M. M. CHATTAWAY

Price 30 cents

Yale University

School of Forestry

TROPICAL WOODS

NUMBER 57

MARCH 1, 1939

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 57 March 1, 1939

A technical magazine devoted to the furtherance of knowledge of tropical woods and forests and to the promotion of forestry in the Tropics.

The editor of this publication and the writer of any articles therein, the authorship of which is not otherwise indicated, is SAMUEL J. RECORD, *Professor of Forest Products, Yale University.*

Subscription price One Dollar for four consecutive numbers. Remittances should be made payable to TROPICAL WOODS.

Address all communications to the editor, 205 Prospect Street, New Haven, Connecticut, U. S. A.

PRINCIPAL TIMBERS USED IN THE SIERRA DEL ECUADOR

By M. ACOSTA SOLÍS

Director del Instituto Botánico y Profesor de Botánica y Farmacognosia de la Facultad de Ciencias, Universidad Central del Ecuador, Quito

The Republic of Ecuador, South America, is divisible into three geographical regions, namely, the Occidental or Litoral, the Oriental, and, between them, the Central or Interandine region. The first two regions are well timbered, but the other, generally known as the Sierra del Ecuador, is confronted with a serious forestry problem.

In former times there must have been extensive wooded areas in the Sierra, at least in the river basins and valleys, but these natural forests have largely disappeared through clearing for agriculture and overcutting to meet the heavy

local demands for lumber, firewood, and charcoal. The total area of the region is about 90,000 square kilometers, but probably less than 5 per cent is now naturally wooded. The real forests represent extensions from the Occidental and Oriental cordilleras and are difficult of access because of lack of roads. Comparatively little has been done toward reforestation, but a beginning has been made, particularly in the densely populated province of Tungurahua. There are no large plantations, but the small landowners plant Eucalypt, Cherry, and Alder trees along the boundaries of their farms and on sites unsuited for cultivation.

The finest woods in the Sierra are Walnut and Cedar, but the reduction in supply and consequent higher cost are making it necessary to utilize all of the timbers that are available. I have in preparation a detailed investigation of these species which will be published in a special booklet entitled "Identificatión anatómica de las maderas usadas en la Sierra del Ecuador." It will be copiously illustrated and will include results of timber tests now being made at the Instituto Botánico de la Universidad de Santiago de Chile. Following is a preliminary account of the woods used in the Sierra, arranged in descending order of their importance.

Nogal or Walnut

Nogal is a true Walnut (*Juglans*). It occurs scattered or in stands on the subandine spurs of both cordilleras where the climate is mild. It is exploited in Santo Domingo de los Colorados, the Corazón, Imbabura, Montañas de Maldonado (province of Carchi), Baños (province of Tungurahua), etc. The trees are 12, 15, or even 18, meters high, with a trunk diameter of 0.80 to 1.50 meter. There are two classes of wood, the dark-colored or "café obscura" and the light brown or "café clara"; the former is preferred for cabinet-work and fine furniture.

Cedro or Cedar

Cedro (*Cedrela*), known to English-speaking people as Cedar, Spanish Cedar, or Cigar-box Cedar, often grows in mixture with Nogal, but generally dominates associations

known as "cedrales." It makes its most rapid growth in sheltered places when the air is very humid, as in the eastern foothills of Saloya and Guarumal, Gualea, but the wood is too porous and light-colored to suit the furniture industry, particularly for use as veneer. On the other hand, timber produced in drier regions is denser and more deeply colored and therefore is in greater demand and more costly. The Cedar of Baños is the best, but the demand for it is so great in the provinces of Chimborazo, Tungurahua, Cotopaxi, and Pichincha that carpenters and furniture-makers in Quito use less expensive kinds which are derived from Saloya, Guarumal, Gualea, and, in smaller amounts, from Ibarra. The trees vary in height from 12 to 18 m. and in diameter from 0.60 to 0.90 m., occasionally up to 1.20 m.

Sisín

Sisín (*Podocarpus* sp.) is the only coniferous tree indigenous to Ecuador. It occurs scatteringly in the foothills of the Andes, for example, at Leito (province of Tungurahua) and Saloya (province of Pichincha), where it attains a height of 8 to 16 m. and a diameter of 0.60 to 0.80 m. The wood is of a lustrous light clear yellow color, of fine and uniform texture, and easy to work. It is used in considerable quantity for carpentry, cabinet-making, and carving and usually is finished in natural color. It lacks figure and is not cut into veneers.

Aliso or Alder

Aliso (*Alnus*) is of common occurrence throughout the subandine region, growing gregariously or, on the high plateaus, scatteringly; it is also planted about farms. The trees are 15 to 20 m. tall, with an erect bole 0.40 to 0.70 m. in diameter at the base and nearly always branching at a height of 5 to 6 m. above the ground. The wood is pale roseate, sometimes striped with red, becoming somewhat brighter upon drying; it is odorless, of fine and uniform texture, and is easy to saw and to plane. It is used in carpentry, furniture-making, and cabinet-work, and before Eucalypt timber became available, was employed in general construction in the same way as Capulí, Sauce, Algarrobo, and Arrayán. In the province

of Tungurahua it is used for making the boxes and packing cases in which fruit is exported.

Canelo

Canelo (*Nectandra* sp.) is a lauraceous tree attaining large dimensions in the mountains of Leito and the foothills of Baños and Oriente. The wood is dark yellow, without figure, and is disagreeably scented. It is also brittle and has a tendency to split when exposed to the sun. Consequently it is less highly appreciated than the kinds described above, but is nevertheless much used in ordinary carpentry.

Arrayán

Arrayán is a general name for several species of Myrtaceae. The trees are 8 to 12 m. high and 0.30 to 0.50 m. in diameter. The yellowish white wood is very hard, heavy, and of fine and uniform texture. It is used to some extent in furniture and cabinet-work and for special articles, such as canes and carpenters' planes.

Capulí or Cherry

Capulí (*Prunus serotina* Ehrh.) and Molle or Muelle (*Schinus molle* L.) are typical trees of all the desert plateaus of the interandine region. The Capulí tree is short, commonly less than 9 m., with a dense crown and a thick bole sometimes 1 m. in diameter. The wood is dense and of two color classes, white or "blanco" and red or "colorado," the latter being highly appreciated. The timber was formerly preferred in the construction of houses but is now largely replaced in that field by Eucalipto. Its principal use at present is for making handles of agricultural implements, carpenters' planes, and special articles requiring a hard and strong wood. In the provinces of Cotopaxi and Tungurahua, where the species is abundant, it is in demand for fuel, as it gives off more heat than any other wood available.

Sauce or Willow

Sauce (*Salix Humboldtiana* Willd.) occurs in the irrigated valleys of the Sierra. It was formerly planted, together with

Aliso, around farms and along streams, and the two timbers were extensively used in building construction, both rural and urban. Though ordinarily they are not very durable, one can still find old buildings made entirely of these two kinds of wood. Sauce is a pyramidal tree, 14 to 20 m. high, the upper third branched; the trunk is 0.40 to 0.60 thick. The light but firm and tough, yellowish white wood is easy to work, finishes smoothly, and is suitable for making boxes, household utensils, and hoops.

Eucalipto

Eucalipto (*Eucalyptus globulus* Labill.) was introduced by President García Moreno in 1865 and is now perfectly acclimated in all of the Sierra region between 2000 and 2200 m. above sea level. The original tree is on a country estate in Ambato. This species, which is too well known to need description, is the timber savior of the Sierra del Ecuador, supplying fuel, construction lumber, and material for making ordinary kinds of furniture.

Ciprés or Cypress

Ciprés (*Cupressus sempervirens* L.) has been widely planted in the interandine region, but now only for ornamental purposes. Such lumber as has been produced is of excellent quality and the cultivation of the trees for forestry purposes should be encouraged. Tests with various other conifers are being made by Sr. Luciana Andrade Marín with promising results.

Pumamaquí

The Pumamaquí (*Aralia argentata* H.B.K.) attains a height of 12 to 16 m. and a diameter of 0.60 m. Its yellowish white, flexible, easily worked wood is used, particularly in the provinces of Pichincha and Imbabura, in carpentry and for candy boxes, wooden spoons, kitchen utensils, and sieve hoops.

Tupial and Xerote

Tupial, an undetermined species of Piperaceae, is a little tree 6 to 13 cm. in diameter. Xerote (*Hesperomeles glabrata*

Lindl., family Rosaceae) is also small but the stems are 13 to 25 cm. through. Both occur in the wooded areas of the alpine plains (páramos) and supply compact and strong woods highly appreciated locally for construction purposes and farm implements. They are also in demand in many of the towns of the province of Imbabura.

The most valuable timbers indigenous to the Sierra del Ecuador are Nogal (*Juglans*), Cedro (*Cedrela*), Sisín (*Podocarpus*), and Arrayán (Myrtaceae). The available supply is very limited and is being consumed faster than it is replenished by growth. To meet this situation efforts are being made to increase the productivity of natural woodlands and to utilize for forest purposes all areas better suited for tree growth than for usual farm crops.

BOTANICAL EXPLORATION OF INTERIOR BRITISH GUIANA

By Albert C. Smith

Associate Curator, New York Botanical Garden

The American Museum of Natural History Terry-Holden Expedition was organized for the purpose of making a medical study of the few remaining Indians of the upper Essequibo region, and to make zoölogical and botanical collections in the little-known interior of that country. Invited to coöperate, the New York Botanical Garden assigned the writer to accompany the expedition, which was very successful in its objectives. The Yale School of Forestry also coöperated, and a special subvention which made possible the collection and transportation of wood specimens was greatly appreciated.

Our botanical knowledge of British Guiana is largely based upon the collections of Robert and Richard Schomburgk, who travelled through the country extensively about one hundred years ago and recorded their impressions in several books which are now available in English translations. Since their time, several other botanical collectors have worked in British Guiana, but none has penetrated to the upper Essequibo region, which therefore was of especial interest to the Terry-Holden Expedition. This region is considered, even by residents of British Guiana, as extremely inaccessible. In recent years a Boundary Commission engaged in surveying the Brazilian border has penetrated the area, and we found the route used by them the logical one to follow. This route led up the Essequibo and its tributary the Rupununi, thence overland to the Kuyuwini, which was followed to its junction with the upper Essequibo. Thus the difficult stretch of the middle Essequibo with its many rapids, including a 90-foot fall, can be avoided. Above the Kuyuwini mouth the Essequibo presents few difficulties, even for heavily-laden boats, and the Akarai Mountains on the Brazilian boundary are near at hand. As the entire area is inhabited by only a handful of Indians in two small villages, all supplies must be carried except meat, the country being fairly rich in game animals, birds, and fish.

Leaving New York on August 27, 1937, the Terry-Holden Expedition finally reached a base camp on the upper Essequibo in mid-December. In the meanwhile we had travelled slowly and had made numerous camps enroute from which collections were made. The rain forest which covers essentially 90 per cent of British Guiana is by no means monotonous to a botanist, although a casual traveller might not distinguish amid the confusion of foliage the several consociations which actually exist. The interior forest is doubtless more mixed and richer in species than that near the coast, but even here it is obvious that different species occur on the river borders which are flooded part of the year, on the higher land, on the low mountain slopes, and on the ridge tops.

To a traveller in a canoe or boat, the forest along the river presents a tangled wall of uniformly green vegetation, predominated by lianas of such families as the Combretaceae, Bignoniaceae, and Leguminoseae, while occasionally the bright inflorescences of the climbing *Norantea guianensis* brighten the treetops. Among the smaller trees with comparatively showy flowers are species of *Inga*, *Eperua*, and the attractive *Gustavia angusta*. The larger trees belong to a great variety of families; those more or less conspicuous, because

their inflorescences are comparatively bright on the edge of the sombre forest, are species of *Vochysia* and *Caryocar*. Conspicuously lacking are the giant trees of *Mora excelsa*, which are so abundant in the lower Essequibo region. Even a tree-collector could not fail to note the variety of plants of the curious family Podostemonaceae on rocks in the river itself, covered by shallow swiftly-flowing water. Of these, the beautiful *Mourera fluviatilis* is the most conspicuous and must be considered one of the most striking Essequibo plants. Certain stretches of river shore are predominated, almost to the exclusion of other species, by the palm *Astrocaryum Jauari*, a spine-covered curse to the boat crews when they must clear a stream of fallen debris to permit passage of their craft.

Slightly back from the river itself is an extensive area of higher land which is not water-covered in the flood season. If one attempts to name the outstanding families of trees which inhabit this zone, the Annonaceae, Lauraceae, and Lecythidaceae at once come to mind. The last is represented by magnificent trees of the genus *Eschweilera*, with fine straight unbuttressed trunks, and especially by the stately Brazil-nut, *Bertholletia excelsa*. The abundance of this tree in the upper Essequibo region is an indication of the Amazonian element which predominates in the flora. On the other hand, the absence of the greenheart, *Ocotea Rodioei*, which is locally abundant in similar conditions along the lower Essequibo, is equally indicative with the absence of *Mora* that the flora of the upper Essequibo is not typical of the "Guiana forest" nearer the coast.

The slopes leading toward the Akarai Mountains show a gradual transition from the forest of the flat areas to that of the summits; in general the trees are smaller and more slender than those of lower elevations, although occasionally some gigantic individual, perhaps of the genus *Cedrela*, *Guarea*, or *Licania*, is conspicuous. Possibly the most obvious feature of this zone is the abundance of small trees and shrubs of the families Piperaceae, Rubiaceae, and Melastomaceae; the latter two contain some of the most showy plants of tropical forests, owing to the great profusion of their often individually inconspicuous flowers. It is primarily in this zone that the

ferns of British Guiana are a conspicuous feature, many epiphytic forms being observable. Of lianas, several bright-flowered *Passiflorae* stand out.

As the Akarai Mountains probably do not exceed 1300 meters in elevation, they are completely covered by the tropical rain forest. At higher elevations, the abundance of Sapotaceae is striking, while other lactiferous trees of the Euphorbiaceae, Guttiferae, and Apocynaceae are also common. These trees and others of diverse families are often rich in epiphytic bromeliads and orchids and parasitic species of *Struthanthus* and *Phoradendron*. Bryophytes and lichens are more abundant in this region than in the lowlands, and in fact in some areas cloak the branches and stems of shrubs in wet masses suggestive of the cloud-forest of higher elevations in other tropical countries. The main ridges of the Akarai Mountains retain for this writer a unique charm, in part because of their rich unknown flora, in part because of the serenity of their wet fragrant forests overhanging the valleys, in part due to their very remoteness and their timeless peace emphasized by the absence of even aboriginal humans.

By the end of February the expedition had divided; two members had continued down the Mapuera and Trombetas Rivers into Brazil, two had returned to Georgetown, and the remaining two of us had returned to the Rupununi savanna region. I collected independently in this area until May, making camps at the base of the Kanuku Mountains. These mountains are a belt of hills with an elevation of less than 1300 meters, extending from east to west, with their western extremity more or less isolated on three sides by savanna. Because of this isolation, it is to be expected that a high degree of specific endemism will be found, a fact verified as the study of my limited collection progresses. In general the region bears a resemblance to the Akarai Mountains, but the rainfall is less and the peaks are more rugged and exposed. This latter fact makes for the appearance on summits and rocky ledges of an herbaceous flora of extremely interesting relationships. The families Cactaceae, Gesneriaceae, Bromeliaceae, Orchidaceae, and numerous terrestrial ferns thus appear in isolated areas.

The slopes of the Kanuku Mountains bear a very dense high forest of essentially the same generic elements as that of the upper Essequibo region. In general, the region appears to be drier, and trees with smaller leaves or with leaves of a mimosaceous type are abundant. Deciduous-leaved trees of such families as Bignoniaceae and Leguminoseae are very conspicuous in certain localities because of their masses of bright-colored flowers. Among trees of economic importance, the Balata, *Mimusops bidentata*, and the Tonka Bean, *Dipteryx* sp., are already partially exploited by the natives or settlers of the surrounding savanna. A wealth of excellent lumber is of course present in this entire area, but the difficulties of transportation to the coast make it unlikely that exploitation will take place for centuries.

The transition area between the Kanuku forest and the savanna is surprisingly narrow. The forest as a rule extends for a mile or two from the base of the mountains, and then suddenly gives way to the broad and often treeless savanna. Only a narrow belt of such woody plants as species of *Cochlospermum*, *Vitex*, *Allophylus*, *Casearia*, and of the families Mimosaceae and Rosaceae intervenes. To a forester, or to one primarily interested in the collection of trees, the savanna has little of interest to offer. To be sure, frequent "bush islands" are found, but these appear to be populated by species which are also represented in the forest fringes. On the savanna itself, *Curatella americana* and the palm *Mauritia flexuosa* are the only really abundant trees.

Leaving the Rupununi region at the beginning of May, we made a quick trip downstream on the crest of the first high water of the season, and arrived in Georgetown on May 11. During the entire trip my collection numbers totalled 1583, in sets of 10 to 16. Wood specimens to the number of 558 were taken, and these have been deposited in the Yale School of Forestry, which will also receive a set of herbarium vouchers when study of the collection has been completed. The first set of herbarium material is at the New York Botanical Garden and duplicates will be widely distributed. In conclusion, I wish to take this opportunity to express my appreciation to those who made this collection possible, notably the American

Museum of Natural History, Mrs. Franklin P. Terry, Dr. William Hall Holden, the Arnold Arboretum, the New York Botanical Garden, and Prof. Samuel J. Record of the Yale School of Forestry.

LIST OF ANATOMICAL FEATURES USED IN CLASSIFYING DICOTYLEDONOUS WOODS[1]

By S. J. Record *and* M. M. Chattaway

Vessels

(Nos. 1–19 apply to cross sections only.)

Arrangement and occurrence of pores:

1. Ring-porous.
2. Intermediate between ring-porous and diffuse-porous.
3. Diffuse-porous.

(The following apply to diffuse-porous and late wood of ring-porous woods.)

4. Pores all solitary (or virtually so, excluding tangential pairs).
5. Short radial multiples of 2 to 4 (6) comparatively numerous; often associated with solitary pores.
6. Long radial multiples, chains, or rows (6 or more pores each) present.
7. Clusters (aggregate of pores not included above).
8. Ulmiform arrangement (*e.g.*, *Ulmus*, *Fremontia*, *Ailanthus*).
9. Flame-like or dendritic arrangement (*e.g.*, *Quercus*, *Rhamnus*, *Strychnos*).
10. Echelon, radial, oblique, or zig-zag arrangement of solitary pores and groups.

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[1] This list was arranged for Miss Chattaway's use in a systematic study of woods while she was a Sterling Research Fellow at Yale University last year. It was designed primarily for a selector card index (described in *Tropical Woods* 29: 53–54; March 1, 1932), but has proved very helpful to students in preparing descriptions of woods. It is mainly an extension of a preliminary list prepared by S. A. Clarke and subsequently revised and published by him in *The New Phytologist* 37: 4: 369–374, October 1, 1938. Credit is also due to Robert W. Hess for many helpful suggestions.—S. J. R.

Size of pores (tangential diameter of largest pores):

11. Small (rarely exceeding 100μ); very small (up to 50μ).
12. Medium-sized (100–200μ).
13. Large (commonly exceeding 200μ); very large (over 300μ).

Abundance of pores and pore multiples:

14. Scattered (few and far between).
15. Numerous, but not crowded laterally.
16. Crowded laterally.
17. Very few (not over 5 per sq. mm.).
18. Few to numerous (5 to 50 per sq. mm.).
19. Very numerous (more than 50 per sq. mm.).

Vessel contents:

20. Tyloses present. (Note abundance, thickness of wall, etc.)
21. Gummy deposits. (Note color, abundance, location, etc.)

Spirals and striations:

22. Spiral thickenings.
23. Striations (other than coalesced extended apertures of pits).

Pits:

24. Vestured.
25. Linear and parallel (scalariform pitting).
26. Opposite.
27. Alternate.
28. Small (less than 7μ diam.); very small to minute (up to 4μ).
29. Medium-sized (7 to 10μ).
30. Large (over 10μ); very large (over 15μ).

Perforations:

31. Simple.
32. Multiple. (Note type of plate, number of bars, etc.)

Wood Parenchyma

(Nos. 34 to 49 apply to cross sections only.)

33. Absent or virtually so.

Apotracheal (typically independent of pores):

34. Diffuse (single cells only or very short rows or both).

35. Reticulate (diffuse and short irregular rows, more or less anastomosing).
36. Concentric.
    37. Uniseriate lines or narrow bands (typically less than 3 cells wide).
    38. Coarse bands (4 or more cells wide).
    39. Terminal or initial.

Paratracheal (associated with the pores):

40. Aliform (tangential wing-like extensions; note if short or long).
41. Aliform-confluent (wing-like extensions joining laterally).
    42. Broken and irregular (tangential rather than concentric bands).
    43. Continuous and abundant (tending to form concentric bands including pores).
44. Vasicentric (with circular or oval outlines).
    45. Vasicentric-confluent (joining without wings, often diagonally).
    46. Vasicentric-conglomerate (associated with pores in clusters and bands, Nos. 1, 7–9).
47. Sparingly paratracheal (cells few, not forming complete sheath).
48. Unilaterally paratracheal (caps or hoods, typically on outer side of pore).
    49. Winged (with lateral extensions of caps).

Rays

50. Definitely two-sized.
51. Larger rays conspicuous.
52. Aggregate rays present.
53. Vertically fused rays present.

Composition:

54. Homogeneous—all cells typically procumbent. (Applies to all rays and admits sporadic upright/square cells.)
55. Heterogeneous—upright/square cells of normal occurrence alone or in association with procumbent cells.

56. Only upright/square cells normally present. (Applies to all rays and admits sporadic procumbent cells.)
57. Both types of cells present in some or all of the rays.
    58. The two types of cells in irregular arrangement, as seen on tangential section. (Applies to multiseriate rays only.)
    59. The two types of cells in separate strata or tiers, as seen on tangential section. (Procumbent-cell tiers usually multiseriate; upright/square-cell tiers typically uniseriate and either marginal or interspersed or both.)
        60. Marginal tiers of upright/square cells conspicuously high. Uniseriate rays (in association with multiseriate) composed almost wholly of upright/square cells.
        61. Marginal tiers of upright/square cells of intermediate height. Associated uniseriate rays composed either of upright/square cells or of two types in tiers.
        62. Marginal tiers of upright/square cells usually only one cell high. Associated uniseriate rays similar or homogeneous.
        63. Uniseriate margins as wide as bi- or triseriate strata of procumbent cells.
64. Cell walls very thick. (Note if sclerotic.)
65. Sheath cells characteristic.
66. Tile cells present. (Note type.)
67. Latex or other tubes present.
68. Special enlarged cells (excluding ordinary crystalliferous and oil cells).

Width (maximum):

69. One or two cells. (Note if uniseriate only.)
70. Three or four cells.
    71. Five or more cells.
        72. Ten or more cells.

Height (maximum):

73. Less than 25 cells.
74. 25 to 50 cells.
75. 50 to 100 cells.
76. Over 100 cells.
77. Less than 1 mm. (Note if exceptionally low.)
78. Over 1 mm. (Note if exceptionally high.)

Abundance (measured tangentially on tangential section):

79. Less than 4 per mm.
80. 4 to 12 per mm.
81. More than 12 per mm.

Ray-vessel pitting:

82. Fine (pits not more than 7μ in diam.).
83. Medium (7 to 10μ).
84. Coarse (more than 10μ).
85. Pit outline sub-circular or short oval.
86. Pit outline much elongated (arrangement more or less scalariform).
87. Pits distinctly two-sized (*e.g.*, Santalaceae, Olacaceae).
88. Pit-pairs unilaterally compound.

Tracheids and Wood Fibers

89. Vasicentric tracheids present.
90. Fibriform vessel members present. (See *Tropical Woods* 41: 8.)
91. Fibers with distinctly bordered pits.
    92. Bordered pits conspicuous (due to size/number).
93. Fibers with simple or indistinctly bordered pits.
94. Septate fibers present.
    95. Aggregated or localized, suggesting wood parenchyma.
    96. Containing starch (in sapwood).
97. Spiral thickenings present.
98. Walls very thin, lumina very large.
99. Walls very thick, lumina very small.
100. Inner layer of wall gelatinous.

Intercellular Canals

101. Vertical, normal (of regular occurrence).
102. Vertical, traumatic (of sporadic occurrence due to wounding).
103. Radial, large (without epithelium and gummy or resinous contents).
104. Radial, small (with epithelium, often with gummy or resinous contents).

Storied Structure

105. All elements in horizontal seriation. (Note number per inch and distinctness of ripple marks.)
106. Some elements only (larger rays apparently not storied).
107. Ripple marks irregular or vague or only local.

Crystalline Cell Contents

Solitary rhombohedral crystals:

108. In rays. (Note type of cell.)
109. In wood parenchyma. (Note type of cell, location of strands, etc.)
110. In septate wood fibers.

Other forms:

111. Raphides. (Note if in rays or wood parenchyma or both; see *Tropical Woods* 46: 22.)
112. Druses.
113. Special (crystal sand, silica, calcium carbonate, etc.).

Special Features

114. Included Phloem. (Note type; see *Tropical Woods* 50: 1.)
115. Oil or mucilage cells. (Note if in rays or wood parenchyma or both.)

THE YALE WOOD COLLECTIONS

Accessions

At the end of the calendar year 1938 the total number catalogued wood samples in the Yale wood collections

amounted to 36,105, representing 11,095 named species of 2723 genera of 230 families. There were 1088 accessions during the year. The largest contributions were from British Guiana (558) and from the Dominican Republic. The sources of all the wood samples received are as follows:

Africa: Conservator of Forests, Ibadan, Nigeria; Field Museum of Natural History, Chicago.

Argentina: Instituto Miguel Lillo, Tucumán.

Australia: Mr. H. E. Dadswell, Council for Sci. and Ind. Research, South Melbourne.

Brazil: Dr. Adolpho Ducke, Jardim Botanico, Rio de Janeiro; Instituto de Pesquisas Technologicas do Estado de São Paulo; Sr. J. A. Pereira, São Paulo; Dr. A. C. Smith, N. Y. Botanical Garden; Sr. Paulo F. Souza, Serviço Florestal do Brasil.

British Guiana: Forest Department, Georgetown; Dr. A. C. Smith, N. Y. Botanical Garden.

British Honduras: Conservator of Forests, Belize; Field Museum of Natural History, Chicago.

Chile: Sr. E. L. Bernath, Santiago.

Colombia: Sr. A. Dugand G., Barranquilla.

Costa Rica: Mr. Austin Smith, Zarcero; United Fruit Company, Boston.

Dominican Republic: Mr. J. G. Scarff, San Pedro de Macoris; Geo. D. Emery Company, New York City.

Dutch Guiana: Agricultural Experiment Station, Paramaribo.

Ecuador: Dr. A. Rimbach, Riobamba.

Guatemala: Prof. I. W. Bailey, Harvard University; Mr. Hermann Von Schrenk, St. Louis.

India: Mr. P. Maheshwari, Allahabad.

Mexico: Prof. I. W. Bailey, Harvard University.

New Guinea: Mr. H. E. Dadswell, Melbourne, Australia.

Peru: Otis Astoria Company, New York City.

Puerto Rico: Forest Supervisor, Rio Piedras.

U. S. A.: Arnold Arboretum, Jamaica Plain, Mass.; Mr. R. E. Bolles, East Jaffery, N. H.; Brooklyn Botanic Garden, Brooklyn, N. Y.; Mr. H. E. Dadswell, Melbourne, Australia; Mr. R. W. Hess, Fayetteville, Ark.; Mr. W. F. Opdyke, Cleve-

land, Ohio; U. S. Dept. of Agriculture and U. S. National Museum, Washington, D. C.

Venezuela: Mr. L. Williams, Caracas.

Sections for Microscopic Study

During 1938 there were added to the slide collections, cross, radial, and tangential sections of 908 specimens representing 545 named species, 238 genera, and 6 families, making a total (after allowing for duplications) of 8766 specimens of 4982 named species, 2254 genera, and 204 families.

Many of these were prepared in the Yale laboratories; others were obtained by purchase or in exchange, the principal sources during 1938 being: Prof. R. H. Wetmore, Harvard University; Mr. H. E. Dadswell, Melbourne, Australia; Dr. L. Chalk, Imperial Forestry Institute, Oxford.

Specimens Distributed

There were distributed during the year 737 wood specimens, mostly for use in connection with specific scientific projects now under way or in preparation.

To Dr. I. W. Bailey, Harvard University, 333 samples: Anacardiaceae (8), Aquifoliaceae (33), Araliaceae (1), Buxaceae (20), Celastraceae (2), Cornaceae (2), Cyrillaceae (8), Hippocrateaceae (10), Icacinaceae (31), Julianiaceae (1), Krameriaceae (2), Leguminosae (10), Loranthaceae (8), Malpighiaceae (1), Octoknemataceae (1), Olacaceae (72), Oliniaceae (1), Opiliaceae (6), Sabiaceae (23), Salvadoraceae (2), Santalaceae (33), Staphyleaceae (4).

To Dr. R. A. Cockrell, University of California, 3 samples of *Strychnos*, Loganiaceae.

To Prof. E. S. Harrar, Duke University, 5 samples of *Bursera Simaruba*.

To Mr. B. A. Krukoff, N. Y. Botanical Garden (in exchange), 185 samples: Acanthaceae (1), Anacardiaceae (7), Anonaceae (16), Apocynaceae (6), Bombacaceae (1), Burseraceae (2), Combretaceae (1), Ebenaceae (7), Euphorbiaceae (23), Flacourtiaceae (9), Guttiferae (10), Hippocrateaceae (1), Humiriaceae (1), Hypericaceae (2), Icacinaceae (1), Lauraceae (2), Lecythidaceae (1), Leguminosae (36), Loganiaceae (4), Melastomaceae (1), Meliaceae (2), Melianthaceae (1), Moraceae (6), Myristicaceae (2), Myrtaceae (1), Ochnaceae (4), Octoknemataceae (4), Olacaceae (5), Passifloraceae (4), Rhamnaceae (1), Rhizophoraceae (4), Rubiaceae (15), Rutaceae (1), Sapindaceae (7), Sapotaceae (3), Scytopetalaceae (3), Simarubaceae (5), Sterculiaceae (8), Verbenaceae (3).

To Mr. P. Maheshwari, Agra College, India, 25 samples: Bombacaceae (7), Araucariaceae (13), Cycadaceae (1), Ginkgoaceae (1), Winteraceae (3).

To Prof. L. W. Rees, University of Minnesota, 147 samples of 28 genera of Tiliaceae.

To Prof. R. B. Thomson, University of Toronto, 13 samples: Cephalotaxaceae (1), Taxaceae (11), Welwitschiaceae (1).

To Dr. O. Tippo, University of Illinois, 2 samples of Eucommiaceae.

To Prof. R. H. Wetmore, Harvard University, 22 samples of 14 genera of Myrsinaceae.

To Mr. L. Williams, Caracas, Venezuela, 2 samples of *Calatola costaricensis*, Icacinaceae.

CURRENT LITERATURE

Contributions to the flora of tropical America. XXXVII. Notes on the flora of Tobago. By N. Y. Sandwith. *Kew Bulletin* (1938) 9: 353–384.

"The object of the following enumeration—which omits many very common species—is to indicate first records for the island and also records which were omitted from those parts of the *Flora of Trinidad and Tobago* which have been published; while a number of observations on the taxonomy or nomenclature of species is included. Two new species are described." One of the novelties is a small solanaceous tree, *Cyphomandra tobagensis* Sandw.

Information is given (p. 363) concerning *Tresanthera pauciflora* K. Schum. (fam. Rubiaceae). "This remarkable plant, frequent in the virgin forests of the Main Ridge, was omitted from the *Flora*, nor has the name hitherto appeared in the *Index Kewensis*, while Standley in 1930 was unable to trace the description. The genus *Tresanthera* Karst. had been monotypic, being based on *T. condamineoides* Karst., which

was collected in rain forests at 500 ft. and upwards near the coast at Puerto Cabello in Venezuela. . . . The Tobago species is apparently always a shrub, scarcely even a small tree, barely reaching 20 ft. in height and with a stem that cannot be described as a trunk; whereas *T. condamineoides* was said to be a real tree, 50–60 ft. in height, and with a trunk a foot in diameter."

Studies of Mexican and Central American plants. VI. By C. L. LUNDELL. *American Midland Naturalist* (Notre Dame, Ind.) 20: 1: 236–242; July 1938.

Eight shrubs and trees of southern Mexico are described as new, namely, *Zanthoxylum Matudai*, *Z. suaveolens*, *Maytenus Purpusii*, *Eugenia chiapensis*, *Deherainia Matudai*, *Symplocos chiapensis*, *S. flavifolia*, and *S. Matudai*.

Flora of Costa Rica. By PAUL C. STANDLEY. *Bot. Ser. Field Mus.* (Chicago) 18: 4: 1137–1571; Nov. 30, 1938.

The fourth and concluding part of the *Flora of Costa Rica* covers the families Gesneriaceae (by C. V. Morton), Lentibulariaceae, Acanthaceae (by E. C. Leonard), Plantaginaceae, Rubiaceae, Caprifoliaceae, Valerianaceae, Dipsacaceae, Cucurbitaceae, Lobeliaceae, and Compositae.

"Of the 6085 species of plants recorded at present from Costa Rica, 270 are listed as known only in cultivation. . . . Only 104 species are regarded as naturalized. . . . Of the total number of species, 2299 are endemic in Costa Rica, so far as is known at present. . . . Disregarding the endemic species, there are 723 species of wider distribution having their northern limit in Costa Rica. Many are South American plants, some of great systematic significance. On the other hand, 574 species that range to Mexico or northern Central America have their southern limit in Costa Rica.

"More significant perhaps are a few data regarding genera. There are at least 16 of these, a good many of them orchids, that are endemic in Costa Rica. There are 107 characteristically South American ones that find their northern limit in Costa Rica. There are only 26 that are preponderantly Mexican and Central American, with a southern limit in Costa Rica. The generic data especially prove, I believe, that, as I have suggested previously, the affinities of the Costa Rican flora are rather South American than Mexican. The principal line of division between the North and South American floras lies not about the Isthmus of Panama, where geographically it might be expected, but rather in central Nicaragua, the southern limit of pine (*Pinus*) forests."

La flora de Costa Rica. By PAUL C. STANDLEY. Translated by ALBERTO QUIJANO. *Revista Inst. Defensa del Café de Costa Rica.* (San José) 7: 107–116; September 1938.

A translation of part of the introduction of Standley's Flora of Costa Rica, published in the Botanical Series of Field Museum of Natural History. The subject matter has been rearranged in part, with addition of notes by the translator.

Studies in the American Celastraceae. I. New Species of *Microtropis, Wimmeria,* and *Zinowiewia*. By C. L. LUNDELL. *Bull. Torrey Club* (Menasha, Wisconsin) 65: 463–476; figs. 1–3; October 1938.

New species are *Microtropis Standleyi* (Costa Rica), *Wimmeria acapulcensis* (Mexico), *W. Bartlettii* (Guatemala, British Honduras; local names Quiebrahacha Blanco, Chintoc, Ixolte Ixnuc), *Zinowiewia australis* (Venezuela), *Z. concinna* (Mexico; local name Gloria), *Z. costaricensis* (Costa Rica, Panama), *Z. Matudai* (Mexico), *Z. pallida* (British Honduras), *Z. rubra* (Guatemala).—P. C. STANDLEY.

Vocabulario de términos vulgares en historia natural colombiana (continuación). By HERMANO APOLINAR MARIA. *Revista Acad. Colom. Cienc.* (Bogotá) 2: 256–263; 358–365; 2 colored pls.; 1938.

A dictionary of vernacular botanical names employed in Colombia, with detailed notes regarding the plants concerned. The present instalments include the names Alagua to Amamor.

Four new species of Vernonieae collected by Glaziou in Brazil. By W. R. PHILIPSON. *Kew Bulletin* 298–300; 1938.

Among the new species described are two shrubs of the genus *Proteopsis*, from Rio de Janeiro and Goyaz, Brazil.

Revision of the Lauraceae. V. A monograph of the genera *Anaueria, Beilschmiedia* (American species) and *Aniba*. By A. J. G. H. KOSTERMANS. *Recueil Trav. Bot. Néerland.* 35: 834–931; 4 figs.; September 1938.

Anaueria brasiliensis Kosterm., a new genus and species, is an Amazonian tree known as Anauerá. It was collected by Adolpho Ducke who fortunately obtained a wood sample (Yale 21329). Of the 15 species of *Beilschmiedia*, four are described as new and 10 represent new combinations. Of the 36 species of *Aniba*, five are described as new and three are new combinations.

Studies of American Menispermaceae, with special reference to species used in preparation of arrow-poisons. By B. A. KRUKOFF and H. N. MOLDENKE. *Brittonia* (New York) 3: 1: 1–74; November 1938.

"In the course of recent studies on the botanical components of Curare the senior author of the present paper visited the Tecuna Indians on his sixth expedition (1935–1936) to Brazilian Amazonia. He found that Calderão, mentioned by Jobert and Schwacke, no longer exists, and also that the few hundred civilized Tecunas, who live widely scattered, but chiefly near Palmares, are no longer familiar with Curare. He was obliged to make a trip by canoe up the Igarape Belem in order to locate Tecunas who still occasionally use blow-guns and Curare who still remember their ancient famous preparation. On his return from this voyage a brief report was prepared on the botanical components of Curare and two menispermaceous plants are mentioned in this paper as important ingredients of the Curare of the Tecunas.

"On his seventh expedition (1936–1937) the Tecunas were visited again and field work with menispermaceous plants was carried on in the region where they live as well as in certain other regions of Brazilian Amazonia. Extensive collections of authentic crude materials, amounting to many hundred kilos, backed by herbarium specimens in each case, were obtained. This material is now being thoroughly studied by several prominent chemists and pharmacologists. Authentic wood samples have been turned over to Dr. R. A. Cockrell, who has undertaken the study of the wood anatomy of the woody menispermaceous plants. The original object of the present paper was to supply the proper botanical names to the plants which are now under chemical and pharmacological study. In the course of our work we found it impossible to accomplish this task without extensive study of all related plants, and soon realized that a revision of the American species of the tribes Triclisiae and Anomospermeae was essential."

"Of the six genera treated in this paper (*Chondodendron, Sciadotenia, Anomospermum, Telitoxicum, Abuta*, and *Elissarrhena*), Diels in his monograph recognized 5, 10, 5, 0, 14, and 1 species respectively, while in the present treatment 8, 12, 6, 6, 17, and 1 species respectively are accepted. In the present paper one genus and 13 species are described as new and it has been found necessary to make six new combinations. Eight species and one variety are here reduced to synonymy for the first time."

***Brunellia Briquetii*, espèce nouvelle du Pérou.** By CHARLES BAEHNI. *Candollea* (Geneva) 7: 361–362; 1 plate; August 1938.

The description of the new species is based on specimens of a tree collected by Mathews in Chicapoyas, Peruvian Andes.

Flora of Peru. By J. FRANCIS MACBRIDE. *Bot. Ser. Field Mus.* (Chicago) 13, part II, No. 3, pp. 665–1136; Oct. 31, 1938.

This number, treating the Berberidaceae to Connaraceae, inclusive, of the Engler sequence, completes the first part (volume) of the Flora of Peru. The Annonaceae are treated by Rob. E. Fries, Myristicaceae by Albert C. Smith, Connaraceae by Julian A. Steyermark. There is included a list of additions and corrections.

Estudios sobre praderas naturales del Uruguay. Primera contribución. By JUAN P. GALLINAL H., L. U. BERGALLI SÓÑORA, E. F. CAMPAL GÓMEZ, L. ARAGONE LEONARDI, and B. ROSENGURTT GURVICH. Montevideo, 1938, pp. 208; 2 maps; numerous illustrations.

A detailed study of the natural prairies of Uruguay, chiefly ecological. While the vegetation of the region under discussion consists, naturally, chiefly of herbaceous plants, there is mention of the shrubs and trees that occur.

Algunas observaciones relativas a los bosques antartándicos. By ALBERTO CASTELLANOS. *Lilloa* (Tucumán) 2: 2: 333–339; 1 map, 1 plate; 1938.

The range of *Araucaria araucana* (Mol.) Koch in Argentina is the Arroyo de los Pinos (37° 43′) southward to Lake Meliquina (40° 23′). The region covered is indicated on a map.

El *Crinodendron tucumanum* Lillo y su relación con las especies chilenas del genero. By H. R. DESCOLE and C. A. O'DONELL. *Lilloa* 2: 2: 341–352; 4 plates; 1938.

The genus *Crinodendron* Molina (=*Tricuspidaria* Ruiz & Pavón), of the family Elaeocarpaceae, consists of three species: *C. patagua* Mol., a tree 50 feet tall with a stout trunk, native to central Chile where it is called Patagua. *C. Hookerianum* Gay, 25 feet high and 6 inches in diameter, in Valdivia and Llanquihue, Chile; common names, Chaquihua, Olivillo, and Polizón. *C. tucumanum* Lillo (with Latin diagnosis), a large tree, sometimes nearly 100 feet high and 40 inches in diameter, in Tucumán, Catamarca, and Salta, Argentina, and in Bolivia; common name Granadillo. The wood of the last species was described in *Lilloa* 1: 81–83.

Ensayos de dureza, compacidad y porosidad efectuados con maderas del país. By EDUARDO LATZINA. *Lilloa* 2: 2: 353–412; 1938.

Gives the results of Brinell hardness tests on 160 kinds of Argentine woods, together with relative and absolute specific gravities and values for porosity.

Bibliography of eastern Asiatic botany. By E. D. MERRILL and E. H. WALKER. Pub. by Arnold Arboretum, Jamaica Plain, Mass., 1938. Pp. 750; 8¾ x 9½. Price $12.50 postpaid.

This work was sponsored by Smithsonian Institution, Arnold Arboretum, New York Botanical Garden, and Harvard-Yenching Institute, and about nine years' work was involved in its preparation. It covers the area from western Tibet to Japan and Formosa, including China proper, Mongolia, Manchuria, Korea, and eastern and southern Siberia, and the period from the beginning of printing, not only in Europe, but also in the Orient, to the end of 1936. It contains more than 21,000 author-entries. Each entry gives the author, the exact title, and the bibliographic citation. To each a brief annotation is added from which it is usually possible to determine whether or not an actual examination of a certain paper is essential to the solution of a particular problem.

"The authors' objectives were to record those papers to which botanists concerned with the study of the plants of the vast area covered must or should refer. Although the point of view in selection is naturally in large part taxonomic, many other subjects are extensively and exhaustively represented, the principal ones being ecology, phytogeography, mycology, economic botany, history of botany, exploration, phylogeny, pathology, agriculture, horticulture, forestry, materia medica, pharmacology, biography, and bibliography. The entries cover all groups of plants including the cellular cryptograms, vascular cryptograms, and the seed plants."—*From Announcement.*

Philippine woods. By LUIS J. REYES. Tech. Bull. 7, Dept. Agr. & Commerce, Manila, 1938. Pp. 536; 5¾ x 9; 86 plates. Price $1.50 (U. S. currency) net.

"Considered an answer to the long-felt need of lumbermen and wood users for complete and up-to-date information on Philippine woods. . . . Its author is considered the leading authority on Philippine woods. Prior to his retirement from the Government, he was for fifteen years the Bureau of Forestry's wood technologist. In this book he has set down his detailed knowledge of local woods gained through years of specialization. New information that is not to be found elsewhere is included in the book. The present publication was expressedly undertaken with the aim of replacing Bureau of Forestry Bulletin 10 (Whitford's *Forests of the Philippines*) and Bulletin 14 (Schneider's *Philippine Woods*) which are

now out of print. Official common names, specific and generic names of the individual tree species are made up to date in accordance with the latest accepted nomenclature.

"The most important features of the 536-page book are the detailed descriptions of woods of 264 important timber species of the Philippines, all of which are illustrated with original photomicrographs magnified 15 diameters. It also includes short descriptions of about 200 additional species of minor importance bringing the total number of species described to 464, representing 227 genera and 56 families of plants.

"Besides the description of the individual species, there are valuable appendices of the classification of Philippine woods into groups, the weights of individual Philippine woods, allowable working stresses, relative durability, individual resistance to attack of dry-wood termites and powder-post beetles, shrinkage, chemical composition and classification of Philippine and some American woods according to characteristics. The book will prove an indispensable reference for those interested in Philippine woods."—MAMERTO D. SULIT, in *Philippine Journal of Forestry* 1: 2: 231.

Philippine journal of forestry. Pub. quarterly by Dept. Agr. & Commerce, Manila. Vol. I: 1: 1–112; 2: 113–231; 1938. Illustrated. Subscription price $1 (U. S. currency) in P. I. and U. S. A., $2 foreign.

This new magazine is well printed and illustrated and the papers are interesting and useful, being "so presented that while they will readily yield their contents to the layman, they will also retain the touch that will make them equally of value to the technical forestry circles. For the last fifteen years this work was carried on by the *Makiling Echo*, a mimeographed quarterly issued in a limited number by the Bureau of Forestry. The *Makiling Echo* did its work remarkably well, the limitations inherent in a mimeographed publication notwithstanding. As it is felt, however, that work could be further improved upon by a printed journal, and as there is need of making the organ of forestry available in a more durable and presentable form to a wider group of readers, the *Makiling Echo* gives way to this publication, the *Philippine Journal of Forestry*."

CONTENTS OF FIRST TWO NUMBERS

A note on laurel wood (*Terminalis tomentosa*) and its market in Great Britain. By J. N. SINHA. *Indian Forester* 64: 11: 669–674; November 1938.

"Figured Laurel is much fancied in England. India at present supplies a quantity and the market is expanding. But figure partakes so much of sentiment that it is hard to define. It is harder still to tell if any given log would yield figured timber, and ordinary Laurel wood is not cared for. In this

article the opinions of certain British brokers and merchants are pooled and hints for exporters are given."—*Author's summary.*

Contributions to the flora of Burma. XIV. *Kew Bulletin* 294–296; 1938.

A list of 18 species not reported previously from Burma.

The forests of the Malay Peninsula and their exploitation. By H. E. Desch. *Malayan Forester* 7: 4: 169–180; 4 halftones; October 1938.

The subject is treated in an interesting and informative way under the following headings: Administration; Climatic factors and geographical position; Types of forest; Timber resources; Forest policy of Malaya; Silvicultural operations; Timber requirement of the future; Exploitation; Methods of extraction; Financial aspects.

Additions to the flora of Borneo and other Malay islands. X. By H. N. Ridley. *Kew Bulletin* 275–285; 1938.

Numerous species new to the area indicated are listed in the families Connaraceae, Leguminosae, Rosaceae, Rhizophoraceae, Combretaceae, and Lecythidaceae. New species of woody plants are described in the genera *Baphia*, *Saraca*, *Spatholobus*, *Pygeum*, *Carallia*, *Terminalia*, *Barringtonia*, and *Careya*.

Aulandra cauliflora. By H. J. Lam. *Hooker's Icon. Pl.* (London) 34; pl. 3360; September 1938.

A small or medium-sized tree of Borneo, the second species to be described of this genus of Sapotaceae, endemic in this island.

***Octomeles sumatrana* Miq. (benoeang) en *Tetrameles nudiflora* R. Br. (winong).** (With summary in English.) By M. J. F. Koopman and L. Verhoef. *Tectona* (Buitenzorg) 31: 11: 777–790; 4 plates; November 1938.

Octomeles sumatrana is a tree of rapid growth, attaining a maximum height of 60 m. and a trunk diameter of 4 m., on alluvial soil at elevations less than 600 m. above sea level throughout the Netherlands East Indies except Java and the Lesser Sunda Isles. The wood is soft, brittle, and coarse;

sp. gr. 0.27 to 0.45, av. 0.34; easy to work, cracks little, but shrinks and warps badly; can be used for packing cases, but is unsuitable for paper pulp.

Tetrameles nudiflora is of general distribution in the Netherlands East Indies except on Borneo and the small islands between Borneo and Sumatra, occurring mainly at elevations less than 1000 m. in regions with a pronounced dry monsoon. It is sometimes 45 m. tall and 2 m. in diameter. The wood has a sp. gr. of 0.25 to 0.40, av. 0.33, and is similar in properties to the other species.

Vergelijking tusschen opbrengstgegevens van eenige Nederlandsch Indische en Europeesche houtsoorten. (Summary in English.) B. G. Hellinga. *Tectona* 31: 11: 791–801; 5 plates; November 1938.

Comparison is made of the principal factors determining yields of eight timbers, namely Beech (*Fagus sylvatica* L.), Spruce (*Picea excelsa* Link.), Poplar (*Populus canadensis* Mönch.), Java Teak (*Tectona grandis* L. f.), Damar (*Agathis dammara* Rich.), Balsa (*Ochroma* spp.), and Djeundjing (*Albizzia falcata* Backer). The data were obtained from yield tables or, for the last three species, from sample plots.

"The European grown *Populus canadensis* approaches the growth of the tropical tree species, which is very fast. Considering that in tropical regions growth is going on the whole year for all the species except *Tectona* and in temperate zones the growth period lasts only half the year, the place of *Populus* with regard to the others is still more remarkable. No one of the species for which data are available has a growth like that of *Ochroma* sp. and *Albizzia falcata*."

Notes on *Xylocarpus*. By H. N. Ridley. *Kew Bulletin* 288–292; 1938.

Three new species of *Xylocarpus* are described from Malaysia and Queensland, and extensive notes are given regarding older species of various regions.

Matériaux pour la flore de la Nouvelle-Calédonie. LI. Revision des Ilicacées. By A. Guillaumin. *Bull. Soc. Bot. France* (Paris) 85: 202–203; 1938.

The Aquifoliaceae or Ilicaceae are represented in New Caledonia by three genera, *Sphenostemon*, with 3 species; *Ilex* with a single species; and *Phelline* with 10. Keys are given for recognition of genera and species.

The wood structure of some Australian Cunoniaceae with methods for their identification. By H. E. Dadswell and Audrey M. Eckersley. Bull. 119, Council for Sci. & Ind. Research, Melbourne, 1938. Pp. 23; 6 x 9½; 7 plates.

"The family Cunoniaceae, included by some botanists in the Saxifragaceae, covers some 26 genera and 250 species of trees and shrubs which are to be found chiefly in the sub-tropical to temperate regions of the southern hemisphere. The family is well represented in Australia, and from seven genera, at least, timbers of commercial value are derived. These timbers are fine to very fine in texture, of uniform structure, in general light in weight and easy to work, and well suited for turnery and all classes of joinery. For these reasons, certain of them have been used to replace the fine-grained softwoods in many fields, and they have also been used in the plywood industry both for corestock and face veneers."

"In this publication the results of the examination of the wood structure of eleven different Australian Cunoniaceae have been summarized for each species in a description covering the habit and distribution, the general properties of the timber, and the details of wood anatomy. Photomicrographs showing details of structure, and low power photographs (10 x) of end sections of the various woods, have been included. A summary of the wood structure of the Australian species has been prepared together with a key for their identifications; in addition, the wood structure of the Australian species has been compared with that of available specimens of other species.

"On the basis of anatomical features, the family has been divided into two main groups, namely, (*i*) including *Ackama*, *Anodopetalum*, *Callicoma*, *Ceratopetalum*, *Cunonia*, *Pancheria*, *Platylophus*, *Spiraeopsis*, *Weinmannia*, and (*ii*) including *Geissois* and *Schizomeria*. The Australian species *Weinmannia lachnocarpa* F.v.M. has been included with the genus *Geissois*, and it has been suggested that, on anatomical grounds, it is better classified as *Geissois lachnocarpa* J.H.M."

The properties of Australian timbers. Part 3. *Pinus radiata* D. Don (*Pinus insignis* Doug.), insignis, Monterey, or remarkable pine. Pamphlet No. 81, Council for Sci. & Ind. Research, Melbourne, 1938. Pp. 31; 6 x 9½.

"One of the most striking developments in the forestry activities of the past half century has been the widespread establishment of plantations of *Pinus radiata* throughout the three British Dominions of the southern hemisphere, namely, Australia, New Zealand, and South Africa. Originally a tree of extremely limited natural distribution, confined to a narrow strip of the Californian coast line, and of no great economic value in its own country, it is now to be found in every State or Province in each of the three Dominions mentioned, and it has formed the major, or even the almost exclusive, species used in the establishment of a series of exotic forest plantations of considerable magnitude.

"The study of the timber of this species is, therefore, of great importance, and the Division of Forest Products has been engaged for some years on extensive investigations of its properties. This pamphlet, which has been compiled by officers of the Division, brings together some of the general results of these studies, together with such other well-authenticated information as is available.

"The timber is a good general utility product, and there are few timbers with a wider range of use when properly selected and suitably prepared for those uses. Like all timbers, it is subject to certain defects, but the main ones can be eliminated or reduced very considerably by proper silvicultural treatment of the growing stands and preparation of the timber for market. . . .

"Though *P. radiata* is at present meeting many of Australia's softwood requirements, and will, no doubt, do so increasingly, the extent to which this timber can eventually meet Australia's needs will depend largely upon the silvicultural, manufacturing, and marketing technique adopted. If pruning is practised, and a sufficiently long rotation allowed,

so that larger quantities of clear timber are available, there is no doubt that this species will replace imported timbers over a wider range of uses. It must be understood that, though thinning and pruning are indicated in this pamphlet as advisable operations to produce the highest quality product, the extent to which they should be practised, the methods adopted, and such other factors, should be laid down by competent foresters, after studying the conditions in each location. In addition to suitable silvicultural methods, it is essential for all such timbers that good milling practices, and especially proper seasoning methods, should be used. A good deal of the early prejudice against this timber was due to imperfect seasoning, but there is no longer any excuse for faulty practice in this regard. Well dried *P. radiata* timber has become firmly established on the Australian market."

The vegetation of South Africa. By R. S. Adamson. Pub. by British Empire Vegetation Committee, London, 1938. Pp. 235; 5½ x 8½; 23 text figs., 12 maps, 9 plates.

This is the first of a series of monographs dealing with the vegetation of the British Empire which are being prepared under the direction of a committee appointed by the first Imperial Botanical Conference in 1924. "The main object is to present what is known of the chief types of natural vegetation in the region dealt with, of the causes of their distribution, and of their exploitation by the inhabitants. It is of special importance that this should be done as soon as possible in view of the increasing rate at which native vegetation is disappearing or being modified out of recognition. A knowledge of what nature produces when she is left to herself is one of the indispensable requisites for wise exploitation."

***Cassia Mannii* Oliver.** By E. Milne-Redhead. *Hooker's Icon. Pl.* (London) 34; pl. 3368; September 1938.

Description and illustration of a large or small tree of central tropical Africa. Several indigenous names are reported: Akofiamende (Ivory Coast), Osara (Nigeria), Mbiri (Belgian Congo), Ntanyenya (Uganda).

Vegetation types of the Colonie du Niger. By J. Dundas. Imperial Forestry Institute paper 15, Oxford, 1938. Pp. 12; mimeographed; 4 plates. Price 3s. 6d.

"While accompanying the Anglo-French Forestry Commission on their visit to the Colonie du Niger, Mr. Dundas recorded his observations on the several vegetation types observed in the area, his knowledge of the adjacent British territory enabling him to make a useful correlation of the vegetation of the two regions. The present paper, though dealing only with the area north of the international boundary, is of considerable service in giving us a descriptive picture of the vegetation of a little-known region, thereby enabling us the better to place the vegetation of Northern Nigeria in its right perspective in relation to that of Africa as a whole.

"These observations have brought out a number of interesting and instructive points. He found that over most of the area the desert sand is now firmly anchored by grass and tree growth; and that the climate prevailing today appears to be more humid than that of the immediate geological past. Also that such Southern Nigerian species as *Anogeissus Schimperi*, *Diospyros mespiliformis*, a tree of semi-evergreen tropical rain-forest, *Celtis integrifolia*, and *Mitragyna inermis* occur in the region described, the *Anogeissus* as far north as 15 degrees N. latitude in the tropical riparian woodland formation. In connection with this latter observation, Mr. Dundas notes that there are no widespread signs of recent increase or decrease of areas of riparian woodland, from natural causes, and he considers it to be the normal edaphic climax, due to telluric moisture. Natural regeneration of thorn species is abundant in the tropical thornland formation. An area of anchored sand dunes in the Manga country produces an association of the tropical grassland formation consisting of a practically pure community of *Andropogon gayanus*, a perennial grass.

"In one association of the tropical savanna woodland formation, a southern species of *Terminalia* (*T. avicennioides*) is locally dominant, while *Parkia filicoidea*, *Pterocarpus erinaceus*, *Butyrospermum Parkii*, *Khaya senegalensis*, *Bombax buonopozense*, *Detarium senegalense*, and *Daniellia Oliveri*

occur, the two last-named here far north of their normal habitat."—*From preface by* J. BURTT-DAVY.

Sur un genre africain peu connu: *Tridesmostemon* Engl. (Sapotacées). By FRANÇOIS PELLEGRIN. *Bull. Soc. Bot. France* (Paris) 85: 179–181; 1938.

The genus *Tridesmostemon* is described in detail, the fruit having been unknown previously. *T. omphalocarpoides* Engler is described as a new species from Cameroun. Two other species are known, in Belgian Congo.

Un arbre nouveau du Gabon. By AUG. CHEVALIER. *Rev. Bot. App. & d'Agr. Tropicale* (Paris) 18: 207: 784–788; 2 text figs.; November 1938.

Ibadja Walkeri A. Chev. is a new genus and species of Caesalpiniaceae, related to *Berlinia* and *Loesenera*. It is a tree upward of 100 feet tall, with erect trunk sometimes 40 inches in diameter above the low buttresses. It is fairly common along streams and in swamps of the Haute-Ngounié, Gaboon; its vernacular names are Apindji, Esuna, Gibayi, Ibadja or Ibadji, and Mubi.

Description du bois d' *Ibadja Walkeri* A. Chev. By D. NORMAND. *Rev. Bot. App. & d'Agr. Tropicale* 18:207: 789–791; November 1938.

Wood lustrous yellowish white, darkening upon exposure; moderately hard and heavy; fine-textured. Growth rings distinct, due to parenchyma. Pores few (about 8 per mm.), small, barely visible, becoming somewhat smaller in late wood; solitary or in radial multiples of 2 to 4. Rays not storied; uniseriate; heterogeneous, the outer marginal cells upright or triangular; crystals and tanniniferous deposits common. Wood parenchyma aliform and confluent into irregular wavy bands 2 or 3 cells wide, becoming more regular and concentric at periphery of growth ring. The structure is similar to that of *Loesenera kalantha* Harms.

A revision of the Eucryphiaceae. By J. BAUSCH. *Kew Bulletin* (1938) 8: 317–349.

"The taxonomy of the *Eucryphiaceae* is fully discussed

from as many aspects as possible. The following are the most important points that emerge: The floral characters of the different species are very uniform. The most important diagnostic feature of the flowers are the hairiness of the ovary, the length of the peduncle and the number of bracts. Both simple and compound leaves occur. Hybrids are recorded, either in nature or in cultivation, for all species except *E. Moorei*.

"The distribution of the species is interesting. Two species occur in Chile, confined to the subtropical and temperate rain forest. *E. glutinosa* (compound leaves) is a lowland tree or shrub, while *E. cordifolia* (simple leaves) extends up the mountains to the level of the glaciers. The other species are Australian, the compound-leaved species occurring in the subtropical rain forests of the continent, and the two simple-leaved species and their hybrid in Tasmania.

"The family is considered to be taxonomically most nearly related to the *Cunoniaceae*. This conclusion is based on morphological characters and on similarity of anatomical structure, especially on the occurrence of both simple and scalariform perforations in the vessels in the two families. Similarity in chemical properties also points to the same relationship."

Mémoires sur les Sapotacées. I. Système de Classification. By CHARLES BAEHNI. *Candollea* (Geneva) 7: 394–508; October 1938.

This important contribution to the classification of the Sapotaceae is in three parts. The first is concerned with the morphology of the twig, leaf, flower, and fruit and provides the basis for the second and largest part on the characteristics of the genera and sections. The last considers the old systems of classification and proposes a new one.

Comparative anatomy of the Moraceae and their presumed allies. By OSWALD TIPPO. *Botanical Gazette* 100: 1: 1–99; 63 figs., mostly photomicrographs; September 1938.

"The present study is an investigation of the anatomy of the Moraceae and of the several families which have been placed near them in the different systems of phylogeny. The

attempt is made to use this anatomical evidence in tracing the phylogeny of this group of families. Further, there has been an endeavor to harmonize the anatomical data with the facts of floral morphology, and with the evidence from the other branches of plant science, such as cytology, paleobotony, and floral anatomy."

"Slides of the secondary xylem from the stems of 465 species, representing 165 genera and 22 families, were examined in detail during this investigation. . . . The material of the Moraceae was collected in various parts of the world by many different collectors. The major part of the collection was assembled at the Yale School of Forestry. . . . The xylem of the other families was studied from slides in the extensive Harvard collection. Eight or nine slides of each species were available in the material of the Moraceae. Often two or more representatives of the same species from different geographical localities were studied. In the other families, more than one slide of each species was studied whenever possible, and frequently specimens of the same species from different parts of the world were examined microscopically.

"There appears to be a correlation between the presence of sclerotic wood parenchyma cells in the xylem and the presence of sclerotic ray cells, sclerotic tyloses, and thick-walled fibers and vessel elements. The advent of ring-porosity, or of some factor or factors causing ring-porosity, seems to give an impetus to anatomical specialization. Non-septate fibers are more primitive than are the septate type of fibers. The solitary pore arrangement of vessels is more primitive than the various aggregate arrangements, such as pore multiples, pore chains, and pore clusters. In comparative anatomical studies, the secondary xylem of herbs and shrubs must be compared with the secondary xylem of trees taken from a region close to the pith.

"The Hamamelidaceae are derivatives of the Magnoliales. The Casuarinales, Fagales, and Urticales cannot be considered as primitive groups among the dicotyledons. These three groups are considered to be derivatives of the Hamamelidaceae. The Cunoniales (including the Hydrangeaceae, Grossulariaceae, Escalloniaceae, Cunoniaceae, and Brunel-

liaceae) are derivatives of the Magnoliales. The Rosales have been derived from some group in the Cunoniales. In the Urticales the Ulmaceae are most primitive, the Moraceae less so, and the Urticaceae are least primitive. The Eucommiaceae are also placed in the Urticales. In the Moraceae anatomical specialization seems to have proceeded from the sub-family Moroideae to the Artocarpoideae to the Conocephaloideae to the Cannaboideae. The tribe Fatoueae of the sub-family Moroideae appears to be the most primitive one in the family. There is no evidence for, and much against, the derivation of the herbaceous Urticales from the Aristolochiaceae. The Rhoipteleaceae do not belong with the Urticales.

"In general, Hutchinson's system is more in accord with the phylogenetic scheme proposed in this paper than are the other systems. His division of the dicotyledons into a herbaecous line and an arboreal line is not borne out by the facts revealed in the present investigation.

"In general, the evolution of floral structures seems to be correlated with the evolutionary development of anatomical structures. After the rearrangement of certain questionable groups, therefore, the classification of the taxonomist and the phylogenetic scheme proposed by the anatomist show striking agreement. There is every indication that the study of anatomy will be of great value in the establishment of a natural classification of the angiosperms."

Intercellular cavities in the rays of dicotyledonous woods. By Irma E. Webber. *Lilloa* (Tucumán, Argentina) 2:2: 465–469; 2 plates; 1938.

"An intercellular cavity differs from an intercellular canal only in lacking one diameter of much greater length than its other diameters. This being the case, while many intercellular canals and cavities are easily distinguishable, any distinction between a short canal and a long cavity must be purely arbitrary. . . . In contrast to radial gum ducts, which are generally of normal occurrence, intercellular cavities in rays are often of traumatic origin. . . . Because of the diagnostic importance which has been attached to radial intercellular canals and the similarity, particularly in tangential sections

of wood, of intercellular canals and cavities, it is hoped that this note concerning the latter will impress upon investigators the desirability of carefully determining the nature of non-interstitial intercellular spaces in rays."

The occurrence of intercellular cavities is recorded for certain species of Araliaceae (?), Compositae, Malvaceae, Myrsinaceae, Rutaceae, and Simarubaceae.

A multiple-entry perforated-card key with special reference to the identification of hardwoods. By S. H. CLARKE. *New Phytologist* 37: 4: 369–374; 1 fig.; Oct. 1, 1938.

Woods are classified according to 64 anatomical features, five kinds of physical properties, and nine geographical regions. Each diagnostic character corresponds to a perforation in a series along the four edges of a card measuring 5 x 8 inches. "A separate card is used for each genus or species to be included in the key. The presence of a feature is recorded by notching the appropriate hole with a pair of clippers, and the absence by leaving the hole unnotched. In consequence, when a thin steel rod is pushed through the complete pack of cards through the holes representing a particular feature, and the pack gently shaken, all the cards of species showing the feature fall out. In identifying a timber this process is repeated on the cards that fall out until only one is left, and this should bear the name of the timber to be identified. . . .

"It may be observed that each card bears a detailed and readily appreciated description of the species, and the pack may be used to furnish lists of species showing particular features. Another great advantage of the card key is that the country of origin may be made a point of entry."

Kiln-drying schedules. By R. G. BATESON and R. E. HODGE. For. Prod. Res. Record 26, Dept. Sci. & Ind. Research, 1938. Pp. 21; 6 x 9¾; 2 charts. Price 15 cents, British Library of Information, 270 Madison Ave., N. Y.

"A short account of the factors influencing the choice of a schedule of temperatures and humidities to employ in kiln-drying timber is given, and the effect of these factors on the kiln-drying properties is discussed. The application of the schedule to any particular timber at any stage of dryness is described and the correct method of warming up a kiln explained.

"An alphabetical list of 178 timbers is included, with their commercial and botanical names. Opposite each timber a schedule number (I to VIII) is given referring to the eight schedules which form the basis of the *Record*. The dry and wet bulb temperatures in °F. and °C. are shown opposite the appropriate moisture content of the timber and, in another column, the relative humidity.

"A note on the application of equilibrium conditions whereby timber may be finally conditioned to any desired moisture content is given, together with a chart showing the relationship, as well as a few remarks on cooling a kiln. A relative humidity chart and table are also included."—*Authors' summary*.

Trade names. By H. E. DESCH. *Malayan Forester* 7: 4: 153–160; October 1938.

"The new list of trade names for empire timbers given in the 4th edition of the Empire Forestry Association Handbook recently published is discussed. It is suggested that the policy of compromise and conciliation adopted in the selection of names has resulted in numerous inconsistencies, which must nullify the hope that the list as it stands will ever be accepted by all parties. Instead, it is proposed that names should be selected in accordance with strict rules, formulated not only in the interests of the timber trade, but also in the interests of producers (*i.e.*, growers) and ultimate consumers.

"Nomenclature difficulties are examined. It is shown that botanical names are not applicable to trade usage. Vernacular and common names are also open to certain objections, while the use of names of well-established timbers with qualifying epithets for botanically unrelated timbers may deceive the ultimate consumer and lead to litigation between conflicting interests.

"It is proposed that (*a*) borrowed names should be dropped unless applied to genuine close relatives that are themselves technically similar to the original timbers; (*b*) geographical adjectives should be used in their strict geographical sense and not to describe a grade or type of timber; (*c*) if two or

three different names exist for essentially the same timber obtained from different regions the oldest name should be preserved provided it does not contravene rule (*a*), and the source of supply should be indicated by a geographical epithet; (*d*) when a name is required for a timber not yet established in the world markets a vernacular name is preferred to either a coined name or the generic appellation. The generic appellation should only be used in the sense of a coined name and, as such, is preferable to a descriptive name.

"It is suggested that a committee, with the powers of a Royal Commission, is required to give effect to the proposals. The committee should be representative of growers, exporters, importers, timber merchants, and professional bodies, in addition to official nominees of the Dominions, Colonies, and Forest Products Laboratories. Unofficial members should be elected by the interests they represent."—*Author's summary*.

"It may be thought that the arguments advanced against the present practice in the use of botanical, vernacular, and borrowed names of trade timbers are of only academic importance. It must be conceded that timbers are being sold in spite of, or because of, their existing names, and firms of long standing in the trade are as concerned as any one with maintaining their reputation for integrity with their customers. Timber merchants, however, do not deal direct with the general public; building contractors, cabinet makers, and other middle men, buy timber and fashion it for the ultimate consumer. They probably know that Philippine Mahogany is not Mahogany, that Rhodesian Teak is not Teak, and that Queensland Walnut is not Walnut, but what of that nebulous person, 'the man in the street'?

"There is no doubt that the layman regards the geographical adjective as indicative merely of the country of origin, and would consider he had been deceived were he to know the facts. On the other hand, once aware that there were many other timbers besides the dozen or so whose names were familiar to him, the layman would buy each on its merits, and would pay the same prices as he does today, or higher or lower ones, according to the appeal the timber made to him. . . ."

M. M. Chattaway. Price 30 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 58 JUNE 1, 1939

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 58 June 1, 1939

A technical magazine devoted to the furtherance of knowledge of tropical woods and forests and to the promotion of forestry in the Tropics.

The editor of this publication and the writer of any articles therein, the authorship of which is not otherwise indicated, is SAMUEL J. RECORD, *Professor of Forest Products, Yale University.*

Subscription price One Dollar for four consecutive numbers. Remittances should be made payable to TROPICAL WOODS.

Address all communications to the editor, 205 Prospect Street, New Haven, Connecticut, U. S. A.

THE WOODS OF *BILLIA, CASHALIA, HENOONIA,* AND *JULIANIA*

By PAUL R. KRAMER
Graduate Student, Yale University

The following descriptions were prepared in connection with a course in systematic anatomy of woods at the Yale School of Forestry. They are published in the belief that they will prove interesting to wood anatomists and also to botanists who are concerned with the taxonomic position of *Henoonia* and the Julianiaceae.

Billia (HIPPOCASTANACEAE)

Two species of *Billia* have been described, namely, *B. Hippocastanum* Peyr. (=*Aesculus mexicana* B. & H. f.), of Veracruz and Oaxaca, Mexico, and *B. columbiana* Planch. & Linden, occurring in uplands from Guatemala to Venezuela. Both are small to medium-sized evergreen trees with opposite, 3-digitate leaves, bright red flowers in terminal panicles, and

fruits consisting of a 3-celled leathery capsule with a single seed in each cell. In *Aesculus*, the only other genus of the family, the leaves are deciduous and usually have five or seven leaflets. The woods have many features in common but are readily separated by the larger size and small number of the pores in *Billia*. The following description is based upon one authentic specimen (Yale 36035) of *B. columbiana* collected by Austin Smith near Zarcero, Costa Rica, where it is known as Cocora or Cucaracho. Eight species of *Aesculus* were studied for comparison.

Heartwood silver-gray to dark gray with greenish tinge; not very clearly demarcated from the whitish sapwood. Luster high. Odor and taste not distinctive. Wood rather light but fairly hard; texture fine and uniform; grain uneven; easy to work; probably perishable in contact with the ground.

Growth rings distinct, principally because of the terminal bands of parenchyma. Pores with rounded outline; small to medium-sized, av. tang. diam. 100μ; few, about 10 per sq. mm.; solitary or in short radial multiples of 2 to 6, occasionally in small clusters, uniformly distributed. Vessels with simple perforations; tyloses and spiral thickenings absent; pits alternate, numerous, small, with oval borders and lenticular, usually included, apertures. Rays uniseriate or locally biseriate, few to 20 cells high; mostly homogeneous, sometimes with large and irregular cells; pits to vessels small, oval. Wood fibers with simple or indistinctly bordered pits. Ripple marks absent.

In *Aesculus* the pores have angular outlines, are very small, not over 70μ, and very numerous, usually more than 100 per sq. mm. Vessels with fine spiral thickenings; tyloses often present. Rays weakly heterogeneous, with marginal cells squarish; ray-vessel pitting mostly confined to marginal cells, often unilaterally compound and giving scalariform appearance. Wood parenchyma very sparingly paratracheal and in single terminal row or very narrow band. Ripple marks fairly regular to very irregular. Otherwise as in *Billia*.

Cashalia (Leguminosae)

Standley has described two species of *Cashalia*, namely, *C. cuscatlanica* Standl., a Salvador tree called Cashal and said to exceed *Ceiba* in stature, and *C. panamensis* Standl., a medium-sized tree discovered by G. Proctor Cooper in Bocas del Toro, Panama, where it is known as Citrón. Standley was "far from certain" that the two trees belonged to the same genus. Both have very large, odd-pinnate leaves, racemose flowers, and reddish, coriaceous, turgid fruits containing one or two seeds.

The type of pubescence on the leaves is the same in each species. The following description of the wood is based upon two sapwood specimens, one (Yale 12139; Cooper 520) from the type of *C. panamensis*, the other (Yale 36319) of *C. cuscatlanica* procured with leaves by Dr. S. Calderón who collected the type material of the species. The two specimens are almost identical in structure and are very distinct from *Swartzia*, a genus Standley thought might be closely related.

Heartwood not seen. Sapwood creamy yellow; parenchyma markings conspicuous. Luster low. Odor and taste absent or not distinctive. Of medium density, hard and strong; texture coarse; grain irregular; working properties fair; durability of heartwood unknown. The timber is said to be locally important in Salvador.

Growth rings absent or indistinct. Pores few, large, sometimes over 300μ in diam.; solitary and in multiples of 2 to 4, fairly uniformly distributed. Vessels without spiral thickenings or tyloses; pits alternate, medium-sized, vestured. Rays 1 or 2, occasionally 3, cells wide and up to 25, commonly less than 15, cells high; homogeneous, with local tendency to heterogeneity; pits to vessels small to medium-sized. Wood parenchyma coarse-celled, abundant; in somewhat irregular concentric bands, few to several cells in width, usually widening to include the pores; marginal crystalliferous strands numerous. Wood fibers not in definite radial rows; arranged in bands about twice as wide as the parenchyma layers; walls of medium thickness. Ripple marks absent or local and very irregular.

Henoonia (Sapotaceae)

Henoonia, with two species of shrubs, appears to be endemic to Cuba. The leaves are small and leathery; the little axillary flowers are borne singly or in clusters; the fruit has a single exalbuminous seed. The only specimen available (Yale 16160) is of *H. angustifolia* Urb., collected with flowering herbarium material in eastern Cuba by G. C. Bucher and determined by J. T. Roig. The original species, *H. myrtifolia* Gris., has been referred by some botanists to the Solanaceae, but the structure of *H. angustifolia* is definitely sapotaceous. The genus is not included in Charles Baehne's *Mémoires sur les Sapotacées. I. Système de classification* (*Candollea* 7: 394–508. 1938).

Heartwood not seen. Sapwood yellowish. Luster medium. Odorless and tasteless. Hard, heavy, and strong; texture fine and uniform; grain fairly straight; takes a glossy polish.

Growth rings present, visible in part. Pores small, rarely over 70μ, thick-walled, few to numerous; some solitary or in short radial multiples, but mostly in chains or flame-like or dendritic pattern. Vessel perforations simple; pits alternate, small, with circular borders. Rays uniseriate or biseriate and up to 30, generally less than 20, cells high; homogeneous to weakly heterogeneous; ray-vessel pit-pairs small, half-bordered, the outline subcircular to short oval. Wood parenchyma abundant, finely reticulate, with tendency to concentric lines and finely terminal; cells often disjunctive. Wood fibers with very thick walls and narrow lumina; pits simple to indistinctly bordered. Vasicentric tracheids present. The structure of *Bumelia* is similar.

Juliania (Julianiaceae)

The Julianiaceae comprise two genera, namely, *Orthopterygium* with one Peruvian species, *O. huaucui* (Gray) Hemsl. (=*Juliania huaucui* Gray), known as Huancui or Huanarpu, and *Juliania* (*Amphipterygium*), with four species in Mexico. They are all resinous shrubs or small trees with alternate, deciduous, odd-pinnate (rarely simple) leaves, with opposite, crenulate or dentate leaflets; the small flowers are dioecious, the male in axillary panicles, the female, consisting only of a pistil, crowded on a receptacle; the fruit is hard, indehiscent, one-seeded, and with a flat wing-like fruiting pedicel.

Taxonomists do not agree on the position of this group. Hemsley (*Phil. Trans. Roy. Soc. London* 3: 199: 169–197. 1907) places it in a separate order between the Juglandales and Fagales. Hutchinson (*Families of flowering plants. I. Dicotyledons*, p. 259) includes it as a second family of the Juglandales. Bentham and Hooker (*Genera plantarum* 1: 428) refers the group doubtfully to the Spondieae tribe of the Anacardiaceae. Standley (*Trees and shrubs of Mexico*, p. 672) considers the family distinct, but places it next to the Anacardiaceae. In this connection Macbride (*Flora of Peru* 2: 2: 266) says: "In foliage, in the presence of resin, in the exalbuminous seed, and anatomically, it resembles the Anacardiaceae, but its resemblance with the Juglandaceae may be more fundamental, as for example the dissimilarity of the staminate and pistillate flowers."

The material available for this study consists of a young stem of *Orthropterygium huaucui*, and a young stem (Yale 31976, from Professor Helia Bravo) and an older one an inch thick (Yale 35270, collected by Mrs. Gordon C. Abbott for Harvard University) of *Juliania adstringens* Schlecht. The latter species is a small Mexican tree, called Cuauchalalate, with a commercial bark used as a source of tannin, dyestuff, and medicine. The wood structure clearly indicates a close relationship to the Anacardiaceae and not to the Juglandaceae.

Heartwood poorly defined in specimen; greenish yellow and brown striped; sapwood brownish. Luster low. Odor and taste not distinctive. Rather light in weight, but firm; texture fairly coarse, uniform; grain straight; durability unknown.

Growth rings poorly defined. Pores small to medium-sized, up to 120μ in diam.; few to numerous, usually 15 to 25 per sq. mm.; solitary and in multiples of 2 to 8, occasionally in little clusters, well distributed. Vessels with simple perforations (one reticulate plate seen); without spiral thickenings; thin-walled tyloses abundant; pits medium-sized, alternate with tendency to opposite arrangement, hexagonal to elongated, the apertures narrow, sometimes coalescent. Rays 1 to 6, mostly 4 or 5, cells wide and up to 30, often less than 20, cells high; uniseriate rays composed of square and upright cells, multiseriate homogeneous or with single marginal rows of squarish cells; crystals common; few small resin ducts present; ray-vessel pit-pairs half-bordered, medium to large, oval to much elongated or gash-like. Wood parenchyma sparingly paratracheal. Wood fibers septate; walls rather thin; pits simple or indistinctly bordered. Vertical resin ducts present in pith and cortex only; radial ducts, with epithelial layer composed of very small cells, present in some of the rays.

Summary

On a basis of the wood anatomy, *Billia* is readily distinguished from *Aesculus;* the two species of *Casbalia* are very similar; *Henoonia* belongs with the Sapotaceae and resembles *Bumelia;* the Julianiaceae are very closely related to the Anacardiaceae.

Sixth Pacific Science Congress

The Sixth Pacific Science Congress of the Pacific Science Association will be held at Berkeley, Stanford, and San Francisco, California, July 24 to August 12, 1939, under the auspices of the National Research Council of the United States of America. Complete information will be sent upon request to the Secretary of the Congress, 205 Hilgard Hall, University of California, Berkeley.

AMERICAN WOODS OF THE FAMILY RHAMNACEAE

By SAMUEL J. RECORD

The Rhamnaceae comprise about 50 genera and 500 species of erect or climbing shrubs and small to moderately large trees, often spiny, generally distributed in both temperate and tropical regions of the world, many of them occupying dry situations. Their economic products are few and are chiefly medicinal, although some species bear small fruits that are comestible and others are local sources of dyestuffs and soap substitutes. One of the best known plants is the European Buckthorn, *Rhamnus cathartica* L., often planted for hedges in Europe and eastern North America.

The woods, which are virtually unknown to the world markets, exhibit a wide range in appearance, structure, and properties. At one extreme in density is the West African *Maesopsis* with a light and soft timber about as easy to work as Spanish Cedar (*Cedrela*), while at the other is *Krugiodendron* of the West Indies with one of the heaviest and hardest woods known. The colors include various shades of yellow, orange, red, brown, and olive, sometimes striped with black. A rare wood noted for its peculiar color is the Red or Pink Ivory of northern Natal (see *Tropical Woods* 13: 4); the scientific name is *Rhamnus Zeyheri* Sond., but the species seems out of place in that genus.

The American trees represent about 17 genera, but the woods of only 13, including one large liana, are described here. For the most part, the woods are attractively colored; without distinctive odor or taste when dry; very hard, heavy, and fine-textured; seasoning without much splitting or warping, moderately difficult to work, taking a glossy polish, and highly resistant to decay. Their utilization is limited because of the scarcity of trees large enough to supply timber.

Growth rings present; woods more or less distinctly ring-porous in *Ceanothus*, *Colletia*, *Discaria*, and *Rhamnus*. Pores all very small in *Colletia*, medium-sized in *Colubrina* (in part) and *Sarcomphalus*, large in part in lianas (*e.g.*, *Ampelozizyphus*), small to very small in the others; few in

Colubrina, *Doerpfeldia*, and *Sarcomphalus*, fairly numerous in the others; generally solitary and in short to long radial multiples, but in flame-like or dendritic pattern in *Rhamnus* (*Eurhamnus*) and in diagonal, zig-zag, or ulmiform arrangement in *Colletia* and *Discaria*. Vessels with exclusively simple perforations; spiral thickenings present in *Colubrina*, *Doerpfeldia*, and *Sarcomphalus*; spiral striations observed in *Sageretia*; tyloses absent; gum deposits common, often as plugs near perforations; pits very small to minute in *Krugiodendron*, *Reynosia*, and *Sageretia*, small to medium-sized in the others. Rays typically 1 to 3 cells wide; not over 2 cells wide in *Ceanothus macrocarpus* Nutt., *Karwinskia* (in part), and *Krugiodendron*; up to 6 and 8 cells wide in *Discaria* and *Colletia*, respectively; distinctly two-sized, uniseriate or biseriate and very large and suggesting those of *Quercus* in *Ampelozizyphus*; height variable, less than 25 cells in *Krugiodendron*, occasionally up to 50, rarely to 100 or more, in the others; more or less distinctly heterogeneous with many square cells, sometimes homogeneous in part (*e.g.*, *Doerpfeldia* and *Sarcomphalus*); crystals common; gum deposits frequently abundant; pits to vessels similar in size to the vascular. Wood parenchyma sparse to very abundant, mostly sparingly paratracheal; finely reticulate in *Sarcomphalus* and *Zizyphus* (in part); short to long aliform and confluent into short tangential to broken, wavy, or fairly uniform concentric bands in *Colubrina*, *Doerpfeldia*, *Reynosia*, and *Zizyphus* (in part); sometimes also in terminal row or narrow band; pith flecks common; crystalliferous strands observed in certain species of *Colletia*, *Colubrina*, *Condalia*, *Doerpfeldia*, *Karwinskia*, *Rhamnidium*, *Sageretia*, and *Sarcomphalus*. Wood fibers typically small; walls moderately to extremely thick and gelatinous, the two types sometimes present in same growth ring; pits very small, simple. Ripple marks absent. No gum ducts seen.

Ampelozizyphus *amazonicus* Ducke, the only species, is a scandent shrub of the lower Amazon region of Brazil, where it is known as Saracura-mira. The leaves are large, leathery, prominently 3-nerved; the small green flowers are borne in axillary cymes; the fruit is a 3-lobed, 3-seeded, elastically dehiscent capsule.

Wood brownish throughout, resembling Oak (*Quercus*). Luster medium. Odorless and tasteless; fresh inner bark is said to have the odor of methyl salicylate. Hard and heavy; texture coarse, grain irregular. Narrow wedges of bark penetrate rather deeply into the wood. No known uses for the plant.

Growth rings present. Pores very large to very small, numerous; large pores solitary or in small multiples, small ones in short to very long radial multiples; walls thick. Rays of two distinct sizes; uniseriate or biseriate and up to 20 cells high, with all of the cells upright or square; multiseriate and

conspicuous, up to 25 or more cells wide and several hundred cells high, often interrupted by the wood fibers, with nearly all of the cells procumbent; pits to vessels small to medium-sized and rounded to elongated. Wood parenchyma sparingly vasicentric and terminal. Wood fibers with moderately thick walls and numerous simple pitts.

Ceanothus, with about 30 species of shrubs and small trees, rarely over 30 feet high and 14 inches in diameter, is confined to the temperate and subtropical regions of North America, being most abundantly represented in California. The branches are often spinose; the alternate or opposite, usually 3-nerved, leaves are persistent in the arborescent species; the little white, blue, or pink flowers are generally borne in axillary or terminal cymes or panicles; the fruit is small, dry, 3-lobed, and dehiscent.

Standley (*Trees and shrubs of Mexico*, p. 720) says: "Some of the species are showy when in flower. The blue-flowered ones are known on the Pacific coast of the United States as California Lilac. *Ceanothus americanus* L., of the United States, is known as New Jersey Tea. The astringent roots contain over 6 per cent of tannin, and an alkaloid, ceanothine. They have been used in the treatment of syphilis, and are said to have purgative properties. The leaves were used by the Indians to make a beverage like tea, and during the Revolutionary War they were employed along the Atlantic coast as a substitute for Chinese tea. . . . The fresh flowers of some, and probably of all, of the species, when rubbed in water, give a cleansing lather which is a good substitute for soap."

The three largest species in the United States, all in southwestern California, are *C. arboreus* Greene, *C. thyrsiflorus* Eschw., and *C. spinosus* Nutt. The arborescent species with the most southern range is *C. coeruleus* Lag., of southern Mexico and Guatemala; it is usually less than 25 feet high and its only recorded uses are medicinal. *Ceanothus* supplies no commercial timber.

Wood reddish brown; distinct but not very sharply demarcated from the whitish sapwood. Luster rather low. Without distinctive odor or taste. Hard and heavy; texture fine; grain variable; not difficult to work, finishing very smoothly; durability rather high.

Growth rings present; wood often ring-porous. Pores very small to minute, the largest not individually distinct without lens, numerous to very numerous; early-wood pores often arranged in a narrow to rather wide band, those in the late wood in radial rows or flame-like or dendritic patches; sometimes the arrangement is definitely radial, with gradual diminution in the size of the pores. Vessels with spiral thickenings; pits rather large. Rays 1 to 3 cells wide and up to 35 cells high; decidedly heterogeneous, often with most of the cells square; small to very small crystals sometimes abundant; pits to vessels small to medium-sized, rounded to lenticular. Wood parenchyma sparingly paratracheal. Wood fibers with thick, sometimes gelatinous, walls and very small simple pits.

COMMON NAMES: Blue blossom, b. myrtle, California lilac, deer brush, Jersey tea, mahala mat, New Jersey tea, red-root snow brush, white thorn, wild lilac (U. S. A.); chaquira, chaquirilla, cuaicuastle, huichagorare, palo colorado, sayolistle, tlaxistle, tnu-yoocó (Mex.).

Colletia, with numerous species of thorny shrubs and little trees, is limited to southern South America. Apparently the only uses are in local medicine. The following description is based on one specimen (Yale 34053) of *C. spinosa* Lam. collected by E. L. Bernath in southern Chile. Color yellowish. Luster medium. Odorless and tasteless. Hard, heavy, tough, and strong; texture fine; grain fairly straight.

Growth rings present; wood more or less ring-porous. Pores small to minute, not individually visible without lens; numerous; mostly in clusters arranged in diagonal or zig-zag bands. Vessels with spirals. Rays 1 to 5, sometimes to 8, cells wide and up to 50, commonly less than 30, cells high; heterogeneous, at least in part; crystals common; pits to vessels small, rounded. Wood parenchyma paratracheal, not very abundant; crystalliferous strands occasionally present. Wood fibers with very thick, gelatinous walls and minute pits.

COMMON NAMES: Quina (Braz.); espina de la cruz (Urug.); barba de tigre, currú, curú-mamuel, espina-cruz, liaka, quina, q. del campo, tola (Arg.); crucero, yaquil (Chile).

Colubrina, with about 25 species of unarmed evergreen shrubs and trees, is sparingly represented in the Old World and widely distributed in tropical America. The leaves are pinnately veined or 3-nerved, sometimes with glands on the under surface; the small yellowish flowers are fasciculate in the leaf axils; the fruit is a globose, elastically dehiscent

capsule. The shiny brown or black seeds are used for making necklaces and the bitter bark is employed in native medicine as a tonic and febrifuge. The timber of a few species is locally important.

The Saguaragy or Sobragy of southeastern Brazil, *C. rufa* Reiss., is a tree of moderate height, but with trunks sometimes 32 inches in diameter, supplying an orange colored or somewhat variegated heartwood that is fine-textured, strong, and durable. It is used for cabinet work, vehicles, shipbuilding, bridges, and is considered first class for railway crossties and fence posts.

Three arborescent species have their northern limit in southern Florida and one densely branched shrub crosses the border from Mexico into Texas. Best known is the Naked-wood or Soldier-wood, *C. reclinata* Brongn., which grows in nearly pure stands on Umbrella Key, where it attains a height of 50 to 60 feet with a thick trunk divided by numerous deep irregular furrows like a tangled mass of serpents and covered with a thin orange-brown bark exfoliating like River Birch (*Betula nigra* L.). The species is also common in the West Indies. The rich, velvety lustered, dark brown or olive-brown wood is little used except for fuel and a few minor purposes, but is suitable for small cabinet work and articles of turnery. Some of the common names recorded for the next species seem more appropriate for this one.

Colubrina ferruginosa Brongn. is widely distributed in the West Indies and also occurs in southern Mexico and Salvador; it is said to reach its best development in Martinique, growing to a height of 75 feet and a diameter of two feet or more. In Haiti the species, called Bois Pelé, grows naturally in the foothills of the high mountains near the end of the southwest peninsula. According to W. R. Barbour (*Tropical Woods* 6: 13) the natives "make a practice of growing Bois Pelé near their homes, usually in a lot 50 to 100 feet square behind the house. The seeds are planted about six feet apart each way and the trees grow very tall and straight with clean boles and little taper. They do best on a rich well-watered soil, such as is suitable for bananas, and apparently are free from insect attacks and disease. It requires about ten years to grow a tree

with a usable length of 40 feet or more and a diameter (breast high) of about six inches. These poles are used solely for rafters and ridgepoles for the wattle-and-daub huts or 'cayes.' The wood is hard, very stiff, works fairly well, is not badly attacked by termites, and lasts a long time when not exposed."

Heartwood generally orange or bright red with a yellow hue, somewhat striped or variegated; rich brown in *C. reclinata;* distinct but not always sharply demarcated from the whitish or yellowish sapwood. Luster medium to high. Without distinctive odor or taste. Moderately to very heavy and hard; sp. gr. (air-dry) 0.75 to 0.95; weight 47 to 59 lbs. per cu. ft.; texture medium to fine (*C. reclinata* being the densest and finest-textured); grain straight to variable; not difficult to work, finishing very smoothly and attractively; is highly durable. Not likely to become commercially important.

Growth rings present. Pores small to medium-sized, few; solitary and in short to rather long radial multiples and sometimes in little clusters, varying in different species, well distributed without pattern, though occasionally with local tendencies to diagonal arrangement. Rays 1 to 3, sometimes 4, cells wide and up to 50 cells high; decidedly heterogeneous; crystals occasionally abundant; pits to vessels small to medium-sized, rounded. Wood parenchyma variable in different species; sparingly vasicentric to short aliform and more or less confluent (very abundant only in *C. heteroneura*); crystalliferous strands common in *C. reclinata*. Wood fibers with medium to very thick walls and small pits.

COMMON NAMES: *C. ferruginosa:* Bitters, snake-bark (Bah.); black velvet, greenheart, mountain ebony, snakewood, wild ebony (Jam.); bijáguara, carbonero de costa, fuego (Cuba); abejuelo, achiotillo, greenheart, quitarán, ratón, snake-bark, soap-tree (P. R.); bois conleuvre, b. de fer, b. de serpent (Mart.); candelón, corazón de paloma (Dom. R.); bois fer-blanc, b. pelé (Haiti); guayul, manzanita, pimiento-ché, yax-puken or yax-pukim (Mex.); chaquirio or chaquiro (Salv.); *C. reclinata:* Naked-wood, soldier-wood (Florida); bijáguara, carbonero, c. de costa, ébano, guaciriano, jayajabico (Cuba); maabee, mabí, naked-wood, smooth snake-bark (P. R.); palo amargo (Dom. R.); bois de fer, b. mabí (Haiti). *Miscellaneous:* Wild coffee (Florida); aleznilla, café cimarrón (Mex.); pichy pang, Spanish elm, wild coffee (Pan.); saguaragy, sobragy, sobrasil (Braz.).

Condalia, with about 10 species of shrubs and little trees, rarely 30 feet high, is of common occurrence, often forming chaparral, in southwestern United States, northern Mexico, and southern South America. The branches are stiff and spinescent; the small leathery leaves are deciduous; the little greenish white flowers are solitary or clustered in the leaf axils; the fruit is a thin-fleshed, edible little drupe. The bark of the roots of some species is used as a substitute for soap and for medicinal purposes. The genus supplies no timber of value.

The largest species is *C. obovata* Hook., which occurs in western Texas and Nuevo León and Tamaulipas, Mexico. Is it often only a spiny shrub covering large areas with dense thickets, but on the high sandy banks of the lower Río Grande and its tributaries it is a tree sometimes 30 feet high and 6 to 8 inches in diameter. The dense wood makes excellent fuel and is said to be the source of a blue dye.

The few specimens of *Condalia* in the Yale collections are of doubtful authenticity and differ too much in their appearance and anatomy to justify description.

COMMON NAMES: Bluewood, logwood, purple haw (Texas); abrojo, barchatas, bindó, brasil, capul negro, capulín, chamís, chaparro prieto, clepe, crucillo, garambullo, garropata, mezquitillo, tecomblate (Mex.); piquillín (Arg.).

Discaria, with numerous species of typically spiny shrubs and little trees, has two representatives in Oceania, the others occurring in southern South America, especially Patagonia and Chile. The best known is *D. febrifuga* Mart., the Quina do Campo of Brazil, so named because the bitter bark, especially of the roots, is used like quinine as a febrifuge; it is said to yield a red dye also; the wood is a source of fuel and charcoal.

The following description is based upon two Chilean specimens of Chacay, one (Yale 5560) determined as *D. discolor* (Hook) P. Dusén (=*Colletia discolor* Hook.), the other (Yale 34054) of *D. serratifolia* (Vent.) B. & H. f. (=*C. serratifolia* Vent.) collected by E. L. Bernath in the Province of Malleco. Heartwood brownish, with Elm-like appearance; not sharply demarcated from the yellowish sapwood. Luster medium. Odorless and tasteless. Hard, heavy, tough, and strong; texture medium; grain straight to irregular; not difficult to work, but rather fibrous; durability presumably low. Of no commercial possibilities.

Growth rings present; wood more or less ring-porous. Pores thin-walled, very small to minute, not individually visible to unaided eye; very numerous, in distinct diagonal, zig-zag, or concentric bands producing an ulmiform pattern. Vessels with spiral thickenings. Rays 1 to 6 cells wide and of various heights up to 50 cells or more; rays heterogeneous in part; ray-vessel pitting fine to medium, sometimes unilaterally compound. Wood parenchyma rather sparingly paratracheal. Wood fibers with thick walls and minute pits.

COMMON NAMES: Brusca, quina do campo (Braz.); bruquilla, chacái (Arg.); quina del campo (Urug.); chacay (Chile).

Doerpfeldia *cubensis* Urb., the only species, is a little tree growing in eastern Cuba, where it is called Bruja Negra and Hueso de Tortuga. The stiff branches bear many short leaf spurs; the leaves are small, obovate, entire, and leathery; the fruit is a small drupe.

Heartwood probably dark reddish brown, judging from small wound areas; sapwood pale yellow. Luster medium. Odorless and tasteless. Very hard, heavy, and strong; texture fine and uniform; grain straight; not very difficult to work, taking a glossy polish. Of no known uses.

Growth rings absent or poorly defined. Pores rather thick-walled, small, not visible without lens, appearing few and scattered, solitary or in small multiples. Rays 1 to 4 cells wide and up to 50 cells high; heterogeneous in part; crystals numerous; pits to vessels medium-sized, rounded. Wood parenchyma long aliform and confluent into numerous, narrow, wavy tangential to fairly regular concentric bands 2 to 4 cells wide; very distinct with lens; crystalliferous strands present. Wood fibers with very thick gelatinous walls and minute pits.

Karwinskia, with several species of unarmed shrubs and small to medium-sized trees, has its center of distribution in Mexico, with extensions into southwestern United States, northern Central America, and Haiti. The leaves are subopposite, pinnate-nerved, and pellucid-punctate; the small flowers are axillary, solitary or in cymes or umbels; the fruit is drupaceous.

The most widely distributed species is *K. Humboldtiana* (R. & S.) Zucc., ranging from western Texas to Yucatán and Oaxaca, Mexico. Standley (*Trees and shrubs of Mexico*, p. 717) says: "The fruit is sweet and edible, but the stones are harmful if swallowed. In people, especially children, paralysis, particularly of the lower limbs, is caused by eating the stones, and similar effects are said to be produced in pigs and chickens. . . . The seeds are oily, and they contain some principle which paralyzes the motor nerves. They are employed in Mexico as an anticonvulsive, particularly in the case of tetanus. An infusion or decoction of the leaves and roots is used locally for fevers." The species is usually a shrub or small tree, but on María Magdalena Islands, off the Tepic coast, where it is known as Tempisque, it occasionally develops a trunk 50 feet long and 24 inches in diameter. The dull red, very dense, fine-textured timber is considered excellent for railway crossties, but most of the trees there have irregular boles.

Another species of southwestern Mexico is *K. latifolia* Standl., commonly called Margarita. It also grows on María Magdalena Island, and boles of mature trees are 14 to 18 inches in diameter and upward of 20 feet to the first large branches. The timber is similar to that of the other species, but is often streaked with black, and defective wood may be almost wholly black; it is noted for its durability.

The Salvador species, locally known as Güiligüiste or Huilihuiste, is *K. Calderonii* Standl. According to Standley & Calderon (*Flora de El Salvador*, p. 141), it is a common tree, sometimes 40 feet high, and supplies timber of excellent quality for making railway crossties, hubs of wheels, weavers' shuttles, mortars and pestles, bowling balls, and fuel.

The following description is based on one specimen each of *K. Humboldtiana*, *K. latifolia*, and *K. mollis* Schlecht. Heartwood dull red or reddish brown, deepening upon exposure; uniform or streaked with black, which may predominate; distinct but not sharply demarcated from the yellowish sapwood. Without distinctive odor or taste. Very hard, heavy, and strong; sp. gr. (air-dry) 1.05 to 1.20; weight 65 to 75 lbs. per cu. ft.; texture fine and uniform; grain fairly straight; rather difficult to work, but finishing very smoothly; seems to season readily without bad checking and to hold its place when manufactured. A good timber in its class, but too scarce to be of value for export.

Growth rings present. Pores very small, not individually distinct without lens, rather numerous; mostly in short radial multiples and rows, well distributed. Rays 1 to 4, mostly 2, cells wide and up to 35, generally less than 20, cells high; heterogeneous, with many of the cells square; crystals common, gum abundant; pits to vessels small to medium-sized, rounded. Wood parenchyma rather sparingly vasicentric; sometimes finely terminal; crystalliferous strands present. Wood fibers with very thick gelatinous walls and minute cavities; pits very small, simple.

COMMON NAMES: Cacachila, c. china, c. silvestre, cachila, capulincillo, c. cimarrón, coyotillo, frutillo, margarita, m. del cerro, negrito, palo negrito, tlalcapolin, tullidor or tullidora (Mex.); güiligüiste or huilihuiste (Salv.).

Krugiodendron, with a single species, *K. ferreum* (Vahl) Urban (=*Rhamnus ferreus* Vahl=*Condalia ferrea* [Vahl] Gris. = *Rhamnidium ferreum* [Vahl] Sarg.), is an evergreen tree often shrubby but sometimes 30 to 50 feet tall and 15 to 20 inches in diameter, growing in southern Florida, the West Indies from the Bahamas to St. Vincent, and in Yucatán, Mexico, and northern British Honduras. The leaves are subopposite; the small yellow-green flowers are borne in short axillary clusters; the fruit is a small, round, black, thin-fleshed drupe. The wood, which is sparingly utilized, is noted for being one of the densest in the world.

Heartwood orange to dark brown, usually more or less streaked; has a waxy appearance; sharply demarcated from the yellowish sapwood. Luster fairly high. Odor and taste absent or not distinctive. Exceedingly dense, horn-like, and strong; sp. gr. (air-dry) 1.34 to 1.42; weight 84 to 89 lbs. per cu. ft.; texture very fine and uniform; grain generally straight; difficult to cut, fairly easily split, takes a high polish; is very resistant to decay. Of no commercial possibilities.

Growth rings poorly defined. Pores not distinct without lens, fairly numerous to numerous; solitary or in small multiples, well distributed. Rays uniseriate or biseriate and few to 25 cells high; decidedly heterogeneous, many of

the cells square; crystals common, gum deposits abundant; pits to vessels minute. Wood parenchyma sparingly paratracheal. Wood fibers with very thick walls, minute cavities, and simple pits.

COMMON NAMES: Black ironwood (Florida, Jam.); acero, carey de costa, coronel, palo diablo (Cuba); bariaco, espejuelo, palo de hierro (P. R.); palo de hierro (Dom. R.); bois de fer (Haiti, Guad.); chimtoc, quiebrahacha (Mex.); axemaster (Br. H.).

Reynosia, with several species of unarmed evergreen shrubs and small trees, has its center of distribution in the West Indies, with one extension into southern Florida. The leaves are mostly opposite, short-petioled, and leathery; the minute yellowish green flowers are borne in axillary clusters; the fruit is a thin-fleshed drupe.

The northernmost species is *R. septentrionalis* Urb. (=*R. latifolia* Chapm.), a shrub or tree sometimes 30 feet tall and 8 inches in diameter, common on scrublands of the Bahamas and also along the coast and islands of southern Florida, where it is known as Red Ironwood and Darling Plum. There are a few species in Cuba that get large enough to supply timber suitable for fence posts and railway crossties, but the supply is very limited.

The following description is based on specimens of three species, namely, *R. dominguensis* Urb., of Dominican Republic; *R. septentrionalis*, of Florida; *R. uncinata* Urb., of Puerto Rico. Heartwood orange brown, becoming reddish brown upon exposure; rather waxy looking; sometimes with blackish streaks; rather sharply demarcated from the thin yellowish sapwood. Luster rather low. Odorless and tasteless; exceedingly hard, heavy, and strong; texture fine and uniform; grain mostly straight; rather difficult to work but taking a high natural polish; very resistant to decay. Apparently without commercial possibilities because of the small size and scarcity of the timber.

Growth rings present, but poorly defined. Pores thick-walled, very small to minute, not distinct without lens, numerous; mostly in radial multiples of two to several pores each, well distributed. Vessels with abundant gum deposits. Rays 1 to 5, mostly 2 or 3, cells wide and up to 50, generally less

than 25, cells high; decidedly heterogeneous; crystals common; pits to vessels very small. Wood parenchyma paratracheal, short aliform to locally confluent. Wood fibers with very thick gelatinous walls and minute pits.

COMMON NAMES: Darling plum, red ironwood (Florida); almendrillo, a. de costa, almendro, brujilla, carey cocuyo, cocuyo de costa, membrillo, m. silvestre (Cuba); guama, chicharrón (P. R.); brillol, galle-galle (Haiti).

Rhamnidium, with a few species of unarmed shrubs and small to medium-sized trees, has its center of distribution in eastern Brazil. Some species have been described from the West Indies, but Urban has transferred three of them, namely, *R. cubense* Britt. & Wils., *R. jamaicense* Urb., and *R. reticulatum* Gris., to the genus *Auerodendron*. The wood material available is inadequate as a basis for an opinion on the proposed classification. One of the most characteristic features of *Rhamnidium* is the opposite, entire, leathery leaves having deeply depressed midrib and parallel lateral nerves with finely anastomosing veins between them. The twigs are slender; the very small flowers are borne in axillary clusters; the fruit is a globular drupe. The timber is little known because of the scarcity of the larger trees.

R. caloneurum Standl. was discovered by G. Proctor Cooper in the region of Bocas del Toro, Panama. According to the collector's notes, it is a tall tree, with a long, clear, unbuttressed bole 12 inches in diameter. The fruits are greenish red, and the wood, when freshly cut, has a scent suggesting peanuts. *R. elaeocarpum* Reiss. occurs in eastern Brazil, where it is called Azeitona, and in Formosa, Argentina; it was also found in northeastern Peru by L. Williams, who says (*Woods of northeastern Peru*, p. 299) that it is a shrub or small tree about 18 feet in height, branching a few feet above the ground. *R. glabrum* Reiss., another Brazilian species, is generally described as a shrub or little tree, but according to J. G. Kuhlmann (*Revista Florestal* 2: 1: 54; *Tropical Woods* 32: 34) it will grow to a height of 65 feet, with a trunk 18 to 20 inches thick, on good soil in humid sites. The sapwood is comparatively thin; the heartwood is light red, deepening to fiery red upon exposure, fine-textured, durable, and well-suited for

cabinet work. Some experimental forest plantations of it have been made.

The following description is based on authentic specimens of *R. caloneurum* (Yale 12053; Cooper 434), from Panama; *R. elaeocarpum* (Yale 19092; Williams 6887), from Peru; *R. ellipticum* Britt. & Wils. (Yale 9204), from Puerto Rico. Heartwood bright red, orange, or orange brown, sometimes with dark streaks; rather sharply demarcated from the yellowish sapwood. Luster medium. Odorless and tasteless when dry. Very hard, heavy, and strong; texture fine and uniform; grain fairly straight; appears to season readily without checking; not very difficult to work, taking a glossy polish; durability high. Of no possibilities for the export trade.

Growth rings usually present. Pores thick-walled, very small, not distinct without lens, rather numerous; solitary and in pairs in *R. caloneurum*, mostly in short to long radial multiples in the other two; distributed without pattern. Gum plugs common in vessels. Rays 1 or 2, sometimes 3, cells wide and up to 50, generally less than 25, cells high; decidedly heterogeneous; crystals sometimes present; pits to vessels small, rounded. Wood parenchyma rather sparingly paratracheal, sometimes locally confluent, occasionally finely terminal; crystalliferous strands present. Wood fibers with moderately thick walls in *R. caloneurum;* very thick-walled and gelatinous in large part in the others; fibers without gelatinous walls sometimes in short to long bands, suggesting parenchyma as seen under lens.

COMMON NAMES: Almendrón charrasco, fruta del bién (Cuba); azeitona, tarumai (Braz.).

Rhamnus, with about 150 species of armed or unarmed shrubs and small to medium-sized trees, is widely distributed in the temperate and subtropical regions of the northern hemisphere, with a few representatives elsewhere. The bark is bitter; there is no terminal bud; the leaves are alternate, feather-veined, entire or toothed; the small flowers are borne in axillary clusters; the fruit is a succulent drupe. The principal uses of the plants are medicinal. The species can be grouped into two subgenera and the woods of the temperate zone, so far as studied, are separable into two classes that are more distinct than most of the other genera. In subgenus *Eurhamnus* the woods are diffuse-porous and the pores are very small to minute and arranged in conspicuous flame-like, zig-zag,

or dendritic pattern; in subgenus *Frangula* the woods are more or less ring-porous and the pores, though never large, diminish gradually in size during seasonal growth.

The center of distribution of the American species is in Mexico with a few as far as Costa Rica and one in Venezuela, while several cross the border into southwestern United States. *R. crocea* Nutt. and its varieties are spinescent evergreen shrubs or little trees 25 to 30 feet high growing in southern California and Arizona, often forming thickets. This species belongs to the subgenus *Eurhamnus* and the wood is similar to that of the common European Buckthorn, *R. cathartica* L.

There are in the United States two arborescent species belonging to the subgenus *Frangula;* both are unarmed and deciduous. The Indian Cherry, *R. caroliniana* Walt., is a tree sometimes 30 to 40 feet high with a slender trunk rarely over 8 inches in diameter, widely distributed in the southeastern quarter of the United States, but at its best in southern Arkansas. It has no commercial uses.

The best known American species is the Cascara, *R. Purshiana* DC., a shrub-like tree rarely 40 feet tall and 20 inches in diameter, usually separating 10 or 15 feet from the ground into numerous stout, generally upright stems. It is indigenous to the northwest United States and British Columbia, making its best growth in coniferous forests on rich bottom-land in the Puget Sound region. The leaves are finely serrate and have a deeply depressed midrib and parallel lateral veins. The winter buds lack scales but are covered with rusty brown hairs. The flowers are greenish yellow and the fruits are small black drupes. The interior of freshly cut bark is bright yellow, turning brown upon exposure to sunlight and has a bitter taste. The bark has long been an article of commerce, being the source of an official drug called "cascara sagrada," which is used in medicine as a laxative. The trees are stripped during the dry season and the stumps allowed to coppice. The bark is dried on wires in the shade and shipped in 100-pound bags or bales to the dealers who allow it to age a year or more before using. An average-sized tree will yield about 10 pounds of dried bark. The supply has been seriously depleted in Wash-

ington and Oregon, but is still plentiful across the Canadian border. The bark of *R. californica* Esch. is sometimes used as a substitute for that of the genuine Cascara.

Wood yellow, orange or orange brown, distinct but often not sharply demarcated from the whitish or pale olive sapwood. Luster medium. Odor and taste absent or not distinctive. Density fairly low to medium in *Frangula*, rather high in *Eurhamnus;* texture medium, grain straight to irregular; easy to work, finishing smoothly; durability fair to good. Of no commercial importance because of the small sizes available.

Growth rings present; woods more or less ring-porous. Pores small to minute, numerous; gradually diminishing in size, mostly in short to long multiples, sometimes in little clusters, without definite pattern in late wood in *Frangula;* of fairly uniform size and in conspicuous pattern throughout growth ring in *Eurhamnus*. Vessels with spiral thickenings. Rays 1 to 3, sometimes 4, cells wide and up to 40, commonly less than 25, cells high; heterogeneous in part; crystals common; pits to vessels small, medium-sized in *R. Purshiana*. Wood parenchyma rather sparingly paratracheal. Wood fibers with thin to medium walls in *Frangula*, with thick to very thick walls in *Eurhamnus;* gelatinous inner layer often present, even in walls of moderate thickness.

COMMON NAMES: *R. caroliniana;* Bog birch, brittle-wood, buckthorn (alder, Carolina, yellow), elbow-brush, Indian cherry, polecat tree, p. wood, stink berry, s. cherry, s. wood, yellow wood (U. S. A.); *R. Purshiana:* Bayberry, bitter-bark, bear berry, b. wood, cascara, c. buckthorn, c. sagrada, chittern, chittim, coffee berry, c. bush, c. tree, pigeon berry, wahoo, wild coffee, yellow wood (U. S. A., Can.). *Miscellaneous:* Buckthorn, California holly (U. S. A.); capulincillo, tlalcapollin (Mex.); duraznillo (C. R.); zamorito (Venez.).

Sageretia, with several species of shrubs and little trees, often with spinose branchlets, has its center of distribution in Asia, but there are a few American representatives with a combined range extending from Florida and southwestern United States through Mexico and Central America to Peru. Some of the species have edible drupaceous fruits and the leaves of *S. theezans* (L.) Brongn. are used in China as a substitute for tea.

The only American species represented in the Yale collections is of *S. Wrightii* S. Wats., collected in the mountains of Arizona by S. B. Detwiler (Yale 26687; S. B. D. 32). It is a shrub with spreading branches that take root and hold the soil on steep slopes. Heartwood rich purplish brown, more or less streaked or variegated; sharply demarcated from the nearly white sapwood. Luster rather high. Odorless and tasteless. Very hard, heavy, and strong; texture fine and uniform; takes a high polish. Of no commercial possibilities.

Growth rings present. Pores thick-walled, very small to minute, rather numerous but not crowded; mostly in small multiples, well distributed. Vessels with spiral striations. Rays 1 to 3, rarely 4, cells wide and up to 40 cells high; heterogeneous; crystals common; pits to vessels exceedingly small. Wood parenchyma sparingly paratracheal and finely terminal; crystalliferous strands present. Wood fibers with thick gelatinous walls.

Sarcomphalus, with about eight species of spinescent or unarmed shrubs and trees up to 45 feet tall, is limited to the West Indies. The leathery leaves are palmately or pinnately veined; the little flowers are borne in terminal panicles; the fruit is a small, nearly dry drupe.

The species attaining the largest size is *S. laurinus* Gris. of Jamaica. According to Fawcett and Rendle (*Flora of Jamaica* 5: 67), it is sometimes 45 feet high, with a trunk upward of 30 inches in diameter, and its dark-colored, hard, fine-textured wood, called Bastard Lignum-vitae, "is looked upon as one of the best timber woods in the island." There are no specimens available for this study. The following description is based on specimens of *S. crenatus* Urb., *S. domingensis* Krug & Urb., and *S. reticulatus* (Vahl) Urb. from Haiti and Dominican Republic. On a basis of wood anatomy, *Sarcomphalus* should include a group of species now included in *Zizyphus*.

Heartwood orange, sometimes with blackish brown streaks; distinct, but not always sharply demarcated from the yellowish sapwood. Odorless and tasteless. Hard, heavy, tough, and strong; texture fine to medium, uniform; grain fairly straight; not difficult to work, taking a glossy finish; durability probably high. Good timber, but without commercial possibilities because of the scarcity of large trees.

Growth rings present. Pores rather thick-walled, few, medium-sized to minute, the largest near limit of vision; occurring singly or more often in radial multiples of 2 to 6 pores each, uniformly distributed. Rays 1 to 2, sometimes 3, cells wide and up to 40, commonly less than 25, cells high; heterogeneous in part; crystals common; pits to vessels medium-sized, rounded. Wood parenchyma abundant, sparingly paratracheal and finely reticulate, fairly distinct with lens; sometimes narrowly terminal; crystalliferous strands present. Wood fibers with medium to thick walls.

COMMON NAMES: Bastard lignum-vitae (Jam.); azofaifa de costa, a. de playa, bruja (Cuba); cacao rojo, espejuelo (P. R.); saona, sopaipo (Dom. R.); coque-molle (Haiti).

Zizyphus, with about 60 species of armed or unarmed, mostly deciduous, erect or vine-like shrubs and small to medium-sized trees, occurs in temperate and tropical regions of both hemispheres. The stipular prickles, when present, are mostly short, straight or recurved. The leaves are alternate to opposite, usually leathery, serrate or entire, and with 3 or 5 prominent nerves extending from the base; the small greenish flowers are borne in axillary clusters or cymes; the fruit is drupaceous, dry or fleshy and comestible. The best known species is the Jujube, *Z. jujuba* Lam., a small spiny tree native of the Old World but widely cultivated in the tropics generally for its mealy-fleshed fruit from which is obtained the jujube paste used in confectionery. *Zizyphus* is not an important source of timber as the larger trees are scarce, but the woods are of good quality and are used locally to a minor extent.

From the standpoint of wood structure the genus lacks homogeneity. The American woods are readily separable into at least two groups and both are distinct from the Old World species so far as studied. One group is characterized by finely reticulate and narrowly terminal parenchyma as in *Sarcomphalus*. Here belong *Z. angolito* Standl., a beautiful tree 40 to 50 feet tall and 20 to 30 inches in diameter in northern Colombia (see *Tropical Woods* 32: 20); *Z. cyclocardia* Blake, a shrub or little tree of northern Venezuela; *Z. havanensis* H. B. K., a Cuban shrub; *Z. guatemalensis* Hemsl., a small tree of the interior of Guatemala; and *Z. sonorensis* S. Wats., a Mexican shrub or a tree upward of 40 feet high, with

small red fruits used locally as a substitute for soap in washing clothes. Only one of the specimens contains heartwood, which is dark brown.

In the second group the parenchyma is distinctly aliform to confluent into tangential to broken or regular concentric bands 2 to 5 cells wide and 2 to 5 pore-widths apart; sometimes the pores are imbedded, but more often they are free on one side. Included here are the Argentine Mistol, *Z. mistol* Gris., a tree upward of 50 feet in height and 24 inches in diameter, with bright red to reddish brown wood; *Z. rhodoxylon* Urb., a small tree of Haiti and Dominican Republic with dull reddish brown wood; the Jamaican Cogwood or Greenheart, *Z. chloroxylon* (L.) Oliv. (=*Ceanothus chloroxylon* [L.] Nees), a tree 30 to 60 feet high, usually with a low-branched trunk, the inner bark bright red. The last species is now scarce, but formerly its very dense and strong, greenish yellow or olive-colored wood was considered the best in Jamaica for use in the coffee and sugar factories for solid framework, cogs, and rollers. In this, as in most of the other species, the heartwood is durable, but slow in forming.

Heartwood typically red or reddish brown; sometimes pale to rather dark olive; distinct, but usually not sharply demarcated from the thick yellowish sapwood. Luster low to medium. Odor and taste not distinctive. Density high; sp. gr. (air-dry) 0.90 to 1.12; weight 56 to 70 lbs. per cu. ft.; texture fine and uniform; grain fairly straight; not very difficult to work, finishing very smoothly. Of no possibilities for the export trade.

Growth rings present. Pores thick-walled, rather few, small to minute, not distinct without lens; solitary and in multiples of 2 to 4, evenly distributed. Rays 1 to 3, occasionally 4, cells wide and of various heights up to 40, rarely to 60, cells; distinctly heterogeneous, many of the cells square; crystals common; pits to vessels small to medium-sized, rounded. Wood parenchyma finely reticulate and narrowly terminal or aliform, confluent, or banded, as described above. Wood fibers with thick to very thick and gelatinous walls.

COMMON NAMES: Cogwood, greenheart, Jamaica laurel (Jam.); cocuya (Cuba); hojancha prieta, yagua (Dom. R.); casser hache (Haiti); jujubier du pays (Mart.); amapole, a. dulce, confite, nanche de la costa, uayum, uayumke (Mex.); mocoso (Guat.); angolito, mondongüito (Col.); cacagüillo,

cana, chicha, chichiboa, jacyuari, mayo, naranjillo, nigua, nigüito (Venez.); joazeiro, j. grande, juá (Braz.); mistol, m. cuaresmillo, sacha-mistol (Arg.).

THE SCIENTIFIC NAMES OF GREENHEART AND BALATA

By N. Y. Sandwith
Royal Botanic Gardens, Kew

Greenheart. In reply to the query by "S. J. R." in *Tropical Woods* 56: 5, Dec. 1, 1938, I suggest that the specific epithet of the botanical name of the Greenheart be written *Rodiaei*, as adopted by Kostermans in Pulle's *Flora of Suriname* 2: 258. My reason is that from the original description and the type specimen it seems impossible to decide whether *Rodiaei* or *Rodioei* was intended by the author of the name, the letters being so closely joined together, but *Rodiaeus* is obviously the more correct formation for a Latin substitute for Rodie.

Balata. It has recently been clearly demonstrated by A. Chevalier (*Rev. Bot. Appliquée* 12. 1932) and by Eyma (*Rec. Trav. Bot. Néerl.* 33. 1936), that the correct name for the tree known wild in Guiana as Balata and passing under the name *Mimusops Balata*, is *Manilkara bidentata* (A. DC.) Chev. The name *Mimusops Balata*, based on *Achras Balata* Aublet, belongs to another species, introduced into America from Mauritius.

Reorganization of Yale Forestry School Faculty

Several promotions and new appointments in the Faculty of the Yale School of Forestry will become effective July 1, 1939. The following concern members of the I.A.W.A.

Mr. Samuel J. Record, Professor of Forest Products, will become Pinchot Professor of Forestry and Dean of the School.

Mr. George A. Garratt, Associate Professor of Forest Products, will become Professor of Lumbering.

Mr. Robert W. Hess has been appointed Assistant Professor of Forest Products.

STUDIES OF SOUTH AMERICAN PLANTS. VII. NOTES ON QUIINACEAE

By Albert C. Smith
Associate Curator, New York Botanical Garden

The six new species and three new combinations proposed in this paper appear necessary after preliminary study of the family at the New York Botanical Garden, in which herbarium the specimens cited are deposited. Duplicates of the mentioned collections are widely distributed in other herbaria.

Quiina Aubl.

The polygamo-dioecious character of most, and probably all, of the species of *Quiina* has been pointed out by Ducke.[1] It is apparent, therefore, that the primary divisions in the keys of Tulasne (Ann. Sci. Nat. Paris III. **11**: 157–169. 1849) and Engler (Mart. Fl. Bras. **12** (1): 477. 1888) are not dependable. Recent collections have disclosed several undescribed species of *Quiina*.

Quiina negrensis A. C. Smith, sp. nov.—Arbor polygamo-dioica ad 18 m. alta, trunco circiter 15 cm. diametro; ramulis gracilibus teretibus cinereis, juventute nigrescentibus paullo complanatis minute puberulis; stipulis coriaceis subulatis (2–4 mm. longis) vel interdum foliaceis et anguste lanceolatis (ad 11 mm. longis et 2.5 mm. latis); foliis oppositis, petiolis nigrescentibus juventute puberulis supra leviter canaliculatis 3–5 mm. longis, laminis tenuiter coriaceis glabris siccitate fusco-olivaceis anguste elliptico-oblongis, 6–10 cm. longis, 2–4 cm. latis, basi acutis et petiolo leviter decurrentibus, apice breviter acuminatis (acumine circiter 5 mm. longo obtuso), costa supra prominente subtus leviter elevata et obscure striata, nervis lateralibus utroque 6–10 arcuato-adscendentibus supra prominulis subtus leviter insculptis vel obscure prominulis, venulis immersis; inflorescentiis hermaphroditis axillaribus ad 5 mm. longis contractis

[1] Arch. Jard. Bot. Rio **5**: 172. 1930.

paucifloris, ramulis gracilibus arcte cinereo-puberulis, pedicellis circiter 1 mm. longis; sepalis 4 membranaceo-scariosis valde concavis suborbicularibus, 1.5–2 mm. diametro, apice rotundatis, basi angustatis, exterioribus obscure ciliatis et interdum extra minute puberulis, interioribus glabris; petalis 5 luteo-viridibus glabris tenuiter carnosis vel submembranaceis, obovatis vel suborbicularibus, sepalis aequalibus vel quam eis paullo minoribus; staminibus circiter 15 uniseriatis, filamentis 0.8–1 mm. longis, antheris circiter 0.25 mm. longis et 0.4 mm. latis; ovario subgloboso sub anthesi ad 1 mm. diametro; stylis 2 carnosis 1–1.2 mm. longis truncatis; inflorescentiis masculis 1–2 cm. longis, rhachide puberula, floribus in fasciculis 3–6-floris congestis, bracteis minutis; pedicellis gracilibus 3–4 mm. longis superne incrassatis; sepalis petalis et staminibus fasciculatis 25–30 eis supra descriptis similibus; fructibus ellipsoideis (ut videtur maturis) ad 5 mm. longis et 4 mm. diametro.

Type, *Krukoff 8008*, collected in August or September, 1936, in high forest on terra firma along the road to Aleixo, Municipality Manaos, basin of Rio Negro, State of Amazonas, Brazil. Another collection from precisely the same locality is *Ducke 322*. The type bears perfect flowers on much contracted inflorescences, while *Ducke 322* bears staminate flowers on longer inflorescences. The species is closely related only to *Q. tinifolia* Pl. & Tr., from which it is readily distinguished by its acute rather than rounded or subcordate leaf bases, its longer and more slender petioles, and its more contracted inflorescences. The several flowers of *Q. negrensis* which were dissected have five petals, while those of *Q. tinifolia* seem consistently to have four.

Quiina gracilis A. C. Smith, sp. nov.—Frutex vel arbor parva (?) ubique praeter inflorescentiam glabra; ramulis teretibus cinereis striatis; stipulis coriaceis subulatis ad 4 mm. longis; foliis oppositis, petiolis rugosis incrassatis 3–5 mm. longis et 2–3 mm. diametro, laminis tenuiter coriaceis siccitate fuscis lanceolato-oblongis, 9–18 cm. longis, 2.5–4 cm. latis, basi rotundatis vel late obtusis, apice obtusis vel obtuse breviter cuspidatis, margine anguste revolutis et

integris, costa utrinque prominente et saepe striata, nervis lateralibus utroque 15–18 arcuato-adscendentibus supra plerumque leviter insculptis subtus valde prominulis, venulis subtus saepe striiformibus; inflorescentiis masculis solis visis gracilibus axillaribus ad 5.5 cm. longis, pedunculo brevi cum rhachide parce fusco-puberulo, floribus plerumque 2 vel 3 fasciculatis, bracteis ovatis obtusis circiter 1 mm. longis margine conspicue ciliatis; pedicellis 2–3 mm. longis basin versus articulatis; sepalis 3 valde concavis obovatis vel suborbicularibus, 1.3–1.8 mm. diametro, apice rotundatis, extra obscure puberulis vel glabris; petalis 3 membranaceis sepala aequantibus vel quam eis paullo minoribus; staminibus circiter 25 fasciculatis, filamentis gracilibus 0.3–0.7 mm. longis, antheris oblongis circiter 0.2 mm. diametro.

Type, *Holt & Gehriger 370*, collected Feb. 4 or 5, 1930, near Cucuhy, Rio Negro, State of Amazonas, Brazil, alt. about 120 m. *Q. gracilis* is characterized by subulate stipules, long and proportionately narrow coriaceous leaf blades which are rounded or very obtuse at the base, and slender elongate staminate inflorescences. Its nearest relative appears to be *Q. tinifolia* Pl. & Tr., which has the leaf blades oblong-ovate, much shorter, and with only 10–12 pairs of lateral nerves. The perianth parts of the new species appear to be consistently 6 rather than 8.

Quiina amazonica A. C. Smith, sp. nov.—Frutex vel arbor polygamo-dioica ad 8 m. alta ubique praeter ramulos et petiolos novellos interdum cinereo-puberulos glabra; ramulis gracilibus teretibus fusco-cinereis; stipulis subulatis setaceis 3–5 mm. longis; foliis oppositis, petiolis supra leviter canaliculatis 2–5 mm. longis, laminis chartaceis siccitate olivaceis vel fusco-olivaceis ellipticis, 6–14 cm. longis, 2.5–5.5 cm. latis, basi acutis vel obtusis vel interdum rotundatis, apice abrupte caudato-acuminatis (acumine gracili 10–20 mm. longo, 1–3 mm. lato, apice ipso obtuso vel subacuto), margine integris vel undulatis vel obscure crenatis, costa supra acute elevata subtus prominente, nervis lateralibus utroque 9–12 arcuato-adscendentibus supra valde prominulis subtus acute elevatis, venulis subtus conspicue striiformibus; inflorescentiis her-

maphroditis axillaribus solitariis (1–) 2.5–5 cm. longis, rhachide gracili, floribus plerumque solitariis interdum 2 vel 3 fasciculatis, bracteis ovatis acutis ad 1 mm. longis; pedicellis gracilibus 4–5 mm. longis basin versus articulatis et paullo incrassatis; sepalis 3 vel 4 concavis deltoideo-ovatis vel suborbicularibus, 0.9–1.1 mm. diametro, apice obtusis vel rotundatis, extra minute puberulis vel glabris; petalis 3–6 membranaceis luteis obovatis vel suborbicularibus integris, 1.5–1.7 mm. longis et latis; staminibus circiter 9 uniseriatis, filamentis membranaceis 0.6–0.9 mm. longis, antheris oblongis circiter 0.4 mm. longis et latis; ovario ellipsoideo sub anthesi circiter 1 mm. longo; stylis 2 carnosis quam ovario paullo longioribus; inflorescentiis et floribus masculis eis supra descriptis similibus sed staminibus fasciculatis 15–17 et ovario nullo; fructibus rubris obscure striatis ellipsoideis vel obovoideis, 11–21 mm. longis, 7–12 mm. latis, apice rotundatis vel obtusis et minute mucronulatis; semine 1 oblongo-ellipsoideo minute villosulo, 4–10 mm. longo, 3–5 mm. lato.

Type, *Krukoff 6445*, collected Oct. 4, 1934, on low terra firma near Tres Casas, Municipality Humayta, basin of Rio Madeira, State of Amazonas, Brazil. Other collections by Krukoff in Amazonas are: from the type locality, *6235*, *6403*; basin of Rio Jurua, near mouth of Rio Embira (tributary of Rio Tarauaca), *4649*, *5073*; basin of Rio Solimoes, Municipality São Paulo de Olivença, near Palmares, *8502*. Some of these specimens were taken from varzea land, others from restinga alta or terra firma. Hermaphrodite flowers are described from the type, staminate flowers from *6403*, and fruits from the type and also from *4649* and *8502*. There seems little doubt of the specimens being conspecific, although those from the Madeira region have slightly the smallest leaves.

Q. amazonica is characterized by comparatively thin leaf blades with obvious secondary nerves, by the slender caudate leaf tips, and by the long straight delicate inflorescences. These characters, and most readily the leaf apices, serve to distinguish it immediately from *Q. rhytidopus* Tul., probably its closest ally. From *Q. Poeppigiana* Tul., a species of similar aspect, *Q. amazonica* is distinguished by its small essentially

setaceous stipules, its usually smaller leaves, its few- (often 1-) flowered fascicles, and its much smaller fruits. *Q. nitens* Macbride, related to *Q. Poeppigiana*, has thick leaves and a short broad obtuse leaf acumen, as contrasted with the new species. From *Q. micrantha* Tul., *Q. amazonica* differs by its larger and proportionately broader leaves with prominulous secondary nerves, and by its longer more slender racemes and pedicels. The other described species of *Quiina* are obviously not closely related to *Q. amazonica*, which, in spite of its extensive range, appears to have escaped description.

Quiina pubescens A. C. Smith, sp. nov.—Arbor ad 16 m. alta, trunco ad 12 cm. diametro; ramulis teretibus gracilibus fusco-cinereis juventute dense et arcte pubescentibus (pilis patulis 0.2–0.3 mm. longis) demum glabris; stipulis foliaceis subcoriaceis sessilibus ovato-lanceolatis, 12–25 mm. longis, 3–7 mm. latis, apice acutis, utrinque parce pilosis; foliis oppositis, petiolis rugosis supra leviter canaliculatis ut ramulis novellis pubescentibus 3–6 mm. longis, laminis coriaceis siccitate supra fuscis subtus fusco-olivaceis anguste ovato-ellipticis, 7–13 cm. longis, 2.5–4 cm. latis, basi acutis et petiolo decurrentibus, apice acutis vel breviter acuminatis (acumine ad 5 mm. longo subacuto), margine anguste revolutis, supra glabris vel costa minute puberulis, subtus constanter et molliter pubescentibus (pilis 0.1–0.3 mm. longis e costa et nervis secundariis conspicue sub lente patulis), costa utrinque prominente, nervis lateralibus utroque 7–10 adscendentibus curvatis supra impressis vel obscure prominulis subtus elevatis, venulis immersis; inflorescentiis fructiferis solitariis compactis fructibus exceptis ad 1 cm. longis, rhachide ut ramulis novellis pilosa; sepalis 4 persistentibus coriaceis oblongo-ovatis obtusis 1–2 mm. longis glabris; fructibus oblongo-ellipsoideis conspicue striatis, ad 25 mm. longis et 15 mm. latis (vel ultra?), basi et apice rotundatis.

Type, *Krukoff 5521*, collected Aug. 15, 1933, on terra firma near mouth of Rio Macauhan (tributary of Rio Yaco), basin of Rio Purus, Territory Acre, Brazil. It is a species characterized by large foliaceous stipules and leaf blades which

are persistently pilose beneath. In leaf shape and texture it may be compared with *Q. florida* Tul., *Q. Poeppigiana* Tul., and *Q. nitens* Macbride, all of which have strictly glabrous leaves.

Quiina albiflora A. C. Smith, sp. nov.—Arbor gracilis 20 m. alta; ramulis teretibus striatis fuscis vel purpurascentibus juventute minute cinereo-puberulis mox glabris; stipulis coriaceis subulatis 8–11 mm. longis et circiter 1 mm. latis; foliis oppositis, petiolis supra leviter canaliculatis 10–20 mm. longis basi valde incrassatis et rugosis, ut ramulis novellis minute puberulis, laminis coriaceis glabris siccitate fuscis oblongo-ellipticis, 14–30 cm. longis, 5–11 cm. latis, basi actuis vel obtusis, apice obtusis, margine leviter undulatis, costa utrinque prominentissima et striata, nervis secundariis utroque 25–30 patulis rectis prope margines adscendentibus supra subplanis subtus prominentibus, nervis tertiariis obscuris, venulis subtus conspicue striiformibus; inflorescentiis masculis solis visis axillaribus compactis 1–2 cm. longis basin versus pluriramosis, pedunculo brevi et ramulis gracilibus minute cinereo-puberulis, floribus albis plerumque 2 vel 3 fasciculatis, bracteis deltoideo-ovatis acutis 1–2 mm. longis puberulis; pedicellis gracilibus glabris 2–3.5 mm. longis; sepalis 4 concavis ovato-orbicularibus, 1.7–2 mm. diametro, apice subacutis vel rotundatis, longitudine obscure nervatis, margine minute ciliatis, extra minute puberulis vel glabris; petalis 5 vel 6 membranaceis sepalis similibus; staminibus 25–30 fasciculatis, filamentis 0.4–0.7 mm. longis, antheris ovoideis circiter 0.2 mm. diametro.

Type, *A. C. Smith 3414*, collected Apr. 1, 1938, in dense forest on northwestern slopes of Kanuku Mountains, in drainage of Moku-moku Creek (Takutu tributary), British Guiana, alt. 200–300 m. *Q. albiflora* is closely related to *Q. Cruegeriana* Gris. of Trinidad, from which it differs by its somewhat smaller leaves with fewer secondaries and with comparatively obscure tertiary nerves, those of the Trinidad species being quite distinct from the striiform leaf fibers characteristic of the genus. *Q. Cruegeriana* has the leaf blades long-tapering at base and with the costa beneath obviously

brown-pilose, the sepals 5 or 6 and connate at base rather than free, and the stamens 50–60 rather than about 30.

Lacunaria Ducke

This well-marked genus of Quiinaceae is distinguished not only by the several characters mentioned by Ducke,[1] but also by having the leaves consistently verticillate instead of usually opposite as in *Quiina*, the sepals often unequal (the two outer ones usually much smaller than the inner), and the styles several rather than two. A key to the species has recently been published by Ducke.[2] It seems that several species originally published as *Quiina* in reality represent this genus.

Lacunaria crenata (Tul.) A. C. Smith, comb. nov. *Quiina crenata* Tul. Ann. Sci. Nat. Paris III. 11: 163. 1849.—This species, from French Guiana and Surinam, appears most closely related to *L. pauciflora* Ducke.

Lacunaria macrostachya (Tul.) A. C. Smith, comb. nov. *Quiina macrostachya* Tul. Ann. Sci. Nat. Paris III. 11: 162. 1849.—Tulasne's original mention of this species as having been collected in Peru was corrected by Engler (Mart. Fl. Bras. 12 (1): 483. *pl. 110. f. 1.* 1888), who indicates that Poeppig's specimens were from the Solimoes region in Brazil. The species is close to, or possibly conspecific with, *L. acreana* Ducke.

Lacunaria silvatica (Pulle) A. C. Smith, comb. nov. *Quiina silvatica* Pulle, Rec. Trav. Bot. Neerl. 6: 277. 1909.—This species of Surinam is closely related to *L. Jenmani* (Oliver) Ducke.

Lacunaria coriacea A. C. Smith, sp. nov.—Arbor polygamo-dioica (?) ad 22 m. alta ubique praeter inflorescentiae partes glabra, trunco ad 15 cm. diametro; ramulis subteretibus vel leviter angulatis cinereis ternatim vel quaternatim ramosis;

[1] Arch. Jard. Bot. Rio 4: 139. 1925; 5: 167. 1930.
[2] Arch. Inst. Biol. Veg. Rio 2: 170. 1935.

stipulis coriaceis rigidis subulatis ad 8 mm. longis; foliis plerumque verticillatis quaternis vel ternis raro oppositis, petiolis rugosis supra leviter canaliculatis 6–10 mm. longis, laminis coriaceis siccitate fuscis oblongis vel elliptico-oblongis, 7–10 cm. longis, 2.5–4 cm. latis, basi attenuatis et petiolo decurrentibus, apice breviter acuminatis (acumine 5–8 mm. longo obtuso), margine anguste revolutis et leviter undulatis, costa supra elevata subtus prominente, nervis lateralibus utroque 9–11 adscendentibus supra leviter impressis vel obscure prominulis subtus prominentibus, venulis subtus conspicue striiformibus; inflorescentiis masculis solis visis ut videtur e ramulis infra folia orientibus compactis pauciramosis, ad 15 mm. longis, rhachide bracteis et pedicellis dense et arcte fusco-puberulis, bracteis ovatis ad 1 mm. longis; pedicellis gracilibus 4–5 mm. longis basin versus articulatis; sepalis 4 coriaceis valde concavis obovatis, apice rotundatis, margine breviter ciliatis, 2 exterioribus 3–4 mm. longis et circiter 2.5 mm. latis extra puberulis, interioribus 5–6 mm. longis et 2.5–4 mm. latis; petalis carnosis obovatis, 5–6 mm. longis, 2–3 mm. latis; staminibus 25–30 fasciculatis, filamentis 3–4.5 mm. longis, antheris transversaliter oblongis circiter 0.3 mm. longis et 0.5 mm. latis, apice retusis.

Type, *Krukoff 8771*, collected in Oct.–Dec., 1936, in high forest on terra firma, basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, State of Amazonas, Brazil. Although neither fruits nor hermaphrodite flowers have been seen, this plant appears to belong in Ducke's recently described genus on the basis of its verticillate leaves, comparatively large flowers, and unequal sepals. *L. coriacea* is related to *L. acreana* Ducke and *L. minor* Ducke, differing primarily from the former by its shorter petioles and smaller leaves with a less tapering base. The staminate flowers of *L. acreana* are not known, but since these flowers generally superficially resemble the hermaphrodite, it may be supposed that they have much longer pedicels and slightly larger sepals than those of *L. coriacea*. From *L. minor* the new species differs by its subulate rather than foliaceous stipules and its larger flowers.

ASSISTANCE WANTED IN CLASSIFYING A SMALL GROUP OF LAURACEOUS WOODS

By Samuel J. Record

I should appreciate information or material that would enable me to clear up some of the confusion concerning the identity of the Kaneelhart of Surinam and the Waibaima of British Guiana, and the relationship with the Casca Preciosa of the Amazon region. There are several specimens of the Guiana woods in the Yale collections, but they lack herbarium vouchers. They are alike in having a rich violet-brown heartwood that is very dense and characterized by sclerotic tyloses and parenchyma cells. The heartwood of Casca Preciosa is similar except that the color is dark olive-brown without any reddish tinge.

In the recent systematic work on the American Lauraceae by A. J. G. H. Kostermans (Pulle's *Flora of Surinam* 2: 244–337, *Revision of the Lauraceae*, etc.), the vernacular names Kaneelhart and Waibaima (various spellings), are listed under both *Licaria cayennensis* (Meissn.) Kosterm. (=*Acrodiclidium cayennensis* [Meissn.] Mez) and *L. canella* (Meissn.) Kosterm. (=*A. canella* [Meissn.] Mez).

According to the same authority the Casca Preciosa or Pau Preciosa of Brazil is *Aniba canelilla* (H. B. K.) Mez, but the British Guiana names given for that species include Arabaima, Wabaima, and Weibeima. An authentic specimen (Yale 21344; Ducke 85) of Casca Preciosa was collected and determined by Adolpho Ducke as *Aniba canelilla*, but a sample (Yale 23973; F. M. 613967) from the site of the Ford plantation on the Rio Tapajoz and bearing the name Preciosa was provisionally determined at Field Museum as *Acrodiclidium canella* Mez; the two woods appear to be of the same species.

Macbride (*Flora of Peru* 2: 868) in reference to the Peruvian species of *Licaria* states that "Ducke (*Archiv. Jard. Bot. Rio de Janeiro* 4: 187. 1925) has recorded *L. canella* Kosterm. as one of the more common species on the upper Amazonian tributaries, where it is known as Casca Preciosa." In the cited reference, however, Ducke says that Casca Preciosa is *Aniba*

canelilla. Macbride (*loc. cit.*, p. 856) says that *Licaria* and *Endlicheria* "could conveniently be treated as sections of *Aniba*," but even so, the woods under consideration seem too much alike to belong to different sections of the same genus.

The problem is still further complicated for the student of woods. *L. canella* is said to be known in French Guiana as Bois Canelle, but Bertin (*Les bois de la Guyane française*, p. 258) describes the wood of that name as yellowish white and very light in weight (sp. gr. 0.50). According to R. C. Marshall (*Trees of Trinidad and Tobago*, p. 82), the wood of *Aniba megocarpa* Hemsl. (listed by Kostermans as a synonym of *L. canella*) is light in weight and whitish when fresh, becoming brown on exposure.

I realize that the Lauraceae are notoriously difficult to classify, but the problem presented seems restricted enough to permit a definite solution from materials already available in the larger herbaria.

CURRENT LITERATURE

Six new trees and shrubs from tropical North America. By C. L. Lundell. *Phytologia* (New York) 1: 9: 305–309.

The plants described as new are *Maytenus guatemalensis* (Guat.-Br. Hond.), *M. Schippii* (Br. Hond.), *M. texana* (Texas), *Eugenia toledinensis* (Br. Hond.), *E. vacana* (Br. Hond.), and *Osmanthus mexicana* (Chiapas, Mex.). The largest tree is *Eugenia toledinensis*, which is about 50 feet high and 12 inches in diameter; the local name, Walk-naked, which is applied to several other British Honduran Eugenias, alludes to the smooth brownish or reddish trunk.

Eine interessante neue *Chamaedorea*-Art aus Mexico. By M. Burret. *Notizbl. Bot. Gart. Berlin-Dahlem* 14: 123: 268–269; Dec. 30, 1938.

A clambering species of *Chamaedorea* from Yucatan is described from a fruiting specimen as *Chamaedorea Seifrizii*. In the absence of material from a plant with staminate flowers it is uncertain whether it is of the section *Stephanostachys* as presumed.

Los pinos de Mexico. By Cenobio E. Blanco. *Bol. Dept. Forestal y de Caza y Pesca* (Mexico) 3: 11: 237–255; 9 plates; 1938.

Contains descriptions of the principal Mexican conifers, with photographic illustrations showing juvenile and old forms of the tree, and the appearance of the bark, foliage, and cones, with a view to simplifying the identification of the species by foresters.

La explotación de los pinos en Mexico. By José García Martínez. *Bol. Dept. Forestal y de Caza y Pesca* 4: 12: 183–229; 1 map; 1938.

A comprehensive report on the composition, distribution, and present and future utilization of the Pine forests of Mexico. It includes concise descriptions of 26 species, including range, botanical characters, size of tree, appearance of bark, color, density, and principal uses of the timber, and notes on other products. Most of the information is contained in convenient statistical form, there being 15 tables. There is also a map showing the principal Pine regions.

It is estimated that the total area of Pine forests is nearly five million acres; number of trees, 285,770,000; total volume, 430 million cubic meters; sustained annual yield, 14,330,000 cubic meters, or eight times the consumption in 1935. Typical stands in Guerrero contain 148 trees per acre, while those in the northern part of Baja California contain only 68, though their average volume (2.6 cu. m.) is the greatest of all.

Necesitamos buen carbón vegetal. By S. Calderón. *Revista de Agricultura Tropical* (San Salvador) 11: 21: 29–32; 1937.

Discusses the local importance of charcoal and the need for propagating native trees that will produce the highest quality. Special mention is made of species of *Quercus*, *Perymenium*, and *Lippia*.

Plantas salvadoreñas que pueden considerarse como fuente posible de rotenona. By S. Calderón. *Revista de Agricultura Tropical* 11: 21: 35–37; 1937.

An annotated list of trees and shrubs growing in Salvador

which are possible sources of rotenone or other active principles having similar properties.

El cultivo del achiote o bija. By Rodolfo Bentz. *Revista de Agricultura Tropical* 11: 21: 90–91; 1937.

An account of the cultivation of Achiote or Bija, *Bixa orellana* L., whose seeds yield a well-known yellow or orange-colored dye used in coloring dairy products and in cookery. It is said to be rich in vitamin B.

Contributions to the flora of tropical America. XXXVIII. Plantae Hintonianae. IX. By A. A. Bullock. *Kew Bulletin* 1: 1–2; 1939.

The following new binomials have been found necessary while working out Mr. Hinton's recent collections of Mimosaceae: *Acacia delicata* (Britt. & Rose) Bullock (=*Acaciella delicata* Britt. & Rose), *A. igualensis* (Britt. & Rose) Bullock (=*Acaciella igualensis* Britt. & Rose), *A. Langlassei* (Britt. & Rose) Bullock (=*Senegalia Langlassei* Britt. & Rose), *A. procumbens* Bullock (=*Acaciella prostrata* Britt. & Rose, not *Acacia prostrata* Lodd.), *Mimosa moreliensis* (Britt.) Bullock (=*Mimosopsis moreliensis* Britt.), and *Desmanthus interior* (Britt. & Rose) Bullock (=*Acuan interior* Britt. & Rose).

Contributions to the flora of tropical America. XXXIX. Results of a recent collecting expedition to British Guiana. By N. Y. Sandwith. *Kew Bulletin* 1: 3–26; 1939.

Among the proposed new species are the following trees: *Swartzia Davisii*, *Hirtella angustissima*, *Faramea egregria*, and *Diospyros ierensis*. There are also notes on various other species, including *Catostemma Alstoni* Sandw., "a tree about 100 ft. high and 1 to 2 ft. in diameter, the trunk ringed as in the allied species"; *C. fragrans* Benth. "occurs in French Guiana, but, remarkably, has not yet been noted in Surinam; a synonym is *Guenetia macrosperma* Sagot."; *Sloanea echinocarpa* Uitt., Arawak name Aruadan, a "tree 100 ft. high, 24 in. diam., with tall spreading buttresses," hitherto regarded as endemic to Surinam; *Ochthocosmus Barrae* H. Hallier, 30 to 40 ft. high; *Bowdichia racemosa* Hoehne, a small tree ranging through the lower Amazon to Matto Grosso; *Pithecellobium Gonggrijpii* Kleinh., Arawak name Manariballi, a small tree, of which *P. Pullei* Kleinh. is possibly only a form; specimens of *Orthaea pendula* Tutin, collected at the type locality, "show that the characters distinguishing the type from *O. apophysota* (Griseb.) A. C. Smith are not maintained"; *Aspidosperma Vargasii* DC., a Venezuelan species, was found at Kumuparu, Demerara River, as "a tree 100 ft. high with little latex and no buttresses."

Comentarios taxonomicos sobre *Robinia violacea* Jacq. y *Geoffroea spinosa* Jacq. By Armando Dugand. *Contribuciones a la Historia Natural Colombiana* (Barranquilla) 3: 1–7; 1 plate; March 10, 1939.

An account of two poorly understood species of papilionaceous trees, namely, *Lonchocarpus punctatus* H. B. K. (=*Robinia violacea* Jacq.), and *Geoffroea spinosa* Jacq. (=*Robinia spinosa* Willd.=*G. Bredemeyeri* H. B. K.=*G. striata* Morong). The common names of the first are Meaparao or Miaparao (Col.) and Aco (Venez.); of the second, Silbadero (Col.).

British Guiana. Report of the Forest Department for the year 1937. By B. R. Wood. Georgetown, 1939. Pp. 9; 8 × 13.

A valuation survey of about 80 square miles of forest situated between Kumaparu Creek and the Demerara and Essequibo Rivers disclosed that the area has more Greenheart and a heavier stand of all other species than any other valued by the Department except the Bartica-Kaburi triangle. The volume of Greenheart now classed as merchantable and accessible was estimated to be 13½ million cubic feet.

"The Teak (*Tectona grandis*) planted in 1936 still looks well and is making good growth, but the older plantations are not maintaining their early promise. A small plantation of Teak established in an area which was not affected by the

forest fires of 1926 is more promising than even the best of the earlier plantings were at one year old. Some years must, however, elapse before any conclusion can be drawn as to whether Teak will prove worth growing under such conditions and it is not proposed to add to existing plantations of exotics for the present."

"The efforts made to interest local firms in the use of Hububalli (*Loxopterygium Sagoti*) for furniture making have now met with considerable success, and a number of saw mills are laying this wood down for seasoning. The experiments carried out with Baromalli (*Catostemma commune*) with a view to finding a substitute for the imported barrels used for the export of molasses from Barbados were successful. Two hogsheads made from split staves of this wood were sent to Barbados and were reported on very favorably. Since the inception of this experiment, however, the quality of the imported barrels has improved considerably and the firm concerned has therefore decided to continue the use of the imported article."

"Acting on a suggestion made by the Colonial Forest Resources Development Department, it was decided, after consulting exporters, that Crabwood (*Carapa guianensis*) should in future be known as Empire Andiroba. As a result of poor-quality shipments in the past, Crabwood had earned a very bad name on the United Kingdom market and it was thought that, by changing the name, interest in this wood might be revived. This species is shipped from Brazil under the name of Andiroba, and is already established on the United Kingdom market."

"The year was the beginning of an export trade in Wallaba charcoal to the United Kingdom. This trade is suffering from the initial difficulty that charcoal as prepared locally is acid and rapidly rots the bags, a difficulty which now appears to be in process of being overcome; if successful there is the prospect of a considerable market being obtained."

"An ordinance known as *The export of timber ordinance* was brought into force on 15th July 1937, and under it all timber named in the schedule must be inspected and branded by an authorized inspector and an export certificate obtained before shipment."

Palmae Brasilienses. By M. Burret. *Notizbl. Bot. Gart. Berlin-Dahlem* 14: 123: 231–260; Dec. 30, 1938.

Observations on conspicuous elements of the Brazilian palm flora as seen on a visit to Rio de Janeiro and Minas and a journey along the coast to Pará. Barbosa Rodrigues' Babassú palm of Matto Grosso was observed at Pirapora, Minas, and is redescribed, emerging, it is hoped, definitely from a snarl of synonymy with part delimitations, as *Orbignya oleifera* Burret. New species described are *Geonoma Barbosiana*, *G. Estevania*, *Attalea Camposportoana*, and *Bactris Bradei*.—B. E. Dahlgren.

Palmae Kuhlmannianae Amazonicae. By M. Burret. *Notizbl. Bot. Gart. Berlin-Dahlem* 14: 123: 261–268; Dec. 30, 1938.

From collections made by J. G. Kuhlmann (1922–24) there are described: *Geonoma Kuhlmannii*, *Bactris* (*Amylocarpus*) *Kuhlmannii*, *Bactris* (*Amylocarpus*) *multiramosa*, *Bactris* (*Eubactris*) *bijugata*, *Bactris* (*Eubactris*) *microspadix*, *Bactris* (*Eubactris*) *platyacantha*, *Bactris* (*Eubactris*) *vexans*, and *Desmoncus Kuhlmannii;* the first one is from Nova Friburgo, State of Rio de Janeiro, the others from the Amazon region.

A merindiba. By Octavio Silveira Mello. Pub. by Ministerio de Agricultura, Rio de Janeiro, 1938. Pp. 107; 6¼ × 9; illustrated.

A study by a member of the Brazilian reforestation service of Merindiba, *Lafoensia glyptocarpa* Hoehne (Lythraceae), a splendid tree abundant in the woods at Gavea. An exposition of its value as an indigenous species available for use in reforestation, with many qualities to recommend it for planting, whether for firewood, production of construction timber, for the protection of watersheds, or as an ornamental shade tree for parks and street planting, or even for hedges and topiary work. Cited in its favor are ready germination, rapid growth, volume of wood production, general vigor, deep root system, and a high degree of indifference to environmental conditions. The paper includes a study of the wood anatomy (with photomicrographs) and timber physics, as well as

practical directions for planting and cultivation. It is illustrated by numerous half-tones and text figures.—B. E. DAHLGREN.

O babaçú na economia nacional. By ALPHEU DINIZ GONSALVES. Pub. by Directoria de Estatística da Produção, Rio de Janeiro, 1938.

An account of the distribution of Babassú palms in Brazil and of the extent of their present exploitation, by states and municipios, as contrasted with the potential capacity of production. The state most heavily blessed with Babassú, Maranhão, produced in 1936 about 30,000 metric tons of kernels, while the production of Brazil as a whole amounts to 40,000 tons. The potential production capacity of Maranhão is estimated at 195 million tons of kernels or 150 million tons of Babassú oil. Possible industrial uses and the economics of Babassú are discussed briefly with extensive statistics, two maps, and a full bibliography.—B. E. DAHLGREN.

Tabelas de medidas agrárias. By JULIÃO BARROSO RAMOS. *Boletim do Ministério da Agricultura*, Rio de Janeiro, March 1938, pp. 33–50.

Tables of metric values of ancient linear and square measures still in common use in many parts of Brazil, such as *bracas*, *leguas*, *alqueires*, *tarefas*, *quadras*, often encountered in accounts of the vegetation of Brazil and therefore of some interest to students of subjects pertaining to forests and forestry. The matter is complicated by the different value of these measures in different zones. An *alqueire* is thus 2.42 hectares in São Paulo, Paraná, Santa Catharina, and in the adjoining part of Rio Grande do Sul and Matto Grosso, but 4.48 hectares in Minas, Rio de Janeiro, Espiritu Santo, and Goyaz. *Tarefas* and *quadras* have several different values according to regions.—B. E. DAHLGREN.

Oleo de oiticica. By ANTENOR MACHADO. *Boletim do Ministério da Agricultura*, Rio de Janeiro, March 1938, pp. 67–75.

A report on the physical and chemical properties of the oil

of Oiticica. The oil obtained by expression or extraction from the seeds of *Licania rigida* (Rosaceae), a tree of the Carnaúba zone of northeastern Brazil. This seccative oil, presenting similarities with Tung oil, as well as distinctive differences, has only recently reached its present considerable importance to the paint and varnish industry. The author has investigated its chemical composition and its polymerization.—B. E. DAHLGREN.

Jahresbericht über Nutzhölzer, 1938. By J. F. MÜLLER & SOHN, A.-G., Hamburg, Germany; pp. 19.

An item of particular interest to the reviewer is the increased use in Germany of Brazilian and Chilean timbers not generally known to world markets. The following notes are translated extracts from the original report with the scientific names and relationships inserted:

Andiroba, *Carapa guianensis* Aubl. (Meliaceae), is a firm and very usable Brazilian wood which evidently can be supplied only in small quantities and diameters. Guaruba, *Clarisia racemosa* R. & P. (Moraceae), is meeting with increasing favor; import records already show a remarkable volume, but the quantities under contract anticipate a heavy increase for 1939. Louro Vermelho, *Ocotea rubra* Mez (Lauraceae), seems to be very usable and should offer great prospects for the future; this is the timber known in British, Dutch, and French Guiana, respectively, as Determa, Wane, and Grignon Rouge. Jacarehuba, *Calophyllum brasiliense* Camb. (Guttiferae), reached the market for the first time in 1938 and had a favorable reception; this is practically the same as the Santa Maria of Central America. Jequitibá, *Cariniana legalis* (Mart.) Kuntze (Lecythidaceae), was offered plentifully and sold well; this species is related to the tree that supplies the Brazil nuts of commerce.

Pinho or Paraná Pine lumber, *Araucaria angustifolia* (Bert.) Kuntze (Araucariaceae), has found a very important market in Germany. If thoroughly seasoned before manufacture, it is suitable for the same purposes as European coniferous woods. Demand is chiefly for uniformly light-colored lumber, and exporters are advised to reduce the proportion of multicolored wood in their shipments as much as possible.

Four kinds of Chilean lumber are considered. Alerce, *Fitzroya patagonica* Hook. f. (Cupressaceae), is at present too high-priced and the sizes offered are not well suited to the German requirements. Maniu, *Podocarpus salignus* D. Don (Podocarpaceae), was in considerable demand so that the mills were almost sold out at the close of the year, and increased production is recommended. Rauli, *Nothofagus procera* Oerst. (Fagaceae), is finding considerable use in joinery and turnery. Laurel, *Laurelia aromatica* Juss. (Monimiaceae), proved popular because of its low price, but shippers are advised to season the lumber better so that it will arrive in bright condition.

Estudio del crecimiento y rendimiento del alamo criollo (*Populus nigra* var. *italica* Du Roi) en el Delta del Paraná. By Max Rothkugel. Pub. Dir. de Agricultura, Ganaderia e Industrias, La Plata, 1938. Pp. 44: 7 × 10½; illustrated.

A report on an investigation of Italian Black Poplar plantations established on islands and sand bars in the delta of the Paraná River, Argentina.

Adición a las Elaeocarpaceas Argentinas. By H. R. Descole and C. A. O'Donell. *Lilloa* (Tucumán) 3: 31–33; 1 plate; Dec. 27, 1938.

The occurrence of *Muntingia calabura* L., a West Indian tree 35 feet high, is reported for Argentina, Province of Salta, for the first time. Two other members of the family also grow in Argentina, namely, *Crinodendron tucumanum* Lillo, which attains a height of 100 feet, and *Aristotelia maqui* L'Herit., which is little more than a shrub.

Resultados preliminares de ensayos de resistencia a la compresión, tracción y flexión efectuados con maderas del país. By Eduardo Latzina. *Lilloa* 3: 81–209; Dec. 27, 1938.

Preliminary results of timber tests on about 80 species of Argentine woods representing 61 genera of 32 families.

Arboles indigenas de frutos comestibles del noreste Argentino. By Teodoro Meyer. *Lilloa* 3: 233–242; Dec. 27, 1938.

Contains brief descriptions, with common names and distribution, of 20 native Argentine trees bearing comestible fruits. The species represent 10 families, namely, Palmaceae, Santalaceae, Opiliaceae, Anonaceae, Leguminosae, Guttiferae, Cactaceae, Rhamnaceae, Myrtaceae, and Sapotaceae.

Anotaciones fitogeograficas de la Pampa Central. By Juan V. Monticelli. *Lilloa* 3: 251–382; 26 text figs., 15 plates; Dec. 27, 1938.

Gives the results of a study of the Pampa Central of Argentina with reference to its probable origin and the distribution and composition of the present vegetation. There is an annotated list of 311 species of 65 families.

Notes on unidentified tropical South American Bignoniaceae of Humboldt and Bonpland. By N. Y. Sandwith, *Lilloa* 3: 457–465; Dec. 27, 1938.

"During a visit to the Paris Herbarium in January 1937 the writer discovered and examined most of the types of Humboldt and Bonpland's Bignoniaceae, and the object of these notes is to attempt to throw further light on such tropical South American species as were merely listed by De Candolle or were quite unknown both to himself and Schumann."

Notas adicionales sobre *Buddleja* en la Argentina. By Lyman Bradford Smith. *Lilloa* 3: 467–471; Dec. 27, 1938.

These notes are supplementary to the synopsis of Argentine *Buddleja* published in the first issue of *Lilloa*.

Identification of Hawaiian plants. A key to the families of dicotyledons of the Hawaiian Islands, descriptions of the families, and list of the genera. By Harold St. John and F. Raymond Fosberg. Univ. of Hawaii Occasional Papers No. 36. Pp. 53; 6 × 9.

"An effort has been made to use characters in constructing the key which are not too obscure for use by the beginner. This practice has been followed consistently in all but a few of

the smallest subdivisions where it was impossible, though this has resulted in a somewhat longer key. Several years of experience in teaching beginners to use keys has indicated those characters which cause the most difficulty, so these have been avoided as far as possible. Definitions of the terms used may be found in any botanical glossary."

Official list of trade names of Indian timbers. (Revised 3rd edition.) *Indian Forest Records* (n.s.) 1: 7: 189–210; Nov. 25, 1938. Price 9d.

"The first official list of trade names for Indian timbers was published in March 1929 as Forest Bulletin No. 71. This bulletin was reprinted with a few additions and alterations in 1931. Since then, experience has shown that the list was by no means perfect. It contained several names which were definitely unsuitable and, in addition, several species were included in the list for which trade names were really unnecessary.

"The Board of Forestry, which met at Dehra Dun in October 1934, decided therefore to publish a revised list of official trade names for Indian woods, and the list contained in this bulletin is the list approved by the Board of Forestry at which the head of the Department of Forestry from each province in India was represented. The list carries, therefore, the approval of every province in India, and is published under the authority of the Government of India. It is hoped, therefore, that forest officers and others will do their utmost to further the use of these trade names, with a view to eliminating the confusion which exists from the use of local vernacular names, more especially in export and inter-provincial trade and in publications. This new list of trade names is fundamentally the same as that published in 1934. A few necessary alterations and additions have been made, and its utility has been enhanced by the addition of several other common vernacular names."—*From Foreword by* H. TROTTER.

State forests of the Empire: Ceylon. By W. M. McNEILL. *Empire Forestry Journal* 17: 2: 195–200; 1938.

A short history of Ceylon and the bearing of successive governments (Sinhalese, Portuguese, Dutch, and British) on the laws and administration as affecting the present forestry situation in the country.

Draft of first descriptive check-list for Ceylon. By L. A. J. ABEYESUNDERE and R. A. DE ROSAYRO. Imperial Forestry Institute, Oxford, January 1939. Pp. 115, mimeographed.

This is the fourth of a series of check lists of the forest trees and shrubs of the British Empire, edited by J. Burtt Davy and A. C. Hoyle.

"The need for descriptive tree catalogues for the use of forest officers is fully recognized. Being restricted to woody plants, such lists are smaller and more compact and therefore less expensive than complete local floras which include also the more numerous herbaceous plants. . . . In addition to their immediate value as a means of identifying species, these preliminary lists serve to call attention to lacunae in the published information about the native trees of the region covered and thus fulfil a useful purpose in eliciting information which can later be embodied in a local *Forest Flora*, the final objective.

"This first descriptive catalogue of the forest trees and shrubs of Ceylon has been compiled from published records and herbarium material by the staff of the Imperial Forestry Institute, with the assistance of two forestry students from Ceylon, Mr. Abeyesundere and Mr. De Rosayro, both of whom put in a good deal of valuable work on the project during their period of study at Oxford. Trimen's *Handbook to the flora of Ceylon*, published 35 years ago, has been the basic source of information, and the additions and corrections contained in Alston's *Supplement* issued in 1931 have been incorporated. The list now comprises 832 species of trees and shrubs. A list of exotic conifers introduced into Ceylon has been included as an appendix. There is also a list of vernacular names, with their botanical equivalents."—*From Introductory Note by* J. BURTT DAVY.

Silviculture in Malaya. By E. J. STRUGNELL. *Empire Forestry Journal* 17: 2: 188–194; 2 plates; 1938.

"The sequence of fellings, girdlings, and cleanings used in the regeneration of Malayan evergreen forest is discussed. The influence of the increasing use of sawmills on this sequence and the use of frill girdles poisoned with sodium arsenite for disposing of unwanted trees are also described."—*Author's summary*.

Nyalas. By A. V. Thomas. *Malayan Forester* 8: 1: 27–28; January 1939.

"The genus *Parastemon*, of the family Rosaceae, contains two described species, one of which is a shrub endemic to Borneo, and the other a tree, *Parastemon urophyllum* A. DC., which occurs in the Malay Peninsula, Sumatra, Borneo, and adjacent islands. It has also been reported from Tenasserim and the Andaman Islands. The usual habitat of *Parastemon urophyllum* is in coastal fresh-water swamps, where it is sometimes abundant. It rarely exceeds 6 ft. in girth. Nyalas is the vernacular name used for it in the Klang district of Selangor and variants of this are sometimes found, *e.g.*, Malas in Sumatra and parts of the Malay Peninsula, and Mengilas in Borneo."

"The tests show that Nyalas is a very heavy, hard, and stiff timber, comparatively low in resistance to shock and, in proportion to its weight, not as strong as either Chengal or Teak. It is very difficult to saw because of the presence of silica, but it may be planed to a good surface and it could possibly be used for turnery or wood carving. Its durability has not yet been tested either experimentally or under observed service conditions, but it is said to have a good reputation locally. Because of its density and the presence of silica it may prove reasonably resistant to marine borers. It is reported to have given satisfactory results in a test in the Panama Canal, but in a test in North Borneo it behaved disappointingly.

"Nyalas has been used locally for the keels of large tongkangs (Chinese sailing vessels), for posts in wooden buildings, and for constructional work, such as overhead shaft supports in sawmills, but convenience of supply rather than proved suitability has undoubtedly been a factor in its selection for

these purposes. If Nyalas proves to be exceptionally durable it will be a valuable timber, in baulk sizes, for bridge and harbor work."

A study of the pulping properties of three trees of *Eucalyptus Sieberiana*, using the sulphate process. By J. C. Cavanagh, H. E. Dadswell, A. W. Mackney, and T. M. Reynolds. Pamphlet No. 86, Council for Sci. & Ind. Research, Melbourne, 1938. Pp. 32; 6 × 9½; 1 plate.

"This publication is one of the first to be issued since the Division of Forest Products began to work in co-operation with the paper industry. It deals with a preliminary study of *Eucalyptus Sieberiana*, this species being selected because of its potential importance at the time the work was planned."—*From Foreword by* I. H. Boas.

The mechanical properties of South Australian plantation-grown *Pinus radiata* D.Don. By Ian Langlands. Pamphlet No. 87, Council for Sci. & Ind. Research, Melbourne, 1938. Pp. 53; 6 × 9½; 18 text figs., 2 plates.

"General information on the timber of *Pinus radiata* has been given in a previous pamphlet (No. 81). In the present pamphlet the results of the mechanical tests are given. For convenience in reading, the publication has been divided into two parts. The first part is complete in itself and sets out briefly in non-technical language the principal results of the tests. In the second part the detailed results and the methods of analysis are given. It is realized that the information given in the second part will be of interest to a comparatively limited number of readers, but it is considered desirable to place on record all the information that has been obtained to date on the mechanical properties of the wood."—*From Foreword by* I. H. Boas.

The wood anatomy of some Australian Meliaceae with methods for their identification. By H. E. Dadswell and Dorothie J. Ellis. Bul. 124, Council for Sci. & Ind. Research, Melbourne, 1939, pp. 20; 6 × 9½; 6 plates.

"In this publication the results of the examination of the

wood structure of nine Australian timbers of the Meliaceae have been recorded, together with information on the occurrence of each and the general properties of the timber. Photomicrographs at 75 magnifications showing details of anatomical features, as revealed by the examination of cross and tangential sections, and low-power photographs (10×) of the end sections of the same species have been included. A key to the identification of the Australian species has been prepared; reference has also been made to published information on the woods of this family and a summary of anatomical characteristics included. On the basis of the anatomical features observed, it has been suggested that the Australian species referred to as *Amoora nitidula* be classified in the genus *Aphanamixis;* the positions of *Cedrela toona* var. *australis*, *Melia dubia*, and *Carapa moluccensis* have also been discussed."—*Author's summary.*

KEY FOR THE SEPARATION OF THE AUSTRALIAN MELIACEAE [1]

1 a. Woods distinctly ring-porous..... 2
b. Woods diffuse-porous..... 3

2 a. Wood light pink-brown; odorless. Late-wood pores often minute and clustered; smallest vessels with spiral thickenings..... *Melia dubia.*
b. Wood red-brown; usually with distinct scent. Late-wood pores not minute nor clustered; vessels without spiral thickenings. *Cedrela Toona* var. *australis.*

3 a. Parenchyma paratracheal-confluent into numerous fairly evenly spaced concentric bands. Rays 1 to 3 cells wide..... 4
b. Parenchyma paratracheal, but not confluent, and in apparently terminal bands. Rays up to 7 cells wide..... 8

4 a. Rays predominantly uniseriate, with not over 30 per cent locally biseriate..... 5
b. Rays predominantly biseriate for virtually the full height..... 6

5 a. Fibers with thin septa and indistinct pits..... *Amoora nitidula.*
b. Fibers with thick septa and distinct pits..... *Synoum glandulosum.*

6 a. Wood straw-colored; odorless. Fibers with thin septa. Extraneous material wanting..... *Dysoxylum rufum.*

[1] Somewhat condensed and in different form from the original.

b. Wood red to red-brown; sometimes scented. Fibers with thick septa. Extraneous deposits abundant in all cells..... 7

7 a. Odor distinct. Match-size splinters burn to full white ash. *D. Fraseranum.*
b. Odorless when dry. Match size splinters burn to charcoal.. *D. Muelleri.*

8 a. Rays without crystals. Pores mostly in short to long radial multiples. Fibers not septate. Sp. gr. (air-dry) greater than 0.80... *Owenia venosa.*
b. Large crystals in upright ray cells. Pores mostly solitary or in very short radial multiples. Fiber septations fine. Sp. gr. (air-dry) less than 0.80..... 9

9 a. Pores readily visible to naked eye. Odor mild. Growth rings distinct. *Cedrela Toona* var. *australis.*
b. Pores near limit of vision. Odorless. Growth rings inconspicuous. *Carapa moluccensis.*

South African grown furniture woods. By M. H. SCOTT. *Journ. So. Afr. For. Assn.* (Pretoria) 1: 41–46; October 1938.

"Although our indigenous forests are peopled by an almost unparalleled variety of species, the number of well known furniture woods can be counted on the fingers of one hand. Brief descriptions of the better known, and some of the more obscure species, as well as of two fine introduced exotics, follow.

"Black Stinkwood, *Ocotea bullata*, holds pride of place over all South African grown species, whether indigenous or exotic. Few, if any, woods in the world are more beautiful than a piece of lustrous, well-figured, golden-and-black Stinkwood. The tree, which occurs principally in the forests of the Knysna District and the Transkei, produces average logs of good length and up to two feet in diameter, and owing to an intense demand for the timber, hollow stems and smaller logs are also readily saleable. It is curious that so beautiful a timber should retain so unattractive a name. The alternatives, Laurel and Cape Olive, to which it is entitled, are seldom or never heard. Logs from older trees invariably contain a certain amount of semi-decayed wood near the center, which for a short time after sawing, emits a distinctly foetid smell which extends even to the neighboring sound wood. The

smell disappears with drying. The wood occurs in a variety of well blended colors. The younger, as well as many of the larger, fast grown, trees yield a wood that is almost white. The familiar brown to black markings may develop gradually with age, or the whole tree change to a uniform gray or golden brown or black, or a combination of these colors, to which a wonderful natural sheen lends added beauty. When the annual rings are obliquely exposed in sawing, a handsome figure results. At times the wood bears a remarkable resemblance to selected Black Walnut. The texture is fine and a high finish may be obtained. Weight per cubic foot, at 10 per cent moisture content, ranges from 38 to 62 pounds, averaging about 47. It is inclined to vary with the color, the black being the heaviest. Stinkwood is one of the most difficult of woods to season satisfactorily. Its shrinkage is high, averaging from 10 to 12 per cent linearly across the grain, and, particularly in the darker wood, is likely to corrugate badly in drying. Until quite recently it was used for almost all wagon parts, and even today, in spite of its high price, is sought after for yokes and felloes. Little is wasted in the trade, ends and small pieces being converted into turned and polished fancyware. It is the most costly of all furniture woods in South Africa."

Other native timbers described or mentioned are Kiaat (*Pterocarpus angolensis*), Yellowwood (*Podocarpus* spp.), Wit Els (*Platylophus trifoliatus*), Tambootie (*Spirostachys africanus*), Cape Beech (*Rapanea melanophleos*), Transvaal Boekenhout (*Faurea saligna*), Terblanz (*F. Macnaughtonii*), Wilde Sering (*Burkea africana*), Wit Sering (*Kirkia acuminata*), Berg Mahogany (*Entandrophragma caudatum*), Red Els (*Cunonia capensis*), Water Pear (*Eugenia Gerrardi*), Matumi (*Adina Galpini*), Red Currant (*Rhus Legati*), Mzeri (*Bridelia micrantha*), Essenhout (*Ekebergia capensis*), Cape Chestnut (*Calodendron capensis*), and Camdeboo Stinkwood (*Celtis rhamnifolia*). Saligna Gum (*Eucalyptus saligna*) and Blackwood (*Acacia Melanoxylon*) are Australian trees grown in South Africa for furniture timber.

Les bois du Congo Belge. (Rev. ed.) By Francis Pêche. Goemere, 21 Rue de la Limite, Brussels, 1939. Pp. 64; 6 × 9½; 30 figs., 1 map, 4 colored plates.

An account of the timbers of the Belgian Congo with reference to their occurrence, properties, and utilization. The four plates in color show the natural appearance of the finished surface of Limba Clair and Limba Noir (*Terminalia superba*), Kambala (*Chlorophora excelsa*), and Wenge (*Milletia Laurentii*). The other illustrations cover the field from forest to consumer.

The natural resistance to decay of some Empire timbers. By W. P. K. Findlay. *Empire Forestry Journal* 17: 2: 249–259; 1 plate; 1938.

"A description is given of a laboratory method of testing the resistance to decay of timbers—small selected samples are exposed to fungal attack under controlled conditions for four or eight months, and the amount of attack estimated from the percentage loss in dry weight caused by the test fungi. The results obtained with a number of species of Empire and home-grown timbers are tabulated and the timbers are classified on a basis of their resistance to decay. The nature of decay resistance and the importance of the soluble extractives in increasing the resistance of a timber to fungal decay are discussed."—*Author's summary.*

Nutzhölzer, Schnitzstoffe. By O. Nerling. *Jahresbericht Hamburgisches Inst. ang. Botanik* 55: 37–54; 1938.

This chapter in the annual report of the Institut for 1937 contains much information of value to persons interested in the names, sources, properties, and uses of woods from all parts of the world. It includes an account of the eight principal timbers of Chile, a list of 39 kinds of "Cedar," and specific gravity determinations for more than 100 woods, mostly of tropical origin.

Anatomy of the leaf and stem of *Gossypium*. By Irma E. Webber. *Journ. Agr. Research* (Washington, D. C.) 57: 4: 269–286; 8 plates; Aug. 15, 1938.

"The descriptions of leaf and stem structure of *Gossypium* presented in this paper are based on a histological examination of the leaves and stems of 12 Old World species, 5 wild Ameri-

can species, 10 cultivated or semi-wild American species, 2 doubtful species, and 9 species belonging to related genera. There is more anatomical variation within each of these three groups and less between the several groups than previous descriptions indicated. Since the distribution of spherical or oblate lysigenous cavities has been thought to be of value in classifying the Hibisceae, their hitherto unreported occurrence in the xylem rays of *G. Armourianum* and in the pith of *G. Kirkii*, *Erioxylum aridum*, *Kokia drynarioides*, *Shantzia Garckeana*, and *Thespesia lampas* is significant. The presence of both spherical lysigenous cavities and elongate mucilage canals in the pith of *Kokia*, *Thespesia*, and *Shantzia* is of interest since the type of cavity present in either cortex or pith has been suggested as a means of distinguishing between the subtribes Euhibisceae and Gossypieae of the tribe Hibisceae. The occurrence of spherical to elongate lysigenous cavities in the pith of *G. Kirkii* may be considered as an additional reason for excluding this species from the genus *Gossypium* since no such cavities were observed in the pith of typical species of *Gossypium*. In regard to Skovsted's proposed inclusion of *Erioxylum aridum* in the genus *Gossypium*, it should be pointed out that this species differs from all typical species of that genus that were examined in having lysigenous cavities in its pith."—*Author's summary*.

German-English botanical terminology. By Helen Ashby, Eric Ashby, Harald Richter, and Johannes Bärner. Thomas Murby & Co., 1 Fleet Lane, London, 1938. Pp. 195; 5¼ × 8½. Price 10s. net. (Nordemann Pub. Co., 215 Fourth Ave., N. Y., $3.00.)

This volume is the third of Murby's German-English terminologies under the general editorship of Dr. W. R. Jones. Each author is a highly qualified botanist who has had experience in the application of the subject to economic problems and in its presentation to advanced students.

"This book takes the form of a brief survey of botanical science, given in English and German. It is written to help the student to enlarge his vocabulary and to become familiar with the technical terms used by German- and English-speaking botanists. Most of the German text is a literal translation of the English, involving some sacrifice of style, but in many instances a close agreement in words would have been impossible without losing clearness of meaning. Moreover, we believe that it is misleading to adhere too rigidly to a literal translation, for the two languages differ in their phraseology as much as in their vocabulary. Accordingly the student will find in this work, as in the literature of botany itself, that the same idea is sometimes expressed differently in German and in English. We have eschewed controversial subjects, but where it has been necessary to introduce them we have chosen the opinion which most easily illustrates the nomenclature."

Fine structure of the plant cell wall. By S. H. Clarke. *Nature* 142: 899; Nov. 19, 1938.

"The aim of the present account is not to offer a complete survey of the literature (the references quoted will lead indirectly to the more important contributions to the subject), but to give a fairly simple picture of the current conception of the different phases of cell wall structure."

A forestry tour in 1937. By L. Chalk. Institute Paper No. 16, Imperial Forestry Institute, Oxford, 1939. Pp. 71; 6 × 9¾. Price 2s. 6d.

A highly interesting account of a seven-months' tour made possible by a grant from the Carnegie Corporation of New York. The countries visited were the United States, British Honduras, Canada, Hawaii, Fiji, New Zealand, Australia, Java, Malaya, Burma, India, and Ceylon. "The objects of the tour were (*a*) to study the problem of higher forestry education, with particular reference to Empire requirements, (*b*) to explore the possibilities of co-operation between forest research organizations in the countries visited, and (*c*) to obtain, in so far as time permitted, a general impression of the conditions in which forestry is practised in the territories included in the tour. . . . The greater part of the report consists of a general narrative of the tour approximately in chronological sequence, but three subjects have been selected for separate treatment—the organization of forest research,

forestry education, and research in my own subject, wood anatomy. Owing to the briefness of my visits, I was able to gain only a superficial knowledge of the problems and conditions in each country, but I have felt it best to give free expression to my views, with the reservation that they are only personal impressions and are not intended in any sense to be regarded as recommendations."

M. M. Chattaway

Price 35 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 59 SEPTEMBER 1, 1939

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Yale University School of Forestry

TROPICAL WOODS

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A technical magazine devoted to the furtherance of knowledge of tropical woods and forests and to the promotion of forestry in the Tropics.

The editor of this publication and the writer of any articles therein, the authorship of which is not otherwise indicated, is SAMUEL J. RECORD, *Dean of the Yale University School of Forestry.*

Subscription price One Dollar for four consecutive numbers. Remittances should be made payable to TROPICAL WOODS.

Address all communications to the editor, 205 Prospect Street, New Haven, Connecticut, U. S. A.

AMERICAN WOODS OF THE FAMILY BOMBACACEAE

By SAMUEL J. RECORD

Composing this pantropical family are about 25 genera and 150 species, mostly trees, often of giant stature. The American genera may be grouped as follows: Bombacineae—*Bombax*, *Bombacopsis*, *Pachira*, *Ceiba*, *Ochroma*, *Cavanillesia*, *Hampea*, and *Chorisia;* Gyranthereae—*Gyranthera*, *Bernoullia*, and *Huberodendron;* Matisieae—*Matisia* and *Quararibea;* Catostemmateae—*Catostemma*, *Scleronema*, and *Aguiaria.* The only timber of commerce is Balsa (*Ochroma*) and it is obtained from plantations; some of the other genera, however, particularly *Bombacopsis*, supply timber of local utility. The inner bark is fibrous and frequently serves for making cordage and for clarifying sugar. Several genera have their seeds imbedded in a woolly or silky fiber which is utilized for stuffing pillows, cushions, and mattresses, and for insulating refrig-

erators; the commercial product known as kapok is obtained from plantations of *Ceiba pentandra* Gaertn.

The woods exhibit a wide range of variation in appearance and properties, though this family is no more heterogeneous than the others of the Malvales. Color typically light throughout—white, yellowish, pinkish, brownish or oatmeal; heartwood reddish brown in *Bombacopsis*, *Catostemma*, and *Aguiaria*. Luster generally low, sometimes high. Without distinctive odor and taste, except in some specimens of *Quararibea*. Sp. gr. 0.10 (*Cavanillesia*) to 1.14 (*Aguiaria*); weight 6 to 71 lbs. per cu. ft.; Bombacineae all light and soft, Catostemmateae hard and heavy, the others intermediate. Texture medium to coarse; feel velvety (particularly in *Ochroma*) to rather harsh; grain mostly straight; working properties variable; durability low except in deeply colored material.

Pores small to very small, mostly indistinct without lens, in *Catostemma*, *Hampea*, *Quararibea*, and *Matisia*; larger, visible to very distinct, in the others; few to rather numerous, occurring singly or in short rows, generally well distributed. Vessels with simple perforations; without spirals; pits alternate, large in *Chorisia*, small in *Catostemma*, *Scleronema*, and *Hampea*, minute in *Matisia* and *Quararibea*, medium-sized in the others; tyloses often present, sometimes abundant. Rays heterogeneous; of two sizes, the larger frequently up to 6, sometimes up to 8 or 10, rarely more than 15, cells wide and of various heights up to 150 or more; large rays often very conspicuous, especially on radial surface, producing attractive silver grain on quarter-sawed lumber; sheath cells present in most genera, but absent or rare in *Gyranthera*, *Huberodendron*, *Scleronema*, and *Aguiaria*; low tile cells absent; *Pterospermum*-type of tile cells (see *New Phytologist* 32: 4: 262) present in *Ochroma* and *Hampea*; crystals common; pits to vessels large to very large except in *Hampea*, *Matisia*, and *Quararibea*, where they are small to minute. Wood parenchyma abundant; finely reticulate, at least in part, except in the Catostemmateae, where it is in distinct bands; cells in horizontal seriation in *Bombax*, *Bombacopsis*, *Pachira*, *Ceiba*, *Cavanillesia*, *Hampea*, and *Chorisia*. Wood fibers with thin to very thick walls; septate in *Bombax*, *Bombacopsis*, *Pachira*, and *Hampea*; pits simple or indistinctly bordered. Ripple marks present in all genera except *Ochroma*, *Huberodendron*, *Matisia*, and *Quararibea*; distinct to indistinct. Vertical traumatic gum ducts seen or reported to occur in *Bombax*, *Bombacopsis*, *Pachira*, *Ochroma*, *Cavanillesia*, *Catostemma*, and *Scleronema*.

Aguiaria, with a single species, *A. excelsa* Ducke, is one of the tallest trees in the region of the upper Rio Negro, a northern tributary of the Amazon, attaining a maximum height of 160 feet. The timber is used locally for construction purposes.

Heartwood rich reddish brown, with light-colored parenchyma markings; has a waxy appearance and feel; sapwood brownish, sharply demarcated. Odorless and tasteless. Very hard and heavy; sp. gr. (air-dry) 1.14; weight 71 lbs. per cu. ft.; rather coarse-textured, not difficult to work, finishing smoothly and with a high natural polish; durability rather high.

Pores visible, mostly solitary or paired. Vessels filled with tyloses and gum in heartwood. Rays 1 to 6 cells wide and up to 60 cells high; not conspicuous, being of the same color as the background. Wood parenchyma abundant, most in fairly regular to wavy metatracheal bands 1 to 6 cells wide and 1 to 3 pore diameters apart; distinct on tangential surface. Ripple marks about 80 per inch, readily visible with lens. No gum ducts seen in only specimen available (Yale 22628; Ducke 168). Structure otherwise as in *Catostemma*.

COMMON NAMES: Duracá or duraque (Braz.).

Bernoullia, with a single species, *B. flammea* Oliv., is a rare tree having the massive proportions and general appearance of *Ceiba pentandra*. It is known to occur at elevations between 500 and 2500 feet in southern Mexico, British Honduras, Guatemala, Honduras, and Panama. A wood specimen (Yale 2187) apparently identical with those of this species from Central America was collected by Georges H. Barrel in the Peruvian Amazon region, the common name being given as Lupuna. The leaves of *Bernoullia* are digitately compound, usually with 5 or 6 leaflets, the inflorescence is scarlet, the fruit is a 5-valved woody capsule, 10 to 12 inches long, containing winged seeds suggesting those of Mahogany (*Swietenia*).

Wood dull, oatmeal-colored or brown, the rays showing prominently as dark flakes on radial surface and give a fine, lace-like appearance to the tangential. Very light in weight but rather firm when dry, very coarse-textured, does not finish smoothly, is perishable in contact with the ground.

Pores few to rather numerous, the larger readily visible; mostly solitary or in pairs, occasionally in radial rows or small clusters. Intervascular pits medium-sized, alternate. Rays 1 to 10 cells wide and up to 100 or more cells high, the cells coarse; sheath cells present; ray-vessel pitting very coarse and irregular, often unilaterally compound. Wood parenchyma abundant; finely reticulate, visible to indistinct with lens. Wood fibers with thin walls and numerous simple or indistinctly bordered pits. No gum ducts seen. Ripple marks present, but indistinct because the large rays are not storied.

COMMON NAMES: Palo calabaza, p. de perdiz (Mex.); mapola (Br. H.); yuca (Pan.).

Bombax, Bombacopsis, and **Pachira** are closely related genera, treated by some botanists as a single genus (*Bombax*), with a total of about 50 species of small to large tropical trees, mostly American. *Bombax*, in the restricted sense, has small, pea-like seeds imbedded in silky wool or kapok, the flowers are large and the stamen fascicles divide into a thousand or more simple filaments, which, with the short, thick stamen tube, give the appearance of a powder puff. *Bombacopsis* differs in having smaller flowers and an elongated, slender stamen tube and from 75 to 200 stamens. *Pachira* has large, chestnut-like seeds not enclosed in wool, the flowers are large, and the stamen fascicles are repeatedly branched.

Woods of *Bombax* and *Pachira* much alike, being dingy brown or grayish brown throughout, like *Ceiba;* light and soft; sp. gr. (air-dry) 0.15 to 0.40; weight 10 to 25 lbs. per cu. ft.; coarse-textured, tough and stringy, perishable, and poorly esteemed for timber. The wood of *Pachira* is somewhat darker, the texture is harsher, the density is greater, and the pores are usually larger and more numerous than that of *Bombax*. The early wood of Bombax is generally much softer than the late wood, whereas in *Pachira* the consistency is fairly uniform.

The following description applies to both genera: Pores small to large, barely visible to distinct; few to numerous; solitary or in small radial multiples, uniformly to irregularly distributed; often more numerous in the outer part of the growth ring in *Bombax*. Vessels with medium-sized, crowded, alternate pits. Rays heterogeneous; 1 to 6, occasionally up to 8, cells wide and up to about 100 cells high; not definitely storied; sheath cells few; crystals common; ray-vessel pitting very coarse and irregular, half-bordered, often unilaterally compound. Wood parenchyma abundant, barely visible to fairly distinct with lens; narrowly vasicentric and finely reticulate; occasionally also in wide, coarse-celled bands in early wood; crystals present. Wood fibers septate; thick-walled in late wood; pits small, rather few, simple. Ripple marks 50 to 80 per inch; regular or irregular, distinct or indistinct; secondary seriation (wood parenchyma cells) sometimes visible with lens. No gum ducts seen.

COMMON NAMES: *Bombax:* Drago (Cuba); fromagier (Haiti); amapola, a. blanca, a. colorada, cabellos de ángel, ceiba, chi-

chochuchi, chilochuchi, clavellina, c. de la barranca, coquito, cuajilote, disciplina, guajilote, itztamatl, jiquique, jumallo, lele, pochote, pochotl, pongolote, tiati, titilamatl, xanocol, xcunché, xiloxochitl, xihuicxan (Mex.); mapola (Br. H.); doncella, muñeco (Guat.); jilinsuche, pilinsuchil, shilo, s. blanco, s. colorado (Salv.); brisakrá, kurí, pochote, psikrá, purí, zgun (C. R.); barrigón (Pan.); barrigón, ceiba de agua, c. de majagua, majagua, m. colorada, (Col.); cachimbo, majumba, sibucara, tambor (Venez.); agonzé, boesiekatoen, boschkatoen, ieljoe-loetanokri, jacomini, kamakotie, katoen, kirikirimaroro, klieklie-maloeloe, koenanaballi, konnanaballi, kriekrie-maroeroe, krikri-wosijono, kri-miauloeloe, mankatoen, mattoe-maauw, momo, para-katoen, sabana-katoen, seesabana-katoen, sienzon, wekelau-manloeloe, wladilikoro, wosijono (Sur.); embirassú, embiratanha, imbira de folho, i. guassú, imbirassú or imbirussú, mamorana grande, mangubeira, monguba or munguba, m. rana, paineira, sumaúma de terra firme (Braz.); palo blanco (Par.); beldaco (Ec.); bellaco-caspi, huimba, huina-caspi, punga, p. blanca de chamisal, pungu (Peru). *Pachira:* Carolina, c. blanca, castaño silvestre, ceibón, c. de agua, c. de arroyo, c. silvestre (Cuba); colorade (Haiti); wild chataigne (Trin.); apombo, kuyche, zapote bobo, z. de agua, z. reventador (Mex.); provision tree, Santo Domingo (Br. H.); sunzapote (Guat.); pumpunjuche, zapatón (Hond.); shila blanca (Salv.); jelinjoche (C. R.); mamé de mono (Pan.); ceiba de agua, mahagua or majagua (Col.); castaño (Venez.); bosch-cacao, kaneriballi; momow (Sur.); châtaignier (Fr. G.); mamorana, m. grande (Braz.).

Bombacopsis, with three or four species of large trees, is apparently limited in its distribution to Venezuela, Colombia, and Central America as far north as Honduras. The trees are of two general types, one with smooth bark, the other very spiny. Best known of the latter group is *B. quinatum* (Jacq.) Dugand (=*B. Fendleri* [Seem.] Pittier=*Pachira Fendleri* Seem.=*Bombax Fendleri* Hemsl.=*Bombax quinatum* Jacq.). Hugh M. Curran supplies the following information concerning it in Colombia, where it is called Tolú (see *Timbers of Tropical America*, p. 415): "This is one of the very

common timbers on the lower slopes in the northern part of the country, occupying the drier gravelly areas in a region of plentiful rainfall. It is associated with other trees of the Bombacaceae and also with *Cedrela*. It reaches a height of 100 feet, has a rather wide-spreading crown of heavy branches, and a somewhat irregular bole inclined to be buttressed and completely clothed with heavy prickles toward the base. It is deciduous and remains bare of leaves for many weeks. The fruits are dry capsules which upon bursting liberate a quantity of soft brown vegetable wool enclosing the small brown seeds. In the regions where it is the principal species there are five or six of the trees to the acre with a yield sometimes of 4000 to 5000 board feet. It reaches the local market either in the form of squared logs or as whip-sawn lumber and is commonly met with in every carpentry shop of the coastal region. It has a soft texture, works readily with all machinery and tools, and is remarkable for the difficulty with which it gives up moisture, carpenters saying that it never becomes thoroughly dry in that humid climate. It is used chiefly for the manufacture of boxes and as a substitute for Cedar (*Cedrela*), and is frequently referred to as false Cedar. The natives make large dugout canoes from the trunks. The same tree occurs, or at least is reported, in the Lake Maracaibo region of Venezuela, and the lumber is well known in all the local markets under the name of Saqui-saqui."

Pittier states (*Esbozo de las formaciones vegetales de Venezuela*, Caracas, 1920, p. 28) that the wood of the Saqui-saqui (*B. sepium* Pitt.), which bears a general resemblance to Spanish Cedar, contains a hygroscopic gum which keeps the material perpetually moist. If the lumber is kept submerged, preferably in running water, it is claimed that this gum will be dissolved out and the quality of the timber thereby greatly improved. The local uses of the wood include general construction and cooperage, especially tanning vats and rum storage vats. The timber has not been exported, but there is a possible market for it for the staves of water conduits. According to Dugand (*Contrib. Hist. Nat. Colombiana* 1: 2, March 25, 1938), *B. sepium* is doubtfully distinct from *B. quinatum*.

Regarding Cedro Espinoso (*B. quinatum*) on the Bayano River watershed of Panama, H. C. Kluge says (*Tropical Woods* 5: 5): "This well-known tree is distributed very generally over the region, growing very well on the barren hilltops. The trunk is very irregular, with prominent buttresses. It sheds its leaves during January and the flowers appear a few weeks later; the fruit pods ripen and fall before the new leaves. The wood dries with extreme slowness; it is much used by the natives because it is resistant to insect attacks and decay."

Heartwood light to dark reddish brown; sharply demarcated from the yellowish sapwood. Luster rather low. Odorless, but with a slightly astringent taste. Light and soft, but firm and strong for its density; sp. gr. (air-dry) 0.40 to 0.60; weight 25 to 37 lbs. per cu. ft.; easy to work, finishing smoothly; some specimens of about as good a quality as *Cedrela*. Vertical traumatic gum ducts occur in some species. Tyloses are abundant. The other anatomical details are virtually the same as in *Pachira*.

COMMON NAMES: Cedro espino (Hond.); aba, cedro espino (Nic.); cedro macho, pochote (C. R.); cedro espinoso, ceiba (Pan., Col.); ceiba, c. colorada, c. tolú, c. tolúa, tolú (Col.); caoba bastardo, cedrillo, cedro dulce, ceiba, c. colorada, jaris, lanillo, masguara, saqui-saqui (Venez.).

Catostemma, with three species of trees, occurs in the Guianas and northern part of the Brazilian Amazon region. The best known species is *C. fragrans* Benth., which is the same as *Guenetia macrosperma* Sagot. It is a tall tree with a long, slender trunk, sometimes free of branches for 90 feet, in British and French Guiana, but has not been found in Surinam. Another British Guiana species is *C. Alstoni* Sandw., a tree upward of 100 feet in height and two feet in diameter. The Brazilian species, *C. sclerophyllum* Ducke, is a medium-sized to tall tree rather common in the now inundated forests near Manáos and northward. The timber is sparingly utilized, although of fairly good quality and suitable for general construction. Heartwood dull yellowish brown, distinct but not sharply demarcated from the yellowish brown sapwood.

Density about the same as Oak (*Quercus*), texture very coarse, feel harsh, durability fair.

Pores barely visible to fairly distinct, mostly solitary or paired, well distributed. Vessels with thin walls and small, crowded, alternate pits; tyloses often abundant; white deposits occasional. Rays conspicuous; 1 to 6 cells wide, occasionally wider, and up to 120 cells high; sheath cells few; crystals common, gum deposits abundant; ray-vessel pit-pairs very large, irregular, distinctly half-bordered. Wood parenchyma abundant, distinct; variable, sometimes aliform or confluent into irregular tangential bands, sometimes mostly in rather widely spaced metatracheal bands 2 to 12 cells wide; cells very short, often nearly cubical; mostly 4 per strand, and sometimes distinctly storied, crystals common; gum deposits abundant. Wood fibers with very thick walls and small simple or indistinctly bordered pits. Vertical traumatic gum ducts common. Ripple marks 75 to 100 per inch, irregular, not very distinct, as the large rays are not storied.

COMMON NAMES: Baramalli (Br. G.); flambeau rouge (Fr. G.).

Cavanillesia, with two or three species of large trees, is of limited distribution in Central and South America. *C. arborea* (Willd.) K. Schum., of south-central Brazil, is said to attain a height of 65 feet and a trunk diameter of 15 feet. In the dry regions the bole becomes considerably swollen several feet from the ground, giving rise to the name Barriguda (pot-bellied). The extremely light and weak wood is not utilized.

C. platanifolia H. B. K. occurs in northwestern Colombia and southern Panama. It is a large tree, usually 65 to 80, sometimes over 100, feet tall, with a ponderous trunk 6 to 9 feet through at the base, which frequently is considerably smaller than the flask-shaped part above. The tree sheds its lower branches, even when growing in the open, so that the crown is always small, open, and seemingly out of proportion to the size of the trunk. The bark is thick and fibrous, and smooth except for the old branch scars.

Heartwood fairly lustrous, yellowish white to pale brown. Without distinctive odor or taste. Extremely light in weight; sp. gr. (air-dry) 0.10; weight 6¼ lbs. per cu. ft.; very soft and fragile, of uniform texture, with rather harsh feel, perishable.

Pores readily visible, usually more numerous in outer part of growth rings; solitary or in pairs or three's. Vessels with medium-sized, crowded, alternate pits; tyloses often abundant. Rays 1 to 10 cells wide, occasionally

wider, and up to 150 or more cells high; of same color as the background; sheath cells abundant, not readily distinguished from wood parenchyma, especially on tangential sections; ray-vessel pitting very coarse and irregular, tending to scalariform arrangement. Wood parenchyma very abundant, composing most of the ground mass; narrow layer of late wood, appearing under lens as band of terminal parenchyma, is composed of several very narrow alternating laminae of wood fibers and small parenchyma cells; elsewhere the parenchyma cells are very coarse and the uniseriate or biseriate rows of fibers are rather widely spaced; individual cells readily visible with lens, and in horizontal seriation, 200 to 220 per inch. Wood fibers small, composing not more than 5 per cent of the wood; pits few, minute, simple or indistinctly bordered. Ripple marks present but indistinct; secondary seriation of wood parenchyma cells visible under lens. Vertical traumatic gum ducts observed in one specimen.

COMMON NAMES: Bongo, cuipo, hamati, quipo (Pan.); macondo (Col.).

Ceiba. There are about 10 species of this genus, but the best known is *C. pentandra* (L.) Gaertn. (=*Bombax pentandrum* L. =*Eriodendron anfractuosum* DC.), of pantropical distribution. It is a massive tree, often 80 to 100 feet high and sometimes much taller, with a cylindrical stem having high, thick plank-buttresses. According to A. E. Navez (*Proc. Nat. Acad. Sci.* 16: 339), the tabular roots are best developed on the side corresponding to the direction of the strongest prevailing winds and are to be considered as traction-resistant rather than compression-resistant structures, *i.e.*, they serve as cables and not primarily as buttresses. The Ceiba is characteristically a tree of the open, with a large coarse crown which in some instances may have a spread of 150 feet. The branches of young trees are spiny. The seeds are rather widely disseminated and find ideal conditions for germination on abandoned agricultural land.

The commercial importance of the tree is in the floss about the seeds, known on the market as kapok. The following information is taken from *Bulletin of the Imperial Institute* (London) 24: 18, June 1926: "The hairs spring from the inner wall of the capsule and are not attached to the seed itself, thus rendering the separation of the seed much easier than in the case of cotton. The hairs are cylindrical, from 0.6 to 1.2 in. in length, with very thin walls. The cells are full of air and

are very light; they also possess the property of being impermeable to moisture, and on this account are extremely buoyant. For this reason kapok is now used throughout the world for the manufacture of buoys, life belts, and life-saving jackets. Its chief use is for stuffing cushions, pillows, mattresses, and similar articles. In a natural condition the fibers lack cohesive force and are unsuitable as a textile material, but by roughening the surface by chemical treatment this difficulty can be overcome, though the yarns have poor wearing properties. Practically the entire commercial supply of kapok is obtained from Java, where the trees are for the most part cultivated as boundary trees and fences, along roadsides, and with other kinds in gardens. The trees begin to bear in three or four years, and 7-year-old trees will yield 350 to 400 pods, 10-year-old trees 600 pods or more. The average yield is about one pound of cleaned floss per hundred pods. In 1924, Java and Madura exported over 15,000 tons of kapok, of a total value exceeding 1½ million pounds sterling. Of this quantity the United States took nearly 8000 tons, the Netherlands and Austria about 3000 tons each."

Heartwood pinkish white to ashy brown, not clearly distinguished from the sapwood. Luster low. Odorless and tasteless. The wood is heavy with moisture when freshly cut but is very light, about 27 pounds per cubic foot, when dry. If seasoned in the log it is almost certain to discolor and is likely to rot. It is little used except for dugout canoes and rafts; suggested uses are corestock for veneers, slack cooperage, packing cases and boxes, toys, and miscellaneous uses requiring a soft, easily worked wood. It cannot compete with Balsa for purposes of buoyancy and insulation. It is doubtful if it is suited for matches. Regarding a special use of the trunks of Sumaúma in the Amazon region, Spruce says (*Notes of a Botanist in the Amazon and Andes*, London, 1908, p. 186): "The softness and lightness of the wood render it suitable above all other trees for hollowing out the trunk into what are called cuchas or floating casks, which, being filled with turtle oil or capivi on the upper Amazon and securely calked, are floated down to the Barra do Rio Negro or Pará." Some of them had a capacity of over 2000 gallons.

Pores numerous, barely visible to distinct; solitary or in short radial multiples, usually evenly distributed, but sometimes more numerous in late wood. Vessels with medium to fairly large, alternate pits; tyloses common. Rays heterogeneous; mostly 1 to 8 cells wide and up to 80 cells high, occasionally considerably larger; sheath cells present, often very large, sometimes making the edges of the rays indistinct because of the resemblance of the cells to wood parenchyma; all pits very large. Wood parenchyma abundant, coarse-celled; narrowly vasicentric and finely reticulate, fairly distinct with lens; sometimes also in narrow bands apparently limiting growth rings. Wood fibers comparatively few, not septate; pits small, simple. No gum ducts seen. Ripple marks present, but poorly defined and often indistinct; secondary seriation (parenchyma cells, 2 to 4 per strand) usually fairly distinct under lens.

COMMON NAMES: Ceiba, corkwood, cotton tree, silk-cotton tree (Br. W. I.); ceiba or ceibo (Sp. Am., gen.); mapou (Haiti); arbe à coton, fromagier (Fr. W. I.); arbol de algodón, cabellos de ángel, mosmote, peem, piim, pitón, pochote, pochotl, xiloxochitl, yaxche (Mex.); ceibón, paniki, panya, sisín, poxot (Nic.); bonga, ceiba, c. bonga, c. de lana (Col.); kankantrie, koddobakkoe (Sur.); sumaúma, sumaumeira (Braz.); toborochi (Boliv.).

Chorisia is typically a genus of southern South America, although one species is credited to Colombia. *C. soluta* D. Smith, of the uplands of Guatemala, is a synonym for *Ceiba aesculifolia* (H. B. K.) Britt. & Baker. The Palo Borracho of Argentina, *C. insignis* H. B. K., is a bottle-shaped tree, for that reason sometimes called Palo Botella, rarely found in the forest, but occurring singly or in small groups in the open, where it attains a height of about 50 feet and a diameter of 6 feet. The trunks are used for making durable dug-out canoes, the bast is good for cordage, and the cottony fibre about the seeds is said to be of sufficient length and strength for textile purposes as well as for stuffing. The Paineira of southern Brazil, *C. speciosa* St. Hil., also occurs in Argentina where it is generally known as Samohú, though that name appears to be shared by other species. From published descriptions the tree is taller, the trunk more slender, and the timber denser than that of *C. insignis*. Its wood is light yellowish brown, with a reddish tinge, not highly lustrous, unattractive. Sp. gr. (air-dry) 0.44; weight about 27 lbs. per cu. ft.; firm, tough,

strong, of moderately coarse texture, rather harsh feel, easy to work, finishing smoothly, not resistant to decay. It is suitable for general interior construction, common lumber, and slack cooperage.

Growth rings present. Pores readily visible, solitary or in short radial multiples, irregularly scattered. Vessels with coarse, alternate pitting; tyloses abundant. Rays 1 to 6, sometimes up to 8 or 10, cells wide and up to 80 cells high; very large sheath cells present; ray-vessel pitting very coarse, irregular, half-bordered. Wood parenchyma very abundant, finely reticulate, the cells of the uniseriate rows commonly wider than the intervening fiber layers and of greatest diameter in early wood; also in apparently terminal bands 2 to 4 cells wide; cells in horizontal seriation. Fibers thick-walled in late wood; pits few, very small, simple or indistinctly bordered. Ripple marks present; primary 45 to 55 per inch, fairly regular but often indistinct; secondary (storied parenchyma cells) four times as many, rather irregular, distinct with lens. No gum ducts seen. Three other South American specimens (Yale 4713, 16854, and 19034), doubtfully classified as *Chorisia*, are much lighter and softer, and the early-wood parenchyma is in bands, up to 8 or more cells wide, separated by uniseriate or biseriate layers of small wood fibers; in the narrow late wood the parenchyma is finely reticulate and the cells are very much smaller.

COMMON NAMES: Barriguda, paineira (Braz.); lupuna (Peru); algodoneiro, lluchán, mandiyú-rá, painá, paineiro, palo borracho, p. botella, samohú or samuhú, s. de flor colorada, yuchán (Arg.); zamuhú (Par.); paineira (Urug.).

Gyranthera, with two species of medium-sized to rather large trees, is of limited distribution in Panama (*G. darienensis* Pittier) and Venezuela (*G. caribensis* Pittier). (See *Boletín Comercial e Industrial* [Caracas] 18: 428–433.) So far as known the timber is not utilized for any special purpose, but should be useful for general carpentry, boxes and crates, and other purposes requiring a tough and strong material light in weight and easy to work but not resistant to decay. Color rather lustrous yellow-brown, with purplish ray flecks on radial surface. Odorless and tasteless.

Pores rather small but visible, occurring singly or in radial multiples usually of 2, sometimes up to 6, pores each, scattered uniformly. Vessels with medium-sized, crowded, alternate pits. Rays 1 to 8 cells wide and up to 100 cells high; gum deposits abundant; ray-vessel pitting coarse, often unilaterally compound, tending to scalariform. Wood parenchyma abundant, distinct with lens; narrowly vasicentric and finely reticulate; gum deposits

common. Wood fibers with medium thick walls and numerous, rather large, simple pits. Ripple marks absent or very irregular. No gum ducts seen.

COMMON NAMES: Candelo, cucharón, niño (Venez.).

Hampea. According to Paul C. Standley (*Journ. Wash. Acad. Sci.* 17: 15: 394), "The genus *Hampea* consists of a small group of American trees and shrubs which has been referred by most authors to the family Bombacaceae, although others have believed its more natural position to be in the Malvaceae. The genus was based by Schlechtendal upon a single species, *H. integerrima*, described from Veracruz. In 1862 Triana and Planchon described a second species, *H. thespesioides*, from Colombia, and in 1886 Sereno Watson a third from Guatemala. A variety of *H. integerrima* was described from Costa Rica in 1899 by Captain John Donnell Smith, and in 1923 I transferred to the genus a Mexican plant described as a *Thespesia* by Presl, and published a new species from the Yucatán Peninsula. Practically all the scanty herbarium material of the genus has been referred without question to the original *H. integerrima*. Our representation of the genus has increased rapidly in recent years and, when an attempt was made recently to name two Central American specimens, it became evident that the group was badly in need of revision. In the present treatment nine species are recognized, one indigenous in Colombia, the others ranging from Panama to southern Mexico."

Wood lustrous yellowish-brown or pinkish; light and soft, rather silky, of medium fine texture, soft feel, not durable. No special uses because the trees are too small for timber.

Pores variable in size, the largest barely visible; mostly solitary or in pairs, sometimes in radial multiples and clusters of 3 to 6; few to numerous. Vessels with fine, alternate pitting; gum deposits common. Rays 1 to 8, generally 1 to 6, sometimes 1 to 4, cells wide, and up to 60, rarely up to 200, cells high; with large, *Pterospermum*-type, tile cells; sheath cells common to abundant; pits to vessels very small; pits to parenchyma numerous, large. Wood parenchyma abundant, indistinct with lens; vasicentric, 2 to 4 cells wide, mostly 4 cells per strand; metatracheal, finely reticulate, also occasionally in bands 2 to 6 cells wide, the cells two per strand or fusiform. Wood fibers with thin walls and few, rather small, simple or indistinctly bordered pits. Ripple marks present; primary, 80 to 100 per inch, variable in regularity and distinctness, all elements but the tall rays being storied; secondary, resulting from the

seriation of the parenchyma cells, mostly twice as many and not always distinct.

There are two types of *Hampea* woods, although the differences are not pronounced. In specimens of *H. panamensis* Standl. and *H. integerrima* Schl., the color is yellowish white throughout, the feel is velvety, the tier junctions are distinct under lens, and secondary seriation is common, whereas in *H. euryphylla* Standl., *H. stipitata* Wats., and *H. trilobata* Standl. the general color is pinkish, the rays are reddish, the feel is somewhat harsh, the tier junctions are not sharply defined, and secondary seriation is indistinct.

COMMON NAMES: Jonote blanco, majagua (Mex.); moho, kajana (Br. Hond.); majáo colorado (Hond.); buriogre (C. R.); azote, burillo (Pan.).

Huberodendron. There are two Amazonian species, namely, *H. swietenioides* (Gleason) Ducke (=*H. styraciflorum* Ducke=*Bernoullia swietenioides* Ducke) and *B. ingens* Ducke, both very large forest trees, 100 to 175 feet tall, with thick, highly-buttressed trunks. The only wood sample in the Yale collections is of the first named species and was obtained by Adolpho Ducke (his no. 210, Yale 23672; see *Arch. Inst. Biol. Veget.* 2: 1: 59, 72). It is of a dull, light brown color, moderately hard and heavy, rather coarse-textured, easy to work, finishing smoothly, probably perishable in contact with the ground.

Pores fairly large, readily visible, rather few, occurring singly or in short radial multiples. Vessels with medium-sized, crowded, alternate pits; tyloses common, rather thick-walled. Rays 1 to 6, mostly 4 or 5, cells wide and mostly 10 to 25, sometimes up to 35, cells high; ray-vessel pitting coarse to very coarse, often unilaterally compound. Wood parenchyma abundant, fairly distinct with lens; the vasicentric uniseriate or biseriate: the metatracheal finely reticulate, the uniseriate lines spaced 4 to 6 rows of fibers apart. Wood fibers with moderately thick walls and numerous simple pits. Ripple marks absent. No gum ducts observed. The structure of the wood indicates a close relationship between *Huberodendron* and *Gyranthera*.

Matisia, with about a dozen species of small, medium-sized, rarely large trees, is most abundant in the Amazon basin, but with extensions to Panama and Costa Rica. The tallest tree is the Sapote of Peru and Ecuador, *M. cordata*

H. & B., which is sometimes 100 feet tall; it occurs in the forest and is also cultivated for its comestible fruits. Its wood is light and soft, one sample having a velvety feel. Uniseriate and biseriate rays are very numerous and the multiseriate are very large, the maximum size being about 25 cells wide and 300 cells high, with wide uniseriate margins; sheath cells abundant, though mostly rounded rather than upright (tang. sect.). Wood parenchyma strands composed mostly of short cells, usually eight per strand; crystals abundant. The other details are about the same as in *Quararibea*. The woods of three other species, namely, *M. dolichosiphon* Schum., *M. obliquifolia* Standl., and *M. ochrocalyx* Schum., are so similar to *Quararibea* that no reliable basis could be found for separating them from that genus. So far as known, the timber of *Matisia* is not utilized for any special purpose.

COMMON NAMES: Cupúassú-rana, cupú-rana, inajá-rana (Braz.); sapote or zapote, sapotillo (Peru).

Ochroma, the source of Balsa, the lightest of commercial timbers, is a genus of large, very fast-growing trees widely distributed in tropical America. Some botanists claim to recognize 10 or more species, but for all practical purposes there is only one, *O. pyramidale* (Cav.) Urb. (=*O. lagopus* Sw.), of which the others are varieties or forms. The genus, like *Bombax* and *Ceiba*, bears seeds enveloped in silky floss or down, and the young seedlings appear promptly in every nearby opening where the soil is exposed. Given ample room on rich, well-drained soil at low elevations, the trees may attain a height of 50 to 60 feet and a trunk diameter of 24 to 30 inches in five or six years. The wood produced under such conditions is very light and soft, weighing only 6 to 8 pounds per cu. ft. when dry. Timber of slow growth, whether from the outer part of old trees or from young ones that developed under adverse conditions, may weigh 25 pounds per cu. ft. These natural variations affect the structure, appearance, properties, and uses of the wood. To secure a uniform product, the trees must be grown in plantations.

Regarding the culture of Balsa in Ecuador, the principal source of supply at present, Samuel Greenhouse says (*Journal*

of Forestry 33: 10: 870, Oct. 1935): "Seeds, having proper moisture and temperature conditions, must be acted on by direct sunlight in order to germinate. This makes removal of all previous cover necessary. The density of natural reproduction makes unnecessary any artificial seeding or planting, but necessitates some means to prevent overcrowding. Until they are 6 months old and about 1½ inches in diameter, the plants are very little more than pith and cortex. They are very easily broken or injured, and even a slight injury often causes death. Even after the trees are fully mature, a slight hurt will cause the wood to develop a hard and fibrous texture, and thereby lose its commercial value. The tree is then called 'macho' ('burrillo' in Central America) as against 'hembra' ('Balsa real' in Central America), the soft-textured tree. This makes it compulsory that the plantation be handled as little as possible, for the careless workman is the chief cause of injury. Until it is seven years old, the water needs of the Balsa tree are supplied by a shallow root system. About that time, due to increasing competition, it will develop a tap root. This causes the wood in the center of the tree, near the base, to become saturated. Decomposition takes place, and the wood in that area assumes a red color, and gradually becomes doty. With time this supersaturated area spreads laterally and in height, decreasing the value of the log. The tree must therefore be harvested before this development occurs. The bole above the first branch will not produce merchantable logs. Lumber with knots has no value. More emphasis must therefore be placed on growth in height than in diameter." (For method of growing Balsa in Costa Rica, see *Tropical Woods* 15: 34.)

The first known use of *Ochroma* timber was by the Incas for their great raft or balsa. "This, primitive though it was, must be hailed as the *chef d'oeuvre* of the ancient Andean shipwright. It was made of seven, nine, or even eleven thick logs of the very buoyant wood of the Balsa tree, lashed together with cords. The logs were arranged in such a fashion that the middle log was longest; those lying on either side of it were somewhat shorter, and those on the two sides were shortest of all. In this way a bow was formed. Over the raft was a sort of

framework of smaller beams upon which a fragile platform with a rude roofed-in area and a mast were erected. The vessel was moved by cotton sails and by paddles. A movable centerboard was inserted, when needed, between two of the logs. . . . Balsas capable of accommodating as many as fifty persons were used for long sea voyages and likewise for trading excursions. They seem to have reached their highest development in the coast country around the mouth of the Guayas River, and to this day one may see craft of this kind slowly making their way upstream or down. They serve as a useful supplement to the steam-driven traffic on that stream."—Philip Ainsworth Means, *Trans. Conn. Acad. Arts & Sciences* 27: 407, Sept. 1925.

Balsa timber is imported into the United States either in logs with the bark on or in the form of lumber. The latter has the advantage of eliminating obvious defects, such as knots and rotten or stained material, and also the bark for which no satisfactory use has been found as it makes poor fuel and its tannin content is very low (see *Tropical Woods* 2: 1). Although the weight of green wood is from two to three times the dry weight, the logs are comparatively light and easy to transport. The wood decays very quickly in contact with the ground and is subject to sapstain if not promptly dried. Seasoned material absorbs water readily when immersed, but this property can be largely overcome by waterproofing processes which do not add greatly to the weight.

Balsa came into prominence during the World War and large quantities of timber were consumed in manufacture of life preservers and rafts and for mine buoys; 80,000 Balsa floats were used in the 250-mile submarine mine barrage in the North Sea. It was also used to line refrigerator trucks for military use in France, and it is to its insulating properties there demonstrated that the timber owes most of its present commercial applications. For protected lining, wood of the lowest density is best, and its efficiency is about the same as that of cork. Cases made of a heavier grade of lumber, preferably with a weight of about 10 pounds per cu. ft., are used successfully for the shipment of pre-cooled perishable commodities such as yeast, dairy products, fresh fruits, meats, and fish. Such a

container, with a capacity of 40 to 80 pounds, can be used for from 50 to over 100 round trips, and as it is much lighter than an ordinary wooden box there is material saving in transportation charges. Balsa is also employed in ceilings and partitions of rooms as a sound-deadener, and under heavy machinery to prevent transmission of vibration to other parts of the building. Other uses include stream-lining in airplanes, pads to protect furniture in shipment, novelties, toys, sea sleds, floats, hat blocks, and diaphragms for loudspeakers.

The resistance of Balsa timber to endwise compression and static bending is about half of that of the best quality of Spruce (*Picea*) having a density four to five times greater (see *Tropical Woods* 41: 45). There are other woods lighter than Balsa (see *Tropical Woods* 41: 45), but they lack its strength, and moreover are not available in sufficient size or quantity to be commercially important.

Heartwood pale brown or reddish; sapwood (comprising most of the commercial timber) nearly white or oatmeal-colored, often with a yellowish or pinkish hue. Luster usually rather high. Odorless and tasteless. Feel velvety.

Pores variable in size, usually distinct to the unaided eye; rather few to numerous, mostly solitary or in pairs, occasionally in multiples of 3 to 6, generally well distributed. Vessels with medium-sized alternate pits. Rays 1 to 8, usually not over 5, cells wide and up to 50 cells high; sheath cells present, often very abundant; large tile cells (*Pterospermum* type) present; all pits large. Wood parenchyma abundant, mostly metatracheal in lines or narrow bands spaced 1 or 2 fiber rows apart, the reticulate pattern usually indistinct with lens; strands with 2 to 4 cells. Wood fibers mostly with very thin walls and large lumina; not septate; pits very small, simple. No gum ducts seen. Ripple marks absent.

COMMON NAMES: Balsa, balsa wood (Trade); balsa (Cent. & So. Am., gen.); bombast mahoe, corkwood, down tree, dum (Jam.); balsa, corkwood, guano (P. R.); ceibón botija, c. lanero, lanero (Cuba); bois flot, mahaudème (Haiti); bois flot, patte de lièvre (Mart.); polak (Br. H.); lanilla, tambor (Guat.); guano (Hond.); algodón (Salv.); gatillo, polak (Nic.); enea, piú, pung, urú (C. R.); lana, puero (Pan.); balso, lano, palo de lana, tacarigua (Venez.); pau de balsa (Braz.); palo de balsa, topa (Peru); tami (Boliv.).

Quararibea, with about a dozen species, is of rather common occurrence throughout tropical America. The trees are mostly small or medium-sized, usually with a slender, smooth-barked, gradually tapering bole and small branches that are in whorls on the young stems. The leaves and bark, at least in certain species, have a peculiar odor variously described as resembling curry powder, fenugreek (*Trigonella foenum-graecum* L.), inner bark of Slippery Elm (*Ulmus fulva* Michx.), or licorice.

The only trees growing to a height of more than 50 or 60 feet belong to an undetermined species growing in the Rio Grongogy basin in southeastern Bahia, Brazil, where it is known as Veroity. According to Hugh M. Curran (see *Timbers of Tropical America*, p. 423), it attains a maximum height of 150 feet, with a trunk 3 to 4 feet in diameter and usually free of limbs for 50 to 70 feet. It grows on rich soil in the rain forest and often comprises the bulk of the stand over considerable areas. The timber is held in poor esteem locally because of its lack of durability and its tendency to stain blue or black soon after cutting. When properly dried, however, it makes a clear white or ivory-white lumber resembling American Holly (*Ilex opaca* Ait). The one serious defect is the presence of numerous large wormholes, rimmed with black, but the mature timber will probably be found to cut as much clear lumber as the average American hardwood, since it is generally free of knots and other defects.

All specimens of *Quararibea* without distinct heartwood; natural color white or yellowish; usually discolored by fungi. Luster low to fairly high. Tasteless and generally odorless, sometimes with characteristic scent of the bark and leaves. Sp. gr. (air-dry) 0.55 to 0.72; weight 34 to 45 lbs. per cu. ft.; texture medium to somewhat coarse, feel rather harsh, working properties good. Growth rings sometimes distinct.

Pores mostly very small, the larger in some specimens faintly visible without lens; few to numerous, but not crowded, occurring singly or in radial multiples of 2 to 6, well distributed. Vessels with very small to minute, alternate pits. Rays 1 to 12, mostly 4 to 6, cells wide and up to 150 cells high; sheath cells numerous, though mostly rounded instead of distinctly upright (tang. sec.); large rhombohedral crystals common; pits to parenchyma cells

often large; pits to vessels very small to minute. Wood parenchyma abundant, finely reticulate, barely visible with lens; strands typically with 4 or 8 cells, the cells not in horizontal seriation; disjunctive parenchyma, with short processes, very common. Wood fibers with rather thick walls, but with fairly large cavities; pits numerous, slit-like, simple or with indistinct borders. Ripple marks absent. No gum ducts seen.

COMMON NAMES: Garrocho, swizzle-stick tree (P. R.); cacahuaxochitl or cacaoxochitl, flor de cacao, madre de cacao, maha, rosa de cacao (Mex.); batidos, mahass, majahás (Br. H.); cuyapo, moro (Guat.); coco mamá, moro (Hond.); garrocho, molenillo, pía (C. R.); bobito, cinco-dedos, guayabillo, guayabo (Pan.); botón (Col.); aspaí, mampuesto negro (Venez.); apezoeloe, cacao-oelie, kibiwara wesjilikodo, kirikiri, maipoelie, taga-hoedoe (Sur.); guarariba, inajá-rana, veroity (Braz.); huayuash-sapote, sapotillo (Peru).

Scleronema, with four species of moderately large trees, is rather widely distributed in the Amazon region of Brazil. The only wood sample in the Yale collection is of *S. micranthum* Ducke (=*Catostemma micranthum* Ducke) supplied by Adolpho Ducke (Yale 20694; Ducke 13). Heartwood lustrous golden brown, with conspicuous ray flecks on radial surface; sapwood oatmeal-colored, sharply demarcated. Odorless and tasteless. Moderately heavy, hard, tough, strong, coarse-textured, easy to work, probably fairly durable; a good timber for general construction and medium grades of furniture.

Pores distinct, numerous, mostly solitary or paired. Vessels with small, crowded, alternate pits; tyloses abundant in heartwood. Rays 1 to 6 cells wide and up to 80 cells high; without sheath cells. Wood parenchyma abundant, readily visible, in fairly regular to wavy, concentric bands, 2 to 4, sometimes up to 10, cells wide, the spacing variable from one to several pore-diameters; bands mostly metatracheal, sometimes including or in contact with the pores. Wood fibers with moderately thick walls and numerous, small, simple pits. Ripple marks about 80 per inch, not very distinct. Vertical traumatic gum ducts present. Other anatomical details as in *Catostemma*.

AMERICAN WOODS OF THE FAMILY SAPOTACEAE

By SAMUEL J. RECORD

The Sapota family includes several hundred species of small to very large trees and some shrubs and is represented in nearly all tropical and subtropical regions. More than 200 genera have been described, but most of them have been reduced to synonymy or to the status of sections of larger genera. Important contributions to the classification have been published recently, but there is still difference of opinion regarding the validity of some genera and the limits of others. The author is convinced that a systematic study of the woods would be of great assistance in solving some of the taxonomic problems, but the material now available is insufficient for conclusive results.

The American woods are here treated under 15 generic designations, namely, *Achras*, *Bumelia*, *Calocarpum*, *Chromolucuma*, *Chrysophyllum*, *Dipholis*, *Ecclinusa*, *Henoonia*, *Labatia*, *Lucuma-Pouteria*, *Manilkara* or *Mimusops*, *Micropholis*, *Paralabatia*, *Pradosia*, and *Sideroxylon*, but according to Baehni's classification (*Candollea* 7: 394–508. 1938) the number would be reduced to seven. Some of the groups are maintained because of apparently valid differences in the woods, the others for convenience pending further reorganization of the family, since aggregation will be a simpler process than segregation.

The trees are characterized by a milky latex, often copious and in some instances of high commercial value, for example, chicle gum from *Achras* and balata from *Manilkara* or *Mimusops*. The leaves are alternate or rarely opposite, simple, entire or rarely dentate, and pinnately veined, the texture and color often profoundly affected by age; stipules are sometimes present, but caducous. The flowers are generally clustered in leaf axils, or above leaf scars, rarely cauliferous; they are typically white or greenish, but highly colored in *Chromolucuma* and *Pradosia*. The fruit is indehiscent, the pericarp usually fleshy, with one to several glossy seeds; usually edible and in some instances succulent and highly esteemed, *e.g.*, the Sapodilla (*Achras*) and the Zapote (*Calocarpum*). The

genus most valuable for timber is *Manilkara* or *Mimusops*, the source of Beefwood or Bulletwood of the Guianas and Massaranduba of Brazil.

Heartwood yellow or orange in *Bumelia*, *Henoonia*, and *Sideroxylon;* dark red or reddish brown in *Achras*, *Manilkara* or *Mimusops*, and some specimens of *Dipholis* and *Lucuma-Pouteria;* grayish or pinkish brown in the others; with oily appearance and feel in certain West Indian species of *Manilkara* or *Mimusops;* sapwood whitish and very distinct though often not sharply demarcated. Luster low to medium. Without distinctive odor. Taste sometimes astringent or somewhat bitter; sweet followed by astringent in *Pradosia*. Density variable from 0.65 to 1.25, mostly between 0.85 and 1.05; weight (air-dry) 41 to 78, mostly 53 to 65, lbs. per cu. ft.; texture typically medium, uniform; grain generally straight, sometimes wavy or otherwise irregular; working properties variable, but usually good; densest woods rather splintery; durability low to very high.

Growth rings usually present. Pores small to minute, usually not individually distinct to the unaided eye, though the groups may be; mostly in small multiples which are sometimes fairly uniformly distributed (*e.g., Chromolucuma* and *Pradosia*), more often in radial or oblique series, sometimes in flame-like groups (*e.g., Bumelia, Henoonia,* and *Paralabatia*). Tyloses usually abundant, sclerotic in part in *Bumelia, Chromolucuma, Ecclinusa, Lucuma-Pouteria, Micropholis,* and *Paralabatia;* fine spirals present in at least some of the vessels in *Bumelia, Henoonia,* and *Paralabatia;* vessel perforations exclusively simple, commonly with a wide rim; intervascular pitting fine to very fine, alternate to sub-opposite. Rays all uniseriate in *Chromolucuma;* in part 2, occasionally 3, rarely 4, cells wide in the others; heights variable up to 60 cells, generally much lower; weakly heterogeneous, in part at least, in *Bumelia, Calocarpum, Chromolucuma,* and *Henoonia*, decidedly heterogeneous in the others; cell walls thick, rarely sclerotic; gum deposits abundant; pits to vessels uniformly small and subcircular or oval in *Henoonia*, in part large, short to long oval or boomerang-shaped, sometimes in scalariform arrangement, in the others; pit-pairs half-bordered or unilaterally compound. Wood parenchyma abundantly developed, but usually not distinct without lens; finely or coarsely reticulate, at least in part, in *Bumelia, Calocarpum, Chrysophyllum, Dipholis, Henoonia,* and *Sideroxylon;* typically in numerous, narrow, uniform to wavy or somewhat broken concentric bands, mostly 1 to 3 pore-widths apart, in the others; cells mostly large, rarely with sclerotic walls; crystals common to abundant in some instances (*e.g. Achras, Manilkara* or *Mimusops,* and *Sideroxylon*), but generally absent or sparse. Wood fibers with moderately to extremely thick walls, the latter often gelatinous; pits small, simple or indistinctly bordered. Vasicentric or sparingly diffuse tracheids present in *Bumelia, Henoonia,* and *Paralabatia*. Ripple marks absent. No gum ducts seen.

Achras comprises three closely related species of medium-sized to large trees apparently limited in natural distribution to southern Mexico, Central America, and northern Colombia. The southernmost form is *A. calcicola* Pittier, a deciduous tree sometimes 80 feet tall and three feet in diameter, of common occurrence in Panama and Atlántico, Colombia, and known as Níspero or Níspero del Monte. The leaves are large and leathery and the bark contains a copious white latex.

A. chicle Pittier is known to occur in southern Mexico, British Honduras, Guatemala, and Salvador. It attains a height of 125 feet and a trunk diameter of three feet or more. It might be inferred from the specific name that this species is the principal source of chicle gum, but its latex is difficult to coagulate and is considered inferior to that of the Sapodilla, and in British Honduras the product is called "crown gum." In Guatemala the tree is known as Zapotillo and in Salvador as Níspero de Montaña.

The best known and most important tree is the Sapodilla, *A. Zapota* L. (=*A. Sapota* L.=*Sapota Achras* Mill.), a native of the Yucatán Peninsula and of indeterminate range southward in Central America, and cultivated generally throughout tropical regions. The glossy, leathery, evergreen leaves are clustered at the ends of the branchlets, as are also the small white flowers. The fruit is a rough and brownish berry, variable in size and form, the skin thin, the flesh reddish or brownish, melting and somewhat milky, of very sweet agreeable flavor, and containing few to several rather small seeds; it is considered one of the best of the tropical American fruits. The usual name in Central America is Níspero; in Mexico, Zapote, Chicozapote, and Zapotillo.

Achras Zapota is important commercially as the principal source of chicle, which until rather recently was the basis for nearly all chewing gum. At the peak of the industry, 1927 to 1929, the production was about twelve million pounds annually, but now it is very much less. The tree is at its best on the calcareous marl and disintegrated limestone over a large

area including the Yucatán Peninsula of Mexico, the Petén province of northeastern Guatemala, and the northern half of British Honduras. It is estimated that the Sapodilla forest there contains at least one hundred million trees. It has been suggested as possible that when the ancient Mayas, who valued the tree highly, made agricultural clearings they spared the Sapodilla trees, which thus obtained an advantage over other vegetation when the areas were abandoned. Other factors in its favor are its tolerance of shade, its ability to reproduce prolifically, and its longevity.

The native tappers, or chicleros, recognize three varieties, based on the color of the latex and the characters of the bark. Zapote Colorado, the commonest form, has a reddish latex and the bark has continuous fissures. Zapote Blanco has a whitish latex, often tinged with pink, the bark is easier to cut in tapping as the fissures are shallower and the inner part is not so fibrous. Zapote Morado is indistinguishable from the Zapote Colorado, except that the latex is darker and slightly purplish. Standley says (*Tropical Woods* 31: 40): "Careful study of the collected material leads one to suspect that such forms, although perhaps recognizable in the forest, never can be separated by characters of specific importance." The following information on Sapodilla tapping is from a paper by H. M. Heyder (*Empire Forestry Journal* 9: 1: 107–113; abstracts in *Tropical Woods* 24: 35–38):

> The tapping season is during the wet months of the year, roughly from October to March, and it begins after the period of heaviest rain, which usually comes about mid-September. Tapping depends greatly upon climatic conditions and a dry year implies a very scanty yield of chicle. . . . The method of tapping Sapodilla differs considerably from methods used in rubber tapping, and is more analogous to the tapping of gutta-percha. There is no continuous flow as in the case of rubber, and the healing of tapping cuts and replacement of latex is extremely slow. After one day's tapping the tree is usually allowed to rest for a period of three years or more, according to the area of bark which has been cut. The method which is used generally in Central America is to make zig-zag cuts in the bark, about eighteen inches apart, all the way up the tree from about two feet above the ground to the first branch. The zig-zag pattern of the cuts originates from the fact that it can easily be made with the machete [a keen-edged cutlass with a 28-inch blade] which every native carries in the forest in Central America. . . . Where the zig-zag cuts have been made for more than two-thirds way around the stem, or where the cuts have been made too deeply, as frequently happens, the cambium is killed, the bark loosens, and the tree slowly dies. A large percentage of the mature and middle-aged Sapodilla now standing in the forests is in a moribund condition due to these causes.
>
> Tapping is generally done . . . between 6 a.m. and 11 a.m., as the air is then still and humid in the forest. The latex coagulates very rapidly on exposure to sun or drying wind, and even without these adverse factors it generally ceases to flow within four to six hours from the time of cutting, so that the chicleros are usually back in their camp soon after midday with the result of their morning's work. Rain does not interfere with tapping, as the extra water can easily be evaporated from the latex. . . . In cooking chicle, a large open cauldron holding about 40 gallons is used, and a small wood fire is placed below it. The chicle bubbles up, giving off a cloud of steam. All through the cooking process, a man stirs the chicle with a paddle to prevent it from scorching against the sides of the cauldron. When the moisture has been much reduced and the chicle has become a viscous mass which can hardly be moved with the paddle, it is dumped out of the cauldron on to a piece of canvas, previously rubbed with soap to prevent sticking, and there moulded into an oblong or oval block of about 20 lbs. weight. The blocks are set aside to harden for a few days and then packed into sacks, loaded on mules, and taken to the nearest river bank, whence they are despatched by boat to the export depot.

The woods of the different species of *Achras* are very much alike. The timber is noted for its strength and durability and was used extensively in early Mayan construction for lintels and supporting beams. It still serves the same purposes, as well as for railway ties, heavy flooring, and tool handles, but is not exported. The anatomy is fairly typical of the red woods of the family.

Heartwood dark reddish or reddish brown; distinct, but not sharply demarcated, from the pinkish sapwood. Luster rather low. Without distinctive odor or taste. Very hard and heavy; sp. gr. (air-dry) about 1.09; weight 68 lbs. per cu. ft.; texture rather fine; grain fairly straight; not easy to work, has a tendency to splinter, can be finished smoothly; highly resistant to decay.

Growth rings often present, usually indistinct. Pores small, not individually distinct without lens, though the groups may be; variable in abundance, sometimes rather few; mostly in multiples, arranged in irregular radial series. Tyloses abundant in heartwood; vascular pitting fine. Rays uniseriate and biseriate and up to 30, though generally only 15 to 20, cells high; decidedly heterogeneous; cells thick-walled; gum deposits usually abundant; pits to vessels in part oval to much elongated, sometimes boomerang-shaped. Wood parenchyma readily visible with lens; in continuous or broken concentric lines or very narrow bands, usually rather uniformly and closely spaced;

crystalliferous strands common. Wood fibers with very thick, often gelatinous walls, and narrow lumen; pits very small.

COMMON NAMES: Chicle tree, naseberry, neesberry or nisberry, sapodilla (English); níspero, sapodilla (Span. Am., gen.); sapote or zapote (Cuba); nisperillo (Dom. R.); sapotille (Haiti); sapotier, sapotille, sapotiller, or sapotillier (Fr. W. I.); mispel, m. boom, mispoe, sapatija (Ned. W. I.); chicle zapote, chicozapote, chiczapotl, guenda-xiña, peruétano, tzicozapotl, xicozapotl, ya, zapote, z. blanco, z. chico, z. colorado, z. de abejas, z. morado, zapotillo (Mex.); chicle macho, chiquibul, sapodilla (Br. H.); muy, zapotillo (Guat., Hond.); muyozapot, níspero de montaña (Salv.); ibán (Nic.); korób, níspero tierno (C. R.); níspero del monte (Col.); níspero de montaña (Venez.); níspero quitense (Ec.); sapotilha (Braz.).

Bumelia, with about 50 species of lactescent deciduous or evergreen shrubs and small to medium-sized trees, is generally distributed from southern United States to Argentina, except in most of the Amazon basin. The plants are often armed with simple or branched spines; the small leaves are commonly clustered on spur-like branchlets; the little white or greenish flowers are fascicled in the leaf axils or along old branches; the fruits are small, one-seeded, and with dry or succulent and edible flesh. The yellowish timber is very hard, tough, and strong, but it is sparingly utilized because the trunks are generally short and poorly formed.

There are 12 species in the United States, with a combined range from Florida to Arizona and extending up the Mississippi valley to near the mouth of the Ohio River. The largest of these is *B. lanuginosa* Pers., which in the Texas coast region attains a height of 50 feet and a trunk diameter upward of 24 inches. There are several species in the West Indies and one of them, *B. obovata* (Lam.) A. DC. (=*Sideroxylon obovatum* Lam.), is said to extend through the high plateaus and western watersheds of Mexico and along the Pacific coast of Central America to northern Colombia. It is sometimes 50 feet high, but more often smaller and branched near the base of the trunk. The wood is used for making household implements and tool handles.

Of the southern species the largest is *B. obtusifolia* Roem. & Schulte, with a wide range centering in northern Argentina. It grows to a height of 65 feet or more, with a trunk sometimes 36 inches thick. The yellowish wood takes a lustrous polish and is used for handles and wheelwright work, but is too dense for general carpentry and not durable enough for exposed construction. It is good for fuel, though several other kinds of native timbers are superior to it.

The following description is based upon samples of 12 species. Wood yellowish throughout, usually with white parenchyma markings, sometimes with tinge of green or pink. Luster medium. Odor not distinctive, taste often rather bitter. Mostly very hard and heavy; sp. gr. (air-dry) 0.80 to 1.01; weight 50 to 63 lbs. per cu. ft.; texture medium to rather coarse; grain variable; not easy to work, but can be finished very smoothly; not highly resistant to decay. Of no commercial importance.

Growth rings present, sometimes very distinct. Pores small, not individually distinct without lens; sometimes in narrow concentric bands in early wood, more often in clusters and short radial multiples associated with tracheids and parenchyma and forming distinct flame-like or dendritic pattern. Vessels in part with fine spirals; thick-walled, sometimes sclerotic, tyloses present. Rays 1 or 2, sometimes 3 or 4, cells wide and up to 30 cells high; weakly to decidedly heterogeneous; cells thick-walled; crystals common; pits to vessels medium-sized, oval to elongated. Wood parenchyma associated with the pores and reticulate, or in narrow closely spaced concentric bands. Wood fibers with thick walls and small cavities. Vasicentric tracheids present.

COMMON NAMES: Antswood, black haw, buckthorn, chittimwood, downward plum, gum elastic, ironwood, saffron plum, sloewood (U. S. A.); cocuyo, jiquí de costa, j. espinoso, sapote espinoso (Cuba); boxwood, breakbill (Br. W. I.); bois de buis, b. de fer, petit buis (Fr. W. I.); bebelama, coma, c. resinera, hastoch, huicicialtemetl, putzmucuy, tempeschitle, tempesquistle, tempextle, tempixquiztli, tempixtle, tempizquixtli, tempizquiztle (Mex.); ávalo (Guat.); ispundio, limoncillo, zapotillo de peña (Salv.); espino blanco (C. R.); caimitillo, limoncillo (Pan.); doncello, espino de brujo, guamachito, pacito de montaña, p. del monte (Col.); barba de tigre, igüí, malarmo, patillo, paují (Venez.); abio, rompe gibão (Braz.); cabo de lanza, guaraniná, guayaibí-rai, horco-molle, ibirá-hú, i.-ñirá, lanza colorada, molle del monte, m. negro (Arg.).

Calocarpum includes two closely related species of large, deciduous, laticiferous trees native to Central America and widely planted in tropical regions for the fruit. The leaves are very large, thin, and clustered at the ends of the twigs; the flowers are borne on the bare branches below the leaves. The timber is not of commercial importance as the trees are protected on account of their edible fruit.

The best known species is the Zapote, *C. Sapota* (Jacq.) Merrill (=*C. mammosum* [L.] Pierre), a tree sometimes 100 feet tall with an elongated crown or more often with a short trunk and spreading crown. It belongs to the class of semicultivated plants and the limits of its natural distribution are unknown, but it is generally considered a native of Central America. Pittier says (*Contr. U. S. Nat. Herb.* 18: 2: 83): "The fruit has a thick mesocarp of a reddish or pinkish color, and a little sticky on account of the latex it contains. The flavor is sweetish, with a peculiar squashy strain, quite delectable if we believe some Spanish authors, but not generally to the taste of foreigners. This strain might, however, be removed or improved by appropriate selection and culture. That same mesocarp can also be turned into an excellent marmalade, or into jelly, and although the fruit does not yet seem to have met with any great favor in our markets, it is not altogether without importance among tropical fruits. The seed contains a large, oily almond, which has a strong smell and a bitter taste. . . . In Costa Rica . . . the whole almond, finely ground, is made into an excellent confection. Moreover, . . . it seems to have been extensively used, and is still used on a small scale, in conjunction with cacao, in the preparation of the current beverage of the natives of Central America. It is called 'sapuyul.' . . . As a historical memorandum, we may also mention that during the first half of the nineteenth century the same seed was still used in Costa Rica in lieu of the present iron to smooth starched white linen."

C. viride Pittier is similar in appearance to the other species but differing, according to Pittier (*loc. cit.*, p. 85), "by the smaller leaves, downy and white beneath, . . . and, above all, the comparatively small, green, and thin-skinned fruit and the smaller, ovate seed. . . . The fruit is superior in

quality to the common Zapote, the flesh not being so fibrous and being free from the squashy flavor that characterizes the latter." Engelsing says (*Tropical Woods* 17: 34) that in Nicaragua it is "a large tree, 100 feet high, with straight and cylindrical trunk sometimes 3 feet in diameter above the buttresses (6 feet) and free of branches for 60 feet, of frequent occurrence among the low hills near the Kukalaya River, attaining its best development in rich well-drained soil. Bark near the base scales off and leaves the trunk smooth, while that higher up is shallowly furrowed between confluent ridges; color greenish gray, sparsely mottled with lighter gray patches higher up. Branches heavy and ascending, with numerous branchlets and twigs at upper end which, with their dark green leaves, form a sort of crown for each branch. White sticky latex exudes copiously from wounded bark and leaves."

The woods of the two species are much alike. They are light-colored when first cut, changing to light brown or buff, eventually acquiring a slight reddish tinge; heartwood and sapwood not clearly differentiated. Luster rather low. Odor absent, taste sometimes slightly bitter. Hard, heavy, tough and strong; texture medium; grain usually straight; working properties fair to good; durability doubtful. Not likely to be of commercial importance.

Growth rings present but not always distinct. Pores not individually distinct without lens, fairly numerous; mostly in small multiples with more or less distinct radial arrangement. Rays 1 or 2, rarely 3, cells wide and up to 45 cells high. Wood parenchyma finely reticulate or in numerous, narrow, fairly regular concentric bands; no crystalliferous strands seen. Other details as in *Achras*.

COMMON NAMES: Mamee apple, m. sapote, marmalade fruit, sapote (Br. W. I.); mamey colorado, m. sapote (Cuba); sapotier (Haiti); grosse zapotte, zapotte, z. á crême (Fr. W. I.); atzapotiquahuitl, chacal haaz, haaz, lava-zapote, mamey, m. colorado, tezonzapote, tezonzapotl, tsapas sabani, tzapotl, zapote, z. colorado, z. mamey (Mex.); mamee apple, m. zapote, zapote (Br. H.); chul, chul-ul, ingerto, sal-tul, tul-ul, zapote ingerto (Guat.); zapote (Cent. Am., gen.); zapotillo (Hond.); bko, fiú, komkrá, kurók, zapote blanco, zapotillo, z. calenturiente (C. R.); mamey, oabo (Pan.); zapote (Col., Venez., Ec.).

Chromolucuma *rubriflora* Ducke, the only species, is a large laticiferous tree, sometimes 100 feet tall, with high buttresses, growing in lowland forests in the east-central Amazon region of Brazil, where it is known as Abiurana and Maiá. According to Baehni (*loc. cit.* p. 429) the genus should be included with *Pouteria*. Ducke, who proposed the genus, says (*Archiv. Jard. Bot. Rio de Janeiro* 4: 101) that the tree is one of the most remarkable of the family, so abundantly represented in Brazil, by reason of its foliaceous stipules, its very large leaves, its very long and slender peduncles, and especially the color of the flowers which gradually changes from yellowish green in the bud through distinct yellow and orange to bright red in the adult calyx. With the exception of *Pradosia lactescens* (Vell.) Radlk., which has reddish violet-brown flowers, the characteristic floral colors in the family are green, white, or rusty-brown.

The following description is based on a single wood specimen (Yale 20,693; Ducke 12). Heartwood light brown with reddish or orange tinge; not clearly differentiated from the sapwood. Luster medium. Without distinctive odor or taste. Hard and heavy; texture medium; grain straight; rather difficult to work; durability doubtful.

Growth rings rather indistinct. Pores not individually distinct without lens, rather few; mostly in pairs or short radial multiples, fairly evenly distributed. Tyloses abundant, sclerotic in part. Rays uniseriate or locally biseriate and up to 30 cells high; cells mostly squarish; pits to vessels large. Wood parenchyma in numerous, regular, coarse-celled, concentric lines or biseriate bands 1 to 2 pore-widths apart; no crystalliferous strands seen. Wood fibers with thick walls.

Chrysophyllum, with about 150 species of small to large evergreen trees and shrubs, is widely distributed in tropical and subtropical regions, especially tropical America. The bark contains a milky latex; the leaves are glabrous and shiny above, densely silky hairy beneath; the small flowers are clustered in axils of the leaves or above old leaf scars, rarely cauliferous; the fruit is variable as to size, form, consistency, and number of seeds.

The best known species is the Caimito or Star-apple, *C. cainito* L., a tree 35 to 65, rarely up to 100, feet high, native in the West Indies and possibly also in eastern Central America.

It is widely planted as a shade tree and also for its succulent, edible fruit which is of the size and shape of a small apple and contains several compressed brown seeds arranged star-like about a central axis. The foliage is bright blue-green above and coppery beneath, affording attractive contrast when stirred by the wind.

The most widely distributed of the North American species is *C. oliviforme* L., a small to medium-sized tree with a straight and slender trunk, occurring in southern Florida, the Bahamas, Cuba, Puerto Rico, Jamaica, southern Mexico, Salvador, British Honduras, Guatemala, and Honduras. The Mexican form was described as a distinct species, *C. mexicanum* Brandeg., but Standley says (*Tropical Woods* 31: 42): "Careful examination of a large number of sheets of this plant, as represented in Mexico and Central America, shows that it can not be separated from the West Indian *C. oliviforme*." It is closely related to *C. argenteum* Jacq. of Costa Rica and Panama, also of the West Indies.

There are several species in the Guianas and the Brazilian Amazon region, the best known perhaps being *C. sericeum* A. DC. The Kokoritiballi of British Guiana is *C. ambelaniifolium* Sandw. The largest of the Argentine species is the Picazú-rembiú, *C. ebenaceum* Mart. (=*C. Martianum* A. DC.), which is sometimes 75 feet high and 20 inches in diameter in Misiones. The Aguay, *C. lucumifolium* Gris., has a wider distribution; its fruit is savory and the latex, called balata, is used like gutta-percha.

The timbers of the various species of *Chrysophyllum* are employed locally in limited amounts for general construction and carpentry, and the darker-colored kinds are suitable for exposed works. They are not likely to become of importance in the export trade.

Heartwood variable in color from pale brown or pinkish to rather dark brown, with gradual transition to the sapwood. Luster rather low. Odor and taste absent or not distinctive. Hard and heavy, though variable in different species; sp. gr. (air-dry) 0.65 to 0.90; weight 41 to 56 lbs. per cu. ft.; texture medium fine; grain fairly straight; not difficult to work, finishing smoothly; durability fair to good.

Growth rings present, but often indistinct. Pores not individually distinct without lens, rather numerous; mostly in small multiples in irregular radial arrangement. Rays uniseriate and biseriate and up to 50, occasionally more, cells high. Wood parenchyma finely reticulate or in very narrow, fairly regular concentric bands; crystalliferous strands absent or few. Wood fibers with thick, often gelatinous walls. Other details much the same as in *Achras*.

COMMON NAMES: Satinleaf (Florida); caimitillo, caimito, c. blanco, c. cimarrón, c. morado, macanabo (Cuba); caimitillo, caimito, c. de perro, c. verde, cainit, lechecillo, teta de burro (P. R.); caimito, c. blanco cimarrón, c. cimarrón, carabana (Dom. R.); caimite, c. marron (Haiti); caimitier, cainitier, pomme surrette (Fr. W. I.); canela, caimito, chiceh, palo de canela, zapote caimito (Mex.); chique, damsel, star-apple, wild star-apple (Br. G.); guayabillo, zapoyillo (Salv.); caimito, c. cimarrón (C. R.); caimito serrano (Venez.); kokoritiballi (Br. G.); apra, atakamara, borowéballi, boschkoffie, jorromeran, kwatta bobbi, laurierkers, loekrie hoedoe, peprebolletrie, riembout, sterappel, takamala (Sur.); caimitier, cainitier, macoucou (Fr. G.); ajará, caimitero, caimito, camiquié, guajará branco, massaranduba-rana, sorva do Perú (Braz.); balata blanca, b. de manchal (Peru); aguay, a. blanco, blanquillo colorado, carapún, carne de vaca, chalchal, lanza blanca, olivo-rá, picazú-rembiú (Arg.).

Dipholis, with about a dozen species of small to medium-sized, unarmed, lactescent trees, occurs in southern Florida, West Indies, southern Mexico, and Central America. The buds are naked; the leaves are persistent; the flowers are usually fragrant and borne in clusters on the axils of the leaves or above leaf scars; the fruit is plum-like. The timber is strong and fairly durable and finds local uses in general construction.

The best known species, with the range of the genus, is *D. salicifolia* (L.) A. DC. (=*Achras salicifolia* L.=*Bumelia salicifolia* [L.] Sw.), a slender tree usually less than 50, rarely up to 75, feet tall and 20 inches in diameter. It is commonly known as Bustic or Cassada in Florida and the British West Indies. The bark is rich in milky latex, which is a minor source of chicle gum in British Honduras and Guatemala.

D. Stevensonii Standl. is a large tree, common in the Mopán region of British Honduras, where it is called Faisán or Zapote Faisán. It resembles *Calocarpum* and was originally confused with *Calocarpum viride* Pittier (see *Forests and flora of British Honduras*, p. 313; *Tropical Woods* 11: 21–22; 53: 43). It is distinguished from the other Central American Sapotaceae by the rustlike tomentum of the leaves. The latex is used for chicle, called chicle faisán. The chicleros recognize two varieties of tree, Red Faisán, whose chicle is as good as that of *Achras Sapota* L., and White Faisán, with higher yield but somewhat lower quality of latex.

According to Charles Baehni (*Candollea* 7: 434, 1938), *Dipholis* is not distinct enough from *Bumelia* to be entitled to generic rank. From a preliminary study of the woods, however, it appears that the separation is justifiable.

Heartwood brownish to reddish brown, with gradual transition to the sapwood. Not highly lustrous. Odor not distinctive, taste somewhat bitter. Very hard and heavy; sp. gr. (air-dry) 0.90 to 1.00; weight 56 to 62 lbs. per cu. ft.; texture medium fine; grain fairly straight; not difficult to work, finishing smoothly; durability fair to good.

Growth rings present, but often indistinct. Pores not individually distinct without lens, rather numerous; mostly in radially arranged multiples. Rays uniseriate or biseriate and up to 30, occasionally more, cells high; decidedly heterogeneous. Wood parenchyma finely reticulate, except in *D. jubilla* Ekman (Yale 19,298) where it is in numerous, narrow, concentric bands. Wood fibers with very thick gelatinous walls. Other details as in *Achras*.

COMMON NAMES: Bustic, cassada (Florida); barberry bully tree, gallamenta (Jam.); almendrillo, almendro, a. silvestre, Carolina, cullá or cuyá, jocuma, j. blanca, juba, j. prieta, jubilla, sangre de doncella (Cuba); almendrón, bustic, espejuelo, tabloncillo, varital (P. R.); caya colorado, c. de loma, c. rubia (Dom. R.); acomât rouge, bois d'Inde, sapotillier marron (Haiti); acomât bâtard, balata bâtard (Fr. W. I.); mijico, xac-chum (Mex.); cháchiga, faisán—red, white, or zapote (Br. H.); nispero amarillo, tempisque (C. R.).

Ecclinusa includes about a dozen closely related species of small to large, unarmed, lactiferous trees apparently limited in distribution to the Guianas, the Brazilian Amazon region,

and southward to Rio de Janeiro. The leathery leaves have well developed stipules; the flowers are sessile and in axillary clusters; the small globular fruits contain several exalbuminous seeds. The timber is of good quality and is used to a limited extent locally for interior construction and carpentry.

E. sanguinolenta (Pierre) Engl. (=*Ragala sanguinolenta* Pierre) occurs in French Guiana where it is known as Balata Pommier and Bois Cochon. According to Bertin (*Les bois de la Guyane française*, pp. 67–69), it has a long trunk 28 to 40 inches in diameter at the base and free of branches for more than 75 feet. The timber has about the density of Oak (*Quercus*) and has good working properties, but is not very durable when exposed to decay. Another Guiana species is *E. guianensis* Eyma, generally known as Bartaballi or Barataballi. It attains a height of about 100 feet and the latex is used to adulterate balata (*Mimusops*).

E. ramiflora Mart. is a small to medium-sized tree in the uplands of the lower Amazon and southward along the coast. Much like it, but smaller and sometimes shrubby, is *E. abbreviata* Ducke in the forests about Manáos. *E. balata* Ducke is a medium-sized to rather large tree of the central and western Amazon. Ducke says (*Tropical Woods* 31: 20) that it "produces almost all the inferior quality of balata of the Brazilian Amazon. This product contains only about 30 per cent of gutta (according to Le Cointe, Director of the Museu Commercial do Pará), but the total value of its exports greatly exceeds that of the superior balata derived from *Mimusops bidentata* A. DC., which, in Brazil, occurs only in the relatively narrow region along the frontier of the Guianas. Enormous quantities of this inferior balata have been exported, especially from Manáos, but this industry is destined to disappear because all the trees in accessible regions are being felled to obtain the latex."

The woods of the few species studied are similar in structure and properties. Heartwood light brown, with pinkish or grayish tinge, and sometimes with widely spaced brown streaks; not sharply differentiated from the sapwood. Luster medium. Odorless; taste mildly bitter. Hard and heavy to moderately so; texture medium; grain fairly straight; easy to work, finishes very smoothly; probably poorly resistant to decay and insect attacks. Not likely to become important for export.

Growth rings present or absent, usually indistinct. Pores near limit of vision, fairly numerous; mostly in radial or diagonal series. Tyloses thick-walled, sclerotic in part. Rays uniseriate or locally biseriate and up to 40 cells high; decidedly heterogeneous, most of the cells square or upright; ray-vessel pitting very irregular. Wood parenchyma in regular, concentric lines or narrow bands about the width of the rays and a pore-width apart. Wood fibers with moderately thick walls and arranged in fairly definite radial rows. (See *Tropical Woods* 31: 27.)

COMMON NAMES: Barataballi (Br. G.); ajowo, araatawere, baalata, bataballi, barataballi, battamballi, kodiebie joesie, malobbi, mattamatta wèwè, poeromotto, wasepoekoe (Sur.); balata, b. pommier, b. rouge, b. saignant, bois cochon, wapo (Fr. G.); abiurana, balata, coquirana, c. itaúba, c. malenta, ucuquirana (Braz.).

Henoonia consists of two species of shrubs apparently endemic in Cuba. The leaves are small and leathery; the little flowers are borne singly or clustered in the axils of the leaves; the fruits have a single exalbuminous seed. The only specimen available for this study is of *H. angustifolia* Urb. (Yale 16,160) collected with flowering herbarium material in eastern Cuba by G. C. Bucher and determined by J. T. Roig. The original species, *H. myrtifolia* Gris., has been referred by some botanists to the Solanaceae, but the structure of *H. angustifolia* is definitely sapotaceous and very close to *Bumelia*. (See *Tropical Woods* 58: 3.)

Wood light yellow throughout specimen. Not highly lustrous. Without distinctive odor; taste slightly bitter. Hard, heavy, and strong; texture fine and uniform; grain fairly straight; takes a glossy polish; is probably not resistant to decay. Of no commercial importance.

Growth rings present, in part distinct. Pores very small, to minute, thick-walled, numerous; in radial patches or flame-like pattern distinct to unaided eye. Vessels sometimes with fine spirals. Rays uniseriate and biseriate and up to 30, generally less than 20, cells high; weakly heterogeneous; pits to vessels small, subcircular to oval. Wood parenchyma finely reticulate with tendency to concentric lines; cells often disjunctive. Wood fibers with very thick walls. Some vasicentric tracheids present.

COMMON NAMES: Rascabarriga, yareicillo (Cuba).

Labatia is a poorly defined genus with several tropical American species generally included with *Pouteria*. Apparently they are all small, unarmed, laticiferous trees with hairy fruits. There are two species in the island of Haiti, at least three in Cuba, and three in Panama. The latter resemble *Lucuma* and all of them were originally referred to that genus (see *Tropical Woods* 4: 8; 31: 43). The woods bear a close resemblance to those of *Paralabatia*, and apparently are not utilized for any special purposes.

COMMON NAMES: Chicharrón, guayabillo de la maestra, sapote culebra de costa, sapotillo (Cuba).

Lucuma and **Pouteria.** According to Eyma's classification (*Rec. Trav. Bot. Néerl.* 33: 159), *Pouteria* includes *Lucuma*, *Labatia*, *Oxytheca*, *Barylucuma*, *Glycoxylon*, and *Pradosia*. Baehni (*Candollea* 7: 394–508) goes further and adds *Chromolucuma*, *Micropholis*, *Paralabatia*, and *Sygygiopsis*, but refers *Glycoxylon* and *Pradosia* to *Chrysophyllum*. The present author has treated *Chromolucuma*, *Labatia*, *Micropholis*, *Paralabatia*, and *Pradosia* (including *Glycoxylon*) as separate genera, though more as a matter of convenience in event of future reorganization of the family than because of profound differences in wood structure. *Barylucuma*, *Oxytheca*, and *Sygygiopsis* are not represented in the Yale collections. Hence, as treated here, *Lucuma* and *Pouteria* are practically synonymous.

The confusion of *Lucuma* and *Pouteria* is of long standing. Eyma says of *Pouteria* (*loc. cit.*): "Aublet's description of this genus and of the only species that he knew, *P. guianensis*, is very clear, and especially his plate 33 does not leave any doubt about its identity. The circumstance, however, that he attributed a wrong fruit to it [*Sloanea*, Elaeocarpaceae] has long impeded a right understanding and may have been the principal cause that so many species have been described as *Lucuma*. . . . The fact that *Pouteria* is a mixture . . . is fully counterbalanced by the even greater confusion in Molina's diagnosis of *Lucuma*, which was based on some very heterogeneous plants. . . . Molina's five species were very inadequately described and, in the absence of herbarium specimens, the vernacular names and notes about their use supply the principal means of identification. Authors agree, however, that *L. keule* Molina and *L. spinosa* Molina are not Sapotaceae, the former being *Adenostemon nitidum* Pers., *Gormortega nitida* Ruiz & Pav. (Gormortegaceae), the latter *Gourliaea chilensis* Clos (Leguminosae)."

The many species in this group are small to large, unarmed, lactescent trees, mostly tropical American. The leaves are without stipules and with varying nervation; the flowers are borne in clusters in leaf axils or above leaf scars; the fruits, which vary in form, consistency, and number of seeds, are usually edible and in some instances highly esteemed. The timber is of good quality for strong construction and the more deeply colored kinds are highly resistant to decay.

Heartwood grayish brown to reddish brown, not sharply demarcated and usually not clearly differentiated from the lighter colored sapwood. Luster rather low. Without distinctive odor; taste sometimes astringent. Moderately to very heavy and hard; sp. gr. (air-dry) 0.70 to 1.10; weight 44 to 69 lbs. per cu. ft.; texture mostly medium, uniform; grain typically straight, occasionally wavy; working properties and durability variable.

Growth rings usually poorly defined. Pores small, not very numerous; generally in small multiples which often are arranged into distinct radial series. Vessel lines often prominent. Tyloses common to abundant, sometimes sclerotic; pitting very fine. Rays uniseriate or biseriate and up to 40, sometimes to 60, cells high; decidedly heterogeneous, pits to vessels large and elongated in part. Wood parenchyma in fine to moderately coarse, uniform to wavy, concentric bands, variable in spacing though generally close together; crystalliferous strands absent or few. Wood fibers with thick to very thick walls.

COMMON NAMES: Canisté or canistel, sapote culebra, siguapa (Cuba); ácana, jácana (P. R.); egg-fruit (Bah.); jaune d'oeuf (Haiti); pain d'espice, penny piece (Trin.); atzapolquahuitl, atzapotl, comíngalo, cozticzapotl, huicón, kanizte, palo de calentura, p. huicón, zapote amarillo, z. blanco, z. borracho, z. de niño (Mex.); mamey cerera, m. cerilla, m. ciruela, silly young (Br. H.); silión, zapotillo (Guat.); chicazapote, guaicume or güicume, pan de la vida, ulozapote (Salv.); silión (Hond., Nic.); canistel, mamón,

siguapa, zapotillo (C. R.); ingerto de montaña, mamecillo (Pan.); caimo blanco, manzano morado, sapote macho (Col.); lechosillo, soberbio, temare, vaquetero (Venez.); assapoko, a. balli, bakupar, barata, kokeritiballi, limonaballi, male bullet tree, moraballo, sororo-borieng (Br. G.); abenbele, a. njambokka, ajapoekoe, akawasiba, aretoboma, aroomé, asepoko konoko, a. moraballi, atakamara, a. balli, basaa botie-ie, basra kokoni-oedoe, basterd bolletrie, biesatokon, boeloewéballi, boesi koesoewé, bosch koesoewé, djoe bolletrie, d. botrie, eukele, hariraro asepokoe, h. moraballi, iawé hepapaja, iengie hoedoe, janboka, jansnijder, jawahe paikoelia, j. papaje, kiemboto or kienboto, kodibiesie, kodibiosiballi, koesariejeppo, koesiri paratare, k. pialatara, kokonihoedoe, koni-koni waata, konoko, k. balli, kororietje-balli, kwatta bobi, laurierkers, lemoepoe, logoesoe fehoeta, lohoedoe, mabijara, mamanten, mambiara, mapijara, mapilan, mapiran, m. warian, m. hariroro, m. khalé-meroe, mapirian, mapiwalan, moraballi, m. diamaro, njamboka, oeroemerian, olemelan, oro oromé, orromé, piento botrie, riemhout, remoe epe, saffoe-ka, sagwenki hoedoe, sueparatarie, tamoené koesali epo, t. paraata, t. paratare, tapoekoe, tepjori pjorikin, tipopolipoli kinwewe, toepoewe, toewonoele, topie a baakawan, t. njambokka, warrossieran, wasse poekoe, wesse poekoe, w. p. kessipoeloe, weti apokwi, witte djoe bolletrie (or botrie), wokko moloko telle, wokoeloe allowe, zwart riemhout (Sur.); balata indien, b. singe rouge, jaune d'oeuf, pomme de pin, wapi, wapo (Fr. G.); abi, abia, abiu, a. grande, a. rana, a. r. grande, a. r. gutta, a. r. mucura, bapeba, b. assú, chauá, cutiti, cutitiribá, c. grande, c. rana, frutão, goititurubá, grão de gallo, guajará, guapeba, guapebeira, maparajuba, massaranduba branca, mata-olho, mucurí, muirá-pixi, oititurubá, pajurá, pariri, uajará (Braz.); balata mapa, caimito, huangana-caspi, locma or lucmo, lucumo, quinilla blanca, pucuna-caspi, sacha-caimito, uchpa-quinilla, urcu-cumala (Peru); aguay-mí, mata-ojo (Par.); mata-ojo (Urug.); aguay, a. guazú, mata-ojo (Arg.).

Manilkara or **Mimusops.** Insofar as the American species are concerned, these two names are synonymous. In the sense

now used by many botanists, they are distinct genera, *Manilkara* being a segregate from *Mimusops* (*sens lat.*). Considered in this way, *Mimusops* is restricted to the tropics of the Old World, while *Manilkara*, with about 50 species, occurs in tropical and subtropical regions of both hemispheres. Ducke (*Arch. Inst. Biol. Veget.* 4: 1: 56) opposes the separation of the genera because of the inconstancy or inadequacy of the features used to distinguish them. Eyma (*Rec. Trav. Bot. Néer.* 33: 205) is of the opinion, however, "that the combination of several characters not always very constant nor very important if taken separately, but all differing in a parallel way, justifies the distinction of the two genera." From present knowledge of the woods, the whole group might well be included in a single genus.

The plants vary in size from little more than shrubs to massive trees 150 feet tall and over six feet in diameter. One of the best known species of *Mimusops* (*sens str.*) is *M. Heckelii* (A. Chev.) Hutch. & Dalz. (=*Dumoria Heckelii* A. Chev.), the West African tree supplying the timber called African Cherry or Cherry Mahogany. The American timbers known to the export trade are the Beefwood or Bulletwood of British Guiana (*M. bidentata*), the Massaranduba of Brazil (*M. Huberi*), and the Almique, Acana, or Donsella from Cuba (*M. albescens*). The product of greatest value is the coagulated latex, called balata, which is obtained from a few species, mostly South American. The fruits are edible but not highly esteemed.

The range of the American species includes southern Florida, the West Indies, southern Central America, and South America to the Peruvian Amazon and southeastern Brazil. The most northern representative is the Wild Dilly or Wild Sapodilla of the southern Florida Keys, *Manilkara emarginata* (L.) Britt. & Wils. (=*Sloanea emarginata* L.=*Mimusops emarginata* [L.] Britt. & Wils.), a tree sometimes 35 feet tall and 12 inches in diameter; it also occurs in the Bahamas, Puerto Rica, and Cuba, although Roig (*Dic. Bot. Nom. Vulg. Cubanos*, p. 839) lists the name as a synonym for *Mimusops Wrightiana* Pierre.

The Acana of Cuba is a large tree supplying one of the best

timbers in the island for heavy and durable construction of all kinds. The name is generally applied to *Manilkara albescens* (Gris.) Standl. (=*Bassia albescens* Gris.=*Labourdonnaisia albescens* [Gris.] Benth.=*Mimusops albescens* [Gris.] Hartog), but according to Roig (*loc. cit.* p. 7) there is another species involved, namely, *M. Wrightiana*. The wood is of a deep rich red color, with an oily appearance and feel; because of its hardness it is difficult to nail without splitting and railway ties made of it must be bored before spiking. It takes a beautiful polish and is often employed for articles of turnery. Limited quantities have been sold in New York under the native name and also as Doncella and Almique. The last is based upon the Cuban Almiquí, and G. C. Bucher of Santiago de Cuba informs the author that "Acana and Almiquí are synonyms, the names being interchangeable in this district." Roig, however, says (*loc. cit.*, p. 35) that Almiquí is *Mimusops discolor* Ekman, and that the common name is also confused with Aimiquí or Jaimiquí, *Manilkara jaimiqui* (C. Wr.) Dubard (=*Mimusops jaimiqui* C. Wr.). The woods, so far as studied, are virtually the same. *M. albescens* occurs also in Hispaniola, being called Bois Huile or Sapotille Marron in Haiti and Nisperillo in Dominican Republic. The fruit resembles an unripe Níspero (*Achras*).

Two Central American species have been described. Pittier says (*Contr. U. S. Nat. Herb.* 13: 12: 465–6) that *Manilkara spectabilis* (Pitt.) Standl. (=*Mimusops spectabilis* Pitt.), which he discovered near Port Limón, Costa Rica, is a very large tree with a straight trunk often reaching a height of 130 feet. "This noble tree is conspicuous by its towering proportions among the constituents of the littoral forests of the Atlantic coast. . . . [It] is one of the Nísperos of the Costa Ricans and the Jamaican immigrants call it Bully Tree. . . . The wood is hard, heavy, and dark and being very resistant to water and wet soil is in great demand for railroad ties." *Manilkara darienensis* (Pitt.) Standl. (=*Mimusops darienensis* Pitt.) was found by Pittier on hills back of Puerto Obaldía, San Blas Coast, Panama. He says (*Contr. U. S. Nat. Herb.* 18: 6: 249–250) that it is 130 to 165 feet tall, with an unbuttressed trunk often over five feet in diameter, and

"has great economic importance as the source of the Panama 'balata' or 'gutta-percha' and the wood is also very valuable. From an ecological standpoint the tree, which is very abundant in the hilly hinterland of the Caribbean coast, is to be considered as a characteristic element of the rain forests of the eastern part of the Isthmus."

As a source of balata the most important species appears to be *Manilkara bidentata* (A. DC.) A. Chev. (=*Mimusops bidentata* A. DC.), a large tree of the Guianas, Venezuela, and the upper and northwestern Amazon region. This tree has often been referred to as *Mimusops balata* (Aubl.) Gaertn. (=*Achras balata* Aubl.), but this name belongs to a tree which was introduced into French Guiana from Mauritius and known only in cultivation (see *Tropical Woods* 58: 24). The native tree is commonly called Pamashto or Quinilla in eastern Peru, Balata in Brazil and French Guiana, and Purgio in Venezuela. In British Guiana the usual names are Bullet, Bully, or Balata tree, while the timber is called Beefwood, Bulletwood, and sometimes Horseflesh. Eyma says (*loc. cit.* p. 208): "Collectors' notes invariably give the vernacular name of this species in Surinam as Bolletrie; in a few instances the name Balata is added, and all labels containing Indian names have Borowé as the Arowaccan and Parata as the Caribbean name. The negro name is Botrie. The Dutch name Paardevleeschout (horseflesh wood, from the red color of the wood) is sometimes encountered in literature but never on collectors' labels. This appears to be the only species from which commercial balata is procured in Surinam." The yield of latex per tree is from 2 to 5 pints, equivalent to 1 to 3 pounds of dry balata, the yield varying roughly with the thickness of the bark.

There are at least five other species in the lower Amazon region of Brazil, all large to very large trees, known as Massaranduba or Maparajuba. Their value resides in their timber rather than their latex. The best for durable construction is the Massaranduba Verdadeiro (true Massaranduba), *Manilkara Huberi* (Ducke) Standl. (=*Mimusops Huberi* Ducke). Eyma says (*loc. cit.*, p. 209): "This species is conspicuous for its leaves, which are light-colored at first, often beautifully

orange or yellow beneath, with distinct darker nervation, the ground color becoming paler to white with age. The species has hitherto been recorded for the greater part of the state of Pará and so I do not hesitate to refer to it some sterile specimens from the interior of Surinam." This is the Milk-tree or Cow-tree which attracted the attention of Richard Spruce during his visit to Pará in 1849 because it secreted an abundance of drinkable milk (see *Notes of a botanist on the Amazon and Andes*, Vol. I, pp. 50–52). He "made trial of the milk, fresh from the tree, both alone and mingled with coffee; its consistency is that of good cream and its taste perfectly creamy and agreeable. It retains its fluidity for weeks, but acquires an unpleasant odor. It is extremely viscid and can with difficulty be removed from the hands or whatever else it touches—a property which renders it an excellent substitute for glue but a rather unsafe article of diet."

Massaranduba in small quantities has been imported into the United States for a long time, but no particular attention was directed to it until timber became available as a result of clearing the site of the Ford rubber plantations along the Tapajoz River. Roswell S. Cheves, of the Day Lumber Company, Springfield, Massachusetts, supplies the following information regarding practical tests made in 1936. Because of insufficient resilience it is not as satisfactory as Maple (*Acer saccharum* Marsh.) for drop-forge hammer bars or as a substitute for Hickory (*Carya*) in picker-sticks of weavers' looms. It gives good service as flooring in industrial plants and machine shops where resistance to trucking and other kinds of hard usage is essential; also bench tops, stair treads, truck bodies, and in paper mills for beaters, agitator bars, and jordan and bed plate filling. In comparative tests of Massaranduba and Oak (*Quercus*) for beater filling under normal working conditions in two paper factories, the Oak failed completely before the Massaranduba showed any appreciable wear. New York timber dealers and manufacturers report that a fine dust arises during sawing which is rather peppery and irritating to the mucous membrane, and also that the lumber must be handled carefully to avoid splinters.

There are two species in Ceará, Piauhy, and Maranhão, Brazil, namely, *Mimusops rufula* Miq. and *M. triflora* Fr. Allem. (= *M. cearensis* Huber); the latter is a small tree, sometimes shrubby. In the coastal forests from Bahia to Rio de Janeiro there are five species, namely, *M. elata* (Fr. Allem.) Miq. (sometimes erroneously credited to the lower Amazon), *M. floribunda* A. DC., *M. Glaziovii* Raunk., *M. longifolia* A. DC., and *M. Salzmanni* A. DC. All of these species are called Massaranduba, and H. M. Curran says that the timber "is much used for railway ties and heavy durable outside construction. The trees occur scattered through the hardwood forests of the coast but are nowhere abundant and the available supply near transportation has been nearly exhausted. They are of large size, 100 feet high and 3 or 4 feet in diameter, with a dark brown or blackish bark of medium thickness, and heavy, dark green leaves 6 to 8 inches long. The heartwood is extremely hard and of a deep red color; the sapwood is usually narrow and is almost white when freshly cut."

The woods of the several American species of this genus studied are similar in structure. Heartwood red or reddish brown, deepening upon exposure; with oily appearance and feel in some West Indian species; distinct but usually not sharply demarcated from the whitish sapwood. Luster low. Without pronounced odor or taste. Generally extremely hard, heavy, and strong; sp. gr. (air-dry) 0.90 to 1.20; weight 56 to 75 lbs. per cu. ft.; easy to moderately difficult to work, finishing very smoothly; highly durable. An excellent timber likely to increase in importance in the export trade.

Growth rings sometimes distinct due to narrow pore-less zones. Pores small to very small, fairly numerous; mostly in small multiples arranged in radial or oblique series frequently visible without lens. Tyloses abundant; intervascular pitting rather fine. Rays 1 or 2, infrequently 3, cells wide and up to 30 cells high; decidedly heterogeneous; gum deposits abundant in heartwood; disjunctive cells present; pits to vessels in part rather large, rounded to much elongated. Wood parenchyma in numerous, narrow, uniform to very irregular, evenly to unevenly spaced concentric bands; sometimes with local tendencies to be coarsely reticulate; crystals common. Wood fibers with very thick walls and very small cavities.

COMMON NAMES: Beefwood, bulletwood, doncella, massaranduba, red lancewood (Trade); wild dilly, w. sapodilla (Florida); ácana, a. de costa, aimiquí, almiquí, balata,

jaimiquí (Cuba); ácana, ausubo, bullet tree, b. wood, mameyuelo, sapota de costa (P. R.); ausubo, balata, nisperillo (Dom. R.); bois huile, sapotille, s. marron (Haiti); níspero (C. R., Pan.); balata, níspero, trapichero (Col.); ácana, balata, cochinillo, massarandú, níspero, pendare, pulvio, purgo, purgüey, purguo (Venez.); balata, beefwood, bulletwood, burueh, koboru (Br. G.); bad bolletrie, badwood, balata, b. boom, basterd bolletrie, boeletrie, borowé, botrie, b. ie, brosse balata, b. bolletrie, paardevleeschout, valsche bolletrie (Sur.); balata, b. franc, b. rouge (Fr. G.); aprauá, balata, chauá, maparajuba, massaranduba (Braz.); balata, palata rosada, pamashto, quinilla, q. colorado (Peru).

Micropholis, usually considered as a section (*Eichlerisideroxylon*) of *Sideroxylon*, includes more than 30 species of small to very large trees, mostly South American. According to Eyma (*Rec. Trav. Bot. Néerl.* 33: 196): "The two genera, as understood by Dubard, can at once be distinguished by the nervation of their leaves, the primary nerves being distant and generally curved in *Sideroxylon*, closer to very close and parallel and generally almost straight in *Micropholis*. Although in other cases, *e.g.*, in *Pouteria*, similar differences have no more than sectional value, the absence of intermediate forms and especially the different shape of the scar [long, narrow, and ventral in *Micropholis*, short, more or less concave, and basal in *Sideroxylon*] in my opinion justify the segregation of *Micropholis* from *Sideroxylon*. I think the characters of the seed and the embryo of more taxonomic value in this family than the presence or absence of staminodes. This approaches *Micropholis* to *Chrysophyllum* instead of to *Sideroxylon*."

The Gumbijava of southeastern Brazil, *Micropholis Gardnerianum* (A. DC.) Pierre (=*Sideroxylon Gardnerianum* A. DC.), is usually a medium-sized tree, but is said to attain a height of 100 feet or more in the Serra do Mar. The yellowish or reddish timber is easy to work and is employed locally for carpentry, interior construction, chairs, and packing cases, but is not durable enough for service in exposed positions.

There are numerous species of *Micropholis* in the Amazon region and at least three in the Guianas. Perhaps the largest

and best known of the latter is the Balata Franc of French Guiana, *M. Melinoniana* Pierre, which, according to Bertin (*Les bois de la Guyane française*, pp. 55–56), is a fairly common tree with a long slender trunk sometimes 80 to 90 feet long and 36 to 40 inches in diameter above the moderately high buttress. The wood is yellowish or roseate when fresh, but becomes light brown with a tinge of red. The timber, though little used, is considered of excellent quality for interior construction and carriage work.

The following description is based on specimens of six species from Brazil and the Guianas. The woods are fairly uniform in appearance and structure and are readily separated from those of the *Mastichodendron* section of *Sideroxylon* because their prevailing color is brown instead of yellow and the wood parenchyma is in concentric bands instead of reticulate. Heartwood grayish brown, usually with reddish tinge, sometimes (*M. paraensis* [Huber] Eyma) with a yellowish green hue; sapwood lighter, but not clearly differentiated. Luster medium. Without distinctive odor or taste. Hard and heavy to decidedly so; sp. gr. (air-dry) 0.80 to 1.05; weight 50 to 66 lbs. per cu. ft.; texture medium, uniform; grain straight; working properties fair to good.

Growth rings present. Pores not individually distinct without lens, fairly numerous; mostly in short multiples which are sometimes in irregular radial rows. Tyloses present; sclerotic in part in *M. cyrtobotrya* (Mart.) H. Bn. and *M. paraensis;* vascular pitting fine. Rays uniseriate or biseriate and up to 30, occasionally 40, cells high; very heterogeneous; sclerotic cells sometimes present; pits to vessels large in part. Wood parenchyma in numerous, fairly uniform, narrow concentric bands, distinct with lens and sometimes without it; cells occasionally sclerotic; no crystalliferous strands seen. Wood fibers with thick to very thick walls.

COMMON NAMES: Sapotillo árbol (Cuba); caimitillo (P. R.); asépochupón colorado, hácano (Venez.); moraballi (Br. G.); koballi, awapau, bobi waata, koesiri balatarie, k. paratare, koni-koni hoedoe, lo-hoedoe, riemhout, remoe époe, seloe boerwin, serere boerwin, wasépoekoe, wokowokoeloe (Sur.); balata blanc, bois crapaud (Fr. G.); apixuna, balata rosada, caramury da varzea, gipy, gumbijava, gumbixama, gumbixava, mangaba-rana, preguiceira, rosadinha (Braz.); barilla del agua, quinilla (Peru); ibirá-camby (Arg.).

Paralabatia, with three species of small to medium-sized, unarmed, evergreen trees, is limited in distribution to the Greater Antilles. *P. dictyoneura* (Gris.) Pierre (=*Labatia dictyoneura* Gris.=*Pouteria dictyoneura* [Gris.] Radlk.) occurs in the mountains of Cuba, where it is known as Cocuyo in common with various other trees whose bark, wood, or fruit has a color suggesting the glowworm (cocuyo). *P. Fuertesii* Urb. is a shrubby tree of Dominican Republic. *P. portoricensis* Brit. & Wils. is a tree 50 feet or more in height growing on limestone hills in northern Puerto Rico.

The woods of the first two species, the only ones available, are yellowish brown or somewhat roseate, without clear differentiation between heartwood and sapwood. Luster medium. Without distinctive odor or taste. Very hard, heavy, tough, and strong; texture medium; grain fairly straight; not very difficult to work, inclined to be splintery, finishes very smoothly; probably not highly durable.

Growth rings distinct to indistinct. Pores small to minute, fairly numerous; in radial multiples which often are clustered and arranged in irregular radial or flame-like pattern distinct without lens. Tyloses present, sometimes sclerotic; smallest vessels with fine spiral thickenings. Rays uniseriate and biseriate and up to 40 cells high; decidedly heterogeneous; pits in part large and irregular. Wood parenchyma in numerous, closely spaced, coarse-celled, concentric bands, 1 to 3 cells wide, and showing distinctly on tangential surface. Wood fibers with very thick, often gelatinous walls. Vasicentric and diffuse tracheids of sporadic occurrence.

COMMON NAMES: Cocuyo, jubilla (Cuba); cuero de puerco, cuyá (Dom. R.); caracolet (Haiti).

Pradosia is a Brazilian genus with a few species of small to large, unarmed, lactescent trees, generally characterized by a sweet taste to the bark and the wood. According to Baehni (*loc. cit.*, pp. 446, 479, 482) these species all belong to *Chrysophyllum*, whereas Eyma (*Rec. Trav. Bot. Néerl.* 33: 159, 167, 168) includes them in *Pouteria*. The characters of the wood appear distinct enough to justify separate treatment of the group.

The best known tree is the Buranhem or Casca Doce of the coastal forests of Brazil from São Paulo northward. In Bahia it is said to attain a height of 100 to 125 feet, with a long, straight, unbuttressed trunk upward of four feet in diameter. The bark is smooth and the reddish inner part contains a small amount of latex and is very sweet, though astringent because of the high tannin content. The botanical nomenclature of this tree is confused. Until 1930 it was identified with *Pradosia lactescens* (Vell.) Radlk. (=*Pometia lactescens* Vell.), which was generally supposed to be the same as *Chrysophyllum glycyphloeum* Casar. (=*Lucuma gylcyphloea* [Casar.] Mart. & Eichl.=*Pradosia glycyphloea* [Casar.] Liais), but Kuhlmann (*Archiv. Jard. Bot. Rio de Janeiro* 5: 205) is of the opinion that these represent two separate species, and that the correct designation of the Buranhem or Casca Doce is *Pradosia glycyphloea.* The flowers of this species are very small, green, and borne in clusters of 2 to 6 in the axils of the leaves.

P. lactescens, according to Kuhlmann (*loc. cit.*), is always a small tree whose bark, instead of being sweet-tasting, is bitter and of a detestable flavor. The small flowers are of a vinaceous violet color and are borne in dense clusters all along the trunk and larger branches. It is commonly known as Bacuri or Bacupari, names generally applied to species of *Rheedia* (Guttiferae) which it resembles. No wood samples are available for study.

A specimen of the wood of Buranhem was collected near Bahia with sterile botanical material by H. M. Curran (Yale 4964; Curran 24). The leaves resemble those illustrated by Kuhlmann (*loc. cit.* pl. XXV) for *P. glycyphloea.* The wood has a sweetish and astringent taste and is similar in structure to authentic specimens of other species of *Pradosia.* Moreover the specimens are from a large tree, thus precluding *P. lactescens.* According to Baehni (*loc. cit.* p. 481) this species is the type of the genus and the correct citation is not *P. glycyphylla* (Mart. & Eichl.) Kuhlmann, but *Pradosia glycyphloea* (Casar.) Liais.

Considering *P. lactescens* typical of the genus, Ducke proposed a new genus, *Glycoxylon*, for the Amazon species, which have mostly opposite, instead of alternate, leaves, and green or white, instead of purplish red, flowers, which are borne in small clusters on the twigs instead of on the main stem and branches. As the name signifies, the wood is sweet and is

locally known as Pau Doce; it also agrees in appearance, properties, and structure with that of the real type of the genus. In a personal letter of April 21, 1937, he says that he is "now certain that *Glycoxylon* is a mere synonym of *Pradosia*." *G. inophyllum* (Miq.) Ducke (=*Chrysophyllum inophyllum* Miq.) is a shrub or little tree called Abihy near Manáos and Pau Doce near Faro. *G. pedicellatum* Ducke is similar to the preceding, but generally taller, occasionally a large tree; in Gurupá it shares with other Sapotaceae the name of Ajarahy. *G. Huberi* Ducke attains a height of 100 to 130 feet and occurs on inundated lands in the estuary; because of the resemblance of its trunk to that of the Pracuúba (*Dimorphandra paraensis* Ducke) it is often called Pracuúba Doce and Pracuúba de Leite. *G. praealtum* Ducke is found in dense forests on non-inundated land near Belem do Pará and is considered the largest of all sapotaceous trees, attaining a height of 160 feet, with an erect, cylindrical trunk with tabular buttresses 10 to 15 feet high. (See *Archiv. Jard. Bot. Rio de Janeiro* 4: 162–166.)

The Amazonian species apparently have few uses, except for the sweet and comestible fruits. The bark is rather low in tannin content and the wood is not highly resistant to decay. The Buranhem of the coastal region supplies bark rich in tannin (upward of 30 per cent) which is employed commercially. The timber lacks color and figure but is considered excellent for the frames of vehicles and farming implements, oars, and heavy interior construction. It appears well suited for tool handles, wheelwright and bent work, and cooperage. It is slow in drying and the thick sapwood is likely to stain during the process.

Color dull grayish brown throughout, usually uniform, but sometimes with rather vague streaks of yellowish to purplish brown. Without noticeable odor; taste highly distinctive, being sweet at first, then bitter or astringent. Very hard, heavy, tough, and strong; sp. gr. (air-dry) 0.95 to 1.10; weight 59 to 70 lbs. per cu. ft.; texture medium fine, uniform; grain generally straight; not very difficult to work, finishing smoothly; poorly resistant to decay. Will probably never be important for export.

Growth rings distinct to indistinct. Pores not visible without lens, fairly numerous; mostly in short, well distributed multiples, not in long radial series. Tyloses present, but not abundant; intervascular pitting very fine, the pit outlines mostly long oval. Rays uniseriate or biseriate and up to 60 or more cells high; decidedly heterogeneous; pits to vessels large in part. Wood parenchyma in fairly regular to irregular concentric lines or narrow bands 2 or 3 cells wide, spaced 1 to 2 pore-widths apart; distinct with lens and sometimes without it; no crystalliferous strands seen. Wood fibers with very thick gelatinous walls.

COMMON NAMES: Abihy, ajaray, bacupari, bacuri, buraem, burahem, buranhe or buranhem, casca doce, guaranhem or guranhem, imyricem, mericeem, muiracehima, paracuhuba doce, p. de leite, pau doce, pracuúba doce, p. de leite (Braz.).

Sideroxylon, in a broad sense, includes a large number of trees of wide distribution in tropical and subtropical regions. Pittier says (*Contr. U. S. Nat. Herb.* 13: 12: 458): "The genus *Sideroxylon* was established by Dillenius, the type, *S. inerme* L., being a tree of the Cape Colony in South Africa. . . . Time after time unfortunate additions increased the genus and caused the original definition to be repeatedly altered. These additions not only included several Bumelias and a few other species belonging to closely related genera of the Sapotaceae, but also a *Scleroxylon* (Celastraceae), a *Myrsine*, and an *Olinia* (Oliniaceae)."

Botanists have divided the genus into sections, and one of these, following Eyma, is here treated as a separate genus, *Micropholis*. Remaining in the Yale collections are specimens of several species determined as *Sideroxylon* which are alike in general appearance and properties, particularly in their yellow or orange color. They differ, however, in the arrangement of parenchyma; in one group, section *Mastichodendron*, it is consistently reticulate, and crystalliferous strands are common, whereas it is in fairly uniform concentric arrangement and no crystalliferous strands were seen in an unnamed group including *S. colombianum* Standl., the Joveroso, Mamón de Leche, or Mamón de Tigre of northern Colombia (see *Tropical Woods* 22: 13) and *S. Meyeri* Standl., the Zapotillo of British Honduras and Campeche. The wood of the Silly Young of British Honduras, *S. amygdalinum* Standl. (=*Lucuma amyg-*

dalina Standl. = *Bumelia laurifolia* Standl.) is brown instead of yellow and its parenchyma is in concentric bands, thus suggesting *Lucuma* rather than *Sideroxylon* or *Bumelia*. (See *Tropical Woods* 31: 45.)

The section *Mastichodendron* comprises several closely related species limited in distribution to the West Indies, southern Florida, Mexico, and Central America. The trees have large boles, sometimes 50 inches in diameter, but are usually not over 60 to 70 feet high, though occasionally upward of 100 feet. The buds are naked; the leaves are mostly clustered near ends of the branchlets; the very small, greenish yellow, ill-smelling flowers are borne in dense clusters on the old wood or in the leaf axils; the fruit is a small, olive-like drupe, edible but not highly esteemed. The best known species is *S. foetidissimum* Jacq. (= *S. Mastichodendron* Jacq. = *S. pallidum* Spreng.), commonly known to English-speaking people as Mastic; it grows in southern Florida, the Bahamas, and many of the Antilles. It appears at its best in Cuba, where it is called Jocuma, and the timber is used in heavy construction of all kinds, vehicles, ox-yokes, fence posts, railway crossties, and to a small extent in furniture.

The Middle American representatives of this section are *S. angustifolium* Standl., of Sonora and Sinaloa; *S. Gaumeri* Pittier, of the Yucatán region; *S. tempisque* Pittier and *S. Capiri* (A. DC.) Pittier (= *Lucuma Capiri* A. DC. = *S. mexicanum* Hemsl. = *S. petiolare* A. Gray) from southern Mexico to Costa Rica.

The following description is based upon specimens of *S. foetidissimum*, *S. angustifolium*, and *S. tempisque*. Heartwood lemon to orange, not clearly differentiated from the yellow sapwood. Luster medium. Without distinctive odor; taste somewhat bitter. Very hard, heavy, tough, and strong; sp. gr. (air-dry) about 1.05; weight about 66 lbs. per cu. ft.; texture medium; grain straight to variable; not easy to work, finishes smoothly, requires care in drying to prevent splitting; durability fair. Not likely to be important for export.

Growth rings present. Pores small, not individually distinct without lens, not very numerous; mostly in small multiples which may be in radial series. Tyloses present; intervascular pitting fine. Rays uniseriate or biseriate and up to 30 cells high; decidedly heterogeneous; pits to vessels in part large and irregular. Wood parenchyma finely to coarsely reticulate or in meshwork with the rays; sometimes absent from narrow zones which show distinctly because of their deeper color; crystalliferous strands abundant. Wood fibers with very thick walls.

COMMON NAMES: Mastic, m. bully, wild olive (Florida, B. W. I.); caguaní, ébano amarillo, jocuma, j. amarillo, lechero (Cuba); tabloncillo, tortugo amarillo (P. R.); caya amarillo (Dom. R.); acomat (Haiti); acoma, coopey, topee (Trin.); acoma bâtard (Guad.); capire or capiri, caracolillo, cosahuico, dzoi, huacux, tempisque, tempixque, tempixtle, totozapotl, zapote de ave, zoy (Mex.); tempisque (C. Am., gen.); cream tree (Br. H.); kobak (Guat.); saquaia (Salv.).

AMBOYNA WOOD

A question has arisen as to the identity of a beautifully mottled wood sometimes imported from the East Indies under the name of Amboyna Wood. It is said to be obtained from a burr (burl).

In the *Treasury of Botany* (by J. Lindley and T. Moore, 1889), Amboyna Wood was referred to "*Pterospermum indicum*"; there does not appear to be any species of *Pterospermum* under the name *indicum* and it is probable that *Pterocarpus indicus* was the species intended. Willis (*A Dictionary of the Flowering Plants and Ferns*) assigns the species to *Pterocarpus indicus* (?); in other places it is merely referred to *Pterocarpus* sp.

I am now advised by Professor A. te Wechel of the Afdeeling Boschexploitatie en Boschhuishoudkunde, Landbouwhoogeschool, Wageningen, Netherlands, that Amboyna Wood is a wood of a burr on the stem of the tree *Pterocarpus indicus* Willd.—J. BURTT DAVY.

STANDARD TERMS OF SIZE FOR VESSEL DIAMETER AND RAY WIDTH

The Council of the International Association of Wood Anatomists has approved the following definitions for terms of size for vessel diameter and ray width in dicotyledonous woods, as recommended by Dr. LAURENCE CHALK, Prof.

IRVING W. BAILEY, Mr. S. H. CLARKE, Prof. PAUL JACCARD, Prof. SAMUEL J. RECORD, and Prof. G. VAN ITERSON, JR., constituting a Committee on the Standardization of Terms of Cell Size:

VESSEL DIAMETER

Class	Subclass	Tangential Diameter
Small	Extremely small	Up to 25μ
	Very small	25–50μ
	Moderately small	50–100μ
Medium-sized		100–200μ
Large	Moderately large	200–300μ
	Very large	300–400μ
	Extremely large	Over 400μ

RAY WIDTH

Class	Subclass	Ray width
Fine	Extremely fine	Up to 15μ
	Very fine	15–25μ
	Moderately fine	25– 50μ
Medium-sized		50–100μ
Broad	Moderately broad	100–200μ
	Very broad	200–400μ
	Extremely broad	Over 400μ

ALBIZZIA LEBBECK NOT *ALBIZZIA LEBBEK*

As the correct spelling of the botanical name of the Kokko tree is constantly recurring and involving loss of time in looking up references, a note on the subject may prove useful.

The spelling *Lebbek* was adopted by Bentham in his monograph of the Mimosaceae, when he transferred the species from *Mimosa* to *Albizzia*. He cited Linnaeus as author of the name "*Mimosa Lebbek*," but a reference to *Species Plantarum* (ed. 1, p. 516; 1753) shows that Linnaeus there spelled it "*Mimosa Lebbeck*." Under the accepted International Rules the original spelling should be followed.—J. BURTT DAVY.

CURRENT LITERATURE

Contributions to the flora of tropical America. XL. Plantae Hintonianae. X. The genus *Quercus*. By E. F. WARBURG. *Kew Bulletin* 84–95; 1939.

"An enumeration of the Oaks collected by Mr. G. B. Hinton in the years 1932–1937 in Mexico. . . . The collections are particularly valuable in that most of the species are represented by a good range of specimens illustrating the variation within the species which is characteristic of so many members of the genus. . . . Many species of Oak described from Mexico have been based on very inadequate material. Some of these are probably based on sucker shoots of other described species, others may be true species, but until proper material is forthcoming from their type localities it is impossible to identify new collections with them and I have had to ignore them." The collections, about 185 in number, are referred to 26 different species, eight of which are described as new.

The firs of Mexico and Guatemala. By ALFRED REHDER. *Journ. Arnold Arboretum* 20: 3: 281–287; 1 fig.; July 1939.

"For more than a century *Abies religiosa* (H. B. K.) Schlecht. & Cham. was supposed to be the only species of *Abies* growing south of the boundary of the United States, if we except the Rocky Mountain fir, *Abies concolor* (Gord.) Engelm., which was found in 1893 by T. S. Brandegee in northern Lower California. Recently, however, a new species [*A. Hickeli*] was described from sterile material by Flous and Gaussen, representing the tree of the mountains of Oaxaca; cones of that species were collected last year by Dr. J. H. Faull, who also brought back from his last journey to Guate-

mala fruiting material of a fir which proves to be a distinct new species [*A. guatemalensis*]."

The new species is readily distinguished from *A. religiosa* by the emarginate and pectinately arranged leaves, and from that and *A. Hickeli* "by the bracts being only half as long as the scales, truncate at the apex and entirely hidden between the scales. In the pectinately arranged leaves and in their emarginate apex, it agrees with *A. Hickeli*, but differs from it in the broadly obovate bracts truncate at the apex and only about half as long as the scale, and in the leaves having only two resin canals. Both species, *A. Hickeli* and *A. guatemalensis*, are easily distinguished, even without cones, from *A. religiosa* by the pectinately spreading emarginate leaves while in the latter they are on the upper surface of the branch, directed forward and more or less appressed to the branch and always acute or obtusish at the apex, never emarginate. *Abies guatemalensis*, which so far is known only from a restricted area near Lake Atitlan in the high mountain range along the western coast of Guatemala, marks the southernmost extension of the range of the whole genus, occurring as it does, between 14° and 15° N. lat., while in Asia and Africa, it does not even reach the Tropic of Cancer."

Avery botanical expedition returns from Guatemala. By PAUL C. STANDLEY. *Field Museum News* (Chicago) 10: 7: 2; July 1939.

"The botanical expedition to Guatemala in 1938–1939, sponsored by Mr. Sewell Avery and conducted by the writer, had for its purpose the collection of data and specimens of plants to be used in preparation of a descriptive flora of that country. Six months, from November 19 to May 13, were spent in the field, and more than 15,000 numbers of plants, represented by perhaps twice as many herbarium specimens, were collected, so that the work may be regarded as highly successful. All except two of the country's 22 departments were visited. . . .

"The geography and climate of Guatemala are extremely varied. The western and southern parts of the republic contain many volcanoes, some of them more or less active, and

other mountains, the highest peaks rising to 14,000 feet. The northern region is formed of non-volcanic rocks, chiefly limestone, and supports a conspicuously different flora. Some areas are arid, with varied displays of giant cacti and typically desert plants. Others, especially near the Atlantic coast, have a heavy rainfall and support a luxuriant rain forest. The central and western regions have generally six months of rain and six months of rainless weather. Temperature varies from the sometimes oppressive heat of the coasts to the almost equally excessive cold of the Altos or uplands. At many places above 7500 feet frost is common, ice often is formed, and scant snow falls occasionally.

"Guatemala lies well inside the tropics, but neither climate nor flora is wholly tropical. Indeed a great part of the vegetation of central and western Guatemala is clearly temperate or, at very high elevations, alpine. The commonest trees over most of the country are Oaks and Pines. Near Cobán the Sweet Gum or *Liquidambar* abounds, with Box-Elder, Willows, Alders, Poison Sumac, Red Cedar, Magnolia, and Yellow Jessamine. In the highest regions are magnificent forests of Cypress (*Cupressus*) and Fir.

"For three months the writer made headquarters in the picturesque and beautiful city of Antigua, twenty-five miles from Guatemala City. Excursions were made to many localities of the high central region, to the dry Oriente bordering Salvador, and to the Pacific coast. Collections were made on forested slopes of the three great central volcanoes, Agua, Fuego, and Acatenango, and also on the low but destructive volcano of Pacaya. In late November, at the end of the rainy season, this central upland affords a lavish display of brilliant flowers—pink and white tree dahlias, begonias, sunflowers, salvias, and dozens of others in every color. By late April the great displays of blossoms have passed, although it is possible to find quantities of flowers at every season. Orchids are none too plentiful in the highlands, or at least not conspicuous. Many of the trees are loaded with bromeliads or 'air plants' showier than most orchids.

"For a month the writer had headquarters in the Occidente, in Quezaltenango, at almost 8000 feet. At this elevation in

March the landscape is strangely reminiscent of that of Illinois at the same season—the same fields of corn stalks and wheat stubble, rough-coated cattle, heavily clothed people, and low houses from which gray smoke rises. In late March the mountains are beautifully green with the unfolding leaves of Alders and Oaks.

"From Quezaltenango excursions were made to the summit of the Sierra de los Cuchumatanes, above Huehuetenango, the white sand mountains of San Marcos, the summit of the Volcano of Santa María, Ayutla on the border of Chiapas, and the Pacific port of Champerico. Visits were made to the *bocacosta* lying at middle elevations between the uplands and the Pacific. Here, at 2000 to 5000 feet, where there is plenty of rain throughout the year, is found probably the most luxuriant and diversified vegetation of Guatemala. Moreover, it has been little explored by botanists, and the brief trips made there were tantalizing because it was clear that only a small number of the amazingly diversified plants could be collected. High upon the slopes of the Volcano of Zunil, at 8000 to 9000 feet, the tropical rain forest is exceedingly rich in species. The northern slopes of Santa María, on the other hand, proved disappointing because of their relative dryness."

Monografía sobre arboricultura propaganda del cultivo del ârbol. By SALVADOR CALDERÓN. Pub. by Ministerio de Agricultura, San Salvador, July 1938. Pp. 31: 4¾ x 7¼.

The purpose of this pamphlet is to stimulate local interest in the propagation of forest trees. It includes a briefly annotated list of 74 woods native to Salvador, with their common and scientific names.

Vocabulario de términos vulgares en historia natural colombiana (continuacion). By HERMANO APOLINAR MARÍA. *Revista Acad. Colombiana* (Bogotá) 2: 8: 543–556; 2 plates in color; 1939.

Another instalment of a useful annotated list of vernacular names of Colombian plants, from 283, Amancayo, to 408, Arapaima, inclusive.

Notes on the botanical components of curare. II. By B. A. KRUKOFF and A. C. SMITH. *Bull. Torrey Bot. Club* 66: 305–314; May 1939.

Through the courtesy of Mr. Richard C. Gill, the authors were able to examine specimens of the plant components of the curare of the Canelos Indians of Ecuador. "The principal components of the curare of the Canelos are invariably members of the Menispermaceae. In this respect their curare resembles that of the Chazuta Indians of Peru, while it differs notably from the more eastern curares such as those of the Javas, Tecunas, Trios, and Wai-wais of Brazil, of the Macusis of British Guiana and of certain tribes of the upper Orinoco basin in Venezuela. The main components of these curares are species of *Strychnos*.

"*Chondodendron iquitanum* appears to be the main ingredient of most preparations of the Canelos, while *C. tomentosum* and *Sciadotenia toxifera* are usually other important ingredients. One or more species of *Strychnos* are often used in the curare of the Canelos, *S. toxifera* being the most commonly used. However, it seems evident that the Canelos do not consider species of *Strychnos* to be essential ingredients, as the poison is often prepared without them. A number of plants other than Menispermaceae and *Strychnos*, used as secondary ingredients by the Canelos, are of the same or related species which have already been reported as components of curare of other South American Indians. The absence of species of *Piper* in the curare of the Canelos is conspicuous; in this respect it approaches the poison prepared by the Chazutas and differs from that prepared by the Tecunas, Javas, Trios, and Waiwais."—*Authors' summary.*

Plantas que curan y plantas que matan de la flora del Cuzco. (Estudio folklórico.) By F. L. HERRERA. *Revista Universitaria* (Cuzco, Peru) 27: 75: 4–76; 1938.

An annotated list of plants of the Department of Cuzco, with known or imputed medicinal or toxic properties. The paper was presented at the First National Chemistry Congress and appears also in the *Proceedings*, pp. 201–264.

Etimologia de algunos nombres vernaculares de plantas indigenas en el departmen to del Cuzco. By F. L. HERRERA. *Revista del Museo Nacional* (Lima, Peru) 8: 1: 81–98; 1939.

A study of the Quechuan names, particularly for plants, in the Department of Cuzco, Peru, together with a list of the scientific equivalents.

Pewne własnósci fizyczne i mechaniczne drewna niektórych gatunków peruwiańskich. By JULIAN RAFALSKI. *Roczniköw Nauk Rolniczych i Leśnych* (Poznań) 46: 219–228; 1939.

Results of tests made at the Institute of Forest Engineering, University of Poznań, on certain physical and mechanical properties of 30 Peruvian wood samples sent to the Institute with vernacular names only (without herbarium vouchers).

Badania nad drewnem piniora brazylijskiego (*Araucaria brasiliana* Lamb.) i peroby rózowej (*Aspidosperma polyneuron* Muell. Arg.), dwu gatunków brazylijskich o dużym znaczeniu gospodarczym. By JULIAN RAFALSKI and STANISŁAW STRYŁA. *Roczniköw Nauk Rolniczych i Lésnych* 46: 229–264; 6 plates; 1939.

The results of a study of two important Brazilian timbers, Paraná Pine and Peroba Rosa, with particular reference to their physical and mechanical properties. The illustrations include two maps, three forest scenes, 6 photomicrographs, and one picture of failures in bending.

O genero *Anacardium* na Amazonia brasileira. By ADOLPHO DUCKE. *Ann. Acad. Brasileira de Sciencias* 11: 1 11–17; 1 plate; March 1939.

An account of the seven Amazonian species of *Anacardium*, with a key for their determination and a description of a new species, *A. tenuifolium*, a tree 120 feet high collected by B. A. Krukoff in Amazonas.

Plantae Krukovianae. VI. By A. C. SMITH. *Journ. Arnold Arboretum* 20: 3: 288–303; July 1939.

This paper is based primarily upon plants collected in Amazonian Brazil by B. A. Krukoff. The trees and shrubs

described as new are *Caryocar pallidum*, *C. parviflorum* (local name Pequiarana), *Conomorpha madeirensis*, *Diospyros bullata*, *D. tenuiflora*, *Krukoviella scandens* (a new genus of Ochnaceae), *Maytenus Krukovii* (probably the same species known in Peru as Chuchuhuasca), *M. micrantha*, *Siparuna pachyantha*, *Smilax graciflora*, *S. Krukovii*, *Somphoxylon magnifolium*, and *Vismia cauliflora* (known as Lacre, like other species of the genus).

Estudo anatomico do lenho de trinta especies do genero *Aspidosperma*. By FERNANDO ROMANO MILANEZ. *Physis* (Buenos Aires, Arg.) 15: 429–490; 49 photomicrographs; 1939.

A detailed systematic study of one or more wood samples each of 30 different species of *Aspidosperma*, together with a key for their determination. The various types of structure are fully illustrated with photomicrographs.

One of the species that seems to the reviewer rather out of place in the genus is *A. quadriovulatum* Pittier, in which, for example, the rays are decidedly heterogeneous, whereas in the others they are typically homogeneous or nearly so. According to Pittier (*Arboles y arbustos nuevos de Venezuela*, p. 66), this species belongs in the same group with *A. anomalum* Muell. Arg. which Ducke (*Archiv. Jard. Bot. Rio de Janeiro* 5: 180) makes the type of a new genus, *Cylindrosperma*.

Preliminary notes on Asiatic-Polynesian species of *Erythrina*. By B. A. KRUKOFF. *Journ. Arnold Arboretum* 20: 225–233; 1939.

"Inasmuch as there appears to be no compact treatment of the Asiatic-Polynesian species, it seems desirable to publish at the present time preliminary notes which are designed to tie Asiatic-Polynesian species with the groups that are being treated in my forthcoming paper on the American species. Several species are here reduced by synonymy and one [*E. Merrilliana*] is described as new." There are also notes on three Australian species.

Researches on tropical woods for the manufacture of pulp. III. Cooking experiments of some Philippine woods. (In Japanese, with abstract in English.) IHACHIRO MIURA. *Cellulose Chemistry* (Tokyo) 13: 12: 453–458; 1938.

Conditions and results of cooking experiments, dimensions of single fibers, and yield and qualities of bleached pulp are shown in tables for 12 Philippine woods whose chemical composition was reported on in a previous issue of the same magazine. "These woods cannot be considered as a good raw material for paper, as their fibers are short. As the woods cannot be easily digested by a calcium bisulfite process, they are not a suitable pulpwood for rayon either, even though the bleached pulps prepared from some of them are of better qualities than commercial rayon pulps. It is noticeable, however, that yields of pulp per cubic meter of wood are large, because their volume-weight is greater than that of soft woods. Within a range of experiment, Almon, Guijo, and Amugis may be considered as a comparatively good pulpwood for rayon among the species examined."

Studies in the Theaceae. IV. New and noteworthy species of *Eurya*. By CLARENCE E. KOBUSKI. *Journ. Arnold Arboretum* 20: 3: 361–374; July 1939.

"Since the publication of the synopsis of '*Eurya*, Subgenera *Euryodes* and *Penteurya*' in 1937 (*Ann. Missouri Bot. Garden*, 25: 299–359. 1937), several new species have come to the attention of the author making a supplementary paper necessary. Besides the new species, other noteworthy recently described species and nomenclatorial notes are included."

Two fossil dicotyledonous woods from the Garo Hills, Assam. By K. AHMAD CHOWDHURY. *Records Geol. Surv. India* 73: 2: 247–266; plates 15–16; 1938.

A comparison of one of the fossils with the wood of living dicotyledons "has shown its greatest affinity to the genus *Anisoptera*. Considering our imperfect knowledge of the anatomy of the living Dipterocarpaceae it does not at present appear to be judicious to give it that generic name. The fossil from the Garo Hills is, therefore, named *Dipterocarpoxylon garoense*, which means that it belongs to the order Dipterocarpaceae excluding the genera *Monotes* and *Marquesia*." The poor state of preservation did not permit detailed analysis of the other specimen, which is therefore placed in the form genus *Dryoxylon*.

Records of Indo-Chinese plants. By E. D. MERRILL. *Journ. Arnold Arboretum* 20: 3: 346–355; July 1939.

This paper is "based on selected specimens received from time to time from Dr. A. Pételot of Université Indichinoise at Hanoi. Several previously described species are herein first credited to Indo-China, while seven are described as new. The genera *Torricellia* de Candolle and *Bennettiodendron* Merrill (*Bennettia* Miquel) are new to Indo-China, while the first true representative of the genus *Sarcosperma* Hooker f. for Indo-China is herein recorded."

Combretaceae of the 1936 Archbold Expedition (Fly River, British New Guinea). By A. W. EXELL. *Journ. Arnold Arboretum* 20: 3: 317–320; July 1939.

Enumeration of the Araliaceae collected by L. J. Brass in New Guinea. By H. HARMS. *Journ. Arnold Arboretum* 20: 3: 321–323; July 1939.

Plantae Papuanae Archboldianae. I. By E. D. MERRILL and L. M. PERRY. *Journ. Arnold Arboretum* 20:3:324–345; July 1939.

"This paper is the first one of a series planned to include data on the assembled Papuasian material available at the Arnold Arboretum. The intention is to include, under various natural groups, descriptions of apparently hitherto undescribed species, records of those previously described from other regions but, so far as our records show, not before reported from the particular geographical area herein noted, and nomenclatural notes. Most of the data appertain to material assembled by the Richard Archbold Expeditions, through the activities of Mr. L. J. Brass who has served as botanist for the

first three New Guinea expeditions. The very extensive collections assembled during the third expedition, which operated in the Netherlands New Guinea in 1938, have not yet been arranged for study. We have included data on other collections available to us, not only from New Guinea but also from the earlier L. J. Brass and S. F. Kajewski collections from the Solomon Islands."

Figure in timber. Trade Circ. No. 43, Council for Sci. & Ind. Research, Melbourne, 1939. Pp. 22; 6 x 9½; 18 figs.

A well illustrated pamphlet designed to answer the following questions: What is meant by figure? How are the various types described and to what is each attributable? How can figured timber be used most effectively?

Mechanical tests on small clear specimens of white cypress pine (*Callitris glauca*). By IAN LANGLANDS. Reprint No. 55 from *Journ. Council for Sci. & Ind. Research* 12: 1: 16–17; February 1939.

"At the request of, and in cooperation with, the Queensland Forest Service, the Division of Forest Products has carried out a systematic series of mechanical and physical tests on eighteen trees of Queensland-grown White Cypress Pine. The detailed analysis of the results of these tests . . . will be published in due course, but, in the meantime, it is considered advisable to give the species averages for the various tests."

The preservation of timber against the attacks of the powder post borer (*Lyctus brunneus* Stephens) by impregnation with boric acid. By J. E. CUMMINS. Reprint No. 56, *Journ. Council for Sci. & Ind. Research* 12: 1: 30–49; February 1939.

"The results of laboratory tests have shown that boric acid, borax, or mixtures of boric acid and borax in low concentration in wood prevent infestation by Lyctus. Laboratory and commercial tests have shown that green veneer can be easily and satisfactorily treated at a relatively low cost, which is economically sound. Details are given and recommendations made for the commercial treatment of various Australian timbers. A provisional patent specification for the treatment outlined has been lodged and accepted."—*Author's summary.*

Forest trees and timbers of the British Empire. IV. Fifteen Uganda timbers. By W. J. EGGELING and C. M. HARRIS, in collaboration with the Imp. For. Inst., Oxford. Clarendon Press, Oxford, 1939. Pp. 120; 6 x 9¼; 15 figs., 16 half-tone pls., 1 map; index to Nos. I–IV. Price 7s. 6d. net; postage 4d. ($2.50, Oxford Univ. Press, 114 Fifth Ave., N. Y.)

This is the fourth number of an exceptionally fine series of publications begun in 1932 on British Empire timbers. The Uganda species covered (Nos. 46 to 60 of the series) are as follows: *Alstonia congensis* Engl. (Apocynaceae); *Markhamia platycalyx* (Bak.) Sprague (Bignoniaceae); *Cynometra Alexandri* C. H. Wright and *Dalbergia melanoxylon* Guill. & Perr. (Leguminosae); *Carapa grandiflora* Sprague, *Entandrophragma angolense* (Welw.) C. DC., *E. cylindricum* Sprague, *E. excelsum* Sprague, *E. utile* Sprague, *Khaya anthotheca* (Welw.) C. DC., *K. grandifoliola* C. DC., *K. senegalensis* (Desr.) A. Juss., and *Lovoa Brownii* Sprague (Meliaceae); *Chlorophora excelsa* (Welw.) B. & H. f. (Moraceae); and *Maesopsis Eminii* Engl. (Rhamnaceae).

"The species described in this number are of unusual interest owing to the geographical position of Uganda between the east and west tropical floras. Some of the species, for example Iroko, *Chlorophora excelsa*, are well known on both sides of the continent while others, such as African Blackwood, *Dalbergia melanoxylon*, are typically eastern. Among the Mahoganies, not only do both eastern and western species of *Khaya* and *Entandrophragma* occur in Uganda, but also intermediate forms which link the species together in continuous series, providing material of great importance for the solution of taxonomic and ecological problems in the group. . . .

"The fifteen species selected for description yield timbers of every class, from the very soft Pattern- or Stool-wood, *Alstonia congensis*, to the extremely hard Ironwood, *Cynometra alexandri*, and from the almost shrubby but highly prized African Blackwood, *Dalbergia melanoxylon*, to the enormous Mahogany trees of *Khaya* and *Entandrophragma*. The differ-

ent kinds of Mahogany provide among them a sufficient variety of timber for most purposes, from general carpentry to veneers."—*From Preface.*

Ecological studies of the rain forest of southern Nigeria. I. The structure and floristic composition of the primary forest. By P. W. RICHARDS. *Journal of Ecology* 27: 1:1–53; 2 pls., 7 text figs.; February 1939.

"The present paper, which forms the first part of the results of the Cambridge Botanical Expedition to Nigeria, is a description of a typical region of the West African Rain Forest. Its chief object is to compare the Rain Forest of this area with that previously studied by the author in British Guiana (Davis & Richards, 1933–4) and Sarawak (Richards, 1936). In order that the comparison should be objective and exact, an effort has been made to give quantitative data whenever possible."

Forestry abstracts. By IMPERIAL FORESTRY BUREAU, Oxford. Vol. I, No. 1, pp. 1–59; 7½ x 9¾, June 1939.

This is the first number of a quarterly which is designed (in the words of the prospectus) to "provide a survey in English of the current literature of forestry from all parts of the world. Each issue will normally include special reviews of the literature of particular subjects, notes on annual reports, and abstracts classified by subject. In the abstracts the aim is to epitomize the contents of each paper so as to enable the reader to judge of its value as a contribution to knowledge. In addition to papers in English, French, and German, attention will be directed to those published in the less familar languages."

Four numbers constitute a volume and indexes will be provided annually. Most of the papers abstracted in the first issue are selected from the literature of 1938. For papers in languages other than English the original titles are usually omitted and only the translations given. The annual subscription (outside the British Commonwealth and the Anglo-Egyptian Sudan) is 25 shillings, postpaid.

M. M Chattaway

Price 35 cents

Yale University

School of Forestry

TROPICAL WOODS

NUMBER 60

DECEMBER 1, 1939

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 60 December 1, 1939

A technical magazine devoted to the furtherance of knowledge of tropical woods and forests and to the promotion of forestry in the Tropics.

The editor of this publication and the writer of any articles therein, the authorship of which is not otherwise indicated, is SAMUEL J. RECORD, *Dean of the Yale University School of Forestry.*

Subscription price One Dollar for four consecutive numbers. Remittances should be made payable to TROPICAL WOODS.

Address all communications to the editor, 205 Prospect Street, New Haven, Connecticut, U. S. A.

NOTES ON SOME HIGHLY AROMATIC LAURACEAE OF BRAZILIAN AMAZONIA

By ADOLPHO DUCKE

All Lauraceae contain substances that are more or less aromatic, and in a few instances the odor is strong and persistent even in old and dry material. These substances are chiefly in the bark, but in some species they also characterize the wood. Most of the aromatic species of America grow in the rain forests of the equatorial hylaea.

There are various categories of lauraceous odors and some of them do not conform with botanical classifications based merely on plant morphology. Thus, the scent of cloves is encountered in *Dicypellium caryophyllatum* and *Acrodiclidium caryophyllatum;* that of fennel in *Acrodiclidium puchury maior* and *Ocotea fragrantissima*. Congeneric species of such a close affinity that they cannot always be easily distinguished may smell very differently, as, for example, the above-cited *A. puchury maior* and *A. caryophyllatum*. According to the

scent of the woods, the aromatic Lauraceae here enumerated can be set in the following order: With scent of—

Linalol: *Aniba rosaeodora* and *A. Duckei* (Pau Rosa, the two essence-yielding species).
Linalol, modified: *A. fragrans* (Macacaporanga), *A. terminalis* (Pau Rosa), *A. parviflora* (Louro Rosa or Pau Rosa), and *Aniba* sp. (Louro Rosa or Casca Açucena).
Linalol, modified and weak: *A. firmula*, *A. Burchellii*, and closely related species (Louro Rosa).
Linalol, mixed with camphor: *Ocotea costulata* (Louro Camphora or sometimes Pau Rosa).
Cinnamon: *A. canelilla* (Casca Preciosa).
Clove: *Dicypellium caryophyllatum* (Cravo do Matto) and *Acrodiclidium caryophyllatum* (Puchury Pequeno or Puchury Menor).
Fennel: *Acrodiclidium puchury maior* (Puchury) and *Ocotea fragrantissima* (Puchury-rana).
Benzoin: *Acrodiclidium Appelii* (Aritú or Louro Aritú).

ANIBA ROSAEODORA Ducke, Pau Rosa (Brazil), Bois de Rose Femelle (French Guiana), Echt Rozenhout (Surinam).—A large forest tree whose scented wood is the sole source of the linalol essence produced in Guiana and the neighboring Brazilian part of the Oyapoc basin. Kostermans cites the species also for northeastern Peru and Colombia, but only based on herbarium specimens without wood.

ANIBA DUCKEI Kosterm. 1938 (=*A. rosaeodora*, var. *amazonica* Ducke), Pau Rosa.—I formerly considered this tree a variety of the preceding species, but I think now that Kostermans may be right in considering it a "good" species. Both are cultivated in our Botanical Garden, and their differential characters appear constant from the lowest age. The scent and the bitter taste of all parts of the two species are, however, the same, and the linalol essence both produce is identical. *A. Duckei* grows in upland rain forests along the Amazon river at a distance of some ten kilometers, in two zones: the southern (better explored) extends from Juruty Velho on the western limit of the state of Pará up to the lower Purús, while the northern lies between the basin of Rio Trombetas and the inland of Manáos. All the linalol exported by the Brazilian state of Amazonas comes from this species, of which I have distributed abundant herbarium material to many botanical institutions, including a wood sample and

flowering twigs to Yale (São José do Mamory, Ducke 110; Yale 22570). Kostermans cites this species also for the southern part of Dutch Guiana, but only on herbarium specimens.

ANIBA TERMINALIS Ducke, Pau Rosa (of carpenters).—A medium-sized tree with well characterized aspect due to its pseudo-verticillate leaves like those of certain Combretaceae. The species seems to be limited to the upland rain forest of the Atlantic zone of the hylaea where it was observed in the state of Pará, westward up to Gurupá, and (according to Kostermans) in French Guiana. The wood yields no essence but is very good for carpentry and is sometimes employed in popular perfumery; the old stems have a dark brown heartwood.

ANIBA sp., Louro Rosa (Manáos), Casca Açucena (Rio Trombetas).—A large tree of the upland rain forest, with small leaves; flowers still unknown. It yields one of the ingredients of the mixture composed of various aromatic barks, very popular at Santarem, Obidos, etc.; the aroma is not very different from that of the true Pau Rosa. I collected this species near the cataract Porteira of the Rio Trombetas (Herb. Jard. Bot. Rio de Janeiro 19934) and north of Manáos (H.H.B.R. 23982 and Ducke 96, with wood sample, Yale 21355).

ANIBA FRAGRANS Ducke 1925 (=*A. firmula* Kosterm. 1938 ex parte), Macacaporanga.—The herbarium specimens of this species resemble those of the true *A. firmula* enough to be united in a single species, but the trees are different, and *A. fragrans* has a strong and persistent odor much like that of the true Pau Rosa and still more agreeable.[1] The species is a small tree hitherto known only from the northern margin of the low plateau named Serra de Santarem where it occurs in drier forest on fertile dark humus soil; perhaps a relict of an ancient indigenous culture. It is one of the principal ingredients of the above-cited popular perfume of Santarem, powder or infusion of the bark or leaves of aromatic Lauraceae; for the present species, the parts employed are little

[1] No one, in Santarem, would confound the very well-known *Aniba fragrans* (Macacaporanga) with *A. firmula*, which is one of the several species of Louro Rosa.

twigs and dry leaves. I distributed botanical material to the principal institutes, to Yale with wood sample (Ducke 202; Yale 23664).

ANIBA FIRMULA (Nees et Mart.) Mez, sensu Kostermans, ANIBA BURCHELLII Kosterm., and some allied and often insufficiently studied species, Louro Rosa (in carpentry, not in perfumery).—These species are trees of variable but more frequently medium size, with pale yellowish brown wood good for carpentry; their bark has an aroma more or less like that of the various Pau Rosas but much milder and not persistent. They occur throughout tropical America rather frequently, in Brazilian Amazonia chiefly in higher and relatively drier localities of the upland rain forest.

ANIBA PARVIFLORA (Meissn.) Mez, Louro Rosa (perfumery), at Santarem sometimes also Pau Rosa.—A little tree whose bright greenish yellow wood is of very different aspect from that of the allied species and less odorous in the inner part; the bark and the fresh sapwood, on the contrary, are very aromatic, having a scent like a mixture of the true Pau Rosa (*A. rosaeodora* and *A. Duckei*) and the European Laurel (*Laurus nobilis*), with a bit of nutmeg. The species goes in the above-mentioned popular perfume of Santarem; its small size prevents more extensive industrial use. It is of common occurrence in the lower and middle Amazon from Santarem to Manáos and tributaries (Tapajoz, Trombetas, Madeira), in moist places with sandy humus soil, chiefly along forest brooks. I sent Yale a herbarium specimen with wood sample (Parintins, Amazonas, Ducke 139; Yale 22599).

ANIBA CANELILLA (H.B.K.) Mez, Casca Preciosa or simply Preciosa.—A rather large tree, sometimes up to 25 m. high, with reddish brown stem. It resembles somewhat the two industrially explored species of Pau Rosa, but is readily distinguished by the cinnamon-like odor and taste of all its parts and by its dark brown heartwood. The bark is used extensively in popular perfumes and medicine and the highly durable wood is greatly esteemed in carpentry. The species is widely spread through the hylaea, where it appears in the upland rain forest of higher points with dry clay soil, from the Guianas and the state of Pará westward to the upper

courses of the Orinoco and Rio Negro, and, southwest, to the middle Purús, but is not of frequent occurrence anywhere. I observed it in the state of Pará, in the basins of the Xingú, Tapajoz, Trombetas, and Nhamundá; in Amazonas, in the basins of the Madeira, Purús, and Rio Negro. Flowering herbarium specimens and a wood sample were sent to Yale (upper Rio Negro and Manáos, Ducke 85; Yale 21344).

Aniba canelilla has nothing to do with the numerous species of southern Brazil known by the vernacular name Canella, nor with *Acrodiclidium* (or *Licaria*) *canella* which is referred to in Macbride's *Flora of Peru* "as one of the more common species on the upper Amazonian tributaries where it is known as Casca Preciosa," a statement based on information erroneously attributed to me. I am not aware if a tree named Casca Preciosa exists in upper Amazonia; I know, however, that *A. canelilla* has not yet been observed westward of the middle Purús.

Aniba elliptica A. C. Smith, of Acre Territory, cannot be united with *A. canelilla*, as Kostermans does in his last work. I examined a type specimen (Krukoff 5601) and found the rather persistent aroma of this plant very different from that of *A. canelilla* and more like a Louro Rosa of the *firmula* affinity. Moreover, the leaves of *elliptica* are much larger than in any fertile *canelilla* twig I have seen.

ACRODICLIDIUM or LICARIA.—Kostermans recently supplanted the genus name *Acrodiclidium*, accepted by all botanists, by *Licaria* Aubl. whose type species is *L. guianensis*, ill described and not reidentified with certainty. Other authors, however, think this substitution not justified. I cannot decide this question and therefore I am obliged to use both genus names in this paper. I think, however, that in cases where no type material exists it might be better to disregard old genera and species that were not described well enough or fully enough to permit reidentification.

Acrodiclidium caryophyllatum Ducke, sp. nov., vel **Licaria caryophyllata** Ducke, sp. nov.—Speciei *A. puchury maior* (Mart.) Mez(=*Licaria puchury maior* [Mart.] Kostermans) partium vegetativarum adspectu simillimum, foliis ramorum

fertilium saepe brevioribus et proportionaliter latioribus lamina 50–140 mm. longa et 30–75 mm. lata; lignum ab eo speciei citatae valde diversum, bonum, odore caryophyllato fortissimo, interius rufobrunneum densum et durum. Racemi fructiferi soli adsunt, ex axillis superioribus, pauciflori, pedunculo cum rhachi simul sumptis 35–40 mm. longis; flores secundum relicta in fructibus junioribus hinc illinc persistentia iis speciei citatae similes videntur at minores, staminibus serierum 1 et 2 sterilibus parvis, seriei 3 fertilibus loculis parvis laterali-introrsis filamento intus sat piloso, seriei 4 staminodiis rudimentariis sub squamae parvae acutae pilosae forma praesentibus. Fructus quam in citata specie multo minores, cupula 20–25 mm. longa et lata, tenuiore, margine obsolete duplicato, bacca adulta 25–35 mm. longa. Arbor saeipus parva, nonnunquam sat elata at trunco debili, foliis alternis utrinque reticulatis, e partibus omnibus caryophyllum (nec foeniculum ut in specie citata!) fortissime et persistenter redolens. Baccae ab incolis utuntur rarius quam speciei citatae. Nomen vulgare Puchury Pequeno vel Puchury Menor.

Habitat secus flumen Curicuriary superius (Rio Negro affluens, in civitate Amazonas), silva riparia profunde inundabili et in paludibus silvaticis "igapó" dictis, loco Tumbira leg. A. Ducke 26–2–1936, H.J.B.R. 37623, cum ligno 261 (Yale 32637). Rami steriles et seminum cotyledones e regione fluminis Uaupés, H.J.B.R. 37622.

The present new species seems to be limited to some western tributaries of the upper Rio Negro; it differs not only from the true Puchury (*A. puchury maior*) and the Puchury-rana (*Ocotea fragrantissima*), both fennel-scented, but also from the various less odorous Louro Puchurys which belong to different genera and have merely local or occasional vernacular names. It also has nothing to do with *Aniba puchury minor* (Mart.) Mez, gathered by Martius at the Japurá and at present unknown in commerce.[2] *Acrodiclidium caryophyllatum* resembles the true Puchury in the form, the consistency, and the reticulated nervures of the leaves, as

[2] Kostermans (*loc. cit.*) says "the seeds are sold as pichurim beans," etc., but this information is evidently a reproduction of what Martius mentioned on the label of his plant and is not confirmed by recent collectors.

well as in the inflorescence and the principal characters of the flowers; it is distinguished by its much smaller fruits, its very different wood, and its aroma like Cravo do Matto, *Dicypellium caryophyllatum*.

ACRODICLIDIUM PUCHURY MAIOR (Mart.) Mez, or LICARIA PUCHURY MAIOR (Mart.) Kosterm., Puchury.—A small tree with dingy whitish yellow wood, strongly fennel-scented in all parts. Its seeds yield the well-known medicinal puchury or pichury beans. The tree is spontaneous in the basins of some western tributaries of the lower Rio Negro and in those of the small rivers between Maués and the lower Madeira; it grows in "igapó" periodically flooded by black streamlets. The beans of the trade come from spontaneous trees; the gathering is difficult because the ripe fruits drop in the water and sink. Cultivated trees are found here and there but only fructify well in certain (probably very acid) soils.

ACRODICLIDIUM APPELII Mez, or LICARIA APPELII (Mez) Kosterm., FORMA?, Aritú or Louro Aritú.—A middle-sized or large (35 m. high) tree which furnishes a very good carpentry timber whose fresh sapwood (as well as the bark) exhales a strong benzoin-like smell. It grows in the upland rain forest, but usually in high and relatively dry places, in the middle Amazon region where it is frequent near Parintins, Maués, and Manáos (Ducke 215; Yale 23677).

Kostermans attributes the Aritú to the subtropical *A. Appelii*, as a tropical geographical form growing in Amazonas and Matto Grosso. He refers to the material he studied as follows: "These two specimens are less densely sericeous on the lower leaf surface than the type specimen; the flowers are identical." He had, however, not seen the woods nor the fruits, nor compared the smell of the plants (the subtropical and the equatorial), the last being a character not to be scorned when one studies Lauraceae. And it must be recorded that a very insignificant number of hylaea-forest trees extend their geographic area to the subtropical South Brazilian highlands.

Ocotea fragrantissima Ducke, sp. nov., Puchury-rana. E subgenere *Dendrodaphne* (Beurl.) Mez.—Arbor ad 45 m. alta trunco cylindrico circiter 2 m. diametri, ligno flavido

bono, ut planta tota valde aromatica odore foeniculaceo. Ramuli subteretes mediocriter validi glabri fuscescentes saepe pallido-lenticellosi. Folia alterna, in ramulorum parte apicali sat approximata; petiolus 10–30 mm. longus canaliculatus minime pilosulus cito glabratus; lamina 60–130 mm. longa, 25–50 mm. lata, obovato-oblonga, basi sensim in petiolum cuneata, apice obtusa vel rotundata saepe complicata rarius retusiuscula, margine lineiformi subtus prominente cincta, adulta tenuiter et elastice coriacea concolor utrinque penninervis et laxe reticulata, supra glabra sat nitida, subtus microscopice papillosa subopaca. Inflorescentiae ex axillis solitariae apice ramulorum in paniculam subcorymbosam laxiuscule multifloram folia superantem compositae; paniculae singulae pedunculo usque ad priman divisionem 40–100 mm. longo sat tenui glabro, hic pluriramosae ramulis ultimis saepe bi- vel trifloris minute canotomentellis, pedicellis gracilibus 4–6 mm. longis bracteolis parvis caducissimis. Inflorescentiae praeter flores in vivo rubidae. Flores albi, hermaphroditi, anthesi incipiente 6–7 mm. longi demum late expansi 9–10 mm. in diametro (in exsiccatis), in alabastro extus tenuiter albido-puberuli, perianthii tubo turbinato sub anthesi fere 1 mm. longo, limbi segmentis oblongo-ovatis acutiusculis, intus densissime albopapillosis. Antherae albopapillosae, locellis per paria superpositis connectivo longe superatis; serierum 1 et 2 foliaceae anguste ovatae introrsae basin versus aliquanto angustatae nec stipitatae; seriei 3 elongato-ovatae basi utrinque glandula magna instructae, apice longe ultra locella lateraliter dehiscentia acuminato-prolongatae. Pistillum glaberrimum. Cupula adulta in siccis 6–10 mm. alta 15–20 mm. lata pateriformis stipite basali usque ad 10 mm. longo subcylindrico supra parum dilatato, crasse carnoso-coriacea margine obsolete duplicato; bacca 30–35 mm. longa subovali-oblonga.

Habitat in silva non inundabili prope fluminis Curicuriary (Rio Negro affluentis) cursum inferiorem, leg. A. Ducke florif. 4–10–1935, fructibus maturis sub arbore Februario 1936, H.J.B.R. 35184, cum ligno 225 (Yale 31952). Puchury-rana (Puchury spurius) appellatur.

A tree remarkable for its great size, and for the very penetrating fennel odor of all its parts; in the fresh wood this scent attains an extraordinary intensity, exceeding that of any other wood I know. The fruits are also aromatic but people do not use them as the seeds are much softer and more difficult to keep than those of the true Puchury. I saw three individuals which rank with the largest trees of the virgin forest of the Lower Curicuriary, where the few inhabitants call them Puchury-rana or false Puchury. From a taxonomic point of view this species is one of the most readily recognizable of this large genus. The characteristics enumerated in the diagnosis, particularly the form of leaves and anthers, are quite sufficient for determination. The species nearest to it seems to be *O. barcellensis* which, however, shows sufficient differences in the leaves, inflorescence, and fruits.

OCOTEA BARCELLENSIS (Meissn.) Mez (=*Nectandra elaiophora* Barb. Rodr., according to Kostermans), Inamuhy (corrupted to Mamory) or Louro Inamuhy at the lower Rio Negro and Solimões; Sassafrás in the upper Rio Negro, in Brazil and Venezuela; occasionally Pau Rosa, owing to confusion with some *Aniba* species.—I am including this species here because it is sometimes mistaken for a Pau Rosa and cited so; the wood (which is very good for carpentry) really resembles it, but has a strong turpentine smell. The tree attains 20 or 30 m. in height; it is well known because cavities of old stems frequently contain great quantities of inflammable liquid which people often confuse with gasoline ("gazolina"). Its habitat is the periodically flooded "igapó" along the Rio Negro, except the cataract region, and the lower part of the Solimões. I have sent Yale herbarium material with wood sample (São Joaquim, Rio Negro, Ducke 2; Yale 20683).

OCOTEA COSTULATA (Nees) Mez, Louro Camphora (Manáos and Juruty Velho), or Pau Rosa (Rio Trombetas and Breves).—I think I have rightly determined this plant, but I have not seen authentic material from British Guiana. In the aspect of its bark the tree resembles the true Pau Rosa, but the stems are never tall and cylindric, but always low and tortuous, and, when very old, contain a thin brown heartwood; the aroma of the bark is agreeable but the wood has a pronounced camphor smell. The tree grows in sandy humus soil along little

streams, in moist or marshy but not flooded places, frequently on the border of "igapó" and upland forest; I observed it near Breves in the Amazon estuary, and in the western part of the lower Amazon from Rio Trombetas and Juruty Velho to Manáos. There is a wood sample with herbarium material (Manáos, Ducke 170; Yale 23632) in the Yale collections.

DICYPELLIUM CARYOPHYLLATUM Nees, Cravo do Matto, or Cravo do Maranhão.[3] This highly aromatic little tree is rather widely spread through the state of Pará but at present is rare, probably because of the destruction of the trees since the colonial time when the bark was exported to Europe. I observed it in the basins of the Xingú, Tapajoz, and Trombetas as well as in the country northeast of Obidos, in upland rain forest. I sent Yale a wood sample with herbarium material (Itaituba, Rio Tapajoz, Ducke 212; Yale 23674).

SOME NOTABLE NEW TREES OF MEXICO

By MAXIMINO MARTÍNEZ

During recent explorations of the forests of Mexico I discovered some trees which are new to science and two of them are of unusual interest because they are of kinds not previously known to occur south of the United States. I took herbarium specimens to Arnold Arboretum for comparative study and will publish full diagnoses soon. Wood samples have been sent to the Yale School of Forestry.

White Pine, *Pinus strobus* L., according to Sargent, has its southern limit in the Appalachian Mountains of northern Georgia. In Chiapas, the most southern of the Mexican states, I found large forests of a tree which has proved to be of this species. There are differences enough, however, particularly in the leaves, which are very slender, to provide ground for describing it as a new variety.

Beech, *Fagus*, has never before been reported from Mexico, but near Zacualtipán, Hidalgo, I found a forest of Beech (Haya) trees which are 30 to 40 m. tall, with trunks 50 cm. to 1 m. in diameter. I consider this tree to be a new species, as it differs from *Fagus grandifolia* Ehrh. in that its leaves are cuneate at the base and the fruits are longer. The wood is hard, durable, and of beautiful appearance.

[3] Maranhão = clove. The bark was formerly exported from the port of São Luiz do Maranhão.

Fir, *Abies*, is represented in Mexico by three described species, *A. concolor* Lindl. & Gord. of Baja California and Sonora, *A. religiosa* (H.B.K.) Schl. & Cham. of central Mexico, and *A. Hickeli* Flous & Gaussen of Oaxaca. In Santa Catarina, Nuevo León, I discovered a tree which resembles *A. magnifica* A. Murr. of California and Oregon, but has much smaller cones, only about 7 cm. long. I shall describe it as a new species.

AMERICAN WOODS OF THE FAMILY ANACARDIACEAE

By SAMUEL J. RECORD

This family consists of about 65 genera and over 500 species of trees, shrubs, and woody climbers, most abundant in tropical and subtropical regions, a few inhabiting the temperate zones. The bark is often resinous and many of the plants have a volatile oil that is caustic or poisonous. The leaves are typically alternate, without stipules, and simple, trifoliate, or odd pinnate with few to many pairs of leaflets; the flowers are generally small and borne in axillary or terminal panicles; the fruits are drupaceous, sometimes edible, or dry and winged. Some of the best known members are the Mango (*Mangifera*), Pistachio (*Pistacia*), Sumachs (*Rhus*), Poison Ivy (*Toxicodendron*), and Quebracho (*Schinopsis*). There are arborescent species of about 25 genera in America, but only two genera (*Astronium* and *Schinopsis*) are of much commercial importance for their timber.

The woods of the family exhibit wide variation in appearance and properties. Color yellow with greenish cast to olive-green, often variegated or streaked, in *Cotinus*, *Mauria* (in part), *Rhus* (in part), and *Toxicodendron;* pink to light reddish orange in *Mosquitoxylum* and *Rhus* (in part); red darkening to brick red or deep brownish red in *Astronium* (*Myracrodruon* section), *Comocladia*, *Schinopsis*, and *Schinus* (in

part); in other genera mostly light brown to dark reddish brown, sometimes whitish or light grayish brown, often with pinkish tinge in lighter-colored specimens, frequently striped or variegated. Luster low, medium, or high. Odor sometimes present but not very distinctive; taste of reddish woods sometimes astringent. Density 0.44 to 1.30; weight (air-dry) 27 to 81 lbs. per cu. ft.; texture coarse to fine; grain variable; working properties poor to excellent, generally good; durability very low to very high.

Growth rings present, not always distinct. Ring-porous structure in some or all species of *Cotinus*, *Rhus*, and *Toxicodendron*, the early-wood pores small to medium-sized and in a narrow to wide band, those in late very small to minute and tending to form diagonal or tangential bands; ulmiform pattern in *Schinus;* elsewhere the pores are mostly small, solitary or more often in radial multiples of two to several pores each. Vessels typically with simple perforations; scalariform plates with many narrow bars also present in some vessels of *Campnosperma;* spiral thickenings present in some or all of the vessels of *Cotinus*, *Lithraea*, *Rhus*, *Schinus* (in part), and *Toxicodendron*. Tyloses usually abundant in heartwood. Rays in part with small to large resin ducts, the epithelial layer composed of one to several rows of very small cells in some or all species of *Astronium*, *Campnosperma*, *Loxopterygium*, *Malosma*, *Metopium*, *Rhus*, *Schinopsis*, *Schinus*, *Spondias*, *Tapirira*, and *Toxicodendron;* other rays generally 1 or 2, occasionally 3, sometimes up to 5, rarely 8, cells wide and mostly less than 30, occasionally up to 50, rarely 100, cells high; weakly to decidedly heterogeneous; crystals common; pits to vessels large, oval to much elongated. Wood parenchyma apparently absent in *Campnosperma;* sparingly vasicentric in the others; sometimes also finely terminal and occasionally diffuse; crystalliferous strands present in a few genera, *e.g.*, *Lithraea* and *Mauria;* pith flecks common in soft woods. Wood fibers with thin to very thick walls; septate, at least in part, in *Anacardium*, *Astronium*, *Campnosperma*, *Comocladia*, *Lithraea*, *Loxopterygium*, *Mauria*, *Metopium*, *Schinopsis*, *Schinus*, *Spondias*, *Tapirira*, and *Toxocodendron;* pits small to minute, simple or indistinctly bordered. Ripple marks absent. Vertical resin ducts not known to occur in any member of the family; radial canals few to numerous, visible with lens, sometimes (*e.g.*, *Loxopterygium* and *Tapirira*) staining the surface of the wood with their dark-colored, oily exudations.

Actinocheita, with a single species, *A. filicina* (DC.) Barkley (=*Rhus filicina* DC.=*Rhus potentillaefolia* Turcz.), is a shrub or little tree, resembling Staghorn Sumac (*Rhus typhina* Torn.), limited to the mountains of southwest Mexico, where it is known as Tetlazian. It is not represented in the Yale wood collections.

Anacardium, with several species of small to very large trees, is represented throughout tropical America, though most of the forms are Brazilian. The leaves are alternate, simple, entire, and petioled; the flowers are small and borne in large terminal panicles; the leathery, nut-like, indehiscent fruit is borne on an enlarged stalk. The timber of certain species has commercial possibilities.

The best known species is the Cashew, *A. occidentale* L., a small tree indigenous to the Caribbean region and naturalized elsewhere in the tropics. Standley says (*Trees and shrubs of Mexico*, p. 659): "From the trunk there exudes a gum somewhat like gum arabic. This can be used for varnish, and in South America it is used for bookbinding in order to prevent the attacks of insects. The most important products of the tree are the fruit and receptacles, both of which are edible. The receptacle is pear-shaped, very fleshy, and yellow or reddish; it is astringent when green, but when ripe has a pleasantly acid flavor. In Mexico sweetmeats are sometimes made from the receptacles, and in some parts of tropical America a kind of wine is made from them, and this after fermentation is distilled to obtain brandy. The pericarp of the fruit proper contains an oil, cardol, which is acrid and caustic. This is driven off by heat, but the fumes which rise when the nuts are heated should not be allowed to reach the face or eyes. The roasted kernels are edible and have a pleasant milky flavor. The oil obtained from the nuts is applied in India to the floors and rafters of houses to preserve them from insects, but its use is dangerous. The ground kernels are sometimes used to flavor wine, and they are mixed with chocolate."

(For an account of the Cashew nut industry in western India, including the harvesting and preparation of the nuts and the utilization of the by-products, see *Bull. Imperial Institute* [London] 36: 1: 44–52. 1938.) The French for Cashew is Acajou, the name generally applied to Mahogany (family Meliaceae). According to A. Chevalier (*Rev. Bot. Appl. & d'Agr. Tropicale* 17: 194: 713), the designation for Mahogany probably originated from the use of the Cashew resin to varnish the ends of *Swietenia* logs to prevent checking in shipment from the West Indies to France. The wood of the Cashew tree is of no commercial value and its uses are few and local.

Some of the other species of *Anacardium* are large trees. Among these are *A. microsepalum* Loes., *A. parvifolium* Ducke, *A. giganteum* Engl., and *A. Spruceanum* Benth. of the Amazon region, the last two extending northward into the Guianas; and *A. excelsum* (Bert. & Balb.) Skeels (=*Rhinocarpus excelsa* Bert. & Balb.=*A. Rhinocarpus* DC.) extending from Costa Rica to Ecuador and Venezuela. The following account of *A. excelsum*, known in Panama as Espavé, is by G. Proctor Cooper (*Tropical Woods* 22: 4–9):

"Espavé occurs in large quantities on the Pacific Coast of Costa Rica and Panama and on the Caribbean coast of Colombia and Venezuela. I failed to find it on the northern side of Panama from Bocas del Toro to the Colombian border and it is not known at Puerto Limón, Costa Rica. It seems to be confined to regions having distinct dry seasons. Although typical of the dense evergreen forest it does not grow at the higher elevations; at least this was found to be the case in Chiriquí, Panama, where the species finds its best development on the lower, well-drained soils. In that locality I found an average of 4 or 5 trees per acre, with a maximum of 10 or 12 massive trees 75 to 125 feet tall. In Darién Province it is said to compose almost pure stands over large areas. Its gregarious occurrence is presumably due to the facility with which it reproduces itself and to its ability to crowd out competing species. . . .

"Under favorable conditions in the forest, Espavé attains a height of 125 to 150 feet, with an unbuttressed trunk 4 to 6 feet in diameter above the basal swelling and free of limbs for 40 to 50, occasionally over 60, feet; the crown is often spreading or urn-shaped, with some of the branches large enough for small sawlogs. Grown in the open, the tree has a short, thick trunk and a full crown of low-spreading branches. The pale, grayish bark, which is scaly or roughly plated, but not deeply furrowed, serves readily to distinguish the tree from its associates in the forest. . . .

"The sapwood, which may be as much as 6 inches thick in large logs, is dingy gray, more or less streaked or blotched with yellow or purple. Fresh heartwood is dull brown, with purplish-red streaks; the freshly exposed interior of thoroughly dry specimens has a lusterless lemon-yellow color, with darker striping. When a dry plank is exposed to the air and light for some time the color gradually changes into a rich golden brown, the striped effect becomes more pronounced, and the purplish tints change to reddish brown. On quarter-sawed boards, the rays are very distinct, for although not large they are darker than the fiber background and show effectively. The vessel lines are also dark-colored and distinct, especially on tangential surfaces. A newly felled log has a slight resinous or pungent scent, but this is probably attributable to the bark, as the dry wood is odorless and tasteless.

"The wood is in some ways easy to work, but radial surfaces have a tendency to become fuzzy when planed or sand-papered, due to the fact that the walls of the fibers are rather soft and yielding and do not cut off sharply and smoothly where the grain is alternating. This type of grain, often called roe or feather grain or cross-banding, is typical of many of the finest cabinet woods, but there the tools make a much sharper and cleaner cut over the crossed grain than is possible with Espavé. However, when varnish is applied, followed by light sanding and wax, a high polish is obtainable. The wood takes stains readily. Occasionally pin knots are found deeply buried in the log and their pith is likely to fleck out when the lumber is being worked. Espavé nails without splitting and holds its shape well in box form if kept dry; exposed to the weather it will warp and check. It is not very durable in contact with the ground.

"The natives use the wood for making kitchen utensils and dishes because it is easy to work and the articles made from it are light, but resistant to wear. The large trunks are well adapted for the making of dugout canoes as they can be fashioned with crude tools, are not easily split, and have a fairly long life. The timber is to be had at the local lumber yards in the various parts of the countries where the trees are available. It is used for general carpentry and construction, inexpensive furniture, and other purposes for which it is suited on account of its lightness, fair durability, and low cost. . . . Attempts to introduce the lumber into the markets of the United States have been made in a desultory way, but with little success, as the wood is not of sufficiently high grade to sell itself. It is none the less potentially a very useful timber and occurs in sufficient abundance to justify careful investigation by industries in this country."

Tests on a limited amount of Espavé timber gave the following results (*loc. cit.*, pp. 7–9): Sp. gr. (air-dry) 0.56; weight 35 lbs. per cu. ft. *Static bending* (lbs. per sq. in.): modulus of rupture, 7175; m. of elasticity 1,683,500; fiber stress at elastic limit, 4690. *Endwise compression* (lbs. per sq. in.): maximum crushing strength, 8230; modulus of elasticity, 1,800,000; fiber stress at e. l., 6190. *Tension* (perpendicular to grain):

586 to 718, av. 636, lbs. per sq. in. *Shearing strength* (along grain): 954 to 1388, av. 1178, lbs. per sq. in. *Cleavage strength:* 222 to 264, av. 247, lbs. per in. of width. *Hardness* (load in lbs. required to imbed 0.444-in. ball half its diam.): radial surface, 615 to 730, av. 680; tangential, 650 to 765, av. 700; end, 620 to 795, av. 710.

Growth rings distinct to indistinct. Pores variable in size, often in same growth ring, the largest readily visible; rather numerous, fairly evenly distributed; solitary and in pairs and small clusters. Vessel lines conspicuous; thin-walled tyloses abundant in heartwood. Rays 1 or 2, sometimes 3, cells wide and up to 40, generally less than 20, cells high; coarse-celled, heterogeneous, most of the cells square or upright, without well-defined stratum of procumbent cells; large crystals common; gum deposits abundant; pits to vessels mostly very large and widely variable in outline. Wood parenchyma rather sparingly developed, not distinct without lens; narrowly vasicentric, occasionally short aliform. Wood fibers septate, thin-walled, squarish, arranged in fairly definite radial rows; pits small, simple or indistinctly bordered.

COMMON NAMES: *A. occidentale:* Cashew, c. nut tree (Eng.); acajou (Fr.); marañón (Sp.); cajuil (P.R.); cacajuil, cajuil (Dom.R.); pomme cajou, p. d'acajou (Haiti); jocote marañón (Salv.); merey (Col.); caují, merei or merey, pajuil, paují, paujil (Venez.); boschkasjoe, kadjoe, kasjoe, kasjoen, mereke, olvi, orvi (Sur.); acaja-iba, acajou-iba, aloi, a. ichie, auloui, caschou (Fr.G.); caju, casú (Peru); acajaiba, acajuiba, cajú, c. manso, cajueiro, oacajú (Braz.). *Other species:* Nariz (Cuba, int.); espavé, espavel, e. amarillo, e. rosado, quina (C.R.); espavé, wild cashew (Pan.); caracolí (Col.); caracolí, c. blanco, chorote, lacre rosado, mija, mijaguo, mijao, paují (Venez.); hoobodia, wild cashew (Br.G.); akajoe, akoejoe, boesi kasjoen, bosch kasjoe, hoeboedie, kadjoe mattoe, merekeballi, oeboedi djamaroe (Sur.); caracolí (Ec.); cajú assú, c. da matta, c. do campo, c. do c. coberto, c. rastreiro, cajueiro do campo, cajuhy, cajurana, cajú-y (Braz.).

Astronium is an important genus with about a dozen species of medium-sized to large timber trees occurring in southern Mexico, Central America, Colombia, Venezuela, Trinidad, British Guiana, Ecuador, Bolivia, Argentina, Paraguay, and (most abundantly) in Brazil. The leaves are odd-pinnate, sometimes with few, commonly with many, entire or serrate leaflets; the flowers are small and paniculate; the sepals become enlarged and cover the small, dry, rounded or elongated fruits. Two sections of the genus are recognized, namely, *Euastronium*, typified by *Astronium graveolens* Jacq., and *Myracrodruon*, of which the best known species is *A. urundeuva* (Fr. Allem.) Engl.

Section *Euastronium*, according to Mattick (*Notizbl. Bot. Gart. Berlin-Dahlem* 11: 110: 991–1012. 1934), includes nine species, one variety, and six forms. *A. obliquum* Gris. is an evergreen tree confined to the hills in northern Trinidad, where it is known as Yoke. *A. Conzattii* Blake (= *A. zongolica* Reko) of southern Mexico is probably not specifically distinct from *A. graveolens*. The Muiracoatiara of the lower Amazon is *A. LeCointei* Ducke; some timber of this species from the Ford rubber plantations on the Rio Tapajoz has been sold in the United States under the name of Mura. *A. Ulei* Mattick, a tree sometimes 50 feet high, distinguished chiefly by the small number of its leaflets, occurs along the Rio Branco, a northern tributary of the Amazon; its wood has not been studied. *A. gracile* Engl. is a tree of medium height, but with a stout bole upward of 36 inches in diameter, known as Ubatan or Ubatão in Rio de Janeiro, and as Urunday-itá, Uruanday-pará, and Uruanday-pytá in Paraguay; the bark contains about 12 per cent of tannin; the black-striped brown wood is said to be only sparingly utilized because of its brittleness.

The two principal species are *Astronium graveolens*, including the variety *Planchonianum* Engl. (= *A. Planchonianum* Engl.), and *A. fraxinifolium* Schott, with four forms. Both species occur together throughout most of the range of the genus and their timbers are practically identical. The color varies from light to dark brown or reddish, more or less conspicuously marked with vertical blackish bands of variable spacing and often producing a very striking and beautiful figure. There is a considerable range of density in different specimens and also within the same sample, the dark zones being the heavier. The timber best known commercially is the Gonçalo Alves of eastern Brazil. Karl Schmieg, a New York manufacturer of fine furniture, says (*Tropical Woods* 5: 2): "Gonçalo Alves is obtainable in long logs 12 to 24 inches in diameter and very straight and sound. The wood is moderately hard and heavy, fairly close in texture, and stands very

well. It is suitable for cutting into veneers and takes a beautiful polish. It has a rather pleasing stripe and bears some resemblance in figure and texture to Golden Ebony, or Coromandel, only it is of a warmer tone; the stripes are dark but not real black. Sometimes the wood exhibits a mottled figure and then approaches the Brazilian Rosewood."

Although a form of *A. fraxinifolium* grows in Colombia, most of the herbarium specimens from that country have been determined as *A. graveolens*. H. M. Curran says (*Timbers of Tropical America*, p. 389): "This is another form of the tree and timber known as Gonçalo Alves in Brazil. I am acquainted with it only in the Magdalena valley in Colombia, where it occurs scatteringly in the lowland forests. It attains a height of 100 feet or more, with commercial lengths of 50 feet and diameters up to three feet. It is a symmetrical tree, only slightly buttressed, and has a rather thin but somewhat rough bark of a brown or grayish color. It is considered the best timber in the Magdalena valley for house posts. The timber is commonly met with in the markets of both countries and is highly esteemed for cabinet work and fine furniture."

Section *Myracrodruon*, sometimes treated as a distinct genus, comprises, according to Mattick (*loc. cit.*), four species and one variety limited in distribution to tropical South America below the Amazon region. *Astronium macrocalyx* Engl. of Bahia and Rio de Janeiro is known in the latter region as Aroeira do Mucury. *A. concinnum* Schott (= *Myracrodruon concinnum* [Schott] Engl.) is apparently confined to the region about Rio de Janeiro. *A. Balansae* Engl., occurs in Brazil, Paraguay, and Argentina. It attains a height of about 50 feet and a trunk diameter of 24 inches and is important for its strong and durable timber, particularly in the Chaco; it is called Urunday in Misiones, Uruanday Pardo in Corrientes, and Uruanday-pichaí in the Chaco. The most widely distributed species is *A. urundeuva* (Fr. Allem.) Engl. (= *M. urundeuva* Fr. Allem. = *A. juglandifolium* Gris.). It is generally known in Brazil as Aroeira, also Chibatan and Ubatan; in Bolivia as Cuchi and Sotocolo; in Paraguay as Urunday-mí; as Urundel in Jujuy and Salta, Argentina, where it is perhaps at its best, with a maximum height of 100 feet, though usually it is not over 60 feet tall and 30 inches in diameter.

The woods of all species of this section, so far as studied, are similar. The yellowish sapwood is comparatively thin and is sharply demarcated from the heartwood, which has a fairly uniform cherry-red color deepening to dark brownish red upon exposure, but lacking the bold blackish striping characteristic of the woods of the section *Euastronium*. There is considerable resemblance to Quebracho (*Schinopsis*), but in general the grain is not so irregular, the consistency is not so flinty, the appearance is more oily, the demarcation between heartwood and sapwood is sharper. The timber is highly appreciated locally for railway crossties, posts, piling, bridge timbers, and other forms of heavy and durable construction, and for fuel.

The following description applies to all species of *Astronium*. Wood hard and heavy to extremely so; sp. gr. (air-dry) 0.85 to 1.28; weight 53 to 80 lbs. per cu. ft.; texture rather fine, uniform; grain variable; fairly easy to rather difficult to work, turns readily, finishes very smoothly and takes a high natural polish; noted for its durability. The softer grades with attractive figure are suitable for veneers for fine furniture; the denser and more deeply colored material, particularly specimens containing a large proportion of black wood, can be used for knife handles in place of Cocobolo (*Dalbergia retusa* Hemsl.).

Growth rings present, sometimes very distinct due to blackish bands which appear initial rather than terminal. Pores small to medium-sized, often visible, particularly in dark zones, because of parenchyma sheaths; fairly numerous; solitary or more often in short radial multiples, usually well distributed. Vessels filled with tyloses in heartwood; white substance sometimes present. Rays in part with small to rather large resin ducts, the epithelial layer composed of 1 or 2 rows of very small cells; other rays 1 or 2, occasionally 3, cells wide in section *Myracrodruon*, 1 to 4, sometimes 5, cells wide in the others; height commonly less than 25 cells, infrequently up to 40; heterogeneous; crystals common, often large; gum abundant; pits to vessels large and irregular. Wood parenchyma sparingly vasicentric; sometimes finely terminal. Wood fibers septate, at least in part; gum deposits abundant, particularly in dark zones. Radial resin ducts visible with lens; usually fewer in section *Myracrodruon*.

COMMON NAMES: *Euastronium:* Yoke (Trin.); cero, copaiva, culebra, kulimche, palo de cera, p. de culebra, sangolica or sangualica, yaga-biche, zongolica (Mex.); glassy wood (Br.H.); ciruelo, jocote de fraile, palo mulato, p. obero

(Guat.); ronrón (Salv.); ciruelillo, ciruelo, c. de montaña, foncontín, masicarán, palo obero, ronrón, pimientillo, sirguelillo (Hond.); ronrón (Nic., C.R.); zorro (Pan.); diomate, gusanero, quebracho, quiebrahacha (Col.); algarrobo barcino, diomate, gateado, g. barcino, gusanero, potro, roble gateado, tibigaro, tirigaro, yomate (Venez.); bauwana (Br.G.); guasango (Ec.); bola-quivo, palo de cruz (Peru); arantha, gomavel, gonçaleiro, gonçalo, g. alves, g. do matto, jejuira, muira-catiara, m.-coatiara, m.-quatiara, pau gonçalo, sangue-sugueira (Braz.); urunday-para (Arg.); urunday-ibá, u. -pytá, u. -para (Par.); almendro macho, cuchi blanco (Boliv.). *Myracrodruon:* Aderno, a. preto, a. vermelho, aroeira, a. do campo, a. do mucury, a. do sertão, a. preta, chibatan, gibatão, guarubú preto, orendauva, ubatan, ubatão, urundeuva (Braz.); urunday-mí (Par.); cuchi, sotocolo (Boliv.); urunday, u. blanco, u. crespo, u. del nordeste, u. del noroeste, u. -mí, u. pardo, u. -pichái, urundel (Arg.).

Campnosperma, with several species of medium-sized to large trees growing gregariously on wet lowlands near Mangrove formations, is best represented in the East Indies. There are two species in tropical America, namely, *C. gummifera* (Benth.) L. March., a tree about 65 feet high of common occurrence in marshy forests in parts of the lower Amazon, and *C. panamensis* Standl. of the Atlantic lowlands of northern Panama and adjacent localities in Costa Rica, where it is known as Orey. The following information is supplied by G. Proctor Cooper (*Tropical Woods* 12: 7):

"I first saw the Orey tree while I was on a trip from Almirante to Bocas by launch. There is a long neck of low swampy mainland off the western part of Columbus Island, on which the town of Bocas del Toro is situated, and viewed from a distance one sees an even, unbroken line of timber that contrasts noticeably with the appearance of the usual type of shore forest. This is due to the predominance of the Orey trees which comprise upward of 50 per cent of the whole stand and form groves here and there that are almost pure in so far as the larger trees are concerned. In this gregarious habit the Orey resembles the Cativo (*Prioria Copaifera* Gris.) and the Silica Palm. I was told by Mr. William Ponton, the British vice consul at Bocas, that Orey occurs in places all along the Caribbean coast from San Blas, Panama, to Puerto Limon, Costa Rica, and, according to reports by natives, was to be found also along the east coast of Nicaragua.

"The specimen in our collection (Yale 10500) was obtained on Colombus Island, near Bocas. It is from one of a group of trees growing just behind the fringe of Mangroves and almost at sea level where the ground is wet and during heavy rains is under water, site conditions said to be typical for the species. The trees are 12 to 18, occasionally 24, inches in diameter breast high, with low and stout buttresses, and a rather short bole covered with a thick, greenish gray bark that is rough, though not deeply furrowed. The crowns, which are large, forked, and spreading, have heavy branches and coarse, brittle, and blunt twigs which bear clusters of leaves at the ends and are marked with prominent leaf scars. From the tips of some of the twigs, beyond the leaves, extended spikes of small, yellow, faintly scented flowers. The new fruits, some of which were nearly mature before the tree was through blooming, are about half an inch in diameter and have a stony pit covered with a green fleshy exocarp from which, when cut into, a dirty gray juice exuded that stained the knife blade a bluish purple. A similar juice was found in cutting the bark of the trunk, but it was not very abundant. The wood is light and soft and is not 'sappy.' It has a rather distinctive, though not pronounced, odor when fresh, but there is nothing unpleasant about it. The color varies from white to grayish buff, without marked contrast between heartwood and sapwood. The dingy pink color that eventually covered the surface of the specimen was not in evidence at the time of cutting and did not penetrate deeply except along cracks. Some blue stain due to a fungus appeared in the sapwood while the sample was being seasoned. I did not observe any local use for the timber."

Orey wood has a somewhat silvery luster in proper light, but on the whole its appearance is not attractive. It is firm, rather fine-textured, tough, and strong for its weight; sp. gr. (air-dry) 0.44 to 0.48; weight 27 to 30 lbs. per cu. ft. Preliminary tests on pulping properties indicate that it is unsatisfactory for sulphite, kraft, or ground-wood because of the difficulty of removing the pinkish gray color, but can be used successfully with the soda process. (See *Tropical Woods* 12: 9.) The timber is not suitable for construction where exposed to decay or insect attack or for purposes requiring great strength or attractiveness of figure, grain, and color. It seems best adapted for making boxes and food containers, the principal use of the East Indian species, as it is easy to work, finishes smoothly, holds nails well, and is free from objectionable odor and taste. It is also worthy of trial for plywood for general utility purposes as it is somewhat like Okoumé (*Aucoumea*) of tropical West Africa.

Growth rings absent or poorly defined. Pores not distinct without lens, numerous; solitary and in radial pairs, evenly distributed. Vessels sometimes

filled with thin-walled tyloses; perforations either simple or multiple, the plates of the latter scalariform with numerous fine bars. Rays in part fusiform, with large intercellular canals surrounded by several layers of very small cells; other rays 1 or 2, sometimes 3, cells wide; height generally less than 40, sometimes to 60, cells; heterogeneous; pits to vessels large, often elongated and in scalariform arrangement; dark gum deposits common to abundant. Wood parenchyma apparently absent. Wood fibers septate in part; walls thin; pits small, simple or indistinctly bordered. Radial ducts few to numerous; exudations show as small specks on tangential surface. Woods of all species similar in structure.

Comocladia, with about 20 species of poisonous little trees, occasionally 30 feet high, with slender, usually unbranched stems, is confined to the West Indies and south-central Mexico. The leaves are odd-pinnate, with 3 to 18 pairs of entire or irregularly toothed, sometimes spinose, leaflets; the minute red flowers are borne in axillary panicles; the fruit is a small drupe. The bark contains a caustic sap that turns blackish and makes an indelible stain. The wood is of good quality and harmless, but is little used because of the small sizes available and the poisonous nature of the trees.

The following description is based upon specimens of six species, namely *C. dentata* Jacq., *C. glabra* Spreng., *C. integrifolia* Jacq., *C. Palmeri* Rose, *C. platyphylla* A. Rich., and *C. repanda* Blake. Heartwood uniform light red, deepening to brick-red upon exposure; sharply demarcated from the brownish or yellowish sapwood. Luster rather low. Without distinctive odor or taste. Very heavy, hard, and strong; sp. gr. (air-dry) 1.10; weight about 69 lbs. per cu. ft.; texture fine and uniform; grain irregular; rather difficult to work, but taking a glossy polish; highly resistant to decay.

Growth rings present, often poorly defined. Pores not distinct without lens, fairly numerous; solitary and in small multiples, often with tendency to diagonal arrangement. Vessels plugged with tyloses in heartwood. Rays all uniseriate or in part biseriate, commonly less than 20, sometimes up to 40, cells high; decidedly heterogeneous; large crystals common; gum deposits abundant; pits to vessels large, irregular. Wood parenchyma sparingly vasicentric. Wood fibers in part septate; bands of thin-walled septate fibers common. No gum ducts seen.

COMMON NAMES: Black plum, maiden plum (Jam.); guao, g. común, g. de sabana, g. hediondo, g. prieto, g. real (Cuba); carrasco, maíz pelado, m. tostado, poison ash, prapa (P.R.);

chicharrón, guao (Dom. R.); bois espagnol, b. pangnol, brésillet, b. franc (Haiti); chinil-té, hincha huevos, pata de pava, tatatil, tatatián, teclatilla (Mex.).

Cotinus consists of two closely related species of deciduous shrubs and little trees with simple, long-petioled leaves, scaly bark, fleshy roots, and strong-smelling juice. *C. coggrygria* Scop. (=*Rhus Cotinus* L.) is widely distributed through southern Europe and the Himalayas to central China. It is the Smoke-tree of gardens, so called because of the large, loose, finely plumose, terminal, gray fruiting panicles which may cover the crown. The American species, sometimes considered only a variety of the other, is *C. americanus* Nutt. (=*Rhus cotinoides* Nutt.=*C. cotinoides* [Nutt.] Britt.). It is of interrupted distribution in the lower Mississippi valley, attaining its largest size in northern Alabama and southern Tennessee, and in the Ozark mountains of southwestern Missouri, northwestern Arkansas, and eastern Oklahoma; it also occurs in Texas, often reduced to a low shrub abundant in mountain canyons and high hillsides in Kenyon county. At its best it rarely exceeds 30 feet in height with a trunk 12 to 14 inches in diameter. The timber is unimportant because of its scarcity, but makes good fence posts.

Heartwood greenish yellow, more or less striped; sharply demarcated from the thin, nearly white sapwood. Luster fairly high. Without distinctive odor or taste. Moderately hard and heavy; texture rather coarse, uneven; grain straight; easily worked, taking a glossy polish; highly resistant to decay. Of no commercial possibilities.

Ring-porous, with several rows of barely visible pores in early wood. Pores in late wood very small to minute, occurring in radial multiples and in clusters, tending to irregular diagonal or wavy tangential arrangement. Vessels filled with tyloses in heartwood; spiral thickenings present, at least in smaller vessels. Rays uniseriate and biseriate, usually less than 30, sometimes up to 40, cells high; heterogeneous; crystals common; gum deposits abundant; pits to vessels rather large, oval. Wood parenchyma sparingly vasicentric. Wood fibers with medium walls and very small pits. No resin ducts seen.

COMMON NAMES: Chittamwood, smoke-tree, yellow wood (U.S.A.).

Cyrtocarpa is a Mexican genus with two species of trees 20 to 30 feet high and 6 to 12 inches in diameter. *C. edulis* (T. S. Brandeg.) Standl. (=*Tapirira edulis* T. S. Brandeg.) is limited to southern Baja California, where it is known as Ciruelo because of its edible drupaceous fruit. *C. procera* H.B.K. occurs from Jalisco to Puebla and Oaxaca; Standley gives the following information about it (*Trees and shrubs of Mexico*, p. 659): "The wood is said to be soft and purplish, with a strong odor, and to be used for making trays, small images, and other articles. Goats are fond of the leaves. The fruit, which is much eaten, is yellow and the flesh resinous, with acid flavor. The fruits are said to be known at Jojutla (Morelos) as 'berracos' and 'chupandías.' The large seeds are eaten by pigs, and they have been used locally (taken internally) as a remedy for leprosy. The bark is employed as a substitute for soap." The genus is not represented in the Yale wood collections.

COMMON NAMES: Chupandía, ciruelo, copal, c. cocote, c. jocote, copalhi, maxocote, popoaqua (Mex.).

Haplorhus *peruviana* Engl. is an evergreen tree, sometimes 50 feet tall, having the appearance of a Weeping Willow (*Salix*), of very limited known distribution in the Peruvian Andes, where it is called Ccási. (See *Notizbl. Bot. Gart. Berlin-Dahlem* 11: 108: 719.) There are no specimens available for this study.

Lithraea, with three species of poisonous shrubs and small trees, is rather widely distributed in southern South America. The leaves are simple in *L. caustica* (Mol.) Miers, but odd-pinnate with 3 to 5 sessile leaflets and a winged rachis in *L. brasiliensis* March. and *L. molleoides* (Vell.) Engl. (=*Schinus molleoides* Vell.). The last species is of considerable local utility; the bark is rich in tannin and dyestuff; the leaves are aromatic and medicinal; the fruits contain an essential oil similar to turpentine; the timber, though available only in small sizes, is of good quality and is used for cabinet work and articles of turnery and carving as well as for fence posts, stakes, fuel, and ashes for soap-making.

Heartwood blackish brown; sharply demarcated from the brownish, pinkish, or greenish tinged sapwood. Fairly lustrous. Odor and taste not distinctive. Hard and heavy, especially the heartwood; texture fine; grain straight to irregular; easy to work, finishing very smoothly; highly resistant to decay. Of no export possibilities.

Growth rings present. Pores not visible without lens, rather numerous; solitary and in small radial multiples, evenly distributed. Vessels with fine spiral thickenings; filled with gum in heartwood. Rays uniseriate or biseriate and up to 40, generally less than 30, cells high; heterogeneous; gum deposits abundant; pits to vessels large, oval to elongated. Wood parenchyma sparingly vasicentric and diffuse, the latter crystalliferous. Wood fibers septate, at least in part; often filled with gum. No resin ducts seen.

COMMON NAMES: Aroeira branca, a. brava, a. da caapuera, a. de bugre, a. do matto, aroeirinha, a. preta, coração de bugre, molle, pau de bugre (Braz.); árbol malo, aruera, a. blanca, a. colorado, a. dura, a. nigra, arueriña, corazón de bugre, molle de beber, m. dulce, palo de bugre, quina (Urug.); aroeira blanca, a. negra, chicha, chichita, molle de beber (Arg.); litre, llithi (Chile).

Loxopterygium, with four species of trees, is irregularly distributed from Venezuela and the Guianas to Argentina. Best known is *L. Sagotii* Hook. f., usually known in Surinam as Slangenhout (Snakewood) and in British Guiana as Hububalli. The tree is said to be fairly common in the forests of those two countries and attains a height of 100 feet and a trunk diameter great enough to produce hewed timbers 20 inches square. The smoothish or wrinkled bark contains a sticky greenish yellow latex. The unequally pinnate leaves have several pairs of rather large leaflets suggesting Ash (*Fraxinus*); the small flowers are borne in axillary panicles; the fruit is a small samara resembling those of Maple (*Acer*), though not borne in pairs. The timber is of good quality and is used to a small extent locally for making boats and furniture. Attempts to increase its utilization in British Guiana have not been very successful, owing largely to the preference for Crabwood (*Carapa*).

Heartwood brown or reddish brown, with dark laminations or streaks of varying width and regularity; usually flecked

with oil specks, distinct on lighter surfaces, especially the tangential; not sharply defined from the fairly thick, brownish gray sapwood. Luster medium. Odor absent or mildly unpleasant; taste not distinctive. Density variable; sp. gr. (air-dry) 0.60 to 0.75; weight 37 to 47 lbs. per cu. ft.; texture medium; grain straight to very irregular; easy to work, finishing smoothly and taking a good polish, though likely to show oil specks; appears durable. Commercial possibilities doubtful.

Growth rings present, distinct to indistinct. Pores small to medium-sized, visible in the dark bands, numerous; solitary and in short radial multiples, well distributed. Vessels with tyloses and gum deposits. Rays in part with resin ducts; others uniseriate or biseriate and up to 30, commonly less than 20, cells high; rather weakly heterogeneous; gum abundant; pits to vessels large, short to long oval. Wood parenchyma very sparingly vasicentric. Wood fibers septate; pits very small. Radial gum ducts visible as small specks on tangential surface and as dark lines on the radial.

COMMON NAMES: Onotillo (Venez.); hoobooballi or hububalli (Br.G.); boesi mahonie, hoeboeballie, koeipjarie, slangenhout, snekie hoedoe (Sur.); kooel pialli (Fr.G.).

Malosma, with a single species, *M. laurina* Nutt. (=*Rhus laurina* Nutt.), is an innocuous evergreen shrub or small tree limited to southern California and Baja California. The leaves are simple and have long petioles; the flowers are borne in large terminal panicles; the fruits are small whitish drupes; the seeds contain a pungent oil. The plant is said to have the odor of bitter almonds. It is known in California as Laurel Sumach.

The following description is based on a specimen (Yale 23961) 2½ inches in diameter collected by H. Bauer in Los Angeles County, Calif., and determined by Howard de Forest, University of Southern California. Heartwood absent. Sapwood brownish with a tinge of pink. Luster medium. Odorless and tasteless. Moderately hard and heavy, suggesting Maple (*Acer*); texture fine and uniform, grain straight; easy to work, finishing very smoothly. Of no commercial possibilities.

Growth rings present, fairly distinct. Pores small to minute, not distinct without lens, fairly numerous; occurring mostly in radial multiples of 2 to 6, evenly distributed, without pattern. Rays in part with small resin ducts, the surrounding cells very small; other rays 1 or 2, sometimes 3, cells wide and generally less than 15, sometimes up to 40, cells high; heterogeneous, but with few distinctly upright cells; pits to vessels large, often elongated and in scalariform arrangement. Wood parenchyma sparingly vasicentric. Wood fibers may contain starch. Radial resin ducts visible with lens.

Mauria, with about ten species of small to medium-sized trees, occurs from the central highlands of Honduras to Venezuela and Peru. The leaves are large and odd-pinnate or in part or wholly simple; the small whitish flowers are borne in terminal and axillary panicles; the fruit is a small flattened drupe.

The Chachique of Venezuela is *M. puberula* Tul. (=*M. heterophylla* H.B.K.), a rather small Andean tree which produces timber of good quality; the heartwood is pinkish brown or greenish, sometimes beautifully figured with irregular markings of black and highly lustrous, suitable for cabinet work, brush backs, and fancy articles, but apparently rare.

M. birringo Tul. (=*M. glauca* Donn. Sm.) occurs in humid upland forests from the central region of Costa Rica through Panama to Ecuador and northern Peru. It was collected by A. Rimbach at elevations of 4000 to 4500 feet in the Cordilleras of Ecuador. According to his notes it is a small to fairly large tree, with a light brown warty bark containing a watery juice sometimes used as a hair tonic. The leaves and fruit have a peppery scent. The wood is plain but of good working qualities and is employed locally in construction and joinery. The tree is poisonous to some persons, producing dermatitis and fever.

The specimens collected by L. Williams in northeastern Peru at elevations of 1500 to 3500 feet have been determined as *M. suaveolens* Poepp. & Endl. He says (*Woods of northeastern Peru*, p. 286) that it occasionally attains a height of 60 feet with a well-formed trunk 15 inches or more in diameter and free of branches for about 18 feet. The lustrous pinkish brown wood is sometimes used for the construction of native huts.

The following description applies to specimens of the foregoing species and *M. simplicifolia* H.B.K. Heartwood brown-

ish, pinkish, or greenish, more or less variegated and sometimes conspicuously streaked with dark brown or black; transition to sapwood usually gradual. Luster silky. Odor and taste not distinctive, though sometimes present. Rather light to moderately heavy, firm, and strong; texture fine and uniform; grain mostly straight; very easy to work, taking a fine natural polish, holds its place well when manufactured; probably fairly durable. Figured material attractive, but probably of no commercial possibilities because of its scarcity or inaccessibility.

Growth rings poorly defined. Pores not distinct without lens, fairly numerous; solitary and in small multiples, well distributed or with tendency to zonate arrangement. Vessels with tyloses and gum deposits. Rays 1 or 2, sometimes 3, cells wide and variable in height up to 50 cells; heterogeneous; gum abundant; pits large, oval to elongated, often in scalariform arrangement in upright cells. Wood parenchyma narrowly vasicentric and diffuse, the latter mostly crystalliferous strands; pith flecks common. Wood fibers septate, at least in part; filled with gum in dark zones. No resin ducts seen.

COMMON NAMES: Cirrí amarillo, koró (C.R.); chocho (Col.); chachique (Venez.); alovillo (Ec.); ingaina blanca, itil, i. blanco, yurac ingaina (Peru).

Metopium, with two distinct species of shrubs and small to medium-sized, poisonous trees, occurs in the Greater Antilles, southern Florida, northern Guatemala, British Honduras, and from Yucatán to Vera Cruz, Mexico. *M. venosum* (Gris.) Engl. (=*Rhus venosa* Gris.) is a poorly known species of restricted range in eastern Cuba, where it is called Guao or Guao de Peladero. It has a slender stem and branches and lanceolate leaflets. There is no wood sample available for this study.

M. Brownei (Jacq.) Urban. (=*Terebinthus Brownei* Jacq. =*Rhus Metopium* L.=*M. Linnaei* Engl.=*M. toxiferum* [L.] Krug & Urb.) varies in size from a shrub to a tree 50 feet high. The odd-pinnate leaves have 3 to 7 large, round or obovate leaflets with long petiolules; the small yellow-green flowers are borne in large, long-stalked, axillary panicles; the fruit is an orange-colored drupe with resinous pulp. The thin, reddish brown bark contains a caustic juice. The wood is not poisonous. In British Honduras, where the timber is utilized locally to a limited extent for making furniture, the tree is often associated with Sapodilla (*Achras Zapota* L.) in swamp and intermediate forests on calcareous soil in the northern part of the Colony.

Heartwood variegated brown and red, with a greenish tinge and golden luster; rather sharply demarcated from yellowish white sapwood. Without distinctive odor or taste. Hard, heavy, and strong; sp. gr. (air-dry) 0.85; weight about 53 lbs. per cu. ft.; texture rather fine and uniform; grain variable; not easy to work, but capable of a high polish; durability high. An attractive wood of limited utility because of the small size of the trees.

Growth rings fairly distinct. Pores small to medium-sized, barely visible, numerous; solitary or in small multiples, evenly distributed. Tyloses abundant, often filled with red gum. Some of the rays containing small resin ducts, with small epithelial cells, other rays 1 or 2, occasionally 3, cells wide and generally less than 20, sometimes up to 40, cells high; crystals common; pits to vessels large, rounded to long oval. Wood parenchyma rather sparingly vasicentric and locally confluent for short distances; also narrowly terminal; dark red gum deposits abundant. Wood fibers with thick walls sometimes gelatinous in late wood; occasionally septate; gum deposits locally abundant. Radial gum ducts visible with lens.

COMMON NAMES: Coral sumach, hog gum, poison wood (Florida); burn-wood, Jamaica sumach (Jam.); guao, g. de costa, g. de peladero (Cuba); cedro prieto, papayo, poison tree (P.R.); cochinillo (Dom. R.); bois mulâtre, mancenillier (Haiti); chachin, chechem, cochinillo (Mex.); black poison wood (Br.H.).

Mosquitoxylon *jamaicense* Krug & Urb., the only species of the genus, is a tree sometimes 80 feet high with a straight smooth trunk occasionally over 24 inches in diameter, but usually much smaller. The generic name, meaning Mosquito Wood, is derived from the common designation in Jamaica where the tree was first discovered. The species also occurs sparingly on the mainland from southern Mexico to Panama. The leaves are odd-pinnate with 11 to 17 leathery leaflets; the little white or greenish flowers are borne in large axillary panicles; the fruits are small drupes, bright red when ripe and making the crowns of the trees conspicuous in the forest. The bark contains a copious odorous resin-like latex. The

timber is of good quality for general construction, but is little used because of its scarcity.

Heartwood pink, deepening to red-orange, with yellowish streaks; rather sharply defined from the yellowish gray sapwood. Without distinctive taste, but with faint odor. Fairly lustrous. Moderately hard and heavy; texture rather fine, uniform; grain straight to very irregular; not very easy to work, but takes a smooth finish; not highly resistant to decay. Of no commercial possibilities.

Growth rings present, but often poorly defined. Pores small to medium-sized, mostly indistinct without lens, rather numerous; solitary and in short radial multiples, evenly distributed. Tyloses present. Rays 1 to 3, occasionally 4, cells wide, sometimes all uniseriate; up to 40, generally less than 20, cells high; decidedly heterogeneous; pits to vessels large and irregular. Wood parenchyma sparingly vasicentric. Wood fibers with medium walls and very small pits. No resin ducts seen.

COMMON NAMES: Mosquito wood (Jam.); nictaa (Mex.); bastard mahogany, ridge redwood, wild mahogany (Br.H.); chichimeca (Guat.); ciruelo (Hond.); cirrí, c. blanco, c. colorado (C.R.); carbonero, jobillo (Pan.).

Pachycormus, with a single species, *P. discolor* (Benth.) Coville (=*Schinus discolor* Benth.), is a short-boled contorted tree growing in the arid central region of Baja California, where it is known as Copalquín and Torote Blanco. It is described by J. A. Veatch as follows (see *Contrib. U. S. Nat. Herb.* 16: 14: 345): "The trunk divides into several ponderous branches that shoot off horizontally and are bent and contracted into grotesque resemblances of the flexed limbs of a corpulent human being. These huge branches often terminate suddenly in a few short twigs covered with a profusion of red flowers, reminding one of the proboscis of an elephant holding a nosegay. The resemblance is heightened by the peculiar brown skinlike epidermis that forms the outer bark, which splits and peels off annually, accommodating the increase of growth. This epidermis, when removed, exposes the smooth greenish-colored surface of the spongy inner bark, which is from 1 to 2 inches in thickness. When this bark is cut through, a milky juice exudes that soon hardens into a compact mass

of gum and resin. The quantity furnished from a single cut is considerable.

"The branches of the larger trees often shoot out to a horizontal distance of 20 feet from the trunk, thus covering an area of 40 feet in diameter. Smaller subordinate limbs spring upward from the upper side of the large boughs, and in this way give a neat oval appearance to the outline of the tree. When loaded with its bright red flowers, the effect is strikingly beautiful, particularly where hundreds of the trees stand near each other, intertwining their boughs, and forbidding ingress to the mysterious space they cover and protect. The leaves are minute and fall off before the blossoms are fairly developed. The young tree looks a good deal like a huge radish protruding from the ground. On the mountain sides, from a little above seashore to an elevation of 1500 feet, these trees grow scatteringly, singly, and in small clumps, but in the narrow vales of the ravines they sometimes form groves of several acres in extent, presenting the impenetrable and compact form above described. From June till August seems to be their blooming season."

There is no specimen of the wood available for this study, but according to Standley (*Trees and shrubs of Mexico*, p. 672), it is soft and porous and soon decays. He adds that considerable quantities of the bark have been exported to Europe for use in tanning.

Pistacia. There are several species in the Old World and one in America. *P. vera* L., of the Mediterranean region and western Asia, is the source of Pistachio nuts of commerce and is extensively cultivated. Mastic is the resinous exudate from the branches of *P. lentiscus* L., another Mediterranean tree; it is used medicinally and for varnish. The Cyprus Turpentine tree is *P. Terebinthus* L. The American species is *P. mexicana* H.B.K. (=*P. texana* Swingle), a small, evergreen tree, occasionally 30 feet high, with a short trunk 15 to 18 inches in diameter, or more often a large shrub, growing from western Texas through Mexico to Guatemala. The leaves are odd-pinnate, with 9 to 29 small, nearly sessile leaflets; the little flowers are borne in axillary panicles; the fruits are small,

nearly dry, purplish drupes with edible seeds. A resin exudes from the branches. There are no specimens of the wood in the Yale collections.

COMMON NAMES: Pistache (Texas); almacigo, lantrisco, lentisco, ramón, yaga-guieguei (Mex.).

Poupartia, a genus allied to *Spondias*, consists of eight species, two of which occur in southeastern Asia, five in Madagascar and adjacent islands, and one in South America. The last, *P. amazonica* Ducke, is a large tree of the central and lower Amazon region of Brazil. According to Ducke (*Archiv. Jard. Bot. Rio de Janeiro* 3: 204), its fruit resembles that of *Spondias* and the wood is white and soft. The shape of the trunk and appearance of the long-fissured bark suggests Cedro (*Cedrela*). This species is not represented in the Yale collections.

COMMON NAMES: Cedro blanco, c. rana, taperebá assú, yacayaca (Braz.).

Pseudosmodingium is a Mexican genus of shrubs and little trees allied to *Rhus*. Best known of the four species is *P. perniciosum* (H.B.K.) Engl. (=*Rhus perniciosa* H.B.K.). of southwest Mexico. Its resin is said to have a carrion-like odor and to be highly poisonous. The wood has not been studied.

COMMON NAMES: Copal jiote, cuajiote, c. blanco, quauxiotl, xiote, yaga-lache (Mex.).

Rhus. The *Rhus* complex, with many species, chiefly innocuous small trees, shrubs, and vines, differs from most of the Anacardiaceae in being extra-tropical, with centers of distribution in both the northern and the southern hemispheres. The classification used here follows that proposed by Fred A. Barkley (*Annals of the Missouri Botanical Garden* 24: 3. 1937), which segregates the American species into six genera; namely, *Actinocheita, Cotinus, Malosma, Metopium, Rhus,* and *Toxicodendron.*

Rhus, as here delimited, is divisible into two subgenera, *Sumac* and *Schmaltzia*. The first consists of about a dozen species and several varieties of erect shrubs and small trees widely distributed over much of North America, Asia, and the

Mediterranean region. The plants are erect shrubs or small trees with comparatively few, coarse, staghorn-like branches, odd-pinnate (sometimes bipinnate) deciduous leaves with thin, sessile, commonly serrate-margined leaflets. Of the seven American species, the most widely distributed are *R. Copallina* L., *R. glabra* L., and *R. typhina* Torner (= *R. hirta* [L.] Sudw.). The last, known as Staghorn Sumach because the branchlets are covered with a thick brown velvety pubescence, is usually a tall shrub, spreading by underground shoots into thickets, but under favorable circumstances becomes a tree, occasionally 35 to 40 feet high, with a rather crooked trunk upward of 14 inches in diameter. *R. glabra*, typically a shrub, occasionally a tree 20 feet high, is widely dispersed from the mountains of Chihuahua, Mexico, throughout the United States and much of Canada. *R. Copallina*, widespread in eastern North America, is typically a low shrub, rarely a tree 30 feet high, characterized by leaves having a winged rachis; one variety extends into Cuba, and another, often considered a distinct species, *R. lanceolata* Gray, is common in Texas and northeastern Mexico. The woods of the group, so far as studied, are light and soft to moderately so, with a thin white sapwood and a lustrous olive-green heartwood more or less distinctly striped or variegated, becoming russet-brown superficially on exposure.

The subgenus *Schmaltzia* comprises about 30 species and many varieties of shrubs (rarely scandent) and small trees, with numerous comparatively slender branches and simple, trifoliate, or odd-pinnate leaves. With two exceptions the species have their center of distribution in Mexico, with extensions across the border into the United States and southward into Costa Rica. The two northern species are *R. aromatica* Ait. (=*R. canadense* Marsh.) of eastern, and *R. trilobata* of western, North America, with overlapping ranges in the Mississippi valley; they belong to the section *Lobadium* and their woods have the greenish color of the *Sumac* group, but are somewhat harder and heavier. Representatives of the southern species, *e.g.*, *R. integrifolia* (Nutt.) B. & H. f. and *R. ovata* Wats., section *Styphonia*, and *R. virens* Lindh., section *Pseudoschmaltzia*, have heartwood of a uniform yellow-

ish red or salmon color and for this reason are often called Mahogany Sumac; the sapwood may have a greenish tinge.

Various species of *Rhus* supply useful products. The acrid berries make a refreshing drink similar to lemonade. The leaves are rich in tannin and are of some commercial importance for the making of special types of leather. The bark and roots also yield a dye and have a part in native medicine. The pliable young stems of *R. trilobata* have long been used by the Indians for making baskets and are considered better than Willow (*Salix*) for that purpose. The wood, though attractive, very easy to work, and fairly durable, is little used because of the small sizes obtainable.

Growth rings present. Greenish specimens distinctly ring-porous, red specimens tending to be diffuse-porous. Pores small to medium-sized and crowded in narrow to wide band in early wood; minute and in multiples and clusters in latewood, tending to form diagonal patches or wavy bands near periphery of wider rings. Vessels often filled with tyloses; spiral thickenings present, at least in smallest vessels. Rays typically 1 to 3, sometimes up to 5, cells wide, and of variable heights up to 50 cells; heterogeneous, though with comparatively few distinctly upright cells; crystals common; gum deposits abundant; pits to vessels rather large, oval to elongated. Wood parenchyma sparingly vasicentric and rarely terminal. Wood fibers with thin walls and very small pits. Radial resin ducts sometimes present, visible with lens; epithelial cells very small and numerous.

COMMON NAMES: Lemonade berry, skunk bush, sumac or sumach (black, dwarf, laurel, mahogany, mountain, shining, smooth, staghorn, white), vinegar tree (U. S. A.); añil del Pinar, sumaque (Cuba); agrillo, agritos, capulín, correosa, hierba de temazcal, lambrisco, lantrisco, lemita, sumaco cimarrón, temezcal, tnu-ndé, yoga-biche, yucu-caya, zumaque (Mex.).

Schinopsis is the source of the valuable South American tanwood known as Quebracho (ax-breaker) in reference to the flinty hardness of the wood. There are two kinds of Quebracho—the red or Quebracho Colorado, the product of this genus, and the white or Quebracho Blanco supplied by *Aspidosperma quebracho-blanco* Schl. (Apocynaceae).

Although at least eight different species of *Schinopsis* have been described by botanists there are only two that are generally recognized as of commercial importance, namely, *S. Lorentzii* Engl. (=*Quebrachia Lorentzii* Gris.=*Loxopterygium Lorentzii* Gris.), a deciduous tree with odd-pinnate leaves having numerous narrow leaflets, and *S. Balansae* Engl., a tree never entirely free of leaves, which in this case are simple and suggest those of Willow Oak (*Quercus phellos* L.), though showing transitions to pinnate with a few coarse leaflets. The former, which is more abundant in the drier western plains, is sometimes referred to as the Santiago type, (Quebracho Colorado Santiagueño), while the latter, which extends into the swampy lands fringing the Paraná and Paraguay rivers, is known as the Santa Fé or Chaco type (Quebracho Colorado Chaqueño). The two kinds are much alike as to flowers, which are small and inconspicuous; fruits, which are samaras; and woods, which are of a light cherry red color at first, but deepening upon exposure to a rich dark red, often with blackish streaks, and are a third heavier than water. A form of dermatitis is said to be induced in sensitive persons by contact with the branches, leaves, or sawdust of the tree or even by close proximity to the foliage (see *Tropical Woods* 17:7).

The botanical range of *Schinopsis* extends over northern Argentina, western Paraguay, a small portion of Bolivia, and an undetermined area in Brazil as far north as the interior of the state of Bahia. The commercial range includes the northern half of the province of Santa Fé, the eastern part of the Province of Santiago del Estero, all of the Territories of Chaco and Formosa, and a narrow fringe east of the Río Paraná in the Province of Corrientes in Argentina, and throughout the explored country west of the Río Paraguay in Paraguay. The extent of this commercial range is approximately 200,000 square miles and embraces practically all of the country known as El Gran Chaco, a vast flat, poorly explored region of mingled jungles and open pampas, inhabited only by nomadic Indian tribes. Extensive areas have been destroyed by fire and wasteful logging. The trees grow singly or in small groups in mixture with other hardwoods in open stands or islands and the space between the islands is usually covered with an almost impenetrable tangle of vines, thorn bushes, and cactus. They are from 30 to 50 feet high, one to three feet in diameter, and clear of branches for 20 to 30 feet. They are of scrubby growth and their trunks are

often bent and twisted, and swollen at the base. The number of trees per acre rarely averages more than five.

The heartwood of Quebracho contains from 20 to 30 per cent of tannin and 3 or 4 per cent of soluble non-tannin. The sapwood, which is from one to three inches thick, contains only about 3 per cent of tannin and 8 per cent soluble non-tannin. The tannin and soluble non-tannin content of the bark are each about 10 per cent. The usefulness of Quebracho is almost entirely dependent on the tannin content of the heartwood, deriving therefrom its great durability as well as its high economic importance as a source of extract, *S. Balansae* being considered the most valuable for this purpose. The extract industry which started in a small way about 1890 is now one of the most important industries of Argentina and Paraguay.

The trees are felled by means of heavy axes, and the bark and white sapwood are hewn off to reduce the weight of the logs and also to prevent the attack of beetles which deposit their eggs in the bark of down timber and fire-damaged trees. The resulting larvae will within six months completely riddle the wood with their galleries. The larger limbs are sometimes used for tanwood and the smaller ones are cut into firewood if not too far from market. The logs are dragged by oxen through narrow paths to wider lanes, called "picadas," which had previously been hewn out from the railroad. They are then loaded on heavy carts and hauled out, two or three tons at a time, to the narrow-gauge logging road where they are swung onto cars and drawn out to the extract factory by means of small wood-burning locomotives. At the extract plant the logs are reduced to chips by mechanical means. These chips are run into copper vats, leached with hot water, and the resulting liquor evaporated in vacuum pans to the consistency of syrup. This is further concentrated by heating and stirring in another type of evaporator and is then run into bags and allowed to cool and harden. It is exported in this form and contains about 65 per cent tannin, 10 per cent soluble non-tannin (mostly coloring matter), and 25 per cent moisture. The spent chips are allowed to dry and are then used for fuel. Logs may be stored for long periods in the open

with only superficial loss of tannin, but users prefer fresh wood because it is easier to chip.

Formerly the logs were exported in great quantities to the United States and European countries where the extract was prepared, but the local extracting industry has gradually developed until there are now about 25 factories in operation in northern Argentina and western Paraguay. The monthly capacities of these plants range from 250 to 2500 tons of solid extract, the total annual output being normally between 150,000 and 200,000 tons.

Quebracho timber has many other uses. It is seldom cut into boards because of the difficulty of sawing and also because thin lumber has a great tendency to check and warp. Practically all of the fence posts, telegraph poles, bridge timbers, and railway ties in the region are of Quebracho, which is one of the most durable woods known. It is extensively used for fuel not only for household purposes but also by factories, power plants, locomotives, and the smaller river steamers. It is also used for wood-block paving, heavy construction, and cart axles.

The Quebracho of Bahia, Brazil, commonly called Baraúna, although this name seems more properly applicable to *Melanoxylon* (Leguminosae), is *Schinopsis brasiliensis* Engl. According to data and specimens supplied by H. M. Curran, this is a common tree of the dry forest, and while its range has not been determined it probably extends southward until it meets or merges into other species. It occurs in nearly pure stands or in association with Aroeira (*Astronium* or *Schinus*) and a number of other dry-forest trees. The forest is thin and open, with a dense undergrowth of thorny shrubs and cactus. The mature tree is 40 to 50 feet high with a much-branched bushy crown suggesting an Oak tree grown in the open. The trunks are short, rarely over 20 feet, with diameters up to 24 inches. The bark is thick, rough, and black, suggesting certain Oaks. The leaves, which are 1 to 5 inches long, are odd-pinnate, with 2 to 8 pairs of leathery leaflets, the largest about an inch long and half as wide. The winged fruits suggest those of Maple (*Acer*), except they are not in pairs. The wood is practically identical in appearance and structure with the

Quebracho of Argentina. It is confused locally with Aroeira and is little used.

Heartwood of all species light red, deepening to brick-red; uniform or with black streaks; distinct but not sharply demarcated from the yellowish sapwood. Luster low to medium. Odor not distinctive; taste astringent. Extremely hard, heavy, and strong, but brittle; sp. gr. (air-dry) 1.15 to 1.30; weight 70 to 80 lbs. per cu. ft.; texture fine and uniform; grain irregular, often roey; difficult to cut, becoming flinty when dry, though splitting readily; takes a high natural polish; exceptionally durable, though standing trees are often defective as a result of heart rot.

Growth rings present. Pores small to medium-sized, visible because of parenchyma sheaths; fairly numerous; solitary and in small radial multiples, evenly to unevenly distributed, sometimes in diagonal arrangement. Vessels closed with tyloses in heartwood; gum deposits abundant. Rays in part with medium-sized to large resin canals, the epithelial layer composed of one or two rows of very small cells; other rays 1 to 3, occasionally 4, cells wide and usually less than 20, sometimes more than 30, cells high; crystals common; pits to vessels large, oval to elongated. Wood parenchyma sparingly vasicentric. Wood fibers with very thick to medium walls, the latter type typically septate. Radial resin ducts visible with lens.

COMMON NAMES: Quebracho (Trade); baraúva, braúna, quebracho hembra (Braz.); quebracho, q. colorado, q. c. chaqueño, q. c. santiagueño, q. macho, q. moro, q. negro (Arg.); soto negro (Boliv.); quebracho, q. rubio (Par.).

Schinus, with 15 or more species of shrubs and small to medium-sized trees, has its center of distribution in the south-central part of South America. In the subgenus *Duvaua* (sometimes considered as a distinct genus) the leaves are simple and the flowers and small drupes are borne in little axillary clusters. The best known and most widely distributed member of this group is *S. dependens* Ortega, a tree, rarely over 20 feet high, with spinose branches, occurring in southern Brazil, Uruguay, Argentina, Chile, and Peru. Its resin is used medicinally.

The species of *Schinus* proper (subgenus *Euschinus*) have odd-pinnate leaves with few to many leaflets, and the flowers and drupaceous fruits are borne in panicles. The largest tree is

S. molle L., a native of Peru, but widely planted for shade and ornamental purposes in regions with mild climates. It is grown abundantly in southern California and is known as Pepper-tree. Standley says (*Trees and shrubs of Mexico*, p. 662): "The tree ascends in the Andes to an altitude of 3600 to 3900 meters, but often occurs at much lower altitudes. It thrives in dry, sandy soil and can endure extended drought. The Pepper-tree is said to have been introduced into Mexico by Don Antonio de Mendoza, the first viceroy, who sent the seeds from Peru. The specific name, *molle*, is the name by which the tree is known in western South America, and is derived from Mulli, the old Peruvian name. *Schinus molle* is an excellent shade tree and a handsome one, remaining green throughout the year. The only objection to it is the fact that it harbors the black scale, which is a serious pest of Citrus fruits. The wood is useful for various purposes and the bark for tanning skins. When fragments of the leaves are placed in water they execute quick jerking movements, due to the sudden discharge of the oil which they contain. The fruit contains a volatile oil and has a flavor resembling that of a mixture of fennel and pepper. The seeds are sometimes used to adulterate pepper. In Mexico the fruit is ground and mixed with *atole* or other substances to form beverages. An intoxicating liquor, known as 'copalocle' or 'copalote,' is obtained by fermenting the fruit with pulque for one or two days. The Pepper-tree is much used in local medicine."

Heartwood dull light red, deepening upon exposure and becoming more or less purplish and rather oily looking; distinct but not sharply demarcated from the brownish gray sapwood which suggests Elm (*Ulmus*). Odor and taste not distinctive. Moderately hard and heavy; sp. gr. (air-dry) 0.54 to 0.68; weight per cu. ft. 34 to 43 lbs.; texture medium to fine, uniform; grain variable, often irregular; very easy to work, especially the heartwood of *S. weinmannifolius* Engl. which cuts like Red Cedar (*Juniperus*); durability high. Good timber, but of no commercial importance because of its small size or its scarcity.

Growth rings present, but not always distinct. Pores small to minute, numerous; mostly in multiples and irregular groups arranged in wavy

tangential bands visible without lens and giving rise to fine pattern on tangential surface. Vessels with rather coarse spiral thickenings; tyloses abundant. Rays in part with rather small to very large resin ducts, the epithelial layer composed of 2 to 5 rows of very small cells; other rays 1 to 4 cells wide and up to 50, generally less than 25, cells high; weakly to strongly heterogeneous; crystals common; gum deposits often abundant; pits to vessels large, oval to elongated. Wood parenchyma very sparingly paratracheal. Wood fibers septate. Radial resin ducts readily visible with lens and sometimes without it; apparently absent from some specimens of *S. molle*. In *Schinus terebinthifolius* Raddi, a Brazilian shrub or little tree, the pores are not tangentially arranged and the vessels lack spiral thickenings.

COMMON NAMES: *S. molle:* Pepper tree (U. S. A.); árbol del Perú, copalquahuitl, molle, Perú, pimiento de América, pirul, ttzacthumi or ttzacthunni, xaza (Mex.); árbol del Perú, pimiento, pimientillo (Salv.); pimiento de California (C.R.); muelle, pimiento (Col.); árbol de pimienta (Venez.); molle, mulli (Peru); aroeira molle (Braz.); aguaribay, bálsamo, curanguay, gualeguay, molle, pimiento, p. del diablo, terebinto (Arg.); aruera, arueriña, aguará-bay-mí, curanguay, molle, paráparay, pimientero, palo del diablo, pimiento del diablo (Par.); pímentero (Chile). *S. dependens:* Molho (Braz.); incienso, molle, m. blanco, m. colorado, m. de curtir, m. de incienso, m. del monte, m. falso, m. rastrero (Arg.); molle, m. del monte (Urug.); huingán (Chile). *Other species:* China-mulli (Peru); aroeira do campo, a. mansa, a. vermelha, aroeirinha, cabuy, cambuy, coração de negro (Braz.); aguará-ibá, aroeira colorada, chichitá mononi, corazón de bugre, laurel muchi, litre, litrecillo, molle negro, trementino (Arg.); arueriña del campo, molle ceniciento (Urug.); aguará-ibá-guazú (Par.).

Spondias, with five or six species of small to large deciduous trees, is widely dispersed throughout the tropics both naturally and through cultivation for the edible fruit. The leaves are large and odd-pinnate; the flowers are small and paniculate; the fruit is a plum-like drupe. The two species best known in tropical America are *S. purpurea* L., with red or purplish flowers and fruits borne in small panicles lateral on the old wood, and *S. mombin* L. (= *S. lutea* L.), a larger often prickly tree, with greenish flowers and yellow fruits in large terminal panicles. Sections of young stems and limbs of old trees readily take root and grow when planted in moist soil and are

commonly used for living fence posts. The timber is so susceptible to decay and insect attack that it is considered nearly worthless for lumber, but if the logs could be sawed without delay and the boards kiln-dried the material would be suitable for making boxes and crates, as it is tough and strong for its weight and holds nails firmly. In some localities it is used for making match sticks.

Color nearly white throughout when fresh, but subject to blue stain. Luster medium. Odorless and tasteless. Rather light in weight, but firm; sp. gr. (air-dry) 0.50 to 0.60; weight 31 to 37 lbs. per cu. ft.; texture medium to coarse; grain fairly straight; not difficult to work, finishing smoothly. Not likely to be of any importance for export.

Growth rings sometimes distinct. Pores variable in size, some of them readily visible, numerous; solitary and in small multiples and clusters, well distributed. Tyloses common. Rays in part with large resin ducts, the epithelial layer composed of 1 or 2 rows of very small cells; other rays 1 to 5, occasionally more, cells wide and generally less than 40, sometimes up to 100, cells high; heterogeneous; crystals sometimes present; pits to vessels large and irregular. Wood parenchyma sparingly vasicentric. Wood fibers thin-walled, septate. Radial resin ducts distinct with lens; few to numerous.

COMMON NAMES: *S. mombin:* Hog plum (Eng.); jobo (Span.); jobito (Cuba); jobobán (Dom. R.); mombin, m. franc (Haiti); abal, chupandilla, ciruelo obo, cozticxocotl or coztilxocotl, hobo, jobo espino, j. roñoso, jovo, kanabal, mompin, obo de zopilote, pompoaque or pompoqua, xkininjobo (Mex.); jocote montero (Nic.); balá, bará, bra, braá, brakra, frap, mube, páalan, paran, xlúra (C.R.); jobito (Pan.); jobo blanco, j. de Castilla, j. macho, Pedro Hernández (Col.); caimito, jobo, marapa (Venez.); hooboo, hubu (Br. G.); hobbo, hoeboe, monbé, moonbé, mope, moppé (Sur.); mombin or monbin, prunier mombin (Fr. G.); acaíba, acajá, acajáiba, acajaseira, acayá-mirim, cajá, c. mirim, c. pequeno, cajáseiro or cajázeiro, c. miudo, imbuseiro, pau da tapéra, taperibá (Braz.); shungu, ubo or uvo, ushun (Peru). *S. purpurea:* Spanish plum (Eng.); ciruelo (Sp.); ciruelo del país, Jamaica plum, jobillo, jobo francés (P.R.); cirouelle (Haiti); abal, atoyaxocotl or atoyaxotl, biaxhi, capuatl-cacao, chiabal, cupu, hobo, jocote, macaxocotl, xobo, xocot, xocotl (Mex.);

palo de mulato (Guat.); jocote de jobo, pitarrillo (Salv.); jocote (C.R.); jobo colorado (Col.); ciruelo de hueso (Venez.); ajuelo (Peru).

Tapirira, with several closely allied species of small to rather large evergreen trees, occurs sparingly from southern Mexico to Peru and eastern Brazil. The best known species is *T. guianensis* Aubl. with its center of distribution in the Guianas. Its leaves are large and odd-pinnate, with 5 to 9 leaflets; the small yellow flowers are borne in terminal or axillary panicles; the fruit is a rather small green drupe. The trunks are well-formed and have low buttresses. The bark is dark gray, shallowly and narrowly fissured; the inner bark is reddish and contains an oily resin. The pinkish or pale brownish timber is easy to work and is used for carpentry and general interior construction, but its appearance is marred by small dark-colored resinous exudations.

Heartwood light pinkish, becoming brownish upon exposure; not sharply differentiated from the sapwood. Fairly lustrous. Odorless and tasteless. Variable in consistency from light and fairly soft to rather hard, the denser kinds suggesting Birch (*Betula*); sp. gr. (air-dry) 0.50 to 0.75; weight 31 to 47 lbs. per cu. ft.; texture medium to fine, uniform; grain generally straight; finishes smoothly, holds nails firmly; poorly resistant to decay. Of no value for export.

Growth rings present, but not always clearly defined. Pores barely visible without lens, fairly numerous; solitary and in short radial multiples, well distributed. Tyloses present. Many of the rays with very small to large resin ducts, the epithelial layers thin and composed of very small cells; other rays uniseriate and biseriate and up to 40, generally less than 25, cells high; heterogeneous, at least in part; crystals common; pits to vessels large, oval to much elongated. Wood parenchyma sparingly vasicentric. Wood fibers thin-walled, septate. Radial resin ducts visible without lens, because of contents. (For further details, see *Tropical Woods* 13: 11.)

COMMON NAMES: Bagamani, vagamani, or vanamani (Pan.); gommier viande biche (Trin.); caoba de montaña, cedrillo, cedro nogal, corazón colorado, jobillo, jobo liso, tapaculo (Venez.); dooka or duka, waramia (Br. G.); ana-akara, anoema latti, ata-apiriri or atapiriri, basa mopé, danlieba, djedoe, doka or dokka, duka, kressi pisie, man krappa, massé,

natawarie nengé, m. nengidjedoe, saprieran, tamoene-nooitjano-atapiriri, warimia, w. balli, witte hoedoe (Sur.); bois tapiré, tapiriri (Fr. G.); cedrohy, guarúba, pau pombo, tatapiririca (Braz.); isa-paritsi (Peru).

Thrysodium consists of one West African and several Amazonian species of small to rather large resinous trees, apparently of infrequent occurrence. The leaves are very large, unequally pinnate, with several pairs of leathery leaflets; the flowers are borne in axillary panicled racemes; the fruit is a rather large ovoid, orange-colored drupe; the leaves, inflorescence, and twigs contain a white latex. The only wood sample in the Yale collections is of *Thrysodium* sp. collected in non-inundated forest near Manáos by Adolpho Ducke (Yale 23649; Ducke 187).

Wood grayish brown with a slight pinkish hue throughout specimen. Luster silky. Odorless and tasteless. Moderately hard, heavy, and compact; texture fine and uniform; grain fairly straight; working properties fair; durability doubtful. Presumably of no commercial possibilities.

Growth rings poorly defined. Pores not distinct without lens, rather numerous; solitary and in small multiples, evenly distributed. Tyloses abundant. Rays uniseriate or occasionally biseriate, mostly less than 25 cells high; heterogeneous; gum abundant; crystals common; pits to vessels large, typically oval. Wood parenchyma sparingly vasicentric. Wood fibers with rather thick walls and very small pits. No gum ducts seen.

COMMON NAMES: Ooluballi or uluballi (Br. G.); castanha de porco (Braz.).

Toxicodendron, with several species of poisonous vines, upright shrubs, and small trees, is widely distributed in America and Asia. The leaves are deciduous; the flowers are borne in pendent, axillary panicles; the fruits are small whitish drupes. The genus is often merged with *Rhus*, but Barkley says (*Annals of the Missouri Botanical Garden* 24: 3: 419): "The generic recognition of *Toxicodendron* as distinct from *Rhus* has long been a matter of controversy, and one which in the nature of such things can never be answered in an absolute manner. The non-glandular pubescence when present on the

fruit-coat, the ceriferous mesocarp, the consistently poisonous effluvium, and the paniculate inflorescence in *Toxicodendron*, as contrasted with the glandular pubescence always present on the fruit-coat, the non-waxy mesocarp, the constantly innocuous effluvium, and the thyrsoidal inflorescence of *Rhus*, as well as many minor characters consistently different between these elements, are characters that seem to the author sufficiently well marked to separate the two as distinct genera."

The American species are divisible into two sections, namely, *Eutoxicodendron* and *Vernix*. The first comprises woody vines and small shrubs with slender branches and trifoliolate leaves. The best known species is the Poison Ivy or Poison Oak, *T. radicans* (L.) Kuntze (=*Rhus radicans* L. =*R. Toxicodendron* L., in part) which grows from southern Canada throughout the United States to southern Mexico and the Bahamas. The section *Vernix* is composed of large shrubs and small trees having comparatively few rather stout branches and odd-pinnate leaves with 5 to 17 leaflets. *T. Vernix* (L.) Kuntze (=*Rhus Vernix* L.) occurs throughout the eastern half of the United States. *T. striata* (R. & P.) Kuntze (=*R. striata* R. & P.=*R. juglandifolia* Willd.), usually a small tree, sometimes up to 35 feet tall, is distributed from southern Mexico to Peru and eastern Brazil. Owing to the small size and the poisonous nature of the trees, the wood of *Toxicodendron* is not utilized.

The following description is based upon specimens of *T. diversiloba* (T. & G.) Greene, *T. radicans*, and *T. Vernix* of U. S. A. Heartwood variegated olive and orange; sharply demarcated from the whitish sapwood. Luster low to medium. Without distinctive odor or taste. Of rather light weight, but firm; texture coarse to very coarse; grain mostly straight; easy to work, finishing smoothly; is probably durable. Of no commercial possibilities.

Ring-porous, the pores in early wood rather large, distinct, and in narrow to wide band; pores in latewood small to minute, not very numerous; solitary or in small multiples. Vessels filled with tyloses in heartwood; spiral thickenings present in small vessels. Rays 1 to 6 cells wide and up to 80 or more cells high; heterogeneous, with many square cells; crystals and gum deposits common; pits to vessels medium-sized, oval to much elongated. Wood parenchyma sparingly vasicentric. Wood fibers septate in part. Large radial resin canals present in *T. diversiloba*.

COMMON NAMES: Poison ash, p. dogwood, p. elder, p. ivy, p. oak, p. sumach, p. tree, p. wood, swamp sumach, thunderwood, three-leaved ivy (U.S.A.); bemberecua, chechén, guardalagua, guau, hiedra, h. mala, h. maligna, hincho-huevos, mala-mujer, mexye, yagalache (Mex.); hinchador (C.R.); ajicito, alicito, birringo, caspi, c. carracho, chiraco, fumo, manzanillo, Pedro Hernández (Col.); incati, itil (Peru).

FURTHER NOTE ON AMBOYNA WOOD

Dr. H. E. WOLFF VON WÜLFING, Director of the Forest Research Institute, Buitenzorg, Java, in a letter dated 29th August 1939, states that the trees producing the Amboyna burls have hitherto been identified as *Pterocarpus indicus*. He suggests, however, that when more *Pterocarpus* material from that region is available it may show that more than one species is involved; "the natives, at least, distinguish a number of varieties and there are big differences in color and density of the *Pterocarpus* wood from this region."—J. BURTT DAVY.

CURRENT LITERATURE

Forestry in Jamaica. By C. SWABEY. *Empire Forestry Journal* 18: 1: 19–29; 1939.

"When, in 1495, the island of Jamaica was first sighted from the galleons of Christopher Columbus it was a land of forests, a land to which the aboriginal Arawak Indians had given the name Xamayca—'land of woods and waters.' The Arawaks, although a populous people, had confined their clearings to patches along the coast, seldom venturing more than 4–5 miles inland. Spanish settlement prior to 1655, although it had succeeded in wiping out the Arawaks, hardly touched the interior mountain masses and was largely confined to cattle ranching on the coastal plains and foothills. In 1665 the island was taken from the Spaniards by Cromwell's forces under Penn and Venables and subsequently

the greater part of the island was disposed of by large Crown grants. The introduction of West African slaves, following the extermination of the Arawaks, made possible enormous increases in sugar production, and the bulk of the accessible and fertile lowland soils were put under cane and other estate crops. At the same time large areas of mountain land were cleared for growing provisions for the slaves, and later for the production of ginger, coffee, etc.

"Until the middle of the nineteenth century but little attention had been paid to forests, apart from their ability to supply Mahogany (*Swietenia Mahagoni*), Cedar (*Cedrela odorata*), Fustic (*Chlorophora tinctoria*), and other cabinet and dye-woods. The fertile soil, abundant rainfall, and comparatively small population had lulled the community into a false sense of their security against the evil effects of unwise land usage. In about 1860, however, the dangers of excessive deforestation began to become apparent and since that date there have been numerous abortive attempts to regulate the problem. Reports have been written, recommendations made and withdrawn, laws passed and repealed, and in effect nothing was done. The Forest Branch, formed in 1937, is thus faced, not mainly with problems of conservation and development, but with complete reconstruction of areas where the damage has already been done."

The author describes the four major regions of the country which have distinctive geology, climate, vegetation, and land use, namely, the interior mountains, the white limestone plateau, the coastal hills, and the alluvial plains. "The policy of the Forest Branch emphasizes the protective value of forests in the fight against erosion, and secondarily the development of better local timber utilization."

Contribución al estudio de las palmas de Cuba. III. Género *Coccothrinax*. By HERMANO LEÓN. *Mem. Soc. Cub. Hist. Nat.* 13: 2, 3: 107–156; pls. 10–22; 2 text figs.; April, June 1939.

An account of the palms of the genus *Coccothrinax*, with descriptions of new species and varieties. The usual vernacular names are Miraguano or Guanito in the western part of the Republic and Yuraguana or Yuraguano in the central and eastern parts.

Caribbean studies. I. Two new Linocieras and a review of the Antillean species. By W. H. CAMP and J. MONACHINO. *Lloydia* (Cincinnati) 2: 3: 219–224; September 1939.

"Of the many problems confronting future students of the Oleaceae, not the least will be the establishment of certain generic lines within the family. This is perhaps nowhere more true than in *Linociera* and its close relatives. Whether this genus will be retained or united with its close allies (*Haenianthus* and *Chionanthus*) we do not predict. Our problem, for the present, is confined to an organization of the species of the Antillean Region as we understand them. In addition, we are describing two new species, one from Puerto Rico and the other from Colombia."

Arboles y arbustos del Istmo de Tehuantepec, Mexico. By LLEWELYN WILLIAMS. *Lilloa* (Tucumán, Argentina) 4: 137–171; 7 text figs.; July 3, 1939.

A Spanish rendition of a paper published in *Tropical Woods* March 1, 1938, with the addition of seven illustrations and a check list of the vernacular names of the plants.

Malvaceae et Sterculiaceae in itinere americano 1925–1926 a G. Woronow et S. Juzepczuk collectae. By E. ULBRICH. *Notizbl. Bot. Gart. Berlin-Dahlem* 14: 124: 356–368; March 31, 1939.

The collection from Mexico, Colombia, and Venezuela contains 42 species of 14 genera of Malvaceae and 12 species of three genera of Sterculiaceae. The new species are *Ayenia Juzepczukii* (Colombia), *Abutilon Woronowii* (Venezuela), and *Sida Woronowii* (Mexico).

Revision of the American Celastraceae. I. *Wimmeria*, *Microtropis*, and *Zinowiewia*. By CYRUS LONGWORTH LUNDELL. Contrib. Univ. Michigan Herb. No. 3, Ann Arbor, July 1939. Pp. 46; 10 plates.

"Few families of phanerogams have received as little at-

tention by American systematists as have the Celastraceae. The paucity of herbarium material, especially from tropical regions, the difficulty of classification because of the necessity for use of microscopical characteristics, the inadequate delimitations of genera, combined with the scarcity in the New World of species of economic importance, may account for this neglect. Further, the wide distribution of most genera and the localization of species have discouraged field studies. Of the three genera included in this initial paper, *Wimmeria* alone has been represented sufficiently by collections to show subgeneric and specific relationships. Three-fourths of the species of *Microtropis* and *Zinowiewia* are known from one or two collections only. It is hoped that collectors' interest in the family will be renewed so that material can be accumulated to justify later a comprehensive monograph."

Suplemento a las plantas usuales de Venezuela. By H. Pittier. Caracas, 1939. Pp. 129; 6½ x 9½.

Dr. Pittier's well-known book, *Plantas usuales de Venezuela*, was published in 1926. Since then many important botanical and wood collections have been made and much valuable information has been secured regarding plants new and old, thus making a supplement highly desirable. The work deals with the distribution and associations of Venezuelan plants, lists the woody species first by families and genera and then by common names, with extensive notes, and concludes with a check list and recent additions to the literature.

Notes on a collection of plants from British Guiana. By A. C. Smith. *Lloydia* (Cincinnati) 2: 3: 161–218; September 1939.

"The purpose of the present paper is to discuss the new and otherwise noteworthy plants collected in 1937 and 1938 by the writer in British Guiana and adjacent northern Brazil. These specimens, representing about 1600 field numbers, were obtained under the auspices of several institutions. Numbers 2101 to 3078 inclusive were collected during the American Museum of Natural History Terry-Holden Expedition; numbers 3079 to 3678 inclusive were obtained under

the joint auspices of the New York Botanical Garden, the Arnold Arboretum, and the Yale School of Forestry."

Numerous new species of trees and shrubs are described by the author and collaborators in the families Annonaceae, Apocynaceae, Bignoniaceae, Caryocaraceae, Celastraceae, Ebenaceae, Guttiferae, Hernandiaceae, Hippocrateaceae, Leguminosae, Melastomaceae, Meliaceae, Moraceae, Myrsinaceae, Nyctaginaceae, Ochnaceae, Polygonaceae, Rosaceae, and Rubiaceae.

On South American Papilionaceae. By G. Jane H. Amshoff. Med. Bot. Mus. en Herb. van Rijksuniversiteit te Utrecht No. 52, March 27, 1939. Pp. 78; 6 x 9; 4 figs.

This paper was written in connection with Pulle's *Flora of Suriname*. It contains taxonomic notes on many genera, mostly trees, and includes 20 name changes and descriptions of three new varieties and nine new species. The last are as follows: *Baubinia surinamensis*, *Cassia Pennelliana*, *Copaifera epunctata*, *Dicorynia guianensis*, *Dimorphandra Pullei*, *Martiusia parviflora*, *Swartzia laevicarpa*, *S. longicarpa*, and *S. remigifer*.

Studies of South American plants. VI. Preliminary notes on Hippocrateaceae. By A. C. Smith. *Bull. Torrey Bot. Club* 66: 231–249; April 1939.

The author proposes 17 species of *Salacia* based on material collected in Amazonian Brazil by B. A. Krukoff. The remaining Amazonian species, including a few from Peru and Venezuela that may be expected in adjacent Brazil, are listed, making a total of 35, which are for the most part high-climbing lianas.

Studies of South American plants. VIII. New and noteworthy species of Lecythidaceae. By A. C. Smith. *Am. Journ. Botany* 26: 6: 407–412; June 1939.

"No comprehensive monograph of the Lecythidaceae has been published other than that of Miers, since which an abundance of herbarium material has been collected in tropical America. Many species of the family have been described

since 1874, but no keys to species in the large genera, such as *Eschweilera*, have been published, with the exception of those in Eyma's excellent treatment of the Surinam species. In Amazonian Brazil and the Guianas alone, more than 80 names have been referred to *Eschweilera*. Although some of these will doubtless fall into synonymy, there certainly remain many species yet to be collected, and one may anticipate that the genus will eventually include at least 150 species in its entire range. As most members of the family are large trees with very hard wood, they have been neglected by most collectors until recently. The following notes are based upon material in the herbarium of the New York Botanical Garden, in which types of the new species are deposited."

The known ranges of *Gustavia pleurocarpa* Pittier and *G. rhodantha* Standl. are extended from Panama to Bolivar, Colombia. "*Cariniana micrantha* Ducke, originally described in 1930 and known from several localities in the basins of the Amazon, Tapajoz, Madeira, Jurua, and Purus, is now represented from the Solimoes by Krukoff 8796. *C. clavata* Novik. (Acta Inst. Bot. Acad. Sci. URSS I. 2: 250. f. 2. 1936) from Amazonian Colombia, described and figured from fruit only, is certainly the same species."

Several trees from the Amazon region of British Guiana and Brazil are described as new, namely: *Cariniana pachyantha*, *Couratari oligantha* (Brazilian name Tauary), *C. reticulata*, *C. stellata*, *Eschweilera alata*, (B.G. name Kakaralli), *E. alutacea*, *E. conduplicata*, *E. confertiflora*, and *E. montana*. Two new combinations are *Eschweilera Miersii* (Knuth) A. C. Smith (=*Chytroma Miersii* Knuth) and *E. rhododendrifolia* (Knuth) A. C. Smith (= *C. rhododendrifolia* Knuth).

Plantae Krukovianae. VI. By A. C. Smith. *Journ. Arnold Arboretum* 20: 238–303; 1939.

Contains descriptions of 17 new species of plants collected by B. A. Krukoff in Amazonian Brazil. The trees are *Siparuna pachyantha*, *Maytenus Krukovii*, *M. micrantha*, *Caryocar pallidum*, *C. parviflorum*, *Vismia cauliflora*, *Conomorpha madeirensis*, *Diospyros tenuifolia*, and *D. bullata*. *Krukoviella scandens* is a new genus and species of scandent shrubs in the family Ochnaceae.

Anais de primeira reunião Sul-Americana de botanica. I. Rio de Janeiro, August 1939. Pp. 290; 7¼ x 10½; illustrated.

This handsomely printed and well illustrated book is Volume I of the proceedings of the First South American Botanical Congress convened at Rio de Janeiro, October 12 to 19, 1938. It is distributed by the Serviço Florestal which succeeds the Instituto de Biologia Vegetal under whose auspices the Congress was held. Three papers of particular interest are: "O nordeste Brasileiro," (pp. 227–237; 15 figs.), by Prof. Hildegardo Noronha; "Explorações botanicos de Surinam" (pp. 239–248 in English, 249–257 in Portuguese), by Prof. A. A. Pulle; "A Amazonia Brasileira" (pp. 275–287, 11 plates), by Dr. Adolpho Ducke.

Colheita de material botanico de região Amazonica (relatório dos trabalhos realizados em 1935/37). By Adolpho Ducke. Pub. by Instituto de Biologia Vegetal, Rio de Janeiro, 1938. Pp. 38; 6¼ x 9.

An interesting journal covering a two years' trip to the Brazilian Amazon region for the primary purpose of collecting seeds and living plants for the botanical garden at Rio de Janeiro.

As especies Brasileiras do género *Ormosia* Jacks. By Adolpho Ducke. *Annaes da Academia Brasileira de Sciencias* 11: 3: 179–193; 2 plates; Sept. 30, 1939.

An annotated list of the 20 Brazilian species of *Ormosia*, with key for their determination. The usual vernacular names for the trees are Buiussú, Olho de Boi, Olho de Cabra, Tenteiro, and Tento.

Revision of the genus *Hevea*, mainly the Brazilian species. By Adolpho Ducke. Rio de Janeiro, 1939. Pp. 32; 6¼ x 9; 3 plates.

This is a new edition, revised by the author, of a paper originally published in the *Arquivos do Instituto de Biologia Vegetal* 2: 2: 217–246; 1935.

Productos forestales del Ecuador. By M. Acosta Solís. *Maderil* (Buenos Aires) 12: 133: 7–10, 27; July 1939.

An informative account of the principal timbers of Ecuador, including not only those now in local or foreign commerce but others which may prove valuable. It is interesting to note that first on the list is Caoba (Mahogany), *Swietenia* sp., which is said to be abundant in the virgin forests in the provinces of Esmeraldas, Guayas, and Manabí.

Neue Arten aus Ecuador. II. By L. Diels. *Notizbl. Bot. Gart. Berlin-Dahlem* 14: 124; 323–341; March 31, 1939.

The trees described as new species are *Prunus Schulzeae* Pilger, *Inga Herthae* Harms, *Pithecellobium Schultzeanum* Harms, *Vochysia retusa* Pilger (vern. name Chimbuya), *Mabea rhynchophylla* Diels, and *Theobroma calodesmis* Diels (vern. name Chucu).

Acción del estado en materia forestal. By Isaac P. Grünberg. *Jornadas Agronómicas y Veterinarias* (Buenos Aires) November 1937, pp. 27–42.

An account of the forestry situation in Argentina, with suggestions for a comprehensive national program.

Vegetation zones of Oahu, Hawaii. By Frank E. Egler. *Empire Forestry Journal* 18: 1: 44–57; 9 plates; 1939.

"The vegetation of the island of Oahu, developed under frost-free tropical conditions from an indigenous flora of less than 1000 species and an introduced flora of about 2000 species, is in a highly dynamic condition, rapidly developing and consolidating in some places, rapidly disintegrating in others. The vegetation, holding magnificent opportunities for semi-natural improvement and for controlled management, is of great significance for the conservation of forage, timber, water, and soil, and possibly for the local control of climate. The abundance of pantropical species, the occurrence of physiognomic types common to equatorial regions, and the development of vegetation in distinct zones comparable to those in other warm regions make it obvious that knowledge of Hawaiian conditions is of practical value to those interested in furthering tropical forestry and vegetation management.

"The organized treatment of Oahu vegetation presented in this paper is offered as a survey and as a framework for detailed studies that will be undertaken in the future. In the concluding paragraphs certain parallels and relationships are drawn so as to facilitate a comparison between the vegetation types of Oahu and those of other tropical regions."—*Author's Preface.*

***Santalum ellipticum*, a restatement of Gaudichaud's species.** By Frank E. Egler. *Occasional Papers of Bernice P. Bishop Museum* (Honolulu) 14: 21: 349–357; April 15, 1939.

"*Santalum ellipticum* Gaudichaud, the Iliahi Aloe or lowland Sandalwood of the Hawaiian islands, is redefined as a single species, exhibiting phenotypic epharmosis and normal variation in flower length, which occurs on Laysan, Oahu, Molokai, Lanai, Maui, Kahoolawe, and Hawaii. *S. ellipticum* var. *littorale*, *S. cuneatum*, *S. cuneatum* f. *gracilius*, and *S. cuneatum* var. *laysanicum* are reduced to synonyms of *S. ellipticum*."

Where did the sandalwood tree (*Santalum album*) evolve? *Empire Forestry Journal* 18: 1: 128; 1939.

"Mr. C. E. Fischer, in an article in the December *Journal* of the Bombay Natural History Society, has made exhaustive inquiries into past history and literature and considers that it was probably introduced into South India and that its true origin is in Timor and in one or two of the neighboring islands, where it is undoubtedly indigenous."

The timber of *Shorea gibbosa* Brandis. By A. V. Thomas. *Malayan Forester* 8: 3: 127–129; July 1939.

"Until recently *Shorea gibbosa* was known only from a single tree in Malaya, although, as *Hopea grisea*, it had been recorded from Borneo. The botanical material that had been collected from the two trees felled to supply material for these tests was originally thought to be from *Shorea Faguetiana*, but, on re-examination, it was identified as *Shorea gibbosa*. Subsequently this species was found to be not uncommon in

parts of Johore, where it was known under the vernacular name of Damar Hitam. This, however, has already been adopted as the preferred vernacular name for *Shorea multiflora*, a species very closely related to *Shorea gibbosa*. Pending the discovery or invention of a suitable vernacular equivalent it will, therefore, be necessary to refer to this form by its botanical name."

"The timber of *Shorea gibbosa* belongs to the White Meranti subgroup 2. It is very easy to saw, not durable, and probably difficult to impregnate with preservatives. It appears to be as strong as, if not stronger than, the typical light Red Merantis. It should be suitable, if protected from termites, for light building construction, flooring, joinery, interior fittings, and decking, and might make satisfactory plywood. Locally it is used for planking and cheap Chinese coffins."

Notes on New Guinea. By J. B. McAdam. *Empire Forestry Journal* 18: 1: 121–123; 1939.

"The demand for timber in Australia caused some of the Australian millers to look further afield for log supplies. This was about two years ago. . . . Until this sudden activity by Australian millers, milling activities here were confined to a few small mills operated by the missions which cut solely for their own requirements and a few pit-sawing concerns operating chiefly in New Ireland on Kwila (*Intzia bijuga*), the most durable timber. However, on the goldfield area around Wau, a community of some thousand whites and several thousand native laborers had sprung up in an area well supplied with three excellent timbers, Hoop and Klinki Pines (*Araucaria Cunninghamii* and *A. Klinkii*), and Red Cedar (*Cedrela australis*). This community was isolated from the coast except by aeroplane transport. Small mills were transported in by large Junker planes and replaced the pit-sawing operations of the days of early discovery. Some four or five small towns have been constructed from the products of these several mills, together with some miles of wooden fluming. However, the main construction is now completed and the mills have to cope with maintenance only.

At present there are four mills operating with a total capacity of about three million super feet and a market of about one million.

"On an area of about 80 square miles following the Bulolo River from Wau down to its junction with the Watut River there are some two hundred to three hundred million super feet of Pine, chiefly Klinki, with smaller quantities of other species such as Cedar, Toun (*Pometia pinnata*), New Guinea Walnut (*Dracontomelum mangiferum*), . . . and *Quercus* spp. A road to connect this area to the coast is now mooted. In the meantime a strip survey is being carried out to obtain a reliable estimate of the Pine. It is intended to sell the Pine by tender; the virgin stands will be rationed over fifty years. It is expected that a 400-acre-a-year plantation scheme will follow closely behind utilization. The first tender will be for five million super feet of Pine per year for a period of ten years and will be called when sufficient knowledge of the road is available. It is estimated that when the first rotation comes into bearing at the end of fifty years the annual cut will be 20 to 25 million super feet. The chief market will be Australia, where the rapidly dwindling supplies of Hoop Pine are creating a keen demand for imported softwood logs.

"To return to the coastal areas, where the activities of the Australian millers are at present concentrated, the chief species being exported are Walnut, Erima (*Octomeles sumutrana*), Toun, *Calophyllum* (of which there are several species), and Amburoi (*Pterocymbium stipitatum*), which is a very white wood with a fine oak grain but very subject to blue stain and borers. Most of the timber cut to date has been obtained from private properties in the process of being cleared for agricultural pursuits. . . . In the early stages considerable damage was done to the reputation of the island timbers by placing parcels of badly borer-infected logs on the Australian market. This lowered the demand considerably, but under the more careful methods of handling the demand has firmed again. Two new saw mills have now been established in New Britain and one near Lae on the mainland, which are catering for the local demand. Until about a year ago this was supplied chiefly by imports from the Philippines."

Termite (white ant) proof construction. Trade Circ. No. 44, Div. of For. Products, C. S. I. R., Melbourne 1939. Pp. 14; 6 x 9½; 14 figs. (structural details).

"There is no completely satisfactory method of permanently eradicating termites once they have become established in the building. Prevention is the only method of dealing with the problem." Estimates have indicated that the cost of applying termite-proof construction to the ordinary brick building will vary from 1 to 2 per cent of the building cost, depending upon the actual wall areas. Above the termite barriers *any* lumber can be safely used, thus making "available for more general use timbers which, under present conditions, are not acceptable to the building industry or which if used are subject to termite attack." The principle of termite-proof construction has been specifically applied in this circular to brick construction, but is applicable also to wooden houses.

The disastrous forest fires of January 1939 in Victoria. By A. V. GALBRAITH. *Empire Forestry Journal* 18: 1: 10–18; 1 map, 1 plate; 1939.

"Early in January 1939 disastrous fires swept the greater portion of the state of Victoria, leaving in their train scenes of unparalled desolation and devastation. The reign of destruction extended over a week, culminating on Friday, 13th January, and during this period, which followed more than a year of severe drought, unprecedented climatic conditions prevailed, including three 'blow-up' days of record temperatures, low humidities, and high winds. Nothing of the like has ever been experienced since the British occupation of Australia, the nearest approach being Black Thursday, 6th February, 1851, when according to report practically the whole state of Victoria was laid waste. It is interesting to note that extensive stretches of what were regarded as virgin forests, and wherein exploitation has already been commenced, undoubtedly originated from these 1851 fires. These stands were destroyed in the recent general holocaust. The most regrettable feature of these January fires was the serious loss of life. Many of the affected districts were relatively thickly populated, and the

almost unbelievable rapidity with which the fires spread caught many people unawares and prevented them from gaining a haven of safety. Altogether over 70 lives were lost, including two district forest officers and two forest firemen."

"The rapidity of spread of the fires was a feature which has given rise to much speculation as to the reason. Reliable observers in different localities reported the totally unexpected and apparently inexplicable bursting into flame of extensive areas far ahead of the known fire front. The sudden appearance of balls of flame seems to indicate some form of combustion of gaseous substances and this theory has been advanced by prominent scientists as an explanation of these phenomena. It has been suggested that the high sun temperatures up to 180°F., extremely low relative humidities of 5 per cent and less, and the extraordinarily hot fires were responsible for the destructive distillation of the leaves of the forest trees well ahead of the main fire. These conditions were supplemented by the relatively high content of volatile oils in the leaves of the Eucalypts, this content varying between 0.5 per cent and 3.5 per cent, with an average probably exceeding 1 per cent. The main constituents of these oils have boiling points between 160°C. and 190°C., whilst flash points of 60°C. have been recorded for the crude oils. Taking into consideration the rugged nature of the country, it is reasonable to assume that the accentuated swirls, eddies, and cross currents of air associated with a fire caused the pocketing of volumes of highly inflammable gases, the ignition of which by sparks or burning debris is a probable explanation of these sudden bursts of fire and the great rapidity with which the fires spread, the latter being further contributed to by the presence of an abnormally large quantity of very inflammable fuel resulting from the cumulative effect of the prolonged drought period."

"Pending more intensive surveys, it is not possible at the present juncture to assess at all accurately the extent of forest country affected by the fires, but reconnaissances carried out up to date indicate that over 1,250,000 acres of reserve forest, representing approximately 26 per cent of the total area of reserved forest in the state, were burned. In addition, it is estimated that 3,000,000 acres of protected forest, and 900,000

acres of timbered private property, including forested areas controlled by water boards and similar authorities, were burned. The major damage to forest country occurred in the central mountain belt, where the bulk of the very valuable sawmilling forests of Mountain Ash (*Euc. regnans*) and Woollybutt (*Euc. gigantea*) were located. In this sector, including both regrowth and virgin stands, it is estimated that over 550,000 acres of reserved forest were burned over, the bulk of the timber and regrowth thereon being killed or badly damaged. On the coniferous plantations, between 9000 and 10,000 acres were destroyed, this loss being confined principally to three plantation areas in the mountain districts—Bright (6000 acres), Toorongo (1500 acres) and Narbethong (1600 acres). A total of 67 forest sawmills, as well as approximately 600 huts, cottages, and other buildings attached thereto, were destroyed.

"In order to appreciate the extent and nature of the damage, it is necessary to understand something of the characteristics of the species concerned. Mountain Ash (*Euc. regnans*) and Woollybutt (*Euc. gigantea*) each occurs in pure formation over extensive contiguous areas in the cool and wetter sections of the mountain forest zone. Under normal conditions it is difficult for fires to travel through this type of forest, and only on 'blow-up' days in the hot summer season is the hazard acute. Each species is easily damaged by fire even in the older age classes, and young regrowth stands are killed outright by a comparatively light fire. In addition, the two species in question possess very limited recuperative powers, and complete defoliation results in the death of the trees. Normally the great majority of Eucalypts coppice vigorously and profusely and after damage or complete defoliation produce abundant adventitious shoots which eventually furnish the trees with a new crown. The two species mentioned, however, are exceptional in this respect, as they do not produce fresh shoots, and this factor introduces complications in securing regeneration of fire-killed areas.

"As a result of the severity of the fires, both mature and immature stands have been killed outright over extensive areas in mountain districts. This has consequently involved

consideration of two major problems, (1) the harvesting of fire-killed timber of merchantable size, whether in virgin or regrowth stands, and (2) establishment of regeneration for production of new growing stock."

Thinning, pruning and management studies on the main exotic conifers grown in South Africa. By I. J. Craib. Dept. Agr. & For. Science Bull. No. 196, Pretoria, 1939. Pp. 179; 6 x 9½; 29 figs. Price 1s.

This report furnishes an example of a carefully planned system of management for a specific forest type; namely, plantations of Yellow Pines in South Africa. Exotic conifers have already been planted in South Africa on 200,000 acres and in 25 years the planted area will be increased to approximately 600,000 acres. Yellow Pines, particularly *Pinus insignis*, *P. patula*, and *P. pinaster*, have been the principal species used. The establishment of new mills and manufacturing plants will be needed to utilize the wood produced in these plantations.—R. C. Hawley.

Enumeratio Lauraceraum Madagascariensium et ex Insulis Mascarenis. Revisio Lauracearum VI. By André J. G. H. Kostermans. *Not. Syst.* 8: 2: 67–128; May 1939.

Included in this enumeration of the Lauraceae of Madagascar and dependencies are 11 new combinations and descriptions of 30 new species in the genera *Apollonias*, *Cryptocarya*, *Ocotea*, *Potameia*, and *Ravensara*.

L'*Avicennia marina* dell'Oltre Giuba (sur caratteristiche anatomiche e meccaniche e sue applicazioni). By Raffaele Cormio. Civica Siloteca Cormio, Milano, 1939. Pp. 11; 9½ x 13; 17 figs.

A copiously illustrated account of the Black Mangrove, with particular reference to the utilization of the forests of Italy's African possessions.

The woody vegetation of the Coast Province of Kenya. By I. R. Dale. Imperial Forestry Institute Paper No. 18, Oxford, 1939. Pp. 28; 6 x 9¾; 2 figs., 4 maps. Price 2s.

Contains descriptions of 12 formations in primary and secondary woodland and an appendix (pp. 20–28) consisting of additions and corrections to the *Trees and shrubs of Kenya Colony* (1936).

Native housing in relation to forestry in the Anglo-Egyptian Sudan with details of types of houses for which local sawn timber output has been standardised. By J. SMITH and A. M. PETRIE. Imperial Forestry Institute Paper No. 20, Oxford, 1939. Pp. 12; 7 plates (plans). Price 2s.

"The purpose of this paper is to describe how forestry in the Anglo-Egyptian Sudan has been concerned in recent years in the betterment of native housing. The movement aims at placing home-grown timber of the cheaper sort, in standardized sizes, at the disposal of persons wishing to build a house of improved local type in localities where relatively high rainfall makes the flat mud roof unsuitable. The scheme was devised and adopted by the Sudan Government Committee for the Improvement of Native Housing. . . . While the details of plan and construction given are believed to be sufficient to enable the designs to be put to practical use, the main purpose of the paper is to make known the particulars of the standardized timber used."

"It is hoped, by the publication of sketch plans and lists of the timbers required, to present the facts in convenient form to all who may have occasion to plan or erect houses of this category. This will at least indicate the cheapest forms in which local timbers can be utilized, and reduce the business of placing orders for them to a telegram of one line."

Effect of water supply on the structure of the xylem elements in certain trees in Egypt. By E. A. M. GREISS. *Bull. Inst. Egypte* (Cairo) 20: 193–225; 6 plates.

The results of a preliminary investigation of the xylem elements in branches of three species commonly propagated in Egypt, namely *Eucalyptus rostrata* Schl., *Morus alba* L., and *Acacia arabica* Willd., var. *nilotica* Forsk., with reference to the differences in specimens from trees growing on the banks of canals where water is constantly present and corresponding material from other individuals in comparatively dry localities dependent on infrequent rains for their water supply. Most of the conclusions are tentative, but it appears that *Morus* responds positively to water supply, *Acacia* is relatively insensitive to drought, and *Eucalyptus* is intermediate.

Le quinquina. By E. H. J. STOFFELS. Ser. tech. No. 24, Inst. Nat. Étude Agr. Congo Belge, 14 Rue aux Laines, Brussels, 1939. Pp. 51: 6¼ x 9½; 21 figs. (drawings and half-tones). Price 18 fr.

A guide for the culture of Cinchona in the Belgian Congo, from the choice of site and species to the harvesting of the bark.

Sur un arbre du Cameroun et du Gabon à bois utilisable (*Afzelia pachyloba Harms*). By AUG. CHEVALIER. **Identification et emplois des bois d'*Afzelia*.** By D. NORMAND. *Rev. Bot. App. & d'Agr. Tropicale* 19: 215: 484–488, 489–494; 2 plates; July 1939.

According to the first paper, *Afzelia Zenkeri* Harms is not distinct from *A. pachyloba* Harms. Descriptions of both were published in the same work, but the latter name has priority because it appeared one page ahead of the other. The foliage, flowers, and fruits are illustrated in detail. The second paper is concerned with the wood of this and related species of *Afzelia*.

Merkblätter über koloniale Nutzhölzer. I. Abachi, *Triplochiton scleroxylon* K. Schum. II. Limba, *Terminalia superba* Engl. & Diels. Pub. by Institut für ausländische und koloniale Forstwirtschaft der Forstlichen Hochschule Tharandt, Germany. March 1939. Pp. 8 and 9; 7 x 10; 7 figs., 1 colored plate (each). Price RM 0.60 and 0.80, resp.

These well illustrated leaflets are the first two of a proposed series on commercial trees of the tropics. They include vernacular and trade names, range, occurrence, and form of the tree, and the anatomy, properties, and utilization of the wood.

Ueber die Beziehungen zwischen mikroskopischem Bau und technischen Eigenschaften von Hölzen. By GERHARD PRÜTZ. *Kolonialforstliche Mitteilungen* 1: 2: 347–390; 48 text figs.; May 1939.

A dissertation concerning an attempt to correlate the minute anatomy with the technical properties of four types of wood, namely, with sparse and with abundant parenchyma, and with and without storied structure.

Nutzhölzer, Schnitzstoffe. By O. NERLING, *Jahresbericht Hambürgisches Inst. Ang. Botanik* 56: 43–59; 1939.

This chapter in the annual report of the Institute for 1938 contains a great deal of important data about commercial timbers, most of which are of tropical origin.

Der tropische Wald als Rohstoffquelle. (Summary in English). By FRANZ HESKE. *Zeitschrift für Weltforstwirtschaft* 6: 7: 413–485; 17 plates; April 1939.

"When looking at the forests as suppliers of raw material, one must start from a geographical and geopolitical point of view. Firstly, because timber is a material with which transport distances form an important part and, secondly, because the old form of liberalistic world economy is giving way to a distribution of the geographical spaces on the strength of political power, which are dictated by motives beyond the mere economical side of the subject. This latter moment becomes prominent when considering how to distribute in a broad way the areas containing raw materials, which are not only of economical importance but are now and mainly in future of a political character. Such a geopolitical conception must in particular govern the study of sources of raw material in the forests, as its sustained exploitation requires planning which extends far more into the future than would be the case in any other branch of economic life. Only the eye of a real statesman penetrates into the distant future and compares to the eye of the true forester, with whom it is a matter of course.

"Based on these considerations, every forest region on the earth must be regarded not only from a technical point of view, but also according to its geopolitical classification, if it is to be judged as a source of raw material of a lasting nature. Looked upon from a high point of view, the world may be divided into three large regions—the Atlantic, the Indo-Pacific, and the Russo-Siberian territories.

"The Atlantic Ocean connects all those countries of the Old and New World which gravitate towards it, thus forming a geopolitical area of countries of similar destiny, comprising the industrial countries and suppliers of raw materials east of the Cordillera Range, on the one hand, and Europe, part of western Russia, and the whole of Atlantic Africa, on the other hand. To this Atlantic area belong the Pine forests of eastern Canada and the eastern half of the United States of America, as well as those of Europe and the western and northwestern parts of Russia. To this territory belong also the tropical forests of Central America and South America east of the Andes, in particular the hylaea of the Amazon and the large belt of virgin forest from Senegal to Angola in western Africa.

"There is no doubt that within this space further geopolitical subdivisions will take place; *e.g.*, as a result of the Panamerica Movement, a tendency from north to south, or in consequence of a closer association of the industrialized European states lacking raw material with Colonial Africa, being its tropical complement. But the important fact is that the Atlantic Ocean is the land-connecting link and this remains the prime factor. The industrialized countries of Europe and America will recognize to a growing extent in the Atlantic tropical forests of South America and Africa their great future suppliers of plant raw material."

The recording of structure, life-form, and flora of tropical forest communities as a basis for their classification. By P. W. RICHARDS, A. G. TANSLEY, and A. S. WATTS. Imperial Forestry Institute Paper No. 19, Oxford, 1939. Pp. 19; 6 x 9¾. Price 1s.

"The authors point out that a natural scheme of classification should be based on the structure, life-form, and flora of the component communities, rather than on mixed criteria

including habitat. They emphasize, also, the point that associations should always be named from species present, not from a presumed formation to which the association belongs. . . . They consider that the three main classes of formations, woodland, grassland, and desert, do not require any special term by which to designate them, and that the term formation-type is most usefully applied to the aggregate of communities all over the world dominated by a distinctive life form, *e.g.*, rain-forest, thorn-forest, etc., while each geographically distinct unit of such a formation-type is recognized as a distinct formation. . . . The outline here given will be very helpful to forest officers in the tropics, and should prove a stimulus to field investigations on definite and uniform lines."—*From Preface by* J. BURTT DAVY.

On the system of the Sapotaceae, with some remarks on taxonomical methods. By H. J. LAM. *Recueil Trav. Bot. Néerlandais* 36: 509–525; 1939.

A discussion of Charles Baehni's "Mémoires sur les Sapotacées. I. Systéme de classification" (*Candollea* 7: 394–508; 1938). It is suggested that the Sapotaceae be divided into three subfamilies, namely, Sideroxyloideae, Mimusopoideae, and Madhucoideae.

The correct names of certain economic plants. By ALBERT F. HILL. *Botanical Museum Leaflets (Harvard University)* 7: 6: 89–111; June 19, 1939.

"In May 1937, there was published under the auspices of the Royal Botanic Gardens, Kew, a book by J. H. Holland entitled *Overseas plant products*. Constituting as it does a dictionary of the natural products of vegetable origin of the Empire, with the trade and vernacular names and their scientific equivalents listed, this work will be of great service to anyone who has to do with economic plants or plant products. . . . It seems advisable for the benefit of those botanists who may have access to Holland's otherwise very valuable work, and for the sake of accuracy in possible future editions, to call attention to certain of the plants the names of which are incorrectly listed."