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Franklinia Alatamaha at "Far Country." Tree sixteen years old, grown from a layer. August, 1943.

Franklin's Tree

CHARLES F. JENKINS

Ten years ago the author prepared for the *Pennsylvania Magazine of History,* an article on the *"Historical Background of Franklin's Tree."* Since then, and within the last year, the old American Philosophical Society in Philadelphia has published the diary of John Bartram, the Philadelphia botanist who first discovered and introduced to the scientific and horticultural world, *Franklinia Alatamaha.* This disclosed a number of errors in the first article and also supplied some additional information, so that the article has been revised for THE NATIONAL HORTICULTURAL MAGAZINE. The first error to be corrected was the spelling of the botanical name of the tree. William Bartram, son of John, named it *Franklinia Alatamaha,* the latter the old spelling of the river on whose banks it was found. Modern geographers have dropped one of the numerous "a's" from the river's name and it is now the Altamaha, but according to rule the original botanical name must persist. The Altamaha rises in the highlands of northern central Georgia, being formed of the union of the Oconee and the Ocmulgee Rivers. It reaches the Atlantic Ocean through Altamaha Sound at Darien, Georgia.

Since the first of August the tree has been in constant bloom at the Hemlock Arboretum and like the venerable philosopher, whose growing namesake it is, *Franklinia Alatamaha* will be giving of its beneficence as did he, with the same generous hand, up to the very end which will be when the first killing frost comes. Few trees or shrubs equal it in the beauty of its blossoms. They float in the air like miniature pond-lilies, with snow-white petals and a great cluster of golden stamens, against the background of its magnolia-like leaves.

No tree which ornaments our gardens has a more romantic history. For one hundred and fifty years botanists have sought to find it growing in its native habitat by the Georgia river which is the descriptive part of its name. Nowhere along the banks of this muddy stream, or elsewhere in the state of Georgia, or in the northern hemisphere, or in the whole wide world have eager searches found it growing in its natural state. Every specimen of Franklin's tree now known in this country is descended from the seeds or seedlings of the little plants carried in 1777 from the banks of the Altamaha to those of the Schuylkill in Pennsylvania, in an overloaded saddle bag. He is a rash person who would say it never will be found. Numerous expeditions have tried to run it down. Ten years ago an enthusiastic amateur horticulturist, Dr. C. C. Harrold, of Macon, Georgia, issued a placard with a colored illustration of the bloom and leaves, which he has scattered among boy scouts, farmers, hunters and woodsmen, hoping that, for a suitable reward, they may come across a living wild plant.

Its story starts with Peter Collinson of London, a wealthy Quaker mercer, who early developed an interest in nature and particularly in botany and gardening. His means enabled him to gratify his tastes and from 1712, until his death in 1768, he was one of that group of cultured Englishmen who found the highest form of enjoyment in developing their gardens and estates. Addison and Pope and Horace Walpole lent their powerful aid to the new enthusiasm. Noblemen did not spare

their means and gave as well their personal supervision to the development of their grounds. With many of them Collinson was in active correspondence and cooperation. He was elected a member of the Royal Horticultural Society, became the host, the friend and correspondent of Linnaeus, Kalm and other international botanists. His garden was first established at Peckham, on the Surrey side of the Thames, but in 1749 he removed to an estate inherited by his wife at Mill Hill, some ten miles northwest of London. It took two years to transplant his botanical treasures and some of them are still growing on the estate, now a boys' school. Still growing is a hemlock, *Tsuga canadensis*, sent by Dr. Christopher Witt, of Germantown, to Collinson prior to 1730.

Through his business connection with the Colonies, Collinson was able to secure seeds and plants with which he enriched his own garden and generously shared with other enthusiasts. Thus it was that in 1730 he was introduced to John Bartram, later to become the leading botanist of the Colonies, a man whom Linnaeus pronounced "the greatest natural botanist of his time."

Like Collinson, Bartram was a Quaker, his father coming to Darby, Pennsylvania, in 1682. The son early developed a love for botany and a copy of Parkinson's Herbal procured for him by a scholarly friend started him on his career as a naturalist. He built his home of native stone, it is said, with his own hands on the west bank of the Schuylkill River in Kingsessing township, a few miles above its junction with the Delaware and here established the first important botanical garden in in the Colonies.

Bartram soon developed what became an extensive and remunerative trade through Collinson by shipping boxes containing 105 varieties of seeds which were sold to subscribers at the uniform price of five guineas a box. The scientists and collectors under the influence of Sir Hans Sloane, whose great collections were later to form the nucleus of the British Museum, were searching far and wide for anything which would enrich their cabinets and gardens. Noblemen vied with each other in the variety and extent of the plantings. Many of them subscribed for the Bartram boxes annually.

To procure these seeds, plants and natural history specimens Bartram traveled, usually alone, from Nova Scotia to Florida and from the sea to the Great Lakes. In the backwoods between the Blue Mountains and the Alleghenies he found his chief hunting ground and here could be heard the tinkle of the little bell tied on his horse's neck, as absorbed in his search he turned the animal loose to graze. By 1765, Bartram's fame as a botanist was secure and through the efforts of Collinson he was appointed Royal Botanist to George III.

Two years before, Spain had ceded East Florida to England in exchange for Havana and Collinson decided that the new royal botanist should attract the attention of the King by exploring the newly acquired peninsula in quest of novelties. Accordingly Bartram, with his son William, set out from Savannah and on September 20, 1765, reached the Altamaha River, then the southern frontier of Georgia. They had missed their way and came to the river four miles below Fort Barrington, which had been built where the road crosses the river to the then wild Indian country beyond. Here they lodged for the night and the next day proceeded to the fort. "This day we found several curious shrubs" Bartram notes in his journal with a provoking vagueness to those who have searched in vain for the original habitat of Franklinia. William Bartram, the son, writing two decades later, records "At this

Courtesy of the Historical Society of Pennsylvania

The Friend and Patron of the Bartrams

place (Fort Barrington) there are two or three acres of ground where it grows plentifully." But the travelers were in a hurry to reach an important Indian Council in Florida where Bartram was to assist, so they neither identified or procured specimens of it. But this was undoubtedly the first contact of qualified botanists with the Franklin tree.

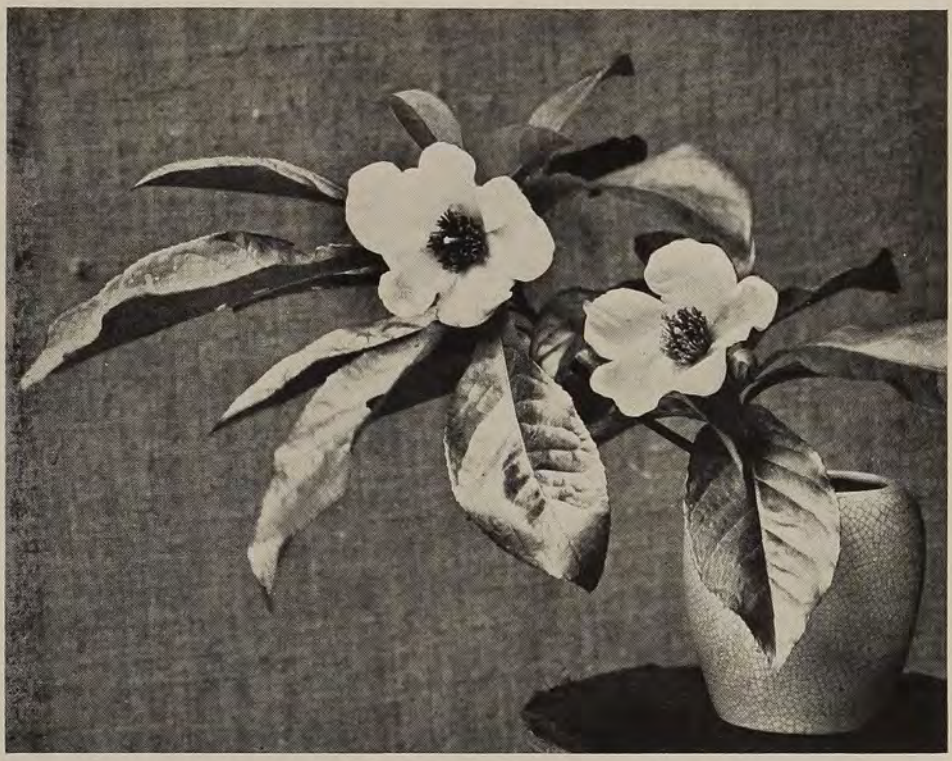
The first name on the list of members of the ancient and now very much alive American Philosophical Society in Philadelphia, is that of Benjamin Franklin, the second is that of John Bartram. They were lifelong friends and fellow workers in the realm of the natural sciences. Franklin in his letters addressed him as "My dear old Friend," while Bartram addressed Franklin as "My dear beloved Friend" and after the death of Peter Collinson Bartram writes, "I have no friend as intimate or capable as my dear Benjamin," and he continues, "although I have been deprived of thy agreeable conversation for several years I have thy pretty exact picture hanging by my bed which gives a dayly fresh remembrance of intimate friendship to thy sincere friend John Bartram." When Bartram's eyesight began to fail Franklin, who was in London, sent over thirteen pairs of lenses so that he might select the pair best suited to his eyes, instructing him to keep those which were successively stronger to use as they might be needed and those of lesser power than he required were to be given to others who might need them.

Collinson's latter years were shadowed by financial shrinkages and the theft at night on more than one occasion of a great portion of his garden treasures. His mantle as agent and correspondent of the Bartrams, fitting not quite so snugly, fell on the shoulders of another Quaker scientist, Dr. John Fothergill, likewise a friend of Franklin's, of the American Colonies and of humanity in general. Dr. Fothergill, like Collinson, had been a friend and correspondent of Linnaeus. It was "our Collinson" he writes Linnaeus, "who taught me to love flowers and he who shared his comradship could do no other than cultivate plants."

Young William Bartram, now desirous of collecting on his own account, arranged with Dr. Fothergill to finance a botanical journey into Georgia and East and West Florida. Arriving in Carolina early in the Spring of 1773 he took boat for Savannah. Fortunately he found the Provincial Assembly of Georgia in session and met several country members at his boarding place whose advice and introductions were later to smooth his way.

Botanical and political history were both in the making as the young botanist, in high spirits, took the road for the South, astride a good horse which had cost him £40, consuming a large part of his first year's compensation. Soon he turned off the high road to the left to visit Sunbury, then a bustling town, considering itself the rival of Savannah in the volume of its shipping, but today its deserted, sandy site is one of the "lost" towns of Georgia.

Bartram had been welcomed everywhere with open arms and true southern hospitality and urged to tarry as long as he would "Having been greatly refreshed by continuing a few days with a kind and agreeable family I prepared to resume my journey southerly," he records. It was the next day, that, taking the road up the northeast side of the Altamaha to Fort Barrington, after riding fifteen miles he again came upon the grove of small trees which he and his father had first discovered in 1765. "On drawing near the fort I was greatly delighted by the appearance of two beautiful shrubs in all their blooming graces." "Blooming" in this case must have been a general term



Franklin's Tree—"Far Country"

for Franklinia does not bloom until the autumn.

Just when Bartram secured the cuttings, plants or seeds of Franklinia which he sent to his patron, Dr. Fothergill, is not clear from his rambling and rather obscure account of his travels, but it would seem that it was on the return from his visit to East Florida. It was in 1774 that Dr. Fothergill, through William Malcom, a nurseryman, presented a plant to the Royal Gardens at Kew and it first became known to the English scientists. I am inclined to the opinion that the Franklinia presented to the Kew Gardens by Dr. Fothergill was not procured by Williams who was also collecting for Dr. Fothergill. The latter writes William Bartram, September 4, 1773, as follows: "There is a young man from England engaged in the service of a company at Charleston. He travels into the Cherokee country and though unacquainted with botany has sent me many rare seeds and some plants packed up with much judgment which are now recovering from their voyage. It may not be improper at some time to go with him as he will be able to point out things which he had not been able to collect." "William Malcolm, a nurseryman of Kennington, introduced Gordonia pubescens to Kew in 1774, the year of its introduction into England," writes Arthur H. Hill, Director of Kew Gardens, July 28, 1932.

For five years Bartram wandered through the wilderness of the country of the Cherokees, the Creeks, the Chictaws, the Chickasaws and the Seminoles. He gazed over the waters of the Gulf of Mexico and noted the mighty

flood of the Mississippi. Towards the north he penetrated what is now Tennessee. He would return to the coast at intervals, shipping his boxes and bales of seeds, plants and natural history specimens to Dr. Fothergill, now from Sunbury, now from Charleston and aagin from Mobile. For long periods his family had no word from him and several times concluded he was dead. Meanwhile the muskets had rattled at Lexington and Bunker Hill; Trenton, Saratoga and Brandywine had passed into history. Independence had been declared. Apparently unmindful, or at least not noting these momentous events which greatly increased the restlessness and danger from the Indian tribes, Bartram pursued his leisurely way, wearing out horse after horse but ever on the alert for some new plant or specimen for his patron. The Seminoles called him "Puc Puggy,"—the flower hunter. He seemed everywhere to have been regarded as a gentle, harmless wanderer to whom it was a pleasure to bring specimens that would help him.

During the spring and summer of 1777, he revisited several districts in East Florida and Georgia and it was then, no doubt, he obtained for his own use the seeds, cuttings or seedlings of the tree that had so intrigued both father and son on their first visit twelve years before. In the late autumn he rode northward, reaching home in January, 1778, to find his venerable father had died and Philadelphia occupied by the British General Howe and his troops. It is said John Bartram's death had been hastened by fear for the safety of his garden on the approach of the British army.

The treasured plants or seeds which Bartram brought home were planted in the Garden and in five years these young trees were producing seeds. Just when Franklin was informed of the honor conferred, by naming the rare tree for him, we do not know, nor whether Franklin in any way acknowledged the honor done him. Many honors had come to him but none that will be more enduring than this one, nor one which in its interest and rarity would be more honorable.

Some twenty miles from Kingsessing, Humphrey Marshall, a first cousin to John Bartram, had established a botanical garden in Chester County, remnants of which still remain. He too was a botanist of note and a correspondent of Dr. Fothergill's. In 1790, his son Dr. Moses Marshall, set out on a botanizing tour extending as far as Georgia. He was interested in hunting up the plantation of Franklinias and found them growing as his cousin had described, near Fort Barrington, but from that day to this, one hundred and fifty-three years, no one has seen it growing in the wild.

It is the rule with botanists that the first publication of a name in some recognized botanical work gives such a name priority and permanently attaches it to the plant. It was in cousin Humphrey Marshall's "Arbustrum Americanum," published in 1785, that the first description of *Franklinia Alatamaha* was given and the name scientifically applied. The European botanists, however, had previously decided it belonged to the family of the Gordonias and early labelled it *Gordonia pubescens*. It has been known by this name for a century and a quarter, but twenty years ago, or more, Dr. Frederick V. Coville, of the Department of Agriculture at Washington, decided that Franklinia is the correct name. The seeds of the latter are so different from those of the Gordonia that he and other botanists regard it as a distinct genus.

The original Franklin tree, or possibly a successor, was growing in Bartram's Gardens when more than a half century ago they were abandoned and greatly neglected. Wandering cows

Courtesy of the Historical Society of Pennsylvania

Franklinia Alatamaha

Courtesy of Mrs. Edward M. Cheston. From a copy belonging to The John Bartram Association made from the Water-Color in the British Museum. William Bartram has written beneath the Original painting: "Franklinia Altamaha, a beautiful flowering tree, discovered growing near the banks of the River Altamaha, in Georgia." WILLIAM BARTRAM, *Delin.* 1788.

broke in and horned the tree so seriously that it was all but dead but rescued by a neighboring gardener it was removed to his nearby home and nursed back to health. Later it came in the possession of the Meehans, the well known nature lovers and nurserymen of Germantown. When it had been recovered the nurserymen proceeded to propagate plants by the layering process. For many years this was the only successful method of propagation. Neither seeds or cuttings could be made to grow although the Bartrams had produced young plants which were listed in their earliest catalogue of plants for sale. In layering, a branch was bent to the ground with a stone placed upon it; in three years it had taken root sufficiently and was cut off from the parent limb. It was allowed to grow where it stood for two years more and was then ready for transplanting. This was how the tree at the Hemlock Arboretum was grown and it was a red-letter day when the friend who cared for it for the five years telephoned it was ready for transplanting. It will be realized how slow the process and how difficult to obtain young plants so that to own a Franklinia tree during the Victorian era was to mark one as a horticultural aristocrat. The number of Gordonias living at that time, mainly in the gardens around Philadelphia, was not more than a score and it is safe to say that every Franklinia growing today in the United States traces back to these garden aristocrats which in turn were descended from the Bartram tree which was so nearly finished by the aggressive cows.

Thirty years ago Dr. Alexander Coville discovered what was wrong,—that both the seeds and cuttings could be propagated successfully only in an acid soil. With this fact established a few appreciative nurserymen are now raising young plants in quantities and the Franklin tree will soon be a common denizen of our gardens.

Many expeditions have searched for the Franklin tree in its original habitat, beginning with the expedition made in 1882, by H. W. Ravenel, a South Carolina botanist, at the instance of Professor Charles S. Sargent of the Arnold Arboretum. Other parties have combed the muddy swamps which border the Altamaha in the region of old Fort Barrington to their own great discomfort and the annoyance of the rattlers and other venomous snakes which infest the region. Professor Edgar T. Wherry, now of the University of Pennsylvania, has made three unsuccessful expeditions. Fire may have destroyed the original plantation, it may have been grubbed out by the early settlers, or the salt tides may have backed up the river, or again freshets may have washed it away. Several times in recent years the daily press has carried a news item that the Franklinia had been found but these have all been erroneous, other plants having been mistaken for it.

Two botanists from Philadelphia, Dr. Francis Harper and Arthur N. Leeds of the Academy of Natural Sciences, visited the Altamaha, near Fort Barrington, on April 5, 1933, searching unsuccessfully for the Franklin tree in its wild state. They did discover on or near the site the other plant Pinckneya, which William Bartram found growing in close association with Franklinia.

The Franklin tree is hardy in the north as far as Boston, growing to a height of about twenty-five feet, branching low, the limbs smooth and beautifully marked. In the autumn its leaves turn a glorious crimson but fall at the first heavy frost. Its smooth, striped trunk makes it easily identified, its snow-white blossoms are its glory and its long continued florescence its distinction. All in all it is a worthy monument and memorial of the "First Civil-

ized American" whom Philadelphia claims as its own.

Bartram's Garden, long in decay, has now been taken over as a city park under the interested cooperative care of the John Bartram Association which has restored and is now protecting and developing the house and grounds. In the garden are again growing many descendants of the original Franklin tree, but one of quick manufacture, symbolizing the electric age which Franklin himself started and the efficiency and hurry of the present day. I have recently seen an acre patch filled with growing, sturdy, young Franklinias and it bids fair to become an every day remembrance of the distinguished circle of Franklin and his botanical friends.

A Step Ahead of Mother Nature

M. B. Foster

Ever since time began, plants have sort of had their own idea of when to flower and fruit. Naturally that urge to reproduce their kind has generally come after some period of cold, drought, or unusual condition when there has been possibly some danger of a stoppage of growth or an extended rest period. Of course if plants just grew year after year with no danger of extinction, then there would be no necessity for the developing of reproductory parts such as flowers which produce the fruit that contain the seeds of the next generation.

Time goes on and man steps into this great moving picture of life. He finds certain fruits and flowers that he consumes as food or places in a corsage for his spring bride. He likes some of them better than others for various reasons. He finds them growing wild in certain sections but wishes the whole world to know their value. He raises them by the thousands, he is a farmer; he raises them by the millions, he is a corporation.

Many years ago in the Azores where they grow pineapples in enclosures under glass, a carpenter accidently set fire to a pile of shavings* while working in one of the pineapple houses. To the surprise of the owner, the plants instead of being destroyed burst into flower a few weeks later, quite out of season for their regular crop. The fruit being marketable at an off season was readily sold and the extra profit nearly paid for the loss from the fire. From then on the natives in the Azores made a frequent practice of smoking pineapples.

About twelve years ago when Rodriguez was working in the U. S. Department of Agriculture Experiment Station in Puerto Rico, he observed that one of the big pineapple growers was shipping his fruit to the American market some months in advance of the other growers. Rodriguez found that his culture was the same as that of other growers except that each year he would erect over certain areas a cloth tent, building a smudge fire underneath for the duration of twelve hours. Flower and then fruit followed in a short period. Curiosity soon led Rodriguez to experiment with wood smoke and he found that it was the action of the ethylene gas contained in wood smoke which caused the flower

*H. C. Adams, Nat. Geographic, Vol. LXVII—No. 1, Jan. 1935.

bud to form within a few days after being exposed to the gas. He published these findings in January 1932.

The government experiments of forcing and hastening pineapples into fruit prematurely in Florida have been based on the findings of Rodriguez's use of ethylene gas. Although similar work has been done with acetylene gas in Hawaii by Collins (published in 1935) and in Australia by Lewcock (made known in 1937), the difference in climate and soil conditions make ethylene more effective in Florida than in Hawaii.

These facts I had been aware of through the friendship of Dr. W. C. Cooper, plant physiologist (formerly member of the Experimental Station of the Dept. of Agriculture in Orlando, Fla.) whose interest in forcing pineapple blooms coincided with mine of getting other bromeliads to bloom prematurely. We made many experiments with bromeliads other than pineapples, such as Aechmea, Vriesia, Billbergias and Quesnalias, using the carbide method and the acetylene method (both used in Hawaii), but found that the results of ethylene were more predictable. Later we collaborated on the idea of a predictable forced bloom for a very special occasion.

In the summer of 1939 on my first plant collecting expedition into Brazil I had had the great pleasure of discovering a new bromeliad (along with many others) belonging to the genus *Aechmea*. Because it was such a striking plant of light green leaves embossed by black splotches with its flower head of orange bracts topped by white flowers, I requested Dr. Lyman Smith of Gray Herbarium at Harvard who was making all identifications of my collected material, to name this particularly beautiful plant for the city of Orlando, Orange County, Florida, which is my home. Although he said this was a bit irregular in the rules of botanical nomenclature, botanists of old have done it for even less appropriate reasons. Orlando, whose city and school colors are orange and white was, as Dr. Smith said, fast becoming the home of the world's largest collection of living bromeliads, my collection containing more than four hundred different species, including many of the new species I have discovered in Brazil in the summers of 1939 and 1940.

I was very anxious to make public to the city of Orlando this unusual plant and chose the propitious time of the 1941 Annual Meeting of the State Horticultural Society to give out the announcement. To make complete the effectiveness of the presentation I wanted to have the plant in full bloom with its orange bracts and white flowers. So, on March 4th, six weeks before the convention with the assistance of Dr. Cooper acting as anaesthesatist in this delicate operation, the ethylene gas was administered to two of these beautiful plants by placing them in a special tent where a continuous flow of atmosphere of 1 part of ethylene to 1000 parts of air was kept constant for a period of twenty-four hours. Our patients were given every care and consideration and watched carefully. Suddenly during the first week in April we had the great thrill of seeing the flower head pushing up from the center of both plants. And greater was the thrill to discover on the morning of the opening day of the convention, April 15, that the flowers were actually open, which I was proud to announce to the convention that evening.

When we decided to carry out this particular experiment I thought it best to use two plants, one a mature plant that had already developed a new side shoot but which I supposed had not yet bloomed as we had just a few months previous brought it from Brazil, and the other a half-mature plant which would not ordinarily bloom un-

The Patient

til December. Apparently those plants were as anxious to show off at the convention as I was to have them, even though the mature plant (which I later found on closer observation) had already bloomed before I brought it from Brazil. Not wishing to be outdone by the younger plant, this oldster promptly proceeded to send its flower head out of the new shoot attached to its side and indeed this display was much larger and more complete than the one on the smaller plant. This urge to reproduce its kind is difficult to repress. Mother Nature will have her way.

This is only an example of what are the possibilities in forcing blooms of bromeliads. Mr. T. Ralph Robinson, president of the Florida State Horticultural Society, and formerly senior physiologist in the U. S. Dept. of Agriculture, was much impressed with the timing of our forced bloom. He suggested that when making herbarium specimens of bromeliads which had no flower at the time of collecting, the living plants could be forced and identification made, long before the normal bloom would appear. Mr. Robinson himself has done some definite work in forcing blooms, by ethylene treatment for pineapple breeding work from immature plants to hasten the making of reciprocal crosses, work that led to his suggesting the enlistment of Dr. Cooper's aid in securing bloom in time for the meeting of the Horticultural Society. He was particularly interested in the success of this first attempt with an ornamental bromeliad, as he had invited the author to give the feature lecture at the opening meeting of the society.

Thus man adds his knowledge to the affairs of the plant world and keeps one step ahead of Mother Nature.

Two New Bomareas and a New Stenomesson

Cesar Vargas C.

My latest studies of the two bomareas and a very interesting stenomesson which I collected in the south of Peru (in the Departments of Apurímac and Cuzco) have led me to believe that they have not been described before. Because of this and on the advice of Mr. E. P. Killip, of the Smithsonian Institution, Washington, D. C., I undertake their respective descriptions. I also take this opportunity to offer my thanks to my botanical colleagues in the herbaria of the University of California, Berkeley, California; the Field Museum of Natural History, Chicago, Ill.; the Gray Herbarium, Cambridge, Mass.; the New York Botanical Garden, New York, N. Y.; and in particular those of the Smithsonian Institution mentioned before, in particular, Mr. Killip, all for the aid and facilities lent me during my stays in those institutions in 1941.

Bomarea ampayesana Vargas, sp. nova. (Plate No. 1)

Florifera 1.8-2 m. alta; caule stricto, apice recurvato tomentoso excepto glabro; foliis multis, anguste lanceolatis, 16-18 cm. longis, 1 cm. latis, margine revolutis, coriaceis, subtus dense et breviter pilosis, nervis prominentibus; bracteis 1.5 cm. latis; umbella pendula, ramis 3-6, divisis, bracteolis ovato-lanceolatis; sepalis 9 - 10 cm. longis, ovato-lanceolatis, apice viridi excepto roseo-flavis, quam petala brevioribus; petalis 11-12 cm. longis, spathulatis, apice viridi excepto flavis; staminibus styloque excertis.

Among all the known species of this genus Bomarea, this has flowers of the greatest length. It resembles *B. crocea* (R. & P.) Herb.; and differs in the size of the flowers, almost double in our species, and in the exerted pistil and stamens. However, following the description of H. Herbert (Amaryllidaceae, plate 8, fig. 1, 1837) which was based upon an herbarium specimen from Peru, we find that that species (B. andinamarcana or Collania andinamarcana, both synonyms of *B. crocea*) possesses almost equal segments, while our species has sepals shorter than the petals. Finally in Hooker's Botanical Magazine, 1846 (Plate 72, Collania andinamarcana) we see in the fine illustration in natural size and color that this bomarea has sepals shorter than the petals. I would point out that that drawing was taken from a greenhouse plant. Nevertheless, in both cases, the stamens and pistil scarcely exceed the lips of the perianth while in *B. Ampayesana* they are much more exserted and, as we have stated above, the total length of the perianth is nearly double that of *B. crocea*, a species well known to me.

1015 Vargas, type in the Herbarium of the University of Cuzco; isotype, Gray Herbarium, Harvard University. Collected on the steep slopes of the Cordillera Ampay, Abancay, Aprurímac, June 1938.

Bomarea velascoana Vargas, sp. nova. (Plate No. 2)

Florifera 1-1.2 m. alta; caule stricto, apice recuvato glabro; foliis ovato lanceolatis 5.5 cm. longis; umbella pendula ramis 2-12 cm. longis, simplicis; perianthio, 5.5 cm. longo segmentibus subequalibus; sepalis ovato-

Bomarea ampayesana, Vargas

acuminatis, apice viridi excepto roseo-flavis; staminibus styloque exsertis; ovario glabro.

This species also is close to *B. crocea* (R. & P.) Herb., but differs in that *velascoana* has shorter, broader and more oval leaves; and in addition, a simple umbel, or rather in a simple radius, not two-parted as in *crocea*. This last character may be considered specific.

1536, Vargas, type, Herbarium of the University of Cuzco; isotypes, Gray Herbarium, Harvard University and the University of California, Berkeley, California. Collected in the Department of Cuzco, Province of Paucartambo, Haciendo Marcachea, Escalerayoc, 3900 m. alt., July 1939.

I am pleased to dedicate this species to my assistant, Sr. Manuel Velasco O., in recognition of his unselfish and disinterested collaboration in my botanical expeditions.

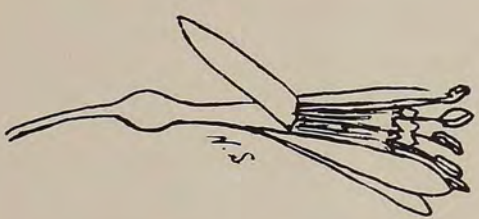
Bomarea Velascoana Vargas. 1563 Vargas type. Marcachea, Pautartambo, Cuzco, Peru, 3900 m. July, 1939.

Stenomesson morrisonii Vargas, sp. nova (Plate No. 3)

Bulbus subglobosus . collo robusto usque ad 8 cm. longo producto; folia oblanceolata ad 50 cm. longa, 22.5 cm. lata, numerosa coaetania; pedunculus solidus 35 cm. altus, 8 mm. latus; flores 3-11 umbellati, pedicellis tenuibus pendentibus 3.5 cm. longis; perigonium alboviride 3.5-4 cm. longum infundibuliforme triente inferiore angustius superne 12 mm. latum, cyatho bifido; stamina perigonio paulo longiora; stylus filiformis valde exsertus.

This species is not near any other. I am pleased to dedicate it to my friend, Mr. B. Y. Morrison, in charge of the

Stenomesson Morrisonii and detail of flower



Division of Plant Exploration and Introduction, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture, as a modest tribute to his generous friendship during my stay in Washington and as a remembrance of his visit to Cuzco.

2291, Vargas, type in the Herbarium of the University of Cuzco. Collected in the Department of Apurímac, Province of Abancay, the gorge of Matará, Hacienda Soccospampa, Dec. 1, 1941, at 2400-2800 m. alt.

University of Cuzco, Peru.
August 1942.

Household Palms and Related Genera

O. F. Cook

(Part II)

A neatly clustered palm from the central plateau of Guatemala has a special development of the leaf-sheath, serving at once to distinguish it from *Omanthe* and from other related genera. Leaf-sheaths are variously formed, usually with the upper margin or "lip" transverse, concave, or notched, on the side opposite the petiole. In relatively rare cases the margin projects upward, beyond the level of attachment of the petiole, and such an expansion is considered as an "antiligule," from its position on the side of the sheath opposite to the ligule. The antiligule of a fan-palm, *Oothrinax anomala,* was described and illustrated in The National Horticulture Magazine, January 1941. A small antiligule may split in the middle, leaving a triangular "tooth" or "auricle" on each side of the base of the petiole, as in *Omanthe* and *Docanthe,* a merely rudimentary organ in these genera, only a few millimeters long. The remarkably expanded antiligule of this Guatemalan relative of *Omanthe* is shown in natural size in figure 7, compared with leaf-sheaths of *Mauranthe* where no antiligule is developed. The name *Legnea lacinata* is suggested for the new palm, in allusion to the antiligule as forming a fringe of slender fibers.

The trunks of *Legnea* are slender, with internodes 3 to 4 cm. long, 1.8 cm. thick, narrowed toward the base; leaf-scars distinct, 2 mm. long. The leaf-sheaths attain 25 cm., and the laciniate antiligule 9 to 10 cm., formed of fine parallel fibers readily splitting apart. Petioles 16 to 17 cm. long, 1 cm. wide at base, 7 mm. at apex, rounded-triangular in cross-section, or the sides becoming grooved in drying, the vitta distinct, pale greenish.

Pinnae 14 or 15 on a side; measurements in centimeters, basal pinna 26.5 by .9, second pinnae 30.5 by 1.7, fifth 37.5 by 2; tenth 30 by 1.8, fourteenth 19 by 1, last pinnae 17.5 by 1.4, joined at base 2.5 cm. Rachis 53 cm. long, the leaf-blade as a whole 68 cm. long, 35 to 40 cm. wide. The upper pinnae are gradually shorter and narrower, the terminal scarcely broader than the subterminal, less than half as long as the pinnae at the middle of the leaf, not so definitely shortened and widened as in *Omanthe.* The pinnae are of firmer texture than in *Omanthe,* strongly grooved in drying, unless firmly pressed. Two veins are prominent, submarginal and intermediate, but smaller veins of different sizes divide the spaces. Submarginal veins nearly equal to the midrib on the underside, less prominent above, separated from the margin by a distinct groove and a fine venule very close to the margin.

Female inflorescence about 75 cm. long; peduncle 49 cm., axis 7 cm.; branches 6 to 8, attaining 20 cm.; one or two of the lower branches may be forked near the base. Some of the branches are decurrent on the axis for 3 or 4 millimeters, as marked by the bract-scars, the bracts obsolete. First joint of peduncle 8 mm. long, 3 cm. broad, strongly compressed, the spathe 5 cm. long; second joint nearly 3 cm. long, spathe 15 cm.; third joint 10 cm., spathe 20 cm.; fourth joint 12 cm., spathe 21 cm.; fifth joint 14 cm., spathe also 14 cm.; sixth joint 4 cm., no spathe; seventh joint to first branch 5.5 cm. The spathes are of thin texture, readily splitting like the antiligules, often exposing the joints of the pedun-

cle. The development of the antiligule may be viewed as an example of metaphanic variation, a carry-over to the leaf-sheaths of the genetic change manifested in the special length and texture of the spathes, which are structurally homologous with the leaf-sheaths.

Flowers rather remote, in distinct depressions. Fruits spherical, 1.2 to 1.3 cm. in diameter in the fresh state, apparently full grown but still green, the branches and exposed surfaces of peduncle orange red. The basal rim of the calyx remains alive and takes a yellow color with maturity, also the thickened fleshy bases of the petals.

The palm formed a cluster of graceful foliage in an open garden of flowers and ornamental plants at Santa Catarina, near San Antonio, between Guatemala City and Antigua, visited with Mr. C. B. Doylé, June 8, 1914, when the photographs were obtained. The wild stock was said to grow in a ravine along a stream above Santa Catarina, where the leaves are gathered for decorations on feast days.

Anothea, a Palm of the Forest Canopy

The long antiligule of *Legnea* may prove less distinctive when account is taken of the leaf-sheath structures among the related palms. Another specialized feature is a marked elongation of the leaf-sheaths, to nearly twice the length attained in *Legnea*, occurring in a group of slender-trunked *Chamaedorea* palms that have the unusual habit of outgrowing even the tallest trees and trailing above them. Only in rare situations is it possible to see these "climbing palms" in action, where clearings or trails have been cut on adjacent higher slopes, giving a view of the forest canopy from above. The tropical forests doubtless will be explored in the future from airplanes or dirigibles, and then the widely sprawling trunks and open grass-like foliage of these climbing palms will become a familiar feature. The generic name, *Anothea*, meaning "over-head runner," is suggested for these palms that trail aloft, with *Anothea scandens* (Liebmann) as the type species. It is noteworthy that no illustrations of this peculiar palm, discovered a century ago, are recorded in the "Index Londinensis."

The habit of growth in *Anothea*, marking a definite departure from all the other *Chamaedoreas*, is approximated in the large group of rattan palms of the East Indies, traditionally referred to the genus *Calamus*. Another remarkably close parallel is the genus, *Desmoncus*, a member of the coconut family, widely distributed through tropical America. Both *Calamus* and *Desmoncus* have the surfaces of the leaves and leaf-bases more or less beset with sharp spines, while *Anothea* is entirely unarmed. The climbing palms are not strictly a part of the undergrowth flora, since they do not complete their development under shade conditions like most of the *Chamaedorea* family, but as mature palms are fully exposed to the sunlight.

The structural feature that attracts most attention in *Anothea* is the reduction of the terminal pinnae to narrow spiniform organs directed backward, obviously adapted to gaining support from other vegetation. Since the lower leaves are not thus specialized, nor even the lower pinnae of the upper leaves, it would seem to many botanists that the terminal hold-fasts are an essentially variable feature, not to be reckoned as a generic distinction. In reality several concomitant modifications are involved in the specialized habit of growth. Not only the size, shape and texture of the terminal pinnae have been altered, and the pinnae turned backward as a result of the basal pulvinus being greatly thickened, but also the rachis, leaf-

sheaths, and internodes are lengthened.

Further adaptations may be seen in the marked elongation and thickening of the rachis, thus giving the hold-fasts wider contacts. On account of the lengthened rachis even the unmodified pinnae are much farther apart than in related palms. The leaf-sheaths also are extremely long, and thickened at the end, especially on the side where the leaf-blade is attached. With internodes 18 to 30 cm. long, leaf-sheaths of 40 to 46 cm. were measured in eastern Guatemala, in 1902. The wide overlapping of the tough, close-fitting leaf-sheaths furnishes protection and support for the terminal joints of the slender trunk. The rachis measures 130 to 155 cm., with 17 to 19 pinnae on a side, the middle pinnae attaining 34 cm. by 5 cm., the terminal pinnae reduced to 11 cm. by 1.5 cm. The petiole, represented by the thickened base of the rachis, is only 3 to 6 cm. long, the rim of the leaf-sheath also thickened and indurated.

The inflorescences develop in the axils of the living leaves, but do not emerge from the leaf-sheaths in the usual manner. The pressure resulting from the growth of an inflorescence splits the two over-lying leaf-sheaths, causing a large longitudinal wound, but the sheaths remain alive. Many of the inflorescences are aborted at an early stage of development by an insect that bores through the leaf-sheaths.

The male inflorescence has a total length of 70 cm., the peduncle 32 cm., the axis 18 cm., with about 30 simple branches, 26 cm. or less in length. The peduncle has 7 joints, measuring respectively in centimeters 1.8, 3, 5, 6, 7, 9, 4.2, the five spathes measuring 9, 17, 17, 18, 17. The female inflorescence is shorter, the axis about 10 cm., with 18 to 20 branches 10 to 12 cm. long, 2 to 3 mm. thick at maturity. The ripe fruits are nearly spherical, 8 to 9 mm. in diameter.

In agreement with *Docanthe* and in contrast with *Mauranthe*, the first joint of the peduncle and the first spathe of *Anothea* are relatively long. Several specimens have grown well in greenhouses at Washington, and one was raised as a house plant with *Neanthe* and other palms. For a few years it was very attractive, trailing over windows and doorways. Eventually it grew too large, and was moved to the patio of the Pan American Union where it thrived for many years and formed a tropical tangle. In large, well lighted rooms or passage-ways it would furnish a striking decoration.

Divergent Linear Pinnae Like Acrocomia

Another outstanding palm, with no resemblance to *Anothea* but in some respects analogous, has borne the name *Chamaedorea glaucifolia*, applied originally by Wendland in 1854 to a conservatory palm supposed to have come from a locality called Chiapas in "New Grenada," the country now known as Colombia. The Mexican State of Chiapas would seem to be indicated by mention of pine woods as the habitat, "in *pinetis prope pagum* Chiapas." Palms grown at the Kew Gardens in England, described and figured by C. H. Wright in the *Botanical Magazine*, Table 8475, October 1912, were from southern Mexico. Specimens from Chiapas are in the U. S. National Herbarium, collected near San Fernando, in January 1907, by G. N. Collins and C. B. Doyle, No. 172, "in open country, below low shrubby vegetation." Seedlings were brought home and grew to maturity in a greenhouse at Washington. Photographs taken in November 1915 show a male plant with a trunk about six feet tall bearing nine inflorescences of various lengths, and a female plant about

half as tall with two inflorescences, much shorter and more compact.

Tolerance of household conditions is not lacking, but the palm soon grows too large for a house plant, and seems less attractive than many of the smaller forms. It was raised in conservatories in England, and appears to have been appreciated more than the other Chamaedoreas, "the most graceful of them all."

The foliage is strikingly different from all the related palms, the pinnae more numerous, longer, and narrower, not in line with each other along the rachis, but standing more or less in groups, pointing in different directions. The basal pulvini are strongly developed and determine the angle of divergence, as in *Anothea*. Such divergent foliage sometimes is described as crisped, decussate, or disheveled, but these words have other meanings.

The linear pinnae projecting at different angles give the foliage of *Discoma* a marked resemblance to that of *Acrocomia*, a much larger palm of the coconut family generally distributed through Mexico and Central America. Only the leaf forms are alike but the similarity is obvious and an analogous name may serve for readier recognition of the smaller palm. The resemblance may have arisen through parallel adaptation to similar conditions of growth. *Acrocomia* is a native of open districts in second-growth woodlands, not of the deeper and denser forests, and *Discoma* seems less adapted to undergrowth than most of its relatives. Stretches of "open bush" are frequent in southern Mexico where this palm is found.

The linear pinnae of *Discoma glaucifolia* (Wendland) are nearly flat, tapering only near the ends, with glaucous lower surfaces that increase the resemblance to *Acrocomia*. Only the midvein is distinct, the submarginal veins scarcely stronger than the venules. The lower pinnae of the basal cluster are turned downward at sharp angles. Some of the pinnae in other clusters are distinctly retrorse, but not so close together as those of the lowest pair, which are nearly opposite, with their margins nearly in contact, sometimes distinctly overlapping across the middle of the rachis. The median ridge of the rachis arises just above these adjacent pinnae. A tendency of the pinnae to be deciduous may be ascribed to shrinkage of the large fleshy pulvini.

The trunk is rather robust, 4 cm. thick at base, narrowed above to 2 cm. or less in greenhouse plants, 3 to 3.5 cm. thick in out-door palms in California. The basal internodes are short, often one cm. or less, lengthening irregularly to 3 or 4 cm.

The leaf-sheaths attain 25 to 27 cm., the mouth nearly transverse, no antiligule, eventually splitting 2 or 3 cm. Petiole 28 to 34 cm., rachis 78 to 88 cm., the blade as a whole 96 cm.; pinnae 47 to 52, in out-door plants 60 or more; lowest pinnae 10.5 cm. by 7 mm.; middle pinnae 22 to 30 cm. by 9 to 10 mm.; last pinnae 8 cm. by 9 mm.; arrangement of pinnae very irregular, from 3 to 4 mm. apart, not consistently grouped but often close together, 2 or 3 on each side, with the lower strongly retrorse. The upper 6 to 10 pinnae are more regularly placed, not in groups.

Inflorescences infrafoliar, attaining 60 cm.; peduncle with 7 spathes, of gradually increasing length; branches numerous, subtended by a rather large bract. Branches of the inflorescences are figured by C. H. Wright in the *Botanical Magazine* Tab. 8457, a male branch with three divisions and three simple female branches bearing spherical fruits 10 to 12 mm. in diameter. The flowers of both sexes have thick, valvate petals, with a rather long monosepalous calyx. The stamens have separate conic filaments shorter than the

robust, subquadrate anthers. The pistillode is rather robust, longer than the stamens, the apex trifid, the sides grooved. Pistil nearly globose, with small sessile stigmas much exceeded by the petals. The palm had been cultivated "in the Aroid House at Kew for some forty years" when Wright's account was published.

Linear Pinnae and Reduced Peduncles

Pinnae nearly as narrow and straight as those of *Discoma* are found in another generic type of southern Mexico, an attractive, cluster-forming palm similar to *Omanthe* and *Legnea,* but smaller and more compact, also likely to prove tolerant as a house plant, since it grows in a relatively dry region. Only the linear pinnae would associate this cluster palm with *Discoma,* neither the general appearance nor the form of the various organs suggesting any affinity. The number of pinnae is only 13 on a side, forming a leaf-blade relatively short like *Neanthe,* and the fruits are spherical like *Neanthe,* but crowded upon smooth robust branches. The flowers of both sexes have free petals, not fused like *Neanthe.*

The very short inflorescences readily distinguish this type from any hitherto recognized in Mexico and Central America. Analogy may be sought in the short inflorescences of *Morenia,* a South American genus, but no affinity is indicated. *Morenia* has ample fleshy spathes, solitary trunks and long leaves with broad pinnae. The Mexican palm has narrow scarious spathes, three exposed, the fourth included. The peduncles especially are reduced, usually much shorter than the branches, and only half as long as the leaf-sheaths. The generic name *Meiota* is suggested in allusion to the notably abbreviate inflorescences, with *Meiota campechana* as the type species. Specimens of the leaves, flowers and fruits were obtained at Campeche, in southern Mexico, June 29, 1906. The palm was noted as a very handsome species with smooth, glistening, deep green stems growing compactly like a small bamboo. It was said to grow wild in the vicinity of Campeche.

A height of 2 to 3 meters is attained, the internodes of variable length, 2 to 12 cm., usually 2 to 5 cm., the diameter 1 to 1.7 cm., the basal internodes thicker, 2 to 3 cm. Leaf-sheaths 12 to 13 cm. long, petioles 6 to 7 cm., rachis 25 to 30 cm., the longest pinnae equal to the rachis in length, the width usually less than 1 cm. The pinnae are linear and grasslike, the terminal pinnae like the others, not markedly shortened and widened as in *Neanthe,* usually about half the length of the longest pinnae near the middle of the leaf, seldom wider than the subterminal pinnae, sometimes narrower. The marginal veins are prominent on the lower surface, without notable intermediate veins.

The inflorescences are remarkably short and compact, definitely infrafoliar, 4 to 5 internodes below the living leaves. The peduncles are 3 to 4 cm. long, the branches usually exceeding the peduncle, often twice as long, numbering 5 to 8, all simple. Flowers of both sexes are set rather close along the branches, the fruits in contact or somewhat crowded, but not compressed. The branches are rather fleshy, smooth and round, not compressed and not longitudinally carinate as in *Neanthe,* the flower-scars nearly round or slightly angled at the sides, set in shallow depressions. Calyx narrow and thick, the lobes very short. Petals thick and fleshy, broadly ovate-triangular, valvate to near the base. Stamens very short, pistillode robust, cylindric, the apex nearly flat, slightly 3-lobed, with slightly expanded thin margins.

Only four joints of the peduncles

have spathes, the fourth spathe rudimentary, included in the third. The first spathe is short, not attaining the third joint of the peduncle. The second spathe covers nearly half of the third which is much the longest, usually projecting to the end of the axis. The young inflorescences often are protected by persistent sheaths of dead leaves, which split eventually. The persistent calyx-lobes of the female flowers have corneous margins, and in dry specimens appear to be imbricate. The petals are irregularly wrinkled lengthwise in the dry state, but hardly costate. The immature fruits become very hard and coarsely wrinkled in drying, as in *Omanthe*.

The first specimens were obtained from a male plant in the patio of a hotel at Campeche, but numerous clumps of both sexes, with flowers and fruit, were seen later in a plaza near the Mercado. The female plants were noted as having "much broader pinnae, of a much lighter shade of green." Clusters of nearly ripe fruits were abundant, but none quite mature, so that a definitely seasonal habit is indicated. The diversity of the sexes is remarkable, and the possibility of two species being brought in and propagated from cuttings may be considered. The female pinnae attain a width of 1.5 cm., with a length of 24 cm.

Several specimens from Yucatan are in the U. S. National Herbarium, some of them labeled *Chamaedorea gracilis*, others *Chamaedorea graminifolia*. The Maya name *xiat* is noted on Schott's No. 719, collected in 1865 at the ruins of Nohpat. Three of Gaumer's numbers, 420, 23215 and 24083, represent this palm. Specimens collected by G. N. Collins at Hacienda Peon, near Merida, No. 26, have longer pinnae, nearly 30 cm. by 1.3 cm., more numerous branches and longer spathes, exceeding the axis.

Paranthe, a Companion of Neanthe

Another parallel in vegetative characters, nearly as close as that of *Mauranthe* and *Docanthe*, is presented in a small palm growing intermingled with *Neanthe bella* in the district of Senahu, Alta Vera Paz, Guatemala, between Panzos and Cajabon. The leaf-forms often are so similar that the plants are taken readily for the same species, but the floral structures have even less resemblance than those of *Mauranthe* and *Docanthe*. The terminal portion of a leaf is shown in natural size in figure 13, with sections of the trunk, leaf-sheaths, inflorescences and flowers. Enlargements of male flowers are shown in figure 12, in the bud stage with the calyx about half the length of the petals, and with the flowers open.

The name *Paranthe* may remind us of the association with *Neanthe* in the forest, and also of the placement of the flowers along the branches, not crowded in either sex, but rather close together, while the flowers of *Neanthe* are relatively remote. Other contrasts with *Neanthe* are long internodes, narrow, close-fitting leaf-sheaths, short, slender, infrafoliar inflorescences, few branches, and close-set flowers, with petals not fused and pistillodes not enlarged.

The pinnae of *Paranthe*, 10 to 14 on a side, generally are somewhat broader and farther apart than those of *Neanthe*, but the variants often overlap. Pinnae of the size shown in figure 13 are somewhat beyond the range of *Neanthe bella*, though often approached in vigorous plants. Another difference is the deeper green of the foliage of *Paranthe* often distinctly tinged with violet, especially in the younger leaves, or those only partially opened. On account of the longer internodes, occasioning a smaller and more open leaf-crown, *Paranthe* doubtless would prove

less attractive than *Neanthe* as a houseplant. A few individuals were brought to Washington and lived several years in a greenhouse, but did not thrive.

Paranthe violacea, New Species

Trunk very slender, erect or creeping, 1 to 2 meters long, 5 to 7 mm. thick; internodes 2 to 6 cm. long; leaves inserted in a 1/3 spiral; leaf-blades 63 to 70 cm. long, 21 to 25 cm. broad, with 11 to 14 narrowly tapering lanceolate pinnae. The decumbent trunks produce coarse aerial, stilt-like roots 2 to 3 mm. thick near the base, gradually tapering.

Leaf-sheaths 13 to 16 cm. long, rather coarse, stiffened by prominent veins and sharply ridged at the back by the decurrent vitta; opening strongly oblique, somewhat auriculate, with age splitting to near the base, persistent for 3 to 4 nodes below the living leaves; petioles 19 to 29 cm. long, 2 to 3 mm. wide, triangular, grooved above and on the sides, persistent with the sheaths, after the pinnae have fallen. Rachis 28 to 30 cm. long, very slender, with lateral grooves, flattened below, sharply ridged above, vitta covering almost the entire under surface, but greenish in color.

Pinnae about ten times as long as broad, grass-like, unsymmetrical, the upper margin more distinctly double-curved. Midvein as prominent above as below, nearer to the lower margin than to the upper, terminating in the lower margin below the long tapering tip, but the terminal pinnae more symmetrical and short-tipped. Texture thin and even, submarginal veins less prominent than in *Neanthe*, intermediate veins not distinct. The pinnae have wider and more regular spacing along the rachis than in *Neanthe*, the upper pinnae not approximate as in *Neanthe*. Basal pinnae smaller and closer together, forming nearly a right angle with the rachis; terminal pinnae little divergent. Measurements of pinnae in centimeters: basal pinnae 9 to 10 by .7 to 1.1; second pinnae 13 to 14 by 1.2 to 1.4, middle pinnae 16 by 1.4 to 1.5; penultimate pinnae 12 to 13 by .5 to .6; terminal 5 to 12 by .6 to .9, separated at the ends of about 6 cm.

Male inflorescences infrafoliar, short, 18 to 20 cm.; peduncle 10 to 18 cm., with 7 joints, the first two very short, less than 1 cm., with very short spathes; joints 3 to 5 with narrow tubular spathes, the last spathe attaining 9 cm., usually exposing the last joint of the peduncle for 1 to 2 cm. Axis very short, 1 to 2 cm.; branches few in both sexes, usually 3 to 6, rather short, 4 to 8 cm. The more robust male plants, with trunks nearly one cm. thick, may have 8 to 10 branches. Male flowers crowded on the prominently angled branches, corolla of three separate broadly triangular petals; stamens 6, much shorter than the petals, anthers oblong, longer than the filaments; pistillode large, ovoid-conic, truncate. Female flowers much smaller than the male and more widely separated in broad depressions of the slightly thickened branches; calyx with broad minutely apiculate lobes about half the length of the very short corolla; petals imbricate, broader than long, the apex broadly angled.

The natural-size photograph reproduced in figure 13 was made at Sepacuite, Alta Vera Paz, Guatemala, March 24, 1902, by G. N. Collins.

A Simple-leaved Genus Allied to Paranthe

A genus rather closely related to *Paranthe* may be recognized in the palm with simple leaves described by Wendland in 1852 as *Chamaedorea geonomaeformis*, separated by Oersted in 1858 as a subgenus *Psilostachys*, and admirably illustrated in 1863. The

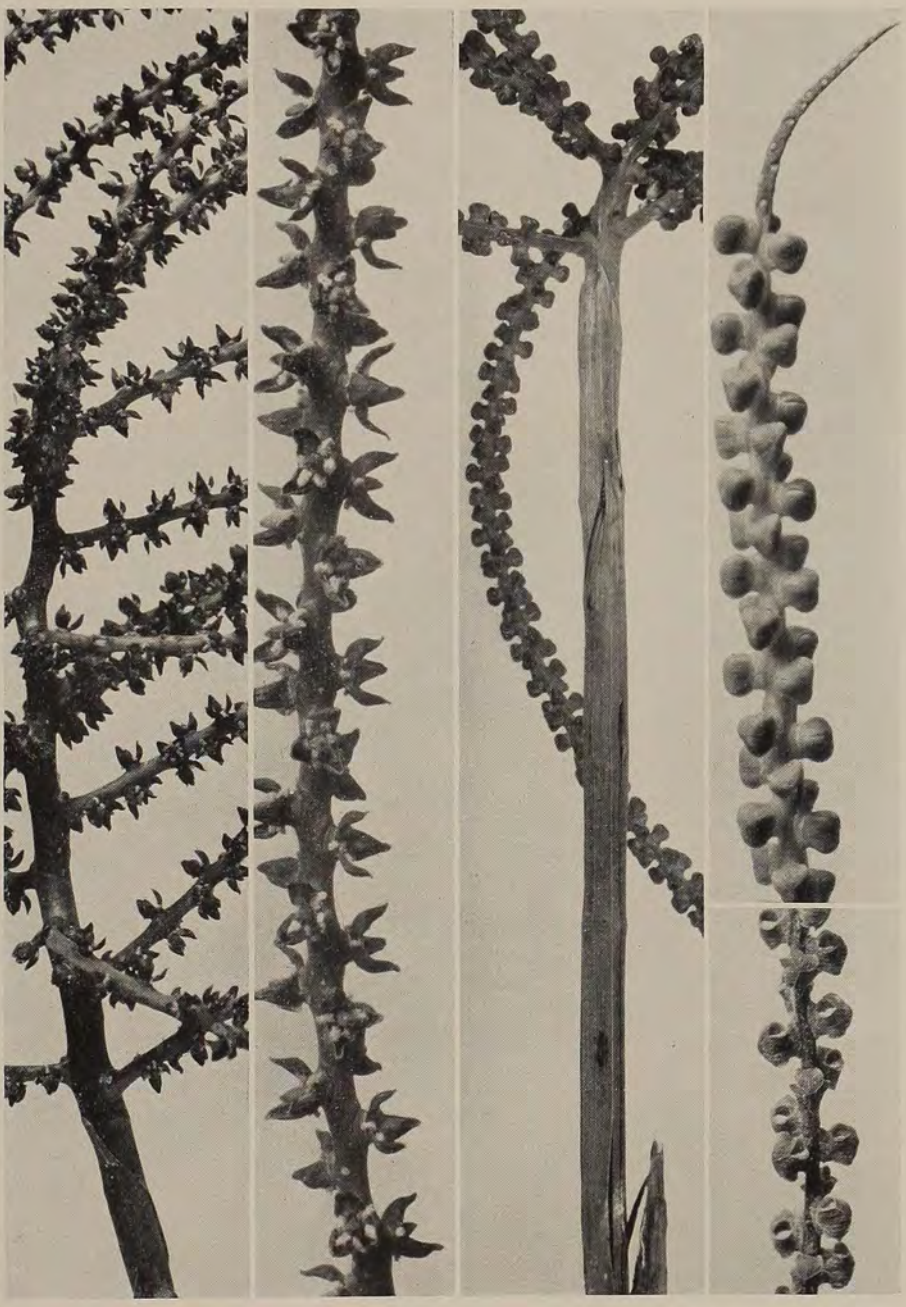


Fig. 10. Mauranthe and Docanthe, male inflorescences, natural size and enlarged.

name *Psilostachys* not being available for generic use, on account of previous applications to genera in three other families, *Migandra* may be substituted. The meaning is that the male flowers are mingled, in being close together, not separated by open spaces. They are not compacted by mutual pressure, but are much closer than the female flowers, also closer than the male flowers of *Paranthe*.

The male petals of *Migandra* are broad and short, united in the upper part, opening at the side. The spreading of the petals as in *Paranthe* would not be feasible in *Migandra* on account of the flowers being set so close on the branches. The flowers in section appear to be narrower and longer than in *Paranthe*, the stamens with longer anthers and relatively short filaments, about half the length of the anthers. The pistillode appears as cylindric, instead of greatly thickened at the base as in *Paranthe*.

The sexes are more different than in *Paranthe*, the female flowers rather widely separate, and the female branches of *Paranthe* shown in figure 13, are not perceptibly crassate. The female calyx has very broad, short lobes, the petals are broadly imbricate, the staminodes minute, triangular, apiculate, the pistil very thick, broadened above as in *Omanthe*, the stigma completely sessile. The male inflorescence has the four upper spathes nearly equal, the axis very short, the four slender branches closely beset with round flower-buds. The female inflorescence, with narrower, longer spathes, is simple or forked.

Migandra is a small, short-jointed, simple-leaved palm. The leaf-sheaths are very short and gradually narrowed to the blade, leaving no distinct petiole. The leaf-form is similar to *Eleutheropetalum* but the veins are much farther apart and about half as numerous, nine on each side, also the floral structures are very different. The original material was collected in Guatemala by Warscewicz.

An Analogue of Neanthe with Corrugate Female Flowers

An extreme specialization of the petals of the female flowers appears in a small Mexican palm collected in the State of Oxaca by Mrs. Ynes Mexia in 1938, her last expedition. The leaves and the inflorescences are much like those of *Neanthe* in patterns and proportions, while the flowers of both sexes are even more divergent than those of *Paranthe*. The female inflorescence is shown in natural size in figure 14, with enlargements of male and female flowers.

The name *Lophthele ramea* is suggested for this rather remarkable palm, that reverses the usual relation of the male flowers being more specialized. The generic designation alludes to the remarkably specialized corolla of the female flower, with large indurate petals closely ridged or crested longitudinally. The specific name refers to the inflorescences, similar in both sexes to those of *Neanthe*, but with several of the lower primary branches notably ramified, some of them with four or five divisions. The male inflorescences have longer and more numerous branches than the female. Forking of one or two branches of male inflorescences is not infrequent in *Neanthe*, but simple branches are the rule in most of the Chamaedoreas. The arrangement of the flowers on the branches in alternating rows, is the same as in *Neanthe*, which adds to the similar appearance and renders the contrast in floral structure the more surprising.

The male petals, instead of being fused into a thick-walled fleshy cup, as in *Neanthe*, are separate in the lower part of the flower, but remain united

Fig. 11. Mauranthe and Docanthe, fruit-clusters, natural size.

above, as in *Docanthe*. The female petals are convolute and corrugate, the surface marked in the dry state with eleven rather regular longitudinal ridges, five on each side of the median ridge, which usually is appreciably thicker than the others. The male flowers are obovate, showing in the dry state distinct longitudinal ridges, but relatively weak and not close together. The male corolla is narrow at the base, the short neck emerging from a very thin calyx. The female calyx is larger than the male, with distinct rounded lobes, usually with 4 or 5 longitudinal wrinkles, but not indurated like the corolla. The narrowing of the male flowers at the base and the minute calyx are in marked contrast with the rather broad straight-sided flowers of *Docanthe* and related genera, rimmed by a firm-textured calyx with regular vertical ribs like the corolla.

A short trunk was noted by Mrs. Mexia, a meter and a half. The internodes are about 2 cm. long, the leaf-sheaths 18 to 20 cm., rather deeply split, the margins with free fibers. Leaf-blades in size and form much resembling *Neanthe*, with eleven pinnae on a side, lacking a pronounced submarginal vein or an intermediate vein, these sometimes imperceptible, but other veins nearly equal. The lack of a regular vein pattern may associate with pinnae tending to wrinkle lengthwise, as in some of the forms that have been referred to *Stachyophorbe*. The inflorescences are interfoliar, the male much larger, the axis 16 cm. long with 24 branches, the lower branches 10 to 12 cm. long, the upper 7 cm. Female inflorescences with axis 8 cm. long, eleven branches, the lower attaining 8 cm., the upper 4 cm. Lower branches of male inflorescence with 6 divisions, those of female inflorescences with 4 divisions; more than half of the primary branches simple.

Narrow Pinnae with Simple Inflorescences

Reduction of the flower-bearing surfaces of the inflorescence to a simple cylinder has been attained by various members of the Chamaedorea family which in other respects are not alike. Several of the forms with simple inflorescences have simple leaves as well, but others have ample pinnate leaves. Simple inflorescences may occur, at least in the female sex, in Central American palms with wide spreading leaves and broad plicate pinnae, notably in *Spathoscaphe arenbergiana*. The name *Stachyophorbe* was proposed by Liebmann for smaller palms from Mexico, with simple inflorescences, some of them with slender short-jointed trunks and rather narrow pinnae, not unlike *Neanthe*. No illustrations of such palms have been found, but an example is given in figure 15, with elongate male inflorescences, very slender and drooping. This palm was photographed in the St. Louis Botanical Garden in 1907. One of the flowering spikes is reproduced in natural size, and also a spike from a similar Mexican palm in the conservatory at Golden Gate Park, San Francisco, but possibly not the same species, the petioles of the palm at Golden Gate being shorter, only 9 cm., those of the St. Louis palm three or four times as long, attaining 38 cm., the length of the rachis. The leaf blade as a whole is about 50 cm. long and nearly as wide, the largest pinnae measuring 30 cm. by 1.3 cm. The basal pinnae are shorter and narrower, 22 cm. by 8 mm., some of them very narrow, only 3 to 5 mm. wide. The upper pinnae also may be much reduced, the terminal to 11 cm. by 8 mm., the subterminal to 13 cm. by 8 to 11 mm., but on some leaves are broader. The rachis is ridged with the white vitta. The pinnae are much narrower than in the original species. The name *Stachyophorbe*

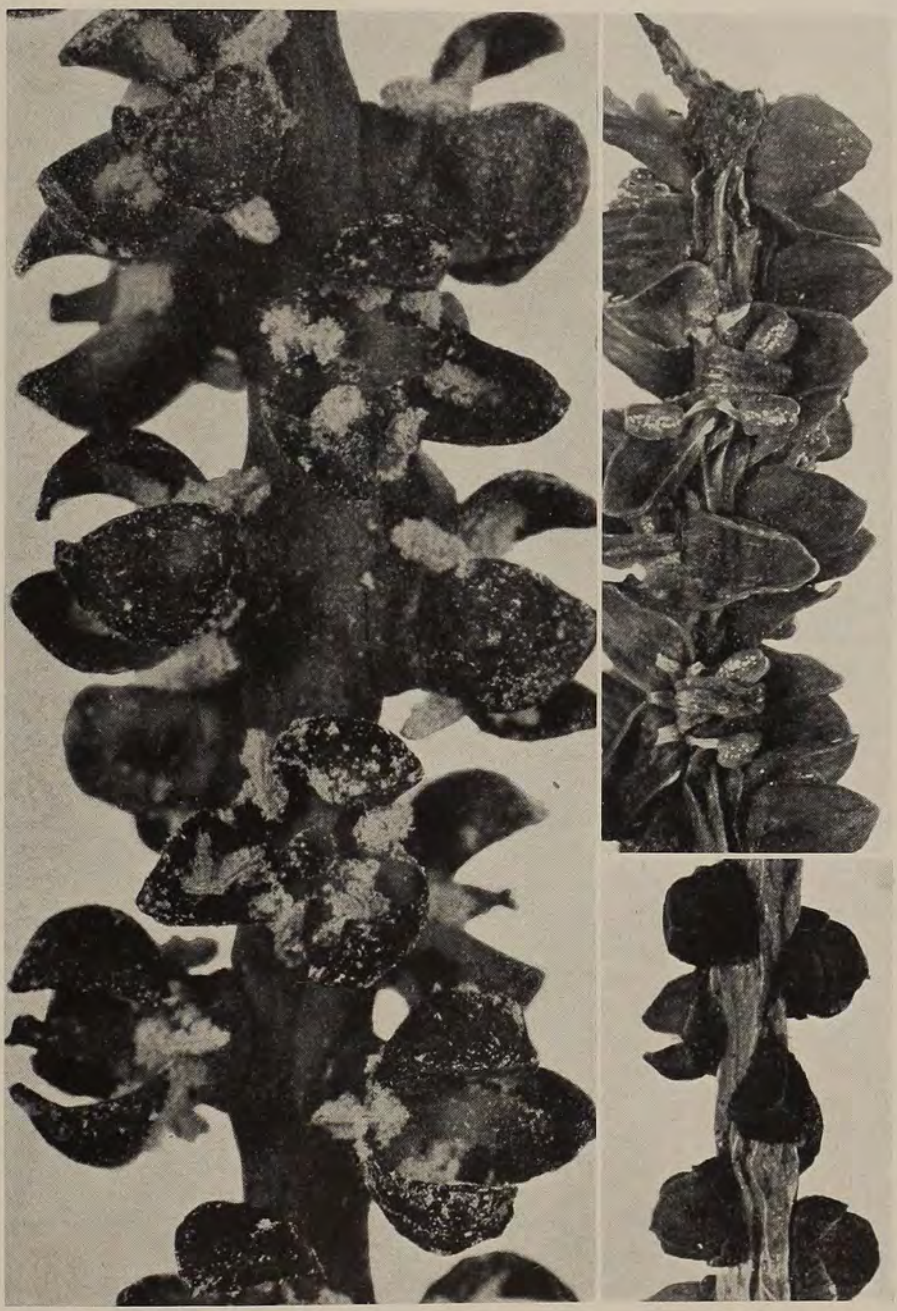


Fig. 12. Mauranthe and Paranthe, male flowers, enlarged.

filipes may be used for this species in allusion to the very slender peduncles and petioles.

Although the association of these palms at St. Louis and at San Francisco with Liebmann's species of *Stachyophorbe* is not beyond question, there is reason to consider them much closer than the palm that was figured by Oersted as representing this genus.

The Original Species of Stachyophorbe

The name *Stachyophorbe* has become involved with palms of other kinds, as a result of the transfer to this genus of a palm described by Wendland in 1852 as *Chamaedorea pygmea*, which in 1863 was elaborately figured by Oersted as *Stachyophorbe pygmea*, so that its characters have been taken as those of the genus, in the absence of other illustrations. This palm has simple inflorescences in the female sex, but in other respects is widely different from the two species originally placed by Liebmann under *Stachyophorbe*, as shown by authentic specimens that have come to the U. S. National Herbarium from the Copenhagen Museum.

Liebmann's first species of *Stachyophorbe*, *S. montana*, renamed by Martius as *Chamaedorea oreophila* on account of a previous *montana* in *Chamaedorea*, was notably larger than *pygmaea*, with a slender close-jointed trunk, 3 to 4 feet high. The rachis is nearly 50 cm. long, deeply grooved on each side underneath, pinnae 12 or 13 on a side, the larger attaining 33 cm. by 3.5 cm., rather strongly wrinkled longitudinally, with 3 or 4 intermediate veins on each side of the midrib rather prominent underneath, though greatly inferior to the midrib. The pinnae have even margins, instead of broadly sinuate and minutely notched on the lower margins as in *pygmaea*.

The specimens of *oreophila* include the terminal portion of a simple female inflorescence, the upper joints extremely slender, attaining 18 cm. by 2 mm., the terminal section of the peduncle 12 cm., less than 2 mm. thick, closely wrapped with a narrow cylindrical spathe 11 cm. long. Fruiting axis 2 mm. thick, probably 10 to 12 cm. long; fruits developed in oblong foveolae with the lower rim prominent and notably indurated. The lower lobe of the calyx is narrower and more prominent than the others. The petals are broadly triangular, angled or submucronate at the tip, widely overlapping in the bud. The stigma in the dry state is compact and triangular, not with norrow projecting lobes as in *pygmaea*.

Also in *Stachyophorbe cataractarum*, Liebmann's second species, the margins of the pinnae are even, not notched or sinuate as in *pygmaea*. The pinnae are narrower than in *oreophila* and the intermediate veins fewer, with a rather strong vein somewhat remote from the margin, more consistently prominent than in *oreophila*, and the texture of the pinnae is notably thinner. Thus the pinnae of *cataractarum* are rather definitely 5-veined, with submarginal veins often nearly as strong as the midrib, and the intermediate veins consistently weaker. The two species may not be very closely related, but neither is close to the type illustrated as *pygmaea*.

Conservatory plants carried under the name *Chamaedorea pringlei* Watson have been noted, some of them producing long, rigid, erect inflorescences, notably exceeding the leaves, as described by Martius under *Chamaedorea oreophila*, from Liebmann's notes on his *Stachyophorbe montana*. The name *Stachyophorbe oreophila* (Martius) should be used to avoid confusion with another *montana* also named by Liebmann under *Chamaedorea*. Such a du-

Fig. 13. Paranthe violacea, trunks, leaves and inflorescences, natural size.

plication of specific names doubtless was an accident on the part of Liebmann, in the nature of a misprint.

A Genus Distinguished from Stachyophorbe

To avoid further confusion, the palm that Oersted figured with remarkable detail in "L'Amerique Centrale" 1863, may be recognized as a generic type under the name *Cladandra pygmaea* (Wendland). The generic designation refers to the ramified male inflorescence, contrasting with the simple spicate inflorescence symbolized in the name *Stachyophorbe*. Other notable features of *Cladandra* are the creeping rootstocks, short open leaf-sheaths, widely spreading lanceolate pinnae, 9 to 12 on each side, forming a nearly circular leaf-blade, lower margins of pinnae broadly sinuate, minutely denticulate. The submarginal veins are prominently developed, but remote from the margins, about 3 mm. from the margin, 5 mm. from the midrib. The terminal pinnae are divergent like the others, not shortened and broadened as in *Neanthe*. The male flowers are shown in section as distinctly stipitate, the petals and the bases of the filaments united to form a solid foot rising above a very short slightly lobed calyx.

As shown in Oersted's drawing, the male inflorescence has 11 rather long branches, with the flowers standing well apart, while the simple male inflorescence, shown in figure 15, has the flowers very compact.

It would appear from Hemsley in "Biologia Centrali-Americana" that Oersted collected *pygmaea* in Chiapas, but this is not confirmed. Oersted in 1858 credited Linden with introducing the palm in Belgium, noting that the specimen in Wendland's collection at Herrenhausen was labeled as from Chiapas. Wendland in 1852 ascribed the palm to Linden, and also the information that it grew in "New Granada," on a volcano called Diablo, at an elevation of 4,000 ft. in the province of "Corocco" doubtless meaning Socorro. Dugand's "Palmas de Colombia" gives the locality of *pygmaea* as "Santander del Norte, Monte Diablo: Funk and Schlim."

Pinnae with Free Auricles

A foliar specialization as definite and remarkable as the long antiligules of *Legnea* appears in a small Guatemalan palm evidently related to *Cladandra*. The lower margins of the pinnae are produced at the base into small linguiform lobes overlapping the rachis underneath. Specimens collected at Chihob, Alta Vera Paz, October 19, 1920, by Harry Johnson, No. 977, are in the National Herbarium. This locality is a few miles west of Coban, in the drainage of the Chixoy river. The generic name *Lobia* is suggested, with *Lobia erosa* as the type species. The generic name refers to the unique feature, the auriculate pinnae, the specific name to the eroded margins of the pinnae.

A habit of growth very different from *Cladandra* is indicated, *Lobia* having a slender trunk with internodes 2.5 to 3.5 cm. long, 5 to 6 mm. thick. The leaf scars are transverse, about one mm. long, with a smooth abruptly raised lower border, the upper sloping surface with occasional spiniform fiber-bases.

Petiole 9.5 cm. long, rachis 16 mm., pinnae 8 on a side, the upper 4 or 5 pairs rather regularly opposite, the upper pinnae tending to be somewhat longer and narrower than the lower, and the strongly diverging terminal pinnae consisting of 3 to 5 united segments, much the widest and longest, measuring 8 to 10 cm. by 2-3.5 cm. The subterminal pinnae 8.5 by 1.2 cm., are somewhat narrower than the next pair below, 8.5 cm. by 1.5 cm. Basal pinnae 6.5 cm. by 1.3 cm., strongly

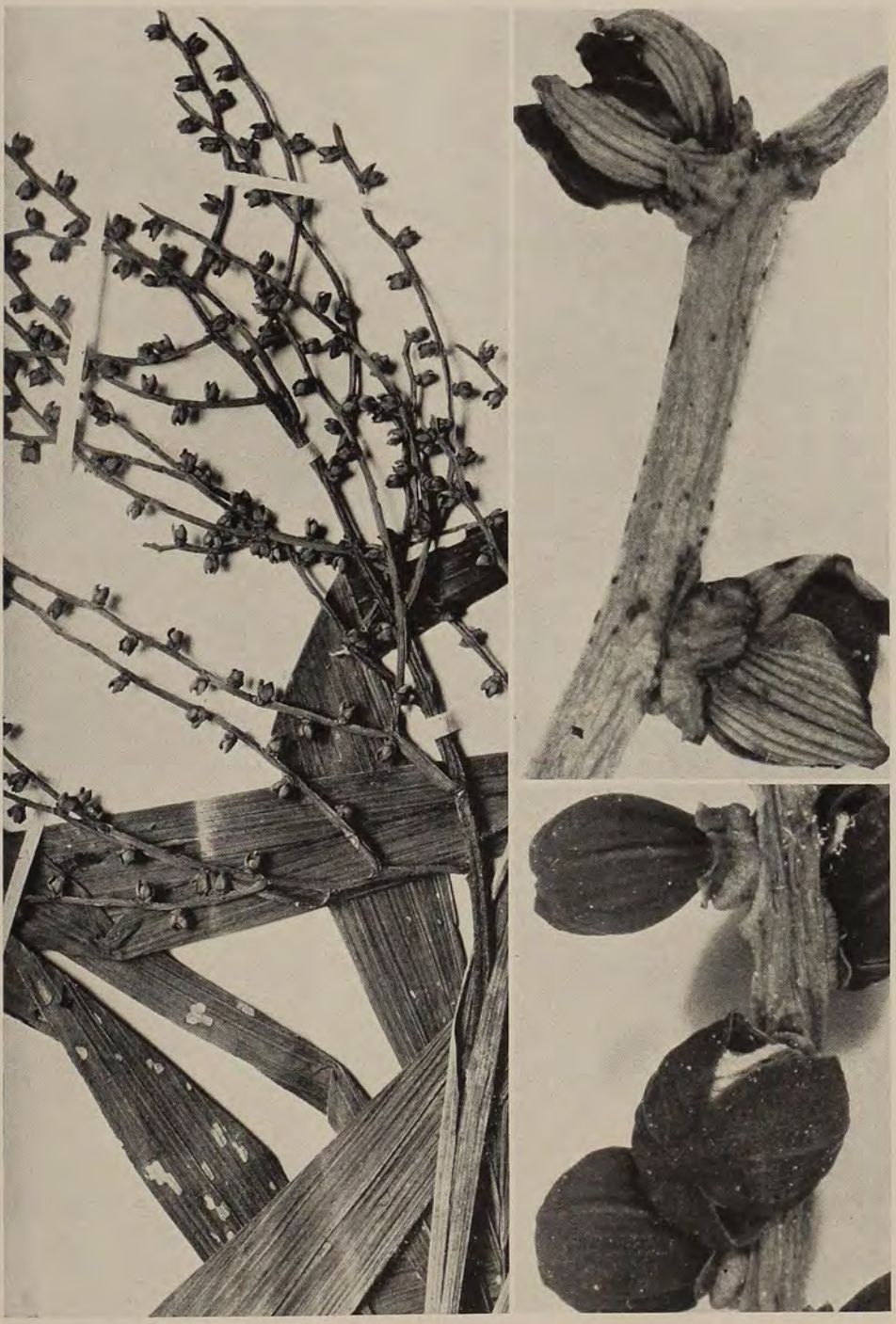


Fig. 14. Lophothele ramea, female inflorescence, natural size, flowers enlarged.

curved on the lower side, often irregularly erose-truncate beyond the middle. The spacing of the pinnae along the rachis is rather regular, 1.5 to 2 cm. apart, the upper pinnae somewhat closer.

The pinnae have only one secondary vein on each side of the midrib, 1.5 mm. or less from the margin, 4 to 6 mm. from the midrib, much closer to the margin and farther from the midrib than in *Cladandra*. Lower margins of pinnae minutely denticulate or erose, sharing the surface sculpture of the rachis, petiole and principal veins, hardly to be described as hirsute or scaly, but rather as minutely scabrous or carunculate, the projections often forming irregular transverse rows. The entire surface of the pinnae has scattered raised points, much smaller than those of the margins and angles. The basal auricles of the pinnae are small but distinct, attaining a length of 2 to 4 mm. and a width of about one mm., directed obliquely below the rachis, in line with the margins of the pinnae. Doubtless the auricles correspond structurally to the decurrent angles of the pinnae in some of the related palms. The roughness of the margins and the surface of the rachis may account for the auricles being free.

Inflorescences infrafoliar, 4 or 5 joints below the living leaves, extremely slender, 18 cm. long, the peduncle 12 cm., the two basal joints very short, together about 3 mm., third joint 1.1 cm, fourth joint 3.5 cm., fifth joint 3.5 cm., sixth and seventh joints nearly equal, 2.2 cm. Lowest spathe, on a young inflorescence, 1.5 cm. long. Spathe of second joint about 2 cm. long, of fourth joint about 4 cm., of fifth joint a delicate sheath about 1 cm. long, sixth joint marked by a slight ring, no spathe.

Female flowers rather widely separated, the two slender branches of the inflorescence not as thick as the peduncle. Calyx with very short broad lobes. Petals very broad, rounded or slightly angled at apex, remarkably even and smooth in the dry state, coriaceous in texture, no indication of fibers.

The relatively short, widely separated pinnae form an oblong leaf-blade, nearly twice as long as broad, in notable contrast with the lanceolate spreading pinnae of *Cladandra*, which are 15 cm. long, 1.5 cm. broad. The terminal pinnae of *Cladandra* are scarcely wider than the others, and have the same venation, apparently representing a single segment instead of a group.

New Generic Names

Several new genera are proposed, with outstanding characters as summarized below. The type species are designated in the text, on pages indicated. Specimens of the new species are in the National Herbarium.

Anothea, scandent trunks, elongate internodes, leaf-bases and rachides; deficient petioles; remote retrorse pinnae; interfoliar erumpent inflorescences. Mexico and Guatemala, page 135.

Cladandra, distinguished from *Stachyophorbe*, long, lanceolate pinnae minutely denticulate on the lower margins, secondary veins remote from margins, terminal pinnae not aggregate. Male inflorescence ramose, female simple. Colombia or Mexico, page 148.

Discoma, numerous linear pinnae, not regularly arranged, inserted at different angles, simulating Acrocomia. Mexico, page 137.

Docanthe, habit and foliage similar to *Mauranthe*, inflorescences interfoliar, basal joints of peduncle elongate, male petals apically connate, fertile carpel becoming strongly resupinate, pericarp lutescent or rubescent, similar to the inflorescence. Mexico and Guatemala, page 96.

Legnea, cespitose, similar to *Omanthe*, antiligule elongate, laciniate, pin-

Fig. 15. Stachyophorbe filipes, male plant, inflorescences natural size.

nae attenuate, inflorescences pauciramous. Guatemala, page 134.

Lobia, related to *Cladandra,* distinguished by relatively long internodes, clustered terminal segments, relatively short, erose pinnae, projecting basal auricles, minutely carunculate rachis, veins and margins; prominent secondary veins, submarginal. Guatemala, page 148.

Lophothele, foliage and inflorescences similar to Neanthe, internodes and leaf sheaths elongate, male petals connate, female petals imbricate, indurate, corrugate. Mexico, page 142.

Mauranthe, slender undergrowth palms with broad sigmoid, firm-textured pinnae, infrafoliar inflorescences, abbreviate basal joints of peduncle, open ecostate male flowers, oblong fruits, nigrescent pericarp. Mexico and Guatemala, page 83.

Meiota, cespitose trunks, linear pinnae, not numerous, infrafoliar inflorescences, abbreviate peduncles and spathes. Mexico, page 138.

Migandra, new name, replacing *Psilostachys* Oersted, related to *Paranthe,* distinguished by simple lamina, suppressed petioles, abbreviate internodes, aggregate male flowers, connate male petals. Guatemala, page 142.

Paranthe, trunk decumbent, internodes long, leaf-sheaths close, inflorescences infrafoliar, abbreviate, pauciramous; flowers of both sexes adjacent, petals not connate. Guatemala, page 140.

Psilostachys Oersted, replaced by *Migandra,* page 142.

Stachyophorbe Liebmann, distinguished from *Cladandra.* A new species, *Stachyophorbe filipes* is illustrated. Mexico, page 146.

The Illusive Ivy - VIII

Proposed Changes in Classification

Alfred Bates

(Part I)

Should anyone expect to find in these articles a systematic and gradually developed treatise on this genus he must count upon being disappointed. This point cannot be too strongly stressed. The reader must always bear in mind that the writer is slowly finding his way through the idiosyncrasies of this plant group, the ill advised welter of names and the often too hasty acceptance by writers on this subject, of statements made by other writers without verification and first hand knowledge — and a thorough knowledge. Such knowledge is not easily obtained. From an experience of thirteen years I would say that short of twenty years of intimate work no one has the right to speak with authority on the genus *Hedera*. By intimate work I mean not only the constant observation of living plants and herbarium specimens (when obtainable) and the vast literature on the subject which is scattered, often in small bits of merely a few lines, through books and garden papers; but also the constant examination of growing plants, in pots and out of doors on walls, trees and as ground covers, for very often the same form will vary under each of these conditions, as they develop into the mature or shrubby stage of growth; and he must also have raised seedlings from seed which is positively known to have been the result of *self*-fertilization. He must get the "feel" of the plant material.

Farrer, in the record of his Tibetan expedition, often made the same plea in regard to the classification of Primula and Meconopsis. Time and again he points out how inadequately a few herbarium specimens together with the diagnosis can supply full data for the establishment of species or variety; for the plants when observed by the thousand growing in the wild show no line between species, variety and form but a gradual variation from plant to plant. (So too with the "varieties" of the ivy.) While on the other hand some minor, but to the gardener's eye, distinct characteristics would be constant throughout in an unauthorized variant.

This difficulty in classification (and designation of name) is more confusing in the genus *Hedera* because the differences which separate the named forms is so minute. Even in the separation of some of the currently accepted species the botanist is forced in a final analysis to rely upon the arrangement of the rays—the formation or grouping of the small hairs which appear to the naked eye as a down or felt on the young growth and the inflorescence. But the gardener asks for less microscopic means of identification. And rightly so; for a form, a variety or *a species* to be of any value in a garden should be outstanding enough to be distinguished by more than microscopic features or hair splitting points of divergence. As this series aims to be an investigation of this genus from a horticultural point of view, this arrangement of the rays will not be discussed, save casually as a down or felt visible to the naked eye, in the descriptions which will follow. A later article will treat solely of these

stellate rays and may or may not be read as the gardener sees fit.

But this ray formation can be used only to separate the species and, to a questionable extent, their major (strongly defined) varieties; the various forms cannot be so distinguished and we are compelled to fall back on leaf shape, color, etc. And here is our great difficulty. These forms are not always constant and often do not show their true characteristics until they are thoroughly established—and even then may vary under different growing conditions. Then too there is the question, just where is the line to be drawn which divides one form from another?

In other plant groups the differences in the inflorescence, the variance in flower shape and coloring and the changes in the arrangement of the floral parts furnish definite and clearly marked points upon which a classification of varieties and forms may be based. Therefore the question arises as to whether the use of the term "variety" (and even of "form" as it is used as a degree of difference *from the "variety"*) is justifiable or scientific in this genus. Granted that in some few cases such use is warranted by a consistent and uniform adherence to a definite type varying from the species, there are a very large number of cases which are given varietal rank in which the type is not always distinct nor constant; may swing between two or more types according to soil, exposure and the conditions under which the plant is grown; or may not settle down to a relatively permanent leaf shape for several years.

Because of this a classification based upon the current system is extremely difficult to follow; and furthermore the correct name of a form cannot always be determined by merely examining a given specimen and relating it to a published description or drawing until it has been under observation for several —often as many as four—years. And even then it may not be exactly similar to the plant from which it was a cutting if the one is in heavy soil and the other in light; if one is in shade and the other in sun; if the one is in a pot and the other in open ground; or if one has a support to attach itself to (not a wire or cane stake) and the other has not. I have too often noted such variance in carefully marked specimens to be convinced otherwise.

To cite one such example from many: My specimen #29—I keep all plants under number with card index records — was a cutting in 1932 obtained from an old and well established plant. Its "name" will not be given lest it confuse the issue; in its rightful place later in the series this notation will be repeated. A rough description is that the leaf was palmate with so great a fullness at the base of each sinus (space between the lobes) as to fold over and appear as a pleat when the leaf was pressed; the plant arrived early at its flowering stage, and bore many intermediate stages of growth on the same plant and at the same time—vining, semi-shrubby and shrubby. It had shown all these characteristics from the first. The original plant completely covered the stone pedestal of a bird bath the basin of which had been broken. My plant was set out at the base of a four foot high and six inch diameter tree stump. After three years it had reached the top and was producing semi-shrubby and flowering stems; in other words, it showed all the characteristics of the mother plant. But cuttings made from any stage of its growth and grown in pots have not lived up to the parent in any way save that the leaf is palmate though always flat. That four- and six-year old pot plants have not developed according to type is not very surprising, for a wire or cane support is not an equable substitute for a wall or tree. But cuttings from the three stages of growth which

were given to the Brooklyn Botanic Garden in 1939 and, when rooted, planted out of doors have also not developed to type. Yet two-year-old plants from the original source which are growing in the garden of a friend are already beginning to show the three stages of growth and the exact leaf shape. All cuttings were carefully labeled one by one as they were taken from the old plants. The explanation is that the mother plant, my own and those in my friend's garden are growing in sunny locations and upon a support while the Brooklyn plants are in partial to full shade and are flat on the ground. Similar instances with other "varieties" could be cited but will be dealt with later under their respective species. The point I wish to make here is that an ivy cannot be identified correctly until the plant has settled down and its habits in sun and shade and as climber and ground cover are fully known. If one must wait over a period of time in order to be able to know the true characteristics of a "variety" and the points of differentiation are so minute, have we the right to use the term "variety" in such cases? I think not.

As this question of the advisability of the use of this term leads us to its use in the marking off of the shrubby, the mature, stage of every ivy's growth which according to current custom labels that stage as "var. *arborescens*"; and as it will be necessary to determine how this mature stage is to be treated when the first of the species, *H. nepalensis*, is described, the entire subject may as well be handled now.

It is but fair to the reader to acknowledge that I have postponed this subject as long as I could in the hope that the suggested changes which will follow would be made by some more scientific writer than myself. I have for several years past been dissatisfied with the use of the term "variety" in connection with this genus and have been formulating these suggestions and have discussed them with several botanists and horticulturists who are interested in ivies. Their reaction has been favorable and I feel justified in presenting them now.

In his monograph on this genus, Tobler suggested the idea when he divided the garden forms into "types" based upon leaf shape. (Die Gattung Hedera. 1912. pp. 119-124 and again in his article Die Gartenformen der Gattung Hedera in Mitteilungen der Deutschen Dendrologischen Gesellschaft. 1927. pp. 10-17). But he does not develop the idea into a system of classification any further than, in his listing of ivy names, to place in parentheses the "type" to which that form belongs. Thus, quoting from his article published in the Dendrologischen Gesellschaft 1927, p. 23:

"*digitata* Loudon 1838 . . . .

zu *H. Helix* L. (typ. palmata) . . "

translating the word "zu" as meaning "belonging to" or "of the," this last line would read, "belonging to *H. Helix* L. (palmata type or group)." Now the differences between many of the "varieties" in these separate groups are so slight as to be hair splitting; and furthermore the differences are not always constant. Take as an example the two forms mentioned above, *digitata* and *palmata*. A plant produced from one of the most reliable nurseries in England under the name *digitata* shows so little difference in leaf shape from *palmata* that even "experts" cannot see any. And furthermore I have had a plant whose leaves were even more digitate than the English importation but which ceased to show that difference as a pot plant or in other gardens; and also in many years produced few or no digitate leaves.

I wish here to reiterate my previous statement that I am accepting Bean's, Tobler's and Nicholson's descriptions of, statements regarding, and names of

ivies rather than those of Americans; and am accepting plants under name from Kew, from Hillier & Sons of Winchester and from L. R. Russell, Ltd., of Richmond rather than names from American sources—unless I am convinced of errors. And this is not in any depreciation of either the botanists or the nurseries of this country. It is just common sense. The ivy is not a native plant here and has never, until of late years, achieved any degree of popularity either in public or in private gardens; ivy has been "just ivy." As there was no interest there was no need for our botanists to give them more than casual attention or our nurseries to carry labeled plants—as late as 1932 one of our largest nurseries was selling Irish Ivy for English Ivy. On the other hand the English and continental gardeners and botanists have had it before them always; in the woods, the hedgerows, on ruins, old and recent buildings, trees, walls, and it has been used in their gardens from time immemorial —it is a tradition and a heritage with them. They have almost been forced to observe its various forms; so why should they not know more about ivies than we in United States do? Just as we know more about the forms of the "ramosa complex" which is an American development; as far as I can discover these branching ivies have not occurred across the Atlantic and are not listed there.

Determining Features for Classification of "Varieties"

Let us now see what characteristics may be used as distinctive points to mark off the different "varieties." And remember, these points must apply to pot grown plants as well as to those grown out of doors if the classification is to be of any use. We will start by elimination of such points as cannot be used.

Points Which Cannot Be Used

Length of Internode. From long observation, for at one time I thought this could be one of the distinguishing features, the length of internode cannot be used because it too often varies in the same form when grown indoors and outside. And it also varies in the later case with soil, exposure and season of growth. A rich soil will almost always produce a longer internode than a poor soil. Exposure to sun or to strong and constant winds invariably produces a shorter internode than shade and less windy positions. The first growth in spring always produces a longer internode than the growth made after midsummer. Then too most young plants when planted at the base of walls or trees—and almost as frequently when used as ground covers—will, if faithfully examined over a period of several years (3-5), be found to make at first long growths on which the internodes are longer than on the later growths which fill in between these long stems after the third year.

Length of Petiole. Nor can the length of petiole be used as a determining factor for much the same reasons given above—soil, exposure and season of growth; but the reactions to these three are slightly different. Soil does not seem to make so great a difference here as in the case of the internodes. Exposure makes more; plants in full sun will always have shorter petioles than those in other locations; this is but what we should expect in the vining stage, for the ivy is a plant of the woods and not by choice of full sunlight. Therefore a drier atmosphere tends to produce a shorter petiole than a damp one. And exposure to constant strong winds seems to make for a shorter petiole. Almost invariably the young growth in spring gives a longer petiole than the later growth of midsummer. Then too the denser the

foliage—either on wall or on ground—the longer the petiole; for the leaf's object in life is to reach light and air so when the foliage is dense a large percentage of the petioles will be lengthened. To see this one has only to observe a well grown specimen of any of the forms and notice how the petioles of all the outer growths are much shorter than those where the growth is more compact.

Size of Leaf. While we cannot wholly reject size of leaf for one of the determining factors it cannot be accepted as one of the principle ones. Every ivy, species as well as "variety," may, for reasons known only to itself, produce abnormally large or abnormally small leaves at certain periods of its growth. But it may be used as one of the secondary points and as such will be considered later on.

Type of Growth. Except in some certain forms, type of growth cannot be used except in a general sense because almost all forms have a marked tendency to send out a few longish wiry stems during their first few years and later fill in with a more compact growth. This trait is more clearly noticeable in plants grown in the open than in pot specimens. But it may be used when well established plants are being analyzed and so more will be said on this point later on.

Points Which Can Be Used

Unless otherwise noted, the following points are characteristics which are clearly shown in both pot and garden grown specimens; and are constant under any normal growing conditions *provided* that, in the case of leaves, only the normally formed leaves on the plant are considered and all the abnormal ones ignored. Long observation has shown me that almost every ivy plant produces some abnormal leaves—some with decided lopsided outline of lobing, or even with truncated lobes or without a lobe on one side; such leaves must be overlooked by any one who is trying to pick out the typical leaf shape of that plant. This leaf shape varies to some extent but will be found to conform to a general plan according to type as later on will be outlined. Readers who are familiar with Tobler's article of 1927 should note that in the drawings of several of the leaves of several of the "varieties" which he shows in outline include some such abnormal leaves.

These points may be grouped under five headings:

I. Leaf Shape,
II. Leaf Color and Texture,
III. Color and Texture of the Petioles and the Young Stems,
IV. Distinct Type of Growth,
V. Age at Which Plant Reaches Maturity.

Again attention must be called to the fact that such minor differences are not enough to warrant designating them as "varieties" except, perhaps, in the last; and this will be discussed later.

(*To be continued*)

Rhododendron Notes

CLEMENT GRAY BOWERS, *Editor*

The American Azaleas and Their Variations

EDGAR T. WHERRY

Called upon to identify a series of native members of the genus *Rhododendron,* Series *Azalea,* in the garden of Mrs. J. Norman Henry at Gladwyne, Pennsylvania, the writer turned to the treatments of these plants in the literature. Such keys as could be found proved, however, inadequate for the purpose, so after extensive field and herbarium study was carried on, a new one was worked out, and is here presented.

The difficulty in naming Azaleas is due to the fact that the various entities to which species names have been assigned are not well differentiated, but intergrade freely with one another. In some cases the intermediates presumably represent ancestral plants from which, by divergent evolution, the "species" have arisen; in other cases they are recent hybrids or descendants from hybrids in which parental characters are reassorted. Extensive cultural and genetic studies would be necessary to decide the relations in individual cases, so listing of the recognizable entities is all that can be undertaken here.

Under each presumable species[1] the features in which notable variation is shown are stated. For convenience in reference, the allelomorphic characters are assigned letters,—the commoner extreme in each case a capital, the rarer a small letter. Entities to which infra-specific names have been applied, and intermediates between species, are then characterized by the letters corresponding to their features. Only a few of the existing combinations of extremes have as yet been named; if all of them had to be, the number of new epithets required would run into the hundreds. The question would then arise as to whether these should be assigned to the category of subspecies, variety, form, hybrid, etc., and some of the names already published might have to be shifted from one status to another. Rather than thus burden the literature, we will here let well enough alone.

Certain of the terms used require comment. "Bud-scales" refers to the principal scales on the thick buds from which flowers arise; scale-pubescence is that on their exterior, convex surfaces only. When leaf-pubescence is noted, that apart from the midrib is meant; on the leaves of all Azaleas the midrib tends to be more or less strigose. "Terminal pubescence" signifies that on the pedicels, calyx-lobes and corolla-tube. The sepals, petals, and stamens of these plants being rather irregular, data given as to their lengths represent average values. Corolla-pubescence described is that on the exterior surface.

To use the accompanying key, an unknown specimen is first placed in the proper Division and Subdivision on the basis of its corolla limb color and its blooming time. It is then run through the key lines, in which the more constant characters of each species are given, until its probable species name is found. The column headed "Notable Variations" is then consulted; if the specimen is typical, it will show the extreme designated by a capital letter in each case. The great

[1]Chiefly according to Rehder in Rehder and Wilson, Monograph Azaleas, p. 117, 1929.

majority of specimens, however, will vary toward the small-letter extreme in one or more characters, and will have to be classed as intermediates between species.

The area in which many of our eastern plants survived the geological changes of post-Cretaceous time is termed for short the Refuge. It extends from eastern Oklahoma to the Fall-line of the Atlantic slope. When the Cretaceous lowland was uplifted and dissected into the present-day mountains and hills of this area some plants adapted themselves to the new conditions, while others became extinct in the refuge area. When surrounding lands became available for occupancy—first the Coastal Plain and then the northland which had been devegetated by ice—extensive migrations took place. Distributions are here stated with these relations in view.

KEY TO AMERICAN AZALEAS (RHODODENDRON SPP.)

DIVISION A. Corolla red, orange, yellow, or, in certain species-intermediates, pink with strong yellow blotch.

Subdivision a. Flowers and leaves developing at approximately the same time; corolla-tube expanding from the middle.

COROLLA-LOBES and tube approximately equal in length; eastern third of Refuge, locally entering Coastal Plain in Savannah valley..... *calendulaceum.*

Notable Variations

Bud-scales: A. mucronulate vs. a. aristate.
—surface: B. glabrous vs. b. canescent.
Blooming-period: C. before vs. c. after foliation.
Mature leaves: D. to 8 x 3 cm. vs. d. to 4 x 1 cm.
—upper surface: E. strigose vs. e. glabrate.
—lower surface: F. green vs. f. glaucous.
G. copiously pubescent vs. g. glabrate.
Terminal pubescence: H. glandular vs. h. glandless.
Calyx-lobes: I. 4 mm. long vs. i. 1 mm. long.
Corolla-lobes: J. longer vs. j. shorter than tube.
—limb: K. red vs. k. yellow.

Infra-specific Entities

alpha, flammea:[2] a.B.C.D.E.F.g.h.i.J.K; *aurantium,* intermediate between K and k; *Azalea bakeri:* a.B.c.D.E.F.G.H.i.J.K; *croceum:* A.B.C.D.E.F.G.H.I.J.k; *Azalea fastigifolia:* a.B.C.d.e.F.g.H,i.j.K; intermediates with: —*austrinum:* A.b.C.D.E.F.G.H.i.j.k; —*cumberlandense:* a.B.c.D.e.F.g.H.i.J.K; —*speciosum:* A.B.C.D.E.F.G.h.i.j.K.

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[2]The writer does not agree with Rehder (op. cit., p. 130) that Michaux's "*Azalea calendulacea alpha flammea*" was *R. speciosum.* Topotype material in the herbarium of the Academy of Natural Sciences of Philadelphia represents *Rhododendron calendulaceum* as ordinarily interpreted, except for being, as Michaux definitely stated, glandless.

To interpret the list of letters which follows each infra-specific term, reference is to be made to the table of Notable Variations. In the present case, it will be found, then, that the features of *Rhododendron calendulaceum,* variant termed "*alpha flammea,*" are:

Bud-scales, aristate; bud-scale surface, glabrous; blooming period, before foliation; mature leaves, to 8 x 3 cm. in size; upper surface of leaves, strigose; lower surface of leaves, green, also glabrate; terminal pubescence, glandless; calyx-lobes, 1 mm. long; corolla-lobes, longer than tube; and corolla-limb, red.

COROLLA-LOBES decidedly shorter than the tube.

TERMINAL PUBESCENCE glandless; bud-scales glabrous, margined with fine cilia; southeast side of Refuge ..... *speciosum.*

NOTABLE VARIATIONS

Leaf-pubescence: A. copious vs. a. sparse.
Calyx-lobes: B. 1 mm. long vs. b. 3 mm. long.
Corolla-limb: C. red vs. c. orange.

TERMINAL PUBESCENCE glandular; bud-scales pubescent, the marginal cilia accompanied by dark glands; leaves copiously pubescent; calyx-lobes 1 to 2 mm. long; Coastal Plain, Chattahoochee valley ..... *austrinum.*

NOTABLE VARIATION

Corolla-limb: A. orange vs. a. yellow.

Subdivision b. Flowers opening well after the leaves have developed; bud-scales glabrous; leaf-pubescence sparse; terminal pubescence partly glandular; calyx lobes 1 to 2 mm. long; corolla-tube cylindric more or less above middle.

BLOOMING PERIOD early summer; corolla-tube copiously pubescent; central part of Refuge ..... *cumberlandense.*

NOTABLE VARIATIONS

Bud-scales: A. aristate vs. a. mucronulate.
Corolla-tube: B. little longer vs. b. much longer than lobes.
—limb: C. red vs. c. yellow at maturity.

BLOOMING PERIOD mid-summer; bud-scales mucronulate; corolla-tube sparsely pubescent, decidedly longer than the lobes; limb red; southeast margin of Refuge ..... *prunifolium.*

DIVISION B. Corolla pink to white, if conspicuously yellow-blotched, not intermediate between species.

Subdivision a. Flowers and leaves developing at approximately the same time.

COROLLA-LOBES and tube approximately equal in length.

UPPER LOBE conspicuously yellow-blotched; leaves sparsely pubescent; terminal pubescence more or less glandular; pedicels to 2.5 cm. long; corolla-tube about 2 cm. long and 4 mm. wide (pressed); stamens 2½ times as long as corolla-tube; range far-western ..... *occidentale.*

NOTABLE VARIATIONS

Leaves: A. broad- vs. a. narrow-elliptic.
Calyx-lobes: B. 5 mm. long vs. b. 1 mm. long.
Corolla-limb: C. white vs. c. bronzy pink.
Fragrance: D. musty vs. d. sweet.

Rhododendron arborescens and atlanticum

Rhododendron occidentale
oblongifolium
austrinum

speciosum
cumberlandense
prunifolium

INFRA-SPECIFIC ENTITY

sonomense: a.b.c.d.

UPPER LOBE slightly if at all yellow-blotched; corolla-tube 2 to 3 mm. wide (pressed).

BUD-SCALES canescent; lower leaf-surface fine-pubescent; corolla-tube expanding from middle, 1.5 to 2 cm. long; stamens approximately 2 x corolla-tube length; flowers opening with the leaves, clove-scented; northern part of Refuge and northeastward to lat. 45° ..... *roseum.*

NOTABLE VARIATIONS

Upper leaf-surface: A. strigose vs. a. glabrate.
Lower leaf-surface: B. glaucous vs. b. green.
Terminal pubescence: C. glandular vs. c. glandless.
Calyx-lobes: D. 1 mm. long vs. d. 3 mm. long.
Corolla-limb: E. deep pink vs. e. white.

INFRA-SPECIFIC ENTITY

Intermediate: *roseum-nudiflorum:* a.b.c.D.e.

BUD-SCALES glabrous or exceptionally sparsely pubescent; flowers opening before or with the leaves, not clove-scented; eastern Refuge eastward to coast and to lat. 43° ..... *nudiflorum.*

NOTABLE VARIATIONS[3]

Habit: A. plants isolated, to 3 m. high vs. a. spreading into colonies, under 0.75 m. high.
Bud-scales: B. glabrous vs. b. silky-pubescent.
Upper leaf-surface: C. glabrate vs. c. strigose.
Lower leaf-surface: D. glabrate vs. d. fine-pilose.
Calyx-lobes: E. 1 mm. long vs. e. 3 (5) mm. long.
Corolla-tube: F. cylindric well above middle vs. f. expanding from middle.
—length: G. 1.5 cm. vs. g. 2.5 cm.
—coarser hairs: H. glandless vs. h. gland-tipped.
—lobes: I. shorter than tube vs. i. equal tube.
—tube-color: J. pink vs. j. white.
—limb-color: K. white vs. k. pink.
L. lacking yellow shading vs. l. yellow-shaded.
Stamen-length: M. 3 x corolla-tube vs. m. 2 x tube.
Fragrance: N. musty vs. n. faintly honeysuckle-like.

INFRA-SPECIFIC ENTITIES

album: A.B.C.D.E.F.G.H.I.j.K.L.M.n; *glandiferum:* A.B.C.D.E.F.G.h.I.J.K.L.M.N; intermediates with: —*calendulaceum* (*mortieri, tricolor,* etc.): A.B.C.d.e.f.G.h.i.J.k.l.M.n.; —*canescens:* A.b.c.d.E.F.g.h.I.J.K.L.M.n; —*roseum:* A.b.c.d.E.f.G.h.i.J.k.L.m.n.

[3]To gain an idea as to frequency of deviations (small letters) from the normal (capital letters), notes were made on 15 plants in Eastern Pennsylvania in May, 1943. They showed: a, 1 plant; b, 4; c, 7; d, 5; e, 1; f, 2; g, 1; h, 4; i, 2; j, 0; k, 3; l, 4; m, 2; and n, 7.

COROLLA-LOBES decidedly shorter than the tube.

HABIT tall-shrubby, to several m. high; bud-scales canescent; corolla-tube cylindric above middle, pubescent with both fine and coarse hairs; flowers honeysuckle-scented; southeastern part of Refuge and over Coastal Plain sw. to long. 95° and ne. to lat. 38° ..... *canescens.*

NOTABLE VARIATIONS

Lower leaf-surface A. green vs. a. glaucous.
—pubescence: B. copious vs. b. sparse.
—coarser hairs: C. glandless vs. c. gland-tipped.
Calyx-lobes: D. 1 mm. long vs. d. 3 mm. long.
Corolla-tube: E. 1.5 cm. long vs. e. 2.5 cm. long.
—coarser hairs: F. gland-tipped vs. f. glandless.
—limb: G. white vs. g. pink.
Stamen-length: H. 3 x corolla-tube vs. h. 2 x tube.

INFRA-SPECIFIC ENTITIES

candidum: a.B.C.D.E.F.G.h; *subglabrum:* A.b.C.D.E.F.G.H; intermediates with: —*alabamense:* a.B.C.D.e.F.G.h; —*atlanticum:* a.b.C.d.e.F.G.h; —*speciosum:* A.B.C.D.e.f.g.H and yellow shading or blotching.

HABIT dwarf-shrubby, rarely over 1 m. high; stamens 2 to 2½ times the corolla-tube-length.

PLANTS isolated; calyx-lobes inconspicuous; corolla moderately pubescent; flowers delicately scented;[4] southeast end of Refuge and down Chattahoochee valley ..... *alabamense.*

NOTABLE VARIATIONS

Bud-scales: A. glabrous vs. a. silky-pubescent.
Blooming-period: B. before vs. b. after foliation.
Branchlets: C. sparsely vs. c. densely strigose.
Upper leaf-surface: D. strigillose vs. d. glabrate.
Lower leaf-surface: E. glaucous vs. e. green.
—pubescence: F. copious vs. f. sparse.
Corolla-tube: G. expanding from middle vs. g. cylindric well above middle.
—length: H. 3 cm. vs. h. 1.5 cm.
—pubescence: I. gland-tipped vs. i. glandless.
—limb: J. white vs. j. pink.
K. yellow-blotched vs. k. lacking yellow pigment.

INFRA-SPECIFIC ENTITIES

R. viscosum aemulans: a.b.c.D.E.F.g.H.I.J.k; intermediates with: —*canescens:* a.B.c.D.E.F.g.h.I.J.k; —*speciosum:* A.B.C.D.e.f.G.H.i.j.K.

PLANTS forming colonies; corolla copiously pubescent especially up lobes; tube cylindric above middle; flowers more or less clove-scented; east margin of Refuge and adjacent Coastal Plain ..... *atlanticum.*

[4] A delightful fragrance, difficult to describe, suggesting that of jasmine but with a tendency toward lemon; similar to the scent of certain native orchids, as *Orchis spectabilis.*

NOTABLE VARIATIONS

Habit: A. 0.25 to 0.5 m. high vs. a. 1.25 m. high.
Bud-scales: B. glabrous vs. b. canescent.
Blooming period: C. after leaves vs. c. before leaves.
Lower leaf-surface: D. glaucous vs. d. green.
E. glabrate vs. e. pubescent.
—pubescence: F. glandless vs. f. gland-tipped
Calyx-lobes: G. 4 mm. long vs. g. 1 mm. long.
Corolla-hairs: H. gland-tipped vs. h. glandless.
I. uniform vs. i. of 2 or 3 kinds admixed.
—limb: J. white vs. j. pink.
K. free from yellow shading vs. k. yellow shaded.

INFRA-SPECIFIC ENTITIES

confusum: A.B.C.D.E.f.G.H.I.J.K; *luteo-album:* A.b.C.D.e.f.G.H.i.J.k; *neglectum:* A.B.C.D.E.F.G.H.i.j.K; *tomolobum:* a monstrosity with cleft corolla-lobes; intermediates with: —*canescens:* a.b.c.d.e. F.g.H.i.J.K; —*nudiflorum* (*pennsylvanicum*): a.B.C.D.E.F.G.h.i. J.K; —*viscosum:* a.B.C.D.E.F.g.H.i.J.K.

Subdivision b. Flowers opening well after the leaves have developed; corolla-lobes shorter than tube; stamens about twice as long as corolla-tube; flowers clove-scented.

CALYX-LOBES more or less conspicuous; bud-scales around 12, glabrous, mucronulate; branchlets buff, glabrate to sparsely strigose; leaves glaucous beneath; corolla-tube 3 to 4 cm. long and 3 to 4 mm. wide (pressed), cylindric well above the middle, its hairs tipped with pink glands; style prominent, red-purple; fragrance intense; eastern third of Refuge ..... *arborescens.*

NOTABLE VARIATIONS

Habit: A. several m. high vs. a. under 1 m. high.
Calyx-lobes: B. up to 6 mm. long vs. b. under 3 mm. long.
Corolla-limb: C. white vs. c. pink.
D. lacking yellow shading vs. d. yellow shaded.

INFRA-SPECIFIC ENTITIES

flavescens: A.B.C.d; *richardsonii:* a.b.C.D; *rubescens:* A.B.c.d.; intermediates with: —*calendulaceum* (*anneliesae, Azalea furbishii*): A.b.c.d; —*viscosum:* A.b.C.D.

CALYX-LOBES more or less inconspicuous; corolla-tube 2 to 3 mm. wide (pressed); style pink; fragrance mild.

PEDICELS up to 2.5 cm. long; corolla-tube cylindric above middle.

HEIGHT to 2 m.; bud-scales around 15, mucronate, more or less canescent; leaves to 10 x 3 cm.; terminal hairs in part gland-tipped; southwestern part of Refuge, south into Coastal Plain ..... *oblongifolium.*

NOTABLE VARIATIONS

Lower leaf-surface: A. green vs. a. glaucous.
—pubescence: B. copious vs. b. sparse.
Calyx-lobes: C. 1 mm. long vs. c. 3 mm. long.
Corolla-tube: D. 3 cm. long vs. d. 2 cm. long.

HEIGHT to several m.; terminal hairs mostly gland-tipped; corolla-tube around 3 cm. long; southern part of Refuge and Coastal Plain w. to long. 93° and ne. to lat. 37° ..... *serrulatum.*

NOTABLE VARIATIONS

Bud-scales: A. around 18 vs. a. around 12.
—tip: B. aristate vs. b. mucronate.
—surface: C. glabrous vs. c. canescent.
Branchlets: D. red-brown vs. d. yellow-brown.
Leaf-size at maturity: E. to 8 x 4 cm. vs. e. to 4 x 2 cm.
Leaf-surfaces: F. glabrate vs. f. fine-pubescent.
—coarser hairs: G. glandless vs. g. gland-tipped.
Lower leaf-surface: H. green vs. h. glaucous.
Corolla-lobes: I. ½ as long vs. i. ¾ as long as tube.

INFRA-SPECIFIC ENTITIES

georgianum: a.b.c.D.E.F.G.h.i; *molliculum:* A.B.c.D.e.f.G.H.I; intermediates with: —*oblongifolium:* A.b.c.d.E.f.G.h.I; —*viscosum:* a.b.C.d.e.F.G.H.I.

PEDICELS to 1 or rarely 1.5 cm. long; bud-scales 12 or fewer, mucronulate or mucronate; fragrance intense; northeastern part of Refuge and east to coast, lat. 44° to 34° ..... *viscosum.*

NOTABLE VARIATIONS

Habit: A. several m. high vs. a. under 1 m. high.
Bud-scales: B. around 10 vs. b. around 6.
—surface: C. glabrous vs. c. silky pubescent.
Branchlets: D. yellow-brown vs. d. red-brown.
Leaf-size at maturity: E. to 4 x 1 cm. vs. e. to 6 x 2 cm.
—surfaces: F. green vs. f. glaucous.
—pubescence: G. sparse vs. g. copious.
Calyx-lobes: H. 1 mm. long vs. h. 3 mm. long.
Corolla-tube: I. cylindric above vs. i. expanding from middle.
—length: J. 2 cm. vs. j. 3.5 cm.
—pubescence: K. glandular vs. k. glandless.
—limb: L. white vs. l. pink.

INFRA-SPECIFIC ENTITIES

coerulescens: a.b.c.D.E.f.G.H.I.J.K.l; *glaucum:* A.B.C.D.E.f.g.H.I.J.K.L; *hispidum:* A.B.c.D.E.f.g.H.I.J.K.L; *montanum:* a.b.c.D.E.F.G.H.I.J.K.L; *nitidum:* a.B.C.D.E.F.G.H.I.J.K.L; *rhodanthum, roseum:* A.B.C.D.E.F.G.H.I.J.K.l; *rubescens:* A.B.C.d.E.f.G.H.I.J.K.l; *tomentosum:* A.B.c.D.E.F.g.H.I.J.K.L; intermediates with: —*arborescens:* A.B.C.D.e.f.G.h.I.j.K.L; —*atlanticum:* a.b.C.D.E.f.G.h.I.J.K.L;—*nudiflorum:* A.B.C.D.e.F.G.H.i.J.k.L.

A Book or Two

The American Land—Its History and Uses. By William R. Van Dersal. 1943. 215 pages. Oxford University Press, New York City. $3.75.

Most people living in an epoch are seldom aware of the really important movements and people of the period, but we surmise that one of the greatest forces for good in contemporary America is the soil conservation movement. This movement has received a great impetus in the past decade and a literature has started to grow up on the subject. Frequently the theme has been somewhat greater than its prophets, but undoubtedly this book is a worthy contribution and will meet the need for a popular presentation of the history of land utilization in America. The author begins with the attempt to reconstruct a picture of the appearance of America in the pre-Columbian period. The reader soon becomes aware of some of the devastation resulting from the sins of the fathers, but the tragic results of American individualism in the exploitation of natural resources are not emphasized unduly in this book. The author is no mere prophet of doom, but has great confidence in the emergence of a better pattern of land utilization.

Statistics and the general outlines of culture for a multiude of economic crop plants are presented in a flowing, vitalized style of writing which kept the reviewer from several hours of needed sleep although we have no particular interest in flax, okra, onions and the multitudinous other crops discussed in this volume. The numerous photographic illustrations are excellent in quality. Probably this book will appeal to any person who has ever had the slightest interest in the soil.

Perhaps one of the weaknesses of the conservation movement in America has been its excessive preoccupation with legislatures and other groups of the mature, and its failure to capture the imaginations of the rising generations in the schools. Probably the unscientific emotionalism or partisan bias of certain groups of conservationists has separated them from educators in the past. However, this presentation seems to us to be sane and sound enough to justify our wish that this book or one like it could be in the curriculum of every American school.

V. T. S.

Bounty of the Wayside. By Walter Beebe Wilder. 1943. 256 pages. Doubleday, Doran and Co., Garden City, New York. $2.50.

During the past few years, the women of the more advanced gardening circles have resurrected the herb lore of mediaeval gardens and still rooms and have published a surprising number of volumes on the subject. Indeed, so many have appeared that a popular writer on gardening of our acquaintance discontinued work on a manuscript on the subject. We were not aware that men had taken up as a hobby the preparation of multitudinous electuaries, preserves, comfits, metheglins, hydromels, tisanes, preserves and all the rest, but we were mistaken. Grandfather Beebe had done all this—and more—much more, with the aid of a large country house as a laboratory and a patient and understanding cook as helper. For materials he had ample gardens and orchards, but he also relied on the bounty of the wayside. Wartime food rationing would have scarcely disturbed him. The range of Grandfather's accomplishments left us a bit

breathless in the final chapters; and although we are somewhat of an advocate of adventurous eating, we could not help feeling that life was rather complex at times for him, although undeniably interesting. This is an amusing book. It would make an excellent gift for a friend who has a hobby of unusual foods or herbal lore.

V. T. S.

Shelter Trees in War and Peace. By Ephraim Porter Felt, D.Sc. 1943. 320 pages. Orange Judd Publishing Co., New York City. $2.50.

This is not a treatise on camouflage, as might possibly be inferred from the title, but is rather a manual for the utilization and care of trees on the vast areas now occupied by military cantonments and similar establishments. It also deals with tree selection and planting for the home owner, with particular reference to protective concealment. At least a part of the thesis of this book is that Americans should plant trees for possible utilization in World War III, since nearly a third of a century will be needed to develop them properly for concealment of large homes and important roads.

The unquestioned competence and prestige of the author assure the reader of authentic information, although there is nothing particularly new about much of the material in this book. The lists of trees for certain localities have been prepared by persons thoroughly familiar with the regions. The various trees available for use in plantings of this type are discussed with reference to undesirable qualities and difficulties of culture, in case such exist. Other compilations of information also help to make the book useful to those in various professions connected with tree culture and make it a useful general reference book.

V. T. S.

Crab Apples for America. By Donald Wyman. Published by the American Association of Botanical Gardens and Arboretums. July, 1943. 81 pages. $1.00.

The preface of this unpretentious but highly useful paper bound volume states that the aim of the author was to bring together all available information on the crab apples grown in North America. The result is reasonably successful and will be highly acceptable, in particular, to nurserymen and landscape architects. This book should help to popularize the crab apples, which is a worthy cause since they have never had full recognition of their value. They have exceptionally long periods of attractiveness in ornamental plantings since in addition to the flowers, the fruits of many sorts are highly colored. Some species provide food for wildlife. The economic value of the crab apples as a food is minimized by the author, except for regions having severe climates. We dissent somewhat from the admonition of the author against planting crab apples in hedges or windbreaks because of the increased difficulty of maintenance. *Malus Sargenti* makes an excellent clipped hedge in some cold regions in which satisfactory hedge plants are few, and we suspect that some other species would also be suitable. Of course fire blight and other diseases and likewise insect pests vary in severity from region to region. However, crab apples do not require any more attention, on the whole, than do lilacs.

Naturally, this book was written from an ornamental rather than a pomological viewpoint and some recent breeding, cytological and rootstock studies of interest to pomologists are not included in the bibliography. There are also a few minor errors. One might infer that the Virginia Crab so prominent in modern pomological literature

is a synonym of Hewes Virginia Crab, which definitely it is not. The Virginia Crab of modern pomology originated, paradoxically, in Iowa.

The classified lists of varieties most useful for beauty of flowers, fruits, culinary uses, and autumnal foliage color are commendable. Fastigiate, pendulous and other specialized forms are listed also. We hope that the committee on crab apples of the organization sponsoring this volume will be able to make studies to determine the most valuable sorts for landscape and other purposes in the various regions of the country. It is to be hoped that the author will be able to issue a definitive work on the subject in due time, not only treating in detail the relative values of the various sorts in landscape work, but also presenting aids to the identification of the most important types by means of keys, drawings or photographs.

V. S.

Roses in Colour and Cultivation. By T. C. Mansfield. E. P. Dutton & Co., Inc., New York City. 264 pages, illus.

When casually introduced to this new book on roses by Mr. T. C. Mansfield and without sufficient time or interest to carefully examine it some may say that here is another book by an Englishman on a subject already well covered and certainly not applicable to American conditions of soil, climate and what have you. That sort of criticism has been given before and usually is based upon prejudice rather than interest in roses.

Mr. Mansfield is an excellent writer who presents his subject in a brief, concise and well organized manner.

Starting out with a brief statement on the history of the rose, he turns to descriptions of those kinds that have had the most influence upon our modern roses. Such material is of interest and great value to all real rosarians. Cultural practices are then taken up with the emphasis put on the "do" and not upon the "don'ts." Site, soil and the use of humus and lime are explained and their importance stressed as well they should be. Strangely there is no mention of the super-deep soil preparation supposedly practiced in England. We are especially interested in his discussion of the treatment of the various types of soil—clay, sand, and chalk—in preparing rose beds.

The chapter on "Roses for Specific Purposes" puts considerable emphasis on why we select roses. Here, Mr. Mansfield cites well-known varieties to illustrate his points. He goes into considerable length to classify the "bedding" roses (hybrid-teas) by color, noting fragrance, and points out that much of the effect of a rose garden is to be obtained through careful arrangement of the plants according to their colors. While this point will hardly be accepted by those with small rose gardens, it is a view that is well taken. Perhaps the author, who makes color photography a hobby along with growing roses, gives color undue emphasis, but many will agree that it is an important consideration and should not be ignored.

The author carries this thesis further in his chapter on selecting plants for the garden, although he soon turns to the importance of understocks, carrying the discussion to the various types — bedding, polyantha, climber, and shrub roses.

Other chapters deal with planting, pruning, propagation, rose pests—diseases, and insects (thank goodness we are not troubled by all that he describes in detail) — and the maintenance of roses. The chapters on pruning and propagation are unusually well written and illustrated. They apply to rose

(*Continued on page* 178)

Sphagnum Moss as a Seedling Medium

VERNON T. STOUTEMYER, CLAUDE HOPE AND ALBERT CLOSE

The use of sphagnum moss as a seeding medium offers many advantages to both professional and amateur plant growers. It is almost a complete guarantee against loss of seedlings from damping-off. It is cheap, and easy to use. Although a few horticulturists have advocated the method in the past for a few particular subjects, the general value of sphagnum for a wide range of plant subjects is little known.

Sphagnum moss, dried or living, has been used as a medium for the germination of nearly all seeds received at the U. S. Plant Introduction Garden at Glenn Dale, Maryland, for nearly 20 years. During this period, plants of nearly 2,500 species have been started successfully in this manner. Complete control of damping-off has been obtained with all these species throughout this period. This remarkable record was obtained without the use of any chemical fungicides at any time either on the seeds or on the seeding medium.

Search through standard horticultural literature has revealed very few instances of the use of sphagnum for seed germination. Several investigators have reported its use for special purposes, but none recommended it widely until the authors published their first paper on this subject in the April, 1941, issue of THE NATIONAL HORTICULTURAL MAGAZINE.

Sphagnum may be used just as collected, or it may be dried. In propagation work at Glenn Dale the living sphagnum collected from local bogs was dried enough to facilitate handling, but not enough to kill it. The ordinary commercial dried sphagnum, obtained in bales, was often moistened slightly before handling, but this step appears to be optional. Following these preliminary steps, both kinds were rubbed through a screen of hardwar cloth having three meshes to the inch. With both kinds of sphagnum, this was an easy task. Where only small quantities are needed, it may be purchased at some seed stores by the pound.

Large quantities of the sphagnum may be prepared quickly by running the dried baled moss through a hammer mill. In this case, the material must be entirely dry to avoid clogging the machine. Various sizes of screens should be tried to find one which will give the correct texture of the moss. Preparation by means of a hammer mill is doubtless the most satisfactory method for large users. When plant growers generally recognize the value of sphagnum, the shredded product ready for use in seeding will probably become a standard commercial article.

The flats used for seeding have usually been made of new white pine, 20 by 10 by 3 inches, with provision for drainage. Seed flats made of pressed galvanized sheet metal also have been highly satisfactory and may be used repeatedly. If a saving on the quantity of miss is necessary, a moisture holding substratum, such as a mixture of two parts of peat moss and one part of sand may be placed in the flat up to within 1¼ inches of the top. Of course, the flat may be filled entirely with the sphagnum with equally satisfactory results.

Loose moss is added to fill the flat, then firmed to bring the surface one-half inch below the top. The flats are well watered, and in order to insure a thorough wetting of the sphagnum, experience at Glenn Dale shows that a second watering within 12 to 24 hours is decidedly helpful. After the flat has

been prepared and watered, a final step is to sprinkle an additional layer of moss over the surface to a depth of one-eighth to one-quarter inch. In order to avoid packing this layer water is applied as a fine spray. Algal growths which have a tendency to grow over a smooth, firmly pressed layer of sphagnum seem to be eliminated by this somewhat loose layer of moss at the surface. This practice is followed at Glenn Dale since somewhat stagnant pond water is used. This layer might be unnecessary in cases in which clear well water is available.

Flats of living sphagnum remain in good condition for a very long period, although one disadvantage is that sometimes the moss may start into excessive new growth which will smother the young seedlings. Often the seedlings in dried sphagnum are larger and greener than those in the living, suggesting that products of disintegration may aid growth. Doubtless only those who have a local supply will find the use of living sphagnum practical. In results there is very little difference between the living and dried moss. The sphagnum used in experiments at Glenn Dale was found to have a pH of approximately 4.3.

In all the flats, the seeds were broadcast over the surface and generally received no other cover than a pane of glass placed over the top of the flat. A light covering of the larger seeds with sphagnum is permitted and reduces the frequency of watering. Glass substitutes of various types fastened to a light wooden frame were also used and were perhaps even more satisfactory because of the light weight and freedom from breakage. Some seeds do not germinate without exposure to light, but all seed flats are protected from direct sunlight on an open bench in the greenhouse until germination has started. As the seedlings developed, air was admitted gradually.

With many subjects, somewhat stronger and more rapid germination with heavier growth of the seedlings can be obtained by watering the flats, either before or after seeding, with a simple two-salt nutrient solution—one teaspoonful each of superphosphate and potassium nitrate per gallon of water, in an amount sufficient to saturate the material. Another satisfactory nutrient solution may be prepared by stirring six teaspoonfuls of the ordinary mixed garden fertilizer in one gallon of water. These solutions may be applied at intervals to promote the growth of the seedlings.

One of the most valuable characteristics of sphagnum as a seeding medium is that by withholding nutrients, plants of many species may be kept at a small size without permanent stunting or serious injury for remarkably long periods. In some cases, seed flats of sphagnum have been kept for nearly a year and normal plants have been obtained from the seedlings following transplanting to a favorable growing medium. This would obviously be impossible with a seeding medium of soil.

Frequently seedlings are pricked off from the flats at a very early stage, sometimes after only two weeks. However, with sphagnum the time for transplanting is not at all critical. When taken out early, the seedlings may be lifted out easily without any loss of the root system, which is not always easy with soil. The veriest amateur should have no difficulty transplanting seedlings grown on sphagnum.

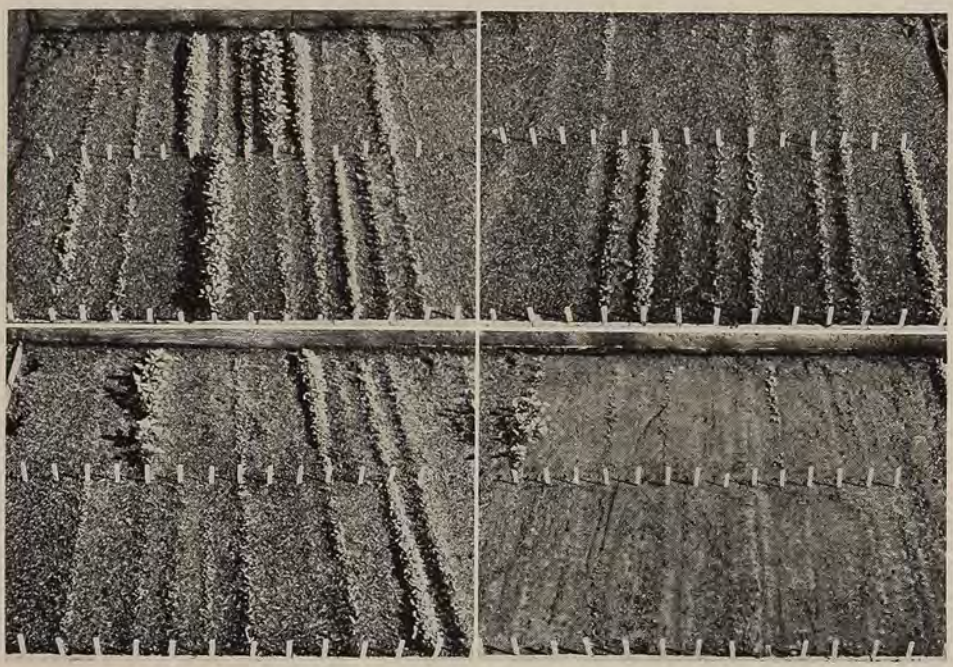
Difficulties in the Use of Sphagnum

Most people who have followed the directions outlined in previous publications by the authors have reported highly satisfactory results. A prominent plant pathologist has indorsed the method and has suggested using it as a means of avoiding the need for using critical wartime chemicals for the con-

Flats of seedlings comparing the stand on soil with that on sphagnum contact with soil 45 days after sowing. In the upper half of each flat, the seeds were sown on a layer of sphagnum lying in contact with the soil. In each pair the flat on the left received a layer ¼ inch thick, that on the right, ¾ inch thick. Upper: left, Myosotis alpestris; right, Exacum affine. Lower: left, petunia; right, snapdragon.

trol of damping-off in flats and seedbeds. However, a few people have reported difficulties and practically all of these have been traced to failure to water the moss sufficiently in preparing the seed flats or to keep them sufficiently watered. Appearances are somewhat deceptive to those accustomer to using other seeding media.

Only one other difficulty has come to the attention of the authors. In using old wooden seed flats where some wood decay had started, an organism was apparently present which destroyed the seeding medium of sphagnum quickly, causing the appearance of damping-off on the seedlings. If old wooden flats must be used, they should be disinfected by thoroughly wetting with 2 per cent formalin solution, using a sprinkel can or brush, or soaking for 15 minutes in ½ per cent solution at least a week before their use for growing seedlings. This trouble has never appeared on reasonably clean wooden seed flats.



The cold-frame plots one month after sowing. Upper left: sphagnum in a layer 3/4 inch thick to which nutrients were applied several times. Upper right: sphagnum in a layer 3/4 inch thick. Lower left: sphagnum 1/4 inch thick. Lower right: unsterilized soil.

Use with Special Plant Groups

The use of sphagnum moss as a seeding medium is satisfactory for practically all of the plants which are started under glass. Sphagnum may be used in outdoor sash-covered frames, although in warm weather somewhat frequent watering may be needed after the sash is removed.

Seeds of all kinds of vegetables have been started with success in sphagnum. The method is particularly well adapted to the home gardener.

Seeds of ericaceous plants and many other fine seeds which are so often troublesome to the nurseryman and florist can be handled with ease and assurance of a good stand of plants.

Cacti and succulents are generally considered to require a neutral soil with good drainage and the high acidity and moisture-holding capacity of sphagnum might lead some to consider it unsuitable for this group. However, studies were conducted using three somewhat difficult species, *Aloe variegata, Cephalocereus senilis,* and *Mammillaria camptotricha* in comparison with soil. In all cases the results were better in sphagnum than in soil.

The Mechanism of the Control

The reasons for the control of damping-off by sphagnum are not clearly understood. Nevertheless, the control is so complete that in addition to eliminating the need for sterilizing the seeding medium, no chemical treatments of the seeds themselves seems to be needed.

Preliminary trials of artificial cellulose sponge, animal sponge, glass wool, peanut hulls, pecan hulls, rice hulls and also cottonseed hulls, shredded or

ground to a satisfactory texture for use in flats for seeding in a manner comparable to sphagnum, failed to show any material promising enough for further trials.

Possibly the superb aeration furnished by the physical structure of the sphagnum combined with the remarkably high water-holding capacity provides conditions which are not conducive to damping-off. The strands of the moss are hollow when viewed in cross-section.

Growing Plants in Sphagnum

The technique of growing plants in sphagnum for shipment is by no means new and has many obvious advantages over soil because of the light weight, cleanness and freedom from diseases or insects commonly harbored in soils. However, few horticulturists have given enough attention to the merits of sphagnum moss as a growing medium for many kinds of plants. Trees growing in sphagnum bogs in the Pacific Northwest have been observed to develop a remarkably heavy root system in relation to the tops. Even cacti have been observed to grow remarkably well at Glenn Dale when potted in sphagnum. Plants of types which tend to require care to avoid overwatering and consequent decline have been observed to grow and thrive under exceptionally casual watering and treatment. Mineral nutrient solutions must be applied at intervals to plants grown in sphagnum in this manner. The possibilities of this type of culture remain largely unexplored at the present, and offer an interesting challenge to professional and amateur alike.

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A Book or Two

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growing in America as fully as under English conditions.

Nearly three-fourths of the book is devoted to brief descriptions of rose varieties. Each variety is classified and described, with supplemental data on vigor of growth, fragrance, pruning, color, and the use for which it is best suited. Most of this data is supplied through a key permitting descriptions of many hundreds of varieties.

Mr. Mansfield has illustrated the book throughout with natural color photographs and pen and ink sketches. The photographs and sketches on propagating and pruning are very well done, making that section of the book especially valuable to all rose growers.

WILBUR H. YOUNGMAN

October 18, 1943

Lilacs for America. Published for the American Association of Botanical Gardens and Arboretums by The Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Swarthmore, Pa. 1943. 64 pages. $1.00.

Readers of THE NATIONAL HORTICULTURAL MAGAZINE are already familiar with the monumental labors of John C. Wister in the field of lilacs, not only as a grower and observer of the family, but as a faithful compiler and student of their history.

The present volume continues the work that has been published from his pen in this field, on several occasions in the magazine. It has the same character and value but is increased by the addition of numerous chapters and notes. For the timid, there are lists of choice sorts, for the erudite there are data to feed their souls, for the independent there are excuses to provoke search and differences of opinion. What more could one want for a dollar?

Nut Trees

Our attention has been called by Mr. John W. Hershey of Downingtown, Pa., to the present campaign to enlist the interest of landowners to plant more nut trees, particularly walnuts. This is a campaign that is going out through all the channels that can be reached and we are happy to suggest to our readers that they communicate directly with Mr. Hershey to see just what they can do to help establish a greater number of the trees in question in their neighborhood. In this time, when we are invited more and more to consider all our lives from a long time point of view as well as from the immediate present, it might be a happy thing to have a chance to plant a few nut trees, in the full assurance that some future day, happier than the present, would see them flourishing in the American scene to which we are so devoted.

Note

Copies of Lilacs for America may be purchased through the Secretary's office of the American Horticultural Society.

The American Horticultural Society

INVITES to membership all persons who are interested in the development of a great national society that shall serve as an ever growing center for the dissemination of the common knowledge of the members. There is no requirement for membership other than this and no reward beyond a share in the development of the organization.

For its members the society publishes THE NATIONAL HORTICULTURAL MAGAZINE, at the present time a quarterly of increasing importance among the horticultural publications of the day and destined to fill an even larger role as the society grows. It is published during the months of January, April, July and October and is written by and for members. Under the present organization of the society with special committees appointed for the furthering of special plant projects the members will receive advance material on narcissus, tulips, lilies, rock garden plants, conifers, nuts, and rhododendrons. Membership in the society, therefore, brings one the advantages of membership in many societies. In addition to these special projects, the usual garden subjects are covered and particular attention is paid to new or little known plants that are not commonly described elsewhere.

The American Horticultural Society invites not only personal memberships but affiliations with horticultural societies and clubs. To such it offers some special inducements in memberships. Memberships are by the calendar year.

The Annual Meeting of the Society is held in Washington, D. C., and members are invited to attend the special lectures that are given at that time. These are announced to the membership at the time of balloting.

The annual dues are three dollars the year, payable in advance; life membership is one hundred dollars; inquiry as to affiliation should be addressed to the Secretary, 821 Washington Loan and Trust Building, Washington, D. C.