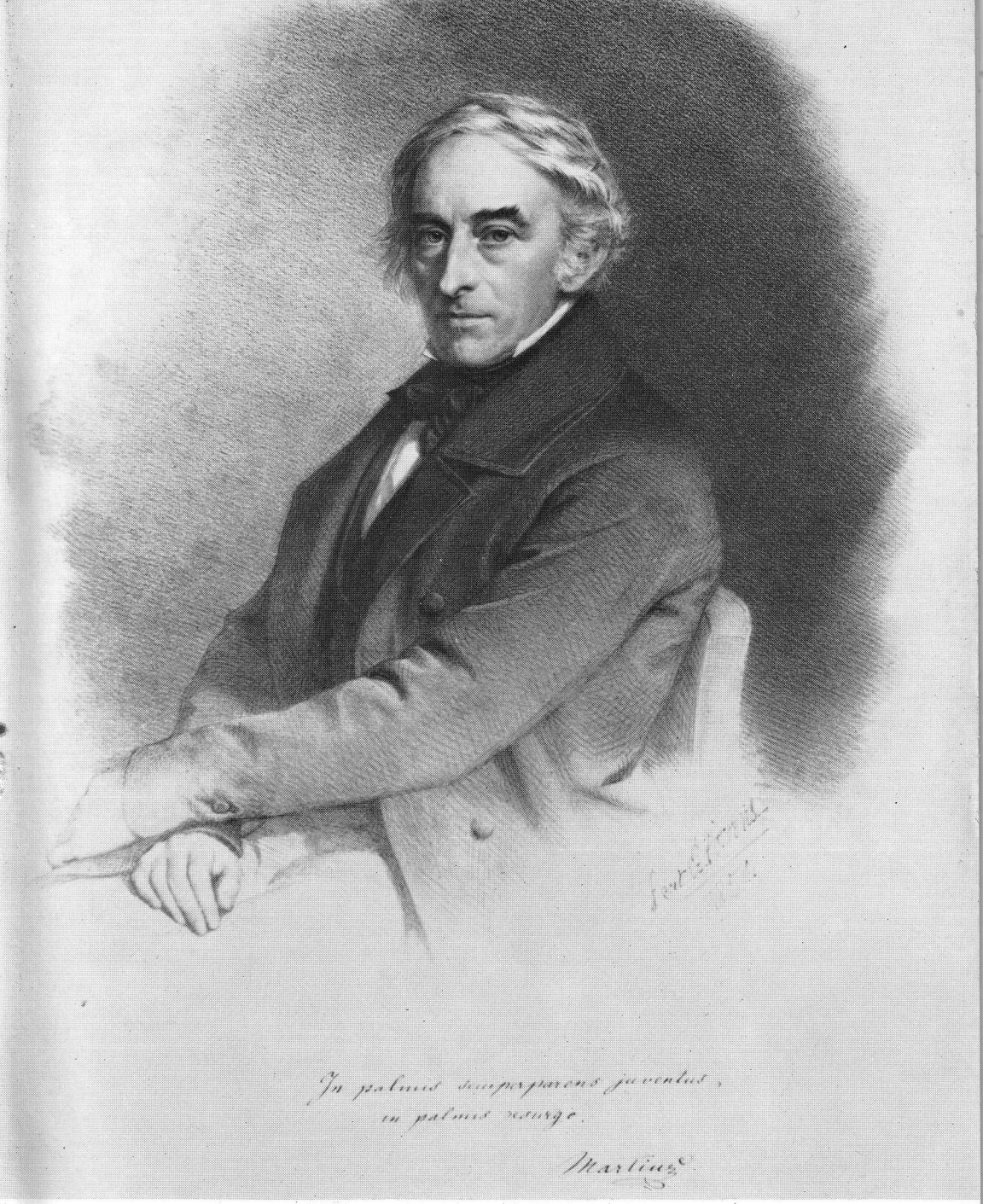

PRINCIPES

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PRINCIPES

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Cover Picture

Portrait of C. F. P. von Martius in 1850 from Frontispiece, Volume 1 of *Historia naturalis palmarum*. See page 158. Photograph by Howard H. Lyon.

PRINCIPES

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Nuts to the Garden of Eden

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The coconut palm evolved without human assistance. The question is, whether mankind could have evolved without the coconut.

Coconut Evolution

The origin and dispersal of the coconut palm (*Cocos nucifera*) have often been subjects of hot scientific debate—particularly at the time of Thor Heyerdahl's epic voyage by balsawood raft. Heyerdahl favored a theory that held South America to be the home of the coconut palm and he suggested that American Indians had carried coconuts to the Pacific Islands (Heyerdahl, 1952). These ideas have been discounted (Merrill, 1954) but botanists cannot agree where the coconut came from or how far the fruit may spread by floating. The general assumption has been that agricultural selection and propagation have masked the center of origin and the effects of natural dissemination.

The coconut has certainly had a long and close association with man in the humid tropics, where it provides food and drink, fuel and shelter, and a source of income. In fact, this close association and the historically recent development of industrial plantations have obscured, until now, the main points of coconut evolution (Harries, 1978). These can be briefly stated. The coconut probably evolved on coral atolls and newly emerged volcanic islands where there was little risk of destruction by animals or of competition from other plants. It was disseminated by floating and grew naturally on the very narrow strip of beach above the high-water mark where it was not overshadowed by forest trees or choked by undergrowth. It could neither reach inland sites nor survive in them. Larger-fruited forms with thicker husks had a selective advantage, not only because they extended the range of dissemination but because, in competition for the very restricted habitat, they eliminated the smaller-fruited forms. Island hopping from a center of origin (which might have been a region, now submerged, somewhere between Australia, New Zealand and New Caledonia) the coconut spread to islands as far apart as the Seychelles in the Indian Ocean and Palmyra Atoll in the Pacific. The long-fruited, thick-husked coconuts that fringed those islands when they were first discovered can still be found there today. The palm grows as tall as any cultivated variety, carries as many fruit, and these weigh from one to two kg. Floating would also have carried these slow-germinating fruit thousands of kilometers to continental coasts. While the distance to America may have been too great, and the climate of Africa and Australia may have been too dry, the southeast corner of Asia would have been ideal.

There is no need to seek human involvement in the selection or dissemination of this coconut. Indeed, I believe that it was not until the coconut reached the coast of southeast Asia that man's

early ancestor, the apelike *Ramapithecus*, came down from the trees some 12 million years ago. There then began a close relationship from which Man was to emerge. This suggestion is made in all seriousness even though the circumstantial evidence comes from some usual sources: a Victorian military hero who believed he had located the Garden of Eden, an award-winning American space scientist who proposed that dragons really did exist, an Emeritus Professor at Oxford who considers that human evolution passed through an aquatic stage, and a best-selling Welsh authoress who gave the feminist movement some new ideas.

The Garden of Eden, the Forbidden Fruit and the Serpent

In 1881, four years before his death at Khartoum, Charles George Gordon made a reconnaissance of the Seychelles Islands, home of the fabled coco-de-mer palm (*Lodoicea maldivica*). Before 1756, the seed of this palm was thought to have come from a plant growing *beneath* the sea because it was only ever found, partly decomposed, floating in the Indian Ocean or washed up on the shores of the Maldive Islands (hence its specific name). The seed, which is the largest in the world, has a remarkable historical reputation as an aphrodisiac due, as the *Encyclopaedia Britannica* delicately explains, to the impudicity of its shape. Gordon wrote to the Director of the Royal Botanic Gardens, Kew, suggesting that the coco-de-mer was the tree of the Forbidden Fruit and that the Seychelles were therefore the Garden of Eden (Lionnet, 1970). This provoked a botanist to remark that ". . . anyone who has seen the nut complete with husk must admire the serpent's inveiglements the more, if it persuaded Eve to bite into such a tough, fibrous and unpalatable object!" (Jeffrey, 1964). Yet, right now, the modern Eve in a package tour to Paradise (as an hotel in the Seychelles is called) can still be enticed by snake-hipped Lotharios to taste the pink, jelly-like endosperm of the immature coco-de-mer.

Similarly, the hard-shelled mature coconut of commerce would not have appealed to *Ramapithecus*. Not only is it difficult to get at (more about that later) but the hard endosperm, eaten raw in large quantities, is not particularly digestible and the few spoonfuls of water are insipid. As with the coco-de-mer, it is the immature fruit that is desirable. In the coconut each developing fruit may contain up to half a liter of liquid that has a 5% sugar content, a fizz imparted by naturally occurring gases and an agreeable flavor.

I am not the first to see the resemblance between the Tree of Life in the Book of Revelation, ". . . which bare twelve *manner* of fruits, *and* yieldeth her fruit every month" and the coconut (Child, 1974) but I do not go as far as General Gordon, who sought a literal interpretation of the Bible. Perhaps Gordon was making another of his heroic stands. Not, this time, against Rudyard Kipling's "lesser breeds without the Law" but against Thomas Henry Huxley's "agnostic"—by 1881 an entire generation had been brought up with Darwinian evolution as an alternative to Biblical dogmatism. I prefer Carl Sagan's approach. Although he considers Eden a metaphor and Genesis an allegory he, nevertheless, points out that if the Biblical Serpent had to go upon its belly as a punishment for tempting Eve then it must once have had legs. He reminds us that snakes do have rudimentary limbs and suggests that the widespread fear of reptiles and the popularity of the St. George type of myth in

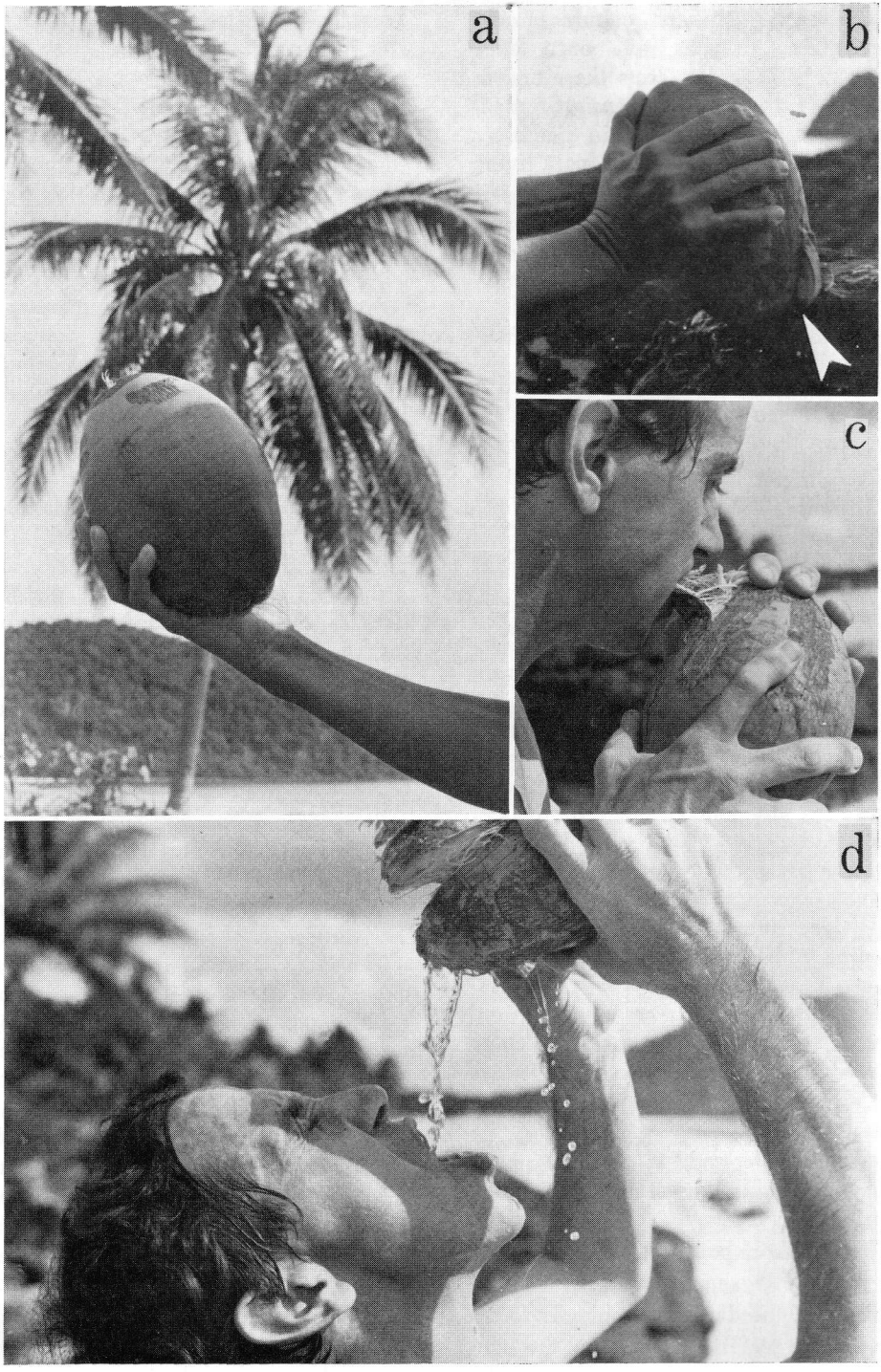
a diversity of human cultures might mean that dragons did once exist (Sagan, 1977). He elects the Komodo dragon (*Varanus komodoensis*), a monitor lizard now found only in the Lesser Sunda Islands of Indonesia, as a living relic.

Adam and Eve Went Down to Bathe

If the coconut palm and the monitor lizard represent the Tree of Life and the Serpent in a southeast Asian Garden of Eden then can we also find Adam and Eve there? Consider *Homo aquaticus*. The possibility that there was an aquatic stage in human evolution, when many hours of each day were spent in the sea, was suggested by Sir Alister Hardy. This unprecedented idea accounts for a number of important human traits: the diving reflex, which controls the flow of blood to the brain and to the heart when the face is immersed in water; the ability of very young babies to swim; the pattern of hairs on an otherwise functionally naked skin; the streamlined shape of the human body; the subcutaneous layer of adipose tissue; and the flexible and sensitive hand and body movements (Hardy, 1960; 1977). Elaine Morgan, dealing with evolution from a woman's point of view, came to similar conclusions and added ideas on reproduction, speech and behavioral responses such as frowning and crying (Morgan, 1972). If Adam and Eve were aquatic then the beaches and shallow seas around the multitude of islands that fringe southeast Asia would have been an Eden-like setting.

The offshore coral reefs and the atolls to which *H. aquaticus* could swim would be free of the dangerous animals found on the larger islands and on the continental coast. Fresh food would be available—shellfish on the shoreline, fish in the sea. One thing alone would seem to be missing—a ready supply of fresh water. If, as Elaine Morgan says, 500 cc of "free" water per day is enough to keep the kidneys of an adult human working then one or two coconuts provide just that quantity of *uncontaminated* water. Moreover, the very act of getting it encourages the development of two more essential human traits that Hardy and Morgan do not satisfactorily account for—the hand with its opposable thumb and the prognathous jaw. As the pictures show (Fig. 1) all that is needed is to grasp the immature coconut fruit, bang it against a conveniently exposed rock on the seashore, tear with the teeth at the loosened fibers of the husk, split the soft shell—and drink. No tools are needed yet the grip that is developed is exactly what is required for wielding wooden clubs or stone implements. Moreover, the immature husk is itself full of sap and, although somewhat bitter, this additional liquid can be extracted by chewing the husk. It may be noted that peeling the fully mature coconut, though a tougher proposition, is by no means impossible and the hard, lignified shell would provide a convenient receptacle if one were needed.

I see no reason why *H. aquaticus* should not have existed and been an evolutionary success. With time, tribes would have spread, going like beachcombers, along coastlines wherever coconuts grew. Large stretches of water would have been barriers so that the Pacific Islands beyond Melanesia and the whole American continent would have been inaccessible. Australia is an interesting case, particularly as recent archeological evidence points to habitation occurring earlier than was once thought possible. The present climate of northern Australia is very dry and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Joseph Birdsell considers that a lack of drinking water would have been a constraint to successful colonization (Birdsell, 1977). Nevertheless, coconuts do grow in Queensland today and during favorable climatic periods in the past both coconut and *H. aquaticus* might have reached Greater Australia, following the island-hopping routes that Birdsell identifies. Elsewhere, coastwise migration during hot and humid periods could have ranged from southern China to India, Sri Lanka, the Middle East Gulf Coast, the east coast of Africa and, perhaps, Madagascar and some islands of the Indian Ocean. Subsequently, cooler or drier times might have isolated groups of *H. aquaticus*, perhaps eliminating them wherever they could not move inland to get fresh water from rivers and lakes if the coastal coconuts failed to thrive (the mean temperature for coconuts to grow successfully must be above 20°C and annual rainfall must not be less than 1,500 mm without prolonged dry spells).

It is tempting to wonder if *H. aquaticus* ever cultivated the coconut palm, thereby making it the first agricultural crop. At first this might amount to no more than guarding bearing palms and self-sown seedlings from other animals. Eventually, there would be unconscious selection for desirable qualities. For instance, there are some coconut palms in which the immature husk is sweet and can be chewed like sugar cane (Child, 1974). These palms are rare, possibly because, with the advent of tool making, coconuts were no longer peeled with the teeth but with a pointed stick and ultimately with a heavy-bladed knife. Perhaps a survey for the presence of the edible-husk character would reveal the extent of the spread of *H. aquaticus*? Another characteristic that has retained its original importance is the quantity of water in the immature nut. Due to selection, the cultivated coconut may have more than twice as much liquid endosperm as the coconut found on uninhabited islands (Harries, 1978).

Epilogue

Perhaps when Adam said, "I heard Thy voice in the garden, and I was afraid, because I was naked . . ." he really meant to say hairless? During glaciations *H. aquaticus* populations would have had to clothe themselves to protect their, by now, hairless and naked bodies from the cold. When they sheltered in caves fossil evidence would accumulate for the palaeontologists. In those fossils that are acknowledged to be in line of descent to man, the powerfully constructed jaws are mute testimony to the need to chew tough and fibrous food. Unfortunately, the Garden of Eden cannot be found in the fossil record. On the seashore of the hot and humid tropics the coconut is eminently disposable and totally recyclable—it is a nonreturnable container par excellence. In acknowledging the importance of the coconut to human evolution it is this very quality that must be commemorated. The coconut was the milk bottle on the doorstep of mankind.

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1. The young coconut fruit (a) can be easily split (b, arrowed) and the husk peeled back (c) to enjoy the sweet drink (d).

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Principes, 23(4), 1979, pp. 149–156

Biology and Human Use of Leopoldinia piassaba

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The diversity of ways in which people employ palm products is often astounding. This is certainly true in the upper Río Negro and Orinoco drainages of Venezuela, Brazil, and Colombia (Fig. 1), where one of the most versatile and economically valuable species is *Leopoldinia piassaba* Wallace. Naturalists long ago made note of this unusual palm (Wallace, 1853; Spruce, 1860) but little about its biology has been reported.

The genus *Leopoldinia* Mart. (named by Martius in 1824 to honor Leopoldina, Empress of Brazil) contains four de-

1. Map of South America with detailed inset showing distribution of *Leopoldinia piassaba*.

scribed species, all of which are limited to the Río Negro and Upper Orinoco regions of north-central South America. The species that has attracted the most attention from biologists is *L. piassaba*. A mature *L. piassaba* tree exceeds 10 m in height and supports a crown of about 25 leaves. Excavation of several individuals revealed that the stem first grows horizontally along the ground before growing upright and roots arise along the horizontal portion. The leaves are approximately 4 m long, including a leaf sheath 0.3 m long, 1.5 m of petiole, and 2.2 m of rachis with pinnae. The sheath of each leaf is fringed by a beard of fibrovascular bundles. Strands in this beard are initially fused into ribbons 3 cm wide but in time shred into individual strands 1.5 m long. The bearded leaf sheaths are persistent and clothe the entire stem of all but the tallest individuals. The shaggy brown, bearded masses of half-grown trunks have been likened to the appearance of rampant bears. The palms are truly an impressive sight, growing as they do in nearly pure stands up to several hectares in extent in secluded parts of dense forest. Sunlight filtering through the interlacing crowns in these palm groves takes on unusual, almost preternatural qualities (the author claims no objectivity in making this observation).

Leopoldinia piassaba displays a distribution pattern that intrigued Wallace (1853) and is as yet unexplained. The species is mainly limited to sandy soils associated with black-water rivers, soils of which are extremely poor in plant nutrients. There are, however, populations in drainage basins of white-water rivers (which carry higher sediment loads and correspondingly more nutrients) adjoining the Casiquiare (Fig. 1). Trees are generally found in scattered patches far from rivers but always seem to be in areas subject to flooding by seasonally high waters. Stands of *L. piassaba* are found along tributaries of the Río Negro as far south as the Padauiri River, some 1000 km above Manaus, Brazil. The Río Negro itself and many of its tributaries lack this species until much farther upstream in the area near the Venezuelan border. From this point upward to the source of the Río Negro, *L. piassaba* is abundant. Populations are also found in the upper reaches of the Orinoco drainage.

The palm is used in a great variety of ways, but outside the area where it is native, it is best known for the fibers it produces. The common name for the species in the Lingoa Geral of Brazil is *piassába* (in Venezuela it is known by its Barre name *chíquechíque*). Unfortunately the Brazilian name is also used for an array of palm fibers, including those from *Attalea funifera* Mart. as well as *Leopoldinia piassaba*. Here only products of the latter species will be considered. These are sometimes called *Pará piassába* in contrast to *Bahia piassába* which refers to *A. funifera*.

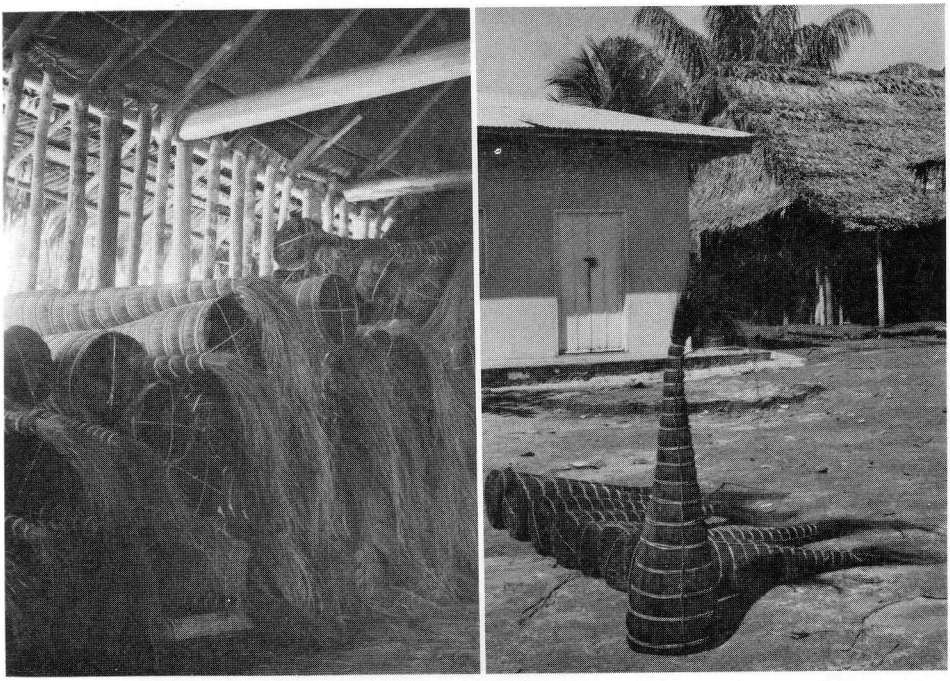
Leopoldinia piassaba is not cultivated, fibers being collected from natural stands. Before cutting, the tangle of fibers is first straightened (Fig. 2). To accomplish this a tree sapling is prepared as a bat. The fibrous mass is then beaten until the fibers are untangled and hang down freely. Resident snakes, rats, birds, insects, and other creatures living in the fibers retreat from the beating, which thus serves two important purposes. Only fibers less than approximately five years old and borne 15 cm or less down from the lowest living leaf are used because older ones become brittle and hard to work. If a tree hasn't been divested of its fibrous mantle in more than five years, a band of the old fibers below the ones being collected is removed to ease straightening operations. Once straight, the fibers are

2. An untrimmed *Leopoldinia piassaba* tree, San Carlos de Río Negro, Venezuela.

3. Fibers fringing leaf sheaths being cut with a small knife, Solano (on the Casiquiare), Venezuela.

cut near the trunk with a short-bladed knife (Fig. 3). Handfuls of these meter-and-a-half long fibers are neatly stacked on a cleared piece of ground. When a sufficient pile has accumulated, the fibers are lashed together near their base into a bundle referred to as a *bahote*. Later these *bahotes* are lashed together into the familiar cone-shaped bundles of commerce (Fig. 4). Split aerial roots of epiphytic aroids called *mamure* are used for lashing. The bundles are then carried to the nearest stream and henceforth transported by dugout canoe. Fibers are sold by the cutters for approximately $0.10 U.S./kg, but the price depends on fiber quality (age) and apparently fluctuates considerably from year to year.

Because fiber cutting does nothing to

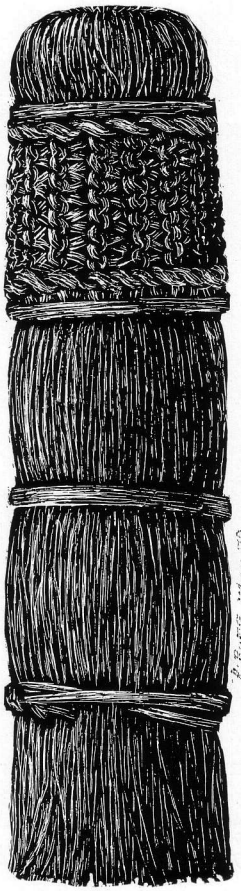


4. Fibers are lashed together into bundles for transportation, Boca Casiquiare, Colombia.

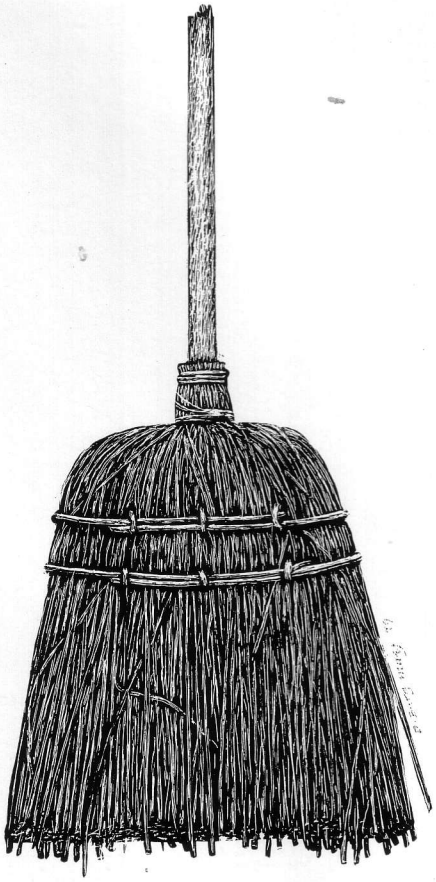
damage the terminal bud, sustained yield of fiber is guaranteed. A mature tree produces approximately 1 kg of fiber per year but cutting is generally delayed for two or three years. Only a few minutes are required to collect the fibers from a tree: one man can harvest 25 or 30 trees in a day. When demand for fibers and leaves is high, trees too tall for the usual collecting operations are cut down. Generally there are sufficient small individuals around to replace the cut mature palms. Cutting of dicotyledenous saplings for fiber bats also reduces competition and serves in time to increase the growing stock of palms.

Fibers from *L. piassaba* are used in making strong and light ropes called *mecate* that are particularly well suited to marine use because they are durable and float. The fibers are light in weight, rough-surfaced, and twist easily into cables. Rope making in this region resembles a maypole dance: generally six men take part, each twisting together his own strand of fibers while threading his way through the strands of his associates. Prices of standard lengths are determined by the rope's diameter, which can exceed 15 cm.

In addition to their use in rope making, fibers of *L. piassaba* are extensively used in broom (*escobar*) manufacture. Two styles of broom are made locally: the first style (Fig. 5) is entirely hand made, while elaborate machines are employed in assembling the second style (Fig. 6). Machines in the broom "factory" in Solano, Venezuela (on the Casiquiare) are constructed of spare parts from bicycles and automobiles with a liberal assortment of parts from unidentifiable sources. When in full operation, the whir, clang, buzz, and twang of the machines amidst the flying fibers would have made Rube Goldberg proud.



5. A small handmade broom from fibers of *Leopoldinia piassaba*.



6. A broom made in the "factory" at Solano, Venezuela.

Where available, fronds of *L. piassaba* are the preferred roofing material. The leaves are unarmed and thus easy to handle, and are extremely durable: a roof of *L. piassaba* lasts for 15 to 20 years in an area receiving more than 2000 mm of rain per year. In town, galvanized aluminum sheeting is slowly replacing palm thatch as the major roofing material even though thatched houses are much cooler and make no deafening din during the frequent tropical cloudbursts. Part of the reason for this change may be governmental urging for abandonment of thatch as a measure to control the reduvid bug that carries Chagas disease and hides in palm roofs during daylight hours.

Cutting of fronds for roofing proceeds during the week of the full moon. It is believed that fronds cut at any other time of the month are full of water and subject to rapid deterioration. A tree is never left with less than four mature or maturing leaves. Trees with fewer than four leaves are thought not to recover from removal of their other leaves. Cut fronds are woven into bundles of 12 to 18 fronds apiece (Fig. 7). The number of fronds in a bundle has superstitious

7. Bundles of *Leopoldinia piassaba* leaves and the house frame to which they are to be lashed, Río Negro, Venezuela.

significance; but, everyone interviewed specified a different propitious number of leaves.

Upon reaching the home site, the bundles are opened and the fronds spread and lashed down three or four fronds thick on slender roof beams. Unlike palm roof construction in other parts of the world, pinnae are not woven together or manipulated in any particular way. Fronds are simply piled thick enough to prevent rain from entering while still allowing smoke from cooking fires to filter out from inside the house.

Small groves of *L. piassaba* trees found near houses and villages often have resulted from seeds discarded after preparation of a *refresco* or refreshing drink from the fruits. Flesh of the fruits is thin and removed by soaking and agitating in water. The resulting much-relished liquid bears (with some imagination) "great resemblance to cream both in colour and taste" (Spruce, 1860).

Thus, *L. piassaba* is employed for its fibers, fronds, and its fruits. When a house needs a new roof the residents go into the forest and cut the necessary fronds. Nearly everyone enjoys the drink prepared from *L. piassaba* fruits and participates in its preparation. Fiber cutting on the other hand is a trade practiced by only a few people. The industry itself has waxed and waned during the last few decades. At present, fiber prices are reasonably good and many people are cutting, but when alternative employment is available fiber cutters readily abandon their trade. This may be due to the hard work and low pay, but no one seems particularly to like cutting fibers no matter what the pay. Fiber cutting is especially avoided during months of high water (July–August) when a greater-than-usual assemblage of terrestrial animals, sometimes dangerous ones, seeks refuge in the fibers. Dangers are real enough and probably underlie myths about *curupira*, the evil spirit inhabiting *L. piassaba* groves (Schultes, 1974). Regardless of the hardships and dangers involved in fiber cutting, the trade lives on wherever this unusual palm grows.

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Principes, 23(4), 1979, pp. 156–157

PALM BRIEFS

Sommieria affinis (Palmae) in Papua New Guinea

Sommieria is a clinostigmatoid genus of three species confined to the western part of New Guinea. Until recently, the genus was not known to occur east of Mamberamo, the type locality for *Sommieria affinis*, in West Irian. In 1975, however, a specimen agreeing with this species was collected at Pagei, in the West Sepik District of Papua New Guinea (*K. J. White P/1*, January 1975, specimen at LAE). This is significant as more than just a range extension. It means that this rare and unusual palm genus is accessible from Papua New Guinea, where botanists can work more freely than they presently can in West Irian. The specimen was marked as voucher for a seed collection, but it is not known whether seedlings have been established anywhere in cultivation.

There is no record of them having been introduced at the Botanic Garden in Lae.

Sommieria affinis resembles a small *Heterospathe*, such as *H. humilis*, except that the fruits are conspicuously warty (Fig. 1), more like those of *Pelagodoxa*. Other features that separate it from *Heterospathe* are a basal stigmatic residue on the fruit (as opposed to a lateral to subapical residue) and homogeneous endosperm. The palm appears to be acaulescent, but this was not certain even to Beccari when he described the species (Bot. Jahrb. Syst. 52: 37. 1914). The peduncle is very long, about seven times as long as the flowering portion of the inflorescence, which would correlate with an acaulescent habit. Beccari described the leaves as elongate-flabellate (fan-shaped). They are actually pinnately ribbed but undivided except at the apex, as in *Asterogyne*, for example. The tips of the pinnae are toothed or bifid, a feature that distinguishes *Sommieria affinis* from the other two species in the genus.

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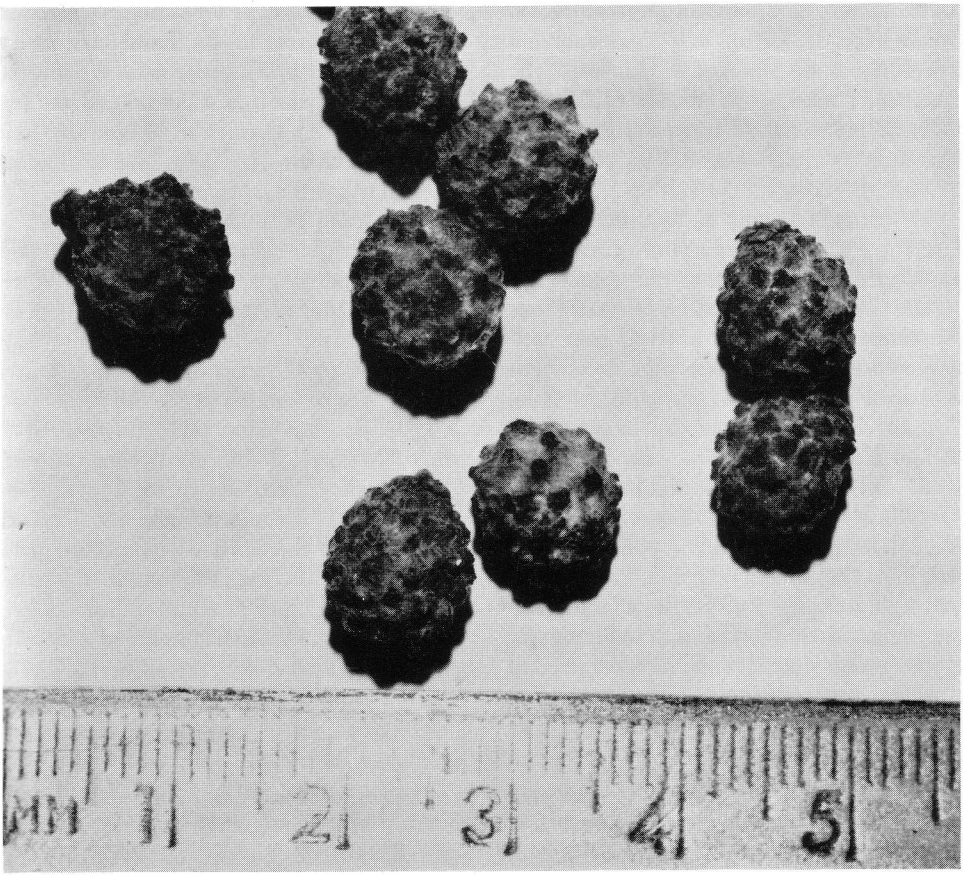

1. The warty fruits of *Sommieria affinis*, from the specimen collected near Pagei, in the West Sepik District of Papua New Guinea.

Principes, 23(4), 1979, pp. 158–170

Martius, the Father of Palms

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Karl Friedrich Philipp von Martius was an intellectual giant, a type of Renaissance man, as it were, as much at home in the arts and letters as in the sciences. In addition to being a botanist, he was also zoologist, ethnologist, linguist (polyglot, actually), economist, geographer, pedagogue, philosopher, geologist, mineralogist, poet, traveller, and Latinist. He had a prodigious memory, wrote elegant Latin, and corresponded regularly with the great Goethe. The results of his trip to Brazil (1817–20) were so monumental and prodigious that the country claims him as one of its own to this day.

He produced some 150 publications in total and among them was his great work on palms, *Historia naturalis palmarum* (1823–1853), on which he labored some 30 years. It appeared in three folio volumes, with 245 colored plates. One of the three volumes describes the palms he himself had discovered in Brazil. The whole monograph was written in an elegant and faultless Latin and is said to be the work by which he is best known. It included the then-known palms of the world, even those found as fossils. It covered anatomy, physiology, morphology, classification, and characteristics of palms; descriptions of the genera and species; reports of various and extensive kinds about their commercial uses, as well as their technological and medicinal uses; profound dissertations about the role that these plants have played in the history of peoples and in the world; valuable teachings about the ethnography and geography for the regions studied; and a truly universal treatment of palm geography; all edited with a solid erudition that characterized the genius of Martius. Another major work on palms was *Palmetum Orbignianum*, published as volume seven of Alcide d'Orbigny's *Voyage dans l'Amérique méridionale* (1847).

Martius is known as "the Father of Palms," a sobriquet he richly deserves. He was enamored of them and is described as admiring them like a tourist, sketching them like a landscape painter, and studying them like a botanist. He spoke of them with near solemnity, confessing that they fascinated him and that many times he had confided to them in his youthful dreams. He wrote "In palmis semper parens juventus; in palmis resurgo" (literally, in palms ever appearing youthful; in palms I am revived), rendered by the Portuguese writer Dutra into "Nas palmeiras existe um viço imorredouro; entre elas, sinto novo alenta," or "In the palms exists an undying exuberance; among them I feel new strength." Medals struck in Martius' honor used the parts of palms for decoration and the request that in death he might find new strength among them. When his friends accompanied his body to the grave, they carried fresh, green palm fronds. Finally, his family* placed at his grave a tombstone whose only

* The Martius family, many members of which had pursued learned professions, traced its lineage back to Galeottus Martius, who was a professor at Padua in 1450. In 1823 Martius married Franciska Freiin von Stengel; they had four children.

adornment was two palm fronds with the words "In palmis semper virens resurgo!" The emperor of Brazil, Dom Pedro II, knelt at his grave in 1871 in homage to this great friend and servant of Brazil. For Martius, palms were a part of nature, which formed the stairway to God. He gave us the names *Acrocomia*, *Brahea*, *Copernicia*, *Desmoncus*, *Diplothemium*, *Guilielma*, *Hyospathe*, *Leopoldinia*, *Lepidocaryum*, *Maximiliana*, *Oenocarpus*, *Orbignya*, *Plectocomia*, *Syagrus*, and *Trithrinax*, as well as *Keppleria* and *Taliera*, genera now known by other names. The material that follows is based on a translation of an article by E. Wünschmann in volume 20 (1882) of a German dictionary of national biography, the *Allgemeine Deutsche Biographie*, that appeared in 55 volumes over the period 1875 to 1912.

His Life

Karl Friedrich Philipp von Martius, botanist, was born April 17, 1794 in Erlangen, Germany and died December 13, 1868 in Munich. Destined for an academic career from the cradle through the gift of academic matriculation from his godfather, he grew up in his parents' home surrounded by love and care and early showed a talent and inclination for scientific study. The direction of this study was inherited from his father, the court apothecary and "professor honorarius" of pharmacy, and was encouraged by a predilection for the natural sciences. Martius also possessed a deep moral earnestness and a natural aspiration for a well-rounded, harmonious cultivation of the mind, and both were nourished by instruction at an excellent secondary school in his home town. To this school he was indebted for gaining a thorough knowledge of classical antiquity. The Latinity of his later writings was famous for its elegance and the reading of Greek and Roman poets and scholars formed his favorite pastime to the end of his days.

When hardly 16 years old, he entered Erlangen University in 1810 to dedicate himself to the study of medicine. But among his academic teachers it was less the indeed learned, but narrow-minded, pedantic botanist Schreber who attracted him intellectually, despite Martius' devotion to botany, than it was the philologist Harless, the philosopher Vogel, the chemist Hildebrandt, the zoologist Goldfuss, and the clinical physician Wendt.

Martius was also indebted to the university gardener Rumelein for considerable instruction in the practical knowledge of plants. But above all, his association with the talented brothers Nees von Esenbeck contributed to his youthful enthusiasm for a deepening absorption in the natural sciences. On March 30, 1814, Martius was conferred a degree of doctor of medicine on the basis of a rather comprehensive dissertation, "Plantarum horti academici Erlangensis enumeratio," which, prepared according to Linnaean methods, compared to a modern scientific garden catalog. But before the completion of this work, Martius had already changed over to being a botanist.

After Schreber's death in 1812, the Munich academicians Schrank and Spix came to Erlangen to buy the botanist's collections and there became acquainted with Martius, whom they inspired to join the then existing "Institut der Élèven der Akademie." This institute was a type of higher school that offered students many advantages in furthering their scientific studies. Martius agreed to go and, after taking the prescribed examinations, was accepted into the institute on May 13, 1814, and placed as an assistant for the administration of the newly-founded botanical garden under the direction of the aging Schrank. Two years later, he

entered into actual state service as assistant to the academy. With joyous eagerness and abundant scientific success, Martius dedicated himself to the duties attendant upon this post, which consisted primarily of the orderly designation and grouping of the plants of the botanical garden. Likewise he strove to learn the indigenous flora through many extended trips beyond the borders of Bavaria to Salzburg and Carinthia.

A literary fruit of this activity was the *Flora cryptogamica Erlangensis* (1814), which contained Martius' first entirely independent research. He had worked on it while in Erlangen and because of its profundity and thoroughness, it earned him the recognition of his colleagues. He also won the benevolent kindness of the plant-loving king, Max Joseph I, who always specifically asked that Martius accompany him as he toured the botanical garden. This situation was of the most critical importance for Martius' future success in life.

The Expedition to Brazil

It was King Max Joseph on whose suggestion Bavarian scholars were also permitted to join the Austrian expedition which, in the spring of 1816, was to go to Brazil, accompanying the newly-married Archduchess Leopoldina of Austria who was to join her spouse, later Emperor Dom Pedro I. Besides Martius as botanist, the academician and zoologist Spix was also chosen. The two learned men left Trieste on April 2, 1817, on the Austrian frigate *Austria*, of necessity after only a short time for their provisioning and scientific preparations. They arrived in Rio de Janeiro on July 15 and remained in the capital city until December and then, separated from the scholars of the Austrian expedition, began to march through the immense land, sampling and searching, from the Tropic of Capricorn to the Equator.

They visited the provinces of São Paulo, Minas Gerais, Goiás, Bahia, Pernambuco, Piauí, and Maranhão, exploring from Pará at the mouth of the Amazon up the shores of this river to the Peruvian border, as well as its great tributaries, the Rio Negro and Rio Madeira, up to the Indian territories. Returning to Pará on April 16, 1820, they arrived back in Munich on December 8, 1820, after an absence of almost four years. The trip covered almost 1,400 geographical miles and, in spite of difficulties and even risks to life, was crowned by unusually good fortune. It remains first among all scientific expeditions to the South American continent, both as to geographical extent, as well as to the volume and importance of the results obtained. With the Brazilian trip, Martius' future was decided and a firm ground laid for his success. Soon after his return he was nominated by the Academy of Sciences as a regular member and was entrusted with the office of second conservator of the botanical garden.

Later Pursuits

A change in his position occurred in the year 1826. After the enthronement of King Ludwig I, the University of Landshut was transferred to Munich and there Martius was appointed botany professor ordinarius in his 32nd year. Six years later, after the pensioning of the elderly Schrank, Martius received the latter's office of first conservator of the botanical institutes, the garden, and the botanical collections. Martius applied himself to his duties as an academic teacher with the same care and the same success as he did to his official affairs. The latter took a great deal of his time, especially after he was chosen secretary for the Mathematical-Physical-Science Class by the Academy of Science in 1840. As part of the duties of this position, he

had the honor to compose a farewell speech for every member of the class who died and the manner in which he did this is admirable. He wrote the most lofty, illuminating, and masterful characterizations of his colleagues, whether from the ranks of his own specialties or scholars from various other disciplines. Martius later gathered these addresses together and published them in 1866 under the title *Akademische Denkreden.* The later addresses he composed about Faraday, Brewster, Flourens, and others appeared in the proceedings of the Academy of Science in 1868.

Otherwise, the whole period of Martius' activity in office showed little change and no exceptional events. His work occupied him so completely that only seldom did he spare himself a break for the pleasure of a long trip to France, Belgium, Holland, England, or Switzerland. From an unexpected event commencing in 1854, Martius' official duties were brought to an untimely end. Even though a more useful alteration plan of the botanical garden had been made with the expenditure of a great amount of time and effort, higher authority approved the construction there of the palace for an industrial exhibition, despite Martius' most forceful remonstrances. Dejected and discouraged, Martius asked for dismissal as professor and garden conservator, which was then granted to him in the most honorable fashion.

But this 60-year-old, still completely vigorous in body and spirit, did not retire to idle ease. On the contrary, he dedicated himself with unbroken effort entirely to his duties for the academy and his own labors. With exceptional industry and considerable monetary expense, he was occupied to the end in enriching and classifying the botanical collections necessary for his work. Thus he had brought together in his home such resources of plants and botanical works as very seldom are found in private possession. His position of class secretary, his worldwide scientific communications, and his numerous personal acquaintances, combined to place upon him the need for an immense correspondence, to which he applied himself with an unusual punctuality. In this he was greatly assisted by his inherent ease and fluency of expression.

Martius' high scientific merits were fittingly recognized. Innumerable works were dedicated to him; many species of plants and animals, even a mountain—Mount Martius in New Zealand—were named after him. Almost every learned society honored him and itself through his enrollment in the count of its members. But the most eloquent expression of high honor from all sides was on the occasion of the celebration of the jubilee marking the 50th year of the granting of his doctorate on March 30, 1864. Fresh in body and spirit, he took part in this celebration. His ceaseless activity caused no noticeable decline in his physically as well as spiritually tough constitution even well into old age. In the autumn of 1868, four years after his jubilee, he visited his son and friends in Berlin and also brought his friend Ehrenberg the latter's honorary diploma from the Munich Academy for his 50th-year doctoral jubilee. However, soon after Martius' return, an illness overcame him and quickly developed into a dangerous pneumonia. After being confined only nine days in bed, he died at 75 years of age, having enjoyed unusually good fortune during his whole life.

His Personal Qualities

In conclusion it may also be mentioned that Martius was an ardent violin player in his earlier years, had written an essay on violin making, and had done research into the most useful form for the instrument and for the properties that the

wood must have, etc. One can often read on Mittenwald violins his saying: "In silvis silui, nunc mortua cano." This versatility of talents that came to light in Martius made him important to more than his own time: his merits as a natural scientist reach into the present with their effects. Like a Cuvier, Jussieu, de Candolle, Robert Brown, and other exceptional minds, he understood how to unite harmoniously in himself the advantages of the learning of the past centuries with that of his own century. Besides classical and universal culture, which were peculiar to the great natural scientists of the former generation, Martius also possessed the more exact knowledge of those disciplines that his contemporaries created or developed further. Specifically, for botany his greatest merit lay in the fortunate bridging between the Linnaean period, in which the beginning of his life span lay, and the later years with their tremendous advances in botanical morphology, anatomy, and physiology, which also provided a deepened conception and a more comprehensive treatment of the vegetable kingdom for taxonomy. Martius contributed to the maintenance of descriptive botany as a viable botanical discipline. One must also give him credit for his fine understanding of how to track down able forces and put them to use in the service of science: A. Braun, H. von Mohl, K. Schimper, O. Sendtner, A. Eichler, and other authorities of botanical science sat at his feet. He possessed as well an eminent teaching ability, which not only made an impression from the lectern but also fascinated his listeners in private company. That beautiful relationship that prevailed between teacher and student came to the fore at the time of the then much-loved Linnaeus festivals. On Linnaeus' birthday, the 24th of May, Martius set out from Munich with his students by boat on the Isar River upstream to the little village of Ebenhausen where, at the Linnaeus oak, a simple meal was eaten, accompanied by speeches, toasts, and poetical outpourings. A friend of poetry, Martius had himself nurtured this facet of intellectual development. He had dedicated several songs to his palms and had published several songs from his larger poem *Suitrams Fahrten* (Suitram's Journeys) in *Charitas*, published by Schenk and Fernau. His spiritual life and his character were also as harmonious as his outward life. Of cheerful temperament, receptive to all that was good and beautiful, friendly and helpful to everyone, and a genuine, noble human being, he placed a living memorial in the hearts of all who knew him.

His Works

With the death of Martius, an outstanding representative of botanical science was gone. The crucial point of his scientific activity lay in his Brazilian trip. What he published before it has already been briefly pointed out. The trip itself opened to him an area of the most fruitful literary activity. Apart from the splendid impressions that the country made on the young, impressionable man, the following half century was not enough to work on the natural history materials that were brought back. Although Brazil had been explored several times before (never in its greater extent), it remained a little-known wonderland. Besides valuable fossils and rock specimens, the natural history specimens consisted of 85 species of mammals, 350 birds, 130 amphibians, 116 fishes, 2,700 insects, 80 each of the arachnids and crustaceans, and of plants about 6,500 kinds. Of the latter, usually several examples of each were carefully preserved and form the best part of the Munich herbarium. Also the botanical garden received a large part of the spoils, partly of the living plants brought back

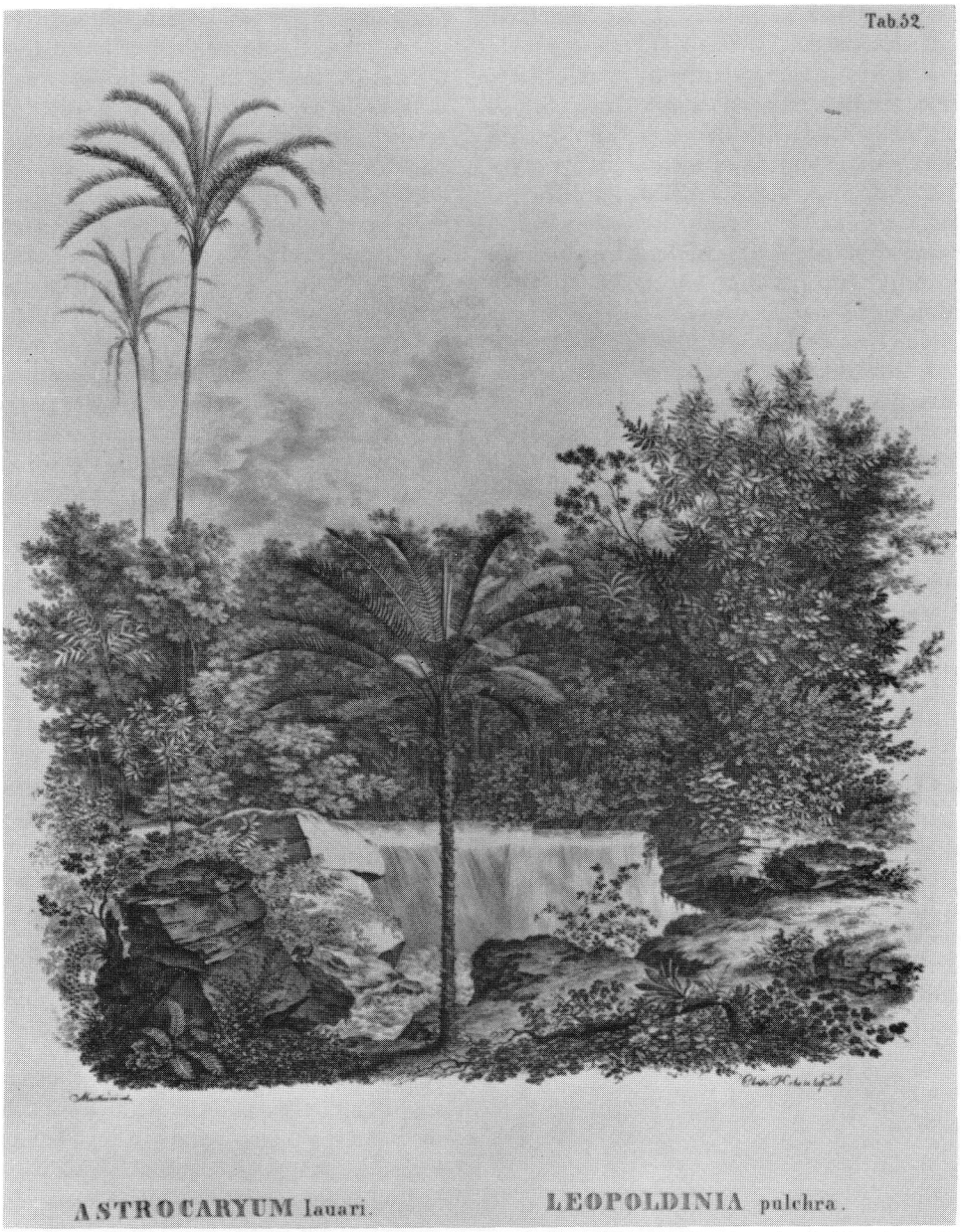
and partly of the plants raised from the gathered seed.

The first great work that was published as a result of the trip was a description of the trip itself, written jointly with Spix, which appeared during the years 1823–30, under the title *Reise in Brazilien auf Befehl S. M. Maximilian Joseph's I. von Baiern von 1817–1820 unternommen* (Journey in Brazil on the order of His Majesty Maximilian Joseph I of Bavaria, undertaken in 1817–1820). Of its three volumes, the last two are almost solely Martius' work, since Spix died in 1826. For a knowledge of Brazil this work is of the same importance as Humboldt's works for the remaining countries of tropical America. Although the real story of the journey's progress is not interrupted by special scientific discussions, which are only added as supplements, the work is so full of geographical, ethnographical, statistical, and natural history materials, that it will be retained for all time as an original source. But it also belongs in the first rank for works on travel, both at home and abroad, because of the perfect style in which it is written, a style which even Goethe repeatedly praised highly. The special work on the Brazilian natural history collection was begun simultaneously with this travel account. From the botanical portions Martius next published an assortment: the phanerogams under the title *Nova genera et species plantarum* . . . in three volumes (1823–32) with 300 colored illustrations; the cryptogams in the *Icones selectae plantarum cryptogamicarum* . . . (1828–34). For the latter work, Hugo von Mohl supplied an excellent treatise about the stem structure of the tree ferns and for the first volume of *Nova genera* Martius had his colleague J. G. Zuccarini as collaborator; everything else is exclusively his own work. Both works contain thorough descriptions, accompanied by exemplary drawings of the whole plants in analytical detail. In part, single plants, characteristic of growth in Brazil, are covered as well as whole ranks and groups of related genera, by which the first ground was firmly laid for a more exact knowledge of the plants being treated. Also the shorter, but precise descriptions of the remaining plants, which total over 400 species in more than 70 genera, contain much important information about the hereditary, geographical, medicinal, and technical relationships. This information attests to a broad knowledge of the pertinent literature, but also to a gift for observation and critical discernment on the part of the author. The artistic handling of the illustrations stands forth as unique and peerless.

Historia Naturalis Palmarum

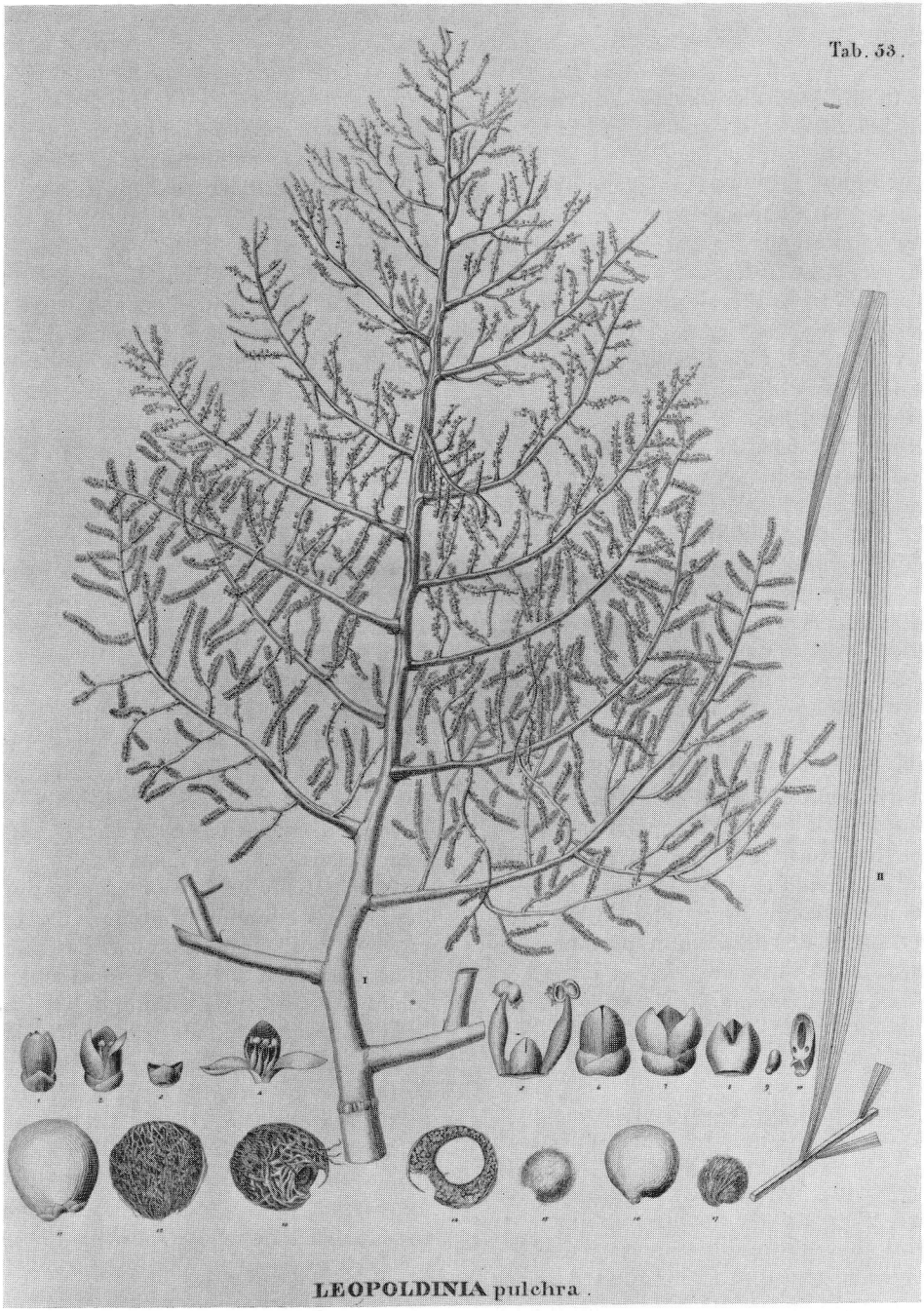
Martius began yet a third work simultaneously with his travel account. It is the work that can be called in every respect his "magnum opus," since it brought him renown all over the world. It is the three-volume *Historia naturalis palmarum* (1823–53), which was accompanied early on by a slim volume entitled *Palmarum familia ejusque genera denuo illustrata* (1824).

It appears that Martius' long sojourn in a land of palms awakened in him the desire to make the natural history of this noble model of the plant kingdom the subject of his special scientific endeavors. For this purpose he studied on the one hand the many living kinds of palms during his trip and collected a rich harvest of specimens for further research. On the other hand, he searched on his return for the palms from other parts of the world, even the prehistoric fossils, so as to bring together the groups in their entirety, as far as possible, for the purpose of studying them in exacting detail. His persistent effort produced a mono-



1. Plate 52 from the second volume of *Historia naturalis palmarum* showing the habit of *Astrocaryum jauari* and *Leopoldinia pulchra*.

graph of epoch-making importance. Its worth was such that it extended beyond the subject treated into other areas of botany, in teaching, in stimulating, and in enlightening. Alexander von Humboldt was right in saying "So lange man Palmen nennt und Palmen kennt, wird auch der Name Martius mit Ruhm ge-



2. Plate 53 from the second volume of *Historia naturalis palmarum* with details of leaf, inflorescence, flowers, and fruit of *Leopoldinia pulchra*.

nannt werden." ("As long as man mentions palms and knows palms, the name of Martius will be quoted with glory.") In the first volume, which appeared after the second, Martius was assisted in those areas less familiar to him, namely the anatomical and paleontological aspects. Hugo von Mohl furnished the anatomy in a highly important chapter while Franz Unger undertook the treatment of fossil palms and A. Braun and O. Sendtner contributed a part of the morphology. But by far the most methodical and comprehensive work is Martius' own, which comprises a monograph on the Brazilian palms in the second volume and the taxonomy of the whole palm family in the third. Herein are contained the results of the differentiations based on morphological research, the classification analyses, as well as the special descriptions of the genera and species along with numerous basic discussions about history and distribution, as well as technical, medicinal, and cultural-historical references for the palms covered. But on the other hand, the chapter by Martius covering the geographical relationships for the entire palm family in the first part is of special importance because here the author's universal ideas on palm geography are laid down. Concerning the artistic merit of the drawings, Goethe passed gracious judgment, which he bestowed in a review in his *Bildung und Umbildung organischer Naturen.*

Flora Brasiliensis

Even while the works referred to were originating and going forward, Martius had taken up yet another, an immense work that occupied him to the end of his days and aimed at nothing less than the systematic enumeration and description of the entire flora of Brazil. At the beginning of his 30th year, in collaboration with Chr. G. Nees von Esenbeck, he had already started on this in a smaller way by publishing *Flora Brasiliensis seu enumeratio plantarum in Brasilia . . . provenientium. . . .* Of the two volumes, the first one, covering algae, lichens, and liverworts, was authored jointly by Martius, Eschweiler, and Nees von Esenbeck, the second one covering the Brazilian grasses, by C. G. Nees von Esenbeck alone. But this form of treatment was abandoned by Martius as inadequate. At the initiative of Prince Metternich and in alliance with Stephan Endlicher, a by far more grandiose plan was drawn up which also enjoyed the active support of Kaiser Ferdinand I of Austria and King Ludwig I of Bavaria. The *Flora Brasiliensis* undertook the challenge to describe in detail and illustrate the entire flora of that land based on all plants collected from Brazil and available to scientists. The one exception was to be the lower cryptogams.

Naturally the solution to this task could only be possible by the union of a great number of scholars. These men had the task of preparing, in Latin, separate monographs on the families of plants chosen and based on certain common criteria for the handling of the plant material. These monographs were then to be bound into volumes in the order of natural, taxonomical classification. Martius had the luck to acquire a group of the most outstanding botanists, both from home and abroad, to take part in the work, of which just a few such as Hornschuch, Nees von Esenbeck, Grisebach, Hanstein, Miguel, and Tulasne will be named here. So under the nevertiring, energetic direction of its editor, the work grew, under the title *Flora Brasiliensis, sive enumeratio plantarum in Brasilia hactenus detectarum. . . .*, into a magnificent production, one that in range and thoroughness finds no peer in the botanical literature of any nation.

From 1840 on, the first issues followed

one after the other with comparative rapidity and when in 1852 Emperor Dom Pedro II of Brazil turned his liberal support to the undertaking, it took on an even stronger upswing. The retirement of Martius soon thereafter made it possible for him to dedicate all his efforts to the work. In 1848, after the death of the first co-editor, Endlicher, Eduard Fenzl took his predecessor's place and in 1861 A. W. Eichler was called upon as assistant in editing and as permanent collaborator with Martius. The monographs, for which at first only the resources of the Vienna and Munich state herbaria and the private collection of Martius were available, were enlarged as little by little greater resources were added. The collections of the Berlin herbarium, the St. Petersburg botanical garden, and the great private herbaria of Alphonse de Candolle, Count Franqueville, Boissier, as well as many smaller herbaria, became available. In individual cases the museums at Kew and Paris could also be used, so that, in time, everything in the way of plants that had been brought from Brazil to Europe was worked into *Flora Brasiliensis*. Because of this it was often necessary for later workers to step over the political boundaries of Brazil and include plants from neighboring regions into the framework of the literary undertaking; in this way the importance of the work for a knowledge of the South American plant world was considerably raised.

The systematic arrangement and description in the *Flora Brasiliensis* is the usual one for larger, descriptive works. Throughout the descriptive parts is a chapter on geographical distribution, and where appropriate, a chapter on the medicinal, technical, commercial, and economic uses of the plants is added. In this regard, Martius himself had prepared many contributions, which were interpolated into the monographs. The Anonaceae and Agavaceae families he treated himself. Also a special supplement volume of "tabulae physiognomicae," a group of original landscapes with characteristic vegetation, sketched at the original locations, was included, with a descriptive text in the most elegant Latin. Finally the work contains two maps, of which the first shows the most important botanical journeys in Brazil and neighboring countries and the second the different geobotanical regions, which, according to Martius, can be distinguished in Brazil. So up to 1869, in 46 parts of *Flora Brasiliensis*, more than 8,000 species in almost 850 genera were treated, of which about 1,400 species were pictured on 1,071 lithographic plates. Of the "tabulae physiognomicae," 55 appeared.

Then Martius died. It had been one of his last concerns that the uninterrupted progress of the monumental undertaking be provided for. His successor in the editorship was A. W. Eichler, professor of botany and director of the botanical garden in Berlin. And so the work went on. By 1882, 109 families, which represent over 10,000 species, had been treated in 91 fascicles, and the final work of 15 volumes (in 40) in 130 fascicles was completed in 1906. To the earlier materials at the disposal of the workers, others were added by botanists Hooker, Oliver, and Warming, and many of the best known representatives of botanical science, such as Baker, Bennett, Warming, Eichler, Engler, Rohrbach, Kanitz, Solms-Laubach, Peyritsch, and others joined the circle of workers.

An eternal monument to the name Martius is erected in the *Flora Brasiliensis*. The fundamental importance of the work lies essentially in the following: all at once it opened up a knowledge of the plant world of nearly all of tropical America. This was done by the range of the geobotanical regions covered as well

as by the completeness of the exhaustive treatment and the great number of drawings, which are without parallel. Also, there is a treasure in the masterful monographs that, in morphological and phytographical hindsight, was epoch-making for plant taxonomy in other areas of botanical science. Indeed, the monographs were written by men who dedicated their whole lives to the study of the family groups.

In close connection with the main work just covered, Martius published yet one more: *Herbarium florae Brasiliensis*. In the specially printed supplements to the Regensburger Flora (1837), there appeared in 1837–40 a catalog to an herbarium collection brought together in Brazil. It was a critical work, with numerous diagnoses and literary references, and was prefaced by an excellent review of all the organized botanical explorations to Brazil up to that time and the nature of the distinguishable geobotanical regions there. In addition, *Systema materiae medicae vegetabilis Brasiliensis* appeared in 1843, a systematic enumeration of the plants that the people of Brazil use for medicinal purposes, with reference to their preparation, application, and results. Of similar content was *Specimen materiae medicae Brasiliensis*, appearing in 1824 in the ninth volume of the memoirs of the Munich Academy, as well as a number of essays in Buchner's *Repertorium der Pharmacie*. There was also a special offprint, appearing in 1831, of *Die Pflanzen und Thiere des tropischen Amerika's* (The Plants and Animals of Tropical America). The fine address *Die Physiognomie des Pflanzenreiches in Brazilien* (The Physiognomy of the Vegetable Kingdom in Brazil), (Records of the Bavarian Academy of Sciences, 1824) is of exclusive botanical nature. But Martius pursued more than natural history interests in Brazil. Being a naturalist in the broadest sense, wherever he ran across new and important phenomena in the diverse provinces, he had studied them with zeal and so he made many valuable contributions to the geography, ethnography, and linguistic understanding of Brazil. The most important evidence is a two-volume work completed in the last year of his life: *Beiträge zur Ethnographie und Sprachenkunde Amerika's* (Contributions to the Ethnography and Linguistics of America). He treated similar areas in gifted fashion in the writings *Abhundlungen über den Rechtszustand der Ureinwohner Brasiliens* (Essays on the Civil Condition of the Natives of Brazil); *Über Pflanzen- und Thiernamen der Tupisprache* (On Plant and Animal Names in the Tupi Language); *Über das Naturell, die Krankheiten, das Arzthum und die heilmittel der Ureinwohner Brasiliens* (The Disposition, Diseases, Medical Practice and Remedies of the Natives of Brazil); *Über Vergangenheit und Zukunft der amerikanischen Menschheit* (Of the Past and the Future of American Mankind). Finally, *Versuch eines Commentars über die Pflanzen in den Werken von Marcgrav und Piso* (Attempt at a Commentary on the Plants in the Works of Marcgrav and Piso) in Proceedings of the Bavarian Academy of Sciences, volume 7, 1853, belongs in this category. Marcgrav and Piso had published in 1648 a "historia naturalis Brasiliae," of special accuracy and truth, whose numerous wood engravings, as well as the original oils on paper, painted by Marcgrav, had passed into the possession of the Berlin royal library. Through the latter, Martius obtained a collection of copies of these pictures, which he used as a basis for the named work.

Other Botanical Writings

If Brazil was the land in which the roots of his literary power lay, Martius

also produced a large number of works that do not especially relate to that country. Of the great number of other works of botanical content, the following monographs may be mentioned: *Beitrag zur Kenntniss der natürlichen Familie der Amarantaceae* (Contribution to a Knowledge of the Amaranthaceae Family), (Proceedings of the Academy Leop. Carol., Vol. XIV, 1825); *Die Eriocauleen als selbständige Pflanzenfamilie aufgestellt und erläutert* (The Pipeworts Proposed and Explained as an Independent Family), (*ibid.*, Vol. XVII, 1833.); *Beiträge zur Kenntniss der Gattung Erythroxylon* (Contributions to a Knowledge of the Genus *Erythroxylon*), (Proceedings of the Bavarian Academy of Sciences, Vol. III, 1840.). The short essay *Conspectus regni vegetabilis*, which Martius used as a textbook for his lectures and in which he developed a new plant taxonomy based mainly on structure and growth relationships of the seed buds (ovaries), appeared in 1835 and merits special mention. It was meant to blend the organic classification of natural taxonomy together with the keenness and certainty of the artificial. But the system did not spread later on. A *Syllabus praelectionum de botanica pharmaceutico-medica*, appearing in 1852, also served didactic purposes.

Martius' everyday activity as director of the botanical garden produced several noteworthy essays. In the *Hortus botanicus Regiae Academicae Monacensis* (1825), apart from an explanation of the climatological and geological relationships of the Munich area, there appeared a history of the garden, an enumeration of the plants outdoors and those in the conservatories, and in conclusion, a description of the profitable uses of the plants. A *Wegweiser für die Besucher des Königlichen botanischen Gartens in München* (A Guide for Visitors of the Royal Botanical Garden in Munich) appeared first in 1852, two years before his resignation. At any rate, Martius gave great care to the botanical garden. It was kept in excellent condition in spite of a very small yearly budget and contained a collection of living plants from almost all families of the plant kingdom. It was hardly surpassed by any similar establishment. The new plant species, raised from seed sent in, were described and these accounts published either in *Amoenitates botanicae Monacenses* (1829–31), or together with P. von Schranck in *Hortus regius Monacensis* (1829).

His interest in horticulture and efficient agriculture was documented by his activity in the horticultural society in Munich, for which he served as chairman until his death. Several of his lectures appeared in the annual reports of this organization, of which the *Vorträge über die Florenreiche* (Lectures on the Vegetable Kingdom) are particularly noteworthy. Also the potato disease occupied him thoroughly. He published an essay about it in 1842 in the Proceedings of the Bavarian Academy of Sciences: *Die Kartoffel-Epidemie der letzten Jahre, oder die Stockfäule und Räude der Kartoffeln* (The Potato Epidemic of Recent Years, or the Vine Stock Blight and Scab of the Potato) and in 1845 in the bulletin of the farmer's association in Bavaria: *Sendschreiben über die Kartoffelkrankheit* (Open Letter about the Potato Disease). Martius was the first one who observed a microscopic fungus in the sick tubers, which he called *Fusisporium solani*; he derived the epidemic-like spread of the disease by the transmission of the spores of this fungus to healthy plants.

Finally, it has already been stressed that Martius cultivated philological studies as one favorite and in his writings was a master of discourse, in German as well as Latin. In the historical-philologi-

cal area there is a small essay *Quaedam de priscorum epistolis in Bibliotheca Universitatis Erlangensis asservatis*, that appeared in 1845 on the occasion of the jubilee of David Heinrich Hoppe.

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PALM RESEARCH

Claude I. Barrant, Research Dept., Coconut Industry Board, Kingston, Jamaica, is carrying out long-term research on nutritional requirements, spacing, weed control and intercropping of *Cocos nucifera*. Main varieties are 'Malayan Dwarf' and a locally developed hybrid 'Maypan.'

Basil O. Been, Research Dept., Coconut Industry Board, Kingston, Jamaica, is testing imported and local varieties of *Cocos nucifera* for lethal-yellowing resistance, and developing hybrids with lethal-yellow resistance, large nuts and good yields. Methods of pollen collection, storage and application are also being investigated.

Andrew J. Dabek, U.K. Overseas Development Ministry, Coconut Industry Board, Kingston, Jamaica, is currently engaged in attempts to identify insect vector(s) of coconut lethal-yellowing disease.

Simon J. Eden-Green, U.K. Overseas Development Ministry, Coconut Industry Board, Kingston, Jamaica, is attempting to isolate mycoplasmalike organisms from lethal-yellowing-diseased coconut palms and transmit them to healthy palms.

Audley L. Gowdie, Coconut Industry Board, Kingston, Jamaica, heads a coconut advisory division with links with several thousand farmers.

David H. Romney, Research Dept., Coconut Industry Board, Kingston, Jamaica, is operating a foliar analysis laboratory for deficiency diagnosis in *Cocos nucifera*: he is also comparing varieties and hybrids in terms of copra out-turn and oil content.

Henry Waters, U.K. Overseas Development Ministry, Coconut Industry Board, Kingston, Jamaica, operates an electron microscope laboratory in the study of the cause and transmission of coconut lethal yellowing. He is mapping the frequency distribution of mycoplasmalike organisms in the palm and studying the three-dimensional shape of the MLO.

Tom Wilson, Coconut Industry Board, Kingston, Jamaica, supervises coconut seed and seedling production in Jamaica, comprising some 150,000 'Maypan' hybrid seed and 800,000 selected 'Malayan Dwarf' seed per annum.

Principes, 23(4), 1979, pp. 171–172

Zinc Deficiency Symptoms of Chrysalidocarpus lutescens

R. B. MARLATT AND J. J. MCRITCHIE

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Chrysalidocarpus lutescens H. Wendl. is grown in large quantities by the nursery industry for use as an indoor foliage plant. The palm is ideal for this purpose, partly because it tolerates low light intensity and low humidity. Leaves of these plants occasionally appear abnormal but no disease-causing organisms have been associated with the problem. Palms can be so seriously affected that they are unsalable.

Twenty-four plants were grown hydroponically in order to determine whether or not the abnormal appearance was the result of faulty mineral nutrition. The experiment was conducted in a greenhouse covered with plastic shadecloth which limited sunlight to approximately 1000 foot candles at bench level. Temperatures ranged from 24 to 32° with infrequent extremes of 21 and 38°C.

A growing medium, free of contaminating minerals, was prepared by mixing equal volumes of perlite and silica sand. The medium was put into well-drained plastic pots and washed with distilled water, rinsed twice with 2% hydrochloric acid to remove acid-soluble contaminants and rinsed another five times with distilled water.

Three modified Hoagland and Arnon's (1) nutrient solutions were prepared to furnish plant nutrients. No zinc was added to one solution, ten times the recommended amount was put into the second and the usual complete nutrient solution was used as a control. The plants were irrigated with the solutions weekly and with six liters of distilled water every three months to remove accumulated salts. Methods were similar to those reported in 1970 and 1978 (2, 3).

Plants that received the generally recommended amounts of zinc and ten times that amount appeared normal at the end of the experiment. Plants irrigated with the solution to which no zinc was added grew slowly and developed uniformly yellowish, extremely undersized leaves with very short pinnae. The latter were closely spaced on the rachis (Fig. 1).

The experiment revealed that symptoms of zinc deficiency in *Chrysalidocarpus lutescens* can seriously detract from the plant's appearance and marketability.

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1. Zinc deficiency of *Chrysalidocarpus lutescens* showing stunted leaf with short, crowded pinnae.

Principes, 23(4), 1979, pp. 173–174

PALM PORTRAIT

1. *Veillonia alba* in flower at about 500 m elevation on Mount Panié, New Caledonia.

Veillonia alba

A white-waxy bloom on bracts of the inflorescence and often the leaf sheath as well as the upper part of the trunk accounts for the epithet *alba* (white) used for this New Caledonian palm. The generic name (pronounced *vey óh nee a*) honors M. Jean-Marie Veillon of O. R. S. T. O. M. and the Service des Eaux et Forêts in Nouméa, who has accompanied me on many expeditions on the island and in whose company the type specimen was collected.

Veillonia alba H. E. Moore has single stems that reach a height of about 7 m (over 20 ft) and a diameter of 12 cm (about 5 in). They are green or gray-brown but, as noted, are often whitish on new growth. The tubular leaf sheaths form a whitish crownshaft that is usually overlain with a coat of brown or red-brown, woolly scales. Leaf blades are gracefully spreading, bearing between 40 and 50 pinnae on each side.

The inflorescence, which is always borne beneath the crownshaft, is much branched and when in flower (see Fig. 1) is creamy-white, covered with small creamy-white flowers. These are replaced in time by ovoid fruits about 16 mm (⅝ in) long that are noteworthy for the minute papillae roughening the exterior. The color of the inflorescence changes from white to green as fruits mature and the fruits are probably reddish when ripe. Seeds are unusual in being crested, ridged, and sculptured, and were introduced into cultivation in 1976 and perhaps earlier, before the species had a name.

I first saw *Veillonia alba* during a visit to New Caledonia in April 1964 on the road from Balade to Parari at an elevation of about 350 m (1,150 ft), where it grew with *Burretiokentia hapala* (see *Principes* 23: 95), and at Colnett near sea level. In both instances, only flowers were seen and it was confused with another genus, *Cyphosperma*. Subsequent visits in 1971 and 1972 provided more complete collections as well as an understanding of *Cyphosperma* and in 1978 *Veillonia* was finally described (*Gentes Herbarum* 11: 299). There is only one species in the genus, which is now known to occur in several localities in northeastern New Caledonia and is cultivated at Tao in the yard of the Henwood home next to the road along the coast. It is certainly among the most attractive of New Caledonian palms and well deserves a place in cultivation.

H. E. Moore, Jr.

Principes, 23(4), 1979, pp. 174–175

PALM BRIEFS

Ptychosperma hosinoi growing in Hawaii

On a recent visit to the Lyon Arboretum in Honolulu, Hawaii, I noticed that several young palms, labeled as *Ptychosperma ledermannianum*, were blooming, apparently for the first time. I recognized immediately that these palms were *Ptychosperma hosinoi* rather than *P. ledermanninaum*. It is not surprising that these two species have been confused, for they both come from the tiny island of Ponape, in the Caroline Islands.

The distinction between the two species is as follows: *Ptychosperma ledermannianum* has inflorescences 60–80 cm long and 100 cm broad, with 4–5 orders of branching and numerous short rachillae, each bearing only 4–10 flower clusters. The inflorescence axes are very pale and quite glabrous. *Ptychosperma hosinoi* has inflorescences 60 cm long

and 50 cm broad with up to 4 orders of branching and relatively fewer rachillae, each bearing 18–30 flower clusters. The inflorescence axes in this species are moderately to densely dark brown lepidote-tomentose. In addition, the fruits of *P. ledermannianum* are somewhat larger than those of *P. hosinoi* (36–44 mm long, as opposed to 28–32 mm long).

Ptychosperma hosinoi is also growing at Fairchild Tropical Garden, but I now know of no *P. ledermannianum* in cultivation.

REFERENCE

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1. *Ptychosperma hosinoi* growing at the Lyon Arboretum, Honolulu, Hawaii. Habit (left); closeup of inflorescence (right).

NEWS OF THE SOCIETY

News from Australia

The following notice was received from Nicholas Heath, Convenor, Sydney, Australia and will interest those who may be in geographical proximity, as well as inspire other members to follow suit:

"On 19th June 22 people were present for the inaugural meeting of The N.S.W.

Chapter of The Palm Society at the Education Centre at the Royal Botanic Gardens, Sydney. It is likely that more would have been present were it not for very heavy rain and the petrol shortage. Nevertheless there was plenty to discuss as many of us met one another for the first time. Potted specimens of considerable interest were exhibited by Lou Forrest from the Gardens' collection, by Dr. Ian Daly, Bruce Boddington, the writer, and others. Comments were made on them and interesting slides from Don Ellison, Lyn Stewart, Rick Budd, and the writer were shown.

"The meeting decided to gather every second month, probably the third Tuesday, but final details were left in the hands of Nicholas Heath (Convenor), Tony Rodd (Treasurer) and Brian Preston. Whilst most of those present were members of The Palm Society, it was decided that nonmembers will be equally welcome and those known to be interested are to be advised of future events. The cost of mailing notices and of refreshments is to be met by a levy on those attending, set at $2.00 on the first occasion. Tony Rodd has indicated that a smaller levy may be sufficient next time as he has retained a small stock of supplies and funds from 22nd of June."

We were happy to get the above news and to hear also that they had a mild winter in Sydney, a great blessing to local members. We wish the new group well and shall be interested to hear about further meetings.

News from California

A pat on the back is always appreciated, so we think this is a nice one for our Editor and for the society too. It is from Jim Mintken of Pepperwood Plant Services: "I have been on the look-out for the several years I have been a member of The Palm Society for books on palms. Although I have several, I finally came to the obvious realization that in totality, PRINCIPES is the finest source of information I can ever hope for, so will really look forward to completing the series. I have 75 varieties of palms now and you might say that I am thoroughly addicted to the pleasures and the hobby of growing and knowing palms." Jim lives in Forestville, California.

From Frank Ketchum, Secretary, come the following reports: In May, the Southern California Chapter met at the Los Angeles County Arboretum, Co-Chairman Doug Hughes presiding. Despite the gas shortage, hot weather, and the Mother's Day holiday, approximately 65 people attended. Members brought their own lunches, then a Mother's Day cake provided by Georgie Hughes was served. After a short business meeting members sold their excess plants. Highlight of the day was a talk by Ken Foster on the joys of growing palms. Ken's slides on his method of growing palms and his various trips were greatly enjoyed. The day ended with a raffle of many wonderful prizes donated by members and business friends, including a seed germinating box, gardening tools, plants, and fertilizers.

For the July Meeting of the Southern California members gathered on the grounds of the Santa Barbara Court House where they ate their lunches and admired the many mature palms. Co-Chairman Howard Gillett conducted the meeting at the Recreation Center with 48 people present. The program, given by Bud Shenkel and Frank McIntosh of Deigaard Nursery, detailed the commercial growing of Kentia palms (*Howea forsterana*). Attending the meeting was vacationing member Michel Guerin, Director of the Tahiti Botanical Garden, who was introduced as were several new members. Those wishing to visit with

Michel were invited to stop by Pauleen Sullivan's house after the meeting. A raffle of dozens of choice palms brought the meeting to a close.

On July 21st and 22nd the Chapter entered a beautiful display at the Fern and Tropical Plant Show held at the Los Angeles Arboretum. Among the speakers, Ralph Velez gave a talk on "Growing Palms." The grand prize at the drawing was a greenhouse, won by Palm Society member Louis Hooper.

News from Florida

There have been no recent meetings of the South Florida members due to unforeseen complications. However, there will be a Palm Sale and Show at Fairchild Tropical Garden on November 3 and 4, 1979, from 10 to 4:30. This sale is in lieu of those previously held by the West Palm Beach members for the past several years, and the much smaller ones held by the local Dade County members. It seems particularly appropriate that this event be held at Fairchild Tropical Garden which has the largest palm collection in the continental U.S., if not the world, with some 500 species of palms represented.

TEDDIE BUHLER

LETTERS

Mr. D. Padmanabhan
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Dear Sir,

In *Principes* 22(4) you published an article on the "Tuberous seedlings of *Borassus flabellifer*" that I read with with much interest and abstracted for *Abstracts on Tropical Agriculture.*

You mentioned a planting density of 1,000 palms per acre with an expected production per palm of 200–300 fruits per year, resulting in a potential starch yield of 18,000–27,000 kg per acre. I am wondering about that statement, because I know from experience that other palm species will not fruit at all even in densities of less than 1,000 per acre. In view of the size of *Borassus flabellifer*, I doubt whether a production of 200–300 fruits per palm can be obtained even with 100 palms per acre in view of competition for light, water, and nutrients. This will reduce the suggested starch yield to 1,800–2,700 kg per acre. Densities of over 60 oil palms per acre or over 80 coconut palms per acre result in reduced fruit yield per acre. Yields of *Bactris gasipaes* in a planting density of 880 palms per acre are nil, although this species is much less robust than *Borassus flabellifer.* I am very interested in any experimental evidence of palms fruiting well in high density plantings as this is contrary to existing experimental observations.

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The Editor

I received Dr. Blaak's letter a few months back and have written to him about our experience in this part of the world. The calculations given in our paper are based on density of the palms growing at a site near Rajapalayam, Ramnad District, Tamil Nadu State, India. I have set one of my students to sample the palm density in several parts of this district famous for the palmyra trees. The average density works out to the number 1,000 or 800 per acre. However, the methods of planting are quite different and interesting. In fact, I am planning to publish a paper on this

unique planting method adopted in this part of the state with numerical data and photographs. At this stage, I would like to wait for sometime more before concluding on the fantastic yield of the palm. However, the yield is over a prolonged period of a year unlike other crops that are of a considerably shorter duration. The tropics are presenting a number of interesting phenomena and we need more data to fully appreciate their potentialities.

D. Padmanabhan

RESEARCH NOTES

Palm Tissue Culture Update

Two additional publications on the tissue culture of palms have come to our attention since we submitted our note on that subject which appeared in the last issue of PRINCIPES (vol. 23, pp. 128–131).

REYNOLDS, J. F., AND T. MURASHIGE. 1979. Asexual embryogenesis in callus cultures of palms. In Vitro 15: 383–387.

Callus was induced in very young ovule sections containing immature embryos when placed on a high auxin medium. Callus cultures of *Phoenix dactylifera*, *Howea forsterana*, and *Chamaedorea costaricana* placed on auxin-free medium produced numerous embryos.

GUZMAN, E. V. DE, A. G. DEL ROSARIO, AND E. M. UBALDE. 1978. Proliferative growths and organogenesis in coconut embryo and tissue cultures. Philippine J. Coconut Studies 3: 1–10.

Mature embryos were grown on auxin containing media with variations in the levels of potassium, calcium, and dextrose. High sugar concentration was especially effective in producing callus from the cotyledonary sheath which could be subcultured. No true embryos have been obtained from these cultures to date, although rootlets and "protocorm"-like bodies were produced.

JACK B. FISHER AND JAMES H. TSAI

Oil Palm Research

CORLEY, R. H. V., J. J. HARDON AND B. J. WOOD (eds.) Oil Palm Research. 532 pp. Elsevier, Amsterdam. 1976.

New publications on the commercial cultivation of palms are dominated today by studies of the oil palm. The current research effort devoted to this palm is impressive, for this book includes contributions by 23 scientists who are each specialists in some facet of oil palm cultivation. The three coeditors themselves are specialists and contributors to the volume.

The book is organized into eight major sections; namely, biology, breeding, mineral nutrition, agronomy, pests, diseases, technology, and a conclusion. Thirty-five chapters give balanced treatment to these subjects. The emphasis of each chapter is on recent research, taking into account unpublished results, and references as recent as 1976 are included. A major strength of the book is its global scope, for it gives good coverage of all regions of oil palm cultivation, including Latin America where the oil palm is still of only minor importance.

As stated in the preface, the objective of the book is to provide a critical and comprehensive review of research results to supply people in the field with background information on oil palm research. The editors have achieved their objective very successfully and produced a benchmark study.

Even more recent information on the oil palm, and palm oil, is to be found in D. A. Earp and W. Newall (eds.) *Inter-*

national Developments in Oil Palm. 804 pp. 1977; and D. A. Earp and W. Newall (eds.) *International Developments in Palm Oil.* 537 pp. 1977. Both were published by The Incorporated Society of Planters, Kuala Lumpur, Malaysia and represent the proceedings of symposia held in Kuala Lumpur in June 1976.

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WHAT'S IN A NAME?

Clinosperma (klý no spér ma) apparently was derived from the Latinization of the Greek word *klinein* (to slant, slope) and *sperma* (seed), perhaps because the seed was inserted obliquely in the endocarp of the immature material seen by Beccari. The latter, however, failed to explain the generic name.

Diplothemium (díp low théme ee um) combines the prefix *diplo-* from the Greek *diploos* (twofold) and *themium*, probably derived from the Greek *themon* (heap) in reference to the two-tiered effect produced by the pedicellate staminate flowers that appear to be superimposed on the sessile pistillate flowers between them.

Itaya (i tíe a) is the name of a river in Peru, tributary to the Amazon, near which the genus was discovered. It was taken directly as a generic name.

Socratea (so krát ee a) was not explained by Hermann Karsten, who proposed it, but seems surely derived from the name of the great Athenian philosopher Socrates (ca. 470 B.C.–399 B.C.).

Wendlandiella (wén dlan dee éll a, or vén dlan dee éll a) commemorates Hermann Wendland (1825–1903), a German botanist and horticulturist who was the third generation in a family of gardeners to the court of Hannover. Wendland collected in Costa Rica and described many palms from his own collections and from material cultivated in Europe. The suffix *-ella*, originally a diminutive, distinguishes this genus from one named for his grandfather, J. C. Wendland (1755–1828).

Wissmannia (wiss mán ee a, or viss mán ee a) pays tribute to Hermann von Wissman (1895–), a German geographer and traveler, upon whose photographs in the Hadramaut of southern Arabia Burret based the genus. Among his several books, von Wissman wrote (with D. van der Meulen) *Hadramaut: Some of its Mysteries Unveiled* (1932).

H. E. MOORE, JR.

PALM LITERATURE

ARNOLD, A. J. AND H. C. HARRIES. 1979. Hybrid coconut seed production: a review of equipment and techniques. World Crops 31: 12–13, 16, fig. 1–4.

New equipment for drying quantities of flowers to obtain pollen suggests modification of other aspects of hybridization programs.

COOPER-DRIVER, G. A. AND M. J. BALICK. 1978. Effects of field preservation on the flavonoid content of *Jessenia bataua.* Botanical Museum Leaflets 26: 257–264.

Flavonoid chemistry of palm leaves is least modified when material is dried in the sun or herbarium. When alcohol, formalin, or FAA are used in the field, 10–50 grams of leaf should be dried naturally for chemical analysis.

FISHER, J. B. 1978. A quantitative description of shoot development in three rattan palms. Malaysian Forester 41: 280–293.

FOURNET, JACQUES. 1978. Flore Illustré des Phanérogames de Guadeloupeu

et de Martinique. 1654 pp. Institut National de la Recherche Agronomique, Paris.

This work deals with both indigenous and cultivated palms of the two islands mentioned, a total of 35 genera and 56 species. The nomenclature, unfortunately, has not been brought up to date in several genera.

GRANVILLE, JEAN-JACQUES DE. 1977. Notes biologiques sur quelques palmier guyanais. Cahiers O.R.S.T.O.M., sér Biol., 12: 347–353.

Branching in several undergrowth palms is considered together with a description of humus collection by leaf funnels in *Astrocaryum* and a study of late production of juvenile leaves in *Syagrus inajai.*

HARRIES, H. C. 1979. The evolution, dissemination and classification of *Cocos nucifera* L. Botanical Review 44: 265–319.

Mr. Harries suggests that large-fruited, thick husked, slow-germinating coconuts of the sort found on Palmyra Atoll in the Pacific Ocean and the Seychelles in the Indian Ocean (the 'Niu Kafa' type) reached Southeast Asia by natural means. There, humans selected for a shorter, less angular, almost spherical fruit with thinner husk and more endosperm that germinates more quickly and requires man's care—a cultivated or 'Niu Vai' type. The last was disseminated widely by man in the Pacific and hybridized with the 'Niu Kafa' type. A center of origin for the coconut and a means of classifying coconuts on the basis of fruit component analysis are suggested.

LETOUZEY, R. 1978. Notes phytogéographiques sur les palmiers du Cameroun. Adansonia, ser. 2, 18: 293–325.

The paper attempts to present the actual state of knowledge of the morphology, and geography of palms of the Cameroun in West Africa. Distributions are mapped and many species are illustrated in their native habitats.

LI, HUI-LIN. 1978. Palmae. *In* Flora of Taiwan 5: 784–794; *pl. 1521–1525.* Epoch Publishing Co., Taipei.

Palms indigenous to Taiwan are described and illustrated and the more commonly cultivated species are listed.

LUCAS, G. AND H. SYNGE. 1978. The IUCN Plant Red Data Book. IUCN, Morges, Switzerland. Paperbound. U.S. $20.00 or £10. [TPC, c/o The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, England.]

Detailed case histories are provided for 250 threatened plant species which include 23 palms. Of these, 12 are considered endangered (*Areca concinna, Burretiokentia hapala, Calyptronoma rivalis, Ceratolobus glaucescens, Cyphophoenix nucele, Medemia argun, Neoveitchia storckii, Pelagodoxa henryana, Pritchardia macrocarpa, P. munroi, Pseudophoenix ekmanii, Roystonea elata*), 7 are considered vulnerable (*Caryota no, Johannesteijsmannia altifrons, Lodoicea maldivica, Maxburretia rupicola, Phoenix theophrasti, Rhapidophyllum hystrix, Wissmannia carinensis*), and 4 are considered rare (*Juania australis, Jubaeopsis caffra, Livistona mariae, Nenga gajah*). *Pritchardia macrocarpa* is extinct in the wild state, *P. munroi* is known only from a single individual, and *Pseudophoenix ekmanii* may also be extinct.

MANOKARAN, N. 1978. Germination of fresh seeds of Malaysian rattans. Malaysian Forester 41: 319–324.

Percentages and rates of germination were studied for 12 species of *Calamus*, 3 of *Korthalsia*, and 1 of *Ceratolobus*, *Myrialepis*, and *Plectocomiopsis*. Variation in germination was found not only within genera but between different samples of the same species; the period for 50 percent germination varied from a low of five weeks to a high of 43 weeks.

MOORE, JR., H. E. 1979. Arecaceae. In A. C. Smith, Flora Vitiensis Nova 1: 392–438; fig. 13, 28, 81–86.

Keys to the 10 indigenous genera and 21–22 indigenous species as well as 17 genera and 23 species of introduced palms are provided, together with descriptions of the genera, brief specific descriptions, and accessory information about types, vernacular names, uses, and distribution. The indigenous genera—*Pritchardia*, *Metroxylon*, *Calamus*, *Veitchia*, *Balaka*, *Neoveitchia*, *Clinostigma*, *Cyphosperma*, *Physokentia*, *Goniocladus*—are treated in somewhat greater detail than the remainder.

PIÑERO, D., J. SARUKHÁN, AND E. GONZALEZ. 1977. Demographic studies on plants. *Astrocaryum mexicanum* Liebm. 1. Population structure. Boletin de la Sociedad Botánica de Mexico 37: 69–118.

The first in a projected series of studies on the ecology of *Astrocaryum mexicanum* describes the general physical and biotic conditions under which the plants grow in Veracruz with a general discussion of the structure and characteristics of the population selected for study.

TANG CHE-ZHI AND WU TE-LING. 1977. A new species of *Chuniophoenix* (Palmae) from Hainan. Acta Phytotaxonomica Sinica 15(2): 111–112, *fig. 1.*

Chuniophoenix humilis C. Z. Tang & T. L. Wu from Hainan is distinguished from *C. hainanensis* Burret by lower, more slender stem, smaller leaves with fewer segments, shorter inflorescences with fewer, simple flowering branches bearing cinnamon-colored bracts, yellow flowers with strongly reflexed petals, and smaller fruits.

H. E. MOORE, JR.

SASTRAPRADJA, S. (ed.) 1979. Palem Indonesia. Lembaga Biologi Nasional P.O. Box 110, Bogor, Indonesia. Price US $2.50 plus US $0.75 for sea mail, US $3.00 for airmail.

Palem Indonesia is the title of an attractive paperback book produced by a team of workers under the editorship of Dr. S. Sastrapradja in Bogor. It describes and illustrates 53 Indonesian palms of economic or decorative potential and discusses the possibilities of developing palm products. The plates are by the accomplished artists Damhuri and Mohammed Anwar. Although the text is in Indonesian, the plates are so attractive that Palm Society members may wish to purchase copies.

J. DRANSFIELD

CLASSIFIED

I have the following palm seeds for sale or exchange: *Cyrtostachys lakka*, *Caryota no*, *Caryota mitis*, *Livistona chinensis*, *Livistona rotundifolia*, *Pinanga disticha*. Tham Chee Keong, P.O. Box 1407, Sandakan, Sabah, Malaysia.

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