above ground. Nineteen holes, each averaging nine to 25 cubic feet, all dug by yours truly by hand with a little help on three of them. I swear I heard Chinese voices on more than one occasion as I peered up from the bottom of one of the larger holes!

When the plants arrived, the two sabals were rolled into their holes and then erected. I say erected, because you don't plant a tree that size, you erect it. As a tractor pushed the trunk up, we secured it three ways with ropes and then installed the underground cables. The holes were filled with good sandy soil with cow manure, sod, wood shavings, grass clippings, topsoil, sand, and peat moss. There was no noticeable shock, and after two and a half months one of the two produced two flower

stalks eventually reaching almost four feet and covered with literally thousands of tiny white flowers. Just imagine, all you non-Florida residents, the thrill of climbing a ladder to the top of your own 19-foot *Sabal palmetto* to watch the insects pollinate flowers in your front yard in St. Louis, Missouri. Words cannot describe the thrill.

The three *Rhapidophyllum hystrix* and four *Serenoa repens* have been permanently installed in good soil but where they can be mulched well, covered when it gets very cold, but not heated. It will be interesting to see how these do in the climate of central Missouri. Other palms were planted in containers for removal to the greenhouse in the winter. An automatic lawn sprinkling system, which I installed in 1976, is ideal for providing regular, steady, and thorough watering essential to good palm growth and I also installed overhead spray nozzles over my front porch to spray the foliage of my royals daily along with the bananas and other water-loving plants in the area. I even have my own rainbow when the mist is on.

The six trees planted permanently are to be sheltered in the winter as follows. All have heating cables in the ground around the root ball, thermostatically controlled: 125-amp service panel was run to a central point, then separate 120- and 240-volt lines were run to a weather-proof box near the base of each tree. All wiring was enclosed in plastic rigid pipe and buried.

A welding company made up 24 plates of steel, which consist of a 5-inch square $\frac{1}{4}$ -inch plate with two 2-inch holes and two 24-inch stainless steel pipes welded below with a smooth clear top. One inch separates the two holes. A post-hole digger will dig a 6-inch-diameter hole 24 inches deep, into which these two 24-inch poles will be placed and the balance filled in with concrete or dirt.



9. The author poses with first large palm ever grown successfully outdoors planted in the ground in St. Louis, Missouri, after the coldest winter on record. Photograph taken on the day when the palm was uncovered in May, 1978.

The top plate will then be flush with the ground. After these are secured, one on each corner of a 10-foot square around each tree, a slightly smaller lightweight metal pole will be slipped into the inner of the two holes on each plate, and on each of the four corners likewise. The length of the pole will be slightly higher than the top of the tree and 24 inches longer than that to slip into the open shaft below the plate on the ground. This will stabilize the pole, yet allow for easy lifting out and replacing on short notice and also will not be noticeable during the spring, summer, and fall months, since it can be removed. The 10-foot-high poles will be simple for four of the six trees. The 20-25-foot poles will be more difficult but not impossible to set. They will need slightly more crossbracing. After the poles are up and cut to the right height, a top frame of $\frac{1}{2}$ -inch reinforcing rod will be made and each end heated and bent down a foot to slip in the open top of each pole. This should be sufficient to keep snow from causing a sag if they crisscross. When this is completed, we go to the next step.

The Griffolyn Company of Texas makes custom plastic bags for use in

many situations. They have a strong, clear material that is fiber-reinforced every inch and will not tear past the next inch if a puncture develops. They make these bags in any size. Whoever heard of a plastic bag $10 \times 10 \times 25$ feet high? They did. One of these bags will slip over the before-mentioned framework. The bottom is open. All other sides are sealed. When this is done, the same process is repeated over; that is, another pole, three inches longer than the previous one is placed in the outer hole on the metal plate, another top frame and another plastic bag three inches higher and six inches wider fits over this second frame.

The purpose is to provide a bag over a bag with a 3-inch air pocket between the two. What this does is neutralize the hot air from inside and the cold air from the outside, resulting in a stable temperature that requires much less heat since it will rise inside the structure and has nowhere to go. Most covers over palms in cold climates fail because of the no-insulation factor. It's more work, but I've a large investment in money and time and I do not intend to lose my trees. This principle worked in my two-by-four greenhouse. I had a $3\frac{1}{2}$ -inch space between two plastic sheets and even though we had temperature to -15°F , my greenhouse stayed warm all winter. The bags will be a little long to allow for some growth and to have a certain amount of slack to set bricks, stones or such on around the bottom, so it can be raised on nice days easily. With a 10×10 foot square area for the trees, there is ample room for a thermostatically controlled heater, one or two fans for circulation, and a large tub of wet gravel or water for humidity. High winds should not be a problem during the three months maximum necessary to protect the trees. Mid-November to mid-February should be the approximate

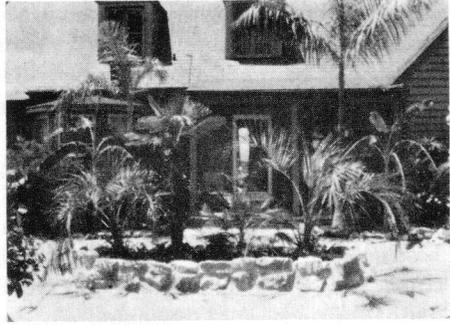
shelter period as the species I've chosen for this experiment are hardy and can take occasional freezes during the remainder of the winter-spring season. By high wind season in March-April-May the trees will be uncovered and on their own for another healthy year.

So as this chapter comes to a close and I recline in my swing under my royal palms, savoring the view, the music, the trees, the atmosphere, imagining myself at a bungalow in some far distant tropical land, I suddenly awaken and realize I've got three weeks before I've got to pack up my whole yard and move it inside. People say, "why don't you just move to Florida?" to which I reply, "It just wouldn't be the same. Down there everyone can live like this. In St. Louis, it's something special that only I can do." But before anyone thinks they can follow my example, I hastily add that between June 1976 and September 1977 this project has cost me many thousands of dollars. All of this because my mother used to cry when she heard the beautiful Hawaiian music. Aloha from St. Louis, Missouri, the new palm capital of the midwest.

Epilogue

As I sit here enjoying the beauty that summer once again bestows on palms and other tropical plants on a 90-degree day in July 1978, it's hard to reflect back to the winter of 1977-78 but I'll try.

First of all, some notes on our winter. This was the *coldest* winter on record in St. Louis (Zone 6) and one of the coldest springs on record. Over 64 inches of snow fell during the winter and there were 71 consecutive days with snow and/or ice on the ground from January 8 through March 20. Average temperatures were 27.5°F maximum, 11.6°F minimum, 19.6°F average for January, 28.1° maximum, 14.1° mini-



10. A new planting to be heated and covered for the winter of 1978-79.

um, 21.1° average for February, and 47° maximum, 28.8° minimum, 37.9° average for March. From January 9 through March 8 we had only nine days when the *high* temperatures rose above freezing, and five of those were a high of 33° or 34°F. The other highs were one each of 35°, 36°, 39°, and 52°F. On February 6, we had a low of -8°F, a high of 14°, and on January 26, a low of -3°, a high of 14°. Wind chill reached -50°F and there were occasional winds up to 50 mph. According to nurserymen locally, some species were killed in St. Louis that had not been killed in 40 years, and our February was the coldest since 1838.

During this winter, four trees were covered with my plastic bag-framework design previously described and all four survived. Two of the four were *Phoenix canariensis* with 18 inches of trunk and a maximum height of seven feet. In one, all fronds and the center spear turned brown shortly after January 4, 1978. Major surgery was performed with all fronds removed and two inches cut into the trunk to find green and the tree cut back to about 16 inches above ground. In the other, all fronds and part of the center spear were killed after low temperatures around January 20. All dead fronds were removed. Dates of damage

are approximate because I couldn't see the trees clearly unless I crawled under the edge of the bag for a periodic check when conditions permitted (snow was often frozen solid around the bag). Both trees are recovering, are a healthy green, and have a height of five feet.

The other two were *Washingtonia robusta*, both with about five feet of trunk and nine feet high overall. One had all fronds and the outer part of the center spear killed about the same time as the *Phoenix canariensis* (January 4). The heater was turned up and full recovery is underway. It now has eleven opened leaves, three of which were damaged in January and were part of the center spear. The other suffered no damage and continued to grow throughout the winter. Not one leaf was killed and it now has 22 fully opened leaves plus the new spear. Naturally I'm proudest of this one.

In the course of the winter, several problems developed that had some bearing on the results. The four upper corners of the plastic bags were worn through by the wind whipping them against the metal reinforcing rods that provided the roof framework. This allowed some loss of heat but can be corrected by inserting a rubber cushion between the two next winter.

Rain and snow also weighed down the plastic roof, but the plastic did not break or tear, and the problem was alleviated by poking several holes in the lowest parts of the roof with a knife so that water and snow melted from the heat inside could drain through the holes and water the tree in the process.

During some warm periods in December before extreme cold weather, temperatures rose to 90° and 100°F inside the bags. I became worried and lowered the heater settings. Thus, when cold weather hit shortly after the first of the year, heater settings were not

high enough in three of the four bags to protect the trees properly. The heater was turned up and even though the coldest weather had yet to come, trees that had lost their green fronds began immediate recovery and continued to grow through the balance of the winter with no further damage. As it turned out, the high temperatures inside the bags during the day when the sun was out were more beneficial than detrimental to the species that were being grown in them.

The bags took quite a beating from the heavy winds, but they held up and for much longer than planned. I kept them on from about November 15 until the second week of May because the trees were growing so well under them. Six months in a plastic bag! At one point, the trees were fully enclosed for a period of over 30 days with no fresh air other than leaks, but the ten-foot-square bag allowed for ample air circulation.

Of other palms, the three needle palms (*Rhapidophyllum hystrix*) were planted in open ground with no protection of any kind except three inches of regular mulch around the bases. They were 30-inch-high plants fresh from southern Florida and probably had never before been exposed to freezing temperatures. They suffered no damage through the first week of February, however. Then some leaf damage was evident and several leaves were heavily damaged by the end of the winter, while others were not. Wind damage during the extreme and extended cold (the ground was frozen practically solid for two months straight) may have contributed to the damage. All three plants did survive without damage to the unopened spears and to a suckering plant on one, and all produced flower stalks in May. Four unprotected *Serenoa repens* and a

Caryota mitis covered with a temporary greenhouse failed to survive, however.

Two *Sabal palmetto* 22 to 24 feet high braved the winter uncovered with fronds tied up and wrapped in burlap with a 20-foot-high smudge pot on its side pumping heat all winter whenever temperatures were below 15°F. By the time I had covered the four small *Phoenix* and *Washingtonia* it was mid-November and I had run out of "steam." Attempts to protect the two *Sabal* with covers were unsuccessful despite the expenditures of over \$600 for scaffolding and \$250 for heating oil. One caught fire from the heater and in seven degrees I was on a ladder with buckets of water to put out the burning burlap, freezing to the ladder with my wet hands. Thank goodness it was late and my neighbors couldn't see me! Despite all this, they retained green fronds for some time and would have made it if I had covered them.

They were cut down in May after the center spear pulled out. I have two new ones, though, and this time I *will* succeed.

So, as I look to the winter of 1978-79, I feel confident I will lose nothing and have put out two new planted areas where trees are in the ground with heating cables and will be covered. These are all reasonably hardy palms and include two 16-foot *Washingtonia robusta*, two 18-foot *Sabal palmetto*, six 3-foot *Sabal minor* in one planter, two 5-foot *Butia capitata*, one *Chamaerops humilis*, and a 6-foot *Trachycarpus fortunei*.

The author is 35 years old, a lifetime resident of St. Louis, single, and maybe just a bit crazy, but if anyone wishes more detailed information or assistance, write to the address given or telephone 314-849-0353 or 314-421-4661.

CLASSIFIED

HAWAIIAN PALMS AND PLANTS. Send stamp for free brochure. Hana Gardenland, P. O. Box 177PS, Hana, HI 96713.

TROPICA—all color Cyclopedia of Exotic Plants by A. B. Graf, D.Sc.; 7,000 photos including 228 of palms, 1,120 pages, price: \$115.00 prepaid if check with order. Send for booklist. ROEHRS COMPANY, Box 125, E. Rutherford, NJ 07073, USA.

WANTED—commercial quantities of fresh palm seed, in particular, *Aiphanes caryotaefolia*. Please send lists or catalogues to Robert Allsopp, Yuka Farm, Tomewin, via Murwillumbah N.S.W. 2484, Australia.

HAWAIIAN PALM SEEDLING COLLECTION. Special for The Palm Society Members. Seedlings with 1-3 leaves out of flats, 10 each of the following: *Chrysalidocarpus lutescens* 'Hawaiiiana,' *Livistona chinensis*, *Pritchardia thurstonii*, *Ptychosperma macarthurii*, *Veitchia merrillii*. Complete collection only \$15.00 plus \$5.00 airmail postage and handling. Many others available. Stamp for list please. Hana Gardenland, P.O. Box 248PS, Hana, HI 96713.

Notes on the Foraging Behavior of a Leaf-cutting Ant on *Oenocarpus bacaba* in the Northwest Amazon of Colombia

MICHAEL J. BALICK

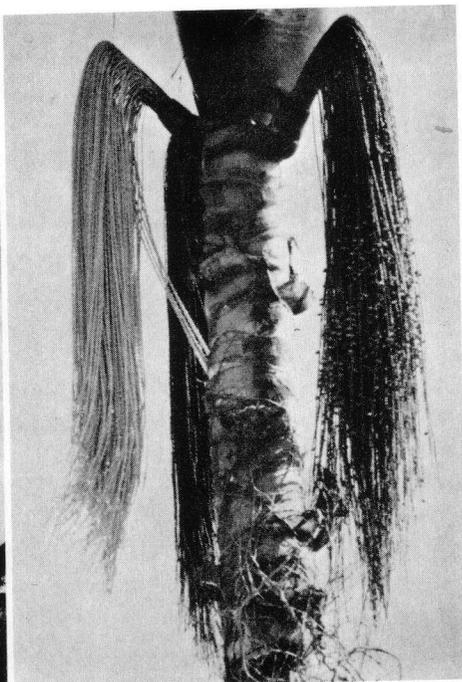
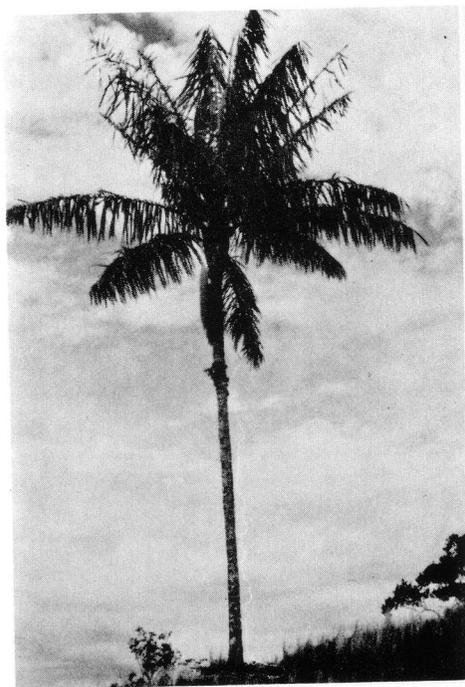
Botanical Museum of Harvard University, Oxford Street, Cambridge, MA 02138

A group of ants whose peculiar foraging behavior is of great concern to agriculturists and horticulturists is found in many areas of the Neotropics and subtropics. These ants, variously known as leaf cutters, gardening ants, or parasol ants, clip sections from the leaves of herbs, shrubs, and trees, and carry these pieces to their nests, where they culture "fungus gardens" upon the leaf residue. According to Weber (1972), of the approximately 10,000 known species of ants, only 180-200 species exhibit this behavior. The most conspicuous by their size, and the best known, are the genera *Acromyrmex* and *Atta*.

Much attention has been devoted to the ants' habit of defoliating plants in forests and cultivated areas. Descriptive accounts of these ants are to be found in many of the early books concerning natural history in the American tropics (Andre, 1904; Barbour, 1945; Bates, 1863; Belt, 1874; Ornton, 1870). Regarding their activity in the Amazon, Ornton (1870) wrote "But the most prominent by their immense numbers are the dreaded saubas (*Atta* sp.). Well beaten paths branch off in every direction through the forest, on which broad columns may be seen marching to and fro, each bearing vertically a circular piece of leaf—unfortunately they prefer

cultivated trees, especially the coffee and orange. . . ."

In contrast to the well-known above-ground activities of these ants, much less is known of their subterranean activities in fungus gardening. At first it was thought that the ants or their young consumed the cut leaves. Thomas Belt, a nineteenth century naturalist, was the first to describe the true purpose of their unique foraging behavior (Belt, 1874) "these ants are so common throughout tropical America, and have excited the attention of nearly every traveller, there still remains much doubt as to the use to which the leaves are put. Some naturalists have supposed that they use them directly as food; others that they roof their underground nests with them. I believe the real use they make of them is as a manure, on which grows a minute species of fungus, on which they feed—that they are, in reality, mushroom growers and eaters. . . ." In a letter to Charles Darwin published in the June 11, 1874, edition of *Nature*, Fritz Muller supported this theory, based on his investigations of the stomach contents of the leaf-cutting ants. There is a close association between the ants and the fungus, in that neither can survive without the other. Each colony cultures only one species of fungus, and the workers



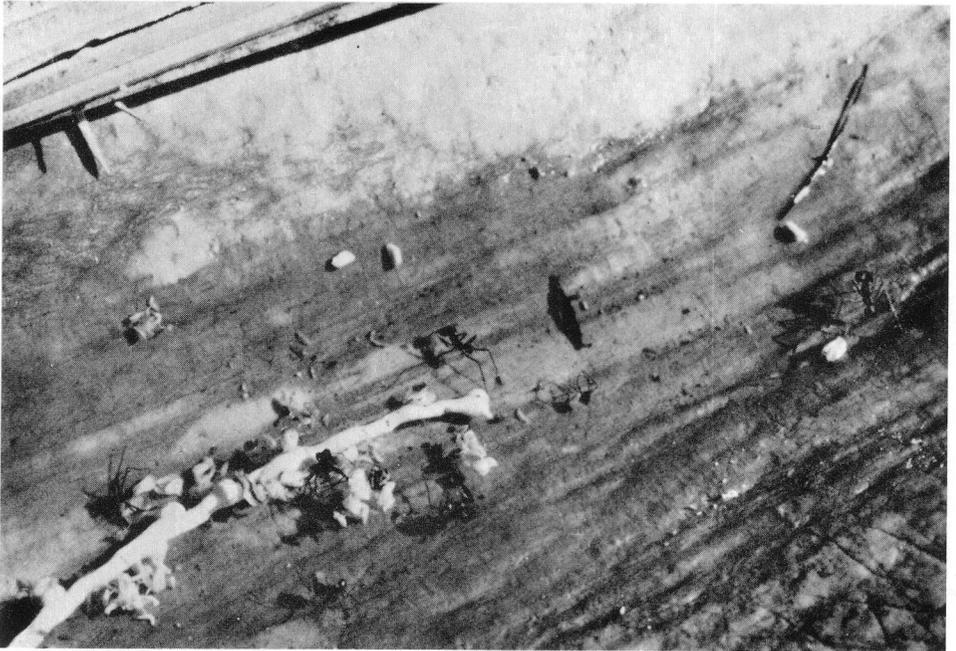
1. *Oenocarpus bacaba* in a grassy field across the Río Vaupés from Mitú, Colombia, an entire tree at left, inflorescences in flower and young fruit at right.

of the colony insure that no other contaminating types of fungus or mold take over.

Leaf-cutting ants are of economic significance throughout their range. They destroy great areas of cultivated plants and grasslands, rendering them useless for agriculture, and the ants actually compete with cattle for food. Weber (1972) notes that ten adult colonies of *Atta capiguara* use the same amount of grass as an entire cow. Many agriculturists from north temperate regions who visit the tropics for the first time and are unfamiliar with the destructive habits of these ants often fail to understand the reasons for the paucity of fruit trees and vegetable crops cultivated by the local people in otherwise lush tropical environments. These northern "experts" often ascribe these cultivation practices to the supposed lethargy of the people,

when in fact the presence or absence of leaf-cutting ants dictates the types of crops that can be grown. Wilson (1971) relates the story of a foreigner living in British Honduras who planted all types of vegetables in his garden against the advice of the local Indians, and who awoke one morning to find his garden completely defoliated, and "Into a hole in the mound [of earth], ants, moving in quickened steps, were carrying bits of our cabbage, tops of the carrots, the beans—in fact our entire garden was going down that hole." These insects play such a visible and important role in the lives of the inhabitants of tropical America, that colloquial folk names have been given to them throughout their range, including *bachaco* (Venezuela), *coqui* (Peru), *isau* (Paraguay), and *sauba* (Brazil).

The economic benefits derived from

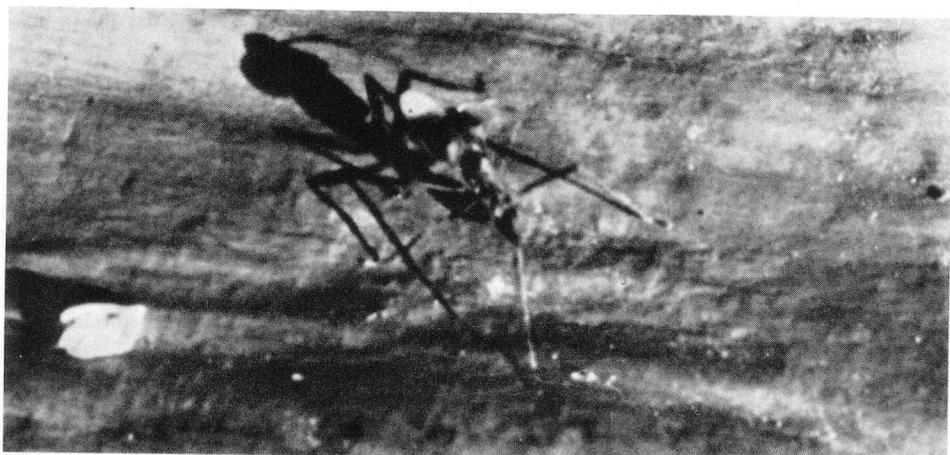


2. Part of an upturned spathe of *Oenocarpus* with live ants at side collecting flowers and a section of rachilla, dead ants, and floating flowers in water.

these ants hardly balances their detrimental activity; the ants (especially queens of the genus *Atta*) are used by native peoples as a food source, and in the United States they are the canned, precooked ants often found in gourmet shops.

I had an opportunity to observe leaf-cutter ants during field studies in the Northwest Amazon of Colombia, on a sunny August day in 1976. The locality was on the Vaupes River, across from the small village of Mitu, the capital of the territory of Vaupes. A single flowering specimen of *Oenocarpus bacaba* Mart. stood in the center of an open grassy field, with an underground nest of *Atta sexdens* L. a few feet from the base of the tree. The flowering spathe of the palm, over one meter in length, had fallen, the flowers had opened, and were surrounded by small black stingless bees (*Meliponidae*), that may possibly

be the pollinators in this species of *Oenocarpus*. After remaining open for an undetermined length of time, the staminate flowers fall from the rachillae. Large soldier ants of the colony were carrying the fallen flowers back to their nest, each holding a single flower clasped strongly in its sharp cutting mandibles. The freshly fallen spathe was upturned toward the sky and contained a reservoir of water from the daily afternoon rains. Many flowers had fallen into the troughlike spathe, and dozens of ants were swarming about, trying to collect the blossoms. An ant would scurry into the spathe and carry off a flower. Climbing out of the incurved spathe often proved an impossible task for these ants. With their load as large as their own bodies, they would slip into the pool of water after trying hopelessly to ascend the slippery walls. Each ant thrashed about in the water for a short time, and



3. An ant carrying a flower from the upturned spathe of *Oenocarpus* above, ants carrying flowers on a foraging trail below.

then drowned. The spathe was filled with dead ants, many of which were still clutching their precious *Oenocarpus* flowers. As the leaf cutters are known to be so destructive to cultivated plants and flowers, I attempted to determine

whether the ants were actually clipping off the blooms from the long "horse-tail" inflorescence of the palm. After searching the flowers and leaves of the tall palm with binoculars, I could find no ants engaged in this type of activity.

Several ants from the colony were moving up and down the thick trunk, perhaps scouting for a nocturnal assault. In some areas these ants are known to be nocturnal, especially during the seasons having hot and sunny days.

Observations of the returning ants at the entrance to the colony tunnel¹ indicated the ants in this group favored the palm flowers over all other material in the area. In an attempt to get the insects to display their "enthusiasm" for the flowers in a more dramatic manner, I knocked the buds and open flowers down from the inflorescence, raining flowers all over the grassy area surrounding the palm. Soon ants seemed to come from everywhere to gather the buds and flowers, each picking one up and following the trail back to the nest. By positioning myself at the entrance hole, I was able to collect herbarium material for botanical studies, simply by picking off the flowers from the insects as they entered their underground nests. The unrestrained preference shown by this ant colony for the flowers of *Oenocarpus bacaba*, raises several interesting biological questions. Are the palm flowers used for anything besides the construction of fungus gardens, or are they simply easier to compost than the thicker, more fibrous grasses that surround the nest in great abundance? Do the ants expend energy by climbing the trees to harvest flowers, or do they just wait until the blossoms fall to gather them? At what time of the day or night is their peak of activity with this particular palm, and what other plant material is used when palm flowers are no longer available? Observations by Rockwood (1975) in Costa Rica show that the foraging behavior of *Atta* is adaptive in

¹ This also might have been one of the entrances to a series of underground trails characteristic of this genus and mentioned in Fowler (1976).

that it changes in rate of collection and type of material preferred, depending on the season or time of day. He also mentions that the ants avoid sunny, heated trails, which may account for the absence of any ants seen collecting on the palm itself, especially in view of the sunny condition when the plant was studied. Do the ants return any benefit to the palm, either by protecting it or perhaps by encouraging some sort of mycorrhizal association in the soil, or by nurturing it through the vast mass of underground "manure" produced by the colony from the leaf residue? Weber (1972) stated that the fungus cultivated in leaf cutter nests exhibits biological activity against certain plant pathogens. Are the ants then doing the palm a further service through protection against attack by plant diseases? Are there other palm flower-ant relationships and are they less evident in jungle areas where the ants have a greater selection of succulent plant parts to forage from? Indeed further research and observation is needed to answer these and other related questions which arise from such observations on Amazonian palms. While this single observation of *Atta sexdens* is of no significance by itself, it is presented in an attempt to stimulate further observations of this type by other students of the Palmae, hoping that a portion of the time spent in the field will be devoted to studies on such insect-palm relations as might be evident. Those living within the natural distribution of the palms have a great advantage in this area of study in that yearlong observations can be made and careful field experiments carried out. Future work will surely reveal much needed information on palm-animal interaction, along with their possible coevolutionary implications, vital topics in view of the current rate of the destruction of the rain forest and attempted elimination of what are presently thought to be insect pests.

Acknowledgements

This study is part of an ongoing thesis investigation of the biology and systematics of the *Jessenia-Oenocarpus* complex. Past field work, during which the previous observations were made, was supported in part by grants from Sigma Xi, the Anderson Fund of Harvard University, and Centro de Desarrollo Integrado "Las Gaviotas" in Bogota, Colombia. I wish to thank sincerely all those persons and institutions who have been so kind in assisting in this investigation. Although too numerous to mention herein, for this particular topic the interest and assistance of the following are gratefully acknowledged: Dr. Paulo Lugari C., Dr. T. Plowman, Dr. M. L. Corne, Dr. E. O. Wilson, J. L. Zarucchi, H. J. Hoyos, C. W. Greene, Jardin Botanico "Joaquin Antonio Uribe" in Medellin, and Instituto de Ciencias Naturales, Universidad Nacional de Colombia.

LITERATURE CITED

- ANDRÉ, E. 1904. *A Naturalist in the Guianas*. Smith Elder and Company, London.
- BARBOUR, T. 1945. *A Naturalist in Cuba*. Little Brown and Company, Boston.
- BATES, H. W. 1863. *The Naturalist on the River Amazons*. John Murray, London.
- BELT, T. 1874. *The Naturalist in Nicaragua*. John Murray, London.
- FOWLER, H. 1976. An unusual trail modification observed in the leaf-cutting ant *Acromyrmex crassispinus* Forel. *Biotropica* 8: 142.
- ORNTON, J. 1870. *The Andes and Amazon: or Across the Continent of South America*. Harper and Brothers, New York.
- ROCKWOOD, L. L. 1975. The effects of seasonality on foraging in two species of leaf-cutting ants (*Atta*) in Guanacaste Province, Costa Rica. *Biotropica* 7: 176-193.
- WEBER, N. A. 1972. *Gardening Ants, the Attines*. American Philosophical Society, Philadelphia.
- WILSON, E. O. 1971. *The Insect Societies*. Belknap Press of Harvard University Press, Cambridge.

Principes, 23(1), 1979, p. 32

PALM RESEARCH

ANTHONY ANDERSON, University of Florida, Gainesville, FL, USA, will begin studies on the ecology and agronomic potential of natural populations of *Jessenia bataua* in 1979. Phenology, pollination efficiency, fruit production and oil yield will be determined at a number of sites in Brazilian Amazonia, in order to pinpoint areas of highest yield for exploitation. Ecological systems that enable this species to achieve high success will be examined through comparisons with other palm species.

ANTHONY ANDERSON, and JURANDYR ALENCAR, INPA, Manaus, Brazil, are conducting phenological observations of 21 species of Amazonian palms in the Ducke Reserve outside of Manaus. The study will be completed in mid-1981.

ANTHONY ANDERSON, MICHAEL BALICK, Harvard University, Cambridge, MA, USA and MARLENE DA SILVA, INPA, Manaus, Brazil, are surveying the status of palm taxonomy in Brazilian Amazonia. Completion date 1979.

MICHAEL BALICK is investigating the economic botany and biology of the domestication of the *Jessenia-Oenocarpus* complex, including systematics, insect-plant relations, chemical and nutritional evaluation of oils and fats of the fruits, and aboriginal uses of these palms. Research also involves the relationship between aboriginal societies in the Amazon basin and the palms in their environment, especially the Bora Indians of Peru and the Guahibo Indians of Colombia.

JOHN DRANSFIELD, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9

3AB, is preparing a monograph of *Korthalsia* and doing floristic work on palms of Java, Sumatra, Borneo, and the Malay Peninsula.

FREDERICK B. ESSIG, Department of Biology, University of South Florida, Tampa, FL 33620, USA, is working on the comparative histology of palm fruits (pericarp), currently of various arecoid alliances, and on taxonomic studies of the palms of New Guinea especially *Orania*, *Gulubia*, *Gronophyllum*, *Hydriastele*, *Areca*, and *Ptychoccus*.

DOMINGO A. MADULID, Philippine National Herbarium, National Museum, Manila, Philippines, is preparing a systematic study and revision of *Plectocomia* under the supervision of Dr. J. Dransfield and Professor V. H. Heywood. (Present address: Plant Science Laboratories, Department of Botany, University of Reading, Whiteknights, Reading, England.)

J. P. MOGEA, Herbarium Bogoriense, Java, is doing monographic work on *Salacca* and phenological studies on *Arenga*.

ROBERT W. READ, Department of Botany, Smithsonian Institution, Washington, DC, USA, is working on the systematic anatomy of *Coccothrinax*, a revision of *Coccothrinax* excluding Cuba, and treatments of the Palmae in floras of the Lesser Antilles and of Trinidad and Tobago.

BRAD YOUNG, Department of Biology, University of South Florida, Tampa, FL 33620, USA, is preparing a systematic study of *Nengella*.

The above list is a beginning and will be continued. Those doing research are requested to send appropriate information to one of the editors.

Live Storage of Palm Pollen

ROBERT W. READ

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

Early Experiments

One of the earliest reports on the storage of live palm pollen was by Kaempfer in 1712. He related how the Orientals cut off the male flowers of *Phoenix dactylifera*, shortly before they opened, and suspended them in a dark, dry place where the pollen remained fertile until the "next year." In 1749 Gleditsch of Berlin had some pollen of *Chamaerops humilis* sent from the garden of Bose in Leipzig, in order to test whether the female plant in his possession would produce fruits with fertile seeds. It proved successful, proving that the pollen had survived the nine day journey to Berlin without damage. This test was repeated in 1750 and 1751 with the same success. Sixteen years later Kolreuter sent pollen of *Chamaerops humilis* in envelopes from Karlsruhe to Berlin and St. Petersburg (Petrograd) with the intention of ascertaining its power of retaining fertility. Although the trip took several weeks, plants which were pollinated with the shipped pollen bore fruits profusely.

The earliest thorough study on the viability of pollen is apparently that by Max Pfundt (1910). It was in this rather interesting work that the foregoing historical observations were found. Pfundt was involved in testing the effect of humidity on pollen viability and concluded that "the life duration of pollen is evidently dependent upon the moisture content of the air, . . ." and that "many [species] live longest in dry (30% relative humidity) or even very dry air (over H₂SO₄)."

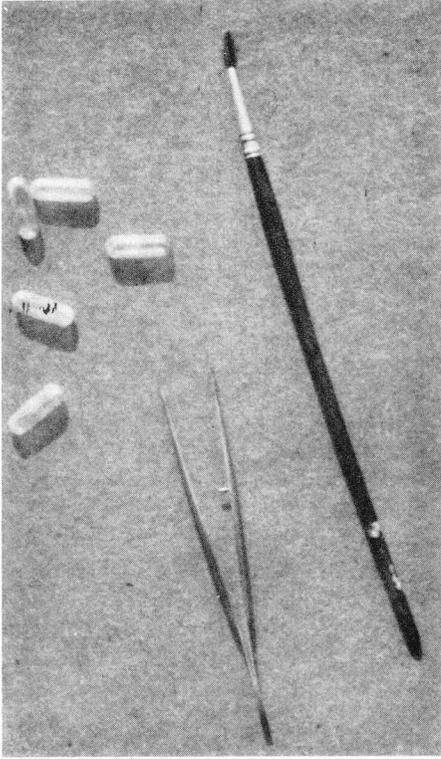
Although I do not have first-hand ex-

perience with long-term pollen storage techniques, such as freezing or drying, such procedures are possible, and experiments on a small scale should prove very useful. In Jamaica, the Coconut Industry Board has been involved in the hybridizing of *Cocos nucifera*, a project requiring freeze-dry storage of various pollen collections. Whitehead (1962) described experiments with freeze-dried pollen in sealed containers under an inert gas in addition to his own experiments with coconut pollen. Freeze-drying techniques are not within the realm of the average palm enthusiast. Whitehead noted, however, that "unopened male flowers from inflorescences of 'Jamaica tall' palms were placed in separate newspaper envelopes and oven-dried at 40°C (for approximately 2 days). Pretreatment in this way has resulted in greatly increased quantities of pollen."

Procedures

The first rule in the collecting of live, viable, pollen for storage or shipping is: *keep it dry!* Don't collect flowers in the rain or with heavy dew; fungal contamination will inevitably result.

For my own work the following technique was quite satisfactory. In the case of tiny flowers with limited quantities of pollen, such as with some species of *Chamaedorea*, entire buds or flowers were collected. These should be spread out on dry, smooth paper in a dry draft-free room or even a warm (not hot) oven for a few hours in order to dry out the floral tissues as much as possible. Or portions of inflorescences can be col-



1. Materials for collecting pollen.

lected at full bloom or as soon before as possible. The pollen is collected by allowing the stamens to shed on a piece of paper in a draft-free room. Pollen should then be stored in gelatin capsules and placed in an airtight container with dry silica gel containing a color indicator. It may even be necessary to dissect unopened anthers from flowers and permit them to dry in the gelatin capsules and silica gel. It is very important not to store more pollen in a capsule than will effectively coat the wall when dry, otherwise the possibility of fungal and bacterial contamination becomes serious. Fragments of the flowers or anthers should be removed from the capsules when dry. It is probably better to store more capsules with less pollen than run the risk of inadequate dehydration.

The pollen of at least one genus of palms, *Thrinax* (Read 1975 p. 49), has been determined to remain quite viable for periods up to 4 months at room temperature (about 26°C). Samples of pollen maintained dry in gelatin capsules that were kept in containers of silica gel at room temperature in Jamaica, were sown on a nutrient medium at intervals over a four month period. Pollen viability was excellent at first (between 70 and 80%), when tested during the first week. Three weeks later samples were again tested with the results that about 41% of the grains germinated.

After 5½ weeks of dry storage at room temperature, there was still 37% viability. However, after 6 weeks, viability dropped rapidly to only 1% germination of pollen sown on fresh medium after about 10 weeks of dry room temperature storage. Refrigeration undoubtedly will increase the life span of the pollen, as long as the pollen is sufficiently dry. Remember that in a humid climate, moisture will condense on the packages or vials upon removal from refrigeration. Therefore, allow the vials or polyethylene bags to return to room temperature before removing the capsules. A small camel's hair brush can then be used to pick up pollen from the capsule walls for application to the female flower parts in order to effect pollination.

Materials Needed

- (1) Small vials or polyethylene bags (zip-type) containing a quantity of dehydrated silica gel, with cobalt chloride indicator to insure that the gel is still dry when used.
- (2) Gelatin capsules (available at most drugstores).
- (3) Tweezers.
- (4) Small camel's hair (or other) paint brush.

LITERATURE CITED

- KAEMPFER, E. 1712. *Amoenitatum exoticarum . . . Lemgoviae*.
- PFUNDT, M. 1910. The Influence of Humidity on the Life-Duration of Pollen. *Jahrb. Wiss. Bot.* 47: 4.
- READ, R. W. 1975. The Genus *Thrinax* (Palmae Coryphoideae). *Smithson. Contrib. Bot.* 19: 1-98.
- WHITEHEAD, R. A. 1962. Room temperature Storage of Coconut Pollen. *Nature* 196: 190.

Principes, 23(1), 1979, p. 35

POLLEN EXCHANGE

Over the years quite a number of members of The Palm Society have acquired a fair collection of palms many of which are now mature. Some of these plants lose a certain attractiveness when they get tall and so a desire comes to acquire young plants to replace the old ones, or perhaps, just to enlarge the collection. However, getting new plants is not always easy and the obvious solution lies in growing palms from seed. But, seeds are not always easy to get either, so why not produce one's own?

As most of us know, some palms are dioecious (male flowers on one plant, female on another) so we must have a plant of each if we want seeds. Often we must hand pollinate since the natural insect pollinators are usually not present in our homes, gardens, or greenhouses. Or, we have just a single plant of a given species and so it becomes a question of either finding pollen to fertilize the female plant, or giving pollen to someone who has such a plant, and asking for a share of the resulting seeds, if any. Because, over the years, I have several times needed pollen and could not find any, an idea was born: to start a service for those who would like to try their hands at producing seed but don't have what it takes to do so.

The plan is to establish a sort of

clearing-house for those who 1) have female plants and need pollen, and 2) have pollen but no female plants. Mary Collins, Horticulturist at Fairchild Tropical Garden, has agreed to handle such a clearing-house. Perhaps in very special cases pollen could be stored here in Miami, but generally she will try to put interested members in touch with each other.

Some palms, like the *Chamaedoreas* in the northern hemisphere, seem to bloom in the spring although there is no hard and fast rule. Most produce male flowers before the female ones (or at the same time) so the pollen needs to be held only a short time, if at all. However, sometimes the males bloom last so that by the time the pollen is ripe the female flowers have long since dried up. How to preserve pollen is discussed above in this issue.

This therefore, is to introduce a new service to members—a *pollen finding* service. If you are interested, please let Mary know what you can furnish in the way of pollen, or whether you need pollen for your female plant.

MISS MARY COLLINS
460 E. Mowry St., Apt. 105
Homestead, FL 33030
USA

TEDDIE BUHLER

Principes, 23(1), 1979, pp. 36-41

NEWS OF THE SOCIETY

Live Palms Needed

The Bahamas National Trust is attempting to restore the palms in the Retreat Garden, former estate of Mr. and Mrs. Arthur Langlois. Any plants of unusual palms will be much appreciated. Donors should send names of palms to Margaret A. Langlois, Nassau, Bahamas, P. O. Box N1656, and she will obtain the necessary shipping permits.

News from Texas

The Houston Area Chapter reports that it held a meeting November 10, 1977 at which time a Nominating Committee was appointed to propose a slate of officers to be presented to the Chapter at the next meeting. A committee of two was appointed to audit the 1977 books. Membership dues were due; they are \$5 per person or \$7 per couple per year. Bob Maurice reported on his 'Greening of Houston' project and is looking for volunteers to sprout seeds. Preliminary plans for the fall show at the Houston Arboretum were discussed. Then it was suggested that a Palm Picture Book of the Houston area be begun. Prints for the book can be made from members' slides and all were urged to gather old slides or make new ones for this purpose. The next meeting of the Houston Area Chapter was held March 9, 1978. It was reported that the Palm Society Notebook of the Palms of Houston is now being put together. A loose-leaf notebook was purchased for the photographs. Copies of members' slides are to be paid for by the Chapter. Horace Bubba presented a program showing slides of Palms of Florida.

On May 13, 1978 the Chapter met for a tour of the City of Houston greenhouses on Memorial Drive, conducted by Ernest Rome, Jr.

News from Florida

A week's visit by member Douglas Wadewitz from Darlington, South Australia, to Miami coincided with the highly successful palm sale held by the Palm Beach County Chapter of The Palm Society at the Mounts Agricultural Building, West Palm Beach, Florida, USA on October 7, 1978. Here is Doug's impression of the sale:

When one is sitting comfortably at home in his own homeland he has no idea of what goes on when he reads about a palm sale at some far-off place. I was fortunate to be invited to visit such a sale. The first impression on entering the hall was like finding yourself in a jungle: palms from 1½" to 15' in all directions. I was introduced to many of the members present and handshakes and welcoming words were extended. After the introductions, someone took me in hand and led me around to examine more closely the exotic and rare palms that had been grown by various members. Many of the seeds from which these palms were grown had come from other members around the world. Some of the plants were going to travel again—buyers had come from as far as 300 miles to find choice plants to enlarge their collections. Some purchased just one or two rarities, others spent up to \$300. It was estimated that some of the palms would have cost three times as much had they been bought at regular retail prices. Most, however, would not have been available anywhere but at such a sale. It was great fun to see people packing their cars with all their plants, driving off as if in a mobile forest. In previous years all plants had been donated, but this year, due to increasing costs of pots, growing medium and fertilizer, half the sales price was returned to the grower. The money then

accruing to the Chapter will be used to help finance more seed collecting.

At the opening hour of 10 a.m. a surge of purchasers stampeded through the jungle, members as well as public, even mothers and fathers with children, so that by noon just pickings remained. The jungle had disappeared.

On Saturday, September 23, 1978, a sizeable group of South Florida members gathered at Fairchild Tropical Garden for a bring-your-own lunch, with iced tea served by the Chapter. Some unexpected home baked cookies helped to make the occasion festive.

The afternoon program consisted of the many interesting slides made and shown by Gertrude Cole and Mel Sneed of the Biennial trip to California and that of the Florida contingent to Costa Rica. A fortunate circumstance had brought member Bob (Dr. Robert W.) Read to Miami from his job at the Smithsonian Institution, so we had the additional pleasure of seeing his slides and hearing the story of a trip he had made to Cuba in February. The trip had been made with a group of scientists who had been invited by the Cuban government, but Bob was the only one interested in plants. Accompanied by a Cuban botanist whose specialty is palms, he had the opportunity of seeing what interested him most. We all thoroughly enjoyed the afternoon and wish more members could have participated.

TEDDIE BUHLER

Reports about 1978 California Biennial Meeting

California here we come, and come we did from many states of the U. S. and from foreign countries to what surely was one of the most enjoyable biennial meetings ever. The hospitality shown us by our various hosts was overwhelming. Those of you who were not there

missed seeing an astonishing variety of both large and small areas, landscaped imaginatively with palms and many other plants, and the excitement of getting to know other members.

Arriving in San Francisco on Wednesday, July 5, a small group from S. Florida found a mini-bus waiting to take us to our hotel and the reception for the early birds set the tone for the following days. Dinner at a Chinatown restaurant gave us a chance to catch a glimpse of life in the largest Chinese colony outside of China. Next day a privately conducted bus tour showed us the highlights of the San Francisco area where *Washingtonia*, *Trachycarpus* and *Phoenix canariensis* are used in street and garden areas. The showy red-blooming eucalyptus was a glorious sight along the streets. At the conservatory of the huge Golden Gate Park the display of tuberous begonias with up to 6" blooms were much photographed. Palms—especially *Chamadorea*—were to be seen in large planters—where they could be protected in cold weather. Unfortunately the variety of outdoor palms is not yet large, but the San Francisco members are trying to remedy that situation.

Later we visited Jack Dane's city garden with a full-sized *Howea belmoreana* as a focal point. A vigorous *Rhopalostylis sapida* introduced us to the many we were to see during the following days. These palms have an astonishingly long crownshaft and large fronds even before the trunk forms; and they bloom with but a foot of trunk. They give an impression of vigor and strength. *Chamaedorea monostachys* seems to do well as do *C. microspadix*, and *C. radicalis* and crosses of these three. Of course, *Trachycarpus* is very much at home as are *Trithrinax* and *Rhapidophyllum hystrix* for those fortunate enough to have them. Jack provided an exotic buffet dinner in the setting of a delightful, restored Victorian house.

Next day, Friday, a bus took the group, now enlarged to 22, to the Berkeley Campus of the University of California to see the interesting plant collections used for botanical studies, with a rather small number of immature palms. Later we went to Warren Dolby's garden on a hillside in Oakland, which was a perfect setting for the delicious luncheon. His combination of palms, apples and citrus gave evidence of the microclimate in his immediate area. He has fine *Rhopalostylis sapida*, *Trithrinax*, a hardy *Caryota urens*, *Parajubaea cocoides*, the same hardy *Chamadoreas* as Jack Dane, but also *C. metallica*, *Livistona mariae*, *L. chinensis*, *Howea forsterana* and *H. belmoreana*. His garden, like those we were to see in the next days, also featured many other lovely plants—cycads, orchids, sultanas, bougainvilleas and fuchias—which have become naturalized and provide a wide range of forms and colors.

Going from Oakland to Dick Douglas' place in Walnut Creek took us to another type of climate—hot and dry in daytime (no rain all summer) but often below freezing in the rainy winter season. Dick grows his large collection of exquisitely cared for *Chamadoreas* indoors, on a protected patio or in his greenhouse. He is doing some hybridizing of these palms with interesting results. Outdoors he has *Arecastnum*, *Butia* (plus hybrids of these), *Jubaea*, *Trithrinax*, *Rhopalostylis*, *Chamaerops*, *Nannorrhops*, and others. A highlight of the day was the planting of a choice specimen of an *Arecastnum-Butia* hybrid in honor of Lucita Wait. Lucita threw in the first shovel of dirt to the sounds of applause and clicking cameras.

Dick served a most delicious buffet around the pool. Worthy of special mention was the enormous bowl of fresh fruit salad with plump blueberries hand-carried from the Georgia garden of his

parents. An exhibit of original illustrations on acetate for Bob Read's forthcoming book on the Palms of the Antilles drew much attention. The return to town via the famous BART (Bay Area Rapid Transit system—elevated where it is in open country, underground in San Francisco) provided a fitting end to the warm hospitality of the Northern California Chapter of The Palm Society.

Next day, Southern California!

Southern California

On Saturday, July 8 at the Kona Inn on Shelter Island in San Diego, a warm welcome was extended by California members and was continued at the reception from 5 to 7 p.m. given by the Southern California Chapter. It was great to see so many old friends, and to meet new ones. That evening Mardy Darian showed slides and told of his misadventures during a plant-hunting trip to Madagascar.

On Sunday a delicious brunch was served at the Cafe Del Rey Morro in Balboa Park, where the Biennial Meeting was held in the afternoon. The formal banquet, with a very large attendance, took place at the Kona Inn that evening. The raffle for the two copies of CULTIVATED PALMS was held. The lucky winners were: for the new copy, Robert W. Maurice of Houston, and for the other, John Covacevitch of Cairns, Australia. Outgoing President Kinnach introduced the newly-elected President Donn Carlsmith and Board members. Member Dick Phillips from Fiji, had brought seeds of a nearly extinct palm and offered packets of them to all interested. New member Rolf Kyburz had come the greatest distance, all the way from Australia. We hope many of our Australian and other Far East members are planning to attend the 1980 Biennial which is to be held in Hawaii.

The rest of the evening was given over to Ken Foster for his program on a recent trip to the Pacific. Ken is an outstanding speaker and his pictures are always of the highest quality.

Monday was spent at the San Diego Zoo, with a box lunch outdoors courtesy of the Zoo and Ernie Chew, one of our new Board members. We saw a surprising number of palms in the famous gardens and there are plans to enlarge the collection. It was a beautiful day with much of interest to see. That evening De Hull showed slides and told about the Florida freeze of January 1977. His talk was most interesting and informative, even if the subject was not one to make palm lovers happy.

Herewith the program for Tuesday as described by Mrs. U. A. Young.

* * *

On Tuesday we had our final glimpse of private gardens in the San Diego area. The first we visited was Jim Specht's. Standing in front of the Specht garden you are welcomed by the scene of a tall *Caryota ochlandra* against the skyline, in the middle a *Noddyopsis decaryi* with its graceful arching fronds and at the left two tall well grown *Arecastrum romanzoffianum*. Following the inviting path your eye is soon caught by a seedling *Howea forsterana* with its brilliant green crownshaft—then on up and into the garden, which runs like a contrapuntal rhythm, along the side of the house to the back area, over a bridge spanning the pool to a loggia, where we were served refreshments. We proceeded around the pool, and through the house to a tall greenhouse with many rare palms and plants.

Then to Jim Wright's, where, as at the Specht's, and later at Ed Moore's, we saw every inch of a relatively small garden, utilized to the utmost to grow and show a large number of palms in a beautiful way. We were impressed with the stout tall *Brahea armata* with silver

leaves, and by the front entrance a seedling *Rhopalostylis sapida*. As you walk through Jim's house you look up and into his garden—and if I were a butterfly cocoon that was transported from some far off exotic place and dropped into Jim's garden, when I metamorphosed, I am certain I would feel I had found a hospitable jungle environment where I could float from trunk to trunk of many palms.

Later, in Ed Moore's garden we encountered the largest specimen of a *Parajubaea cocoides* we had ever seen, with a 15-foot fiber-covered trunk, two old 25-foot seedling *Brahea armata*, a flowering *Sabal minor* and a *Livistona* with a branched trunk.

Lunch, at Theresa Yianilos' Spanish Colonial home, surrounding an open court, accented by a large olive tree, was an outstanding affair—and their greenhouse was packed with potted palms that we all would have liked to take home with us. We were impressed by the lovely lunch and this lovely lady with her concern and action in perpetuating our love—PALMS.

BEN YOUNG

* * *

After lunch most of us went to see the delightful garden of Ralph McAfee. He is still developing his garden but has already done a wonderful job of transforming a steep hillside into an exotic garden with a narrow footbridge spanning the deepest part of a ravine. The legs of those of us who are used to walking on level terrain were quite sore by this time—California certainly provided many ups and downs!

Tuesday evening Theresa Yianilos told us about her experiences in dealing with officialdom. She has been battling to keep old palms in public areas in San Diego and to have more planted. She had good suggestions about how to tackle the powers at city hall.

Wednesday was another full day, as written here by Mrs. David Besse.

* * *

By 7:30 Wednesday July 12, we were sleepily travelling north through the early mist to Bill Gunther's where we were greeted in his courtyard with a delicious Mexican breakfast. The sun broke through and we spent a delightful hour zigzagging up and down the paths of his hillside, amazed at the extent of the stone terracing forming tiny pools and pocket gardens, and pleased with this easy view of the numerous, well-marked palms and exotic plants.

Our day was a progressive party and we next reconvened at the Darian's hill-top home near Vista. Mardy and Cherie are expansive hosts and took delight in showing up their huge atrium and extensive grounds with its fine collection of palms, many of which they had collected in Madagascar. We wandered in the woods envying the large *Howea* and *Rhopalostylis* and a *Chambeyronia macrocarpa*; we were astonished at the size of a *Caryota urens* along the driveway and noted a fine *Lepidorrhachis* by the front door. Certainly all of us coveted a magnificent specimen of *Neodypsis lastelliana* with its smooth green trunk and suede brown internodes and crownshaft. A colorful collection of Koi fish, alligators, and tortoises briefly diverted us from our plants.

Lunch was two hours away after a drive through the golden California hills, past modern factories and shopping centers, and into lovely residential Huntington Beach to where large clumps of *Chamaerops* made looking for door numbers unnecessary. Lois and Ken Rossten treated more than 80 of us to cold meats and salads and homemade peach ice cream. We sat in their garden, chatted with our friends, and delighted in seeing palms collected on trips to Colombia, Costa Rica, Mexico and Jamaica. Next door at Frankie and

Frank Ketchum's we stood in the shade of an olive tree, enjoying the palms about us, and again those of us from out-of-state remarked on the enormous success of these California patio gardens.

A few blocks away the crown of a tall *Areca catechu* pointed our way to the home of Ralph and Nilda Velez. On the corner an *Archontophoenix cunninghamiana* signaled us with a perfect lavender inflorescence, and we admired a vigorous *Copernicia alba* by its side. Every available space was used for beautifully grown specimens: along the house, between the sidewalk and street, in the patio, and under a protective greenhouse. Our tour was highly informative and we would have liked to linger enjoying our hosts' gracious hospitality.

Again it was time to separate in our various cars and find our way to the Huntington Sheraton, a fine old hotel located in the midst of the homes and gardens of Pasadena. It was the perfect lodging for our group; for even in the dusk we could admire the immaculate lawns and flowerbeds, and pick out in the skyline the silhouettes of *Phoenix*, *Brahea* and *Washingtonia*. Dinner revived us and the day had a special ending. Fred Boutin of Huntington Botanical Gardens talked of "Symbolism in Palms," showing us an excellent series of slides, reminding us of the unique combination of art, manuscripts, and plants that is Huntington's pride.

This day was certainly used to the fullest!

LIBBY BESSE

* * *

Thursday we were treated to a tour of the world-famous Huntington Garden, guided by Director Myron Kinnach and Fred Boutin. The palm collection is mostly an old one with impressive trees in full maturity. A lunch, as good to taste as it was to look at, was served

al fresco by the ladies connected with the Garden and even though it was a hot day with temperatures supposedly just over the 100° F mark, it was pleasant in the Garden under the shade of the huge trees. It was a most beautiful setting.

From here we proceeded to Loren Whitelock's garden with its fantastic collection of cycads, one of the largest private collections in the world. A number of palms helped set off the cycads. By the time we got to A. J. Vance's garden and the coolness of the closely-planted hillside below the house we much appreciated the lemonade Dr. Vance so kindly provided. In fact, we drank it all and finally resorted to water to quench our thirst! Dr. Vance is a painter. His house was a treasure of interesting art, and his garden contains many palms that were happily growing under conditions that seemed rather crowded. The day ended with a talk by Al Bredeson who showed slides taken on a recent trip to Costa Rica. Those going on the trips to that delightful country were most interested in Al's descriptions.*

Friday was another full day, with a visit to Pauleen Sullivan's small but exquisite garden. Pauleen has a closed-in swimming pool and around it grow many tender exotics, including beautiful palms, such as *Cyrtostachys*, that could not survive outdoors. She also has lovely palms planted at the two apartment houses she owns. All her plants are in top condition and a joy to behold. Lunch was served while we regained our strength for a visit to the estate of Madame Ganna Walska. Lotusland is indeed all that word-of-mouth has re-

puted it to be. A short report such as this cannot do justice to such a garden. Outstanding is the Blue Garden with its blue grass, *Erythea armata* palms, blue cedars and spruce. It was like fairyland. The enormous trunks of the six or seven *Jubaea spectabilis* in another area dwarfed all who stood near them. The cycad collection contains many rare specimens. We regretted that Madame Walska's health did not permit us to meet her.

Afterwards a walk to see a very old stand of *Howea forsterana* nearby brought a memorable California visit to a fitting end and we thank all those whose efforts helped make this an outstanding Biennial Meeting. A special word of commendation is due those who set up the Newsletter containing interesting palm articles and details about the daily programs. Thank you, California members!

TEDDIE BUHLER

THE PALM SOCIETY BOOKSTORE

The Palm Society announces a new service to the membership—THE PALM SOCIETY BOOKSTORE. It is now open for mail-order business, and it has in stock more different palm book selections than are available in any other bookstore on earth.

Prepaid mail orders are now invited for the palm books listed below and should include the indicated price plus \$1.00 extra per book to cover packaging and postage to any address in the world. (California residents please add 6% sales tax.)

INDEX TO PRINCIPES (Vols. 1-20, 1965-1976, H. E. Moore, Jr., 68 pp.)	\$ 3.00
CULTIVATED PALMS OF VENEZUELA (A. Braun, 1970, English copy, original in Spanish, 94 pp. and 95 photographs.)	4.50
THE INDIGENOUS PALMS OF SURINAME (J. G. W. Boer, 1965, Part of Flora, 172 pp.)	21.00

PALMS (D. Muirhead, 1961, 140 pp.)	2.50
PALMS OF MALAYA (T. C. Whitmore, 1973, 132 pp.)	14.50
PALMS OF SOUTH FLORIDA (G. B. Stevenson, 1974, 251 pp.)	5.00
PALM TREES OF THE AMAZON (A. R. Wallace, Fascimile of 1853 original, 129 pp.)	16.00
PALMS OF THE WORLD (J. C. McCurrach, 1960, 290 pp.)	19.00
SUPPLEMENT TO PALMS OF THE WORLD (A. C. Langlois, 1976, 252 pp.)	25.00
THE GENUS PRITCHARDIA (O. Beccari and J. F. Rock, 1921, 74 pp.)	12.00
THE GENUS THRINAX (R. W. Read, 1975, 98 pp.)	3.00
THE MAJOR GROUPS OF PALMS AND THEIR DISTRIBUTION (H. E. Moore, Jr., 1973, 115 pp.)	4.50

Send check in US currency payable to The Palm Society, together with specific indication of book (or books) desired, and with clearly legible return address, to Pauleen Sullivan, 3616 Mound Avenue, Ventura, California 93003, USA.

Many members of the Society will recognize the Bookstore address as being the address of the Secretary of the Society. Indeed, it is that. Pauleen Sullivan has volunteered to serve as manager of The Palm Society Bookstore, and she feels confident that the time requirements of the Bookstore work will not necessitate her resigning her positions as Secretary and as a Director of the Society, nor any of the many other jobs she is doing on behalf of the Southern California Chapter. She should know, because actually the bookstore has been in operation for several years, under Pauleen's management, as an activity of the Southern California Chapter. The only real change is that now, with the approval of the Palm Society's Board of Directors, the Bookstore becomes an activity of the Society as a whole.

The bookstore really had its origin four years ago when, during a meeting of the Southern California Chapter, two new members told Pauleen that they had tried at numerous bookstores but had not been able to find a copy of McCurrach's book, "Palms of the World." Another member, overhearing that conversation, said that he was equally frus-

trated. He had placed an order for the same book in a big commercial bookstore more than three months previously, but to no avail. The bookstore still did not have the book for him.

Then and there, Pauleen promised to help. All on her own, she began buying books and literature on palms from any and all sources where they could be obtained. During subsequent meetings of the Southern California Chapter, she brought many palm books for resale to Chapter members at cost price, just as a voluntary service. By the time the Langlois' book "Supplement to Palms of the World" was published, Pauleen already was one of the world's leading retailers of palm books; in one single day she sold 37 copies of that new book, at \$25.00 each. She was featured in the Southern California Chapter's Newsletter with the title "The Mobile Bookstore."

Last year, the Southern California Chapter hosted the 1978 Biennial Meeting of The Palm Society. When the out-of-state visitors learned about the Chapter's bookstore, Pauleen was "mobbed." In one single day of the Biennial Meeting, with the help of Kurt Rossten, she sold \$745.00 worth of palm books to out-of-state Palm Society members who were attending the convention. That incident made it clearly apparent that there was a very real need to let all members of the Society know (1) what palm books are available, (2) what they cost, and (3) where they can be purchased.

Obviously, because of the worldwide membership of the Society, a mail-order and mail-delivery arrangement would be most desirable. Because of her experience, Pauleen Sullivan was by far the most qualified person to operate a mail-order bookstore for The Palm Society. Would she be willing to take on the big job?

Pauleen responded in the affirmative. She knew that it would involve many

hours of her time, but she was willing "because it would directly benefit members of The Palm Society."

When we receive books from The Palm Society Bookstore, let's appreciate the fact that our order was processed by a volunteer who is working without financial compensation to help us, and to help make The Palm Society stronger.

Thank you, Pauleen!

BILL GUNTHER

LETTERS

A Letter from the Late David Barry, Jr.

Dent Smith has suggested that the following letter received from David Barry, Jr. at the time when The Palm Society was being formed provides an insight into the kind of man he was and complements the notice of death that appeared in *Principes* 22: 78, 1978. It is reprinted with the permission of Mrs. Barry.

California Jungle Gardens
11977 San Vicente Boulevard
Los Angeles 49, California

December 15, 1955

Mr. Dent Smith
2514 South Peninsula Drive
Daytona Beach, Florida

Dear Mr. Smith:

For twenty-odd years I have been growing and introducing palms. I used to maintain before the last war "an international palm seed exchange service." As a consequence, "my" palms are now growing in many parts of the world.

Of course I am delighted to know of your plan to form a Palm Society and I would, of course, become a willing member.

Since I started raising and collecting palms the population of Los Angeles County has grown from approximately 1,000,000 people to 5,000,000, and, as far as I know, I am still the only active palm collector in the area. It has been a very lonesome hobby, now outgrown into a nursery business, with plants other than palms being really important commercially.

My first palm friend and tutor, an Englishman, of Riverside, near Los Angeles, Mr. J. Harrison Wright, has long since gone to his reward. He was a great friend of L. H. Bailey. William Hertrich, Superintendent Emeritus of the Henry E. Huntington Estate in San Marino, is a great palm enthusiast, an expert in palms here, and the author of a book on palms and cycads in Southern California.

When the Spanish style architecture fell from popularity during the Big Depression, admiration for palms reached an incredible low. The high regard for palms as a decorative relief to the plain lines of modern architecture has revived an interest in palms, but this revival is confined to about a half dozen of the hardy and easy-to-grow species. Plantsmen and nurserymen here know almost nothing of the family.

In fact, over the years it has been a

very discouraging plant activity. Nevertheless, I have been faithful to my great love for an admiration of palms.

Many palm enthusiasts become cycad growers as well. The two kinds of plants that form a lasting crown of leaves are often associated together in public and private collections. The collection of the Montgomerys and that at the Huntington Gardens are examples. I collect and grow cycads extensively. The merits of calling the society the "Palm and Cycad Society" might be considered.

Several years ago I joined hands with Mulford B. Foster in forming "The Bromeliad Society." This is an active and steadily growing organization. One of the aspects of it, and, as I have observed, the important element in any active plant society, other than the purely social, is a continuing source of new and novel species. This may become a problem, and, I believe, as such, should be anticipated.

As you know, most palms that live in South Florida will not live here, and some of the attractive palms from the

islands in "cool oceans" do better here than there. Any interchange of knowledge and/or material between Florida and California will be restricted as to mutuality of interests.

I can report that the interest in palms in the Hawaiian Islands is negligible, and hard to stimulate because high land values make for smaller home sites with less and less room for palms. I have many plant friends in the islands, but I hesitate to name them as possible palm aficionados.

Enclosed is my first nursery catalogue and a list of palm species that I put together about eight years ago. There have been many deletions and additions since.

I am working incessantly to bring in new palms and cycads, plants that will live in our coastal belt and that will endure our killing freezes that come around about every decade. I am more than anxious to join hands with collaborators.

Sincerely yours,
DAVID BARRY, JR.

STATEMENT OF OWNERSHIP MANAGEMENT, AND CIRCULATION OF PRINCIPES, JOURNAL OF THE PALM SOCIETY, REQUIRED BY ACT OF 23 OCTOBER 1962: SECTION 4369, TITLE 39, UNITED STATES CODE, FILED 11 SEPTEMBER 1967.

PRINCIPES, JOURNAL OF THE PALM SOCIETY is published quarterly at 1320 S. Venetian Way, Miami, Florida 33139. General Business Offices: 1320 S. Venetian Way, Miami, Florida 33139. Publisher: The Palm Society, 1320 S. Venetian Way, Miami, Florida 33139. Editor: Dr. H. E. Moore, Jr., Cornell University, Ithaca, N.Y. 14853. Managing Editor: None. Owner: The Palm Society, 1320 S. Venetian Way, Miami, Florida 33139.

The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of the total amount of bonds, mortgages, or other securities are: None.

CIRCULATION:	Average number of each issue during preceding 12 months	Actual number of copies of single issue published nearest to filing date
A. Total no. of copies printed	1625	1600
B. Paid Circulation		
1. Sales through dealers	—	—
2. Mail subscriptions	1314	1259
C. Total paid circulation	1314	1259
D. Free distribution by mail carrier		
1. Samples, complimentary	11	11
2. Copies distributed to news agents	None	None
E. Total distribution	1325	1270
F. Office use, left-over	300	330
G. Total (Sum of E & F)	1625	1600

I certify that the above statements made by me are correct and complete. Signed, Mrs. Theodore C. Buhler, Executive Secretary.