M. M. CHATTAWAY.

Yale University School of Forestry

TROPICAL WOODS

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 5 March 1, 1926

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

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NOTES ON NEW CABINET WOODS FROM BRAZIL

By KARL SCHMIEG[1]

The making of fine furniture calls for not only the best of the standard cabinet woods of the trade, but also a great many of the rarer and lesser known kinds. In the whole course of our manufacture we use about one hundred different kinds of wood, emanating from all parts of the world. Brazil's contributions in the past have been few, notably Rosewood, Tulipwood, Kingwood, and Pernambuco Wood, but these have been long and favorably known. More recently other woods from that country have become available to cabinet makers and some of these are very promising. Following is a

[1] President of the firm of Schmieg, Hungate & Kotzian, Inc., designers and cabinet makers, New York City. From the time of his apprenticeship (1886–89), Mr. Schmieg has been continually engaged in the making of fine furniture in Germany, England, and America. He is a student of woods and one of America's foremost authorities on furniture and cabinet making.

brief account of our experience with Oleo Vermelho, Gonçalo Alves, Embuia, and Cordia Wood.

Oleo Vermelho (*Myroxylon toluiferum* H.B.K.).—Our first acquaintance with this wood was about five years ago. It comes from southern and eastern Brazil and is in the form of round logs of good size and quite sound, except for a small center defect. The wood is rather hard, somewhat more so than Cuban Mahogany, and is very firm and strong. It is fragrantly scented and its color varies from yellow-orange to purplish-rose. It has a rich figure and the texture suggests Padauk, only the pores are smaller. When finished, Oleo Vermelho has a marked resemblance to Cuban Mahogany. The principal hindrance to its use is the fact that it does not respond well to staining and consequently is limited in its application.

Gonçalo Alves (*Astronium fraxinifolium* Schott).—This is a timber of eastern Brazil which is obtainable in long logs, 12 to 24 inches in diameter, and very straight and sound. The wood is moderately hard and heavy, is 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.

A few years ago we bought some veneers which were said to be of Gonçalo Alves, but the wood is somewhat different from that just described. It is intermediate between that and a kind of Zebra-wood we obtain in London, and is much the best of the three.[2] It makes beautiful furniture, but unfortunately we have not been able to procure additional supplies of it.

Embuia (*Nectandra* sp.).—We began using this wood about six years ago. It is a product of southern Brazil where the trees are said to grow in association with the Paraná Pine. The lumber is obtainable in very large planks which are free

[2] Specimens of these three woods have been examined by the editor and all belong to the genus *Astronium*, though it is possible that they are of Central American or Venezuelan rather than of Brazilian origin.

of natural defects, except some worm holes, but we find that the darker-colored wood is inclined to warp and crack during the seasoning process. In working qualities it is much like English or French Walnut, though tending to dull sharp-edged tools more quickly than is the case with European Walnut. The fine dust seems to contain an irritating principle which affects some of the workmen. The wood finishes well, has a high luster and a beautiful color. There is a considerable range in the color, some specimens being light yellow, approaching Satinwood, others exhibiting various shades of brown and suggesting the darkest Circassian Walnut and very dark Brazilian Rosewood. Since there is a similar variation in weight, it may be that the Embuia wood of the trade is the product of two or three closely related species of trees.

We are using Embuia where we have ordinarily used American Walnut. It can take the place also of English, French, Italian, and Circassian Walnut, as it can be selected for color to match any of them. It is suitable for reproductions of English period furniture (such as Queen Anne and William and Mary), Italian, Spanish, and also Louis XV and Louis XVI French furniture where French Walnut and Beech were used. The wood should have a good future in this country, though there is need of experiments to determine the best methods of overcoming certain minor difficulties in manufacturing operations. It is to-day practically the only wood obtainable in large planks so much needed for heavy carved work, such as table trusses and shaped chair legs.

Cordia Wood (of the type of *Cordia Goeldiana* Huber).—This timber is obtained in the form of lumber of good lengths and widths, though we have not had any very large planks. The wood it intermediate in density between American Walnut and Chestnut, and its texture and figure suggest Elm. It is very uniform in texture and weight, seasons without difficulty, warps less than most woods, and stands as well as Mexican Mahogany. It takes glue well, and being of a neutral color, is adapted to almost any kind of finish. We are having the best results with a wax finish, which does not completely close the pores, and do not recommend a finish which closes the pores. We are making at this time about

fifty sets of Cordia Wood furniture and are agreeably impressed with its possibilities.

Brazil has a large variety of timbers, but few have proven as useful as those just mentioned.

TREES OF THE BAYANO RIVER WATERSHED, PANAMA

During the first half of the year 1924, Mr. H. C. Kluge, of Schenectady, N. Y., was engaged in forest work on the watershed of the Bayano River, Panama. Incidental to his regular duties, he collected for the Yale School of Forestry the leaves, flowers, fruits, and wood specimens of over 50 different trees. The determinations of the botanical material were made by Dr. Paul C. Standley, Associate Curator, Division of Plants, Smithsonian Institution, Washington, D. C. In this collection are 54 species, representing 48 genera and 26 families. Two new species have been described by Standley, namely, *Calderonia Klugei* and *Bumelia panamensis*.

The following account embodies the substance of Mr. Kluge's notes and correspondence, and to this material the editor has added short descriptions of the appearance and quality of the woods. There is a range in density from exceedingly light and soft to very hard and heavy. Classified rather roughly, out of 52 woods there are 14 as heavy as hickory (*Carya*) or heavier; 12 medium heavy, or in the class with birch (*Betula*); 15 medium light, or in the class with yellow poplar (*Liriodendron*); 11 ranging from the type of basswood (*Tilia*) to balsa (*Ochroma*).

It will be noted that mahogany (*Swietenia*) does not appear in the list. Mr. Kluge says: "I never saw or heard of a single mahogany tree growing in the Bayano, although it occurs in the adjoining watersheds. Attempt was made to discover the reason for this, but no satisfactory explanation could be found."

Amygdalaceae

Hirtella triandra Swartz. "Camaroncillo." A small tree about 30 feet high and 12 inches in diameter, growing along river banks.

Wood hard and heavy, of medium texture, more or less cross-grained, rather splintery, of pale brown color. (Kluge 48; Yale 7247.)

Licania platypus (Hemsl.) Fritsch. "Sangre." A very common tree of general distribution, attaining a diameter of 36 inches and a trunk length of 40 feet. The larger trees are buttressed.

Wood hard and heavy, straight-grained, rather coarse-textured, somewhat splintery, fairly easy to work, of dull brownish color. (Kluge 31, 41; Yale 7144, 7240.)

Anacardiaceae

Anacardium Rhinocarpus DC. "Espavé." Judging from the logs and lumber, there are three kinds of "espavé," namely, red, yellow, and black. These differences could not be noted in the leaves and fruits. The lumber from this locality appears much superior to that from the Atlantic side, including the Gatun Lake region.

Wood of medium density, rather cross-grained, fairly coarse-textured, tough and strong, color variable from yellowish to reddish brown. (Kluge 5; Yale 7119.)

Araliaceae

Sciadodendron excelsum Gris. "Jobo lagarto." This tree attains large size, trunks 24 inches in diameter and 35 feet long being common. Likely to be confused with the other "jobo" (*Spondias*).

Wood rather light, firm, coarse-textured, fairly straight-grained, tough, of harsh feel, pale brown in color. (Kluge 50; Yale 7249.)

Bignoniaceae

Tecoma pentaphylla Juss. "Roble." This tree is well distributed, growing on all kinds of sites. The trunks are usually irregular, but may be free of limbs for 40 feet. The flowers are pink and very showy.

Wood of medium density and texture, straight-grained, easy to work, light brown with penciling of darker parenchyma on tangential surface. Ripple marks distinct. A good wood, well known throughout tropical America. (Kluge 20; Yale 7133.)

Bombacaceae

Bombacopsis Fendleri (Seem.) Pittier. "Cedro espinoso." This well-known tree is distributed very generally over the region, growing very well on the barren hilltops. The trunk is usually 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.

Wood light and soft, but tenacious, having much the consistency of "cedro" except that it is tougher; is straight-grained, rather coarse-textured, of red-brown color. Ripple marks indistinct. (Kluge 11; Yale 7125.)

Cavanillesia platanifolia H. B. K. "Quipo." A very large tree, sometimes nine feet in diameter and 90 feet to the first limb. Very abundant, comprising nearly half the stand. Usually grown on rocky, barren hills.

Wood exceedingly light and soft, spongy, coarse-textured, with harsh feel, nearly colorless. (Kluge 30; Yale 7143.)

Pachira villosula Pittier. "Mamé de mono." A tree of the river bottoms attaining large size, but not considered valuable as a source of lumber.

Wood light but firm, coarse-textured, rather cross-grained, with harsh feel, light-colored, becoming yellowish on surface. (Kluge 29; Yale 7142.)

Quararibea pterocalyx Hemsl. Vernacular name unknown. Wood hard, heavy, of medium texture, cross-grained, white. Considerably denser than the "guayabillo." (Kluge 53; Yale 7343.)

Quararibea asterolepis Pittier. "Guayabillo." Wood of medium density, rather hard, nearly white, suggests holly. (Kluge 58; Yale 7348.)

Borraginaceae

Cordia alba (Jacq.) R. & S. "Sabto." Wood rather light, firm, rather fine-textured, of consistency of yellow poplar, straight-grained, easy to work, pale brown. (Kluge 52; Yale 7251.)

Cordia alliodora (R. & P.) R. & S. "Laurel." This tree does not reach the size it does in other regions, the largest found being 12 inches in diameter. Occurs throughout the hills, rarely near streams.

Wood rather light, firm, rather coarse-textured, gray, suggesting soft elm. Traumatic gum ducts present. (Kluge 3; Yale 7117.)

Burseraceae

Spondias lutea L. "Jobo." A common tropical tree of all second-growth stands. In the forest it attains large size, usually about 24 inches in diameter, with a clear length of 40 feet.

Wood light, but firm and tough, of medium texture, fairly straight-grained, easy to work, white. A good wood for boxes. (Kluge 34; Yale 7146.)

Combretaceae

Terminalia obovata (Poir.) Eich. "Amarillo real." A well distributed tree, not exacting in its requirements. The trunks are rather slender, free of limbs up to about 40 feet and usually less than 24 inches in diameter.

Wood moderately hard and heavy, medium-textured, olive color. Resembles "amarillo fruta" (*Lafoensia*). (Kluge 21; Yale 7134.)

Terminalia sp. "Palo amarillo" or "carba suella." This tree appears to be much the same as the "amarillo real" (*Terminalia obovata*), but the natives claim that the fruit is different.

The wood agrees in color and general properties with "amarillo real," but there are some anatomical differences, particularly in the amount and arrangement of the parenchyma. (Kluge 9; Yale 7123.)

Elæocarpaceae

Muntingia calabura L. "Pacito." A tree of medium size usually found along the lower water courses. It is planted by the natives for its fruit, which is cherry-like and very sweet.

Wood light, soft, fibrous, tenacious, straight-grained, medium-textured, with a soft feel, dull brown. Ripple marks indistinct. (Kluge 17; Yale 7130.)

Euphorbiaceae

Sapium thelocarpum Schum. & Pitt. "Olivo macho." A tree, rarely over 18 inches in diameter, found on well-drained bottom lands. The wood splits badly in drying.

Wood rather light and soft, of medium and uniform texture, straight-grained, pale yellow. (Kluge 7; Yale 7121.)

Flacourtiaceae

Hasseltia floribunda H. B. K. Vernacular name unknown. A slender tree of the river flats, with a trunk diameter of 10 inches.

Wood fairly light, rather hard, fine-textured, fairly straight-grained, easy to work, nearly colorless. (Kluge 32; Yale 7144 A.)

Lauraceae

Nectandra globosa Mez. "Sigua." A tree of the river flats, with a trunk about 30 feet long and 18 inches in diameter.

Wood rather light and soft, rather coarse-textured, straight-grained, easy to work, pale olive, lustrous. (Kluge 27; Yale 7140.)

Leguminosae

Cassia grandis L. "Caña fistula." This tree is found in the open along river courses in the neighborhood of existing or abandoned plantations and reaches large size, although the trunks are short. The seed pods contain a thick sweet fluid which is edible.

Wood rather hard and heavy, coarse-textured, fairly straight-grained, colorless to pale roseate. (Kluge 46; Yale 7745.)

Diphysa carthagenensis Jacq. "Macana." A tree of the rocky hills. Of small size in this locality, but said to attain considerably larger dimensions in the region east of Panama City.

Wood very hard and heavy, fine-textured, grain interwoven, tough, splintery, takes high polish, brownish yellow. Has fine ripple marks. (Kluge 28; Yale 7141.)

Enterolobium cyclocarpum (Jacq.) Gris. "Coratu." Widely, but usually sparsely, distributed, occasionally forming heavy stands in favored localities. It attains very large dimensions, and trunks 30 feet long and 12 feet in diameter are not uncommon. The natives use the trunks to make dug-out sailboats, some of which have a capacity of nine tons.

Wood light and soft, of the consistency of "cedro," coarse-textured, very easy to work, lustrous brown. (Kluge 35; Yale 7147.)

Erythrina glauca Willd. "Palo bobo" or "palo santo." This short-bodied tree attains a diameter of about 30 inches and attains its best growth on low overflow land and in swamps without outlet.

Wood very light and soft, fibrous, coarse-textured, harsh feel, straw-colored. Ripple marks present. (Kluge 10; Yale 7124.)

Erythrina rubrinerva H. B. K. "Pernilla de casa." This small bushy tree

furnishes material for fence posts in wet places, since the posts take root and grow.

The wood is light but fairly firm, very coarse-textured, has a harsh feel, and is straw color. (Kluge 13; Yale 7127.)

Inga punctata Willd. "Guava del mono." A small tree growing near water courses, with a trunk 12 inches in diameter and about 25 feet long. Forest animals and birds like the fruit.

Wood rather light and soft, of medium texture, straight-grained, somewhat splintery, easy to work, finishes smoothly, yellowish. (Kluge 33; Yale 7145.)

Inga rufescens Benth. "Coralillo." A small tree very sparsely distributed along river banks.

Wood hard and heavy, of medium texture, fairly straight-grained, finishes smoothly, pinkish brown. (Kluge 40; Yale 7239.)

Inga spuria Willd. "Guava." A small-sized tree common along the river and creek banks. Birds are very fond of its fruit.

Wood rather light and soft, straight-grained, tough, rather splintery but not harsh, yellow-brown with pinkish tinge. (Kluge 16; Yale 7129.)

Lonchocarpus lucidus Pittier. "Malvecino." Abundant in the river valleys. The trunks do not exceed 18 inches in diameter and 30 feet clear length. The wood is readily attacked by wood lice, pin worms, etc., and is not durable.

Wood rather hard and heavy, of medium texture, rather splintery, pale yellow. Ripple marks present. (Kluge 22; Yale 7135.)

Platymiscium polystachium Benth. Vernacular name unknown. (Fertile botanical material submitted without wood specimen and notes.) (Kluge 56.)

Prioria Copaifera Gris. "Cautivo." Occurs on the lower wet river bottoms, attaining a diameter of five feet and clear lengths of 40 feet. In the Atrato River region, as well as in the drainage areas of the rivers and creeks flowing into the Gulf of Darien or Uraba, it composes pure, dense stands, the trunks averaging three feet in diameter and free of limbs for 50 feet. There are two kinds—one with a pink sapwood, the other white. A thick gum exudes from the freshly cut sapwood, hence the Colombian name "trementino." This gum is little in evidence on dry lumber and seems not to hinder the application of paint; in fact, the wood takes paint readily.

Wood is of the consistency of "cedro," rather coarse-textured, straight-grained, chocolate-brown with fine oily streaks. (Kluge 6; Yale 7120.)

Swartzia darienensis Pittier "Naranjillo." Small tree usually not over 25 feet high. Grows along water courses, but not in swampy places. Fruit eaten by birds.

Wood very hard and heavy, fine-textured, interwoven grain, ochre color. Has irregular ripple marks. (Kluge 2; Yale 7116.)

Leguminosae, species unknown. "Pernilla del monte." A tree, sometimes three feet in diameter and 40 feet clear length, growing in well-drained sites, foothills and even on hilltops. The soil in the region of its growth has a clay base and in many cases is almost pure clay. The species differs from the "pernilla" of the interior of Colombia in that the seeds are entirely red, while those of Colombia are red with black spots.

Wood moderately hard and heavy, rather coarse-textured, straight-grained, takes a good polish, is yellow-brown in color. (Kluge 14; Yale 7127A.)

Lythraceae

Lafoensia punicifolia DC. "Amarillo fruta." This tree is well distributed though nowhere abundant. It attains a diameter of 24 inches and clear length of about 30 feet.

Wood rather hard and heavy, texture medium, grain fairly straight, light to dark olive in color. Apparently a good wood. (Kluge 18; Yale 7131.)

Malvaceae

Hibiscus tiliaceus L. "Algodoncillo." A stunted or short-boled tree growing along the water courses.

Wood light, firm, medium-textured, straight-grained, nearly white. Ripple marks present. (Kluge 42; Yale 7241.)

Meliaceae

Cedrela sp. "Cedro amargo." One of the less common trees, occuring in wide variety of sites.

Wood light and soft but firm, fragrant, reddish. (Kluge 4; Yale 7118.)

Trichilia acutanthera DC. Vernacular name unknown. A single small tree was found growing near the river's edge.

Wood rather light, firm, of about the consistency of white birch, pale brownish. (Kluge 47; Yale 7246.)

Trichilia tuberculata (Tr. & Pl.) C. DC. "Alfaje." A tall, slender tree, rarely over 12 inches in diameter, occurring in all the valleys.

Rather hard and heavy, of the consistency of black birch, straight-grained, finishes smoothly, brownish. (Kluge 37; Yale 7236.)

Moraceae

Ficus glabrata H. B. K. "Higueron." A rather common tree in all the river valleys. It attains large dimensions, the trunks often 40 feet long and four feet through. The broken bark exudes a white latex.

Wood rather light and soft, coarse-textured, straight-grained, of harsh feel, brittle, nearly colorless. (Kluge 43; Yale 7242.)

Myrsinaceae

Icacorea revoluta (H. B. K.) Standl. "Uvito." A small tree, not over 12 inches in diameter, found in all parts, even on the high, dry, barren peaks of the highest hills. The natives use it for posts and beams in the construction of their huts, owing to its strength and durability.

Wood rather hard and heavy, of medium texture, straight-grained, with conspicuous rays, suggesting oak. (Kluge 8; Yale 7122.)

Palmaceae

Astrocaryum sp. "Palma negra" or black palm. A slender palm with large pinnate leaves and clusters of rather small, pear-shaped, orange-colored fruits.

The outer layer of the trunk to a depth of about one inch is nearly black and composed of very hard fibers closely compacted together, and surrounding a loosely fibrous core. Used in U. S. for making fishing rods. (Kluge 45; Yale 7244.)

Polygonaceae

?Coccoloba caracasana Meisn. "Ubero." A small tree, rarely over 12 inches in diameter, found occasionally in the river valleys.

The wood is different from that of any other species of *Coccoloba* examined and is more like *Ruprechtia*. It is rather light, firm, fine-textured, straight-grained, easy to work, light pinkish brown. There are numerous concentric bands of crystal-bearing wood fibers present as in *Triplaris*. (Kluge 25; Yale 7138.)

Triplaris americana L. "Guayabo hormiguero." A tall slender tree overtopping all the others except the "quipo" (*Cavanillesia*). The name "hormiguero" refers to the stinging ants which inhabit the tree.

Wood rather light, firm, straight-grained, of rather fine texture, easy to work, light-colored with pinkish hue. There are numerous bands of crystal-bearing wood fibers present. (Kluge 38; Yale 7237.)

Rhizophoraceae

Cassipourea elliptica Poir. Vernacular name unknown. (Fertile botanical material submitted without wood specimen and notes.) (Kluge 54.)

Rubiaceae

Antirrhœa trichantha (Gris.) Hemsl. "Candela." A rather rare tree of the river valleys, with a trunk rarely over 25 feet long and 12 inches in diameter.

Wood rather light, firm, of the consistency of tupelo, fairly straight-grained, yellow-brown. (Kluge 39; Yale 7238.)

Calderonia Klugei Standl. "Palo colorado." A tree of medium size, usually with crooked trunk, found on the lower lands subject to inundation. The change in color of the wood suggests the "chachaguante" of Campeche, Mexico.

Wood hard and heavy, fine-textured, straight-grained, somewhat splintery. Color yellowish changing to decidedly pink. This wood is denser and of finer texture than that of *Calderonia salvadorensis* Standl. (Kluge 19; Yale 7132.)

Calycophyllum candidissimum (Vahl) DC. "Madroña." This tree reaches a height of 40 to 50 feet and has a very irregular and usually very crooked trunk. It is very abundant in the region, sometimes forming almost pure stands. The wood is used chiefly for kindling and charcoal, and is said to be highly resistant to marine borers.

Wood hard and heavy, fine-textured, fairly straight-grained, pale brown in color, similar in consistency to birch. (Kluge 15; Yale 7128.)

Posoqueria latifolia (Lam.) R. & S. "Fruta de mono." A slender, pole-like tree of common occurrence. The fruit is eaten by birds and wild animals.

Wood hard and heavy, fine-textured, of fairly straight grain, nearly colorless. (Kluge 51; Yale 7250.)

Sapotaceae

Bumelia panamensis Standl. "Limoncillo." A rather uncommon tree occurring on well-drained sites. It reaches a diameter of 24 inches, but is short-boled.

Wood hard and heavy, with a harsh feel, rather cross-grained, splintery, light reddish brown. Parenchyma bands are conspicuous. (Kluge 12; Yale 7126.)

Chrysophyllum Cainito L. "Caimito." A common tree, well distributed, occurring on the slopes and crests of hills and ridges, and along the banks of streams near their headwaters. The trunks are often 30 feet long and 24 inches in diameter. A small amount of milky latex will exude when the bark is cut or bruised. The fruit, which is about the size of an English walnut, is edible.

Wood very hard and heavy, rather fine-textured, straight-grained, splintery, very strong, of light brown color. (Kluge 49; Yale 7248.)

Mimusops darienensis Pittier. "Nispero." The bark, trunk, and wood of this tree resemble the "chicle," but the leaves are different.

Wood very hard and heavy, strong, fine-textured, fairly straight-grained, reddish brown. (Kluge 55; Yale 7345.)

Simarubaceae

Quassia amara L. "Guavito." A shrubby tree growing near streams above the influence of the tides. A decoction of the wood is used by the natives as a febrifuge.

Wood rather hard and heavy, fine-textured, exceedingly bitter, yellow. (Kluge 36; Yale 7148.)

Sterculiaceae

Sterculia apetala (Jacq.) Karst. "Panamá." Large tree, three to four feet in diameter, usually buttressed up to about 12 feet, clear length about 32 feet, free from defects. Bark smooth and whitish, suggesting beech. Crown well proportioned, umbrella-like. Tree well distributed in lowlands and hills, but not on barren ridges.

Wood very light, soft but tenacious, coarse-textured, nearly colorless. (Kluge 1; Yale 7116.)

Tiliaceae

Apeiba Tibourbou Aubl. "Cortez." Wood light, firm, tough, rather fine-textured, nearly white. Has conspicuous concentric zones or arcs of cottony tissue. Ripple marks present. (Kluge 57; Yale 7347.)

Luehea Seemannii Tr. & Pl. "Guacimo." In the good soil of the river bottoms this tree attains a diameter of 18 inches and a trunk length of about 30 feet. The fruit is attractive to birds.

Wood light and soft, of medium texture, straight-grained, easy to work, pale brown, without luster. Ripple marks present. (Kluge 24; Yale 7137.)

CHECK LIST OF THE COMMON NAMES

Alfaje	*Trichilia tuberculata* (Tr. & Pl.) C. DC.	Meliaceae
Algodoncillo	*Hibiscus tiliaceus* L.	Malvaceae
Amarillo fruta	*Lafoensia punicifolia* DC.	Lythraceae
Amarillo real	*Terminalia obovata* (Poir.) Eich.	Combretaceae
Black palm	*Astrocaryum* sp.	Palmaceae
Caimito	*Chrysophyllum Cainito* L.	Sapotaceae
Camaroncillo	*Hirtella triandra* Swartz	Amygdalaceae
Caña fistula	*Cassia grandis* L.	Leguminosae
Candela	*Antirrhœa trichantha* (Gris.) Hemsl.	Rubiaceae
Carba suella	*Terminalia* sp.	Combretaceae
Cautivo	*Prioria Copaifera* Gris.	Leguminosae
Cedro amargo	*Cedrela* sp.	Meliaceae
Cedro espinoso	*Bombacopsis Fendleri* (Seem.) Pittier	Bombacaceae
Coralillo	*Inga rufescens* Benth.	Leguminosae
Coratu	*Enterolobium cyclocarpum* (Jacq.) Gris.	Leguminosae
Cortez	*Apeiba Tibourbou* Aubl.	Tiliaceae
Espavé	*Anacardium Rhinocarpus* DC.	Anacardiaceae
Fruta de mono	*Posoqueria latifolia* (Lam.) R. & S.	Rubiaceae
Guacimo	*Luehea Seemannii* Tr. & Pl.	Tiliaceae
Guava	*Inga spuria* Willd.	Leguminosae
Guava del mono	*Inga punctata* Willd.	Leguminosae
Guavito	*Quassia amara* L.	Simarubaceae
Guayabillo	*Quararibea asterolepis* Pittier	Bombacaceae
Guayabo hormiguero	*Triplaris americana* L.	Polygonaceae
Higueron	*Ficus glabrata* H. B. K.	Moraceae
Jobo	*Spondias lutea* L.	Burseraceae
Jobo lagarto	*Sciadodendron excelsum* Gris.	Araliaceae
Laurel	*Cordia alliodora* (R. & P.) R. & S.	Borraginaceae
Limoncillo	*Bumelia panamensis* Standl.	Sapotaceae
Macana	*Diphysa carthagenensis* Jacq.	Leguminosae
Madroña	*Calycophyllum candidissimum* (Vahl) DC.	Rubiaceae
Malvecino	*Lonchocarpus lucidus* Pittier	Leguminosae
Mamé de mono	*Pachira villosula* Pittier	Bombacaceae
Naranjillo	*Swartzia darienensis* Pittier	Leguminosae
Nispero	*Mimusops darienensis* Pittier	Sapotaceae
Olivo macho	*Sapium thelocarpum* Schum. & Pitt.	Euphorbiaceae
Pacito	*Muntingia calabura* L.	Elæocarpaceae
Palma negra	*Astrocaryum* sp.	Palmaceae
Palo amarillo	*Terminalia* sp.	Combretaceae
Palo bobo	*Erythrina glauca* Willd.	Leguminosae
Palo colorado	*Calderonia Klugei* Standl.	Rubiaceae
Palo santo	*Erythrina glauca* Willd.	Leguminosae
Panamá	*Sterculia apetala* (Jacq.) Karst.	Sterculiaceae
Pernilla de casa	*Erythrina rubrinerva* H. B. K.	Leguminosae

Pernilla del monte	?	Leguminosae
Quipo	*Cavanillesia platanifolia* H. B. K.	Bombacaceae
Roble	*Tecoma pentaphylla* Juss.	Bignoniaceae
Sabto	*Cordia alba* (Jacq.) R. & S.	Borraginaceae
Sangre	*Licania platypus* (Hemsl.) Fritsch.	Amygdalaceae
Sigua	*Nectandra globosa* Mez	Lauraceae
Ubero	*?Coccoloba caracasana* Meisn.	Polygonaceae
Uvito	*Icacorea revoluta* (H. B. K.) Standl.	Myrsinaceae

SOME DEPOSITS RESEMBLING LAPACHOL

The writer has had occasion from time to time to submit to Dr. Samuel C. Hooker, the eminent authority on lapachol, samples of woods containing yellow deposits in their vessels.

One of these was a Brazilian wood known as "angelim amargosa" (probably *Andira vermifuga* Mart.). This yielded, upon extraction with benzene, "a beautiful compound apparently in a condition of great purity, evidently closely related to chrysarobin (chrysophan-anthranol), but of higher melting point and different minor characteristics. A trace dissolved in a drop or two of 1 per cent solution of caustic soda in the cold and exposed on a watch glass to the air, gradually darkens the solution, becoming crimson-colored, probably due to the formation of chrysophanic acid or a closely allied substance."

Dr. Hooker's report on specimens of *Intsia* (*Afzelia*) is as follows: "The yellow substance is not lapachol. As seen under the microscope it lacks the brilliancy and bright yellow color of lapachol and seems in places to be more compact and wax-like, although probably crystalline. Tested as above, the deposits in *Intsia amboinensis* Thouars. (Yale No. 8196) give a solution which passes from a fine yellow to a beautiful blue and then to a brown. The wood contains in addition a white substance which gives no characteristic color reaction with NaOH.

"The yellowish substance in these specimens of *Intsia* appears to be identical with that which I found in the Indian wood believed to be *Panjanelia multijuga* Kurz (Bignoniaceae), and the similarity seems to me, as a layman, to extend so markedly to the structure of the wood that I should think it desirable to verify the original identification. The

color changes of the substance upon the application 1 per cent NaOH are highly characteristic, passing from yellow to brown to *violet*, and then to a rich yellow-brown." The present writer has examined the Indian wood referred to above, and confirms Dr. Hooker's belief that it is *Intsia* and not *Panjanelia*. Corresponding changes should be made in the references to this wood in *Tropical Woods* 1: 8.

"The Javanese specimen (Yale No. 8193) of 'ràdja boenga' (*Adenanthera tamarindifolia* Roxb.) seems to contain a small quantity of a yellowish substance like that in *Intsia* and, in mixture with it, a larger quantity of an undoubtedly closely allied substance scarcely to be distinguished from it in appearance.

"The examination of all of the woods was made by detaching minute quantities of the substances with a needle point and following the color changes under the microscope."

Dr. Hooker has confirmed the writer's finding of lapachol in specimens of the two Madagascar woods, "zahana" and "sofintsoy," as reported in *Tropical Woods* 1: 8. The identities of these two woods are still in doubt, although unquestionably they belong to the Bignoniaceae.

Bibliography of Woods

There are still available for distribution a limited number of copies of Supplement No. 1. to *Bibliography of the woods of the world (exclusive of the temperate region of North America) with emphasis on tropical woods*. This supplement consists of 10 mimeographed pages of references, Nos. 645 to 758, inclusive, and a cumulative index. So long as the supply lasts copies may be obtained free upon application to the editor of *Tropical Woods*. The supply of the original bibliography is entirely exhausted.

Gum Ducts in Lecythidaceae

The Lecythidaceae was inadvertently omitted from the list of families with vertical canals of the gummosis type in the wood. (*Tropical Woods* 4:19–20.) The ducts in *Lecythis* and *Eschweilera* resemble the "gum veins" in *Eucalyptus*.

CURRENT LITERATURE

Cross-ties of foreign woods. By R. S. Belcher, S. B. Fisher, John Foley, H. C. Hayes, and A. F. Maischaider. *Proc. American Railway Engineering Association*, Vol. 26, 1925, pp. 1033–1078.

This report is compiled from the responses to two questionnaires, one to railroads of the United States using ties of foreign woods and referring to their experience with these woods, the other dealing with the matter of supply and availability of foreign woods.

The most interesting part of the report is that headed "American tests of foreign woods as ties." While the results are admittedly inconclusive, the experience on the whole has not been satisfactory. The two principal defects of the woods used have been a tendency to split to pieces and lack of resistance to decay. The former is attributed largely to climatic conditions and Mr. A. W. Buel is quoted as saying: "It is important to bear in mind that some species which give fair service in their native climate may fail in northern regions, due to their tendency to develop radial season-checks, extending from face to center of heart."

That ties of woods noted for their resistance to decay in tropical countries should rot out in four or five years when placed in track in a northern latitude does not seem logical. The most likely explanation of this apparent anomaly is that the ties which rotted in the United States would have failed even more quickly under tropical conditions; in other words, that inferior woods were sent under the guise of much better kinds. This conclusion is supported by evidence in the report (pp. 1045, 1060, 1076) and also by the personal experience of the reviewer who examined a lot of Amazon ties which had failed. The committee urges every railroad which undertakes to test ties of foreign woods to make sure of the proper identification of the woods "so as to be in a position to know what wood it is handling and to avoid it or get it again as may be desired."

The report serves as a good object lesson. The haphazard introduction of miscellaneous lots of unassorted and un-

high quality, will soon be things of the past. The coming of tropical woods will bridge the gap and enable us to keep wood as a staple commodity until our new crops can be harvested.

"Increase of populations south of us will absorb any excess in the future, and we can never expect a deluge of low-priced woods, as the long haul will necessitate utilization of low grades near the point of origin.

"Tropical hardwoods are to be a potent factor in the markets of the future. The trade must accept this phase of the situation, and it will be wise for them to coöperate at this time in all measures which will protect their industries and enable them to profit through their use, rather than wage a losing fight to retard their introduction."

The status of forestry in Porto Rico. By W. D. DURLAND. *Journal of Forestry* 23: 11: 913–918, Nov. 1925.

The need of forestry is fully recognized in Porto Rico, but, according to the author, very little is actually being done toward the practical solution of the problem.

"Porto Rico was at one time densely wooded over its entire area. Due to years of cutting, burning, and clearing in conjunction with a shifting method of agriculture, this forested area has been reduced on thousands of acres to barren land—denuded and exposed slopes. The problem confronting forestry on the island is unquestionably one of artificial regeneration to obtain wood production and a protective cover."

Collectively, the forest land area under government ownership or control forms but 2.5 per cent of the total land area of Porto Rico and the amount of this which is capable of producing economic forests is equal to only one per cent of the total area of the island.

"Ninety-four and three-tenths per cent of the total land area of Porto Rico is held by private owners. Consequently it can readily be understood that it is through this medium that forestry must work if any material progress is to be made in forest regeneration. . . . The problem, because of the lack of established precedents in forest regeneration in tropical regions similar in conditions to Porto Rico, is intricate and complex, but it can be solved. The criticism hinges around the

point that no definite or sincere effort has ever been made to seek the solution, in spite of the fact that government paraphernalia and financial support are supplied for this purpose."

It is generally supposed that tree growth in the Tropics is both rapid and abundant. This would be true for Porto Rico if the factors of soil and competitive growth were equally as favorable as the factors of climate. But the soil on the hill and mountain slopes, comprising practically all of the forest land of the entire island, has, as a result of deforestation, seriously deteriorated under prolonged exposure to the action of constant warm weather and abundant rainfall. In addition to abnormal conditions of soil, forest plantations have to contend with "maleza," a rank growth of low vegetation that is very difficult and expensive to control. There is urgent need for high-grade experimental work which will serve as a practical object lesson for the private owner.

British Honduras. Annual report of the Forest Trust for the year ended 31st March, 1925. By J. N. OLIPHANT. Belize, 1925. Pp. 25; 8 x 13.

"By an ordinance dated 15th August, 1923, responsibility for the development and maintenance of Crown forests of the Colony and for administration of the funds provided for that purpose was vested in a Forest Trust, consisting of two official and two non-official members under the chairmanship of the Governor."

The staff of the forestry department consists of a conservator, two assistant conservators, and clerical assistants at headquarters; and two forest rangers, one captain in charge of improvements, one temporary inspector of Crown licenses, and three forest guards in the field. Shortage in staff "is the chief limiting factor in the programme of forest development contemplated by the Trust."

In the Silk Grass Reserve 3,551 trees and 16,591 seedlings have been improved by cleanings and liberation cuttings since 1922. Over 19,000 individual mahogany trees of various ages have been located in this reserve. The cost of the improvement work, including labor and captain's wages, but

not overhead, has averaged 20½ cents per tree. "There was a certain amount of damage to mahogany seedlings by isolation and subsequent insect attack, and it has been found necessary to modify the technique in the direction of girdling instead of felling the smaller stems of the worthless species in order to secure more gradual ingress of light, and of reducing the radius cleaned around individual seedlings. Most of the damaged seedlings have since recovered and are putting on satisfactory height-growth."

"The Tidewater Company's pine mill at All Pines is now in full working, and local lumber is being placed on the market in quantity. The export returns for February, 1925, show a consignment of 29,156 ft. of this lumber to Spanish Honduras. The establishment of this industry marks a definite turning point in the economic development of the Colony, as involving the substitution of home-grown for imported produce in respect to an important item of consumption."

"Though the Crown lands constitute about half of the total area of the Colony, it has been calculated that they do not contribute more than one-sixth of the total mahogany output. . . . The local chicle industry is on the decline, mainly owing to destructive methods of tapping encouraged by lack of control. It will be some time before proper supervision of chicle cutting can be organized, and in any case it is likely that the intensive growing of sapodilla for chicle production will in the near future supersede the wild chicle industry, as has been the case with rubber."

The exports of domestic produce from British Honduras during 1924 show the following proportions: Forest, 82 per cent; agricultural, 16 per cent; marine, 2 per cent. The composition of the forest produce is as follows: Mahogany, 85 per cent; cedar, 4 per cent; chicle, 9 per cent; logwood and miscellaneous, 1 per cent each. A little over three-fourths of this forest produce goes to the United States, and nearly all of the remainder to the United Kingdom.

Appended to the report are accounts of the forestry activities of the Belize Estate & Produce Co., Ltd., the Chicle Development Co., and the Botanic Station. The last is conducted mainly as a forest experiment station.

A study of ancient Andean social institutions. By PHILIP AINSWORTH MEANS. *Trans. Conn. Acad. Arts and Sciences* 27: 407–469, Sept. 1925.

In the course of this highly interesting account of the social institutions of the Incas and their predecessors there is a brief description, accompanied by numerous references, of the dug-out canoes and the great balsa rafts which were in use at the time of the arrival of the Spaniards in 1530.

"The American Indians as a whole were curiously deficient in skill and enterprise as navigators. The ancient Peruvians were no exception to the general rule. They had, however, several sorts of craft, none of which was worthy of a seaman's admiration. They were as follows:

"1. The dug-out, called *canoa* in the Antilles and *piragua* in what is now Colombia. The dug-outs of the people on the coast of Peru were commonly made of the light wood of the *ceyba* tree. These craft were swift, whether under sails of cotton or propelled by paddles, but they were extremely capsizable. The smallest dug-outs could hold only two passengers; but some of them were fifty or sixty feet long and could hold thirty or more people.

"2. The *totora* raft. Vessels of this type were formed of bundles of a reed called *totora* which grows plentifully in Peru. . . .

"3. Pontoon-rafts of two types: one in which inflated seal skins were held together, catamaran-fashion, by a wooden platform; the other a platform resting on a number of empty calabashes held together by a network of cords. . . .

"4. The great raft or *balsa*. This, primitive though it was, must be hailed as the *chef d'œuvre* 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 sort of 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."

After recounting several reports of sea voyages the author says: "We may safely conclude, therefore, that 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 up stream or down. They serve as a useful supplement to the steam-driven traffic on that stream."

The Peruvian balsa, as determined by J. Francis Macbride, is *Ochroma boliviana* Rowlee. (See his *South American plants*, Field Museum of Natural History (Chicago), Pub. 231, Bot. Ser. 4: 4: 91, June 29, 1925.)

Rubber production in the Amazon Valley. By WILLIAM L. SCHURZ, O. D. HARGIS, C. F. MARBUT, and C. B. MANIFOLD. Trade Promotion Series No. 23, Bu. Foreign and Domestic Commerce, Washington, 1925. Pp. 369; 5¾ x 9; 45 half-tones and maps; bibliography. Price 65c.

"This is the fourth of a series of publications made under instructions from Congress 'to investigate and report on the possibilities of developing the rubber-plantation industry in the Philippine Islands and Latin America.' This report discusses the present status of the wild-rubber industry in the various political units of the Amazon Valley and deals with those physical, economic, and political factors that should be considered by the prospective investor in order to judge of the possibilities of establishing rubber plantations there. . . . The territory with which this report deals approximates 2,250,000 square miles in extent, or about three-fourths the area of the United States exclusive of Alaska. The population of this region is estimated at 1,500,000."

In addition to the great wealth of information of primary value to the rubber industry there is much in this report of interest to persons concerned with the development of the forest resources of the vast region of the Amazon. As regards transportation: "Ocean-going vessels can ascend the Amazon

above Iquitos, Peru, and the Tapajoz, Madeira, and Purus for considerable distances from their junctions with the master stream." While in respect to climate: "The Amazon Valley does not deserve the maligned reputation it has borne as having an especially hot, humid, and unhealthful climate, rendering it almost uninhabitable. It has, on the contrary, for an equatorial region, a relatively pleasant climate and one of the least deadly for the colonist or traveler of any of the tropical countries."

"The Amazon forests, like those of other tropical regions, can be divided as to height into three tiers or stories—a bottom story composed of small trees, which furnishes the largest number of species and individuals; a middle story; and a top story, composed of only those that are capable, when mature, of reaching great height. . . . Though there are many kinds of trees in Amazonia, only a small proportion become large enough to furnish saw timber. From the standpoint of lumbering this is important, for it means that for logging operations on a commercial scale the forests are less complex than a purely botanical census shows. . . . Until reliable quantitative studies have been made, little can be stated about the relative percentages of the different species that occur in the upper stories of the forests of any particular region. Rough cruises on the forests of French, Dutch, and British Guiana show that over considerable areas and under similar topographic conditions from one to eight or ten species form more than 50 per cent of the trees of the upper story. As Guiana forests are similar in character to those of the Amazon, like results might be expected were such cruises made."

The second part of the report deals individually with the nine sections into which the whole region, described in the first part, was divided. These sections are as follows: (1) Islands and Para; (2) Lower Amazon, South; (3) Lower Amazon, North; (4) Upper Amazon, North; (5) Madeira; (6) Upper Amazon, South; (7) Acre; (8) Bolivia; (9) Peru, Ecuador, and Colombia. There is for each a map showing the river system and the location of the towns and cities. There are notes on the vegetation, lists of the tree species with vernacular and scientific names, and in some cases notes on the woods.

The lumber industry is still in its infancy in Amazonia, the scenes of greatest activity being at the two extremes of the region. "A considerable lumbering industry is being developed on the basis of the forest resources of this [Island and Para] area, particularly in the region of the furos and along the main river channels to the west of Marajo. However, no effort is made to utilize more than the trees found near the edges of the watercourses. Part of this business is devoted to the shipping of logs, which are exported to Europe (generally to England, Germany, or Italy), to southern Brazil, or to the River Plate. We also saw one lot of logs destined to be used as cigar-box material in the United States. Ocean steamers taking on cargoes of logs are now a familiar sight in the delta.

"A local lumbering business is also being built up and has already become one of the two principal economic supports of the delta area, the other being the collection of oilseeds. Moreover, the industry is capable of great expansion, provided the timber back from the edge of the streams can be worked. In addition to the sawmills in the City of Para and at several other points, there is a mill at Abaete that appears to be doing an excellent business in working the light and medium woods of the locality, especially for the manufacture of box shooks. We saw one consignment of shooks ready for shipment to Mexico to be used for oil cases. The Para mills are largely devoted to the production of cabinet materials for the local furniture industry and to turning out a wide variety of general construction materials."

"The forests of Peru contain a wide variety of hard and soft woods of present and potential value. The exploitation of certain timbers, while not of large magnitude, is progressing; and in this respect the Peruvians, though more isolated and burdened with higher freight rates, are doing more to develop this industry than their neighbors in the State of Amazonas, Brazil.

"It is said that heavy timber grows on the eastern slopes of the Andes up to 4,000 feet, and that above this, in places, some black walnut occurs. At the present time only three kinds of woods are exported—(*a*) red cedar (cedro), (*b*) caoba aguano, used as a substitute for mahogany in furniture and veneering, and (*c*) huito, a white hardwood."

It is to be regretted that the exploring party did not determine the identity of this so-called mahogany substitute, since specimens of the wood indicate that it undoubtedly is a species of *Swietenia*. (See *Tropical Woods* 1: 4.)

Lumber industry of the Philippine Islands, with special reference to export species. By JOHN A. FOWLER. Trade Promotion Series No. 24, U. S. Bu. For. and Dom. Commerce, Washington, 1925. Pp. 41; 6 x 9; 1 map; 4 full-page halftones. Price 10c.

This publication is issued for the purpose of helping American and other foreign users of Philippine woods to obtain a better understanding of the supply, export possibilities, properties, and uses of these woods and of others that might be more largely used. The major divisions of the report are under three headings, namely, General conditions governing lumber development; Character and uses of Philippine woods; Production, consumption, export, and import. There is also an appendix covering the lumber grading rules employed by the Philippine Bureau of Forestry.

Annual report of the Director of Forestry of the Philippine Islands for the fiscal year ended December 31, 1924. By ARTHUR F. FISCHER. Manila, 1925. Pp. 216; 6 x 9; 1 plate; 1 colored chart.

Even a cursory examination of this report is sufficient to give an idea of the great extent and importance of the work of the Bureau of Forestry. A closer study shows that various lines of activity have had to be curtailed as demands upon the staff and resources have exceeded the facilities for meeting them. It is to be hoped that the sacrifice of scientific investigations to the exigencies of administration will prove only temporary.

"The inadequacy of the personnel and funds allowed the Bureau of Forestry in its appropriation is yearly becoming more acute. The demand for certificates of government inspection and grading on shipments of lumber to the United States and foreign countries has increased to such an extent

that the personnel of the Bureau trained in such work has been able to keep up with it only by neglecting other work. This can be readily seen from the data of lumber exported for the last three years, i.e., in 1922, 18,300,000 board feet; in 1923, 36,950,000 board feet; and in 1924, 50,760,000 board feet. The classification of public lands also has become very pressing without a sufficient increase in personnel to hasten the consummation of this work."

The increase in lumber exports is largely attributable to organized effort on the part of the producers to build up their markets. The largest increase was in shipments to Japan and was only in part due to the rebuilding needs following the earthquake and fire. At the expense of the Philippine Lumbermen's Association a member of the Bureau was detailed for a three months' study of the market requirements and wood-using industries of Japan. "He visited the large companies interested in Philippine hardwoods and made them acquainted with the properties and uses of these woods which have been recently introduced in their country. Japanese lumbermen complained of the unusual shrinkage of Philippine woods, but a thorough investigation carried out by the Forest Experiment Station revealed the fact that Philippine woods do not warp and shrink any more than the common Japanese hardwoods, and that the whole trouble lies in the fact that our woods are used for furniture and construction before they are thoroughly seasoned." The volume of shipments to Australia has also increased, and incidentally the work of inspection has become more difficult because the Australian government requires a certificate from the Bureau of Forestry to the effect that the lumber is free from wood-boring insects. During the year local Philippine markets absorbed a total of over 141,000,000 board feet of lumber and timber, including nearly 5,000,000 board feet of imported wood.

The herbarium of the Bureau contains 3,025 specimens, representing 117 families, 559 genera, and 1,295 species. According to Dr. Merrill, formerly of the Bureau of Science, "the total number of merchantable species . . . is nearly 3,000. . . . The Bureau of Forestry needs the services of a dendrologist to do systematic collecting, and it is believed that this will be cheaper and the result more satisfactory than for the forest officers to collect botanical and wood specimens."

The last of the 17 recommendations is "that funds be provided for the establishment of a forest products laboratory for the Division of Investigation and for at least six experiment stations in various parts of the Islands."

Geographical distribution of Coniferae in the Far East. By Ryozo Kanehira, Taihoku, Formosa, 1925, pp. 6.

Under the tribes of the Taxaceae and Pinaceae are listed the names of the genera, and the number and general geographical distribution of the species. This is followed by a table and some interesting notes.

Twenty-six genera are represented in the Far East, of which four, namely, *Keteleeria*, *Taiwania*, *Amentotaxus*, and *Cunninghamia*, are common to China and Formosa, but do not occur elsewhere. The fact that there is no endemic genus common to Japan and Formosa indicates that the latter was connected with the Asiatic continent in the Tertiary period. Of eight genera common to Japan, China, and Formosa, all but one, *Cephalotaxus*, are represented in North America, thus indicating that the two continents were formerly connected. A table shows that the Coniferae are represented by 17 genera and 42 species in Japan, 20 genera and 61 or 62 species in China, 15 genera and 23 species in Formosa, and 15 genera and 86 species in North America.

Teak: Its habitat, exploitation, and marketing. By Lieut. Wendell P. Roop. Technical Bulletin No. 1–25, Navy Dept. Bu. of Construction and Repair, Washington, 1925. Pp. 37; 6 x 9; 7 half-tones, 5 drawings.

This report is based upon personal investigations of Lieutenant Roop while stationed at Rangoon. The subject is treated under five chapter headings as follows: I. Properties and uses; II. Teak production in the Burma forests; III. The teak industry at Rangoon; IV. General comment on grading rules for teak lumber; V. The future of teak.

Owing to the importance of this timber in ship construction

and the difficulties involved in supplying the needs of the United States Navy, the author recommends the establishment in the Philippines of a naval reservation for teak plantations. The initial cost is estimated at $15 per acre (1,000 trees). An 80-year rotation is suggested. "Leaving out of account the proceeds of thinning [expected to begin after 10 to 15 years], a final yield of 8,000 feet board measure per acre would be sufficient to produce returns of 5 per cent, stumpage being taken at the rates current in Burma. It is believed possible to obtain yields of three times this figure. Precedent for such an undertaking may be found in the naval live oak timber reservation of 3,338 acres near Berwick, La., which was acquired by Executive order, dated February 29, 1820."

An account is given of the teak plantations now existent in the Philippines, some of them of recent establishment. "The oldest teak plantation in the Philippine Islands and the only one which has ever yielded a commercial product is that of Jolo. This island, in the extreme southern part of the Archipelago, has an area of about 400 square miles, and, though teak is scattered over a large part of this, it is found chiefly in two small areas. The amount of commercial sawn timber obtainable is estimated at 1,000,000 feet board measure. It is not indigenous, but it is not known who planted it. It has been there a long time, perhaps for a thousand years, and the conditions prevailing at present combine the disadvantages of plantations and of wild growth with the advantages of neither. The stand is very open and has been damaged by fire. The trees appear to have had no care whatever and never to have been allowed to attain a mature growth. Local use in small sizes has gone on for a long time, as the qualities of the wood are fully appreciated by the natives and branches are chopped off and trees mutilated in a most wasteful way. Not until recently was an attempt made to place any of it on the market. In 1919 a considerable amount was cut, and of this in 1921 about 200,000 feet board measure were shipped to Manila.

"The demand for this shipment, however, never came up to expectations, and after two years somewhat more than half of it remains unsold, even though repeated reductions have brought the price down to about $56 per 1,000 feet board measure.

"This remaining material is all in short lengths, not over 12 feet, and small sizes not exceeding 8 inches by 8 inches. It is more free than the run of Rangoon teak from defects incident to growth, probably because the trees were not very old when cut. But it has more than the run of Rangoon teak of defects of seasoning and sawing. Even aside from the matter of length, there is little material in the lot which will conform to the Navy specification for decking without excessive waste in recutting. These results are not such as to encourage the continued marketing of Jolo teak under present conditions, but they do indicate that the technical difficulties are of the sort that can certainly be overcome."

Summary of results of treated and untreated experimental sleepers laid in the various railway systems of India, brought up to date. By J. H. WARR. Indian Forest Bul. No. 59 (Economy series), Calcutta, 1924. Pp. 34; 7 x 10; 4 charts. Price 3s. 3d.

"The results of experiments, commenced in 1910, to ascertain the durability of certain Indian timbers after treatment when used as railway sleepers, have been recorded in detail in the *Indian Forest Records*, Volume VI, Part IV of 1918, and Volume IX, Part I of 1922, and in Technical Paper No. 231 of 1922, issued by the Railway Board of India. This summary of results is based on the inspection reports, 1923–24, whereas those recorded in the above mentioned reports are of 1920–21. In future it is proposed only to issue summaries until the last batch of sleepers have failed, when a final report will be issued."

"From the results obtained it will be seen that powellising and introducing fairly large quantities of creosote or a mixture of green oil or Avenarius carbolineum oil (both creosotes) and earth oil have given equally good results. To treat sleepers with chloride of zinc, followed by a small coating of creosote, or to treat with a small quantity of high grade oil is economically unsound, though cheaper than a full-cell process."

Note on "ainee," *Artocarpus hirsuta* Lamk. By C. CLAUDE WILSON. Indian Forest Bul. No. 60 (Economy series), Calcutta, 1925. Pp. 7; 7 x 9¾; 1 map; 1 pl.; 1 diagram; wood sample for frontispiece. Price 9d.

One of a series of publications dealing with individual Indian woods. Information is given as to distribution, regeneration and growth, properties, uses, and methods of extraction of the timber. The list of the other woods described in this series is as follows:

Andaman marble-wood or zebra wood (*Diospyros Kurzii* Hiern.).
Burmese "leza" wood (*Lagerstroemia tomentosa* Presl.).
"Carallia" wood (*Carallia integerrima* DC.).
"Petwun" or "trincomali" wood (*Berrya Ammonilla* Roxb.).
Burmese "in" wood (*Dipterocarpus tuberculatus* Roxb.).
Burma "padouk" (*Pterocarpus macrocarpus* Kurz.).
"Gumhar" (*Gmelina arborea* Roxb.).
"Bija sal" or "vengai" (*Pterocarpus Marsupium* Roxb.).
"Sain" or "saj" (*Terminalia tomentosa* W. & A.).
"Benteak" or "nana" wood (*Lagerstroemia lanceolata* Wall.).
"Sandan" (*Ougeinia dalbergioides* Benth.).
"Dhaura" or "bakli" (*Anogeissus latifolia* Wall.).
Blackwood (*Dalbergia latifolia* Roxb.).
"Dhauri" (*Lagerstroemia parviflora* Roxb.).
"Sundri" timber (*Heritiera minor* Lam.).
Red sanders (*Pterocarpus santalinus* L. f.).
"Babul" (*Acacia arabica* Willd.).
"Kokan" or "lampatia" timber (*Duabanga sonneratioides* Ham.).
"Hollong" timber (*Dipterocarpus pilosus* Roxb.).
"Pyinma," "ajhar," or "jarul" wood (*Lagerstroemia Flos-Reginae* Retz.).
"Haldu" (*Adina cordifolia* Hook. f.).
Odina Wodier Roxb.
"Semal" or cotton wood.
"Kindal" or "hongal" (*Terminalia paniculata* W. V. A.).
"Thingan" (*Hopea odorata* Roxb.).
"Gurjun" or "kanyin."

Project No. IV: Mechanical strength, seasoning properties, treatment of and key to certain Indian sleeper-woods. By R. S. PEARSON, L. N. SEAMAN, C. V. SWEET, J. H. WARR, and H. P. BROWN. Pub. by Economic Branch, Forest Research Institute, Dehra Dun (U. P.), India, 1925. Pp. 38; 7 x 9¾; ill. Price 1s.

The object of this project is to correlate all of the known or determinable factors which underlie the choice of a particular timber for railway sleepers, based upon the assumption that to ensure durability the timber requires treatment. The possible sleeper timbers are first grouped with reference to available supply. Schemes of operation are outlined for determining (1) the mechanical strength, (2) seasoning properties, and (3) treatability of these timbers, and (4) for studying the anatomy of the woods with reference (a) to means of identification and (b) to problems of impregnation.

Familiar flowering trees in India. By IDA COLTHURST. Calcutta and Simla, 1924. Pp. 161; 5¼ x 7¼; 56 half-tones and 5 colored plates; index.

"This book is by no means an exhaustive treatise on our Indian flowering trees, but it purposes to furnish popular descriptions and illustrations of the most familiar ones, so that those having no knowledge of even the rudiments of botany, and yet seeking acquaintance with the trees, may be able to recognize them with little difficulty."

"The book has been arranged according to the natural classification of the vegetable kingdom, and includes the range and locality where each specimen mentioned occurs, the scientific, popular and vernacular names of the trees, their economic and medicinal uses, and their association with religion and legend."

Interim report on the work under projects No. 1 and No. o done by the Section of Timber Testing, Economic Branch, Forest Research Institute. By L. N. SEAMAN. *The Indian Forest Records*, Vol. X, Part VII, 1924. Pp. 7; 4 tables; 1 text fig. Price 2 as.

"Project No. 1 is a systematic scientific investigation of the strength and the related mechanical and physical properties of woods grown in India. It is conducted along lines standardized by the older laboratories of Canada and of the United States, and the strength values represented herewith are strictly comparable with those found in reports published by any laboratories following the same practice. The tests are made on small clear specimens, and from results so far ob-

tained safe working stresses are derived by means of known factors."

Table No. 1 gives the results of tests on green timber of teak, "sain," "kanyin," "gurjan," "in," and deodar; on air-dried timber on all of these except deodar; and on kiln-dried timber of teak and sain. Table No. 2 gives the results of a smaller number of tests, under project No. 0, on green and air-dried timber of several additional species. Table No. 4 gives the relative strengths of timbers using teak as the standard. Table No. 4 gives two sets of working stresses for 16 Indian timbers, along with those of Douglas fir and southern yellow pine for comparison; and in order that the values may be correctly applied a set of tentative grading rules is appended.

The economic importance and control of the "sal" heartwood borer. By C. F. C. Beeson and H. C. Chatterjee. *The Indian Forest Records* (Entomology series), Vol. XI, Part VIII, 1925. Pp. 47; 7 plates. Price 2s. 3d.

This is the first of a series dealing with *Hoplocerambyx spinicornis* Newm. (Cerambycidae), a large heartwood borer of "sal" (*Shorea robusta* Gaertn. f.), one of the most important trees of India. It is estimated that the total annual outturn of this timber from all sources in India is about 12 million cubic feet or 245,000 tons, of which Government forests produce not less than 9½ million cubic feet. The amount of this, converted and in the round, that is damaged by the heartwood borer is placed at not less than 10 per cent. This estimate leaves out of consideration the total loss on trees so severely damaged that their extraction is impossible. This annual loss is considered preventable, and measures to that end are described and recommended.

Queensland Forest Service. Report of the Provisional Forestry Board for the year ended 31st December, 1924. Brisbane, Australia, 1925. Pp. 38; 8 x 13; 9 plates.

"The present situation of Queensland with respect to its timber necessities is that its population of 810,000 people is using between 200,000,000 superficial feet and 300,000,000

superficial feet of wood per annum, or between 250 superficial feet and 370 superficial feet per capita per year. This population is increasing at the rate of 2.3 per cent per annum, so that in 60 years it will amount to 3,170,000 souls, and in 100 years to close on 10,000,000 individuals. For each of these people must be provided by the State a minimum annual wood ration of 250 superficial feet, which is equal to a future annual community requirement for Queensland of 2,500,000,000 superficial feet. This requirement is more than ten times the entire cut of all the timberlands of the State in both Crown and private lands, and no less than forty times the present outturn of the 4,500,000 acres of forest reservation now held for the purposes of a permanent wood supply for the people.

"The interstate forest authorities have agreed upon the provision for Queensland of a minimum forest reservation area of 6,000,000 acres. To assure to the succeeding generation of Queenslanders the supplies of wood which they will so obviously require, this minimum forest reservation of 6,000,000 acres must be brought as soon as possible into a state of maximum productivity of timber. This, then, is the task to be faced by the new administration."

New Zealand State Forest Service. By L. MacIntosh Ellis. Wellington, 1925. Pp. 35; 8½ x 13; illustrated.

This is the first quinquennial review of the operations of the national forest policy, together with the annual report of the Director of Forestry for the year ending March 31, 1925.

"The indigenous, mature, and growing forest resources of the Dominion, as shown by the first forest inventory, indicate that on 5,589,500 acres of commercial forests there are: (1) 38,878,040,000 ft. board measure of softwoods (kauri, totara, matai, rimu, miro, white pine, silver pine, and kaikawaka); (2) 23,187,560,000 ft. board measure of hardwoods, and broad-leaved trees (beeches and tawa). Ownership, 75 per cent State, 25 per cent private.

"The kauri is practically all gone, and a great proportion of what is left is State-owned. The quantities of totara and matai are not considerable, and are chiefly concentrated in

the central part of North Island. The normal life of the white pine resources is not more than twelve years. Rimu is today the principal economic softwood timber, but this timber must gradually give way, in forty years, to plantation and hardwood timber. The total quantity of economically available softwoods, after deducting all areas of inaccessible, protection, and climate forests, is 25,000,000,000 ft. board measure. The hardwoods will only function in the national timber problem as a subsidiary source of supply because of their general distribution in the mountain and plateau regions and because, owing to their normal refractory qualities, they do not lend themselves readily to industrial, constructional, and building uses. (Over 90 per cent of New Zealand's demand, as of all civilized countries, is for softwoods.)"

The average annual consumption of wood for all purposes, in millions of cubic feet of finished produce, is as follows: Sawn timber, 27; fencing and farm, 16.1; firewood, 29; mining, etc., 7; misc., 2.2; total, 81.3. With the present population of 1,350,000 the annual per capita consumption of sawn timber alone is 240 board feet, as against 153 board feet for Australia. New Zealand imports 19.5 per cent of her lumber, while the imports by Australia are 42 per cent. It is estimated that the virgin softwood resources of New Zealand will be economically exhausted by the period 1965–70. The total area of forest plantations is 141,250 acres, 62,945 acres State owned. It is recommended that the State plantations be increased to 300,000 acres during the next 10 years.

Preservative treatment of fencing-posts. By A. R. Entrican. Cir. No. 19, New Zealand State Forest Service, Wellington, 1925. Pp. 15; 6 x 9½; 4 figs.

A publication of general interest to farmers, and dealing with the principles and methods of timber preservation. "Fencing costs have risen to such heights during the last few years that they now form one of the major expenses of farm maintenance and improvement. Posts and other timber prices have led the general upward tendency in the prices of construction materials, and reflect the serious depletion of our forest resources."

The principal fencing-timbers used in New Zealand are classified on a basis of the natural durability of the heartwood as follows: 1. *Very durable:* Puriri, silver pine, totara, broadleaf, kowhai, hinau, kawaka, and black locust. 2. *Durable:* Hard red and black beech, matai, jarrah, maire, kauri, *Eucalyptus botryoides*, *E. eugenioides*, *E. Macarthuri*, and *E. viminalis*. 3. *Not durable:* Pukatea, rata, manuka, mangeao, mountain and silver beech, tanekaha, tawhero, kamahi, rimu, white pine, rewa-rewa, taraire, tawa, miro, *E. amygdalina*, *E. coriacea*, *E. obliqua*, and *E. globulus*.

The "insignis" pine. Cir. No. 3 (rev. ed.), New Zealand State Forest Service, Wellington, 1925. Pp. 16; 6 x 9½; ill

Forestry in New Zealand. Cir. No. 22. New Zealand State Forest Service, Wellington, 1925. Pp. 16; 6 x 9½; 1 map.

Preliminary reports on the requirements of the Eastern and Central Provinces, Gold Coast Colony. By H. W. Moor and D. Hendry. Govt. Press, Accra, Gold Coast, Africa, 1924. Pp. 26; 8½ x 13; 1 large map. Price 2s.

"The Eastern Province of the Colony, exclusive of Mandated Territory, covers an area of about 9,410 square miles. Of this area, rather more than two-thirds is lightly wooded or open grass savannah and the remainder woodland or under crops that require forest conditions for their growth. The disforestation, consequent of the rapid expansion of the cocoa industry and general development of the country has, in recent years, been so great, that it is essential that further disforestation should be controlled if the climatic conditions on which this and similar industries are dependent are not to be affected to the point of endangering the stability of these industries. It is estimated that at the present time not more than 20 per cent of the province is under forest and much of that is of an inferior quality." The proposed reserves include approximately 870 square miles, of which about 690 square miles are situated in cocoa-producing portions of the province and occupy about 20 per cent of it.

The area of the Central Province is about 4,605 square

miles; the population about 302,000. "The cocoa industry is by far the largest in the Province and, together with the production of food crops, occupies the energies of the bulk of the people." Kola is grown to some extent, some gum copal and Calabar beans are collected for export. Palm oil is produced on a large scale for domestic consumption. "The rubber industry is quite dead in this Province." "Timber is largely cut for domestic consumption everywhere, but no definite timber industry exists. Attempts have been made by firms at different times and in various places to cut mahogany, etc., for export, but they were nowhere successful, and now all appear to have given it up."

"Taking the country as a whole, the forests are being attacked by the advance of the savannah country from the north, east, and south. Exact figures cannot be given as to the rate of advance, but the cumulative evidence forces the conclusion that it is rapid and that the forests are being rolled towards the Ivory Coast at an ever increasing rate. The advance of the savannah country is most rapid from the north where it is aided by the desiccating influence of the Harmattan, and by the annual grass fires." The portions of the country where the rainfall averages only 40-50 inches a year are considered the danger belts and it is in these that it is proposed to establish the Savannah Defence Belt, 80 miles long and from two to four miles wide. Other proposals are in relation to the protection of water catchment areas, making a total of 700 square miles, or 15 per cent of the area, to be reserved.

The "saligna" gum (*Eucalyptus saligna*). Notes on its physical qualities, conversion, and uses. By M. H. Scott. *South African Journal of Industries* 7: 8: 504–6, Aug. 1924.

The blue gum (*Eucalyptus globulus*). Notes on its physical qualities, conversion, and uses. By M. H. Scott. *South African Journal of Industries* 7: 9: 575–8, Sept. 1924.

M. M. CHATTAWAY Price 25 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 6 JUNE 1, 1926

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 6 June 1, 1926

A technical journal 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 in Yale University.*

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

Price 25 cents per copy

MAHOGANY IN THE UPPER AMAZON

The statement was made in *Tropical Woods* 1: 4 that true mahogany was being imported into the United States from the Peruvian Amazon and that effort was being made to secure botanical specimens in order that the systematists might confirm the editor's findings, which were based upon a study of the wood.

Leaf specimens collected personally by Mr. Georges H. Barrel, President of the Aguna Mahogany and Timber Company, 88 Broad Street, Boston, Mass., from a tree "on the left bank of the Rio Itaya, some 50 miles from its confluence with the Rio Amazonas," have recently been received by the editor and forwarded for identification to Dr. S. F. Blake, U. S. Bureau of Plant Industry, Washington, who reports as follows:

"The leaf specimens of the Peruvian mahogany are not distinguishable from *Swietenia macrophylla* King, and can be

referred to that species temporarily with the reservation that flowering specimens may show differences. On geographical grounds, that species is the most likely to occur there. In all probability the Colombian record of *S. macrophylla* is correct, although flowers have not yet been collected so far as I know."

The following information is contained in letters from Mr. Barrel. "The mahogany trees are so tall and so difficult to climb that we had to visit twenty specimens before we could secure any leaves. There do not seem to be any young trees. The trees were not in bloom while I was there and no fruits could be found on the ground, but I left instructions that samples should be sent.

"The mahogany trees grow very far apart, and in one particular journey of eight hours of continuous marching through the jungle we were able to visit only 17 trees, and these had previously been located by our Indian guide. An estimate of the mahogany standing is not now possible. We are continually discovering new territories in which it grows, but not a single tree, so far as we can ascertain, occurs below the Rio Nanay.

"We are erecting a modern band-mill, known as Nanay Mills (Aguna), Ltd., on the Rio Amazonas at the mouth of the Rio Nanay and will be able to saw about 300,000 feet a month. We have also dammed the outlet of a small stream, thus forming a log pond with a capacity of upward of 10,000 logs. The location is six miles below Iquitos, and ocean-going vessels of 5,000 tons carrying capacity can dock at our wharf. We expect to handle about 6,000 logs of mahogany this year, as compared with 2,500 last year and 1,200 in 1924. All logs shipped are now carefully selected, and we are able to do this by means of a powerful Stiff Leg Derrick. There is no equipment like ours in the whole Amazon and we believe that our operations there will give a decided impetus to the timber business.

"In addition to cutting permits on land owned by our associates on the Rio Sumirai and Tapiche, we have several hundred thousand acres of concessions on the Tigre, Pastaza, and Morona Rivers, and also on various tributaries of the Rio Ucayali."

MUCILAGE CELLS AND OIL CELLS IN THE WOODS OF THE LAURACEAE

By H. H. Janssonius

Handelsmuseum of the Koloniaal Instituut at Amsterdam

The microscopical examination of the woods of the Lauraceae for the ninth part of the *Mikrographie des Holzes der auf Java vorkommenden Baumarten*, which will form the first part of Volume V of this work, demonstrated the occurrence of oil cells in the wood of nearly every species of this family so far investigated. These oil cells, which have already been described by several authors, are widely variable in abundance in the different species. They occur (1) as a rule at the margins of the ordinary wood parenchyma, the latter not being abundant and usually only paratracheal; (2) sometimes diffused among the libriform fibers, in which case they are usually limited to the neighborhood of the other wood parenchyma; (3) often among the erect cells of the medullary rays.

Oil cells are nearly always more numerous on the radial sides of the vessels than on the tangential, and in many cases they are in direct contact with the vessels. When the oil cells are few in number they are nearly always isolated. Oil cells are ellipsoidal or barrel-shaped with their longest axis longitudinal, and they are larger than adjoining wood parenchyma cells and upright ray cells. Their walls are thin and lignified. There is a very thin lignified skin surrounding the contents.

In several species of this family I found mucilage cells besides the oil cells and it is a striking phenomenon that these mucilage cells are disposed in the same places and manner as given above for the oil cells. In fact the two kinds of cells are distinguishable from one another only by their oil and their mucilage. Furthermore, the study of the distribution of the oil and the mucilage cells in different specimens of the same species and in different species of the same genus suggests that one kind can replace the other. The oil cells are more numerous than the mucilage cells in all cases so far examined, except three of five species of *Cinnamomum*, namely *C. iners* Reinw., *C. javanicum* Blume, and *C. Burmanni* Blume, in which the mucilage cells range from abundant to very abun-

dant. In *C. iners* only the mucilage cells are found; in *C. javanicum* oil cells are present, but only in small quantity; in *C. Burmanni*, while the mucilage cells outnumber the oil cells, the latter are more numerous and the mucilage cells correspondingly less numerous than in the case of the two preceding species.

The mucilage cells of these three species are very large, and two or more often in contact. If the wood is soaked in water the mutual walls neither disappear nor are ruptured by the swelling of the mucilage, as usually happens in material where mucilage cells with unlignified walls adjoin one another. Moistening with water causes these three woods, and especially *C. iners* and *C. javanicum*, to become mucilaginous. Pieces soaked for some hours become coated with a thick mucilage layer and the water gets slimy. The woods are very tough, but their elasticity is low; thin longitudinal pieces can be wound in the form of a spiral and will retain that shape to a considerable degree.

With the exception of the indications given by me in *Mikrographie einiger technisch wichtigen Holzarten aus Surinam* (Akad. v. Wetenschappen, 2d section, Vol. XVIII, 1914), I have found only three references to mucilage in the wood of the Lauraceae, namely v. HÖHNEL: Anat. Unters. über einige Secretionsorgane d. Pflanzen (*Ber. Wiener Akad.* 84: 597, 1882); P. SIEDLER: Chinesisches Bandoline-Holz (*Ber. d. d. Pharm. Ges.* 11: 20, 1901), and The Chinese "Pau Hoi" (*Tropical Woods* 3: 1, 1925). These three articles presumably describe the same wood, but only the first contains information regarding the occurrence of mucilage cells.

In this connection it is worth while to mention that the microscopical examination of cinnamon bark (*Cinnamomum zeylanicum* Nees), made many years ago for the *Botanical Pen-portraits* of MOLL and JANSSONIUS, disclosed oil cells and mucilage cells in the secondary phloem, which were distinguishable from one another only by their oil and their mucilage. At that time I expressed the opinion that these two kinds of cells can apparently replace each other and that to this phenomenon are probably attributable some of the differences noted in the quality of cinnamon bark.

(December 1, 1925.)

SOME FUNDAMENTAL CONSIDERATIONS OF SPECIFIC GRAVITY

By SAMUEL J. RECORD *and* HARRY D. TIEMANN

The specific gravity of a wood is the ratio of the weight of a given volume of it to that of an equal volume of water. The volume of a particular block of wood is affected by its hygroscopic moisture content, being smallest when perfectly dry and maximum when the cell walls are saturated. Any wood is at its greatest density, in the sense that it contains the maximum amount of wood substance per unit of volume, when it is absolutely dry, though its relative density, or specific gravity, is usually least at that point. If the wood substance were of the same specific gravity as the water and the swelling of this substance were directly as the volume of the water absorbed, then it is evident that the specific gravity of the wood substance ought not to change with changes of moisture. But, as the dry specific gravity of wood substance is presumably about 1.56, it would appear that absorption of water (below the fiber-saturation point) should cause a reduction in its specific gravity as a whole, presuming as before that the change in volume were the same as the volume of water added.

A change in the water content expressed as percentage by weights would mean a greater change in volume of water than if the same percentage were expressed as percentage of volume. To visualize this statement consider 1 cc. of dry solid wood substance of specific gravity, say 1.5 for convenience. Suppose that it absorbs 20 per cent of its dry weight of water and swells by an amount of 20 per cent of its original volume. The increase in volume would be 0.20 cc., but the volume of water added would be *not* 0.20 grams, but 1.5 times 20 per cent equals 0.30 grams, or 0.30 cc. Hence if the swelling were proportional to the moisture absorbed it should amount to 30 per cent (20 per cent times its dry specific gravity) rather than 20 per cent. We have become so accustomed to talking of moisture content in terms of weights, that we are apt to lose sight of the meaning in relation to volumes. The specific gravity after absorption in the above case would evidently be

$\frac{1.5\,(1+0.2)}{1(1+1.5\times 0.2)}=1.38$ or $G\frac{1+P}{1+GP}$.[1] If it swelled 20 per cent in volume and increased 20 per cent in weight its specific gravity would evidently remain unchanged. But in that case some of the volume of the water (namely, $1.5\times 0.2-0.2$, or 0.1 cc.) must have disappeared internally.

In measuring the swelling in a natural *block* of wood, it is difficult to know how much water occupies the interstices and how much enters the cell walls, and furthermore the total volumetric swelling may not be the same as that of the substance of which the block is composed. But if a very dense piece could be used with scarcely any interstices, then the measurements ought nearly to approximate those of solid wood substance.

There are several woods which have a specific gravity (oven-dry) of 1.30 or more and thus approximate a solid block which would have an oven-dry specific gravity of about 1.56. The heaviest wood in the Yale collections proved to be a specimen of Letterwood (*Piratinera guianensis* Aubl.) from Dutch Guiana. This specimen was chosen for tests to determine the affect of soaking upon specific gravity.

The block when thoroughly air-dry had a specific gravity of 1.365. After being dried in an oven at 100°C. to a constant weight, it had a specific gravity of 1.363. The specimen was then immersed in fresh water and tested at intervals, at first daily, later at longer periods, for nine months. The changes in specific gravity, increase in volume in percentages of the dry volume, percentages of water absorbed by volume based on the same dry volume, and the usual "moisture per cent," are given in the following table:

[1] Let W_d = weight of dry wood.
v_d = volume of dry wood.
P = per cent moisture absorbed (expressed decimally).
g_d = specific gravity of dry wood.
Then $g_d=\frac{W_d}{v_d}$.
New weight $W=W_d(1+P)$.
Volume of water absorbed $=W_dP$.
∴ new volume $v=v_d+W_dP$; and new specific gravity
$g=\frac{W_d(1+P)}{v_d(1+g_dP)}=g_d\frac{(1+P)}{(1+g_dP)}$.

TESTS UPON A BLOCK OF LETTERWOOD

1	2	3	4	5	6
Time of soaking	Specific gravity	Swelling, per cent of dry volume	Volume of water absorbed, per cent of dry volume	Moisture per cent, by weight	Per cent of volume in air spaces
Thoroughly air-dry..	1.365	8.3	11.6	8.5	
Oven dry.....	1.363	0	0	0	12.7
Soaked 1 day.....	1.343	3.9	3.3	2.4	
" 2 days.....	1.333	5.7	4.6	3.4	
" 3 "	1.340	6.1	5.9	4.3	
" 4 "	1.339	7.8	8.5	5.9	
" 10 "	1.337	13.5	15.5	11.4	
" 2 weeks.....	1.353	15.7	20.1	14.9	
" 3 "	1.358	16.5	22.0	16.1	
" 6 "	1.368	18.0	25.5	18.7	
" 2 months....	1.388	18.3	27.8	20.4	
" 4 "	1.385	19.3	28.9	21.2	
" 9 "	1.388	19.6	29.7	21.8	

From this table it will be observed that so long as the increase in weight (5) keeps pace with the increase in volume (3) the specific gravity remains unchanged, whereas when the weight increases more rapidly than the swelling, the specific gravity of the block increases. But in either case it means that the *volume* of water entering the block exceeds the volumetric increase of the whole. In other words, a constant or an increased specific gravity with absorption of water means that some of the water-volume must disappear, that is, it must either enter the air spaces or else a reduction of the combined volume of the wood substance plus imbibed water must occur; otherwise the specific gravity must decrease. It is calculated

that the air spaces in the Letterwood amounted to 12.7 per cent of the original dry volume.[2]

The volume of water absorbed after nine months' immersion amounted to 29.7 per cent. Assuming that all of the air spaces became filled then approximately $29.7-12.7=17$ per cent must have entered the cell walls. The proportion is not exactly correct since as the block swells the percentage of air space probably became less by approximately the percentage of swelling or $(1-.196)\times 12.7=10.2$ per cent air space left.[3] This would leave $29.7-10.2=19.5$ per cent volume of the original volume of the block in the form of water to enter the cell walls. The actual measured swelling was 19.6 per cent. This is certainly remarkably close to the volume of water imbibed according to the above analysis and would seem to indicate that swelling of wood substance is proportional to the volume of water imbibed as hygroscopic moisture.

It is also to be observed that the specific gravity at first actually decreased for the first two days (which should be the case explained above if all the moisture entered the cell walls

[2] Using the metric system:
V_b = volume of block, dry.
W_b = weight of block, dry (same as W_s).
V_s = volume of solid substance in the block, dry.
V_a = volume of air space in the block, dry.
G_s = specific gravity of solid wood substance, dry.
G_b = specific gravity of the block as a whole, dry.

$$V_a=V_b-V_s. \qquad V_s=\frac{W_s}{G_s}=\frac{W_b}{G_s}=\frac{V_bG_b}{G_s}.$$

$$V_a=V_b-\frac{V_bG_b}{G_s}=V_b\left(1-\frac{G_b}{G_s}\right)$$

Let P_a = per cent of the volume of the block (expressed in decimals) occupied by air space. Then $P_a=\frac{V_a}{V_b}=1-\frac{G_b}{G_s}$.

[3] This is purely an assumption. A hole bored in a block of wood evidently increases in size as the wood swells, but the case of the lumina of the cells is totally different. Observations indicate that the swelling of the wall radially to the cell cavity is much greater than it is in the circumferential direction. Roth showed that in yellow pine the lumina became smaller with absorption of moisture. Microscopic examinations of dried cells seem to indicate the same. While no definite data are available, the assumption that the natural cavities in wood shrink in the same ratio that the block as a whole swells, seems reasonable.

and caused a swelling proportional to the volume of water imbibed) and then became nearly constant until the tenth day. It did not regain its oven-dry value until after three weeks. This, of course, follows from the fact that the volume (column 3) increased in ratio more rapidly than the ratio of increase in weight (column 5) which would be the case providing the wood substance were heavier than the water entering into it. In other words the mixture of the heavier and lighter substances (wood and water) becomes lighter per unit of volume than the heavy substance alone. In comparing columns 2, 3, and 4 it seems probable that during the first three or four days all of the water absorbed was imbibed by the cell walls, but that after this time some of the water also entered the interstices, since the water-volume increase began to exceed the wood-volume increase. The specific gravity, however, does not change until the rate increase in weight (5) catches up and passes the rate of volume increase after the third week.

The above analysis is based on the supposition that the block as a whole swelled the same amount as the wood substance. This, of course, is probably not strictly true, but since the densest obtainable wood was chosen purposely with this distinct end in view, it is probable that the discrepancy is quite small, if not entirely negligible. In the analysis as to the volume of water filling the air spaces the assumption that the air spaces were reduced by the swelling in the same proportion as the swelling of the block as a whole, probably takes care of this discrepancy, as it might be assumed that if the air spaces were not reduced then the swelling of the block as a whole would be identical with that of the wood substance itself. The conclusion is that the swelling of the wood substance is identical in volume with that of the water imbibed.

A more definite conclusion might have been obtainable had the absorption taken place in a damp atmosphere of about 80 or 85 per cent humidity rather than by immersion in water, because no doubt the outer portions (both the wood substance and also the air spaces) became saturated before the interior. That is, the outer layer probably had much more than the fiber-saturation-point requirement of water before the first day, with only a few per cent average absorption.

It would be interesting to carry on the experiment further,

and measure the swelling after the block had been boiled in paraffin so that all the air spaces would be filled with wax, and the water could enter only the wood substance. Also, to measure the swelling of the wood substance itself by displacement in oil or melted paraffin, compared to the swelling of the block as a whole.

Consideration of this problem has brought into question the meaning of specific gravity of wood substance. The method used by Dunlap[4] in determining this was to float thin slices in a liquid (solution of calcium nitrate in water) whose density was made the same as that of the wood. The ambiguity consists in that the liquid used also penetrates the substance being measured and causes it to swell. If we are to assume that no preferential absorption exists beween the wood substance and the chemical salt and that the salt enters the wood in the same concentration as exists in the surrounding solution, also that the swelling is in exact proportion to the volume of the solution imbibed, then the thing measured is not the specific gravity of the wood substance as a whole, but instead it is the specific gravity of the ultimate particles of which the substance is composed. As there are probably interstices between these particles, in the dry wood, into which the water enters causing swelling, then the actual specific gravity of solid wood substance as a whole would be something less than that determined in this manner. This may account for the discrepancy between the results obtained by Sachs of 1.4 to 1.52 by Archimedes' displacement method and 1.54 to 1.56 by the suspension method, and of Dunlap's results of 1.5 to 1.62.

One of the main objections to the results is that we do not know any of the three assumptions made. If only the pure water enters the wood substance leaving the salt outside, then the specific gravity measured is not that of dry wood substance, but rather that of the saturated material. If any of the salt is preferentially absorbed, then the reverse is the case, the density measured is the wood substance particles plus the weight of the absorbed salt. If a change in concentration of the salt solution takes place as it enters the substance, then neither the saturated nor the dry density is measured, but

[4] Dunlap, Frederick: Density of wood substance and porosity of wood. *Journ. Agr. Research* 2:6:423–8, Sept. 1914.

something in between. Moreover, if any volume change of solution occurs, that is, if the dry wood plus the liquid occupies less or more than the combined volumes of the two separately, then there is introduced an indeterminable error in the method. It would seem desirable therefore to make a determination by means of some liquid which does not enter the wood substance, either by displacement or flotation. In the meantime it is best not to assume the figure as definitely determined.

ADDITIONAL INFORMATION ON "PAU HOI"

Regarding the Chinese "Pau Hoi," the statement in *Tropical Woods* 1:1 is not complete. I extract the following from Bretschneider, *History of European Botanical Discoveries in China*, p. 710 (London, 1898): "In 1898 P. [G. M. H. Playfair] sent to Kew specimens in leaf of a tree called *tciao chang*, which he had collected in the mountains near Ning-po, with the information that shavings of the wood when soaked in water yield a mucilage, which is used by Chinese ladies in bandolining their hair. These specimens were identified as *Machilus Thunbergii* Sieb. & Zucc., and flowering specimens subsequently received from the same gentleman confirmed the identification. On the authority of Dr. A. Henry, P. adds that the Canton shavings are from the same tree. Mr. Hemsley figured the tree in Hooker, *Icones Plant.* tab. 2538 (1897). See also *Kew Bulletin* 1897, p. 336."

The account in *Kew Bulletin* extends over a page. The name of the shavings in the Mandarin dialect, which is the most widely spread form of colloquial Chinese, is Pao-hua. J. Matsumura (*Shokubutsu-Mei-I*, Part I, *Chinese Names of Plants*, page 218) also refers to this plant as Pao-Yeh. This book of Matsumura is founded on manuscripts which I gave to him when I retired from China in 1900 and it is the most authentic list of the Chinese names of plants that has yet been published. The shavings are also referred to by me in *Journal of Asiatic Society of Japan*, Vol. XXIV, supplement I, *List of Plants from Formosa*, No. 1112. — Prof. Augustine Henry, *College of Science for Ireland.*

A RAIN-TREE IN BOLIVIA

One of the strangest phenomena observed by the members of the Mulford Exploration party of 1921 was that of a rather copious rainfall from the branches of a tree at mid-day in perfectly clear weather and in brilliant sunshine. The tree stood on a dry bank, in an open place by the side of the road, and with few other trees about it. The rainfall was continuous and steady, and its pattering was like that of a mild shower on one of our summer days. It was sufficient to wet one's clothing in a few moments, if standing beneath the tree. The size of the tree was about that of a large wild-cherry tree. There being no convenient way of climbing it, it was felled, when the cause of the shower was found to be a profusion of caterpillars' nests, of all sizes up to a foot or more in length, which occupied the forks of the branches and branchlets. They closely resembled the nests of our common tent caterpillar, except that they were surcharged with water, in which abundant larvae led an aquatic existence. The water was evidently drawn from the bark of the tree where covered by nests. No openings in the bark could be detected with the naked eye, and the party had no time for an investigation of the mechanism of the procedure. The tree was in flower-bud at the time, and the specimens secured prove it to be a hitherto undescribed species of *Vouacapoua* (family *Fabaceae*). A description will appear, under the name *Vouacapoua pluvialis*, in Volume VII of the *Memoirs of the N. Y. Botanical Garden*, in connection with descriptions of several hundred genera and species collected on that expedition.—Dr. H. H. Rusby, *Dean of the College of Pharmacy of the City of New York.*

NOTES ON CUBAN WOODS

In reference to the note entitled, "Cuban 'sabina' for archery bows" (*Tropical Woods* 3: 9), Prof. Hermano León of the Colegio de La Salle, supplies the following information: The names "sabina" and "sabina de costa," and sometimes in Cuban botanical literature, "enebro criollo," are given to *Juniperus lucayana* Britton (=*J. australis* Pilger in Urban, 1923). This species grows not only on coastal lands, but also

on highlands, as Sierra de Nipe. Another species, *J. saxicola* Britton & Wilson, has recently been described. It grows on high ridges far from roads and is not now exploitable. There is reason for believing that the latter is but a form of the other, though good fruiting specimens will be necessary to determine the matter definitely. The name "sabina cimarrona" is given in Cuba to *Podocarpus angustifolia* Gris. and *P. aristulatus* Parl.

Prof. León also calls attention to the fact that the vernacular name in Cuba of *Calycophyllum candidissimum* DC. is "dágame" and not "degame" as given in the list of trade names on the page cited above. This is a case, however, where the trade name represents a variant from the vernacular, and it is pronounced as two syllables instead of three, with the accent on the final instead of on the first. It is sometimes spelled "degamme." Makers of archery bows usually call it "lemonwood."

THE "BOIS PELÉ" OF HAITI

"Bois pelé," *Colubrina ferruginosa* Brong., known as "naked wood" in Florida and the Bahamas, is not found generally over the Republic of Haiti, but exists in considerable quantities in the foothills of the high mountains north of the town of Cayes, near the end of the southwest peninsula.

In that section the natives are unusually intelligent and progressive. They 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 ridge-poles 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.—William R. Barbour, *Directeur, Division de Sylviculture, Haiti.*

NOTES ON THE DISTRIBUTION OF CAPE BOXWOOD

The extreme northern limit of the range of Cape Boxwood (*Buxella Mac-Owanii* Van Tieghem or *Buxus Macowani* Oliver) is Ntsubane Forest, Lusikisiki, District, East Pondoland (longitude 29° 45′ east, latitude 31° 27′ south), where it grows on the Embotyi beds of the Cretaceous series. All of the country to the north and northeast of this is table-mountain sandstone on which the species has not been discovered.

Cape Boxwood has also been found in the Poko Forest of the Lusikisiki District, at the mouth of the Ntafufu River, 13 miles southwest of Ntsubane, on stiff soil derived from dolerite, but this is unusual.

The chief sources of supply of the timber are the forests of Port St. Johns, Cwebe, Dwesa, and Manubi, which are on Ecca shales and Lower Beaufort beds. The tree is also fairly abundant in the neighborhood of East London.

The first part of paragraph 2, page 36, of RECORD and GARRATT'S *Boxwoods* (Bul. No. 14, Yale School of Forestry, 1925) should be amended to read as follows: "The tree inhabits the forests within 20 miles of the sea from Alexandria to East Pondoland. It is scarce east of Port St. Johns, where the shale recedes from the coast and is replaced by carboniferous sandstone; it is also scarce or absent west of Port Elizabeth. It is gregarious, often forming almost pine forests in some places, as at East London."

In reference to the footnote on page 37 of the same publication, it is my experience that the name "gala-gala" is limited in its application to *B. Macowani* and *Notabuxus natalensis*.—O. B. MILLER, *Assistant District Forest Officer, Kokstad, South Africa.*

GERMINATION OF A NEW *ASPIDOSPERMA*

A technical description of the fruit of this *Aspidosperma*, which is certainly an undescribed species, will appear in my report on the new genera and species of the Mulford Expedition, shortly to be published in Volume VII of the *Memoirs of the New York Botanical Garden*. Several of the seeds

which have germinated exhibit such interesting peculiarities in this process that it seems desirable to place the details on record.

This fruit appears to be reduced to a single carpel, which is very large, hard and woody, closely resembling that of *A. Pohliana* Muell. Arg. It is about 14 cm. long and about 11 cm. broad and is borne on a stipe 3 or 4 cm. long and about 1 cm. thick. The seed germinates while still in the pod, the caulicle penetrating downward through the stipe and following the curvatures of its fibro-vascular bundles. A seedling, with cotyledons still attached, consists of an epicotyl nearly 2 dm. long, and a hypocotyl 7 cm. long, the terminal portion being missing. Both cotyledons are winged, the layers of the wing separating with their respective cotyledons. Exposed portion of the cotyledon dark-brown, 3 cm. broad, subrotund with deeply cordate base and irregularly crenate margin. The seedling leaves are alternate, or the first two subopposite, very shortly petioled, about 7 cm. long, 3.5 cm. broad, obovate, or the first two ovate, with obtuse base and very shortly produced obtuse summit. Secondaries 8 or 10 on each side, ascending and crooked.—Dr. H. H. RUSBY, *Dean of the College of Pharmacy of the City of New York.*

IMPORTS OF MAHOGANY LOGS INTO THE UNITED STATES

(*From Department of Commerce Reports*[1])

FOR TWELVE MONTHS ENDING JUNE 30

Source	1922	1923	1924	1925
	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.
United Kingdom	1,430,000	3,923,000	2,897,000	1,638,000
Central America	16,497,000	17,575,000	22,777,000	31,058,000
Mexico	3,163,000	5,221,000	2,906,000	9,558,000
Africa	16,106,000	15,023,000	16,033,000	26,081,000
All other Sources	2,807,000	1,153,000	2,362,000	1,947,000
Totals	40,003,000	42,895,000	46,975,000	70,282,000

[1] Published by permission of the U. S. Department of Commerce.

REQUIREMENTS FOR WOOD-PULP MILL

Before seriously considering the pulp-making properties of any woods it is advisable to investigate the manufacturing facilities available in or near the areas of growth. Unless these are suitable and economical the raw materials would be of no value for this purpose. The following are essential:—

(1) Mill site with a permanent fresh water supply of not less than 40,000 gals. per hour.

(2) Unless such site is in the immediate neighborhood of the raw material, say a radius of seven miles, water transport of the logs must be available to such site.

(3) If coal is not available, wood fuel must be present under similar transport conditions to (2).

(4) Lime or limestone of good quality must be present somewhere in the district, but as the amount required is small in comparison with raw material and fuel, it need not necessarily be near by.

(5) The mill site should either be close to a shipping port or, if distant, water transport should be available from mill to port.

(6) The quantities required for a pulp output of 10,000 tons per annum (it is not worth while considering a smaller unit) would be approximately:

25,000 tons per annum of dry raw material.
45,000 " " " of wood fuel or
15,000 " " " of coal.
3,000 " " " of lime or
6,000 " " " of limestone.

If these conditions are possible it may be worth while inquiring into the suitability of the raw material and this can be done on samples of about 3 lbs. weight each. This would not be regarded as a complete test but the results would be sufficient to indicate whether or not the materials were good enough to warrant the expenditure which would be incurred on full trials of several tons each.—From letter of Mr. W. RAITH, *Officer-in-charge, Paper Pulp Section, Forest Research Institute, Debra Dun, India*, to Mr. J. N. OLIPHANT, *Conservator of Forests of British Honduras*. (Published by permission.)

SOME TRADE NAMES OF WOODS

Ailon = *Magnolia* sp. (So. U. S. A.)
Birmah = Santa Maria, *Calophyllum Calaba* Jacq. (Brit. Honduras.) (See *Tropical Woods* 3: 9.)
Burma "mahogany" = *Pentace burmanica* Kurz. (Burma.)
Cordia wood = Freijo, Jenny wood, *Cordia Goeldiana* Huber (Amazon, Brazil.)
Juana costa "mahogany" = *Enterolobium cyclocarpum* Gris. (So. Mex.)
Kingwood = *Dalbergia cearensis* Ducke (Ceará, Brazil.)
Lacewood = quarter-sawn sycamore, *Platanus occidentalis* L. (U. S. A.)
Lemonwood = degame, *Calycophyllum candidissimum* DC. (West Indies.)
Mosal = Paraná pine, *Araucaria brasiliana Lamb.* (So. Brazil.)
Picus "mahogany" = okoumé, *Aucoumea Klaineana* Pierre. (West Africa.)
Roba "mahogany" = crabwood, *Carapa guianensis* Aubl. (Guianas.)
Swamp "walnut" = willow, *Salix nigra* L. (So. U. S. A.)
"Tecoma yew" = cabbage-bark, *Andira inermis* H. B. K. (West Indies.)
Veseet = white tamarind, *Acacia glomerosa* Benth. (Brit. Hond.)
Yemoke = yemeri, *Vochysia hondurensis* Sprague. (Brit. Hond.)

NOTE ON SOUTH AFRICAN "KERSEHOUT"

The "kersehout," *Pterocelastrus variabilis* Meisn. (Celastraceae), is often erroneously known in English as cherrywood, although the vernacular name means candlewood. This mistake is due to the confusion of the words "kers" or "kaars" (candle) and "kersie" (cherry). The significance of "kersehout" appears to be in the very straight candle-like appearance of the tree when young.—E. J. NEETHLING, *Kokstad, South Africa*.

Central American Pteridophyta Collected by Samuel J. Record, Jan.–March 1926. Identifications by WILLIAM R. MAXON, Smithsonian Institution.

Guatemala

Asplenium uniseriale Raddi.
Dryopteris meniscioides (Liebm.) C. Chr. An extremely rare species.

British Honduras

Adiantum pulverulentum L.
Adiantum tenerum Swartz.
Alsophila Schiedeana Kunze.
Blechnum occidentale L.
Danæa elliptica J. E. Smith.
Dicranopteris pectinata (Willd.) Underw.
Dryopteris obliterata (Sw.) C. Chr.
Dryopteris panamensis (Presl.) C. Chr.
Dryopteris tetragona (Sw.) Urban.
Leptochilus cladorrhizans (Spreng.) Maxon.
Lindsæa portoricensis Desv.
Lygodium mexicanum Presl.
Nephrolepis biserrata (Sw.) Schott.
Pityrogramma tartarea (Cav.) Maxon.
Polypodium Palmeri Maxon.
Pteris Kunzeana Agardh.
Selaginella umbrosa Lem.

The following series of articles by the editor of *Tropical Woods* appeared in *Veneers* (The S. H. Smith Co., 701 Wulsin Bldg., Indianapolis, Indiana):

We will need the tropical woods. Aug. 1925, pp. 22–24.
The wood named Rakuda. Sept. 1925, pp. 22–24.
Banak—new British Honduras wood. Oct. 1925, pp. 28–29.
Describing Santa Maria wood. Nov. 1925, pp. 28–30.
Duali—trade-marked Philippine wood. Dec. 1925, pp. 22–24.
Okoumé or Gaboon mahogany. Jan. 1926, pp. 22–24.

CURRENT LITERATURE

Forestry work in the Island of Porto Rico. By WM. P. KRAMER. *Journal of Forestry* 24: 4: 419–425, April 1926.

"The forestry work in the Island of Porto Rico proceeds under the auspices of two governments, namely, that of the Insular or Island Government and that of the Federal or United States Government. Under a special coöperative agreement entered into six years ago between the Forest Service of the United States Department of Agriculture and the Department of Agriculture and Labor of the Insular Government, the Federal Forest officer in charge of the Luquillo National Forest is also employed as chief of the Porto Rico Forest Service; thus complete coöperation between the Federal and Insular Governments in forestry is secured and all duplication of effort eliminated.

"Although the United States initiated the forest work in Porto Rico, the Island Government was quick to realize its true value and adopted in 1917 the law and the recommendations as proposed by officials of the United States Forest Service, but no appropriations were made available until the year 1919. Because of the lack of personnel and adequate funds very little practical work was accomplished previous to 1919 and attention was directed chiefly to the formulation of plans for the effective organization of the Forest Service and to the preliminary work essential to the taking up of definite practical projects during the fiscal year 1920 and those following. At the present writing progress has been made and practical forestry has moved forward with confidence to the important place it is destined to attain and hold in the development of the economic and social life of the people of this island."

"Our main problem here is one of general reforestation. The entire Island is suffering from the most acute wood and timber famine to which any country in the Western Hemisphere has ever been subjected. The average annual consumption of solid wood for purely domestic purposes is but 10 cubic feet per capita. Excepting only one or two of the smaller

A handbook of the principal trees and shrubs of the Ancon and Balboa Districts, Panama Canal Zone. By HOLGEN JOHANSEN. Feb. 1925. Pp. 97; 7 x 10; 33 plates; 1 map; index.

This handbook covers most of the trees and shrubs which are important either for economic or ornamental purposes. There is a short description of each plant listed and reference is made to a map by which the specimens with name plates may be found in the field. The whole is beautifully illustrated with full-page plates showing trees and fruits of especial interest. In the Summit Plant Introduction Garden there is the beginning of a collection of tropical plants from all over the world, and several of these exotics are described and figured.

Arboles y arbustos nuevos de Venezuela. Cuarta y quinta decadas. By H. PITTIER. Extractado del *Bol. cient. y techn. Mus. Com. Venez.* n. 1, 1926. Caracas, 1925. Pp. 73; 6 x 9.

Contains descriptions of 21 new species of Venezuelan trees and shrubs, representing seven families; also description of a new genus, *Aveledoa*, of the Olacaceae. Several old species of *Pithecolobium* are referred to *Samanea* Merr.

CHECK LIST OF VERNACULAR NAMES

Vernacular name	*Botanical name*	*Family*
Azufaifo	*Zizipbus mauritiana* Lam.	Rhamnaceae
Cabrahosca	Misc. genera	Apocynaceae
Cacagüillo	*Zizyphus melastomoides* Pittier	Rhamnaceae
Caro hueso de pescado	*Samanea polycephala* (Benth.) Pittier	Leguminosae
Chichiboa	*Zizyphus melastomoides* Pittier	Rhamnaceae
Chupón	*Gustavia yaracuyensis* Pittier	Lecythidaceae
Clavellina colorado	*Caesalpinia pulcherrima* Sw.	Leguminosae
Coco de mono	*Jugastrum Cbristi* Pittier	Lecythidaceae
Dividive	*Caesalpinia coriaria* Willd.	Leguminosae
Dividive de los Andes	*Caesalpinia tinctoria* Benth.	Leguminosae
Ébano	*Caesalpinia Granadillo* Pittier and *C. punctata* Willd.	Leguminosae
Flor de muerto	*Gustavia yaracuyensis* Pittier	Lecythidaceae
Garrapata de playa	*Caesalpinia Bonducella* L.	Leguminosae
Granadillo	*Caesalpinia Granadillo* Pittier	Leguminosae
Guaímaro macho	*Couma sapida* Pittier	Apocynaceae
Guatapan or guatapanare	*Caesalpinia Coriaria* Willd.	Leguminosae
Macagua	*Aveledoa nucifera* Pittier	Olacaceae

Mayo	*Zizyphus melastomoides* Pittier	Rhamnaceae
Motin	*Gustavia fustis-mortui* Pittier	Lecythidaceae
Palo de muerto	*Gustavia fustis-mortui* Pittier	Lecythidaceae
Paraguatán	*Sickingia* spp.	Rubiaceae
Penitente	*Petræa glandulosa* Pittier	Verbenaceae
Ponsigué	*Zizyphus mauritiana* Lam.	Rhamnaceae
Quiebrahacha	*Caesalpinia punctata* Willd.	Leguminosae
Samán	*Samanea Saman* Merr.	Leguminosae
Samanigua	*Samanea Samanigua* Pittier	Leguminosae
Urupagua	*Aveledoa nucifera* Pittier	Olacaceae
Vaca hosca	*Couma sapida* Pittier	Apocynaceae
Yacure	*Pithecolobium dulce* Benth.	Leguminosae
Yuyubo	*Zizyphus mauritiana* Lam.	Rhamnaceae

British Guiana. Report of the Forestry Department for the year 1925. By B. R. WOOD. Georgetown, 1926. Pp. 12; 8½ x 13.

"The forestry department took actual shape on 29th October, 1925, with the arrival of the technical members of the staff from England, and the activities of the department cover a period of two months only." The present report is accordingly confined to a general review of the present state of the Colony with respect to its forests and forest industries, with suggestions for the future. Prominent among the latter is the suggestion for the establishment of a Forest Trust modeled on that of British Honduras, except that no loan would be necessary.

Neue beiträge zur flora Surinams IV. Rosaceae und Leguminosae. By AA. KLEINHOONTE. Extrait du *Recueil des Travaux Botaniques Néerlandais*, Vol. XXII, 1925. Pp. 380–417; 6 x 9; 5 line drawings.

The author describes 25 new species, most of which are trees. ROSACEAE: *Licania stricta*, *L. gracilis*, *L. grisea*, *L. densiflora*, *L. pachystachya*, *Hirtella cotticaënsis*, *H. manigera*, *H. lanceolata*, *H. caudata*, and *Couepia surinamensis*. LEGUMINOSAE: *Ormosia melanocarpa*, *Diplotropis leptophylla*, *Clathrotropis? surinamensis*, *Poecilanthe ovalifolia*, *Hymenolobium flavum*, *Vatairea surinamensis*, *Andira villosa*, *Hymenæa multiflora*, *Campsiandra surinamensis*, *Swartzia minutiflora*, *Dimorphandra Gonggrijpii*, *Parkia microcephala*, *Inga urnifera* *Pithecolobium Gonggrijpii*, and *P. Pullei*. He also makes a new

combination, *Stryphnodendron polystachyum* (Miq.) Kleink. (= *Piptadenia polystachyum* Miq.), and presents an incomplete description of *Stryphnodendron flammatum*.

The vernacular names are given in a few instances as follows: *Licania pachystachya*—manvonkhout, man foengoe (Negro English); marisiballi (Arowak). *Ormosia melanocarpa*—kokriki, agipau (Sarowak); barakaro korero ibibero iwi (Arowak); awaakoko (Karaib). *Hymenolobium flavum*—wormbast, reejoeloe (Karaib); liadiadan koeloera (Arowak). *Swartzia minutiflora*—ijzerhart, iesriharti (Negro English); wajewoe (Saramak); ietikiboralli (Arowak); ieljoetawoe (Karaib). *Dimorphandra Gonggrijpii*—morabucquia. *Inga urnifera*—switiboontje, worisjeporo apotopo, waikie (Karaib); rabba-rabba (Arowak). *Pithecolobium Gonggrijpii*—water tamarinde, bosch tamarinde. *Stryphnodendron flammatum*—bois serpent (French Guiana); angelim rajado (Brazil); boschtamalen, slang houdou, sneki housou, bousi tamarin, putalocus (Surinam). (For a detailed description of "bois serpent" see Record and Mell's *Timbers of Tropical America*, pp. 212–4.)

Breves notas para o estudo florestal do Brazil. By Amazonas de Almeida Torres. Pub. by Ministerio da Agr., Ind. e Com., Rio de Janeiro, 1925. Pp. 41; 6½ x 9.

This publication contains in condensed form a great deal of useful information relative to the extent and commercial importance of the forests of Brazil, the exports of forest products, matters of legislation, etc. There is an account of the early exploitation of brazilwood ("pau brazil") over 400 years ago.

Brazilian imports of wood for the years 1920–23 varied from nearly 15,000 tons to over 38,000 tons. The exports of wood for 10 years were as follows:

1915.....	33,778 tons	1920.....	125,393 tons
1916.....	75,192 "	1921.....	100,493 "
1917.....	49,568 "	1922.....	130,456 "
1918.....	179,797 "	1923.....	185,028 "
1919.....	103,823 "	1924 (11 mos.)	141,285 "

Plantes nouvelles ou peu connues de la région amazonienne (III^e Partie). By A. Ducke. Extracto dos *Archivos do Jardim Botanico do Rio de Janeiro*, Vol. IV, Nov. 6, 1925. Pp. 208; 7 x 10; 25 pls.

This is a continuation of the series of the author's valuable contributions to the knowledge of the Amazon flora. As would be expected in the botanical exploration of this great region, new classifications are found desirable, new genera and species are described, and some old ones combined, transferred, or discarded. Unfortunately there is very little information included regarding the woods and it is to be hoped that work in this field is not being neglected.

A few items of special interest to the reviewer are as follows: *Brosimum angustifolium* Ducke yields a kind of "*muirapiranga*" inferior to that of *B. paraënse* Huber (the "satiné" of French Guiana) in that the texture is coarser and the color not nearly so beautiful. (Page 2.)

The name of the "angelim rajado" (the "bois serpent" of French Guiana) is changed from *Pithecolobium racemiflorum* Ducke to *P. racemosum* Ducke, as the former name was preoccupied. (Page 30.)

Mora Schott and *Dimorphandra* Schomb. are considered separate genera. The "mora" of the Guianas is listed as *Mora guianensis* Schomb. (= *Dimorphandra excelsa* Benth. = *D. Mora* B. & H. = *D. guianensis* Baill. = *Mora excelsa* Benth.). The Panama species, *Dimorphandra oleifera* Triana, becomes *Mora oleifera* (Triana) Ducke. There is a third species, *M. paraënsis* Ducke. (Pp. 39–45.)

A kind of rosewood of Ceará, producing a wood called "violete," is named *Dalbergia cearensis* Ducke. (Page 73.) This is undoubtedly the true Brazilian Kingwood, the identity of which had not previously been established, although the reviewer had already referred it to the genus *Dalbergia*. (See Record and Mell's *Timbers of Tropical America*, p. 278.)

The "jarana," named by Huber *Chytroma Jarana*, has been referred by Ducke to his new genus, *Holopyxidium*. There are two species, *Holopyxidium Jarana* (Huber) Ducke and *H. retusum* (Berg) Ducke. Huber's genus *Goeldinia* is included by Ducke with *Allantoma* Miers. (Pp. 152–154.)

As Leguminosas do Estado do Pará. By ADOLPHO DUCKE. Separata dos *Archivos do Jardim Botanico do Rio de Janeiro*, Vol. IV, Nov. 1925. Pp. 133; 7 x 9½.

There are approximately 550 known species of leguminous plants native to the State of Pará. Of the 102 different genera listed in this publication, 66 of them have representatives which are trees, some of them the largest and most important in the forest. The remainder are herbs, shrubs, and lianas.

Dr. Ducke has performed a valuable service in bringing together the descriptions and vernacular names of these plants. The whole is provided with a convenient index. Considerable difficulty was encountered in collecting botanical specimens from the tall trees, and in many instances flowers and fruits were shot down with a rifle.

Tropical forestry and research. By TOM GILL. *Bulletin of the Pan American Union*, March 1926, pp. 241–251.

The author of this article, the tenth in the Pan American forestry series, is an American forester with tropical experience in Mexico and Cuba, the latter work being under the direction of the Tropical Plant Research Foundation, Washington. His paper explains in a very interesting way why tropical timbers are as yet so little used and emphasizes the need for research in tropical silviculture, forest botany, and wood technology.

Logging and marketing problems with tropical timbers. By DONALD M. MATTHEWS. *Bulletin of the Pan American Union*, Dec. 1925, pp. 1225–30.

The author of this article was for six years in the Bureau of Forestry in the Philippines, for ten years in charge of forest work in British North Borneo, and since February, 1926, in charge of a forest research project in Cuba for the Tropical Plant Research Foundation, Washington, D. C.

The marketing of the rare kinds of timber, the only ones for which there has been a ready market, has been conducive to small logging operations of the most primitive nature. The introduction of modern methods, with power transport, requires for its success the utilization of the secondary species

for which a market must be created. The wood-using industries are extremely conservative and very slow to accept a new and untried species of timber, even though backed by authoritative laboratory tests.

"It is very difficult for any single lumber enterprise to combat this conservatism in the market, and one of the chief factors which has impeded the more rapid development of the use of tropical wood has been the lack of any concerted selling effort. . . . The best way to get around this difficulty would be the combination of all producers in a general region, with a central organization for the disposal of their product in the country which seems to offer the best opportunities. . . . The difficulty in starting any such selling organization lies chiefly in getting in touch with and persuading producers to trust their interests to a selling organization which would not be under the control of any one of them. . . . It would take considerable capital and a large amount of perseverance to establish a selling organization to deal with tropical timbers in markets of the Temperate Zone, but it is undoubtedly the outstanding need of the tropical lumbering industry today."

"The first step called for would be a survey of the producing field with the aim of collecting accurate data as to the sources of supply of all tropical timbers which are now being produced in commercial quantities. As a complement to this, a study of the wood-using industries should be made to determine what timber products now coming forward in commercial quantities are chiefly required and by whom. Once these data were in hand, they could be put to immediate practical use in promoting the utilization of tropical timber products by the industries which are in greatest need of them. This is the first and possibly the easiest part of the work that there is to be done. As regards tropical America at least, the biggest problem is the determination of the extent and value of the potential sources of supply. The aim should be to collect data of a nature which would enable the countries owning the forests to offer concessions to capital which would be attractive enough to interest it and at the same time be so constructed as to safeguard the forest resource. This is a piece of work which will take many years to accomplish in its entirety, but the field offers no obstacles to quick results.

The focal points for the survey of the potential possibilities of tropical timber supplies should naturally be those which were covered by the first survey—i.e., present production points. Working from these, with a knowledge of the quantity and quality of production which can be immediately obtained, there would be a minimum of delay in getting into utilization the vast untouched forest resource which we know exists, but as to which we have so little reliable information."

Exploitation of Philippine forests. By ARTHUR F. FISCHER. *Bulletin of the Pan American Union*, January 1926. Pp. 39–47.

The author of this instructive article is Director of Forestry of the Philippine Islands. He discusses some of the problems of logging and marketing tropical timbers and includes the license agreement under which the lumber companies operate. The development of the lumber industry after the advent of the Americans has been such that to-day "practically no tropical country in the world has as modern a system of steam logging and manufacturing as the Philippine Islands. India and the Dutch East Indies, after studying and noting the development in the Philippines, are beginning to use the same methods which the Philippines transplanted from America."

"It is a well-known fact that in practically all instances, with the exceptions of a very few sawmills, the industry has been started in virgin timber and as a result has developed small communities in and around sawmills. The agricultural land available if cleared has been taken up by inhabitants and employees of the sawmills and developed gradually into towns and large municipalities, good citizens with small land holdings developed, and thereby civilization and good government enhanced by sawmills located among non-Christian tribes. Nomadic non-Christians gradually began to obtain employment in the sawmill and have become as a result settled in definite incorporated communities which have, as stated above, attained the status of full-fledged municipalities. The payrolls of some of the companies are very large, and a considerable portion of this money has been invested by employees in the surrounding lands which, as a consequence, have been developed. Small, well-managed, and money-making haciendas are to-day owned by ex-employees of sawmills who 8 or 10 years ago came into an unsettled and uninhabited place. This has been the history in every instance where sawmills have been founded in virgin territory. Countries of Central and South America with similar conditions can learn from this development.

"After harvesting of the wood crop on agricultural lands, the disposition of these agricultural lands should be regulated so that the employees of the sawmills have the opportunity of acquiring parcels, thereby establishing and settling a new community and at the same time producing a more permanent labor force for the sawmill. This phase of country development, apart from the amount of money gained in the manufacture of lumber for export and local sale, is the outstanding economic feature of Philippine sawmill development. The same can, by proper regulation through a government entity, be performed in any tropical country.

"Much pioneer work has to be done by the government through its scientific staff in the identification of timbers as well as in finding out the uses of these timbers not only locally, but in the markets of the world. This is necessary before sawmill development can hope to make a success. The lumbermen to-day in the Philippine Islands realize the efforts on the part of the government for laying the foundation of their industry through the identification of wood, classification and reconnaissance of timbered area, and the investigation of markets for the output. It is very necessary to find out what are the principal woods in a stand of forest, the area, topography, and other necessary data and to make a survey of possible markets prior to sawmill establishment. In the Philippine Islands up to the present time, approximately 2,700 species of trees have been botanically identified. Many of these are marketable in quantity and the greatest bulk of the lumber sawn for local as well as export trade comes from not more than 50 species. It is, therefore, necessary that a fairly thorough study be made of the forests of the country in order to find out what the majority of species are and to study these species with the object of developing

the uses and markets for them. As soon as this has been ascertained, a definite entity with scientific and technically trained men should be placed in control to safeguard the future forest, after a classification of the land has been made and before sawmills are allowed to operate."

Belangrijke houtsoorten van Nederlandsch-Indië. By L. G. DEN BERGER and F. H. ENDERT. Med. van het Proefstation voor het Boschwezen, No. 11. Buitenzorg, Java, 1925. Pp. 136; 7 x 10½. With **Platenatlas** (printed separately). Pls. 15, with 60 half-tones.

This is a valuable contribution to the knowledge of the more important timbers of the Dutch East Indies. It contains detailed descriptions of 60 species, representatives of 18 genera. The two most important families are the Leguminosae and the Dipterocarpaceae, with 16 species each.

The descriptions follow a uniform outline as follows: Species; trade name; class (durability and strength); vernacular names; distribution; dimensions of trees and logs; working properties; trade; description of the wood with reference to color, luster, scent, taste, grain, hardness, growth rings, pores, parenchyma, medullary rays, resin ducts, and ripple-marks.

The most useful feature from the standpoint of identification with a hand lens is the atlas containing photographs of the cross sections of the 60 woods described. Each figure measures 6 x 8 cm. and has a magnification of ten diameters. As the photographs were made with reflected rather than transmitted light, one sees just how the woods appear under a lens. This method is not new, but the results obtained are the best the editor has seen.

Kultuurproeven met industrie-, konstruktie-, en luxe-houtsoorten. By IR. F. KRAMER. Med. van het Proefstation voor het Boschwezen, No. 12. Buitenzorg, Java. Pp. 99; 7 x 10½; 27 half-tones.

This is a report of the results obtained from young plantations of 40 different species of trees believed to be useful for

the afforestation of the Javanese plains. The data were obtained principally from 200 experimental plots located on good volcanic sand in the residency of Kediri to the northwest of Kloet Mountain.

The species are classified into three groups, namely, industrial (16), constructional (19), and cabinet timbers (5). Among the constructional timbers very satisfactory results have been secured with *Albizzia falcata* Backer, *Casuarina equisetifolia* Forst, *Guazuma ulmifolia* Lmk. var. *tomentosa* Schum., and *Melia Azedarach* L. The cabinet timbers planted were *Dalbergia latifolia* Roxb., *Pterocarpus indicus* Willd., *Santalum album* L., *Swietenia macrophylla* King, and *S. Mahagoni* Jacq. In one plantation of the large-leaved mahogany the trees attained in seven years in good soil an average height of 47 feet (max. 54 ft.) and a diameter of 5.6 inches (max. 9½ in.). *S. Mahagoni*, on poor ground, reached an average height of 21 feet (max. 29 ft.) and a diameter of 3⅕ inches (max. 5½ in.) in 5½ years.

The development of India's forest resources. Compiled by the Economic Branch of the Forest Research Institute, Dehra Dun. Calcutta, 1925. Pp. 39; 7 x 9½; 22 full-page half-tones. Price 5s.

This interesting and attractive publication "is presented with a twofold object, namely, to convey to persons interested in timber and minor forest products some idea of what is being done to place forest produce on the market in a suitable form, and secondly to put inquirers in a position to judge as to what extent their enquiries can be answered and what value to place on information supplied."

The subject matter is presented in eight sections, as follows: (1) Brief history of the Economic Branch; (2) Wood technology; (3) Timber testing; (4) Timber seasoning; (5) Wood preservation; (6) Paper pulp; (7) Minor forest products; (8) Wood-working. Each section is written by the officer in charge.

Eucalyptus trials in the Simla Hills. By R. N. PARKER. Forest Bulletin No. 63 (Botany series), Calcutta, 1925. Pp. 27; 7 x 10. Price 10d.

An account of some experiments started in April, 1908, with the object of finding suitable species for use in afforesting bare hills and providing a cheap fuel supply. "The experimental areas at Gumman and especially Barog are on ground which most closely resembles the class of land available for forest plantations. It is in just these two places that the growth has been disappointing and it seems evident that the cost of growing and planting Eucalyptus will never be justified except on good or fairly good soil. The rate of growth of Eucalyptus falls off very greatly on shallow rocky soil and for this reason alone the idea of using them in any afforestation of bare hills or for regular plantations in the Himalaya can be safely abandoned."

Summary of results of laboratory experiments with different wood preserving antiseptics. (Results of 14 years' experiments.) By S. KAMESAM, with a preface by J. H. WARR. Forest Bulletin No. 64 (Economy series), Calcutta, 1925. Pp. 28; 7½ x 9½; ill. with charts and diagrams. Price 3s.

Tables for bark deductions from logs. By S. H. HOWARD. Forest Bulletin No. 65 (Silviculture series), Calcutta, 1925. Pp. 11; 5½ x 8½. Price 4d.

A note on the working qualities of some common Indian timbers. By H. E. KINNS. Forest Bulletin No. 66 (Economy series), Calcutta, 1925. Pp. 43; 7 x 10. Price 1s.

The information contained in this bulletin was originally sent by the author to the Forest Research Institute for inclusion in PEARSON & BROWN'S "Timbers of India," and is in the form of answers to a series of questions sent out by Mr. Pearson. This questionnaire was as follows:

"1. Average size of logs available and whether straight, cylindrical, or otherwise? 2. Whether the timber is available in commercial quantity and if so, how much? 3. Uses; present and possible future uses? 4. Seasoning qualities; best way of dealing with the timber, such as girdling, converting green, etc.? 5. Durability; whether liable to insect attack, fungus, or stain? 6. Working qualities; such as difficulty in sawing, suitability for turning, etc.? 7. Any general remarks worth recording about the timber?"

The information supplied by Mr. Kinns, who is Wood Technologist for the United Provinces, was considered too comprehensive to include in the book, but contained so much that is new and important that its publication in a bulletin was authorized. Twenty-eight different woods are included in the report, which is notable for the data of practical value it contains.

Notes on the antiseptic treatment of Assam timbers for railway sleepers. By J. H. WARR, assisted by S. KAMESAM. *The Indian Forest Records* (Economy series), Vol. XI, Part X, 1925. Pp. 106. Price 3s. 3d.

Seven different kinds of woods were chosen for tests, and the impregnations were with coal tar creosote either without any adulterant or with a mixture of crude petroleum. Some of the points of interest are as follows:

1. **Ping** (*Cynometra polyandra* Roxb.).—Average life untreated, 5 years. Sp. gr. (air-dry) 0.90–0.97. "The nature of the wood, either on account of its structure or its resin content or some other cause peculiar to the species, tends to prevent uniform absorption. It is at present, therefore, advisable to use only the full-cell process and impregnate the wood to refusal."

2. **Hollong** (*Dipterocarpus pilosus* Roxb.).—Average life untreated, about 4 years; mechanical life about 12 years. Sp. gr. (air-dry) 0.78–0.82. "The wood contains a considerable quantity of resin which exudes from the wood during seasoning and probably accounts for the fact that the sleepers did not dry out or treat at all uniformly." Modified Lowry process, with recovery of 25 per cent of gross absorption, recommended.

3. **Makai** (*Shorea assamica* Dyer).—A non-durable wood. Sp. gr. (air-dry) 0.64–0.70. "Impregnations under 5 lbs. per cubic foot are not satisfactory, as even with heavier impregnation the side penetration is only about one-fourth inch. Some specimens are capable of taking up a good deal more than this and a 7-lb. treatment gives satisfactory re-

sults." Full-cell process, with preliminary vacuum of 20 to 24 inches for 45 minutes, recommended.

4. **Otenga** (*Dillenia indica* L.).—Average life untreated, about 3 years; estimated mechanical life about 12 years, failure due to cracking. Sp. gr. (air-dry) 0.60. Wood easily impregnated; gross absorption heavy. Lowry process, with highest possible recovery, recommended.

5. **Uriam** (*Bischofia javanica* Blume).—Average life untreated, about 5 years. Wood tends to check badly. Sp. gr. (air-dry) 0.64–0.67. Only the sapwood can be impregnated. Empty-cell process recommended. Treated sleepers should be laid in track with heart side up.

6. **Hollock** (*Terminalia myriocarpa* H. & M. A.).—Average life untreated, about 5 years. Wood tends to check badly. Sp. gr. (air-dry) 0.64–0.73. Readily impregnated. Slow Lowry process, with gross impregnation of 10 lbs. and net of 7 lbs. per cubic foot, recommended.

7. **Ajhar** (*Lagerstroemia Flos-Reginae* Retz).—Average life untreated, about 7 years. Sp. gr. (air-dry) 0.57–0.64. Only the sapwood can be impregnated. "The timber, however, is a very good one and does not fall far short of the durability mark (reckoned as 10 years' life) when untreated. It is therefore quite probable that the light treatment will turn the scale and give an increase in life more than commensurate with the cost of treatment. . . . It is strongly recommended that a pressure period of three hours be employed so as to sterilize the wood."

Forest Commission of Victoria. Sixth annual report. Financial year 1924–1925. Melbourne, 1925. Pp. 12; 8 x 13.

"The year has been a notable one in the forest history of Victoria, being marked by the growing interest in forestry matters evinced by most classes in the community. This growing interest has been made manifest in a number of ways, of which the principal, or at least the one of most immediate importance, was the sanctioning by Parliament of a forest loan of £500,000. This sum is to be expended over a period of five years for the systematic development, improvement, conservation, and establishment of the forests, both of the

indigenous hardwoods and of the introduced softwood species."

Mogano Benin. By Cav. E. A. Lezzi. *Il Legno* 5: 6: 113, March 15–31, 1926.

The Benin mahogany, *Khaya grandifolia* Stapf, is found in the evergreen forests of southern Nigeria where it bears the vernacular name of "oguanco." It attains a height of about 100 feet and a diameter of 4.5 feet at a height of 12 feet above the ground. The buttresses or root spurs are 6 feet or more in height and their contorted grain gives rise to finely figured wood. The crown is broad and open, and the large pinnate leaves are very glossy. This latter feature serves to distinguish this tree from the other species of *Khaya*, the leaves of which have a dull appearance. The bole is longer and smoother than in the case of *K. Punchii* and *K. anthoteka*. The capsule containing the seeds is not very leathery and is divided into 5, occasionally 4, segments.

The wood of the Benin mahogany is similar in appearance and properties to that of the other species of *Khaya*, though there is usually a larger proportion of sapwood because of the more rapid growth of the trees. The timber reaches the market in the form of hewed logs about 28 inches square and 12 feet or more in length.

Insects and man in tropical America. By J. Bequaert. *Natural History* (New York) 26: 2: 133-146, March–April 1926.

This article bears the sub-title, "Impressions formed on a journey to the River Amazon as entomologist of the third Hamilton Rice expedition." The author is a member of the department of tropical medicine, Harvard Medical School.

"The time is at hand when the most progressive races of mankind will be driven by dire necessity to the virgin fields of endeavor in the tropics. We are far beyond the stage in which mere courage and physical strength fulfill the requirements of success in tropical enterprise. The tropics and their riches will ultimately belong to those peoples who skilfully apply the multiple resources of human knowledge. To insure a healthy, productive, and contented life will be the first prob-

lem to solve. It is therefore safe to predict that entomology will have an ever increasing share in the settlement of equatorial regions . . . where the struggle between insects and man assumes a fierceness not dreamt of by dwellers in temperate climes."

The rain forests of the tropics. By Tom Gill. *Nature Magazine* (Washington, D. C.) 7: 5: 297-300, May 1926.

A highly interesting description of a tropical forest and the struggle for existence among the various plant forms. The concluding paragraphs are as follows:

"Half the virgin timber of the Philippines is already gone; Haiti is forestless, except for the straggling growths on her higher mountains; the forests of Cuba, exploited for more than 400 years, have degenerated in size and quality till they no more resemble the original cover than a stubble field resembles the tasseled corn.

"This does not mean that forests must inevitably perish from the earth, for some countries have already learned to maintain and improve their woodlands through wise use. It only means that not forever can man reap without sowing—not even in those moist and fertile regions of the rain forests. For Nature in her universal economy keeps very exact accountings and, gladly accepting man as an ally in the task of growing timber, resolutely refuses to be his slave. And as we begin to see more clearly that in the timber of the tropics lies America's one immediate hope in her crisis of hardwood exhaustion, it is well to remember in turn that the hope of these tropical forests is wisdom and forbearance in their use.

"As man invades new forest frontiers, he determines consciously or unconsciously whether the timber shall be treated as a crop capable of innumerable harvestings or whether, careless of the aftermath, he shall slash and destroy. Today in the United States man looks upon the results of practically unrestricted forest destruction. He finds little solace in the knowledge that he might have acted with more prudence. Tomorrow, ax in hand, he enters the tropics. It is for him to decide whether he will foster and increase Nature's bounty by a wise harvesting—or whether to add more wreckage to the treeless wastes and worthless jungles of the world."

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 7 SEPTEMBER 1, 1926

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 7 September 1, 1926

A technical journal 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 in Yale University.*

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

Price 25 cents per copy

THE EDITOR VISITS CENTRAL AMERICA

The editor had the privilege of visiting British Honduras and Guatemala last winter (January–March) under particularly favorable circumstances. As the guest of the Forestry Department of British Honduras he was afforded every facility for studying forest conditions and making collections in different parts of the Colony. He is especially indebted to his Excellency, Governor John Alder Burdon, to Conservator of Forests J. N. Oliphant, to Asst. Conservator Duncan Stevenson, in charge of the Northern Districts, and Asst. Conservator Neil S. Stevenson, in charge of the Southern Districts.

Forestry work, notably the improvement of young mahogany, "banak," and a few other species, was seen to good advantage in the Middlesex area and Silk Grass Reserve, Stann Creek District. Experiments with local hardwoods for crossties on the British Honduras Railway were explained by

Supt. G. W. E. Francis, who publishes a summary of his findings in this issue. A visit was made to the Tidewater Lumber Company's logging operations for secondary species near the railway, and the pine logging and milling operations at All Pines.

At Hillbank, on New River Lagoon, the members of the party were guests of Mr. C. Hummel, first Conservator of Forests of British Honduras and now manager of the Belize Estate & Produce Company, Ltd. The forest and forestry work on the extensive holdings of this concern were explained by Mr. Hummel, and some important collecting trips were made in company of Mr. Harry Winzerling, of the forestry staff.

Through the courtesy of Mr. James Craik, manager of the Central American operations of the Chicle Development Company, a visit was made to the company's experiment station at Honey Camp Lagoon, where Mr. M. Esquivel, in charge, and Capt. H. M. Heyder, Asst. Conservator on special detail, provided opportunity for inspecting the sapodilla improvements and tapping experiments, as well as for collecting important species.

The trip up the Belize River to El Cayo, Benque Viejo, Vaca Falls, etc., was made under the personal direction of Mr. Ernesto Castillo, resident manager of the Mengel Company, operating for mahogany. One of the excursions from Camp Six included a portion of the Great Southern Pine Ridge.

The collections in British Honduras consisted of about 250 plants, of which 53 were trees. Nearly all were in flower or fruit, and in the case of the trees, wood specimens were secured. The careful handling and dispatching of this material from Belize during the collector's absence was kindly attended to by Mr. C. V. Freeman, of the United Fruit Company.

In addition to providing the basis for the new species described elsewhere in this issue, the collections, thanks to Drs. Standley, Rose, and Blake, have served to establish the identities of a number of doubtful trees, including the following:

Axemaster	*Krugiodendron ferreum* (Vahl) Urban	Rhamnaceae
Banak	*Virola merendonis* Pittier	Myristicaceae
Black poison wood	*Metopium Brownei* (Jacq.) Urban	Anacardiaceae
Grande Betty	*Cupania guatemalensis* Radlk.	Sapindaceae
Lignum-vitae	*Gymnanthes lucida* Sw.	Euphorbiaceae
My lady	*Aspidosperma megalocarpon* Muell.	Apocynaceae
Polak	*Ochroma bicolor* Rowlee	Bombacaceae

The first and last woods in the above list represent extremes of density, "axemaster," with a weight of 89 pounds per cubic foot, being the heaviest ever tested in the Yale laboratory and probably entitled to the rank of the heaviest wood in the world, while the "polak" or "balsa," with a weight of about seven pounds per cubic foot, is the lightest of all commercial woods. Three of the trees of the list, namely, *Krugiodendron*, *Metopium*, and *Gymnanthes*, represent new extensions of the West Indian flora. It will be noted that the so-called "lignum-vitae" is not the genuine lignum-vitae of commerce (*Guaiacum* spp.) which belongs to an entirely different family (Zygophyllaceae). It was a source of disappointment that the identity of the species of the Honduras rosewood could not be determined, but it is hoped that adequate botanical material for this purpose will soon be forthcoming. A revision of the preliminary check list of British Honduras trees (*Tropical Woods* 1: 14–16) is being made in coöperation with the Forestry Department.

The visit to the valley of the lower Río Motagua was made as the guest of the United Fruit Company. Excellent facilities for getting acquainted with the forest and making collections were made available by Division Manager G. S. Bennett through Mr. Henry Kuylen, manager of the Los Andes District. Botanical material and wood specimens of 50 trees were collected and Mr. Kuylen is continuing the work. A report on the trees of this region appears elsewhere in this issue. An inland trip was made to Guatemala City and Antigua.

To the persons mentioned, and also to the many others who so kindly contributed to the success and enjoyment of his visit to Central America, the editor wishes to express his personal gratitude and that of the Yale School of Forestry as well.

NEW SPECIES OF TREES COLLECTED IN GUATEMALA AND BRITISH HONDURAS BY SAMUEL J. RECORD

By PAUL C. STANDLEY[1]

The important collection of trees made in January, February, and March, 1926, by Prof. Samuel J. Record in British Honduras and the Atlantic coast of Guatemala, has proved, upon study, to contain a number of species previously unknown. Descriptions of these are published here. The Caesalpiniaceae and Mimosaceae were studied by Drs. N. L. Britton and J. N. Rose, who have contributed descriptions of four new species in these families.

Of the species here described, one (*Anaxagorea*) represents a genus unknown previously north of Panama, and two others (*Cameraria* and *Couma*) belong to genera new to the Central American flora. Among the trees of the collection determined by the writer as belonging to published species, several represent notable extensions of range.

The large number of novelties discovered in this collection emphasizes the fact that the forests of the Atlantic lowlands of Central America are still very imperfectly known. Many important trees await discovery in these highly varied forests.

Anaxagorea guatemalensis Standl., sp. nov.

A medium-sized tree with rather thin, smooth, brown bark, the inner bark fibrous; branchlets terete, smooth; petioles stout, about 1 cm. long, glabrous; leaf blades elliptic-oblong, broadest at or slightly above the middle, 28–35 cm. long, 11–14 cm. wide, rounded-obtuse and abruptly short-acuminate at apex, with acute acumen, rounded to acutish at base, thin, glabrous, slightly paler beneath, with about 13 lateral nerves on each side; peduncles axillary, 5 cm. long or less, 2 or 3-flowered, the pedicels 5–7 mm. long, ferruginous-tomentose, the bracts 1.5–2.5 mm. long, ovate-deltoid, obtuse; sepals ovate-oblong, 7–8 mm. long, spreading, obtuse, ferruginous-tomentose; outer petals in bud 13 mm. long, densely ferruginous-tomentose outside; carpels of the fruit about 4, glabrous, the sterile stipelike basal portion 2 cm. long, thickened upward, the body of the carpel obliquely ovoid, 1.5 cm. long, 1 cm. broad, dehiscent along the inner suture, bearing at apex a stout abrupt beak 3 mm. long; seeds 2 in each carpel, strongly compressed, black, very lustrous, about 14 mm. long and 8 mm. wide.

[1] Published by permission of the Secretary of the Smithsonian Institution.

Type in the U. S. National Herbarium, No. 1,209,922, collected in forest in the valley of the lower Río Motagua, between Los Andes and Entre Ríos, Guatemala, March 1, 1926, by Samuel J. Record (No. 41; Yale No. 8872).

The vernacular name is "palanco." This name, from *palanca*, a pole used for propelling a boat, is given in Central America to various trees of the Annonaceae. Prof. Record reports that the wood of *A. guatemalensis* is light-colored and rather soft, with prominent medullary rays.

Only one other species of the genus has been found previously in Central America, *A. panamensis* Standl., a frequent shrub in the forests of the Canal Zone. It differs from the Guatemalan plant in its small leaves and 1-flowered peduncles.

Cynometra retusa Britt. & Rose, sp. nov.

A medium-sized tree, the twigs glabrous; leaf buds covered with large ovate striate bracts; stipules filiform, scarious, 8–10 mm. long, caducous; petiole 4–5 mm. long; leaflets 2, membranaceous, oblong, oblique, acuminate, 6–8 cm. long, retuse, glabrous, shining above; flowers in very short, axillary, sessile racemes; pedicels 7–9 mm. long, hairy; sepals and petals yellow, the latter 5 mm. long; ovary densely lanate.

Type in the U. S. National Herbarium, No. 1,209,915, collected by Samuel J. Record (No. 1) near Entre Ríos, lower Río Motagua valley, Guatemala, Feb. 25, 1926 (Yale No. 8832).

Prof. Record writes of this tree as follows: "One of the commonest trees of the forest. The new leaves are very light-colored and on drooping twigs, being highly conspicuous in contrast with the dark green of the old foliage. Bark thin, smooth, brown, with prominent scattered lenticels. Wood fine-textured, hard, light-colored. Vernacular name, 'pata de cabro,' in reference to leaves."

Inga Recordii Britt. & Rose, sp. nov.

A medium-sized tree, the twigs puberulent; stipules wanting; petiole 1–2 cm. long, terete; rachis of leaf wingless, pubescent, bearing large cup-shaped glands between the leaflets; leaflets 5 or 6 pairs, lanceolate, long-acuminate, 5–13 cm. long, shining and somewhat pubescent above, pale and appressed-pubescent beneath; spikes 2–4 cm. long, axillary or in terminal panicles; peduncles 1–2 cm. long; bractlets minute; calyx 4–5 mm. long, appressed-pubescent; corolla slender, 18 mm. long, silky-pubescent; stamens 3 cm. long, the sheath included; ovary terete, densely lanate.

Type in the U. S. National Herbarium, No. 1,209,905, collected by Samuel J. Record in Stann Creek District, British Honduras, Jan. 19, 1926. Also

collected near Entre Ríos, lower Río Motagua valley, Guatemala, March 1, 1926 (No. 40; Yale No. 8871).

Called "bastard bri-bri" in British Honduras, and "guamo macho" in Guatemala.

This species is related to *I. laurina* and *I. Standleyana*.

Caesalpinia Recordii Britt. & Rose, sp. nov.

A shrub or small tree, the twigs terete and pubescent; leaves twice pinnate, the petiole and rachis pubescent; pinnae 2 pairs; leaflets 4–6 pairs, oblong, obtuse, glabrous above, pale and softly pubescent beneath, not glandular; racemes elongate, 25–30 cm. long, many-flowered, pubescent; bracts ovate, acuminate, pubescent, 4–6 mm. long, caducous; pedicels 15–20 mm. long, jointed near the middle, pubescent; calyx 7–8 mm. long, softly short-pubescent, the lobes obtuse; petals about 10 mm. long, purplish with yellowish margins, the outer ones covered on the outside with sessile glands; stamens only a little longer than the petals, densely long-lanate on the lower half; ovary densely pubescent.

Type in the U. S. National Herbarium, No. 1,209,908, collected by Samuel J. Record in British Honduras in February, 1926.

Zygia Recordii Britt. & Rose, sp. nov.

A shrub or medium-sized tree, the twigs glabrous; leaves sessile or nearly so; pinnae 1 pair, with a gland between them and between the upper pair of leaflets; rachis of pinnae pubescent; leaflets 2, 3, or 4, obliquely oblong, 4–9 cm. long, acute, obtuse, retuse, or sometimes short-acuminate, glabrous, strongly veined on both sides; flowers in short, sessile or short-peduncled spikes; calyx 0.5 mm. long; corolla slender, 5 mm. long, glabrous; stamens 12 mm. long, the sheath long-exserted; pods flattened, 5–10 cm. long, 1 cm. broad, strongly curved, sometimes orbicular, glabrous; seeds flattened, orbicular, 1 cm. in diameter.

Type in the U. S. National Herbarium, No. 1,209,906, collected by Samuel J. Record along the bank of New River, near Guinea Grass, British Honduras, Jan. 29, 1926. Collected also in the Entre Ríos region, lower Río Motagua valley, Guatemala, Feb. 25, 1926 (No. 5; Yale No. 8836).

Zygia Browne has been segregated recently from *Pithecolobium* by Fawcett and Rendle.

Pterocarpus belizensis Standl., sp. nov.

Tall tree with high buttresses, the bark thin, smooth, greenish gray; branchlets slender, terete, glabrous; leaves glabrous, the slender rachis 16–19 cm. long; leaflets 7–9, on petiolules 5–7 mm. long, the blades lance-oblong to ovate-oblong, 11–17 cm. long, 3.5–6.5 cm. wide, rather abruptly long-acuminate, with obtuse tip, obtuse to broadly rounded at base, thin, the venation prominent on both surfaces; body of fruit very thick and hard, 5–8 cm. in greatest diameter, coarsely reticulate-veined, glabrous.

Type in the U. S. National Herbarium, No. 1,209,911, collected at Middlesex, British Honduras, Jan. 17, 1926, by Samuel J. Record (No. 12; Yale No. 8780). *Record* No. 1 (Yale No. 8769), from the same locality, also represents the species.

The leaves of *P. belizensis* resemble those of *P. officinalis*, but the remarkable size of the fruits precludes the reference of this British Honduras tree to that species. In all the fruits, unfortunately, the wings have rotted or have been broken off. They were found on the ground, but the collector states that there is no doubt as to their proper association with the foliage specimens, since they were found under all the trees bearing such foliage.

The tree is known locally as "kaway" or "swamp kaway." It is reported to be very common along stream banks. The bark has a blood-red latex. Prof. Record states that the wood is rather soft and white, but as a result of injury it takes on a beautiful red and brown coloration, suggesting the cabinet woods of some of the species of the Far East.

Mouriria cyphocarpa Standl., sp. nov.

Medium-sized tree with glabrous branches and foliage; branchlets brown, terete; petioles stout, 3 mm. long; leaf blades lance-oblong or narrowly elliptic-oblong, 10–17 cm. long, 4.5–6.5 cm. wide, abruptly short-acuminate, rounded and usually emarginate at base, dark green above, much paler beneath, with about 15 pairs of nearly straight lateral nerves, these anastomosing close to the margin; peduncle in fruit 2 cm. long, glabrous, bearing 2 or more flowers; fruiting pedicel 6 mm. long, finely brown-tomentose; fruit subglobose, asymmetric, 1.5 cm. in diameter, covered (like the broad persistent calyx lobes) with a fine dense ferruginous tomentum; ovary apparently 4-celled, but 2 of the cells abortive, the fertile ones 1-seeded; seeds irregularly semiglobose, 8–11 mm. in greatest diameter, dark brown and shining, but adherent to the cell wall.

Type in the U. S. National Herbarium, No. 1,265,713, collected in the Los Andes region of the lower Río Motagua valley, Guatemala, Feb. 25, 1926, by Samuel J. Record (No. 12; Yale No. 8843).

Only one other species of *Mouriria*, *M. parvifolia* Benth., has been reported from Central America. In that the leaves are 1-nerved and only 2–6 cm. long. The Guatemalan tree has foliage similar to that of the Mexican *M. Muelleri*, but the fruits of the two species are quite dissimilar.

Cameraria belizensis Standl., sp. nov.

Small tree with slender twigs and ashy gray bark; branchlets dark red-brown, glabrous; petioles slender, 2–3.5 mm. long; leaf blades ovate-oval, 20–30 mm. long, 12–20 mm. wide, rounded at base, rounded at apex and emarginate, dark green, glabrous, the lateral nerves very numerous, irregularly anastomosing near the margin, connected by numerous irregular veinlets; flowers terminal, solitary, the slender pedicels 3–4 mm. long, glabrous; calyx glabrous, 2 mm. long, the 5 lobes rounded-ovate, imbricate, obtuse and mucronate, with thin margins; corolla white, glabrous, the tube 6–7 mm. long, dilated in the throat, the 5 lobes broad, nearly equaling the tube; anthers short, obtuse, the connective produced into a long filiform appendage.

Type in the U. S. National Herbarium, No. 1,209,909, collected in open savanna near Honey Camp Lagoon, Orange Walk District, British Honduras, Jan. 30, 1926, by Samuel J. Record.

The material available for study is fragmentary and incomplete, but the writer feels fairly confident that it is referable to the genus *Cameraria*, which has not been known previously from Central America. The tree is known as "savanna white poison," and is reputed to be very poisonous when in contact with the body.

Couma guatemalensis Standl., sp. nov.

Large tree with milky sap, the young twigs hirtellous with short slender stiff brownish hairs; leaves ternate, the petioles stout, 8–17 mm. long, hirtellous; leaf blades elliptic, those of the flowering branches 6.5–8.5 cm. long and 3.5–4.5 cm. wide, the mature blades up to 27 cm. long and 18 cm. wide, usually obtuse and abruptly short-acuminate at apex, obtuse at base and often short-decurrent, thin, deep green above and glabrous or nearly so, beneath sparsely soft-hirtellous, the costa very stout, the lateral nerves about 18 pairs, straight or slightly curved, the lower ones divergent at nearly a right angle, the transverse nerves nearly straight and parallel; cymes borne in the axils of the upper leaves, many-flowered, dense, the peduncles 2–4 cm. long, sparsely puberulent; pedicels 1–3 mm. long, densely and minutely hirtellous, the bracts small, dry, brown; calyx 4 mm. long, densely puberulent, the lobes oblong, obtuse, very unequal; corolla pink, the tube 1 cm. long, glabrous below, puberulent above, the lobes oblong, 6–9 mm. long, obtuse; fruit (immature) subglobose, 2.5 cm. in diameter, abruptly contracted at base into a very short, thick stipe.

Type in the U. S. National Herbarium, No. 1,209,923, collected in the valley of the lower Río Motagua, near Entre Ríos, Guatemala, March 1, 1926, by Samuel J. Record (No. 42; Yale No. 8873).

The type consists of flowering material. It is to be inferred, from the immaturity of the leaves, that the tree

probably sheds its leaves during the "verano" or dry season, and develops new leaves at the time of blossoming. There is at hand a specimen with fruit and fully expanded leaves that is doubtless referable to the same species. This was collected by the writer (No. 25,100) in a swamp near Puerto Barrios, Guatemala, in June, 1926. With the material obtained at that time, I had not been able to determine the tree, but while studying Prof. Record's collection, I remembered the tree of Puerto Barrios, and recognized its identity with the flowering material.

No species of *Couma* (Apocynaceae) has been known previously from Central America. The occurrence of the genus in Guatemala is a matter of interest, since a Colombian species is said to yield chicle. In the case of the Guatemalan tree, which is known as "palo de vaca" (cow tree), Prof. Record states that when the bark is cut or broken, a rich creamy milk pours out in abundance, and this, as he proved by personal test, is sweet and palatable and not very sticky. He reports further that the bark is about 1 cm. thick, red-brown, and coarsely granular; the wood dull brownish and moderately hard and heavy.

Chomelia Recordii Standl., sp. nov.

Small tree, the twigs grayish, short-hirtellous, unarmed; stipules 4–5 mm. long, oblong-triangular, acuminate, appressed-pilose; petioles 3 mm. long, pilose with short spreading hairs; leaf blades elliptic-ovate, 4–8.5 cm. long, 2–5 cm. wide, obtuse or acute, with obtuse tip, rounded or obtuse at base, subcoriaceous, green above, sparsely short-pilose along the costa, elsewhere glabrous, the costa and lateral nerves impressed, beneath slightly paler, copiously short-pilose with whitish hairs, the lateral nerves about 6 pairs, arcuate; flowers clustered and sessile at the ends of the branchlets; calyx and hypanthium 5–6 mm. long, tubular-campanulate, densely pilose with long appressed white hairs, the lobes linear-oblong, acute or acutish, about equaling the hypanthium; corolla densely pilose-sericeous with white hairs, the tube very slender, about 2 cm. long, the lobes oblong, obtuse, 4 mm. long.

Type in the U. S. National Herbarium, No. 1,209,919, collected in high forest between Los Andes and Entre Ríos, in the lower Río Motagua valley, Guatemala, March 1, 1926, by Samuel J. Record (No. 31; Yale No. 8862).

A well-marked species which can not be confused with any of the few members of the genus reported previously from Central America. The local name is "clavo."

TREES OF THE LOWER RÍO MOTAGUA VALLEY, GUATEMALA

By SAMUEL J. RECORD *and* HENRY KUYLEN

In the area under consideration the average annual rainfall is in excess of 100 inches and the conditions are favorable for growing bananas, the only important industry. In natural condition the soil is covered with a virgin rain forest of mixed hardwoods. In clearing for cultivation it has been the common practice to destroy all of the timber except the mahogany, but a beginning has been made in the local utilization of several species for purposes of general construction. Excellent transportation facilities are afforded by rail to the seaport at Puerto Barrios, reducing to a minimum the mechanical difficulties of exporting logs.

The bottomlands of this region range from swamps to higher lands rarely, if ever, inundated. In the swamps the large trees are scattered and there is a thick tangle of undergrowth, with more or less abundant manaca palm and bamboo. The forest improves toward the better drained soils and is at its climax on the lands best suited for banana culture. Here the trees are tall, many with high buttresses, and a person can make his way through the forest without being seriously impeded by the undergrowth. There are no pure stands of single species, but the trees which commonly rise above the others are less than twenty in number. Dr. H. N. Whitford, who visited the region in 1919, estimated that three-fifths of the stand was composed of five species, namely, "tamarindo," "naranjo," "masico," "zorra," and "ceiba."

The higher lowlands merge into the foothills and while the same species may be found, their relative abundance changes, and "naranjo" and "tamarindo" become more common. Still higher up, the characteristic tree is the "Santa María." According to Dr. Whitford the average stand of merchantable timber on the ridges is about 8000 board feet per acre, with some areas reaching at least 15,000 feet, of which fully one-half would be "Santa María" and a fourth "tamarindo" and "naranjo."

Pine and oak are common on the foothills near Virginia and westward, and on some of the talpetate soils the pine grows in

open stands nearly to the Motagua River. Still farther west the vegetation becomes more open and stunted, the pine is confined to the high ridges, and eventually there is a stretch of desert. The forests about Guatemala City are open stands of scrubby hardwoods, with occasional patches of pine and cedar.

The only timber of eastern Guatemala that is being exported is mahogany. Most of the lumber for local construction is imported from the United States, being chiefly southern pine and cypress. The railway crossties are creosoted southern pine. Local woods are used for temporary piling, construction of bridges across the drainage canals and ditches, and very recently in a limited way for general construction lumber. It is the belief of the writers that these timbers will prove to be satisfactory for many local purposes and that some of them should find a market in the United States. They may be roughly classified as follows:

Structural timbers.—Aguacatillo, carbón, chaperno, chichipate, frijolillo, granadillo, guayabo, hormigo, lagarto, laurel, maquelizo, paleta, rajate bien, and Santa María.

Furniture woods.—Caoba, ciruela, cola de mico, encino, granadillo, guanacaste, hormigo, and laurel negro.

Veneers for plywood.—Aguacatillo, barbás, carbón, lagarto, leche amarilla, sangre, Santa María, and tortugo.

Wheelwright work.—Chaperno, chichipate, granadillo, paleta, and silion.

Boxboards and pulp.—Amate, ceiba, chilicuate, Indio desnudo, jobo, San Juan, and tapasquit.

The following notes regarding the trees and woods are based upon the personal observations of the authors. The wood specimens are in the collections of the Yale School of Forestry and are of two series: (1) The Guatemalan portion of Nos. 3670–3745, collected by Dr. H. N. Whitford and Mr. L. R. Stadtmiller, who accompanied the Economic Survey Mission sent out in the spring of 1919 by the U. S. Department of State for the purpose of making a survey of the economic resources of the region in eastern Guatemala and Honduras lying between the Motagua and Chamelecón Rivers. (See BLAKE, S. F.: Native names and uses of some plants of eastern Guatemala and

Honduras. *Contr. U. S. Nat. Herb.* 24: 4, 1922.) (2) Nos. 8832–8928, collected by Record and Kuylen in the spring of 1926. The identification of the botanical material of the first series was by Dr. Blake, that of the second by Dr. Paul C. Standley, assisted by Drs. Blake and J. N. Rose.

The following list includes representatives of 84 genera and 38 families. While a great many of the trees are useless from the standpoint of their timber, they serve as valuable aids in the classification of woods on a basis of structure, though only in occasional instances are such points touched upon in this paper. A few items of special interest from an anatomical standpoint are: Intercellular canals in some of the rays in *Maximilianea* (Bixaceae); ripple marks in the same wood; cribriform fiber-pit membranes in *Couma* (Apocynaceae); dentate ray tracheids and small ray pits in *Pinus oöcarpa*, a white pine (Pinaceae); and oak-like rays in *Parathesis* (Myrsinaceae).

Amygdalaceae

Licania hypoleuca Benth. "Chozo." Medium-sized tree with rather small leaves, growing on sandy clay. Apparently not abundant.

Wood brown, hard, heavy, strong, fairly straight-grained, medium-textured, easy to split, finishes smoothly, is not very durable. Suitable for heavy construction in temperate climates. (Yale No. 3727.) (For detailed description see *Timbers of Tropical America*, pp. 198–9.)

Anacardiaceae

Astronium Conzattii Blake. "Ciruela," "palo obero," or "ronrón." ("Palo-mulatto" of British Honduras.) Large tree, said to reach a height of 100 feet and a diameter of three feet.

Wood reddish, with black streaks, rather waxy. A beautiful cabinet wood closely resembling the "Gonçalo Alves" of Brazil. (Yale No. 3731.) (See *Tropical Woods* 5: 2, March 1, 1926; *T. of T. A.*, p. 389.)

Spondias lutea L. "Jobo" or "jocote." ("Hog plum" of British Honduras.) Of common occurrence everywhere. Much used for live fence posts.

Wood nearly colorless, free of odor, light in weight, but firm, coarse-textured. Readily attacked by insects and does not resist decay. Kiln-dried lumber suitable for boxwoods, veneer-core stock, and interior rough construction outside the Tropics.

Anonaceae

Anaxagorea guatemalensis Standl. "Palanco." (See p. 4.) Small or medium-sized tree in lowland forest. Not utilized.

Wood moderately light and soft, but tough. Has rays as prominent as in sycamore (*Platanus*). Pores few, small, irregularly scattered. Parenchyma in fine, closely spaced, concentric lines. (Yale No. 8872.)

Anona sp. "Anona." Slender tree, sometimes 75 feet high. Fruit about as large as the custard apple. Wood of medium hardness.

Apocynaceae

Couma guatemalensis Standl. "Palo de vaca." (See p. 8.) Large tree, apparently rare, with thick, dark-colored bark with copious creamy white latex that is palatable. Not utilized. May prove valuable as a source of chicle.

Wood dull brown, moderately hard, of medium texture and fairly straight grain, not difficult to work. Pores not very numerous, small, but visible, in radial rows of two to several; white substance common. Rays fine and inconspicuous. Parenchyma in irregular network with rays; not visible without lens.

Minute anatomy: Larger pores mostly 0.14 mm. in diam.; vessel perforations simple; intervascular pits minute, the apertures lenticular. Rays heterogeneous in part; one or two cells wide and up to 20, mostly under 12, cells high; cells with gummy contents, occasionally also with crystals; pits into vessels elongated (mostly vertically) to include two to several in vessel wall. Parenchyma in irregular, tangential, uniseriate lines, the cells filled with red gum in heartwood; no canals or latex tubes seen. Fibers in radial rows; cavities large; pits fairly numerous, with distinct circular borders and lenticular orifices; *pit membranes appear distinctly cribriform.* (Yale No. 8873.)

Tabernaemontana amygdalifolia Jacq. "Cojon de mico." Medium-sized, much branched tree, with smooth and very latescent bark, of common occurrence on hillsides, sandy soil, and well-drained flats. The wood is not used. The latex is used with tobacco in native medicine to extract gusanos (beef-worms).

Wood yellow, only moderately hard, fairly straight-grained, fine-textured, easy to work, finishes smoothly. Pores not visible without lens, numerous, mostly in radial arrangement. Rays not visible without lens. Parenchyma not visible. (Yale No. 8848.)

Araliaceae

Didymopanax Morototoni (Aubl.) Dcne. & Pl. Large tree, widely distributed throughout tropical America, growing best in old clearings and edges of savannas. Bark gray, slightly ridged. Leaves very large, palmately compound, usually with nine long-stalked large leaflets.

Wood whitish, light and soft, but tenacious, easy to work, is not durable. Suitable for boxboards and general carpentry in temperate regions. (Yale No. 3726.) (For detailed description see *T. of T. A.*, pp. 484–5.)

Bignoniaceae

Tecoma pentaphylla Juss. "Maquelis," "maquelizo," or "matiliscuate." ("Mayflower" of British Honduras.) Tree sometimes 90 feet high, with long clear bole having an average diameter of 25 inches. Of fairly common occurrence on variety of sites from wet lowlands to dry uplands. Timber easy to

work, finishing smoothly. Suitable for interior construction, such as ceiling, flooring, framing, and furniture.

Wood of medium density. Superficially resembles plain-sawn oak, hence the common name of "roble" in many Latin-American countries. (Yale Nos. 3670, 8888, 8915.) (For detailed description see *T. of T. A.*, pp. 534–6.)

Tecoma sp. "Cortes." Tree sometimes 90 feet high and 24 inches in diameter, occurring in the better drained lowlands, apparently not abundant.

Wood yellow, changing to brown upon exposure; very hard, heavy, and tough, cross-grained, not easy to work, fairly durable. Pores in heartwood filled with yellow deposits of lapachol. (Yale No. 3707.) (For description of the group to which this belongs see *T. of T. A.*, pp. 538–542.)

Bixaceae

Maximilianea vitifolia (Willd.) Krug & Urb. "Comasuche." Small slender tree with large leaves and conspicuous yellow flowers, common in savanna lands. Wood not utilized.

Wood very soft and spongy, laminated, falling to pieces in drying. Ripple marks faintly visible without lens, irregular, rays not storied; no. per inch about 50. *Intercellular canals in some of the rays.* (Yale No. 8846.)

Bombacaceae

Ceiba pentandra (L.) Gaertn. "Ceiba" or "cotton-tree." Largest tree in the forest, attaining a height of 150 feet and a diameter, above the large buttresses, of 7 feet. Common on hillsides and in flats and swamps. One of the few trees that is not killed by the cutting down of the surrounding timber, and is accordingly often left for shade in pastures. Wood not utilized.

Wood grayish, light and soft, but tough, coarse-textured, not durable. (For detailed description see *T. of T. A.*, pp. 419–420.)

Ochroma bicolor Rowlee and *O. concolor* Rowlee. "Balsa" or "tambor." A common tree of the second growth, along with *Cecropia*, reaching a height of 90 feet and a diameter of 24 inches. Logs used to small extent for rafting purposes. Suitable for articles of insulation and buoyancy.

Wood light gray or nearly white to pale brown; very light and soft, esp. in young trees of fast growth; tough and strong for its weight. (Yale Nos. 3688, 8882, 8883, 8884.) (For detailed description see *T. of T. A.*, pp. 424–6.)

Pachira macrocarpa Walp. "Zapotón." ("Provision-tree" of British Honduras.) Medium-sized tree with very conspicuous flowers and large brown fruits, growing commonly along streams. Not utilized.

Wood light and soft, tough and fibrous, not durable.

Quararibea asterolepis Pittier. "Moro." Tree 70 feet high and 16 inches in diameter, occurring on rich clay soil, the trunk regular, with thin bark showing gray patches on surface and yellow interior. The rather large simple leaves have an odor resembling that of slippery elm (*Ulmus pubescens*).

Wood white, moderately hard, straight-grained, rather coarse-textured, easy to work, not durable. Rays coarse and distinct. (Yale No. 3699.) (For detailed description see *T. of T. A.*, pp. 422–4.)

Borraginaceae

Cordia diversifolia Pavón. "Manuno." Medium-sized tree.

Wood similar in structure to "laurel," but harder and not wooly. Color somewhat golden brown. Much like the "frei-jo" (*Cordia Goeldiana* Huber) of Amazon region, Brazil. Suitable for furniture. (Yale No. 8874.) (See *Tropical Woods* 5: 3, March 1, 1926.)

Cordia spp. "Laurel," "laurel blanco," and "laurel negro." Tree 100 feet high, with fairly straight trunk free of branches for upward of 75 feet, av. diameter, 30 inches (max. 50 in.). Conspicuous when in flower, the blossoms white. Occurs on all kinds of soil. Logs will float. Timber easy to saw and work, finishing smoothly. "Laurel blanco" is light-colored and, while resistant to ants, will not stand exposure well. "Laurel negro" resembles walnut and is highly durable. It is used for bridge flooring. Both suitable for furniture and carpentry.

In "laurel negro" the sapwood is nearly white, heartwood dark brown, with peppery scent. Wood rather light and soft, but tough and strong; saws wooly, but will take a smooth finish when dry. Rays show prominently on radial surface, producing attractive figure. (Yale Nos. 3689, 3704, 8842, 8921.) (See *T. of T. A.*, pp. 516–521.)

Burseraceae

Bursera Simaruba (L.) Sarg. (= *B. gummifera* Jacq. = *Elaphrium Simaruba* (L.) Rose). "Indio desnudo," "jenequite," "palo chino," or "palo jiote." ("Gombo limbo" of British Honduras.) Tall, slender, and usually crooked tree, with shiny copper-colored bark. Common in lowland forest. Used for live fence posts.

Wood whitish or light brown, fairly soft but firm and tenacious, texture medium to coarse, grain fairly straight. Easy to work, finishes rather smoothly; is not durable. Suitable for boxboards, interior construction, and paper pulp. (Yale No. 3577.) (For detailed description see *T. of T. A.*, pp. 337–9.)

Protium ternatum Pittier(?). Small tree in lowland forest. Not utilized.

Wood of pinkish color, fine-textured, straight-grained, easy to work. Shows numerous pith flecks. Is very much like birch (*Betula*) in appearance and properties. (Yale No. 8849.) (For information regarding other woods of this genus see *T. of T. A.*, pp. 334–7.)

Capparidaceae

Crataeva Tapia L. "Tortugo." Tree of irregular shape, about 60 feet high, and of an average diameter of 18 inches. No known use for the timber, but suitable for plywood.

Wood pale yellow, moderately light and soft, but tough, somewhat irregular-grained, coarse-textured, easy to saw, finishes smoothly, is not durable. (Yale Nos. 8852, 8892.) (See *T. of T. A.*, pp. 190–1.)

Combretaceae

Terminalia obovata (R. & P.) Eichl. "Bolador," "guayabo" or "guaya-

billo," or "naranjo." Large tree, 125 feet tall, with long and well-formed trunk 35 inches (av. 20) in diameter above the high root spurs, the bark very smooth and of a light gray color. The tree is of common occurrence in the hills, in the river bottoms and also in swamps. The logs will not float. The timber is not very easy to work, but is highly resistant to decay and to insects and is suitable for heavy and durable construction.

Thick sapwood light olive, heartwood darker and sometimes streaked deep brown or black. Texture medium, somewhat splintery; grain roey, producing feather striping on tangential surface. Wood takes a high polish and would make attractive furniture. (Yale Nos. 3678, 3695, 3709, 8887.) (For detailed description see *T. of T. A.*, pp. 476–7.)

Euphorbiaceae

Sapium pleiostachys K. Schum. "Chilicuate." Fairly common tree, attaining a height of 90 feet, with smooth, cylindrical bole having an average diameter of 25 inches. Bark latescent. Timber not utilized, but suitable for boxboards and paper pulp.

Wood white throughout, light and soft, suggesting *Hura*. Straight-grained, easy to cut, tough and strong for its weight. Pores the size of pinholes, scattered singly or more often in radial groups of two to several pores each. Parenchyma in very fine lines forming network with rays. (Yale No. 8891.)

Fagaceae

Quercus brachystachys Benth., *Q. citrifolia* Liebm., and *Q. oleoides* Cham. & Schl. "Encino," "roble," or "roblecito." Trees, usually of short stature, common in pine ridge and interior mountains. Wood hard, heavy, tough, and strong. Structure of the live oak type. Timber not extensively used. Wood of first species (Yale 3717) is of a dark reddish brown or chocolate color and the rays are low and thick. That of the second species (Yale No. 3716) is pale brown and the rays are thin and high.

Flacourtiaceae

Carpotroche platyptera Pittier. "Sucte." Small tree in lowland forest.

Heartwood pinkish brown, thin sapwood yellow. Pores minute. Rays distinct. Parenchyma not visible. Wood moderately hard, fine-textured, straight-grained. Not utilized. (Yale No. 8860.)

Casearia aculeata Jacq. (?) "Guacuco." Small or medium-sized tree occurring in the dense lowland forests.

Wood nearly white or yellowish, rather hard, straight-grained, fine-textured, tough, more or less splintery. Not utilized. (Yale No. 8864.)

Hasseltia mexicana (Gray) Standl. "Chichimi" or "quina." Tree 40 to 50 feet high, with straight, cylindrical trunk, sometimes 15 inches in diameter. Grows in flat lands.

Wood creamy white, sometimes with pale brown streaks, rather hard and heavy, fine-textured, cross-grained, splintery. Not utilized. (Yale Nos. 8877, 8890.)

Oncoba laurina (Presl.) Warb. "Achiote." Small tree with irregular stem and very thin fibrous bark. Wood yellow-brown, hard and heavy, rather

fine-textured, straight-grained, not durable. Pores in radial groups, rays very distinct on cross section, parenchyma not visible. (Yale No. 8860.)

Guttiferae

Calophyllum Calaba Jacq. "Santa María." Tree 110 feet high with a well-formed bole free of branches for upward of 60 feet, and 30 to 40 inches in diameter. Fairly common on clay soils and hills. General appearance suggests mahogany. Timber easy to work, is resistant to ants, fairly durable when exposed. Warps badly, even in sawing. Used in construction work for beams, framing, siding, and floors. (Yale Nos. 3691, 3691A, 3703, 8920.) (See *Tropical Woods* 4: 13–15, Dec. 1, 1925; also *T. of T. A.*, pp. 440–2.)

Symphonia globulifera L.f. "Leche amarilla" or "pimientillo." ("Waika chewstick" of British Honduras.) Large tree of commercial proportions, but very limited occurrence.

Some logs from British Honduras have been used for rotary-cut veneer for plywood; it takes glue readily and is strong. (Yale Nos. 3702, 8869.) (For detailed description of the wood see *T. of T. A.*, pp. 443–4.)

Lauraceae

Nectandra glabrescens Benth. "Aguacatillo." Wood yellowish or light olive, glossy, with a waxy feel, works easily, takes a high polish. Wood is similar in many respects to that of *Phoebe ambigens*, but is somewhat finer-textured and straighter-grained. There are many large oil cells present, visible under lens (10x). (Yale No. 8870.)

Phoebe ambigens Blake. "Aguacatillo" or "guambo." Large tree, 125 feet high, with long, well-formed trunk 25–35 (max. 45) inches in diameter, with low buttresses. Sheds its leaves at time of flowering and is covered with purple blossoms. Fairly plentiful in flat lands and on sandy hillsides, but avoids swamps. The logs will float. The timber is fairly light and very easily worked and is well suited for interior work such as rafters, siding, ceiling, and flooring.

Wood of light olive color, with satiny luster, with somewhat waxy feel, not scented, uniform-textured, feather-grained when quarter sawn. Vessel lines are rather fine, but distinct, and the rays produce a fine silver grain on radial surface. Wood is of about the consistency of black walnut (*Juglans nigra* L.), takes a high polish, and could be used to advantage for good furniture. (Yale Nos. 3674, 3697, 8885.) (For detailed description see *T. of T. A.*, pp. 175–6.)

Leguminosae

Acacia Cookii Safford. "Guascanol." ("Cockspur" of British Honduras.) Small, slender tree with fern-like foliage and armed with long, paired thorns which harbor stinging ants. Not utilized.

Wood hard, heavy, tough, straight-grained, rather coarse-textured. Sapwood yellowish white; heartwood unknown. Pores surrounded by diamond-shaped patches of parenchyma, often confluent. Rays minute. Wood of about the consistency of hickory (*Carya*). (Yale No. 8863.)

Andira excelsa H.B.K.(?) "Frijolillo" or "guacamayo." Large tree, 110

feet high with fairly straight and uniformly round bole having an average diameter of 25 inches above the buttresses, which are from 9 to 12 feet high. Grows on hills, sandy lands, and in swamps. Logs will not float. Timber classed among the best for general construction, beams, heavy flooring, and other purposes requiring strength and resistance to decay and insects.

Wood greenish yellow, turning brown upon exposure; sapwood white, sharply defined. Heartwood intensely bitter. Hard, heavy, tough, and strong, coarse-textured, grain more or less interlocked. Easy to saw. Pores small, but visible, surrounded by distinct circles of parenchyma. (Yale Nos. 3690, 3744, 8893.) (See *T. of T. A.*, pp. 301–3.)

Andira inermis H.B.K. "Chaperno." ("Cabbage-bark" of British Honduras.) Large tree, 120 feet tall, with a long and fairly straight trunk, 24 to 30 (max. 35) inches in diameter, covered with a smooth, grayish bark. Logs will not float. Timber easily sawn, fairly easy to work, and highly durable. Useful for heavy construction and for logging-cart wheels. (See *T. of T. A.*, p. 300.)

Cassia reticulata Willd. "Barajo." Shrub with large compound leaves and conspicuous yellow flowers, growing in openings in the forest. Root said to have medicinal properties.

Wood rather light and soft, fine-textured. Pores small, but visible; surrounded by indistinct circles of parenchyma. Rays minute. (Yale No. 8868.)

Cynometra retusa Britt. & Rose. "Pata de cabro." (See p. 5.) Small or medium-sized tree, very common in understory of lowland forest. New leaves very light-colored and conspicuous. Vernacular name refers to the fancied resemblance of the paired leaves to the foot of a goat. Not utilized.

Heartwood pale brown, merging into lighter-colored sapwood. Wood hard, strong, tough, fairly straight-grained, fine-textured. Pores small but visible, scattered singly or in radial groups of two or three. Parenchyma in numerous, distinct, wavy, fairly evenly spaced concentric bands which may or may not include the pores. Rays minute. (Yale No. 8832.)

Dalbergia cubilquitzensis (Donn. Smith) Pittier. "Granadillo" or "junero." Large tree, 100 feet high, with straight cylindrical trunk having an average diameter of 30 inches, and free of branches for about three-fourths of its length. Bark fairly thick, nut-brown in color. Logs will not float. Timber considered one of the best in the forest, and fairly common. Used for wagon axles and tongues, truck-wheel spokes, and suitable for general construction where strength and resistance to decay and insects are required.

Wood orange-colored with purple streaks, darkening upon exposure to purplish brown; sapwood white, sharply demarcated. Not scented. Rather hard and heavy, very tough, texture rather fine, grain more or less interlocked. This is a cabinet wood of the rosewood class, taking a beautiful polish, and showing a pleasing grain. (Yale Nos. 3721, 8896.)

Dialium divaricatum Vahl. "Paleta" or "tamarindo." ("Ironwood" of British Honduras.) Large tree, often 100 feet high and 25 inches in diameter, with thin and smooth bark. Logs will not float. Timber as hard, strong, and durable as "chichipate." Used for heavy construction and for repairing logging-cart wheels. (Yale Nos. 3696, 3698, 3710, 8845.) (For detailed description see *T. of T. A.*, pp. 239–240.)

Enterolobium cyclocarpum (Swartz) Gris. "Guanacaste." Very large tree with large ear-shaped pods.

Wood walnut-brown in color, very light and soft to moderately so, easy to work, takes good polish, is durable. Suitable for carpentry and cabinet work. (Yale Nos. 3706, 3737, 3742, 8905, 8917.) (For detailed description see *T. of T. A.*, pp. 204–7.)

Erythrina rubrinervia H.B.K. "Pito" or "piton." Small thorny tree with very showy red flowers. Used for live fence posts. (For description of similar species see *T. of T. A.*, pp. 306–8.)

Hymenæa Courbaril L. "Guapinol." ("Locust" of British Honduras.) Medium-sized tree with glossy, leathery leaves in pairs, and large black pods.

Wood variable, brown, orange, or purplish; hard, heavy, strong, durable. (Yale Nos. 3711, 3723, 3728.) (For detailed description see *T. of T. A.*, pp. 231–3.)

Inga Recordii Britt. & Rose. "Guamo macho." (See p. 5.) Resembles the common "guamo," but the petioles of the leaves are not winged.

Wood brownish gray, or with pinkish hue, hard and heavy, medium-textured, straight-grained. Rays minute. Pores small but visible, scattered, surrounded by narrow ring of parenchyma which is not very distinct. (Yale No. 8871.)

Inga Rodriguezíana Pittier. "Guamo" or "cuajinicuil." ("Bri-bri" of British Honduras.) Small or medium-sized tree of common occurrence in the dense lowland forest. Makes good shelter for cacáo plants.

Wood very pale brown, or pinkish, moderately hard, somewhat cross-grained, rather coarse-textured. Rays minute. Pores distinct, scattered, inclosed in distinct patches of parenchyma which are elongated and more or less confluent. (Yale No. 8878.)

Lonchocarpus hondurensis Benth. Medium-sized tree, about 75 feet high and free of branches for about 50 feet. Bark thick, fairly smooth, grayish green. Purple flowers in racemes.

Wood yellowish throughout, hard, heavy, and very tough, has the consistency of hickory (*Carya*) and appears suitable for tool handles. Pores few and small. Parenchyma in distinct concentric bands. Structure and properties somewhat like "chaperno" (*Andira inermis*). (Yale No. 8898.)

Pithecolobium arboreum (L.) Urb. "Cola de mico." ("Black tamarind" and "John crow" of British Honduras.) Large tree, sometimes 125 feet high, apparently scarce.

Wood reddish brown, moderately hard, easy to work, finishes smoothly, has good cabinet qualities, is durable. (Yale No. 3676.) (See *T. of T. A.*, pp. 209–210.)

Platymiscium polystachyum Benth. "Hormigo." Fairly large tree, occasionally 100 feet high, with a long straight bole averaging 20 inches in diameter (max. 35 in.). Of rather common occurrence on various sites. Logs will not float. Timber is fairly easy to work, takes a smooth finish and beautiful polish, is highly durable. Now used for bridge planking. Suitable for heavy construction and for high-grade furniture. (Yale Nos. 3672, 3743, 8880, 8889, 8913, 8924.) (For detailed description see *T. of T. A.*, pp. 297–8.)

Schizolobium parahybum (Vell.) Blake. "Zorra" or "plumajillo." ("Quam"

of British Honduras.) Large deciduous tree with long pinnate leaves; covered with golden flowers latter part of February, making it very conspicuous. Trunk straight and well formed above buttresses, which are from 6 to 10 feet high. Not utilized.

Wood of Guatemalan trees not as light and soft as that from other regions, very tough and cross-grained. (Yale Nos. 3685, 8839.) (For detailed description see *Tropical Woods* 2: 2–5, June 1925.)

Sweetia panamensis Benth. "Chichipate." ("Billy Webb" of British Honduras.) Large tree, 110 to 125 feet tall, with an average diameter of 30 inches (max. 45 in.), the trunk free of limbs for 65 feet, but inclined to be poorly formed, with resultant waste in sawing. Common on clay lands, especially on talpetate. Logs will not float. The timber is difficult to saw and work, but is very strong and the most durable of all. Suitable for heavy construction, logging-cart wheels, etc. (Yale Nos. 3673, 3732, 3741, 8904.) (For detailed description see *T. of T. A.*, pp. 261–3.)

Zygia Recordii Britt. & Rose. "Pepe nance?" (See p. 6.) Small tree of the lowland forest. Not utilized.

Wood white (young tree), hard, heavy, tough, strong, rather fine-textured, fairly straight-grained, finishes smoothly. Pores small, solitary, or in radially compressed groups, imbedded in irregular parenchyma bands which are widely variable in width and length, producing ulmiform pattern. Ripple marks absent. (Yale No. 8836.)

Melastomaceae

Miconia calvescens DC. "Sirín morado." Small tree in lowland forest, with large leaves, velvety green on upper surface and rich purple beneath. Bark resembles that of white ash (*Fraxinus americana* L.). Tree not utilized.

Wood pale brown, moderately hard, fine-textured, straight-grained, not durable. Pores very small, not numerous, occurring singly or in radial groups of 2 or 3. Rays minute. Parenchyma indistinct.

Microscopic features: Vessel perforations simple. Intervascular pits minute, alternate; vessel-parenchyma pits similar, often elongated; pit membranes cribriform. Rays uniseriate, most of the cells upright or square. Fibers in radial rows; pits simple; starch grains often present. (Yale No. 8854.)

Miconia impetiolaris (Sw.) Don. "Sirín." Small tree in lowland forests, with wood similar to that of preceding species. Not utilized. Thin, gray, fine-wrinkled bark. (Yale No. 8854.)

Miconia aff. *Langlassei* Standl. "Sirín." Small tree in lowland forest, with greenish gray, thin, and smooth bark. Wood similar to that of preceding species. Not utilized. (Yale No. 8855.)

Meliaceae

Cedrela sp. "Cedro." The Spanish cedar attains large dimensions but the tree is of rare occurrence in this region. (Yale No. 8901.) (For information regarding various species of *Cedrela* see *T. of T. A.*, pp. 340–8.)

Guarea excelsa H.B.K. (?) "Cedrillo." Medium-sized tree in lowland forest. Specimen collected was covered with ants. No uses of timber known.

Wood pale reddish, moderately hard, strong, straight-grained, finishes smoothly. Resembles birch (*Betula lenta*) in general appearance and properties. Pores small, scattered. Parenchyma in numerous, wavy, concentric lines. Rays fine and inconspicuous. (Yale No. 8853.)

Swietenia macrophylla King. "Caoba." The mahogany tree attains a height of 125 to 150 feet, with a bole clear of limbs for 60 or 70 feet, the base buttressed for 12 to 15 feet in largest specimens, the average diameter above the spurs about 30 inches (max. 60 in.). Occurs scatteringly in the forest. The timber is exported and is the same as the British Honduras mahogany. (Yale Nos. 3694, 3725, 8926, 8927.) (For information regarding *Swietenia* see *T. of T. A.*, pp. 348–356.)

Trichilia izabalana Blake. "Carbón," "carboncillo," or "cola de pavo." Tall tree, sometimes 120 feet high, with a long, straight, but not uniformly round bole, 20 to 35 inches in diameter. It occurs on dry, sandy soil, well-drained flats, and hillsides. Logs will not float. The timber is easy to work and is suitable for the same uses as "aguacatillo."

Wood pale reddish, rather hard and heavy, somewhat cross-grained, finishes smoothly, taking a high polish, with good subsurface luster. Pores of about the same size as in *Swietenia*. Numerous wavy lines of wood parenchyma visible without lens. Rays fine and indistinct. (Yale No. 8886.)

Moraceae

Brosimum terrabanum Pittier. "Masico." ("Breadnut" of British Honduras.) A medium-sized tree, the leaves of which are used for fodder for cattle. Not very plentiful.

Wood pale brown or nearly white, hard and strong, being of about the consistency of hickory (*Carya*), not difficult to work, finishes smoothly, is not durable. (Yale No. 3675.) (For structural details see *T. of T. A.*, p. 138.)

Castilla elastica Cerv. "Ule." Medium-sized tree, common along rivers and in rich bottomlands. The latex is used locally to make rubber coats by a sun-vulcanizing process.

Wood whitish, light, soft, rather coarse-textured. Not utilized. (See *T. of T. A.*, pp. 128–130.)

Cecropia sp. "Guarumo." ("Trumpet" of British Honduras.) Slender tree with hollow stems and very large peltate leaves, common in second growth. Not utilized.

Chlorophora tinctoria (L.) Gaud. "Mora." ("Fustic" of the trade.) Small tree, with flat crown and short, irregular bole covered with smooth, gray bark. Twigs with spines.

Wood yellow, very hard, strong, durable. Used as a source of dye. (Yale Nos. 3929, 8911, 8925.) (For detailed description see *T. of T. A.*, pp. 118–122.)

Ficus glabrata H.B.K. "Amate." Large fig tree with wide-spreading crown and smooth latescent bark. Common on river banks and in pastures. The fruits are sometimes used for making preserves. Timber not used. (See *T. of T. A.*, pp. 142–3.)

Ficus Hemsleyana Standl. "Mato palo." Strangler fig common on trees in the bottomlands. Not utilized.

Myrsinaceae

Parathesis macranthera D. Sm. "Manchador." Small tree in dense forests of bottomlands. Not utilized.

Wood pinkish, rather light and soft, fine-textured. Pores very small, scattered. Rays distinct, suggesting beech (*Fagus*). (Yale No. 8856.)

Parathesis Rekoi Standl. "Chimiche." Small tree of the dense lowland forest. Not utilized.

Wood resembling white oak (*Quercus alba* L.) in color and general appearance, but moderately light and soft, easy to work, takes a smooth finish. Rays very conspicuous, producing beautiful oak-like figure on quarter-sawn lumber. (Yale No. 8875.)

Parathesis serrulata (Sw.) Mez. Small tree, common in lowland forest. Not utilized.

Wood similar to preceding, only somewhat harder and heavier. Both well suited for furniture and cabinet work if they can be had in proper sizes. (Yale Nos. 8834, 8847.)

Myristicaceae

Virola merendonis Pittier. "Sangre." ("Banak" of British Honduras.) Large tree, 125 feet high, with trunk sometimes 50 inches in diameter (av. 35 in.) and free of limbs for 90 per cent of its length, growing in all kinds of soil. Logs will float. Timber of medium density, easy to work, finishes smoothly. Used for battens and interior work. Is not resistant to decay or to ants. Logs subject to pinworm attack. (Yale Nos. 3679, 8838.) Timber of this species now being exported from British Honduras to the United States, mostly for manufacture of plywood. (See *Tropical Woods* 4: 12–13, Dec. 1, 1925.)

Ochnaceae

Ouratea podogyna D. Sm. Medium-sized tree in lowland forest. Not utilized.

Wood pale brown, moderately hard and heavy, fairly straight-grained, medium-textured, not difficult to work, not durable. Pores barely visible, irregularly scattered, mostly single. Parenchyma not visible without lens, forming fine, irregular network with the rays. Rays distinct on cross section. (Yale No. 8857.)

Palmaceae

Attalea Cohune Morris. "Palma de manaca" or "palma de coroza." ("Cohune palm" of British Honduras.) The most common palm of the region. Leaves much used for thatch. Kind of beer made by cutting hole about a foot square into the "cabbage" part and screening it tightly for about a week during fermentation. Kernel of nuts yields high grade oil ("Cohune oil") but extraction is very difficult on account of the hardness of the thick shells. These shells were used during the war as a source of charcoal for gas masks.

Bactris sp. "Guiscoyol." ("Pokenoboy" or "pork-and-doughboy" of British Honduras.) Slender palm, very spiny throughout. The fruit is edible. Stems used for rafters and partitions of huts, and for making fish traps.

Chamaedorea sp. "Lancitillo." ("Monkey-tail" of British Honduras.) Small slender palm with very stout stem. Not utilized.

Cocus nucifera L. "Palma de coco." The coconut, planted for its fruit.

Oreodoxia regia H.B.K. "Palma real." The royal palm, often planted.

Pinaceae

Pinus caribæa Mor. "Pino." This three-needle pitch pine, which is the same as that of British Honduras, is common in hilly interior localities and on sandy flats with hardpan (talpetate), grows in open stands and is usually slender. Used for piling.

Pinus oöcarpa Schiede. "Ocote" or "pino." This pine usually has its needles in clusters of 5 (sometimes 3 or 4) and is more like the white pine and the wood is softer than that of the preceding. Tree confined to hills.

Wood light-colored, uniform-textured, with no dense bands of late wood in growth rings. Resin ducts conspicuous. Pits between ray parenchyma cells and wood tracheids small, simple, 3 to 5 per cross field. Ray tracheids with upper and lower walls smooth to reticulate. (Yale Nos. 3715, 3735; Honduras.)

Poaceae

Bambos aculeata (Rupr.) Hitchcock. "Tarro grande." Stems used for poles and gutters, cut into sections for planting pots, and when partially split and flattened out serve for floors, siding, and partitions of native huts.

Rubiaceae

Chomelia Recordii Standl. "Clavo." (See p. 9.) Small tree, with somewhat fluted trunk, occurring in dense forest. Not utilized.

Wood very light brown, moderately hard and heavy, straight-grained, very fine-textured, easy to work, not durable. Suitable for small turned articles. Pores minute, very numerous. Parenchyma not visible. Rays barely visible. (Yale No. 8862.)

Ixora nicaraguensis Wernham. "Amaco." Small tree, common in lowland forest. Not utilized.

Wood similar to preceding, but somewhat denser, pores less numerous. Parenchyma in exceedingly fine network scarcely visible with lens. Rays not visible without lens. (Yale Nos. 8840, 8866.)

Posoqueria latifolia (Rudge) R. & S. "Chintonrol." ("Snake-seed tree" of British Honduras.) Small or medium-sized tree found in dense lowland forest. Not utilized.

Wood similar to preceding. Parenchyma network very distinct under lens. Some of the rays visible without lens. (Yale No. 8858.)

Randia armata (Sw.) DC. "Torolillo." Small tree of lowland forest, with very thin, brown, fibrous bark. Not utilized.

Wood pale brown, hard, heavy, tough, and strong, very fine-textured, straight-grained, not durable. Suitable for tool handles. Differs from preceding woods in having few pores and parenchyma in distinct tangential or concentric bands. Rays uniform, minute, not visible without lens. (Yale No. 8867.)

Rutaceae

Esenbeckia pentaphylla (Macfad.) Gris. "False candlewood." Medium-sized tree with smooth, greenish bark showing irregular vertical rows of light-colored lenticels. Fruits woody, star-shaped capsules. Timber not utilized.

Wood light yellow, hard, heavy, tough, and strong, fine-textured, fairly straight-grained, difficult to split, takes a high polish. Suitable for handles and articles of turnery. Pores small, faintly visible, scattered, mostly in radial pairs. Parenchyma in distinct tangential bands of variable width and spacing. Rays fine, faintly visible. (Yale No. 8851.)

Zanthoxylum Kellermanii P. Wils. "Lagarto." ("Prickly yellow" of British Honduras.) Large tree, about 100 feet high, with well-formed trunk having an average diameter of 35 inches above the buttresses, which may be 8 to 12 feet high. Bark very thick and usually covered with large thorns. Timber used locally for bridge boards, but suitable for flooring, ceiling, and house frames.

Wood pale yellow, with little distinction between heart and sap. Moderately hard, fairly straight-grained, coarse-textured, easy to work, finishes smoothly, is not very durable. Parenchyma in distinct, wavy, tangential bands. (Yale Nos. 8895, 8928.) (For description of other species see *T. of T. A.*, pp. 317–321.)

Salicaceae

Salix chilensis Molina (= *S. Humboldtiana* Willd.). "Sauce." This willow is a slender, graceful tree common along the banks of the Motagua River and in swamps. Not utilized. The Humboldt willow is also found along the upper Belize River in British Honduras, and is very generally distributed elsewhere in tropical America. The wood is similar to that of the black willow (*Salix nigra* Marsh.) of the United States. (For description of the wood see *T. of T. A.*, pp. 106–7.)

Sapindaceae

Cupania macrophylla A. Rich. "Carbón colorado." Small or medium-sized tree in lowland forest.

Wood pinkish, of medium density to rather light and soft, fine-textured, easy to work, finishes smoothly, is not durable. Not utilized. (Yale Nos. 3722, 8833.)

Sapotaceae

Achras Chicle Pittier. "Nispero" or "zapotillo." ("Chicle macho" of British Honduras.) Tall tree found at elevation of 1000 feet near Izabal, with smooth, entire, leathery leaves and clusters of white flowers. Latex used to limited extent for chicle, though the principal source of this gum is *Achras Zapota* L. of the Peten region.

Wood dark red, very hard, heavy, strong, fine-textured, durable. Similar in properties to "bullet wood" or "massaranduba" (*Mimusops*). (Yale Nos. 3734, 3745, 8944.)

Calocarpum mammosum (L.) Pierre. "Sapote." Large tree of the uplands, sometimes 100 feet high, with erect but usually short trunk covered with a reddish brown, shaggy, latescent bark. The fruit is edible.

The brown wood is rather hard, mostly straight-grained, easy to work, fairly durable. Little utilized as the trees are chiefly valuable for their fruit. (Yale No. 3680.) (See *T. of T. A.*, pp. 491–2.)

Lucuma izabalensis Standl. "Silion." Large tree, 125 feet high, with a merchantable length of 50 to 60 feet, and average diameter of 25 inches (max. 40 in.). Logs will not float. Timber checks badly in the log, thus reducing its value for heavy and durable construction.

Wood pale reddish brown, rather hard and heavy, tough and strong, straight-grained, rather fine-textured, not difficult to work, finishes smoothly. Suitable for handles and spokes. (Yale Nos. 3700, 8841.) (For botanical description see *Tropical Woods* 4: 6, Dec. 1, 1925.)

Sideroxylon Tempisque Pittier. "Tempisque." Medium-sized tree, with short, thick, often irregular bole, growing sparingly on sandy soil. Fruit edible.

Wood yellow, hard, heavy, strong, with somewhat irregular grain, texture medium, not very easy to work, but taking a high polish. Durability doubtful. (Yale No. 3730.) (For further details see *T. of T. A.*, pp. 493–4.)

The above woods of the Sapotaceae may be distinguished as follows: *Sideroxylon*—yellow, pores single or in scattered groups of 2 or 3, parenchyma in irregular network with rays. *Calocarpum*—brown, pores in radial groups of 2 to 4, the groups tending to form diagonal chains, parenchyma in irregular network with the rays. *Lucuma*—pale reddish brown, pores much the same as in preceding, parenchyma in distinct, but not sharply defined, concentric lines or narrow bands. *Achras*—dark red, pores in radial chains, parenchyma in fine, irregular, but sharply defined, tangential lines; wood considerably denser than others.

Solanaceae

Solanum bicolor Willd. Small tree in lowland forest. Not utilized.

Wood white or straw color, rather light and soft, medium-textured, not durable. Pores faintly visible, not very numerous, occurring singly, in pairs, or in small clusters. Parenchyma not visible. Rays fine, but visible.

Minute anatomy: Vessel perforations simple, intervascular pits rather large, with coalescing apertures. Rays heterogeneous, 1 to 4 cells wide and up to 30 cells high, the cells of the uniseriate rays upright; pits into vessels of same size and appearance as the intervascular. Fibers in radial rows, apertures rather large, pits with minute circular borders and slit-like apertures. Parenchyma scantily developed about vessels. (Yale No. 8859.)

Sterculiaceae

Guazuma ulmifolia Lam. "Caulote." ("Bay cedar" or "pixoy" of British Honduras.) Small or medium-sized tree of common occurrence in the forest. Wood not utilized. Fruits serve as food for domestic animals. (Yale No. 8844.) (For detailed description of wood see *T. of T. A.*, pp. 428–9.)

Tiliaceae

Heliocarpus Donnell-Smithii Rose. "Mahau." ("Yellow moho" of British Honduras.) Medium-sized tree, common on uplands and hillsides. Not utilized.

Wood white, exceedingly light and soft, spongy and fibrous, perishable. Pores resemble pinholes, scattered. Rays distinct. Poorly lignified tissue in wavy, concentric bands wider than denser fiber layers. Ripple marks present, irregular, visible; larger rays not storied. (Yale Nos. 8865, 8881.) (See *T. of T. A.*, pp. 408–9.)

Luehea Seemannii Tr. & Pl. "Tapasquit," "cotonron," or "llallo." Large tree, 90 feet high, with very irregular trunk and high buttresses, growing in dense lowland forest.

Wood pinkish brown, of medium density, rather fine-textured, easy to work, not durable. Not utilized. (Yale Nos. 3671, 8835.) (See *T. of T. A.*, pp. 407–8.)

Verbenaceae

Vitex longeracemosa Pittier. "Barbás." Tree 90 feet high, with well-formed bole 30 inches in diameter. Bark smooth, thin, whitish. Leaves opposite, palmately compound; small, racemose flowers lilac.

Wood yellowish throughout; moderately hard and heavy, medium-textured, finishes smoothly. Not utilized. (Yale Nos. 3733, 8897.) (For detailed description see *T. of T. A.*, pp. 526–7.)

Vitex sp. "Rajate bien." Medium-sized tree, with thin gray bark and opposite compound leaves with three leaflets. Grows in sandy loam.

Wood dull brown, sometimes streaked, moderately hard, straight-grained, medium-textured, easy to work, finishes smoothly, easy to split, dries very slowly, is durable. Suitable for construction timber. (Yale No. 3684.)

Violaceae

Rinorea guatemalensis (Wats.) Bartlett. Small tree in lowland forest, with very thin bark, flaking off irregularly. Not utilized.

Wood yellowish, hard, heavy, and strong, straight-grained, fine-textured, not difficult to work, takes a high polish, is not durable. Pores not visible without lens, numerous, in long radial rows. Rays rather fine, but very distinct.

Minute anatomy: Vessels with scalariform perforations, many narrow bars, often anastomosing more or less; intervascular pits very small, crowded, variable in shape, tending to scalariform. Rays heterogeneous, most of the cells upright or square; 1 to 4 cells wide and few to about 100 cells high; pits into vessels larger than the intervascular, variable, often scalariform. Fibers in radial rows; some with gelatinous layers; pits simple. Parenchyma sparingly developed about vessels. (Yale No. 8850.)

Vochysiaceae

Vochysia guatemalensis Donn. Smith. "San Juan" or "sanpadranno."

Rather large, well-formed tree, with a trunk two feet in diameter. Not abundant. The slender yellow flowers are conspicuous.

Wood pinkish brown, very light in weight, but fibrous and tough, coarse-textured, easy to cut, but saws wooly, does not appear highly durable. (Yale Nos. 3681, 3708, 8919.) (For detailed description see *T. of T. A.*, pp. 366–8.)

Check List of Common Names

Achiote	*Oncoba laurina* (Presl.) Warb.	Flacourtiaceae
Aguacatillo	*Nectandra glabrescens* Benth.	Lauraceae
Aguacatillo	*Phoebe ambigens* Blake	Lauraceae
Amaco	*Ixora nicaraguensis* Wernh.	Rubiaceae
Amate	*Ficus glabrata* H. B. K.	Moraceae
Anona	*Anona* sp.	Anonaceae
Balsa	*Ochroma* spp.	Bombacaceae
Barajo	*Cassia reticulata* Willd.	Leguminosae
Barbás	*Vitex longeracemosa* Pittier	Verbenaceae
Bolador	*Terminalia obovata* (R. & P.) Eichl.	Combretaceae
Candlewood, false	*Esenbeckia pentaphylla* (Macfad.) Gris.	Rutaceae
Caoba	*Swietenia macrophylla* King	Meliaceae
Carbón or carboncillo	*Trichilia izabalana* Blake	Meliaceae
Carbón colorado	*Cupania macrophylla* A. Rich.	Sapindaceae
Caulote	*Guazuma ulmifolia* Lam.	Sterculiaceae
Cedar	*Cedrela* sp.	Meliaceae
Cedrillo	*Guarea excelsa* H. B. K. (?)	Meliaceae
Cedro	*Cedrela* sp.	Meliaceae
Ceiba	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Chaperno	*Andira inermis* H. B. K.	Leguminosae
Chichimi	*Hasseltia mexicana* (Gray) Standl.	Flacourtiaceae
Chichipate	*Sweetia panamensis* Benth.	Leguminosae
Chilicuate	*Sapium pleiostachys* K. Schum.	Euphorbiaceae
Chimiche	*Parathesis Rekoi* Standl.	Myrsinaceae
Chintonrol	*Posoqueria latifolia* (Rudge) R. & S.	Rubiaceae
Chozo	*Licania hypoleuca* Benth.	Amygdalaceae
Ciruela	*Astronium Conzattii* Blake	Anacardiaceae
Cojon de mico	*Tabernaemontana amygdalifolia* Jacq.	Apocynaceae
Cola de mico	*Pithecolobium arboreum* (L.) Urb.	Leguminosae
Cola de pavo	*Trichilia izabalana* Blake	Meliaceae
Comasuche	*Maximilianea vitifolia* (Willd.) Krug. & Urb.	Bixaceae
Cortes	*Tecoma* sp.	Bignoniaceae
Cotonron	*Luehea Seemannii* Tr. & Pl.	Tiliaceae
Cotton-tree	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Cuajinicuil	*Inga Rodrigueziana* Pittier	Leguminosae
Encino	*Quercus* spp.	Fagaceae
Frijolillo	*Andira excelsa* H. B. K. (?)	Leguminosae

Granadillo	*Dalbergia cubilquitzensis* (D. Sm.) Pittier	Leguminosae
Guacayamo	*Andira excelsa* H. B. K. (?)	Leguminosae
Guacuco	*Casearia aculeata* Jacq. (?)	Flacourtiaceae
Guambo	*Phoebe ambigens* Blake	Lauraceae
Guamo	*Inga Rodrigueziana* Pittier	Leguminosae
Guamo macho	*Inga Recordii* Britt. & Rose	Leguminosae
Guanacaste	*Enterolobium cyclocarpum* (Swartz) Gris.	Leguminosae
Guapinol	*Hymenæa Courbaril* L.	Leguminosae
Guarumo	*Cecropia* sp.	Moraceae
Guascanol	*Acacia Cookii* Safford	Leguminosae
Guayabillo or guayabo	*Terminalia obovata* (R. & P.) Eichl.	Combretaceae
Guiscoyol	*Bactris* sp.	Palmaceae
Hormigo	*Platymiscium polystachyum* Benth.	Leguminosae
Indio desnudo	*Bursera Simaruba* (L.) Sarg.	Burseraceae
Jenequite	*Bursera Simaruba* (L.) Sarg.	Burseraceae
Jobo	*Spondias lutea* L.	Anacardiaceae
Jocote	*Spondias lutea* L.	Anacardiaceae
Junero	*Dalbergia cubiliquitzensis* (D. Sm.) Pittier	Leguminosae
Lagarto	*Zanthoxylum Kellermanii* P. Wils.	Rutaceae
Lancitillo	*Chamaedorea* sp.	Palmaceae
Laurel	*Cordia* spp.	Borraginaceae
Leche amarilla	*Symphonia globulifera* L. f.	Guttiferae
Llallo	*Luehea Seemannii* Tr. & Pl.	Tiliaceae
Mahau	*Heliocarpus Donnell-Smithii* Rose	Tiliaceae
Mahogany	*Swietenia macrophylla* King	Meliaceae
Manchador	*Parathesis macranthera* D. Sm.	Myrsinaceae
Manuno	*Cordia diversifolia* Pavón	Borraginaceae
Maquelis or maquelizo	*Tecoma pentaphylla* Juss.	Bignoniaceae
Masico	*Brosimum terrabanum* Pittier	Moraceae
Matiliscuate	*Tecoma pentaphylla* Juss.	Bignoniaceae
Mato palo	*Ficus Hemsleyana* Standl.	Moraceae
Mora	*Chlorophora tinctoria* (L.) Gaud.	Moraceae
Moro	*Quararibea asterolepis* Pittier	Bombacaceae
Naranjo	*Terminalia obovata* (R. & P.) Eichl.	Combretaceae
Nispero	*Achras Chicle* Pittier	Sapotaceae
Ocote	*Pinus oöcarpa* Schiede	Pinaceae
Palanco	*Anaxagorea guatemalensis* Standl.	Anonaceae
Paleta	*Dialium divaricatum* Vahl	Leguminosae
Palma de coco	*Cocus nucifera* L.	Palmaceae
Palma de coroza	*Attalea Cohune* Morris	Palmaceae
Palma de manaca	*Attalea Cohune* Morris	Palmaceae
Palma real	*Oreodoxa regia* H. B. K.	Palmaceae
Palo chino	*Bursera Simaruba* (L.) Sarg.	Burseraceae

Palo de vaca	*Couma guatemalensis* Standl.	Apocynaceae
Palo jiote	*Bursera Simaruba* (L.) Sarg.	Burseraceae
Palo obero	*Astronium Conzattii* Blake	Anacardiaceae
Pata de cabro	*Cynometra retusa* Britt. & Rose	Leguminosae
Pepe nance (?)	*Zygia Recordii* Britt. & Rose	Leguminosae
Pimientillo	*Symphonia globulifera* L. f.	Guttiferae
Pino	*Pinus* spp.	Pinaceae
Pito or piton	*Erythrina rubrinervia* H. B. K.	Leguminosae
Plumajillo	*Schizolobium parahybum* (Vell.) Blake	Leguminosae
Quina	*Hasseltia mexicana* (Gray) Standl.	Flacourtiaceae
Rajate bein	*Vitex* sp.	Verbenaceae
Roble or roblecito	*Quercus* spp.	Fagaceae
Ronrón	*Astronium Conzattii* Blake	Anacardiaceae
Sangre	*Virola merendonis* Pittier	Myristicaceae
San Juan	*Vochysia guatemalensis* D. Sm.	Vochysiaceae
Sanpadranno	*Vochysia guatemalensis* D. Sm.	Vochysiaceae
Santa María	*Calophyllum Calaba* Jacq.	Guttiferae
Sapote	*Calocarpum mammosum* (L.) Pierre	Sapotaceae
Sauce	*Salix Humboldtiana* Willd.	Salicaceae
Silion	*Lucuma izabalensis* Standl.	Sapotaceae
Sirín	*Miconia* spp.	Melastomaceae
Sucte	*Carpotroche platyptera* Pittier	Flacourtiaceae
Tamarindo	*Dialium divaricatum* Vahl	Leguminosae
Tambor	*Ochroma bicolor* Rowlee	Bombacaceae
Tapasquit	*Luehea Seemannii* Tr. & Pl.	Tiliaceae
Tarro grande	*Bambos aculeata* (Rupr.) Hitch.	Poaceae
Tempisque	*Sideroxylon Tempisque* Pittier	Sapotaceae
Torillo	*Randia armata* (Sw.) DC.	Rubiaceae
Tortugo	*Crataeva Tapia* L.	Capparidaceae
Ule	*Castilla elastica* Cerv.	Moraceae
Willow	*Salix chilensis* Molina	Salicaceae
Zapotillo	*Achras Chicle* Pittier	Sapotaceae
Zapotón	*Pachira macrocarpa* Walp.	Bombacaceae
Zorra	*Schizolobium parahybum* (Vell.) Blake	Leguminosae

"COW TREES"

The new species of *Couma* (see pp. 8, 13) adds another to the list of so-called "cow trees." The first, a *Brosimum* (Moraceae), was discovered in Venezuela by Alexander von Humboldt 125 years ago. Richard Spruce found another, a *Mimusops* (Sapotaceae), in Pará, Brazil. Dr. Pittier says (*Las plantas usuales de Venezuela*, p. 394) that the sweet and palatable latex of *Couma sapida* Pittier deserves serious study as a possible substitute for the milk of mammals.

NATIVE WOODS USED FOR RAILWAY CROSSTIES IN BRITISH HONDURAS

By G. W. E. Francis, *Superintendent, British Honduras Railway*

During the construction of the Government Railway in Stann Creek, British Honduras, some 16 years ago, use was made of creosoted Norwegian pine crossties or sleepers. In 1914 these were replaced in the older sections of the line by ties of native woods and since then no sleepers have been imported.

The gauge of the railway is 3 feet, and the rails are 40 lbs. standard, flat bottom, 30 feet long. The road bed is ballasted over the whole length of 25 miles. Traffic consists of three trains (up to 200 tons total weight each) on an average per week, motor and pump cars the whole time, and freight trains for the local timber contractors once or twice daily towards the end of the dry season. It is expected that logging trains will be more frequent during the next few years while a large lumber company is operating at the head of the line. About 15 miles of track are on the level coastal plain which has been freed from forest growth and extensively cultivated, and is consequently drier than the 10 miles running up into the hills and the bush, where the rainfall is about 100 inches per annum.

Following is a summary of the observations to date. More detailed examinations are under way.

Starting in July, 1914, six native woods were selected for trial. These were made from young poles having a heartwood of 5 to 6 inches and were cut into ties 7 feet by 7½ to 8 inches by 6 inches.

It was found that the water content of Santa María, Nargusta, and Salmwood was less than in Waika Chewstick, My Lady, and Bullhoof, and later that Ridge Redwood and Yemeri could be classed with the first three, both on a basis of moisture content and freedom from becoming brittle with age.

All the ties are air-dried under shelters along the railside for periods up to four months. A brush treatment of preservative has been tried in several instances, but the heavy rains and

the hot sun bleach the wood so quickly that the treatment adds only about a year to the life of the sleeper. The woods with initial lower water content appear to be less brittle when dried and to absorb the preservative more readily than the others. In the hinterland these woods last 3½ or 4 years without treatment and 4 to 5 years when treated. Nearer to the coast where the humidity is less, untreated ties, if properly air-dried before being put in the track, last 4½ or 5 years, while of those treated a large percentage last 5 or 6 years.

In the sections of line where the ground is continually damp and shaded, especially on curves without rail braces and far inland, the ties sometimes rot earlier through being "nail-killed" ("spike-killed"). These "nail-killed" sleepers will probably last just about two-thirds as long as those ties in which the nails (spikes) were not "pulled" and the rail re-spiked. These very damp sections are more conducive to fungous growth on the sleepers.

My Lady and Bullhoof are very brittle when matured. Should the nails be drawn from sleepers of these woods after the first two years they will certainly be "nail-killed." When these woods are very dry they absorb much moisture during the wet season and become so brittle in the succeeding dry weather that, if not properly packed with ballast directly under the rails and "shoulders," they invariably break under the pressure of the rolling stock.

Waika Chewstick is fairly durable and when fully mature holds well in the track, lasting often as long as Nargusta and Yemeri. The sapwood contains more water than Santa María or Nargusta, though the heart has a comparatively small water content and tends to become brittle with age and to break in the same way as My Lady and Bullhoof.

A few sleepers made from Banak and native Cypress have been used during the last year or two, but no check on their durability has been made. They are, however, still in good condition.

It is thought that better results would be obtained if the sleepers were sawn to size from mature timber instead of being hewn from small poles, as the proportion of heartwood would be greater. It is a noticeable feature of all the woods used that those cut on the "broken ridge" are harder and more resistant

than those grown on richer soil. They have a smaller water content, less sap in the mature tree, and the fiber is firmer and more set. The wood from the richer soil invariably commences to decay earlier than the wood from the broken ridge.

Atmospheric conditions in this valley put a severe test on all woods and the great changes of moisture and heat contribute largely to the early deterioration of any woods with the possible exceptions of Ironwood, Axemaster, Cortez, Black Bullet Tree, and Black Sapodilla. These have not been used as sleepers as the cost of extraction has hitherto been prohibitive.

Following is a rough classification of the woods in use, together with their botanical names:

Santa María	*Calophyllum Calaba* Jacq.
Nargusta	*Terminalia obovata* (R. & P.) Eichl.
I Salmwood	*Cordia Gerascanthus* L.
Ridge Redwood	*Mosquitoxylum jamaicense* K. & U.
Yemeri (heart only)	*Vochysia hondurensis* Sprague.
Waika Chewstick	*Symphonia globulifera* L.f.
II My Lady	*Aspidosperma megalocarpon* Muell.
Bullhoof	*?Drypetes* sp.

NOT YET CLASSED

Banak	*Virola merendonis* Pittier
Cypress	*Podocarpus coriaceus* Rich.

OUTCOME OF "PHILIPPINE MAHOGANY" CASE

On July 15, 1926, the Federal Trade Commission (U. S. A.) ordered that the respondents (Thomas E. Powe Lumber Co., Indiana Quartered Oak Co., and Jones Hardwood Co.) "do cease and desist from advertising or selling or offering for sale, under the term 'Mahogany,' 'Philippine Mahogany,' or any other term of similar import, woods known under the common or trade names, 'red lauan,' 'tanguile,' 'narra,' 'apitong,' 'bataan,' 'lamao,' 'almon,' 'orion,' 'batang,' 'bagaac,' 'batak,' and 'balacbacan,' or any other wood, lumber, or wood products, unless such wood or lumber, or the wood from which such products are made, is derived from trees of the Mahogany or Meliaceae family."

NOTE ON "ARBOLOCO"

By SIDNEY F. BLAKE

In *Tropical Woods* (2: 3, June 1925) editorial mention is made of the description by M. T. DAWE ("*Account of a journey through the western portion of Colombia*. Publ. by Col. Bu. Inf. and Trade Propaganda, London, 1919, p. 10") of "arboloco," a Colombian tree identified as *Montanoa Moritziana* Sch. Bip. The writer has recently studied material, borrowed from the Kew Herbarium, collected by Mr. Dawe, and finds it to be not *M. Moritziana* (a *nomen nudum*, synonymous with *M. quadrangularis* Sch. Bip.), but the closely related *Montanoa Lehmannii* (Hieron.) Blake.[1] The herbarium label describes it as a "tree about 30 ft. high confined to volcanic lands north of Manizales in Caldas. Timber is very durable and is used for beams in the construction of buildings, for making billiard cues, etc. The bole is hollow, but the timber has a great reputation for its strength and durability, notwithstanding."

In his note on this subject, Prof. Record gives a description of a specimen of the wood of "arboloco" sent him from Bogotá, accompanied by fruiting specimens identified by the present writer as a species of *Montanoa*. He considered the wood "so plain and ordinary" in appearance that it seemed unlikely to be of value for the manufacture of billiard cues. The specimen examined was not hollow, but had a pith an inch and a half thick.

The genus *Montanoa* is chiefly Mexican, but at least four species occur in the elevated regions of northwestern South America, from Venezuela and Colombia to northern Peru. The commonest one in herbaria is *M. ovalifolia* DC., which ranges from Colombia to northern Peru and appears to be common about Bogotá, where it has been collected by Mr. Dawe (No. 300, in Kew Herb.) as well as by others. It is probable that the specimen of the wood of "arboloco" supplied by Mr. Jorge Pinzón de Castilla from Bogotá was of this species, and it may well be that *M. Lehmannii* has a

[1] BLAKE, *Journ. Washington Acad. Sci.* 16: 216. 1926.

different trunk and wood. *Montanoa quadrangularis* Sch. Bip. (of which *M. Moritziana* Sch. Bip. and *Montagnæa excelsa* Ernst are synonyms) occurs in Colombia (?), in Mérida, and even as far east as Galipán, near Caracas, whence came the type *Montagnæa excelsa*. The latter, known as "tara blanca," was described by Ernst as a tree up to 12 meters high and 20 to 30 cm. thick, with spongy wood and very thick pith. Owing to the weakness of the trunks they are often shattered by the wind at a height of 4 or 5 meters, whereupon there spring from the root a great number of sprouts which soon attain considerable size. As Ernst makes no reference to any useful application of the tree, it is probable that it has none.

Most of the Mexican and Central American species of the genus are shrubs. *M. hexagona* Rob. & Greenm., of Chiapas, is described as a large tree, and *M. Rekoi* Blake, of Oaxaca, as a large tree with a trunk 0.5 meter thick, and corklike bark. It contains a rosin or camphor-like substance which burns like pitch.

Correction

In "Notes on Cuban woods" (*Tropical Woods* 6: 12), the statement that *Juniperus saxicola* Britton & Wilson may be only a form of *J. lucayana* Britton was an editorial mistake arising from a combination of two separate memoranda on the subject. Prof. León writes that he considers the former species valid; that it grows in the high ridges of the Sierra Maestra and should not be confused with the "sabinas" of the coastal lands and highlands, as Sierra de Nipe. These coastal and highland "sabinas" are the ones which are believed to represent a single species, *J. lucayana*.

Prof. León also states that "dagame" is pronounced with the accent on the second syllable, rather than on the first. The erroneous pronunciation given in the article was made upon authority which the editor considered reliable.

The subscription price of *Tropical Woods* is One Dollar per year of four numbers.

CURRENT LITERATURE

Mahogany—Antique and modern. A study of its history and use in the decorative arts. Edited by William Farquhar Payson. New York: E. P. Dutton & Co., 1926. Pp. 154+xxii; 8½ x 13; 250 pp. of half-tone plates. Price $15.

This magnificent volume makes its appeal to architects, interior decorators, furniture manufacturers and craftsmen, and also to laymen interested in traditional decorative designs and to the practical application of these designs to present-day living conditions.

The first chapter, "In the forest," is by the editor, and his descriptions of the tree and of the logging operations are supplemented by many telling illustrations.

"Mahogany and the cabinet-maker of today" is the contribution of Mr. Karl Schmieg, for years one of the leading craftsmen of England, today perhaps the foremost cabinet-maker in America. His chapters on "The preparation of the wood," "The nature of mahogany," and "The working and finishing of the wood" serve as a manual of highest authority.

"Mahogany in architecture" is the work of Mr. Kenneth M. Murchison. There are four chapters: "Noteworthy English interiors," "Decorative treatment in France," "Colonial architecture in the United States," and "Mahogany in modern use." The home builder finds a wealth of information in text and well-chosen illustrations.

Mr. Henry B. Culver, author of *The Book of Old Ships*, contributes the part entitled, "Structural and decorative uses in marine architecture and boat-building." The earliest known use of mahogany by civilized man had to do with ships and from the time that Hernando Cortez, the conqueror of Mexico, repaired his vessels with that timber between the years 1521 and 1540, mahogany has proved its merit for frames and planking of wooden ships, as well as for interior trim of modern vessels.

There is a short article on "The piano and its prototypes" by Frances Morris, and a much longer one on "Historic furniture styles" by Mr. Charles Over Cornelius. Both authors are Associate Curators, American Art, Metropolitan Museum of Art, New York City. "The furniture of the

present day" is by Mr. Ralph Erskine. Here, as elsewhere, the text is beautifully and lavishly illustrated.

The two appendices include a "Technical description of mahogany" and "Architectural hints on mahogany," the latter by Mr. Kenneth M. Murchison.

Forestry in Haiti. By Wm. R. Barbour. *Yale Forest School News* 14: 3: 44–45, July 1926.

"In 1924 the Service Technique, a Department of Agriculture for the Republic, was organized under the direction of Doctor Geo. F. Freeman, and an American staff was assembled, including a chemist, a plant pathologist, an entomologist, a veterinarian, a horticulturalist, etc., their duties falling under the direction of a Director of Agronomy and a Director of Agricultural Teaching.

"In January, 1925, a Division of Silviculture was formed with the writer as Director, and in February practical work began. Appropriations totalled $25,000 which included both Forestry and the introduction of sisal."

"The first step in forestry proper was to make a reconnaissance of the island and study the existing species, the soil, topography, rainfall, and other factors. This has not been completed, but a great part of the republic has been covered, partly on foot, part by automobile, part on horseback, and some of the least accessible portions by aëroplane. The latter method has proven especially valuable in preliminary work."

"Haiti's commercial development has been so retarded that it is believed that forestry work has been begun in time to produce merchantable timber when needed. Fast growing species like wattle can produce firewood in seven years, before any shortage of fuel is apt to develop. It is not believed that Haiti will ever have to import firewood, as do the sugar centrals in Porto Rico, Barbados, and other islands. Logwood also grows rapidly, and new stands can probably be matured before the existing supplies are exhausted, at least at the present rate of exportation.

"There are in Haiti large areas of 'gommier,' whose wood is light, soft, and fairly tough. It has not been used because artificial drying methods are necessary to prevent warping and staining. It is hoped that a sawmill and dry kiln can be bought next year, and experiments carried on to produce 'gommier' lumber for construction purposes, crating material, and other uses to replace imported pine. Eventually, with improved transportation facilities, the pine regions should supply goodly amounts of rough lumber.

"During the ten remaining years of the American occupation, if appropriations continue adequate, it is hoped that great progress in forestry can be made. The silvicultural problems are complex, and there are few available data, but tropical rotations are so short that exact data on growth and silvicultural requirements can be obtained much quicker than in temperate regions. Haiti is centrally located in the Caribbean region, with a flora representative of the entire region from Venezuela to Florida and from the Leeward Islands to Mexico, so that data obtained here will be applicable over a wide territory. This is especially true on account of the widely varying topographic, soil, and climatic conditions. From a forester's viewpoint, there probably is no more interesting region in all tropical America than the backward, but potentially rich and important, Republic of Haiti."

Arbol del balsamo, *Toluifera Pereirae* (Klotzch) Baill. By Maximino Martínez. *Boletín de la Dirección de Estudios Biológicos* (Mexico) 3: 3: 49–51, May 1926.

Contains a description of the tree which produces the so-called "balsam of Peru," the various common names, methods of collecting the balsam, the uses of the material, analyses of the balsam, brief history, and bibliography.

Amapa prieta. By Jesus Gonzalez Ortega. *Mexico Forestal* 4: 3–4: 31–35, Mar.–Apr. 1926.

The "amapa prieta" (*Tabebuia Palmeri* Rose) is a tree 20 to 40 feet high and 8 to 24 inches in diameter, growing in all parts of the State of Sinaloa at altitudes of from 30 to 1300 feet. It requires from 100 to 150 years to reach maturity. The foliage, which is dense from July to October, is cast at the beginning of the flowering season. From November to March the trees are covered with beautiful white, lilac, or rose-colored

flowers which render the crowns conspicuous at long distances. The wood, which is obtained in pieces 16 to 20 feet long and 16 inches square, is of a greenish brown color and very dense (sp. gr. 1.02 to 1.10) and strong. The vessels contain abundant deposits of lapachol and the dust arising in milling operations produces reddish stains on the sweat-moistened portions of the laborers' clothing and also gives rise to a mild form of dermatitis. The timber is highly valued for house posts, beams, sills, and door and window frames; also for railway ties, fence posts, fuel and charcoal.

Tabebuia chrysantha (Jacq.) Nicholson yields a wood similar in properties and uses to the foregoing and is often confused with it in the timber trade. *Tabebuia pentaphylla* (Juss.) Hemsl., known as "amapola" or "amapa rosa," has a wood lighter in color and softer which is very good for cabinet-making. This wood is free from lapachol.

Report on the forests of British Honduras with suggestions for a far-reaching forest policy. By C. HUMMEL. Reprinted for the Forest Trust, Belize, 1925. Pp. 122; 5½ x 8½; 1 map. Price $1.00, postpaid.

"As this report constitutes the standard work on the forests of British Honduras, and the basis of the accepted forest policy of the Government, it was decided by the Forest Trust to reprint it in more convenient form, with the addition of an index. Revision has not been feasible. The report, written about four years ago, still gives an accurate presentment of the economic and forest problems of the Colony, and of the lines on which it is hoped to solve them. Substantial progress has been made, and some of the potentialities indicated, notably the pine and secondary woods industries and the silvicultural development of Mahogany and Sapodilla forests, have since become realities."—Introduction by J. N. OLIPHANT, Conservator of Forests, March 6, 1926.

Manual de las plantas usuales de Venezuela. By H. PITTIER. Caracas, 1926. Pp. 458 + xvi; 6½ x 9½; 42 half-tone plates.

This large volume is a notable contribution to the knowledge of Venezuelan plants and represents years of careful investigation on the part of the author. Dr. Pittier is also well known for his work in Central America, and those interested in tropical forestry are especially indebted to him for his contributions to the knowledge of the trees, particularly in Panama and Costa Rica.

This manual begins with a prologue by Dr. Lisandro Alvarado and a short preface by the author. The introduction covers 92 pages and is divided into three sections: (1) Investigation of the flora of Venezuela and the present status of our knowledge with regard to the same; (2) Outline of the distribution of the plants in Venezuela (with reference to topography, climate, and various formations); (3) The common plants of Venezuela (with reference to their uses and economic importance).

The enumeration of the common plants of Venezuela requires 320 pages. The arrangement is alphabetical on a basis of the common names. The information given includes the scientific name, the family, and synonyms; brief description of the plant; locality of growth; uses. There are numerous illustrations showing forest scenes, trees, leaves, flowers, fruits, etc.

The manual concludes with a list of the scientific names with their vernacular equivalents (pp. 415–452), and a bibliography (pp. 453–8).

Anatomical characters and identification of the important woods of the Japanese Empire. (In Japanese.) By RYOZO KANEHIRA. Report No. 4, Dept. of Forestry, Gov. Research Institute, Taihoku, Formosa, 1926. Pp. 297; 7½ x 10; 31 plates, mostly photomicrographs; keys, tables, indexes.

A comprehensive work, the first half of which is concerned with anatomical details, the second with descriptions of the woods by families and keys for their identification. Those who cannot read the text will nevertheless find the many excellent photomicrographs and sketches and the various tables exceedingly useful.

The swamp cypresses, *Glyptostrobus* of China and *Taxodium* of America, with notes on allied genera. By AUGUSTINE HENRY and MARION MCINTYRE. *Proc. Royal Irish Academy* (Dublin), Vol. XXXVII, Sec. B, No. 13, pp. 90–116, May 1926. Pls. 7.

Glyptostrobus is a very ancient genus of conifers, which is on the verge of extinction at the present day. Only one species (*G. pensilis* Koch) now survives in the living state, and this is restricted to two small areas near the coast in southeastern China, where it seems to have been preserved in cultivation by the superstitious beliefs of the people. It is unknown as a wild tree. It grows on swampy river banks subject to inundation, develops a single straight stem above an enlarged conical base, has a fibrous and stringy bark, carries a rather open loose crown with two distinct kinds of branchlets—perennial and annual—and the roots give rise to peculiar woody excrescences or "knees" which are unlike those of *Taxodium* in that they have a curious way of curving or bending over.

The paper gives a full account of *Glyptostrobus*, or Chinese "water pine," and makes comparisons with the allied genera *Taxodium*, *Wellingtonia*, and *Sequoia*. The account is well illustrated with photographs and drawings.

Kapok—A survey of its production within the Empire, with notes on its cultivation and uses. *Bulletin of the Imperial Institute* (London) 24: 18–36, June 1926.

The term "kapok" has been used for the product of a number of trees, but it should be restricted to the floss of *Ceiba pentandra* (L.) Gaertn. (=*Eriodendron anfractuosum* DC.). 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.

Administration report of the Forest Department of the Madras Presidency for the year ending 31st March 1925. (Two volumes.) By H. TIREMAN *et al.* Madras, 1926. Pp. 160 and 161; 6 x 10; ill. Price: I, Rs. 1-8-0; II, 12 As.

A report of unusual interest, made the more so by the introductory note of the Chief Conservator of Forests, which begins: "The Forest Department is and always has been the object of so much criticism that I think it will not be out of place if I take this opportunity of placing on record a short account of the aims and objects of forestry, the past administration of the department, the present situation, and the possibilities of the future." It is through such summaries that the outsider gets the best view of the situation as a whole, while a frank discussion of the difficulties of administration adds a human interest not found in dry statistics and serves to encourage foresters in similar positions elsewhere. Forestry, by the very nature of things, can be popular only in the abstract; its practical application demands sacrifice of the immediate for the remote, with consequent opposition by those from whom such sacrifice is required.

The reviewer is particularly interested in the report of the Forest Engineering Branch, as it indicates the possibilities

of modern logging methods in the exploitation of tropical forests and also gives an account of the means employed for getting new timbers introduced to the foreign trade. Laboratory tests at Dehra Dun are supplemented by practical tests of timbers in actual service by the Forest Department or by interested persons, firms, or other departments, and all existing data are brought together and correlated to the end that inquiries from prospective purchasers and users can be intelligently and promptly answered.

Progress report on forest administration in Jammu and Kashmir State for the Sambat year 1981 (1924–1925). By H. L. WRIGHT. Srinagar, 1925. Pp. 53 + il; 7 x 10; 8 halftone plates; 4 diagrams.

This is a substantially bound, fairly well-printed, and splendidly illustrated report covering the various activities of the forest administration for the year ending April 12, 1925.

This report bears ample testimony to the difficulties besetting forest operations in that portion of India and to the unremitting efforts to overcome them. One is impressed anew with the diversity of the factors involved in successful forest management and the variety of interests affected. The betterment of conditions for the people of the region is kept constantly in view, and the best interests of those dependent upon the forests are carefully considered. The report is full of references of this kind, one of which may be cited as follows (p. 41):

"Indirectly, too, the resin industry is a valuable asset to the State and to part of its people, for it provides employment in places where the zamindar has few opportunities of adding to his scanty income, and where many of the people are heavily in debt, and enables even boys to earn a living wage without interfering with their ordinary agricultural and domestic duties. In teaching these people the value of work, and in helping them to overcome their inherent indolence and to free themselves from the burden of debt, the Forest Department is playing an important part in improving the moral and physical well-being of the people of this part of the Jammu province."

Second interim report on the work under project No. 1 by the Section of Timber Testing, including the results of the mechanical and physical tests on certain of the commoner Indian timbers up to end of 1924. By L. N. SEAMAN. *The Indian Forest Records* (Economy series), Vol. XII, Part III, 1925. Pp. 20. Price 3s.

Monograph on the New Zealand beech forests. Part I. The ecology of the forests and taxonomy of the beeches. By L. COCKAYNE. Bul. No. 4, N. Z. State Forest Service, Wellington, 1926. Pp. 71; 6 x 9½; figs. 44; 2 maps. Price 4s.

A valuable contribution, comprehensive in scope and lucid in presentation. Beech (*Nothofagus*) forests now form by far the larger part of New Zealand's national forest wealth. "Up to recent years the timber furnished by the New Zealand beeches has been but little used—and even yet its employment is quite local—owing to the superabundance of kauri and the various taxads. But with the rapid decrease in the supply of these timbers it stands out clearly that no species of value can long remain unused, and it is well known that the wood of the beeches possesses many excellent qualities and can be utilized in a variety of ways. Further, . . . beech forests regenerate well and with fairly satisfactory rapidity, which can be greatly increased by forestry methods. . . . Before many years elapse beech timber will be in constant demand, so it is urgent to accumulate as soon as possible the data upon which the successful management of beech forests depends."

Five species of *Nothofagus* are considered valid, namely, *N. Menziesii* (Hook. f.) Oerst., *N. fusca* (Hook. f.) Oerst., *N. truncata* (Col.) Cockayne, *N. Solandri* (Hook. f.) Oerst., and *N. cliffortioides* (Hook. f.) Oerst. The common names for the species are silver beech, red beech, clinker beech, black beech, and mountain beech, respectively. There are also various hybrids.

The work is divided into five sections: (1) Introduction, (2) Classification of the beeches, (3) The distribution in New Zealand of the species of *Nothofagus*, (4) The ecology and classification of the beech forests, and (5) Summary of the

preceding sections. The monograph is in two parts, the present "having the purely scientific aspect as its theme," Part II, not yet issued, "dealing with its practical bearings, silviculture and matters pertaining thereto being discussed."

Following is a very interesting characterization of the New Zealand forest in general (p. 7): "The New Zealand forest, as a whole, belongs to that ecological class known as 'rain-forest,' its presence and continuance depending on frequent rainy days occurring at all seasons of the year. In its most characteristic form it closely resembles the forest of wet tropical regions in its physiognomy, structure, and growth-forms—so much so, indeed, that more than one visiting botanist, of wide travel, has declared that it is as tropical in aspect as the rain-forest of Java. The forests possessing this extreme tropical stamp may be called '*subtropical rain-forest*' or '*rain-forest proper*,' for short. Such consist, so far as the tall trees go, of more or less taxads or the kauri, together with many broad-leaved dicotylous trees, or both kauris and taxads may be absent. But there is another class of forest—at the present time the most extensive—where one or more of the species of *Nothofagus* (beech) is dominant and the special rain-forest characteristics are less in evidence. As such forest is ecologically equivalent to that of the extreme south of South America on the west and Tierra del Fuego, I am here calling it '*subantarctic rain-forest*.' Between the two classes there are all manner of intermediates, but in what follows, though the latter are not neglected, it is *Nothofagus* forest proper which is the main theme.

"It is the special characteristics, now to be briefly explained, which distinguish these rain-forests of ours, that make their intensive study essential for the development of one important feature of New Zealand forestry—the indigenous forests—and mark it not only as distinct from that of Europe, but of far greater complexity.

"These special characteristics are as follows: (1) The trees and shrubs, with but one or two exceptions, are evergreen; (2) there are usually many different species of trees; (3) colonies of tall tree-ferns with huge leaves, far-extending horizontally, are abundant; (4) smaller ferns occur in the greatest profusion; (5) there is an extremely dense undergrowth, frequently

consisting of several tiers of vegetation; (6) woody lianes (climbing plants) abound, often making entanglements; (7) epiphytes (perching plants), some of them shrubs, some potential trees, are frequently a striking feature; (8) mosses, liverworts, and filmy ferns, all sometimes of great size for these classes of plants, cover wide breadths of the forest-floor and the numerous rotting logs and drape the tree-trunks; (9) some trees have strong buttresses at the base, which may be plank-like; (10) the roots of the trees extend far horizontally and are often raised above the surface of the ground; (11) there are very few bulbous or true herbaceous plants; (12) huge tussocks made of sedges are often present in quantity; (13) small bryophytes and lichens frequently occur as epiphytes on leaves of trees."

Rubber production in Africa. By H. N. Whitford and Alfred Anthony. Trade Promotion Series No. 34, U. S. Dept. of Commerce, Washington, D. C., 1926. Pp. 136; 6 x 9; map. Price 25c.

This is the fifth of a series of publications on crude rubber issued under authority of the Sixty-seventh Congress, which appropriated funds for the investigation of raw materials wholly or largely under foreign control.

"Up to 1912 Africa stood second to South America in the amount of rubber supplied for world consumptions. The continent reached its maximum in the year 1906 with shipments amounting to over 20,000 tons. Again in 1910 it produced this amount, but since then there has been a gradual reduction until in 1922 about 2500 tons were exported. The total African production was contributed by some 25 different political units."

"From the standpoint of transportation facilities, the countries bordering the Gulf of Guinea are the most favorably situated. In general, however, the coastal lands of these countries are not suitable to Hevea production, hence the need of access to the interior. In some instances means of access are already supplied by navigable streams and by railways and motor roads. However, much of the territory not yet developed agriculturally would need new access facilities."

Up to about 1910 practically all of the rubber that was gathered came from wild plants—trees, shrubs, and vines, mostly of the family Apocynaceae. They are of such a nature that the cheapest method of collecting the latex is to destroy the plants, and many of the old regions are no longer in position to produce wild rubber.

Plantations of various kinds of plants producing rubber were started on an experimental scale during the first decade of the present century, but were largely abandoned during the war. Only the Para rubber is now considered worthy of commercial exploitation and the total acreage of this species amounts to about 38,000 acres. With few exceptions rubber is grown intermixed with other crops, either perennial or annual.

"From the data available it is impossible to determine whether, under existing economic conditions, rubber could be produced in Africa in competition with the European-owned plantations of the Middle East, although, due to the general practice of mixed agriculture in Africa, rubber is brought into bearing at much lower costs than in the East. On account of better transportation, the chances of competing in production might be better in the regions bordering the Gulf of Guinea than in the interior districts. . . . In general, the policy of the various Governments is to encourage the natives to plant commercial crops. This method has been strikingly used in the Gold Coast, where the acreage in cacao has been increased to such an extent that the Coast has become the chief cacao-producing country in the world. Similar methods fostered either by Government agencies or by commercial interests might be followed with rubber."

Timbers from Nigeria and **Woods from Nigeria as paper-making materials.** *Bulletin of the Imperial Institute* (London) 24: 1: 1–8; 8–14, June 1926.

The first of these reports concerns the possibilities for joinery and furniture manufacture, the second the pulping and paper-making qualities, by the soda process, of five Nigerian species.

1. **Abura** (*Mitragyna macrophylla* Hiern.).—A reddish

brown wood, fairly soft, fine-textured, of moderate weight and plain appearance. Recommended for local use for light constructional and other work where great strength is not essential and to replace imported softwoods employed for such purposes.

The pulp, though well-reduced, did not bleach readily and gave a cream-colored opaque paper of fair strength and quality. Av. fiber length 1.6 mm.

2. **Afara** (*Terminalia superba* Engl.).—An oak-colored, straight-grained wood, of medium hardness and strength, fairly stiff and not unduly brittle, easy to work. Suitable for joinery and inexpensive furniture.

Wood not easily pulped. Pulp of a dark cream color, giving an opaque paper of fair strength. Av. fiber length 1.2 mm.

3. **Oro** (*Irvingia Barteri* Hook. f.).—A pale greenish brown, heavy, hard wood of fairly fine texture. Suitable for the heaviest construction, including railway ties.

Wood could not be entirely reduced and all the specimens of paper contained small light silvery specks. The pulp would not bleach. Av. fiber length 1.5 mm.

4. **Arere** (*Triplochiton nigericum* Sprague).—A yellowish, soft, light, coarse-textured wood of nondescript appearance. Suitable only for local rough work.

Wood not easy to reduce and pulp difficult to bleach. It gave a strong opaque paper of cream color and fair quality. Av. fiber length 1.4 mm.

5. **Ogia** (*Daniella Ogea* Rolfe).—There were two planks, one pale yellowish brown, fairly fine-textured, of moderate weight and good appearance, the other pale yellow and coarser-textured. The first could be employed for joinery, furniture-making, and many general constructional purposes, but would need careful finishing. The other was considered suitable only for local rough work. "If the two specimens were from the same tree or from different trees of the same species, it is evident that very careful selection of the sawn timber would be necessary."

The woods required rather severe treatment for complete reduction and the pulp did not bleach readily. The papers were of good strength and quality. Av. fiber length 1.5 mm.

Catalogue of a private collection of walking sticks. By RUDOLPH BLOCK, 450 West End Avenue, New York, 1926. Pp. 76; 5½ x 8¼.

"This is primarily a collection of the interesting woods of the world. The selection of walking sticks as a medium for presenting the varieties and beauties of these woods is a secondary feature. Where two or more specimens of the same wood find a place in this collection it is only because of some idiosyncrasy of color, figure, or other quality that is characteristic of the varieties of this wood."

The catalogue embraces 700 sticks, wrought from material gathered from all parts of the world, and classified on as accurate a scientific basis as present knowledge will permit. The publication is fully indexed and accordingly has an independent value as a check list of the common and botanical names of nearly 600 different species.

The reviewer's acquaintance with this collection began early and has continued with growing enthusiasm as the natural beauties of the woods are revealed in infinite variety through the art of the designer and finisher. No such collection exists elsewhere in the world, and far from being completed it is only well begun. Eventually it will be placed upon exhibition where it will serve as a source of pleasure and inspiration and education to all who are privileged to view it. Lovers of wood owe a great debt of gratitude to Mr. Block for his assiduous efforts in bringing together this unique and magnificent collection.

Perhaps the readers can supply some needed information. What is the name of the tree that produces the "flower wood" of "hua-li-mu" of China? Likewise, for the "tulip wood" of Brazil, the "ponto" of the Dutch East Indies, "Cambodge boxwood" and "beloi" of Indo-China, and "maho gonil" of French Guiana? What species of *Diospyros* supplies Macassar ebony? What species of *Hymenæa* yields a purpleheart similar in appearance to that of *Peltogyne?* What species of *Nectandra* furnishes the "embuia" of southern Brazil? Is the "African cherry," of the west coast, a species of *Kayea?* And last, but by no means least in the mind of the collector, how can one get a specimen 44 inches long and an inch square of the "pink ivory" of Zululand?

M. M. CHATTAWAY.

Yale University School of Forestry

TROPICAL WOODS

NUMBER 8 DECEMBER 1, 1926

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TROPICAL WOODS

NUMBER 8 December 1, 1926

A technical journal 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 in Yale University.*

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

TROPICAL ARBORETUM IN THE CANAL ZONE

In July, 1923, the Panama Canal initiated the establishment in the Canal Zone of a center for the gathering together of all tropical trees of economic value. Although the time has been short very appreciable strides have already been taken toward the ultimate goal, and the botanical gardens now comprise an area of approximately 200 acres and contain about a thousand species. In many cases the introduced plants have made a very remarkable growth.

Five shade houses provide shelter for thousands of young plants, which are being propagated for planting in their permanent locations on the grounds and also for distribution to all sections of the Isthmus of Panama. The results of such distribution are becoming very noticeable in many places.

The site of the gardens was originally jungle, requiring clearing and the construction of roads. While this development work is proceeding gradually, effort is made to maintain the

tree plantings in botanically classified plots. The important trees and shrubs are labeled, and an attractive handbook, with map and descriptions, has been prepared by Mr. Holger Johansen, Agronomist.

In a few years the constantly increasing collections will prove of the highest usefulness to all interested in tropical arboriculture and forestry. The gardens are in a strictly tropical region, located on territory controlled by the United States of America, and readily accessible from everywhere—a combination of circumstances exceptionally favorable to the success of the undertaking.

It is to be hoped that the important start already made will receive from the tropical forestry world the financial and moral support necessary for the realization of an urgent need —a great Arboretum in the American Tropics.

TERMITE RESISTANCE TESTS AT PANAMA

By Thos. E. Snyder, *Entomologist*

Bureau of Entomology, U. S. Department of Agriculture

On February 26, 1924, the Federal Bureau of Entomology began at Panama a series of tests as to the relative effectiveness of various preservatives in protecting wood, wood pulp, and fiber boards against attack by termites. In addition to the tests of treated woods, the relative resistance to termite attack of a series of untreated tropical American woods is being tested.

These tests are located on Barro Colorado Island in Gatún Lake, Canal Zone, Panama, through the courtesy of the Institute for Research in Tropical America, whose Panama station is located in this island jungle.

The termite fauna on this island is rich and consists of 30 species, representing three families and including species both subterranean and non-subterranean in habit, i.e., those that attack wood indirectly through the ground and directly, not from the ground.

Among the preservatives tested are creosotes, various soluble salts (such as chlorides, fluorides), a series of war-time

chemicals prepared by the U. S. Chemical Warfare Service (including halogens), sprayed metal, waxes, and waste products from the manufacture of United States lumber.

A model demonstration termite-proof building, constructed entirely of woods and pulp or fiber products impregnated with preservatives, is located near these service tests.

Among the untreated woods are United States grown woods, native woods of Panama, etc.

Already three preliminary reports have been made on the condition of these tests by Mr. James Zetek, resident custodian of Barro Colorado Island. It is hoped to continue and enlarge these tests to cover a period of at least 10 years.

In addition to obtaining data on the best preservatives for use in the tropics for wood and wood products, not only in contact with the ground but for interior finish, termite-resistant woods will be discovered that can be used as veneer in the manufacture of furniture for sale in the tropics. The termite-proof building should convince builders that United States grown woods properly treated with preservatives are effective in the tropics.

Certain species of termites (*Coptotermes*) dissolve and penetrate lime mortar between bricks in foundations and lime concrete. In coöperation with the National Lime Association, a series of 16 test walls of brick and mortar and concrete have been constructed at Falls Church, Va., in the termite test plot. Degrees of slaking and different percentages of lime are being tested to find the most effective combination.

It is hoped to duplicate these tests at Honolulu, Hawaii, and at Panama.

Note: The editor of *Tropical Woods* wishes to obtain as much information as possible regarding the termite-resistance of woods and invites correspondents to report their observations to him.

THREE NEW SPECIES OF CENTRAL AMERICAN TREES

By PAUL C. STANDLEY[1]

Of all Central America, one of the regions least known botanically is British Honduras, whose flora, if we may judge by the scanty material available for study, must include many interesting species. It is not surprising, therefore, that collections made recently in that country have yielded several new species of trees, one of which, a distinct new *Bourreria* (Boraginaceae) is described here. It was found in one of the sendings of tree specimens made this year to Prof. Samuel J. Record by Mr. H. W. Winzerling, of the Belize Estate and Produce Company, who has contributed substantially by his work of exploration and collection to our knowledge of the British Honduras flora.

There is described here also a new *Vitex* (Verbenaceae) collected in the Atlantic lowlands of Guatemala by Mr. Henry Kuylen, of the United Fruit Company, who has made an important collection of trees in that region. I have included the description of a new Burseraceous tree found by myself this year in the Canal Zone. It belongs to a family noted for the production of important gums and resins.

Protium asperum Standl., sp. nov.

Arbor 10–20 m. alta; folia magna, petiolo 30 cm. longo, scabro, subtus convexo, supra late canaliculato, rhachi aequilonga; foliolis oppositis, 6-jugis, petiolulis validis, circ. 8 mm. longis; foliolorum lamina oblonga vel late oblonga, 16–24 cm. longa, 5–7 cm. lata, abrupte et breviter acuminata, basi obtusa et saepe subobliqua, coriacea, subnitida, integra vel subundulata, utrinque punctulis minutis scaberrima, costa valida, nervis lateralibus utrinque circ. 30, subtus prominentibus; inflorescentia in statu fructifero paniculata, multiflora, pedunculo 5 cm. longo, panicula 14 cm. longa, rhachi angulata, scaberula, pedicellis angulatis, 5–12 mm. longis; fructus obovoideo-globosus, 1 cm. longus, glaber, subnitidus.

Type in the U. S. National Herbarium, Nos. 1, 251, 938–939, collected in wet forest on Barro Colorado Island in Gatún Lake, Canal Zone, Panama, November, 1925, by Paul C. Standley (No. 41161).

This species is remarkable for the scabrous leaves, a character that I do not find attributed to any other representative of the genus.

[1] Published by permission of the Secretary of the Smithsonian Institution.

The tree is frequent on Barro Colorado Island, and is known as "caraño," a name applied in Central America and northern South America to other species of the genus. The tree at once attracts attention because of the fact that from wounds in its trunk it exudes large quantities of a balsam or resin, which has a penetrating, agreeable, and distinctive odor. A large deposit of the semi-liquid balsam frequently may be found at the base of the trunk. I was informed by a native guide that in Panama this resin is gathered and sold. It is used probably for incense, like the resins furnished by other members of this family.

Christiania africana DC.

This species is a quite unexpected addition to the flora of Central America. Specimens have been collected in British Honduras by H. W. Winzerling (No. III–7), who reports the vernacular name as "palo mulato." The plant is a tree with light brown wood, the large long-petioled rounded-ovate leaves deeply cordate at base, the small flowers arranged in panicled cymes.

The genus *Christiania* consists of two species, one of which is endemic in Madagascar. The other, *C. africana*, grows in central Africa, Congo, and Senegambia, and in northern Brazil and British Guiana. There are several other well-known plants which have a similar distribution, indicating, according to the views of some writers, a former land connection between eastern South America and western Africa. This tree is likely to be found along the coast between British Honduras and the Guianas.

Bourreria mollis Standl., sp. nov.

Arbor, ramulis teretibus, dense velutino-pubescentibus; petioli 8–15 mm. longi, pilis brevibus divaricatis dense pubescentes; foliorum lamina elliptica vel ovali-elliptica, 6–8.5 cm. longa, 3.5–5.5 cm. lata, abrupte acuta vel saepe obtusa, basi obtusa vel late cuneata, supra nitida et obscure viridis, primo in nervis minute pilosa sed mox glabrata, subtus pilis minutis divaricatis cinereis dense velutino-pubescens; cymae terminales, pauci- vel multiflorae,

pedunculatae, ca. 4 cm. latae, ramulis dense tomentosis; flores sessiles vel brevipedicellati; calyx anguste campanulatus, 5 mm. longus, minute denseque cinereo-tomentosus, lobis plerumque 3, triangularibus vel rotundato-ovatis, obtusis vel acutiusculis, tubo multo brevioribus; corolla alba, tubo calycem paulo excedente, in parte superiore 2.5–3 mm. crasso, glabro, lobis oblongo-ovatis, divaricatis, 5 mm. longis, apice rotundatis, extus puberulis; antherae oblongae, 2 mm. longae; filamenta glabra, exserta, 5–6 mm. longa; stylus 4 mm. longus, ramulis 2 mm. longis, stigmatibus disciformibus.

Type in the U. S. National Herbarium, No. 1, 266, 030, collected in British Honduras in 1926 by H. W. Winzerling (No. III–12).

Related to the Mexican *B. Andrieuxii* (DC.) Hemsl., but that species is described as having hispidulous filaments and 5-lobed calyces.

The British Honduras tree is said to be known by the names "opay," "beh-eck," and "roble."

Vitex Kuylenii Standl., sp. nov.

Arbor, ramulis obtuse angulatis, obscure brunneis, lenticellis plurimis linearibus notatis, sparse puberulis; petioli 5–6 mm. longi, semiteretes, graciles, puberuli; foliola plerumque 5, brevipetiolulata, elliptica, lanceolato-elliptica vel obovato-elliptica, inaequalia, 7–14 cm. longa, 3–6.5 cm. lata, breviter acuminata, acumine obtuso, basi cuneatim acuta, integra, tenuia, laete viridia, ad nervos minutissime puberula, alibi glabra; inflorescentiae axillares, longipedunculatae, thyrsiformi-paniculatae, laxe multiflorae, pedunculis 8–11 cm. longis, paniculis 6–11 cm. longis, ca. 3 cm. latis, ramulis lateralibus 5 mm. longis vel brevioribus; pedicelli graciles, 2–5 mm. longi, puberuli; bracteolae minutae, deciduae, bracteis linearibus, 1.5–3 mm. longis; calycis tubus campanulatus, 2.5 mm. longus, puberulus, lobis 5 anguste triangulari-oblongis, tubo paulo brevioribus, divaricatis vel reflexis, acutiusculis; corolla extus sparse puberula, tubo 6 mm. longo, 3.5 mm. crasso, limbo ca. 14 mm. lato, in fauce villoso; filamenta exserta, 8 mm. longa, pilosa; stylus filamentis aequilongus, pilosus.

Type in the U. S. National Herbarium, No. 1, 266, 025, collected at Entre Ríos, Guatemala, in 1926 by Henry Kuylen (No. 66; Yale No. 8897).

Of the Mexican and Central American species of *Vitex* the one most closely resembling this is *V. Hemsleyi* Briq., of which *V. capulin* Pittier is, apparently, a synonym. In *V. Hemsleyi* the calyx lobes are erect and broadly triangular, the primary branches of the panicle are longer, and the cymes dense, the pedicels being much reduced.

The vernacular name of the Guatemalan tree is reported as "barabás" or "barbás."

A NEW *ALBIZZIA* OF BRITISH HONDURAS

While on the lands of the Belize Estate and Produce Company last winter, the editor, in company with Mr. H. W. Winzerling, collected botanical and wood specimens from a young tree locally known as Wild Tamarind, a name applied also to species of *Acacia*. Later in the season Mr. Winzerling collected additional material. These specimens have been studied by Dr. Nathaniel Lord Britton, Director-in-Chief, New York Botanical Garden, and Dr. J. N. Rose, Associate Curator, Division of Plants, U. S. National Museum, and they consider the tree a new species of *Albizzia*. Their description is as follows:

Albizzia Hummeliana Britt. & Rose, sp. nov.

A small (?) tree, the twigs angled, puberulent. Leaves 10–12 cm. long; petiole 2–4 cm. long, puberulent, bearing a large oblong, sessile gland near its middle; pinnae 5 pairs; leaflets 9–12 pairs, oblong, 7–12 mm. long, obtuse, glabrous above, strongly nerved and puberulent beneath; inflorescence paniculate; peduncles slender, 2 cm. or less long, puberulent; flowers in small heads, pediceled; calyx 1.5 mm. long, puberulent, with minute teeth; corolla 3–4 mm. long, glabrous except the tips of the lobes; stamens numerous, short, the sheath included; ovary densely velvety; pod 11–12 cm. long, 18 mm. broad, acute, but not apiculate at apex, cuneate at base, glabrous.

Collected by Samuel J. Record near Hill Bank, New River Lagoon, British Honduras, Jan. 26, 1926 (Yale No. 8795), and by Harry W. Winzerling, 1926.

Type in U. S. National Herbarium, No. 1, 209, 912.

Named in honor of Mr. C. Hummel, Manager, Belize Estate and Produce Company, and formerly Conservator of Forests of British Honduras.

PROMOTING FORESTRY BY RADIO IN BRAZIL

The Radio Society of Rio de Janeiro is lending its support to the important forestry program undertaken by the Brazilian Government and is broadcasting popular lectures on various phases of forestry. Some of the subjects are as follows: (1) The importance of forests. (2) The principles of arboriculture. (3) The principles of silviculture. (4) Conservation of indigenous forests. (5) Areas for reforestation. (6) The best trees to plant. (7) Establishment, cultivation, and protection of forest plantations. (8) Mixed and pure forests. (9) Yields and financial returns.

"AMAPA" FOR INTERIOR TRIM AND FLOORING

By EMANUEL FRITZ

Associate Professor of Forestry, University of California

"Amapa" is a new wood from the west coast region of Mexico. About two years ago the writer showed a sample of it to a lumberman who became impressed at once with its possibilities for the interior trim of homes. As a result, two installations were made in Berkeley, California,—the first as flooring and the second as millwork, both in homes of moderate cost.

The flooring, which was square-edged, 3/8" x 1¾", was used in the living room, dining room, and a vestibule. In the second installation, Amapa was used for an ornamental mantel and a heavy panelled front door and for the interior doors, baseboards, picture mouldings, and window and door trim of living room, dining room, and large vestibule. The interior doors were of the one-panel type, the panels being of plywood and the stiles and rails of built-up construction.

In each case the material, ready to lay in the case of the flooring and ready to install in the case of the millwork, was furnished by a mill in Nogales, Arizona, which obtains the timber in the State of Nayarit on the west coast of Mexico. This concern operates a sawmill near San Blas and cuts the logs into "cants" or heavy squares, which are then carried by boats 127 miles up the coast to Mazatlan where they are loaded upon cars and shipped to Nogales. The plant at Nogales reduces the cants to boards, and these, after seasoning, are worked into the finished products.

Amapa is said to be well established in the southwest for flooring and millwork, including doors, sash, trim, and the like. The University Library at Tucson is finished in Amapa, as are also several expensive homes in this and other Arizona cities. The two Berkeley installations previously mentioned are probably the only ones at present in the San Francisco Bay region of California.

Amapa is a Mexican name for *Tecoma pentaphylla* Juss. (= *Tabebuia pentaphylla* Hemsl.), a tree widely distributed in Mexico, Central America, northern South America, and the West Indies. Some other names for it in various parts of its range are roble, maquiliz, apamate, mano de leon, and mayflower. The species is closely related to the better known "prima vera" (*Tabebuia Donnell-Smithii* Rose).

Amapa wood is of medium density, light grayish brown in color, and has an attractive appearance. The rays are fine and inconspicuous, but the parenchyma layers give rise to a distinct pattern on the tangential faces of lumber. Sharp, clean edges are readily obtained and the surface planes to a glossy smoothness, except for the fine depressions of the vessel lines. It nails well, although in thin tongue-and-groove flooring it is advisable to pre-bore the nail holes in the tongues.

In each of the Berkeley installations the wood is finished in natural color, only filler, white shellac, and wax being used. The effect is bright, but neat and dignified, harmonizing especially well with furnishings of a light color. The writer has finished some specimens with mahogany and oak stains with good results, particularly with moderately dark oak stain. As flooring, Amapa seems to be a good substitute for oak where a lighter color and finer figure are desired.

While the two installations described may not be the forerunners of wider applications of Amapa in the San Francisco Bay region, they, nevertheless, call attention to a comparatively new wood which possesses certain characteristics of color and beauty that should offer architects the means for obtaining certain effects not possible in other woods.

Some *Ilex* Woods without Spiral Elements

During the course of some investigations in the Yale tropical wood laboratory last summer by Mr. David A. Kribs, of the University of Minnesota, wood specimens of three species of *Ilex* were found to be without spiral fiber-tracheids and vessels, which hitherto were thought to be characteristic of the genus. (See *Tropical Woods* 3: 14.) These specimens are: *Ilex Martiniana* D. Don., "kakatara" of British Guiana (Yale No. 9485; Field Museum No. 549,848); *I. casiquiarensis* Loes., "pavier blanc" of French Guiana (Yale No. 5388; Bertin No. 3029); *I. pulogensis*, of Phil. Is. (Yale No. 2190; Phil. B. F. No. 18,145).

THE "MANWOOD" OF PANAMA

"Manwood" is one of the locally well-known timbers of the Bocas del Toro region of Panama, being noted for its great durability. Dr. Alvin G. Cox, who in the summer of 1923 obtained the wood and leaves of the tree for the Yale collections, says that he saw Manwood house posts that had been in place for two generations.

Mr. L. E. Weaver, Superintendent of Agriculture, Guatemala Division, United Fruit Company, was acquainted with this timber while in Bocas del Toro and supplies the following information: The tree grows on hills and rocky ground, has a thin bark and about an inch of white sapwood, while the heartwood is brown, flecked with white. The wood is straight-grained, very heavy, will not float and consequently is expensive to get out and to handle, but it is very highly esteemed in Panama for fence posts, railroad and tram ties, and other purposes requiring a strong and durable material.

The wood was identified by the writer as *Minquartia guianensis* Aubl. of the family Olacaceae. This determination has recently been confirmed by Dr. Paul C. Standley, who states (June 24, 1925) that the leaf specimens secured by Dr. Cox are "very close to *Minquartia guianensis* Aubl. and perhaps identical with that species." So far as known, this genus has not previously been reported on the North American Continent.

The Yale collections contain a number of specimens of this wood which serve to indicate the range of the species. PANAMA: Nos. 6744 and 6905, from Dr. Cox, interior of eastern Bocas del Toro, July 22 and Aug. 2, 1923; bole of tree 2½ feet in diameter and 40 feet to first limb; common names are "manwood" (Eng.), "palo creollo" (Sp.), and "urodibe" (Indian). COSTA RICA: No. 6133, "palo de piedra," from Mr. H. T. Purdy, along southern coast. No. 7802, "manú," from Mr. C. H. Lankester, Ontario Farm, Reventazón, near sea level, Oct. 1924; labeled, "One of the hardest timbers of the Atlantic coast. Called 'platano' in Nicaragua." NICARAGUA: No. 7641, "manwood," Mr. F. H. Fischer, Kukra River (flowing into the Bluefields Lagoon), March 5, 1925. DUTCH GUIANA: No. 4167, "arata" or "konthout," from Forestry Department.

BRAZIL: No. 4013, "acaricuára," from the late Dr. J. Huber, lower Amazon.

According to Le Cointe,[1] the tree is known in the Amazon region as "acariuba" or "acaricuára," and in French Guiana as "mincouart" or "minquar." He says the wood is absolutely incorruptible and is without equal for posts either in dry or humid regions, though, unfortunately, the tree is of very irregular form. Teixeira da Fonseca[2] states that the "acaricuára" occurs in Amazonas and Pará, is a tree 20 to 50 feet high, with a very irregular and deeply fluted trunk 25 to 35 inches in diameter. The wood is highly esteemed for heavy and durable construction, especially for house posts. It also yields an olive-colored dye. Other vernacular names are given as "acary," "acary coara," "acariquára," "a. do igapó," "a. da varzea," "acary uba," and "acariúba." (For detailed description of the wood see *Timbers of Tropical America*, pp. 150–1.)

THE WOOD OF *SAURAUIA VILLOSA* DE CANDOLLE

The numerous species of *Saurauia* are mountain plants—shrubs and small trees, or occasionally trees of medium size. The position of the genus is doubtful and, while usually referred to the Dilleniaceae, its wood lacks the broad rays so characteristic of that family, and some botanists include it in the Theaceae (Ternstroemiaceae).

Saurauia villosa DC. occurs in southern Mexico and Central America. A specimen (Yale No. 3692), with sterile botanical material identified by Dr. Paul C. Standley as probably this species, was collected in 1919 near El Lemón, Honduras, by Dr. H. N. Whitford. The tree, known locally as "zapotillo," was growing in red clay soil at an elevation of about 2000 feet above the sea. It was 70 feet high, with a round, narrow, and deep crown, and a regular bole 50 feet long and 16 inches in diameter, the bark on which was one-half inch thick, gray

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[1] LE COINTE, PAUL: *L'Amazonie Brésilienne, II.* Paris, 1922, p. 12.

[2] TEIXEIRA DA FONSECA, EURICO: *Indicador de madeiras e plantas uteis do Brazil.* Rio de Janeiro, 1922, pp. 6–7.

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in patches on the surface and red inside. The simple, alternate leaves are oval or cuneate-obovate, 6 to 14 inches long and 2 to 4 inches broad, the margins finely and sparsely toothed, the upper surface rough, the underside covered with rather soft brown hairs; there is a very prominent midvein and numerous nearly parallel veinlets. The leaf petioles, young twigs, and buds are velvety.

Common names

Zapotillo, sapocillo (Honduras). Other species: Almendrillo, mameyito, m. blanco, pipicho (Mexico); moquillo (Venez.).

Description of the wood

General properties: Heartwood pale reddish brown, merging into the sapwood. Not highly lustrous.

Odor and taste absent or not distinctive.

Rather light, but firm, sp. gr. (air-dry) 0.58, weight 36 lbs. per cu. ft., medium-textured, straight-grained, easy to cut, saws finely wooly and is rather hairy under the plane, is tough and strong, probably not durable. Consistency similar to red gum (*Liquidambar*).

Growth rings: Poorly defined; due to slight color differences.

Parenchyma: Not visible with lens.

Pores: Very small, indistinct without lens; very numerous, crowded, well distributed, no special arrangement; irregular in shape; open.

Vessel lines: Very fine and inconspicuous.

Vessel contents: None observed.

Rays: Fine, visible on cross section, indistinct on tangential, and about as distinct as in maple (*Acer*) on radial surface, where they appear considerably darker than the background.

Ripple marks: Absent.

Gum ducts: None observed.

Minute anatomy: Pores 0.083 mm. to 0.116 mm. (av. 0.088 mm.) in diameter. Vessel perforations scalariform, with many narrow bars; intervascular pits small, screw-head type; *projecting tips of vessel segments spiral*, suggesting Hamamelidaceae. Rays decidedly heterogeneous, the procumbent cells very small; 1 to 5 cells wide and few to 100 cells high (0.15 to 1.66 mm., av. 0.98 mm.); cells filled with red gum in heartwood; pits into vessels resemble the intervascular in size and appearance. Wood fibers thick-walled, squarish in cross section, tending to form definite radial rows where not interrupted too much by the pores; pits numerous and distinctly bordered. Parenchyma diffuse and only sparingly developed.

Remarks: In general, the woods of the Dilleniaceae are characterized as follows: Rays of two kinds, the larger conspicuous and oak-like; pores few and rather large; vessel perforations either simple or scalariform, or both; wood fibers with distinctly bordered pits.

Material: Yale No. 3692.

THE WOOD OF *KRUGIODENDRON FERREUM* (VAHL) URBAN

Krugiodendron, a monotypic genus of the family Rhamnaceae, was so named by Urban in 1902 in honor of Leopold Krug (1833–1898), a student of the West Indian flora. The species was first described by Vahl in 1793 as *Rhamnus ferreus*. It has since been variously known as *Ceanothus ferreus* DC. (1825), *Scutea ferrea* Brongn. (1827), *Condalia ferrea* Gris. (1859), and *Rhamnidium ferreum* Sargent (1891).

It is a small evergreen tree, occasionally 30 to 40 feet high and 15 to 18 inches in diameter, but often shrubby, with ridged bark and spreading branches, the young twigs covered with a dense velvety pubescence. The leaves, which are mostly opposite, are 1 to 1.5 inches long and ¾ to 1 inch wide, bright green above and dull beneath, nearly glabrous, with stout petioles ¼ inch long. The small yellow-green flowers are borne in axillary clusters much shorter than the leaves. The fruit, which is generally solitary, is a drupe about ⅓ inch long, with thin black flesh and a thin-walled pit.

The species is one of the commonest of the small trees in certain portions of southern Florida, where it is known as "black ironwood." It also occurs in coastal scrublands, thickets, woodlands, and hillsides at lower elevations, generally in dry districts, throughout the West Indies from the Bahamas to St. Vincent. The existence of the tree in British

Honduras was determined by Dr. Paul C. Standley from botanical material collected by the writer near Honey Camp Lagoon, Orange Walk District, Jan. 31, 1926. The tree, notorious on account of the hardness of its wood, is known as "axemaster."

The wood is the densest known. Sp. gr. tests made by the writer on two thoroughly air-dry specimens, one from eastern Cuba and the other from British Honduras, afforded the same result in each case, namely, 1.42, which is equivalent to nearly 89 pounds per cubic foot. The densest wood previously tested in the Yale laboratories was letterwood, (air-dry) 1.365. Tests made on the woods of the United States for the Tenth Census report gave a specific gravity (oven-dry) of 1.302; weight 81.14 lbs. per cu. ft. The determinations for two air-dry specimens were 1.3546 and 1.343, respectively. In the tests of the various species black ironwood ranked first out of 429 in sp. gr.; first out of 430 in fuel value; 45th out of 310 in elasticity; 90th out of 310 in bending strength; fifth out of 317 in end crushing; and third out of 314 in hardness as measured by resistance to indentation.

Common names

Black ironwood (So. Florida); carey de costa (No. Camagüey), palo diablo (Oriente), coronel (Pinar del Río), acero (Pen. de Zapata) (Cuba); palo de nierro, bariaco, espejuelo, black ironwood, ebony wood (Porto Rico and Virgin Is.); bois de fer (Guadeloupe); axemaster, quebracho (Brit. Hond.); ironberry.

Description of the wood

General properties: Orange-brown to dark brown, often more or less streaked; appears waxy. Sapwood pale yellow, sharply defined.

Odor and taste absent or not distinctive.

Excessively dense, horn-like, very fine-textured, fairly straight-grained, very hard to cut, fairly easy to split, finishes smoothly, appears durable.

Growth rings: Absent or poorly defined in some specimens, fairly distinct in others, due mostly to color variations.

Parenchyma: Invisible.

Pores: Very small, faintly visible without lens, fairly numerous, well distributed, occurring singly or in short radial groups.

Vessel lines: Very fine and indistinct.

Vessel contents: Gum deposits abundant.

Rays: Very fine, not visible without lens on cross and tangential sections, fine and inconspicuous on radial.

Ripple marks: Absent.

Gum ducts: Absent.

Minute anatomy: Vessels with simple perforations; pits minute, crowded. Rays one or two cells wide, few to 20 or more cells high; decidedly heterogeneous, many of the cells square; rhombohedral crystals very common in square cells; gum deposits abundant; pits into vessels resemble the intervascular pits. Wood parenchyma sparingly developed about vessels. Fibers small, with very thick walls and minute cavities; pits indistinct, simple.

Material: Yale Nos. 7414, 8813* (Brit. Honduras); 9129* (Cuba). Asterisk indicates botanical material.

THE WOOD OF *KOEBERLINIA SPINOSA* ZUCCARINI

This species, the only one of the genus and the sole representative of the family Koeberliniaceae, is a shrub or tree, sometimes 25 feet high, with a short trunk rarely a foot in diameter. The small branches and twigs are short, stiff, green, and spine-tipped, and the minute, scale-like leaves are so early deciduous that the plant is commonly thought to be entirely leafless. The small, greenish flowers are borne in short racemes, and the fruit is a small berry. The bark is thin and flaky, in color and general appearance suggesting mulberry (*Morus*). The inner bark is laminated and, especially on the older portions of the stem, contains several layers of flattened resin ducts which, upon being cut, exude a sticky, reddish brown resin; the sieve plates are scalariform.

The species occurs in Mexico from northeastern Sonora to Tamaulipas and Hidalgo, and in the United States from western Texas to southern Arizona, and often forms impenetrable thickets over large areas. It is known generally in Mexico as "junco" or "juanco," and in Arizona as "corona de Cristo."

There are at present no special uses for the wood, though investigations are being made of its resin content. The heartwood burns very readily, with a spluttering flame, and gives off a sooty smoke of a disagreeable odor. (See P. C. STANDLEY: *Trees and shrubs of Mexico*, p. 538.)

DESCRIPTION OF THE WOOD

General properties: Very dark orange-brown, deepening to nearly black; highly resinous. Sapwood thin (¼ to ¾ in.), yellowish white, sharply defined.

Odor slightly pungent when wood is worked. Taste not distinctive.

Heartwood very dense; sp. gr. (air-dry) about 1.20; sapwood of lighter weight, floating readily in water. Grain fairly straight. Texture rather fine. Heartwood appears highly durable, is easy to cut, finishes smoothly, but has a dull oily appearance.

Growth rings: Fairly distinct, due to ring of larger pores in early wood; sometimes indistinct.

Parenchyma: Invisible.

Pores: Visible in sapwood of larger stems, resembling small pinholes; invisible or nearly so in heartwood and throughout small stems. Widely variable in size, the larger ones tending to form single rows at beginning of growth rings; rounded or oval in shape; usually solitary; open in sapwood, closed in heartwood. Max. tang. diam. in large stem, 0.144 mm.; in small stem, 0.064 mm.

Vessel lines: Fine and indistinct.

Vessel contents: Dark-colored resin very abundant.

Rays: Fine, but visible on cross section; near limit of vision on tangential; fine, but distinct, on radial surface. Max. height, 0.70 mm.; max. diam. (without canal), 0.08 mm.

Ripple marks: Absent.

Gum ducts: No true gum ducts present in wood. Numerous radial intercellular canals, varying in size from a pinhole to a lenticular cavity one-sixteenth inch high, observed in larger stems, but not in small ones. They resemble those found in certain Apocynaceae and Euphorbiaceae. (See *Tropical Woods* 4: 18.)

Minute anatomy: Vessels with simple perforations; spirals

distinct in all vessels of a branch, but absent in large vessels and indistinct in smaller ones in wood of trunk; pits nearly round, screw-head type, alternate; tyloses absent; gum abundant in heartwood. Rays homogeneous; cell walls densely pitted; pits into vessels of same size and appearance as the intervascular pits; as seen on tangential section, most of the rays are several cells (1–7) wide and many cells (up to 100) high, the cells rounded, variable in size, irregularly arranged; some of the rays with cavities, occasionally 2 per ray, or with cores of thin-walled tissue. Wood parenchyma thin-walled, diffuse, or more commonly in uniseriate lines, 2 to 5 fibers apart, in irregular, tangential arrangement. Ground mass composed largely of fiber-tracheids, with very narrow lumina and with thick walls very abundantly pitted radially and tangentially, the pits with lenticular mouths and showing their border clearest in section; *walls with spirals*, distinct to indistinct.

Material: Yale No. 8959, supplied by Mr. William H. Williams, Missouri Pacific Railroad Company, with botanical material identified by Dr. B. L. Robinson, Gray Herbarium, and Dr. S. F. Blake, U. S. Bureau Plant Industry.

NOTES ON TROPICAL AFRICAN TREES

The following additions to Dr. T. F. CHIPP's *Native-Botanical Names Index of Gold Coast Trees* ("The Forest Officer's Handbook," 1922) have been furnished by a collection of herbarium specimens received from the Gold Coast Forest Department, and critically determined by the staff of the Imperial Forestry Institute, Oxford:

Vernacular name (Wassaw language)	*Botanical name*	*Family*
Adidi	*Elæophorbia drupifera* Stapf.	Euphorbiaceae
Asun-kruma	*Homalium* sp. nov.	Flacourtiaceae
Dukwa	*Lonchocarpus sericeus* H.B.K.	Papilionaceae
Kotoprepre	*Berlinia beudelotiana* Baill.	Caesalpiniaceae
Pam-prama	*Corynanthe paniculata* Welw.	Rubiaceae
Sese-dua or Sese-hahamo	*Christiana africana* DC.	Tiliaceae
Sisier	*Trema guineënsis* Ficalho	Ulmaceae

"Kotoprepre" was rightly referred by Chipp to the genus *Berlinia*, but the species had not been identified; the same Wassaw name is applied also to *Bussea occidentalis* Hutch., to *Calpocalyx* sp., and to *Xylia* sp., according to Chipp.—JOSEPH BURTT DAVY, *Lecturer in Tropical Forest Botany, Imperial Forestry Institute, Oxford.*

"Flowers of the Brazilian Rosewood"—A Correction

The flowers described by Mr. H. D. Tiemann in *Tropical Woods* 2: 9 are not those of the tree producing the Brazilian rosewood of commerce, *Dalbergia nigra* Fr. Allem. (Leguminosae), as stated, but belong to *Jacaranda mimosifolia* Don, a Brazilian and Argentine tree of the family Bignoniaceae. The common name "Rosewood of Brazil" on the labels of the specimens of the *Jacaranda* in the Melbourne Botanic Gardens was the source of the confusion of the two trees.

Mr. H. M. Curran writes: "My recollection is that the 'jacarandá' of Brazil, the true rosewood, has masses of yellow pea-like flowers which are born above the foliage on large trees only. Small trees did not bloom in our region (southeastern Bahia), though specimens in parks do so in about four years."

The fact that both of the above-mentioned species, and some others in addition, are known in parts of Brazil as "jacarandá" has resulted in considerable confusion in the literature. Schumann says (*Pflanzenfamilien* IV, 3, 209): "The woods of several species of *Jacaranda* are highly prized as cabinet woods and bear, as do certain species of *Machaerium*, the name 'jacarandá'." It remains to be shown, however, that any species of *Jacaranda* produces other than the plainest and most ordinary kind of wood. Logs of *Machaerium* spp. are sometimes mixed in shipments of Brazilian rosewood, but the wood lacks the essential properties of the true rosewood (*Dalbergia nigra*) and is an unsatisfactory substitute for it.

CURRENT LITERATURE

Les richesses forestières de la République Dominicaine. By WILLIAM DAVIES DURLAND. *La Revue Industrielle du Bois* (Paris) 6: 85: 18, Feb. 15, 1926; 6: 87: 49–50, Apr. 15, 1926.

The forests are described under the following classification: (1) Evergreen hardwoods; (2) partially evergreen hardwoods; (3) pine forests; (4) savannas; (5) thorn forests; (6) deciduous forests; (7) littoral forests. The timberlands have never been extensively exploited and the principal losses have been due to shifting agriculture and fire damage. The most important timber from a commercial standpoint at present is the pine which grows, mostly in park-like stands, in the central Cordillera toward the Haitian frontier. The hardwood forests are difficult of exploitation because most of the woods are as yet unknown to the trade. Through proper forestry measures the Republic is still in position to conserve the natural resources and avoid the devastation which has taken place in some other portions of the West Indies.

Report on the Freshwater Creek Crown Lands, Lowry's Bight, B. H. By DUNCAN STEVENSON. Pub. by the Forest Trust, Belize, British Honduras, April 1926. Pp. 13; 5½ x 8½; 1 map.

"This report is published as a typical example of the work done by the forest staff in rapid cruising of forest properties. . . . While no claim is made to precision in detail, the results obtained are sufficiently reliable as a basis for the preliminary valuation of the forest growth on the property cruised and as a guide to its topography. . . . The cruise cost less than $200, or 1.4 cents per acre."

The tract, with an area of approximately 14,400 acres, is situated in the extreme northern portion of the Colony, not far from San Estévan. The various types and their extent are as follows: *Savanna* (open grassland, generally swampy), 3000 acres; *wamil* or *huamil* (second growth following abandoned shifting cultivation), 340 acres; *acaché* (stunted forest growth on swampy soil) and *broken ridge* (cays of slightly

higher elevation and better drainage), 4400 acres; *high ridge* (intermediate type of exploitable forest, characterized by bayleaf palm and having prolific growth of mahogany and sapodilla), 6000 acres; *cohune ridge* or *corozal* (climax type of forest, characterized by cohune palm and having comparatively few, but large, mahogany and sapodilla trees), 660 acres.

The principal species on the savannas are cutting grass, button wood, red mangrove, coco plum, white poison wood, logwood, and pimento palm. "The acaché contains mahogany and sapodilla of stunted and slow growth and, on account of the pan formation below and the almost year round water-logged nature of the soil, may be considered as an edaphic climax type." "Broken ridge cays contain good stocks of medium growth mahogany and sapodilla in association with black poison wood and Santa María, and would be well worth silvicultural improvement in favor of sapodilla, the mahogany being a doubtful proposition on account of the haulage difficulties." The high ridge areas "contain rich stocks of mahogany and sapodilla of excellent growth and abundant regeneration." The cohune ridge "is less suitable for sapodilla and mahogany production, from the evidence of nil generation, but would be excellent for agricultural cultivation."

The number of mahogany trees (above sapling size) per acre varied from 0 to 2.5, averaging a little over one per acre over the total productive area (11,060 acres). Sapodilla, with a maximum of 6.3 trees per acre, averaged 2.2 trees (of workable size for chicle) per acre over the total productive area. During the five years 1922–1926 there were 1570 mahogany trees cut on the tract, while during the seasons 1918–19 to 1924–25 the production of chicle amounted to 70,193 pounds of the best grades. The presence of so many swamps, which are negotiable only during the short dry season, is a serious impediment to tractor-hauling of mahogany logs, but chicle can be transported by mules at all seasons.

Trinidad and Tobago. Administration report of the Conservator of Forests for the year 1925. By R. C. MARSHALL. Trinidad, 1926. Pp. 14; 8½ x 13. Price 6d.

Imports of wood, chiefly for building and construction, amount to from £100,000 to £300,000 annually, while the local timber industry awaits development. "A well-run sawmill on a proper basis opens a good field for investment as, in addition to the local market, there are distinct possibilities of an export trade, especially mora for railway sleepers. In the Mayaro mora forest, which extends over about 100 square miles, it is estimated that there is a total stand of mature mora in the vicinity of 100,000,000 cubic feet. . . . The Forest Department desires to encourage the investment of capital in the exploitation of the timbers of the Colony. . . . In the past local timber has undeservedly acquired a bad name owing to faulty methods of stacking and seasoning or, more often, to its having been used unseasoned, in which condition, naturally, it shrinks and warps. No timber can acquire or maintain a good reputation if so mishandled and it is mainly on this account that Trinidad timbers have frequently been compared adversely with imported timbers." Seasoning experiments conducted by the Forest Department have shown that there are no inherent difficulties in seasoning native woods.

Sowing and planting operations have been temporarily slowed down to permit of fuller investigation of all of the problems involved. Silvicultural data are being acquired on cedar (*Cedrela mexicana* Roem.), cypre (*Cordia alliodora* Cham.), crappo (*Carapa guianensis* Aubl.), locust (*Hymenæa Courbaril* L.), poui (*Tecoma serratifolia* Don.), galba (*Calophyllum Calaba* Jacq.), angelin (*Andira jamaicensis* W. Wr.), and balata (*Mimusops globosa* Gaertn.).

Greenheart. By B. R. WOOD. Extract from *Official Gazette*, Georgetown, B. G., July 17, 1926. Pp. 4; 8 x 13.

"The true Greenheart (*Nectandra Rodiæi*) occurs in commercial quantities on the north central portion of British Guiana, behind the coastlands, and principally in the area drained by the Cuyuni, Essequibo, Demerara, and Berbice Rivers. In these areas it avoids the drier and poorer soils, growing largely on the slopes leading down to the streams. It is also found in the damp ground near the streams, provided

the conditions do not approach too closely to true swamp, but in such situations the tree is not so big nor the quality quite so good as on the slopes, nor are the stands per acre anything like so great as a rule.

"There is a very large quantity of this wood remaining in the Colony, the former workings having been almost all in the vicinity of the navigable streams, and this large quantity awaits development by more modern methods of logging than have been adopted in the past. . . . The area of forest over which Greenheart is known to occur is approximately 20,000 square miles, while strip valuation surveys . . . have disclosed, on an area of 400 square miles, commencing at six miles from a port at which steamers up to 16 feet draught can load, a total stand of 77,000,000 cubic feet of sound mill timber 16 inches and over in diameter at breast height. . . . The triangle of land having Bartica as its apex, the Essequibo and Mazaruni Rivers as its sides, and a line drawn from Tiboko to Potaro Mouth as its base, a total area of 2,360 square miles, is estimated to contain above 300,000,000 cubic feet of sound merchantable Greenheart timber. . . . On the average, 19 per cent of the trees are unsound. Hewn logs of shipping specification are obtainable from 10 inches to 25 inches square caliper measure, squares above 21 inches not being common and generally carrying a somewhat higher price. Log lengths are usually from 30 to 70 feet."

Here follow a description of the wood and data regarding its properties and resistance to marine borers. "It can, therefore, fairly be claimed that whilst no timber in salt water is immune from attacks by teredo, the record of Greenheart is unsurpassed by any other timber, but it must be borne in mind that this applies in the Tropics to *salt water only*, not to brackish water, and Greenheart has most undeservedly been given a reputation for failing in America in *salt* water because of a much advertised failure in *fresh and brackish water*. . . . It is seen that the teredos attacking Greenheart are both fresh and brackish water species, and are *not* the species which ordinarily occur in salt water, and that they are all tropical species. They cannot have any effect on Greenheart in salt water in the Tropics, nor in water in temperate regions at all."

Agricultural survey of South America: Argentina and Paraguay. By LEON M. ESTABROOK. Dept. Bul. No. 1409, U. S. Dept. Agr. (Washington, D. C.), June 1926. Pp. 90; 6 x 9; figs. 19 (maps and scenes). Price 20c.

An account of the resources of these countries with reference to present and prospective competition with the farming industry of the United States. The information about the forests is badly marred by inaccuracies in nomenclature.

A note on the problem of painting "ipil" wood. By WALTER L. BROOKE. *The Philippine Journal of Science* 30: 3: 303–306, July 1926.

"Ipil" (*Intsia bijuga* O. Ktze.) is one of the best structural timbers of the Philippine Islands, but the coloring matter it contains is so easily soluble in water that during the rainy season it leaches from the wood and produces unsightly stains, at first a dirty red, later changing to an unsightly dark brown. The red coloring matter is a tannin of the phlobatannin class. The trouble can be reduced by immersing the wood in running water for several days or by allowing it to pass through a rainy season uniformly exposed or, if already erected, without painting. All formulas for painting unleached wood must depend on the paint being water-tight or on precipitating the tannin. Some formulas are suggested.

Mikrographie des holzes der auf Java vorkommenden baumarten. By H. H. JANSSONIUS. Leiden: E. J. Brill, 1926. Pp. 577–874; 5½ x 9; figs. 272–296; index and table of contents.

The concluding part of Volume IV of this monumental work is concerned with the woods of the Apocynaceae, Loganiaceae, Borragineae, Scrophularineae, Gesneraceae, Bignoniaceae, and Verbenaceae. Macroscopic features are introduced for the first time.

Federated Malay States. Report on forest administration for the year 1925 and **Annual report of the forest research officer.** By G. E. S. CUBITT and F. W. FOXWORTHY, resp. Kuala Lumpur, 1926. Pp. 59; 8 x 13.

"Increasing prosperity has caused increased demands for timber, but the labor needed to supply those demands has been attracted from work in the forest to easier and more lucrative employment on rubber plantations. The results have been extravagant rises in the market rates for timber and, at the end of the year, something approaching a timber famine. In the Kinta district, where the demand for mining fuel is enormous, the position is a matter of special concern. Planters, who have hitherto been sellers of firewood, are expected soon to become buyers, and waste wood is already being taken from plantations and elsewhere which would not be looked at in districts more favorably situated."

Regarding "jelutong," the gum of *Dyera* spp. (Apocynaceae) now coming into extensive use in place of chicle in the manufacturing of chewing gum, the statement is made that while the potentialities of the industry are great, "unfortunately we know little or nothing about the capacity of the jelutong tree to stand tapping, and the indications are that it is easily damaged. It is necessary, therefore, to proceed with great care, and it is doubtful whether the tapping rules are even now sufficiently stringent. Any large reduction in the rate of tapping permitted is, however, likely to reduce the outturn per tree below the limit which will yield a profit, unless the tapping of jelutong can be combined with some other forest industry. At the present rate of royalty Government is doing little more than covering the cost of supervision, and the profit may be turned into a loss if any large number of trees succumb to injuries. Tapping experiments are being made. A suggestion has been made by one of the big manufacturers of chewing gum that jelutong might be grown in plantations in the same way as rubber, and terms for the grant of land for the purpose were drawn up and approved by the Government." The agricultural chemist reports that sodium silico-fluoride is an effective coagulant and preservative for jelutong sap, and that dilution of the sap with water makes it more difficult to coagulate.

Various kinds of tests, mostly of a practical nature, are being made on different woods. "Nyatoh," *Palaquium* and *Payena* spp. (Sapotaceae), and "mersawa," *Anisoptera* spp.

(Dipterocarpaceae), have proved suitable for tight cooperage. Several woods are proving valuable for furniture. A serious difficulty in utilization is the tendency of the timber to split in drying. "The usual methods of seasoning in this country subject the wood to too severe conditions in the way of sudden changes in temperature and exposure. It is unlikely that we will get satisfactory results in the seasoning of our woods until the rate of seasoning can be carefully controlled." A special seasoning test of 100 tons of "keruing" (*Dipterocarpus* spp.) has been inaugurated as "economic utilization of the timbers of the Malayan forest hinges very largely on the economic use of keruing."

Productie van djatihout in British Indië, Siam en Nederlandsche Indië. By A. J. WARTA. *Tectona* (Buitenzorg) 19: 6: 493–508, June 1926.

The principal differences in the exploitation of teak forests in British India and the Dutch East Indies may be summarized as follows:

British India	*Dutch East Indies*
Selection felling.	Clear cutting.
Private enterprise.	Government enterprise.
Few timber assortments.	Great many timber assortments.
Logs sawed in mills.	Logs hewed round or square.

List of trade fiames for Indian timbers. *The Indian Forester* 52: 7: 331–340, July 1926.

The list has been arranged in two parts, giving in alphabetical order (1) the scientific and corresponding trade names and (2) the trade and corresponding scientific names. "No timbers belonging to different genera have been given the same trade name, with the exception of the Burmese species *Pentacme suavis* and *Shorea obtusa* whose timbers are virtually indistinguishable and by local usage considered equally useful. Closely similar timbers belonging to the same genus have been grouped under the same trade name where there is not sufficient industrial difference in their use to justify allotting a separate name to each species." The list includes 146 species and groups of species.

Hardwood problems in India. By W. A. ROBERTSON. *Empire Forestry Journal* 5: 1: 73–77, 1926.

"In Burma until quite recently it was customary to lump all timbers other than teak into a class rather contemptuously called 'junglewoods.' During the war in Mesopotamia, intelligent interest, it is said, exhibited itself by the creation of a further class, 'redwood,' which has not been satisfactorily identified, nor is likely to be, seeing that at least twenty species yield redwoods; but these dull days seem to be slowly passing, and the results of the last few years' investigations point to there being a real definite use for practically every species, so that we can go a stage further and divide our timbers roughly into 'luxury,' 'general utility,' and 'match woods.' From now onwards the problem lies not so much in finding a use for any particular species, but in arranging to make it available in the quantities which modern industry demands."

"The only conclusions one can draw at present seem to show that the main solution of the hardwood problem lies chiefly in the development of permanent continuous lines of all-the-year-round communications between the forests and the main arteries of traffic, which development will obviously have to be done by Government, while exploitation will have to be backed by organizations which have capital at their disposal less expensive than local capital."

Kiln seasoning of Indian timbers. Project No. VII. By STANLEY FITZGERALD and S. N. KAPUR. Pub. by Economic Branch, Forest Research Institute, Dehra Dun, 1926. Pp. 30; 7 x 9¾; 8 plates.

A manual of the methods of kiln-drying Indian timbers. "The question of the proper seasoning of timber in India has been occupying the attention of the Economic Branch for many years, as it was realized from the very start that the seasoning problem was at the root of all our difficulties in trying to place little-known and little-used timbers on the market. . . . Although air-seasoning may be accepted as the standard practice, the fact remains that the most effective and ultimate solution of many of the timber seasoning problems in India lies in the prompt conversion of the logs, followed by artificial drying in seasoning kilns."

Report on forest administration in Burma for the year ending 31st March 1925. By H. W. A. WATSON. Rangoon, 1926. Pp. 223; 6½ x 10; 16 plates.

In regard to forest regeneration, "the general policy is to confine planting to areas from which the existing crop can be extracted beforehand and to carry out after extraction planting operations regulated by carefully prepared plans which endeavor to utilize the soil to the best advantage and to avoid waste of energy on attempts to stock soils of doubtful productivity. Our natural forests are generally so poorly stocked that if following extraction we restock the better soils artificially, leaving the aftergrowth on the poorer soils to recover naturally, we shall not only have replaced the capital removed, but also have substantially improved the outlook for the future."

"It is easier and distinctly cheaper in the mixed forests of Burma to bring a crop of useful species on to the ground by artificial than by natural means and at best the natural crop looks ragged and uneven compared with the artificially created crop. Yet . . . the artificially created crop is exposed to dangers of which we do not yet know the full extent, not only from animals, insects, and fungi, but probably also from soil deterioration. . . . We must undoubtedly pay more attention to the natural regeneration of our mixed forests." Climber-cutting was undertaken on 84,898 acres, felling of *Ficus*-bound trees on 5,489 acres, and improvement fellings proper on 21,638 acres.

"We know comparatively little about the possibilities of most of our timbers other than teak, and still less about the possibilities of minor products of the forest. . . . Economic research has for its object to make good these deficiencies and to place the knowledge acquired at the service of the trade." A start has been made in the assembling and arrangement of type specimens of the woods, and various timbers were sent to the Forest Research Institute, Dehra Dun, for testing. Kiln-drying experiments have not proved very

satisfactory. "The general experience of the year leads to the conviction that the water-spray type of kiln is not suited to the conditions, climatic and otherwise, of Burma." Air-seasoning experiments promise interesting results. Several timbers of little commercial value are being tried for railway crossties after antiseptic treatment. Twenty-one different species of timber have been used in the workshops. Small stocks of various timbers are held in storage to enable enquirers to get bulk samples to try out.

Reports on certain forest areas of Tavoy and Mergui Districts inspected from the ground as a preliminary to the aerial stockmapping of these districts. By C. W. Scott and C. R. Robbins. Burma Forest Bulletin No. 14, Silvicultural series No. 10. Rangoon, Nov. 1925. Pp. 42; 6 x 9½; map.

Descriptions of the forests by types, together with notes on the commercial possibilities. Appendix I contains a list of the vernacular and scientific names of the plants mentioned in the report. Appendix II includes interesting information as to the abundance and importance of the principal Mergui timbers.

Report on aerial reconnaissance, stockmapping and photography of the forests of the Tavoy and Mergui Districts (South Tenasserim Forest Division) January to April 1925. By C. W. Scott and C. R. Robbins. Burma Forest Bulletin No. 13, misc. series no. 2. Rangoon, Feb. 1926. Pp. 76; 8 x 13; 3 maps; 4 plates. Price 3s.

The area concerned is some 15,000 square miles in extent, being about 350 miles long and about 40 miles wide. Approximately 85 per cent of this is under forest of one kind or another, and the object of the operations was to produce a stockmap of these forests, distinguishing as many of the different forest types as possible and indicating their boundaries. Reconnaissance sketching from the air was found more satisfactory than photography for the particular conditions of the region and the observer was able to distinguish thirteen different forest types and to locate their boundaries accurately on previously prepared inch-to-the-mile maps.

Progress report of forest administration in the Province of Assam for the year 1924–25. By F. Trafford. Shillong, 1925. Pp. 18 + 51; 8 x 13. Price 2s.

"The figures for 1924–25 indicate that the revenue from forests has continued to increase at an even more rapid rate than before. . . . This expansion is due to the efforts of the Conservator and his officers to accelerate the exploitation of the forest, more especially in the Goalpara Division by means of the new tramway. . . . The province has gained much from the increased exploitation of mature timber which, if left in the forests, would in course of time die and rot. . . . The policy of the Government is to carry exploitation to the utmost possible limit without depreciating the capital value of the forests. . . . The area of unclassed State forests and the quantity of timber standing in them is rapidly decreasing owing to the opening out of the province. Consequently it is necessary to ensure that the Reserves contain a sufficient amount of hardwood timber likely to mature within the next fifty or sixty years. . . . In Assam it is not only necessary to preserve a supply of timber sufficient for existing needs. It is necessary also to provide for the future increase of population as well as for demands likely to arise for sleepers owing to the extension of railways within the province and in India generally."—From Government resolution on the report.

The Bombay forests. By W. E. Copleston. Bombay, 1925. Pp. 57; 7½ x 9½; 28 half-tone figs. Price 1 rupee.

An interesting and attractive booklet issued by the Government of Bombay "in order that the public may understand the aims and purposes of the Forest Department and may thus be induced to lend a sympathetic hand."

Annual progress report on forest administration in the Presidency of Bengal for the year 1924–25. By E. O. Shebbeare. Calcutta, 1925. Pp. 41; 8 x 13.

"In an eight-year-old teak plantation at Kaptai (Chittagong Hill Tracts), the average annual girth of the trees in the thinned plot exceeded that in the unthinned plot by 4 inches."

"The forest economist's report that 'chilauni' [*Schima Wallichii* Choisy] after kiln seasoning is a sound constructional timber with few defects opens up the possibility of disposing of this very plentiful, but hitherto useless, tree. The superintendent of the Calcutta Research Tannery reports that the acorns of 'sungre katus' [*Quercus pachyphylla* Kurz] produce a good tanstuff which could be used for the same purposes as Turkish valonia in heavy leather tannage."

Forest administration report of the Bombay Presidency, including Sind, for the year 1924-25. By A. G. Edie. Bombay, 1926. Pp. 223; 6 x 9½. Price 7s. 9d.

"The operation of early burning to ensure the protection of the forests against destructive fires later on may be considered to be still in an experimental stage in the greater part of our forests. The conclusions so far arrived at are favorable. In the East Khandesh Division experiments for finding an economical and practical method of protecting teak seedlings have indicated the placing of stones round the seedlings as the best method. This method has also been tried in Thana against rats with success. The experiments in progress for discovering the best height for coppicing 'anjan' [*Hardwickia binata* Roxb.] have indicated that the greater the height, within reason, the more profuse and vigorous is the resulting coppice."

Tractors and trailers proved satisfactory for hauling crossties and logs. "There is no doubt that mechanical transport can be successfully developed, the main difficulty being to secure suitable establishment in unhealthy forest districts. Work was continued in the Nagzari valley with a Fordson tractor fitted with a Huston skidding winch. . . . Logs up to 3 tons weight were hauled up slopes of as much as 50° and from a range of 1,700 ft. This year a bullock power winch was set up in addition. Though more limited in scope than the other outfit, it has proved its great usefulness already."

Special efforts are being made to develop the match industry, utilizing such soft-wooded species as "bahan" (*Populus euphratica* Oliv.) and "lod" (*Symplocos Beddomei* Clarke). "Several local woods having been found to be satisfactory substitutes for hickory picking sticks in cotton and jute weaving looms, large scale experiments with those woods are being arranged for."

Forestry programme of the Commonwealth Government. By C. E. Lane-Poole. Victoria, Australia, 1925. Pp. 7; 8 x 13; 1 map. Price 6d.

A report dealing with afforestation projects at Capital Territory and Jervis Bay. It is recommended that the proposed Australian Forestry School be located at Canberra.

Report on the forests of Norfolk Island. By C. E. Lane-Poole. Victoria, Australia, 1926. Pp. 35; 8 x 13; 16 half-tone plates; 3 graphs; 1 map.

Norfolk Island, situated 930 miles from Sydney and 400 miles from New Zealand, is five miles long and three miles wide, or about 8000 acres in extent. It was a convict settlement from 1788 to 1855, later occupied by inhabitants of Pitcairn Island. The present population is 726.

"The island was originally covered all over with a dense subtropical rain forest with the pine (*Araucaria excelsa*) dominating the other trees by one hundred feet. . . . The whole island, except the two mountains and the land running down from them to the north coast, has at one time or another been cleared and put under crops and grass. . . . It is only on Mount Pitt that the jungle has come back; everywhere else, except in deep gorges . . . the stock have been sufficient to maintain, with the help of man, the grass conditions. Wood land has been defeated by grass land and, thanks to man, pine alone has triumphed, but it has grown as a park tree and has lost its forest habit of growth in these pasturelands."

The principal tanning materials of Australia, and their leather forming properties. By M. B. Welch and F. A. Coombs. Bul. No. 10, Technological Museum, Sydney, 1926. Pp. 20; 5½ x 8½; 7 plates. Price 6d.

This bulletin deals principally with those barks or substances of proved worth for tanning purposes, points out some of the peculiarities of each, and the results to be obtained.

Australian vegetable tannages are built upon a foundation of wattle bark, the principal supplies being obtained from *Acacia pycnantha* Benth. and *A. mollissima* Willd. Next in importance are the barks of certain species of *Callitris*, or "cypress pines." Mangrove barks are obtainable in large quantities throughout the northern tidal waters from *Rhizophora*, *Ceriops*, and *Bruguiera*, but the leather of mangrove tannage has an objectionable red color. Almost all of the eucalypts produce kino, usually in the wood, more rarely in the bark, and as a tanning agent this kino appears to be superior to other known tanning materials obtained from the eucalypts. Although sulphited kino is inferior to sulphited quebracho, owing to its high percentage of non-tans, it may be able to replace a large amount of the sulphited quebracho now used in Australia.

The tannins of the black cypress pine (*Callitris calcarata* R. Br.) and their distribution in the bark. By F. A. Coombs, W. McGlynn, and M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 59: 356–382, April 1926. Four photomicrographs.

The black cypress pine yields an important tannin-bearing bark available in large quantities, but a satisfactory extraction on a commercial scale has proved to be difficult, a considerable amount of the tannin being destroyed. Methods for obviating this trouble, through the use of finely ground material, are outlined.

"Analyses made on bark samples from different sized trees seem to show that the maximum tannin content is found in small, well-grown trees. There is practically no variation in the tannin content of the bark removed at different heights on the tree, in this respect differing considerably from wattle. Although analyses of individual barks have shown up to almost 37 per cent tannin, the figure obtained from commercial samples is in the vicinity of 20–25 per cent tannin."

Eucalypts in New Zealand. By H. A. Goudie. Circ. No. 20, N. Z. State Forest Service, Wellington, 1925. Pp. 14; 6 x 9 ½; pls. 3.

"For uses where strength, hardness, or durability are essential qualities the woods of several of this genus [*Eucalyptus*] have few (if any) equals. In this country eucalypt timbers are usually associated with such works as wharf and bridge construction, telephone and electric-transmission poles, wood-paving, railway-sleepers, and vehicle-construction, and farmers generally regard eucalypts as a source from which to obtain a supply of durable fencing-timber. In Australia and Tasmania these timbers are applied to all the aforementioned purposes, and in addition many of the softer kinds are used for building-construction and furniture. . . . Fortunately, the planting which has been done during the past forty years affords us much valuable information in this respect, and at Rotorua and elsewhere the State Forest Service has experimented with over seventy species.

"From the results of such experimental work and by the observation of the efforts of private planters it is possible to offer fairly accurate information to intending growers. It should always be borne in mind that a knowledge of the climatic conditions of a district is of much more importance than information regarding the soil, because failures with the eucalypts are more often due to an adverse climate than to unsuitable soil. The moisture content of the soil is, however, an important consideration, as all the species make large demands upon the soil-moisture, while some will fail utterly unless they are able to get plenty of moisture. All species are more or less susceptible to saline winds, and seldom make satisfactory growth near the sea-coast unless sheltered from winds directly off the sea. If a wise selection of species is made by planters the growing of eucalypts should prove a profitable business. Species suitable for electric-transmission poles and construction of railway and tramway cars and ordinary vehicles will in the comparatively near future find a ready and profitable market.

"An attempt has been made hereunder to classify species according to their relative merits. All are now growing successfully in various parts of the Dominion.

"(1) Durable timbers suitable for electric-transmission poles or for sawing into planks and applying to uses where

strength and durability are essential qualities: *E. pilularis* (New South Wales), black-butt; *E. saligna* (New South Wales), flooded gum; *E. Muelleriana* (Victoria and New South Wales), yellow stringy-bark; *E. eugenioides* (New South Wales and Queensland), white stringy-bark; *E. Gunnii* (Tasmania), cider-gum.

"(2) Durable timbers valuable for fencing and like purposes, but of inferior quality for saw-bench: *E. Macarthuri*, *E. viminalis*, *E. botryoides*, *E. ovata*. It is possible that these species may be useful as poles, but the tendency of the timber to crack radially is a drawback. This disadvantage may yet be overcome by proper seasoning methods.

"(3) Softer timbers, not possessing great durability when in contact with the ground, but valuable for milling and for general construction purposes: *E. fastigata*, *E. gigantea*, *E. obliqua*, *E. regnans*."

Note on the structure of some Eucalyptus woods. By M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 58: 169–176, Oct. 1924.

This paper is concerned with the identification of the woods of *Eucalyptus pilularis* Sm. ("blackbutt"), *E. microcorys* F. v. M. ("tallow-wood"), and *E. maculata* Hook. ("spotted gum"). These woods range in color from almost white to light brown, are rather fine-textured, and weigh 50 to 60 lbs. per cu. ft. Though typically distinct, they may exhibit sufficient similarity as to make the determination of small samples a difficult task by ordinary methods. The principal diagnostic features are summarized as follows:

E. microcorys	*E. maculata*	*E. pilularis*
Pore rows oblique.	Pore rows radial.	Pore rows oblique.
Parenchyma in metatracheal bands.	Parenchyma abundant, in metatracheal bands.	Parenchyma rare, not in metatracheal bands.
Rays uniseriate, usually heterogeneous.	Rays multiseriate, homogeneous.	Rays uniseriate, usually homogeneous.
Oil globules numerous.	Oil globules few.	Oil globules very few.
Marked reaction with iron salts.	Little reaction with iron salts.	Marked reaction with iron salts.

"In common with all other Eucalypts, these woods are diffuse-porous." An exception to this statement exists in the

collections of the Yale School of Forestry (No. 2653). It is a specimen obtained from the Museum of Economic Forestry, Sydney, and is labeled "Mountain ash or gum-topped stringy-bark. *Eucalyptus gigantea* Hook." It is distinctly ring-porous and apparently the pore bands occupy the late wood!

The identification of the principal ironbarks and allied woods. By M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 59: 329–345, April 1926. Four photomicrographs, 4 text figures.

About 20 species of *Eucalyptus* belong to the class commonly known as "ironbarks" because of their hard, rough, deeply furrowed bark. Those most valued for their strength and durability are *E. paniculata* Sm. ("grey ironbark," "white ironbark"), *E. crebra* F. v. M. ("narrow-leaved ironbark"), *E. siderophloia* Benth. ("broad-leaved ironbark"), *E. Sideroxylon* A. Cunn. ("red-flowering ironbark" or "mugga"). Frequently confused with these are the woods of two smooth-barked trees known as "grey gum," *E. punctata* DC. and *E. propinqua* D. & M. This publication deals with the anatomical and other features useful in identifying the six species.

The air-seasoning and kiln-drying of timber. By A. R. Entrican. Circ. No. 21, N. Z. State Forest Service, Wellington, 1926. Pp. 20; 6 x 9½; 3 figs.

"It is the object of this circular to indicate to manufacturers and wood-users how seasoning defects may be minimized."

"With the ever-increasing scarcity of seasoned wood greater attention should be directed towards the improvement of drying practices. The prevalent use of green timber is opposed to the best interests of the community, and recognition of this danger by wood-users is reflected in the growing tendency to look abroad for supplies of seasoned wood. If this trend is to be arrested the timber industry must take concerted action to render to the community an efficient drying service. The wise use of dry kilns both by sawmillers and wood-users will relieve the situation to a material extent. To the Forest Service they are of fundamental importance. By their aid new uses will be

developed for timbers hitherto left in the forests owing to the difficulty of seasoning the wood under natural conditions."

A description of a new species of *Eucalyptus* from southern New South Wales. By W. A. W. DE BEUZEVILLE and M. B. WELCH. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 58: 177–181, Nov. 1924. Two plates.

The species described, *Eucalyptus Badjensis*, is a large forest tree locally known as "gully ash." It is closest in external morphology to *E. viminalis* Labill. The description is unusual in that it contains the anatomical details of the leaves, bark, and wood. The timber is pale reddish in color, with small black fungous stains which retard its use; it is of moderate weight and is considered suitable for building purposes, although its durability is not known; it must be seasoned carefully to prevent cell collapse and "wash-boarding."

Annual report on the forest administration of Nigeria for the year 1924. By H. N. THOMPSON. Lagos, 1925. Pp. 25; 8 x 13.

One of the interesting items in this report indicates that measures for the protection of man from sleeping sickness are accompanied by an increased fire hazard to the open forests in the eastern provinces. "Attention is drawn to the great damage done to the open Savannah Forests each year by the fierce forest fires that pass through them in the dry season. To quote from the Senior Conservator of Forests' report: 'The drying up of streams, the denudation of hillsides and the gradual desiccation of the country are all direct results of these fires.' The damage done by the fires can be reduced to a large extent by resorting to the practice of firing the grass early in the dry season, but the whole question is somewhat complicated by the fact that recent experiments conducted with a view to exterminating tsetse flies in the Savannah forests of Africa indicate that one of the most successful measures tried for attaining that end consists in the deliberate burning *as late as possible in the dry season* of the belts of vegetation that form their breeding haunts."