CHECK LIST OF THE COMMON NAMES

Abezguen	*Salvadora persica* L.	Salvadoraceae
Abser	*Acacia tortilis* Hayne	Leguminosae
Adjar	*Maerua crassifolia* Forsk	Capparidaceae
Ahetes	*Acacia albida* Delille	Leguminosae
Alenda	*Ephedra alata* Dcne.	Ephedraceae
Aleo	*Olea Laperrini* Batt. & Trab.	Oleaceae
Amateltel	*Cocculus pendulus* Forst.	Menispermaceae
Ana	*Leptadenia pyrotechnica* Dcne.	Asclepiadaceae
Arassou	*Calligonum comosum* L'Her.	Polygonaceae
Arganier	*Argania Sideroxylon* R. & S.	Sapotaceae
'Arta	*Calligonum comosum* L'Her.	Polygonaceae
Baboul	*Salvadora persica* L.	Salvadoraceae
Betoum	*Pistacia atlantica* Desf.	Anacardiaceae
Defla	*Nerium Oleander* L.	Apocynaceae
Ebenier	*Diospyros mespiliformis* Hochst. (?)	Ebenaceae
Elel	*Nerium Oleander* L.	Apocynaceae
Fersig	*Tamarix gallica* L.	Tamaricaceae
Figuier	*Ficus Teloukat* Batt. & Trab.	Moraceae
Hallab	*Periploca laevigata* Ait.	Asclepiadaceae
Irak	*Salvadora persica* L.	Salvadoraceae
Jejubier	*Zizyphus Lotus* L.	Rhamnaceae
Korounka	*Calotropis procera* Ait.	Asclepiadaceae
Laurier-rose	*Nerium Oleander* L.	Apocynaceae
Myrte	*Myrtus Nivellii* Batt. & Trab.	Myrtaceae
Olivier	*Olea Laperrini* Batt. & Trab.	Oleaceae
Oyou	*Salvadora persica* L.	Salvadoraceae
Retam	*Retama Retam* Webb.	Leguminosae
Sedra	*Zizyphus Lotus* L.	Rhamnaceae
Selouf	*Periploca laevigata* Ait.	Asclepiadaceae
Siwak	*Salvadora persica* L.	Salvadoraceae
Tabakat	*Zizyphus Lotus* L.	Rhamnaceae
Tabrakat	*Tamarix articulata* Vahl	Tamaricaceae
Talha	*Acacia tortilis* Hayne	Leguminosae
Tamarix	*Tamarix* spp.	Tamaricaceae
Tamat	*Acacia Seyal* Delille	Leguminosae
Tarfa	*Tamarix gallica* L.	Tamaricaceae
Tarout	*Cupressus Dupreziana* A. Camus.	Pinaceae
Teborak	*Balanites aegyptica* Delille	Rutaceae
Tehoq	*Salvadora persica* L.	Salvadoraceae
Teloulout	*Capparis spinosa* L.	Capparidaceae
Terrakat	*Grewia populifolia* Vahl (?)	Tiliaceae
Tlaïa	*Tamarix articulata* Vahl	Tamaricaceae
Tourha	*Calotropis procera* Ait.	Asclepiadaceae

Yale University School of Forestry

TROPICAL WOODS

NUMBER 13 March 1, 1928

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, Yale University.*

Subscription price One Dollar per year of four numbers. Remittances should be made payable to TROPICAL WOODS.

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

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"We have had botanical and wood specimens of 'longotra fotsy' for the past five or six years, but the material was not sufficient for determination; in my notes it is recorded as doubtfully Lauraceae. It was because of this doubt that I did not consider it advisable to mention the wood in my work,

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'Les bois de la forêt d'Analamazaotra.' Since then we have received another specimen of 'longotra fotsy' from Mr. Louvel and one of 'longotra mena' from Mr. Perrier de la Bathie. Upon receipt of your letter Mr. Paul Danguy and I examined these specimens and are convinced, beyond possible doubt, that they belong to the genus *Cryptocarya*. My assistant has described two new species, *C. Loiselii* P. Dang. and *C. Perrieri* P. Dang., respectively. Because of the opposite arrangement of their leaves, these two species are easily distinguished from others of the genus, and the woods of India we have in our collections under the name of *Cryptocarya* do not have storied rays, whereas this feature is very distinct in the 'longotras' of Madagascar.

"In an article, which appeared in the *Bulletin Economique de Madagascar* in 1924, Mr. Louvel calls attention (p. 90) to the 'longotra mena' and further along reproduces a photograph of a 'longotra mena' tree having a basal circumference of 7.50 meters. This proves that it is a very large tree and, thanks to your query, we now know its exact classification."

Comparison of the wood in question with specimens of *Cryptocarya* in the Yale collections leads the editor to believe that the differences are of generic rank rather than specific only. At least they are sufficient to demarcate a sub-genus.

Extending the Known Range of *Minquartia*

In a small lot of wood samples recently received by the editor from Mr. J. R. M. Barber who collected them in the northern coastal region of the Province of Esmeraldes, Ecuador, near the Colombian border, is one bearing the vernacular name of "pechiche" (Yale No. 10,119). This has been identified as *Minquartia guianensis* Aubl., the same as the true "manwood" of Panama. (See *Tropical Woods* 8: 10, Dec. 1, 1926.) This species was collected also by G. Proctor Cooper and George M. Slater in Progreso, Department of Chiriqui, Panama.

RHODESIAN TIMBERS

By W. E. Tongue

Zambesi Saw Mills, Ltd., Livingstone, Northern Rhodesia

South Africa as a whole is very poorly supplied with indigenous timbers of any sort and relies to a very great extent on importations to meet its lumber requirements. For this reason it is unlikely that any considerable quantity of timber will be available for export overseas. Parties having *bona fide* timber propositions to offer need not seek markets beyond the confines of Southern Africa.

At present, the bulk of the softwood consumed in this country comes from the Baltic area of northern Europe, and to a less extent from the Pacific slope of North America. Hardwoods come mainly from Australia, the biggest items being railway sleepers; there is also a considerable quantity of Burma teak imported.

Rhodesia (Northern and Southern) has a moderate supply of hardwood timber, but practically no softwoods. The only wood in such quantity as to have any commercial importance outside of Rhodesia itself is that known as Rhodesian Teak or Redwood (native name "mkushi"), *Baikiæa plurijuga* Harms. (Leguminosae). It is very extensively cut for railway sleepers for use both in this country and on the South African Railways in the Union. It is a very dense wood, durable, warps little, but is inclined to develop surface checks upon exposure. It is strong when green, but becomes "brash" when dried out. In color it resembles Burma teak when first cut, but becomes dark red upon exposure.

The Zambesi Saw Mills are mainly engaged in the production of railway sleepers of this timber. As a by-product they get large quantities of small sections which they dispose of for various purposes, such as the manufacture of wood-block and parquet flooring, a purpose for which the wood is well adapted, being both handsome in appearance and exceedingly resistant to wear. The market in South Africa is too small to absorb all of these by-products, hence a considerable quantity of lumber is burned which might be used elsewhere to advantage.

"PINK IVORY" WOOD

"Pink Ivory," according to Boulger,[1] "is a beautiful, but as yet undetermined, wood, of an Acacia-like tree of moderate dimensions, growing in kloofs in southwestern Natal, with yellowish broad sapwood and rose-pink heart . . . " Elsewhere (*loc. cit.*, p. 104) he refers to it as "a singularly beautiful wood." This description made special appeal to Mr. Rudolph Block, New York City, who is collecting the rare and otherwise interesting woods of the world,[2] and, after repeated attempts, he secured several excellent specimens of the wood. Portions of some of these have been generously donated to the Yale School of Forestry, and accompanying them are memoranda from which the following information has been compiled.

The tree producing the wood known as Pink Ivory, or more commonly as Red Ivory, is *Rhamnus Zeheri* Sond., of the Rhamnaceae or Buckthorn family. It grows in scrub forests and hot thorn-veld valleys and kloofs in Zululand (northern Natal) and adjacent regions. Ordinarily it is not over 20 feet high, but in exceptionally well-favored localities where the associated trees are tall it will reach a height of 40 feet, though the trunk remains slender and rarely attains a diameter of a foot. The Kafir (Xosa) name for it is "umnini," while the Zulus call it "umgoloti."

The wood has always been prized by the Zulus and their kindred, such as the Swazis. Under the old tribal custom, which still prevails in the interior, the trees were not allowed to be cut. Formerly only the Head of the Royal House was entitled to carry a stick of "umgoloti" and infringement of this prerogative was punishable by death. The Zulu king, Dingaan, whose defeat by the emigrant Boers in the early forties is still celebrated in South Africa by a national holiday, always carried an "assegai" (spear) hafted with this wood. It is said that he killed his own mother with this spear, and, after his defeat, he was himself killed with it, at his own desire, by his henchmen.

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1 BOULGER, G. S.: *Wood*. London, 1908, p. 255.
2 See *Tropical Woods* 7: 48, September 1, 1926.

Examination of the specimens of Pink Ivory wood received at the Yale laboratory yields the following results: The heartwood is of an unusual color, being a bright pink with a golden luster when fresh, but deepening in time to pinkish red or dark red; fades to brown upon prolonged exposure to the sun. The sapwood, which is nearly white and rather sharply demarcated, is tougher than the heart and not so hard and brittle. The red wood is dense and compact, the thoroughly air-dry material weighing about 63 pounds per cubic foot (sp. gr. 1.07). It is hard to cut, but takes a smooth, glassy polish. One correspondent says: "I have known a settler to make a cross beam of this wood for the front of his wagon, but he was glad to take it out again, for it was so smooth and slippery that it was not possible to stand on it."

Anatomy: Growth rings fairly distinct, due to lighter-colored zones. Parenchyma not visible. Pores very small, barely visible without lens; numerous, but not crowded; occurring for the most part in radial pairs or short rows. Rays very fine; visible on cross section; invisible on tangential; low and inconspicuous on radial surface; heterogeneous, with the marginal cells bearing small crystals of calcium oxalate; pits into vessels minute, numerous, half-bordered, resembling the intervascular. Fibers very small, thick-walled, with minute cavities and indistinct simple pits. *Material:* Yale Nos. 11,133, 11,133A, and 11,133B from Mr. Block.

MORE ABOUT THE CHINESE "PAU-HOI"

In *Tropical Woods* 3: 1, Sept. 1925, appeared a short note by the editor on the Chinese "pau-hoi" or bandoline wood, in which the question was raised as to the identity of the tree. This prompted a letter from Professor Augustine Henry, College of Science for Ireland, citing certain references in which G. M. H. Playfair is credited with the statement over 30 years ago that the tree from which the shavings were obtained in Ningpo is *Machilus Thunbergii* Sieb. & Zucc. Playfair is further quoted as saying that, on the authority of Dr. A. Henry, the Canton shavings were from the same tree. (See *Tropical Woods* 6: 11, June 1, 1926.)

In a letter of November 7, 1927, Dr. Henry states that he has recently examined the botanical specimens sent by Playfair to the herbarium at Kew and that there is no doubt that the tree from which they were obtained is *Machilus Thunbergii*. This species is a common one in China, but "neither Wilson, Ford, myself, or any other collector," says Dr. Henry, "ever said that it produces the shavings in question. I never succeeded anywhere in identifying the source of the shavings, and as I was never at Canton and never told Playfair that the Canton shavings were produced by *Machilus Thunbergii*, I am at a loss to know how he was led into the misstatement regarding my connection with the subject."

The identity of the "pau-hoi" has yet to be determined. According to Dr. Kanehira (*Tropical Woods* 10: 53, June 1, 1927) it is certainly a species of *Machilus*, though perhaps undescribed.

Is *Maba* distinct from *Diospyros?*

In *Timbers of Tropical America*, page 504, appears this statement: "The woods of *Maba* and *Diospyros* are not distinguishable." Further investigations have failed to change the editor's opinion that in so far as the woods are concerned the two genera may be considered as one.

In his description of *Maba nicaraguensis*, Paul C. Standley says (*Journ. Wash. Acad. Sci.* 17: 20: 526, Dec. 4, 1927): "In the Nicaraguan tree the calyx seems to be as often 4 or 5-parted as 3-parted. In the genus *Maba* the calyx is supposed to be 3-parted; in *Diospyros* 4 or 5-parted. It is evident that in this case, at least, this difference does not hold, and it is therefore doubtful whether *Maba* can be maintained as a distinct genus."

Mr. G. Proctor Cooper spent the winter in further exploration of the forests of Panama and Costa Rica under the auspices of the Yale School of Forestry. The work was made possible through the coöperation of the New York Botanical Garden, Field Museum of Natural History, and United Fruit Company.

THE PERSAUD COLLECTION OF BRITISH GUIANA WOODS

By David A. Kribs

Graduate Student at Yale University

Introduction

"Mr. A. C. Persaud came to my attention in the course of the Stanley Field Guiana Expedition of 1922," says Dr. B. E. Dahlgren, Acting Curator of Botany of the Field Museum of Natural History, Chicago. "We had taken a small vacant house on the outskirts of Georgetown to serve as headquarters and assembling place for our collections. Living almost within sight of this place, Mr. Persaud, on learning that we were collecting plants, came to offer his services. He was a quiet, gentle Hindoo, of slight stature. By nature a student, his main interest in life was unquestionably plants, and in a more favorable environment he would undoubtedly have become a botanist of some note, but with various handicaps in a small English colony,—poverty, extraction, and poor health—he seems to have eked out a scanty living by gardening, alternating with odd jobs, such as tinsmithing, for which he was completely unfitted. It seems to me now, after the lapse of a number of years, that he told me that he had made collections of fungi for some English institution. With a few exceptions among those holding official scientific or educational posts in Georgetown, there was probably no one in the colony with a more genuine interest in plants or with a more intimate knowledge of much of the local flora.

"Mr. Persaud was engaged to help in making our collection for the Field Museum and was later recommended to the attention of Mr. H. Lang, then Associate Curator of African Mammals in the American Museum, who was about to spend a vacation making natural history collections in British Guiana in the company of Mr. William J. LaVarre, Jr., the latter interested in business in the diamond fields. The result of this was the Lang-LaVarre collections made along the Mazaruni River, most of which reached the Field Museum as

a gift in rather poor condition. On an expedition not primarily undertaken for botanical collecting and at an unfavorable season of the year, mould and moisture had played havoc with the imperfectly dried plants.

"Inasmuch as Dr. H. A. Gleason, of the New York Botanical Garden, was engaged in the study of the British Guiana flora, and also as the flora of Dutch Guiana was apparently being thoroughly collected by the energetic director of the Botanical Station at Paramaribo, Dr. G. Stahel, it seemed superfluous for the Field Museum to encourage a collector of general botanical material in British Guiana. However, with the Field Museum's interest in woods, there was the ever present problem of connecting the study of woods with taxonomic diagnoses. In view of the taxonomic work then being done on Guiana plants, British Guiana seemed to me a particularly favorable field for some collecting of tropical woods properly accompanied by herbarium material. Mr. Persaud's reliability being beyond question, this rather difficult and important collecting seemed to me a task which might well be entrusted to him and he was accordingly employed with Capt. Marshall Field expedition funds for South American exploration to secure wood and herbarium specimens during a part of 1923 and 1924. Toward the end of the latter year he wrote that his work had been greatly interrupted by illness and shortly afterward word was received of his death.

"The herbarium material was referred to Dr. Gleason for determination and the wood specimens to Professor Record."

The Persaud collection of woods, as received from the Field Museum of Natural History, consists of 88 specimens about a foot long and one-half inch thick, split from the middle of the stem of saplings and small trees. The writer, at the time Instructor in Forestry at the University of Minnesota, sectioned and studied these specimens at the Yale School of Forestry during the summer of 1926, the work being done under the direction of Professor Record.

The number of species considered in this report is 68, representing 60 genera and 32 families. In a few instances

descriptions are omitted or much curtailed because the woods have already been described in *Tropical Woods* or in *Timbers of Tropical America*. Most of the species, however, which are represented in this collection have not previously been studied in detail and many of them have proved to be of exceptional interest.

Amygdalaceae (Almond Family)

The woods of the genera *Hirtella*, *Licania*, *Moquilea*, and *Parinarium* have the following characteristics in common:

Gross anatomy: Growth rings visible, due to zonate variation in fiber density. Parenchyma in very fine concentric lines forming web-like structure with rays. Pores large, visible as small pin holes, solitary, scattered; tyloses appear as white spots. Vessel lines conspicuous as white lines or as long coarse scratches of same color as background. Rays very fine and inconspicuous.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, numerous, not crowded, screw-head type. Fibers arranged in definite radial rows; make up most of the ground mass of the wood; square to hexagonal in section, extremely thick-walled, with minute lumina; large, circular, bordered pits numerous on radial and tangential walls. Rays mostly uniseriate, a few biseriate in median portion; decidedly heterogeneous; dark red gum abundant. Vessel-ray pits (1) half-bordered and (2) simple, large and elongated, with tendency to scalariform arrangement. Parenchyma in numerous, fine, concentric or wavy, tangential, uniseriate lines; cells filled with dark red gum.

Hirtella hirsuta Lam. "Buku-buku." Wood chocolate brown, uniform; luster dull. Heavy and hard; fine-textured; straight-grained; finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.132 mm. to 0.199 mm., av. 0.17 mm. Vessel segments 0.58 mm. to 0.91 mm. long, av. 0.79 mm.; end walls oblique, with short to long tips. Fibres 1.06 mm. to 1.46 mm. long, av. 1.32 mm.; 0.014 mm. to 0.024 mm. wide, av. 0.02 mm. Rays numerous, 16 to 21 per mm.; height 1 to 60 cells, or 0.08 mm. to 1.63 mm., av. 0.64 mm.

Material: Persaud No. 28; Field Museum No. 549,775; Yale No. 9444.

Licania cyathodes Benoist. Color bluish gray, streaked with yellow; not uniform; luster dull. Odor and taste not distinctive. Hard and heavy; grain somewhat roey; texture fine; not easy to cut, but finishes fairly smoothly.

Minute anatomy: Tang. diam. of pores 0.08 mm. to 0.17 mm., av. 0.12 mm. Vessel segments 0.33 mm. to 0.83 mm. long, av. 0.65 mm.; end walls horizontal to oblique. Rays 18 to 24 per mm.; height 1 to 50 cells, or 0.05 mm. to 1.195 mm., av. 0.52 mm. Fibers 1.11 mm. to 1.58 mm. long, av. 1.39 mm.; 0.016 mm. to 0.027 mm. wide, av. 0.02 mm.

Material: Persaud No. 97; Field Museum No. 549,857; Yale No. 9491.

Licania heteromorpha Benth. Color chocolate brown, uniform; dull luster. Hard and dense; grain somewhat roey; texture fine; finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.149 mm. to 0.215 mm., av. 0.18 mm. Vessel segments 0.50 mm. to 0.83 mm. long, av. 0.65 mm.; end walls oblique, with long tips. Fibers 0.91 mm. to 1.46 mm. long, av. 1.24 mm.; 0.016 mm. to 0.024 mm. wide, av. 0.02 mm. Rays 18 to 22 per mm.; 1 to 45 cells high, or 0.05 mm. to 1.59 mm., av. 0.53 mm.

Material: Persaud No. 94; Field Museum No. 549,854; Yale No. 9489.

Moquilea sp. Heartwood light brown; sapwood yellow-brown, not distinct; luster dull. Very hard and heavy; straight-grained; fine-textured; finishes smoothly.

Material: Persaud No. 141; Field Museum No. 549,907; Yale No. 9508.

Parinarium campestre Aubl. "Burhoorada." Color light orange-brown; luster dull. Hard and heavy; fibrous; grain roey; texture fine; finishes fairly smoothly.

Minute anatomy: Tang. diam. of pores 0.13 mm. to 0.23 mm., av. 0.19 mm. Vessel segments 0.66 mm. to 0.91 mm., av. 0.83 mm.; oblique ends, short tips. Fibers 1.23 mm. to 1.53 mm. long, av. 1.43 mm.; 0.014 mm. to 0.027 mm. long, av. 0.02 mm. Rays 18 to 22 per mm.; height 1 to 30 cells; or 0.05 mm. to 0.88 mm., av. 0.35 mm.

Material: Persaud No. 58; Field Museum No. 549,813; Yale No. 9467.

Anacardiaceae (Sumach Family)

The woods of *Anacardium* and *Tapirira* have the following characteristics in common:

Gross anatomy: Growth rings visible, but inconspicuous; due to slight zonate variation in fiber density. Pores barely visible without lens, numerous, evenly distributed, occurring in radial groups of 2 to 4, tyloses and gummy substances common. Vessel lines conspicuous, considerably darker than the background. Rays fine; faintly visible on cross and

tangential sections; distinct on the radial, being darker than background.

Minute anatomy: Vessel perforations exclusively simple; intervascular pits numerous, very large, crowded, oval to polygonal in outline, the apertures elliptic (*Anacardium*) to slit-like (*Tapirira*). Fibers arranged in definite radial rows; square to hexagonal in section; lumina frequently filled with yellow gum; radial walls with numerous simple pits. Rays 1 to 4 cells wide; decidedly heterogeneous; cells frequently filled with dark brown gum; pits into vessels conspicuously large, simple, elongated, and frequently in scalariform arrangement.

Anacardium giganteum Hancock. "Hooboodia" or "wild cashew." Color of wood variegated, pinkish brown, yellow or greenish brown, not uniform; lustrous. Odor and taste not distinctive. Light and soft, but firm; grain somewhat roey; texture fine; works easily and finishes smoothly.

Minute anatomy: Parenchyma fairly abundant; paratracheal 3 to 5 cells thick, with wing-like extensions. Tang. diam. of pores 0.05 mm. to 0.12 mm., av. 0.08 mm. Vessel segments av. 0.42 mm. long. Fibers 0.58 mm. to 1.19 mm. long, av. 0.88 mm.; 0.02 mm. to 0.027 mm. wide, av. 0.022 mm. Rays 1 to 28 cells high, or 0.07 mm. to 0.8 mm., av. 0.47 mm.

Material: Persaud No. 36; Field Museum No. 549, 787; Yale No. 9451.

Tapirira guianensis Aubl. "Waramia." General properties and gross anatomy described in *Timbers of Tropical America* pp. 383–384.

Minute anatomy: Rays with marginal cells containing diamond-shaped crystals; resin canals numerous, their av. diam. 0.03 mm. Parenchyma paratracheal as isolated cells. Fibers septate. Tang. diam. of pores 0.08 mm. to 0.15 mm., av. 0.11 mm. Vessel segments 0.33 mm. to 0.63 mm. long, av. 0.50 mm. Fibers 0.89 mm. to 1.26 mm. long, av. 1.04 mm.; 0.02 mm. to 0.038 mm. wide, av. 0.027 mm. Rays 3 to 9 per mm., 2 to 26 cells high or from 0.08 mm. to 0.66 mm., av. 0.33 mm.

Material: Persaud No. 6; Field Museum No. 549,749; Yale No. 9428.

Tapirira Marchandii Aubl. "Duka." Color of wood uniform light pink; lustrous. Light and soft; straight-grained; fine-textured; works easily and finishes smoothly.

Minute anatomy: Same as *T. guianensis*. Tang. diam. of pores 0.08 mm. to 0.166 mm., av. 0.106 mm. Vessel segments 0.50 mm. to 0.82 mm. long, av. 0.7 mm.; end walls horizontal to oblique with long tips. Fibers 1.11 mm. to 1.58 mm. long, av. 1.34 mm.; 0.013 mm. to 0.027 mm. wide, av. 0.023 mm.

Rays 3 to 10 per mm., 2 to 35 cells high, or 0.116 mm. to 0.996 mm., av. 0.458 mm.

Material: Persaud No. 35; Field Museum No. 549,785; Yale No. 9450.

Anonaceae (Custard-apple Family)

Rollinia multiflora Spltz. "Koyetchi" or "black mahoe." Color pale yellow-brown; luster dull. Odor and taste not distinctive. Light and soft; straight-grained; fine-textured; finishes fairly smoothly.

Growth rings plainly visible due to zonate variation in fiber density. Parenchyma in fine, white, concentric lines forming a distinct web-like structure with rays. Pores barely visible, open, not numerous, uniformly distributed; mostly solitary, but occasionally in radial pairs. Vessel lines not distinct. Rays visible on cross section, but not on tangential; distinct on radial, being much darker than background. Pith flecks common.

Minute anatomy: Vessels with simple perforations; intervascular pits minute, numerous, not crowded, the apertures slit-like, but not extending to edge of border. Fibers thin-walled, in no definite arrangement; numerous, minute, simple or indistinctly bordered pits in radial and tangential walls. Rays 1 to 4 cells wide; slightly heterogeneous; cells partially filled with light brown gum; diamond-shaped crystals numerous. Vessel-ray pits of same appearance as the intervascular. Paratracheal parenchyma uniseriate; metatracheal concentric, 1 to 5 cells wide, individual cells larger than the fibers; gash-like pits in end walls characteristic. Tang. diam. of pores 0.049 mm. to 0.13 mm., av. 0.09 mm. Vessel segments 0.28 mm. to 0.45 mm. long, av. 0.39 mm.; end walls slightly oblique, with short tips. Fibers 1.0 mm. to 1.66 mm. long, av. 1.34 mm.

Material: Persaud No. 12; Field Museum No. 549,756; Yale No. 9431.

Aquifoliaceae (Holly Family)

Ilex Martiniana D. Don. "Kakatara." Color dull white throughout. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; rather hard to cut, but finishes fairly smoothly.

Growth rings indistinct. Parenchyma scarcely visible with lens. Pores at limit of vision, open, numerous, solitary or in radial pairs. Vessel lines indistinct. Rays of two sizes, the larger appearing as fine white lines on cross section, and giving

speckled appearance to tangential surface; visible, but not distinct, on radial.

Minute anatomy: Pores thin-walled, oval to angular in outline; vessel perforations exclusively scalariform, with from 30 to 60 bars; *spirals absent;*[1] intervascular pits in part small with oval to almost square borders and elliptic mouths, and in part elongated with tendency to scalariform arrangement. Fibers thick-walled, but with large lumina; in irregular radial rows; large bordered pits numerous on radial walls, the mouths slit-like and extending beyond border; *spirals absent.* Rays 8 to 12 per mm.; 1 to 4 cells wide; decidedly heterogeneous; cells frequently filled with yellow gum; multiseriate rays with high uniseriate margins. Pits into vessels of the same appearance as the intervascular. Paratracheal parenchyma uniseriate; metatracheal as isolated cells. Tang. diam. of pores 0.033 mm. to 0.08 mm., av. 0.058 mm.; vessel segments 0.91 mm. to 1.44 mm. long, av. 1.20 mm.; oblique ends and gradually tapering tips. Fibers 1.66 mm. to 2.62 mm. long, av. 2.11 mm.; 0.022 mm. to 0.04 mm. wide, av. 0.035 mm. Rays 1 to 40 cells high, or 0.166 mm. to 1.99 mm., av. 1.21 mm.

Material: Persaud No. 88; Field Museum No. 549,848; Yale No. 9485.

Bombacaceae (Cotton-tree Family)

Catostemma fragrans Benth. Color that of oatmeal; luster dull. Odor and taste not distinctive. Light and soft; straight-grained; fibrous; coarse-textured; works with difficulty; does not finish smoothly.

Growth rings not distinct. Parenchyma in wide concentric bands; more abundant than fibers. Pores resemble small, open pinholes; scattered; appearing singly or in radial groups of 2 or 3. Vessel lines inconspicuous. Rays visible as heavy white lines on cross section and as diamond-shaped spots on tangential; conspicuous and large on radial surface, being darker than background.

Minute anatomy: Vessels thick-walled; perforations simple; intervascular pits alternate, large, numerous, the borders oval, the apertures lenticular. Fibers polygonal in section, extremely thick-walled, in part gelatinous, with minute lumina; not in definite lines; pits large and conspicuous, simple or very indistinctly bordered. Rays of two kinds (1) uniseriate and (2) 4 to 20 cells wide; decidedly heterogeneous; cells filled with red gum; pits into vessels large, simple to half-bordered, irregular, elliptic or elongated radially. Parenchyma in tangential bands 5 to 15 cells wide; individual cells 3 or 4 times as large as the fibers, and filled with red-brown gum. Tang. diam. of

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[1] See *Tropical Woods* 8: 9, December 1, 1926.

pores 0.13 mm. to 0.23 mm., av. 0.18 mm. Vessel segments 0.166 mm. to 0.415 mm. long, av. 0.33 mm. Fibers 1.83 mm. to 2.59 mm. long, av. 2.0 mm.; 0.022 mm. to 0.033 mm. wide, av. 0.026 mm. Rays 2 to 4 per mm., mostly multiseriate, 4 to 20 cells wide; 3 to 100 cells high, or 0.08 mm. to 2.16 mm., av. 1.46 mm.

Material: Persaud No. 134; Field Museum No. 549,900; Yale No. 9505.

Burseraceae (Torchwood Family)

Icica Schomburgkiana (Engler). "Oolu." Color pale pinkish brown, deepening on exposure; luster dull. Odor and taste not distinctive. Medium hard and heavy; grain somewhat roey; texture fine; finishes smoothly.

Growth rings not distinct. Parenchyma invisible. Pores barely visible without lens, mostly open, numerous, evenly distributed, solitary or in radial groups of 2 or 3. Vessel lines very fine, slightly darker than background. Rays not visible without lens on cross and tangential sections; barely visible on radial, being of same color as background. Radial gum ducts present, appearing as very small black specks on tangential surface.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, large, of screw-head type, numerous, but not crowded. Fibers septate, small in section, thick-walled, with middle lamella thickened at corners; arranged in irregular radial rows; minute simple pits confined to radial walls. Rays 15 to 20 per mm.; mostly uniseriate, a few partly biseriate; heterogeneous; cells filled with deep red gum; end walls densely pitted; pits into vessels simple to half-bordered, elongated radially and tending to scalariform arrangement; intercellular canals small, av. tang. diam. 0.033 mm. Parenchyma paratracheal, 1 or 2 cells wide. Tang. diam. of pores 0.05 mm. to 0.08 mm., av. 0.06 mm. Vessel segments 0.38 mm. to 0.63 mm. long, av. 0.48 mm.; oblique ends, long projecting tips. Fibers 0.66 mm. to 1.01 mm. long, av. 0.83 mm.; 0.008 mm. to 0.016 mm. wide, av. 0.014 mm. Rays 3 to 25 cells high, or 0.08 mm. to 0.50 mm., av. 0.285 mm.

Material: Persaud No. 59; Field Museum No. 549,814; Yale No. 9468.

Caryocaraceae

Caryocar glabrum Pers. "Bats souari." Heartwood grayish brown; sapwood lighter, but not sharply defined. Odor and taste not distinctive. Moderately heavy and hard; grain roey; fibrous; medium-textured; works easily and finishes smoothly.

Growth rings indistinct to distinct, due to darker zones being nearly free of parenchyma and also to certain parenchyma lines being more regular than others. Parenchyma abundant, in numerous, fine, broken, tangential lines, not visible without lens. Pores appear as large, open pinholes, numerous, in radial pairs or appressed groups of 3 to 8; tyloses occasionally present. Vessel lines distinct as rather long scratches, darker than background. Rays not visible without lens on cross and tangential sections; not very distinct on radial.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, very large, crowded, the borders oval to polygonal, the apertures oval. Fibers polygonal in section, extremely thick-walled, often with mucilaginous layers common and minute lumina; pits inconspicuous and simple. Rays 15 to 22 per mm.; mostly uniseriate, a few partly biseriate; filled with brown gum; decidedly heterogeneous; pits into vessels (1) small to large, oval, simple to half-bordered and (2) tangentially elongated and tending to scalariform arrangement. Paratracheal parenchyma uniseriate, metatracheal in broken uniseriate lines and as isolated cells; cells of same size as the fibers in section; rhombohedral crystals of calcium oxalate and red-brown deposits common. Tang. diam. of pores 0.085 mm. to 0.17 mm., av. 0.13 mm. Vessel segments 0.61 mm. to 1.00 mm. long, av. 0.80 mm. Fibers 1.83 mm. to 2.16 mm. long, av. 1.99 mm.; 0.016 mm. to 0.03 mm. wide, av. 0.022 mm. Rays 2 to 50 cells high, or 0.166 mm. to 2.22 mm., av. 1.03 mm.

Material: Persaud No. 90; Field Museum No. 549,850; Yale No. 9487.

Ebenaceae (Ebony Family)

Diospyros guianensis (Aubl.) Gürke. "Bara-bara." Color of the heartwood variegated, brown to black; sapwood yellowish brown, sharply defined. Odor and taste not distinctive. Moderately heavy and hard; straight-grained; fine-textured; finishes smoothly.

Growth rings fairly distinct, due to zonate variation in fiber density. Parenchyma in fine tangential lines, not visible without lens. Pores barely visible, open, numerous, evenly distributed, solitary or in radial groups of 2 to 4. Vessel lines inconspicuous. Rays barely visible on cross section; not visible on tangential; visible, but inconspicuous, on radial.

Minute anatomy: Vessels thick-walled; perforations simple; intervascular pits alternate, very small, with oval borders and elliptic apertures. Fibers small, thick-walled, arranged in radial rows; pits small, round-bordered, with slit-like apertures extending beyond the border. Rays 18 to 22 per mm.; mostly uniseriate, a few partly biseriate; decidedly heterogeneous; cells filled

with red-brown gum; pits into vessels of same appearance as the intervascular. Paratracheal and metatracheal parenchyma uniseriate; cells filled with red gum. Tang. diam. of pores 0.066 mm. to 0.10 mm., av. 0.09 mm. Vessel segments 0.38 mm. to 0.58 mm. long, av. 0.46 mm. Fibers 1.16 mm. to 1.54 mm. long, av. 1.36 mm.; 0.019 mm. to 0.027 mm. wide, av. 0.022 mm. Rays 1 to 30 cells high, or 0.066 mm. to 1.39 mm., av. 0.63 mm.

Material: Persaud No. 22; Field Museum No. 549,769; Yale No. 9439.

Elæocarpaceae

Sloanea Linderi Johnston. Heartwood yellowish brown; sapwood white; luster high. Odor and taste not distinctive. Light and soft; straight-grained; coarse-textured; fibrous; finishes fairly smoothly.

Growth rings inconspicuous. Parenchyma in fine broken tangential lines, not visible without lens. Pores numerous, appearing as large open pinholes, solitary or in radial groups of 2 or 3. Vessel lines resemble long scratches, darker than background; gummy deposits common. Rays coarse and conspicuous, being considerably darker than background. Vertical gum ducts, gummosis type, observed in uniseriate arc. Ripple marks fairly distinct under lens; irregular; rays not storied.

Minute anatomy: Vessels with simple perforations; intervascular pits large, numerous, crowded, the borders oval or hexagonal, the apertures slit-like and tending to coalesce. Fibers thin-walled, septate, without definite arrangement on cross section, but in horizontal seriation on longitudinal; pits small, slit-like, simple. Rays 3 or 4 per mm.; of two kinds, (1) uniseriate and (2) 6 to 12 cells wide; heterogeneous; cells filled with red-brown gum; pits into vessels small, elliptic, simple to half-bordered. Parenchyma storied; paratracheal 1 or 2 cells wide; metatracheal uniseriate, broken; solitary cells and groups diffused; individual cells 2 or 3 times the size of the fibers. Tang. diam. of pores 0.15 mm. to 0.315 mm., av. 0.216 mm. Vessel segments 0.365 mm. to 0.53 mm. long, av. 0.4 mm.; end horizontal or slightly oblique, with short tips. Fibers 1.5 mm. to 2.07 mm. long, av. 1.89 mm.; 0.016 mm. to 0.027 mm. wide, av. 0.023 mm. Rays 8 to 140 cells high, or 0.697 mm. to 4.15 mm., av. 2.82 mm.

Material: Persaud No. 62; Field Museum No. 549,818; Yale No. 9470.

Euphorbiaceae (Spurge Family)

The genera *Alchornea*, *Amanoa*, *Mabea*, *Maprounea*, and *Sapium* have the following characteristics in common:

Gross anatomy: Growth rings faintly visible, due to zonate variation in fiber density. Parenchyma in fine broken tangential lines; barely visible without lens. Pores numerous, resembling large pinholes, evenly distributed, occurring singly or in radial groups of 2 to 5, tyloses frequently present. Vessels distinct as coarse to fine lines darker than background. Rays barely visible with lens on cross and tangential sections; inconspicuous on radial, being of same color as background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, very large, numerous, the borders oval to angular, the apertures slit-like, except in *Amanoa* which has very small, crowded pits, with round to polygonal borders and dot-like apertures. Rays decidedly heterogeneous; uniseriate in *Alchornea*, *Mabea*, and partly biseriate in *Amanoa*, *Maprounea*, and *Sapium*; cells filled with yellow to brown deposits; pits into vessels (except in *Amanoa* where they are of same appearance as the intervascular) large, simple to half-bordered, irregular in outline; with a tendency to a scalariform arrangement in *Maprounea*.

Alchornea triplinervia (Spreng.) Muell. Arg. "Cassava wood." Color almost white throughout; luster dull. Odor and taste not distinctive. Very light and soft; straight-grained; medium-textured; cuts easily, but does not finish smoothly.

Minute anatomy: Fibers thin-walled, square or elongated radially in section, in definite radial rows; pits scarce, minute, simple or very indistinctly bordered. Parenchyma in broken tangential lines 1 or 2 cells wide; individual cells of same size as fibers. Tang. diam. of pores 0.116 mm. to 0.166 mm., av. 0.15 mm. Vessel segments 0.36 mm. to 0.95 mm. long, av. 0.79 mm., with short tips. Fibers 0.80 mm. to 1.36 mm. long, av. 1.195 mm.; 0.03 mm. to 0.059 mm. wide, av. 0.046 mm. Rays 15 to 18 per mm., 7 to 51 cells high, or 0.17 mm. to 2.74 mm.

Material: Persaud No. 138; Field Museum No. 549,904; Yale No. 9506.

Amanoa guianensis Aubl. Color reddish brown; luster dull. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; finishes fairly smoothly.

Minute anatomy: Fibers very thick-walled, with minute lumina, frequently mucilaginous, arranged in irregular radial rows; pits very small, inconspicuous, and simple. Parenchyma in uniseriate, broken, tangential lines, 3 rows of fibers apart; individual cells smaller than the fibers in section and filled with light brown gum; frequently chambered and containing rhombohedral crystals of calcium oxalate. Tang. diam. of pores 0.116 mm. to 0.166 mm., av. 0.143 mm. Vessel segments 1.0 mm. to 1.56 mm. long, av. 1.21 mm.; with long, overlapping tips. Fibers 1.99 mm. to 2.72 mm. long, av. 2.42 mm.; 0.022 mm. to 0.038 mm. wide, av. 0.027 mm. Rays 16 to 18 per mm., 4 to 100 cells high, or 0.199 mm. to 3.15 mm., av. 1.94 mm.

Material: Persaud No. 27; Field Museum No. 549, 774; Yale No. 9443.

Mabea sp. Color pale brown; luster dull. Light and soft; fairly straight-grained; medium-textured; works easily and finishes fairly smoothly.

Minute anatomy: Fibers polygonal in section; thick-walled, with small lumina; in definite radial rows; pits numerous, very small, simple or indistinctly bordered. Parenchyma in broken, uniseriate lines; individual cells of same size as the fibers in section. Tang. diam. of pores 0.10 mm. to 0.18 mm., av. 0.15 mm. Vessel segments 0.33 mm. to 0.80 mm. long, av. 0.58 mm.; with exceptionally long overlapping tips. Fibers 0.91 mm. to 1.23 mm., av. 1.11 mm. long; 0.01 mm. to 0.02 mm. wide, av. 0.016 mm. Rays 15 to 20 per mm., 1 to 32 cells high, or 0.08 mm. to 1.245 mm., av. 0.46 mm.

Material: Persaud No. 51; Field Museum No. 549,804; Yale No. 9462.

Maprounea guianensis Aubl. Heartwood pale brown; sapwood white; luster dull. Light and soft; straight-grained; fine-textured; works easily and finishes smoothly.

Minute anatomy: Fibers almost square in section, thick-walled; in definite radial rows; middle lamella thickened at corners; pits numerous, minute, bordered, the apertures slit-like. Parenchyma in fairly numerous broken tangential lines 1 or 2 cells wide; individual cells about twice the size of the fibers in section. Tang. diam. of pores 0.05 mm. to 0.10 mm., av. 0.075 mm. Vessel segments 0.45 mm. to 0.88 mm., av. 0.58 mm.; with exceedingly long tips. Fibers 0.83 mm. to 1.33 mm. long, av. 1.17 mm.; av. width 0.02 mm. Rays 15 to 22 per mm., 10 to 67 cells high, or 0.25 mm. to 2.07 mm., av. 1.43 mm.

Material: Persaud No. 3; Field Museum No. 549,746; Yale No. 9425.

Sapium sp. Color pale yellow; luster dull. Light and soft; straight-grained; medium-textured; works easily, but does not finish smoothly.

Minute anatomy: Fibers almost square in section, thick-walled, but with large lumina; in definite radial rows; middle lamella thickened at corners; pits numerous, large, distinctly bordered, the apertures slit-like. Parenchyma in broken tangential lines 1 to 3 cells wide; pitting in end walls gash-like; individual cells same size in section as the fibers. Tang. diam. of pores 0.12 mm. to 0.28 mm., av. 0.21 mm. Vessel segments 0.83 mm. to 1.41 mm. long, av. 1.10 mm.; with long overlapping tips. Fibers 1.52 mm. to 2.07 mm. long, av. 1.79 mm.; av. width 0.04 mm. Rays 0.17 mm. to 2.22 mm. high, av. 0.83 mm.

Material: Persaud No. 52; Field Museum No. 549,805; Yale No. 9463.

Flacourtiaceae

Homalium guianensis (Aubl.) Warb. Heartwood dark olive-brown; sapwood yellowish brown. Odor and taste not distinctive. Fairly heavy and hard; grain roey; finishes smoothly.

Growth rings faintly visible, due to zonate variation in fiber density. Parenchyma invisible. Pores not visible without lens, open, numerous, evenly distributed, occurring singly or in radial groups of 2 to 6. Vessel lines fine and distinct, being darker than background. Rays barely visible on cross section; invisible on tangential; visible, but not distinct, on radial.

Minute anatomy: Vessels thick-walled; perforations simple; intervascular pits very small, numerous, crowded, the borders oval to polygonal, the apertures slit-like and tending to coalesce. Fibers polygonal in section, thick-walled, septate; in irregular radial rows; pits simple, conspicuous. Rays 12 to 16 per mm.; 1 to 3 cells wide, the latter with high uniseriate margins; decidedly heterogeneous; cells filled with light brown gum; pits into vessels in part of same appearance as the intervascular, in part small, elliptic, half-bordered. Parenchyma absent or very sparingly developed. Tang. diam. of pores 0.05 mm. to 0.10 mm., av. 0.07 mm. Vessel segments 0.78 mm. to 1.04 mm. long, av. 0.96 mm.; with oblique ends and short tips. Fibers 2.07 mm. to 2.11 mm. long, av. 2.03 mm.; 0.02 mm. to 0.03 mm. wide, av. 0.027 mm. Rays 2 to 100 cells high, or 0.13 mm. to 2.95 mm., av. 1.16 mm.

Material: Persaud No. 54; Field Museum No. 549,809; Yale No. 9465.

Guttiferae Hypericaceae

Caopia (Vismia) sp. "Bloodwood." Heartwood light pinkish brown; sapwood yellow; luster high. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings not visible. Parenchyma abundant around vessels and as wavy concentric or broken tangential lines. Pores not numerous, open, evenly distributed, occurring singly or in radial groups of 2 to 8. Vessel lines not distinct. Rays invisible on cross and tangential sections; low, but distinct, on radial, being considerably darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, very small, numerous, not crowded, the borders round, the apertures slit-like. Fibers thick-walled, square or flattened tangentially in section; in definite radial rows; pits simple, small, mostly on radial walls. Rays 12 to 15 per mm.; 1 to 4 cells wide; decidedly heterogeneous; end walls of cells densely pitted; red-brown gum deposits common; pits into vessels small,

elliptic, simple to half-bordered. Paratracheal parenchyma uniseriate, the individual cells 2 or 3 times the size of the fiber in section; metatracheal 2 to 4 cells wide, the individual cells of the same size as the fibers in section. Tang. diam. of pores 0.08 mm. to 0.20 mm., av. 0.15 mm. Vessel segments 0.30 mm. to 0.73 mm. long, av. 0.50 mm.; with horizontal to oblique ends and short tips. Fibers 1.0 mm. to 1.58 mm. long, av. 1.19 mm.; 0.01 mm. to 0.027 mm. wide, av. 0.02 mm. Rays 1 to 35 cells high, or 0.03 mm. to 0.76 mm., av. 0.35 mm.

Material: Persaud Nos. 44, 46; Field Museum Nos. 549,796, 549,798; Yale Nos. 9456, 9457.

GUTTIFERAE

Clusia colorans Engl. "Kufa." Color light yellow-brown; luster dull. Odor and taste not distinctive. Moderately hard and heavy; curly-grained; medium-textured; finishes fairly smoothly.

Growth rings and parenchyma not visible. Pores appear as large open pinholes, numerous, evenly distributed, occurring singly or in radial pairs. Vessel lines distinct as coarse scratches. Rays fine, visible on cross section and barely so on tangential; distinct on radial surface, being considerably darker than background.

Minute anatomy: Vessels thick-walled; perforations simple; *intervascular pits entirely scalariform.* Fibers polygonal in outline, thick-walled, frequently mucilaginous; in irregular radial rows; numerous large simple pits in both radial and tangential walls. Rays 4 to 6 per mm.; 3 or 4 cells wide; decidedly heterogeneous; end walls of cells densely pitted; yellowish brown deposits abundant; pits into vessels elliptic to elongated, some very large and gash-like. Parenchyma very sparingly developed as isolated cells about vessels. Tang. diam. of pores 0.10 mm. to 0.18 mm., av. 0.15 mm. Vessel segments 0.70 mm. to 1.08 mm. long, av. 0.91 mm.; with horizontal to oblique ends and short tips. Fibers 1.477 mm. to 1.99 mm. long, av. 1.74 mm.; 0.02 mm. to 0.035 mm. wide, av. 0.028 mm. Rays 4 to 80 cells high, or 0.25 mm. to 1.34 mm., av. 1.09 mm.

Material: Persaud No. 41; Field Museum No. 549, 793; Yale No. 9453.

Tovomita Schomburgkii Tr. & Pl. "Awasakuli." Color pinkish red, becoming dark red-brown on exposure; luster dull. Odor and taste not distinctive. Hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings not distinct. Parenchyma not visible. Pores numerous, open, barely visible without lens, fairly uniformly distributed or somewhat zonate, occurring singly or in radial

groups of 2 to 4. Vessel lines indistinct. Rays visible on cross and tangential sections; large and conspicuous on radial surface, being somewhat darker than background.

Minute anatomy: Vessels with simple perforations; *intervascular pits exclusively scalariform.* Fibers small, square or flattened tangentially in section, extremely thick-walled, frequently mucilaginous, with minute lumina; pits simple, minute, mostly confined to radial walls. Rays 9 to 15 per mm.; 1 to 5 cells wide; decidedly heterogeneous, the marginal cells much elongated vertically; end walls of cells densely pitted; globules of dark red gum very numerous; pits into vessels simple to half-bordered, and either large and oval or elongated and in scalariform arrangement. Parenchyma sparingly diffuse and sometimes paratracheal, 1 to 3 cells wide; cells frequently filled with red gum. Tang. diam. of pores 0.05 mm. to 0.12 mm., av. 0.08 mm. Vessel segments 0.56 mm. to 1.16 mm. long, av. 0.91 mm. Fibers 1.36 mm. to 1.66 mm. long, av. 1.44 mm.; 0.01 mm. to 0.02 mm. wide, av. 0.016 mm. Uniseriate rays 1 to 30 cells high, or 0.17 mm. to 2.74 mm., av. 1.36 mm. Multiseriate rays 33 to 155 cells high, or 1.27 mm. to 4.56 mm., av. 3.0 mm.

Material: Persaud Nos. 115, 118; Field Museum Nos. 549,879, 549,882; Yale Nos. 9500, 9502.

LAURACEAE (Laurel Family)

The genera *Endlicheria*, *Nectandra*, and *Ocotea* have the following characteristics in common:

Gross anatomy: Growth rings present, but not distinct; due to a zonate variation in fiber density. Parenchyma in very narrow circles about pores, distinct to indistinct. Pores very small, numerous, evenly distributed, occurring singly (esp. in *Ocotea*) or in radial groups of 2 to 6; gum deposits and tyloses common. Vessel lines distinct, being darker than background. Oil cells, when present, appear under lens as small yellow dots on longitudinal section. Rays barely visible without lens on cross and tangential sections; visible, but not conspicuous, on radial surface, where they are slightly darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, large, numerous, not crowded, the borders round, the apertures slit-like. Fibers small, in definite radial rows; thin-walled, but with large lumina (thick-walled, with minute lumina in *Nectandra Rodiæi*); septate, except in *Endlichera;* pits simple, numerous, minute, mostly confined to radial walls. Rays 10 to 12 per mm.; uniseriate or mostly biseriate; heterogeneous; dark brown deposits common; pits into vessels large, elongated, simple to half-bordered, approaching scalariform arrangement in *Nectandra*

sp. and *Ocotea*. Parenchyma vasicentric, 1 to 4 cells wide; individual cells 2 or 3 times the size of the fibers in section. Oil cells (absent in *Nectandra Rodiæi*) large, thin-walled, barrel-shaped, and filled with lemon-colored oil.

Endlicheria multiflora (Miq.) Mez. "Burhuda" or "bastard silver-balli." Color yellowish green; not uniform; luster high. Odor and taste not distinctive. Fairly light and soft; grain somewhat roey; texture medium; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.12 mm. to 0.20 mm., av. 0.17 mm. Vessel segments 0.53 mm. to 0.75 mm. long, av. 0.68 mm. Fibers 0.96 mm. to 1.54 mm. long, av. 1.245 mm.; 0.022 mm. to 0.03 mm. wide, av. 0.027 mm. Rays 2 to 20 cells high, or 0.116 mm. to 0.448 mm., av. 0.33 mm.
Material: Persaud No. 49; Field Museum No. 549,802; Yale No. 9460.

Nectandra Rodiœi Schomb. "Greenheart." Wood described in *Timbers of Tropical America*, pp. 186–187.

Material: Persaud No. 38; Field Museum No. 549,790; Yale No. 9452.

Nectandra sp. Color pale greenish yellow; luster high. Odor and taste not distinctive. Fairly light and soft; grain somewhat roey; fine-textured; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.07 mm. to 0.13 mm., av. 0.11 mm. Vessel segments 0.51 mm. to 0.85 mm. long, av. 0.58 mm. Fibers 1.16 to 1.58 mm. long, av. 1.29 mm.; 0.02 mm. to 0.027 mm. wide, av. 0.024 mm. Rays 1 to 30 cells high, or 0.06 mm. to 0.80 mm., av. 0.40 mm.
Material: Persaud No. 78; Field Museum No. 549,838; Yale No. 9481.

Ocotea Schomburgkiana (Nees.) Mez. Color pale yellowish brown; luster high. Odor and taste not distinctive. Light and soft; straight-grained; fine-textured; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.10 mm. to 0.15 mm., av. 0.13 mm. Vessel segments 0.58 mm. to 0.95 mm. long, av. 0.81 mm. Fibers 1.06 mm. to 1.3 mm. long, av. 1.18 mm.; 0.02 mm. to 0.03 mm. wide, av. 0.024 mm. Rays 2 to 18 cells high, or 0.067 mm. to 0.48 mm., av. 0.33 mm.
Material: Persaud No. 151; Field Museum No. 549,918; Yale No. 9511.

Lecythidaceae (Monkey-pot Family)

?Eschweilera sp. "Kakarali" or "small monkey pot." Color bright yellow variegated with pale to pinkish or grayish brown; luster dull. Odor and taste not distinctive. Wood hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings distinct due to terminal parenchyma. Parenchyma conspicuous in numerous white concentric lines. Pores rather few, visible as small pinholes, or occasionally as small white spots, due to tyloses; solitary or in radially appressed groups of 2 to 4. Vessel lines indistinct. Rays barely visible without lens on cross section, forming a web-like structure with parenchyma; visible, but inconspicuous, on radial surface.

Minute anatomy: Vessels thick-walled; perforations simple; intervascular pits alternate, large, numerous, not crowded, the borders and apertures oval. Fibers square to polygonal in outline; extremely thick-walled, in part mucilaginous, with minute lumina; in irregular radial rows; occasional gum deposits; pits numerous, small, simple or indistinctly bordered, mostly confined to radial walls. Rays 10 or 12 per mm.; 1 to 3 cells wide; mostly homogeneous; cells filled with brown gum; pits into vessels (1) of same appearance as the intervascular and (2) larger, round to elliptic, or elongated, simple to half-bordered. Paratracheal parenchyma uniseriate, metatracheal in fine wavy concentric lines or bands 1 to 6 cells wide; cells thick-walled, occasionally conjugate; marginal strands of laminae chambered and containing small crystals of calcium oxalate; lumina filled with brown gum. Tang. diam. of pores 0.05 mm. to 0.17 mm., av. 0.10 mm. Vessel segments 0.30 mm. to 0.73 mm. long, av. 0.48 mm. Fibers 1.53 mm. to 2.07 mm. long, av. 1.58 mm.; 0.008 mm. to 0.021 mm. wide, av. 0.016 mm. Rays vary from 1 to 60 cells high, or 0.07 mm. to 1.49 mm., av. 0.56 mm.
Material: Persaud Nos. 32, 42, 112; Field Museum Nos. 549,779, 549,794, 549,876; Yale Nos. 9447, 9454, 9499.

Leguminosae (Bean Family)

Two constant features of the minute anatomy of the woods of the Leguminosae are (1) exclusively simple perforations of the vessels and (2) cribriform membranes of the intervascular and vascular-parenchymatous pits.

Dimorphandra excelsa Baill. or **Mora excelsa** Benth. "Mora." General properties and gross anatomy described in *Timbers of Tropical America*, pp. 225–227.

Minute anatomy: Intervascular pits minute, with round borders and round to oval apertures. Fibers polygonal in outline, extremely thick-walled,

sp. and *Ocotea*. Parenchyma vasicentric, 1 to 4 cells wide; individual cells 2 or 3 times the size of the fibers in section. Oil cells (absent in *Nectandra Rodiœi*) large, thin-walled, barrel-shaped, and filled with lemon-colored o

Endlicheria multiflora (Miq.) Mez. "Burhuda" or "bastard silver-balli." Color yellowish green; not uniform; luster high. Odor and taste not distinctive. Fairly light and soft; grain somewhat roey; texture medium; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.12 mm. to 0.20 mm., av. 0.17 mm. Vessel segments 0.53 mm. to 0.75 mm. long, av. 0.68 mm. Fibers 0.96 mm. to 1.54 mm. long, av. 1.245 mm.; 0.022 mm. to 0.03 mm. wide, av. 0.027 mm. Rays 2 to 20 cells high, or 0.116 mm. to 0.448 mm., av. 0.33 mm.
Material: Persaud No. 49; Field Museum No. 549,802; Yale No. 9460.

Nectandra Rodiœi Schomb. "Greenheart." Wood described in *Timbers of Tropical America*, pp. 186–187.

Material: Persaud No. 38; Field Museum No. 549,790; Yale No. 9452?

Nectandra sp. Color pale greenish yellow; luster high. Odor and taste not distinctive. Fairly light and soft; grain somewhat roey; fine-textured; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.07 mm. to 0.13 mm., av. 0.11 mm. Vessel segments 0.51 mm. to 0.85 mm. long, av. 0.58 mm. Fibers 1.16 to 1.58 mm. long, av. 1.29 mm.; 0.02 mm. to 0.027 mm. wide, av. 0.024 mm. Rays 1 to 30 cells high, or 0.06 mm. to 0.80 mm., av. 0.40 mm.
Material: Persaud No. 78; Field Museum No. 549,838; Yale No. 9481.

Ocotea Schomburgkiana (Nees.) Mez. Color pale yellowish brown; luster high. Odor and taste not distinctive. Light and soft; straight-grained; fine-textured; works easily and finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.10 mm. to 0.15 mm., av. 0.13 mm. Vessel segments 0.58 mm. to 0.95 mm. long, av. 0.81 mm. Fibers 1.06 mm. to 1.3 mm. long, av. 1.18 mm.; 0.02 mm. to 0.03 mm. wide, av. 0.024 mm. Rays 2 to 18 cells high, or 0.067 mm. to 0.48 mm., av. 0.33 mm.
Material: Persaud No. 151; Field Museum No. 549,918; Yale No. 9511.

Lecythidaceae (Monkey-pot Family)

?Eschweilera sp. "Kakarali" or "small monkey pot." Color bright yellow variegated with pale to pinkish or grayish

brown; luster dull. Odor and taste not distinctive. Wood hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings distinct, due to terminal parenchyma. Parenchyma conspicuous in numerous white concentric lines. Pores rather few, visible as small pinholes, or occasionally as small white spots, due to tyloses; solitary or in radially appressed groups of 2 to 4. Vessel lines indistinct. Rays barely visible without lens on cross section, forming a web-like structure with parenchyma; visible, but inconspicuous, on radial surface.

Minute anatomy: Vessels thick-walled; perforations simple; intervascular pits alternate, large, numerous, not crowded, the borders and apertures oval. Fibers square to polygonal in outline; extremely thick-walled, in part mucilaginous, with minute lumina; in irregular radial rows; occasional gum deposits; pits numerous, small, simple or indistinctly bordered, mostly confined to radial walls. Rays 10 or 12 per mm.; 1 to 3 cells wide; mostly homogeneous; cells filled with brown gum; pits into vessels (1) of same appearance as the intervascular and (2) larger, round to elliptic, or elongated, simple to half-bordered. Paratracheal parenchyma uniseriate, metatracheal in fine wavy concentric lines or bands 1 to 6 cells wide; cells thick-walled, occasionally conjugate; marginal strands of laminae chambered and containing small crystals of calcium oxalate; lumina filled with brown gum. Tang. diam. of pores 0.05 mm. to 0.17 mm., av. 0.10 mm. Vessel segments 0.30 mm. to 0.73 mm. long, av. 0.48 mm. Fibers 1.53 mm. to 2.07 mm. long, av. 1.58 mm.; 0.008 mm. to 0.021 mm. wide, av. 0.016 mm. Rays vary from 1 to 60 cells high, or 0.07 mm. to 1.49 mm., av. 0.56 mm.
Material: Persaud Nos. 32, 42, 112; Field Museum Nos. 549,779, 549,794, 549,876; Yale Nos. 9447, 9454, 9499.

Leguminosae (Bean Family)

Two constant features of the minute anatomy of the woods of the Leguminosae are (1) exclusively simple perforations of the vessels and (2) cribriform membranes of the intervascular and vascular-parenchymatous pits.

Dimorphandra excelsa Baill. or **Mora excelsa** Benth. "Mora." General properties and gross anatomy described in *Timbers of Tropical America*, pp. 225–227.

Minute anatomy: Intervascular pits minute, with round borders and round to oval apertures. Fibers polygonal in outline, extremely thick-walled,

frequently mucilaginous, with minute lumina; in irregular radial rows; inconspicuous simple pits confined to radial walls. Rays 10 to 14 per mm.; 1 or 2 cells wide; homogeneous; cells filled with dark brown gum; pits into vessels resemble the intervascular. Parenchyma paratracheal, 6 to 10 cells wide, often confluent into tangential bands, with the marginal strands frequently chambered and containing crystals of calcium oxalate; dark brown deposits frequent. Tang. diam. of pores 0.10 mm. to 0.18 mm., av. 0.14 mm. Vessel-segments 0.46 mm. to 0.56 mm. long, av. 0.51 mm.; with diagonal end walls and short tips. Fibers 1.11 mm. to 1.29 mm. long, av. 1.19 mm.; 0.008 mm. to 0.02 mm. wide, av. 0.016 mm. Rays 1 to 25 cells high, or 0.05 mm. to 0.115 mm., av. 0.30 mm.

Material: Persaud No. 81; Field Museum No. 549,841; Yale No. 9482.

Diplotropis brachypetala Tul. "Aramatta." Heartwood dark brown, with fine striping of vessel lines; has waxy appearance; polished surface satiny; sapwood brownish white, sharply defined. Odor and taste not distinctive. Hard and heavy; grain irregular; texture medium; hard to cut and difficult to work; finishes smoothly and is capable of taking a high polish.

Growth rings not visible. Parenchyma paratracheal and extending wing-like to form coarse concentric or tangential lines. Pores prominent because of parenchyma; numerous, uniformly distributed, occurring singly or in radially appressed groups of 2 or 3; frequently filled with brown gum. Vessel lines distinct, due to parenchyma sheathes. Rays not visible without lens on cross section; visible, but inconspicuous, on radial.

Minute anatomy: Intervascular pits large, with oval to polygonal borders and large elliptic apertures. Fibers polygonal in outline, thick-walled, with small lumina; in irregular radial rows; small simple pits confined to radial walls. Rays 8 to 10 per mm.; 1 to 3 cells wide, mostly biseriate; homogeneous; cells filled with brown gum; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, diffuse, and in tangential bands 8 to 12 cells wide; individual cells larger than fibers in section; marginal strands frequently chambered and containing hexagonal crystals of calcium oxalate; brown gum deposits common. Tang. diam. of pores 0.17 mm. to 0.23 mm., av. 0.20 mm. Vessel segments 0.35 mm. to 0.41 mm. long, av. 0.36 mm.; ends horizontal to oblique, with short tips. Fibers 1.41 mm. to 1.83 mm. long, av. 1.56 mm.; 0.014 mm. to 0.022 mm. wide, av. 0.021 mm. Rays 4 to 25 cells high, or 0.08 mm. to 0.50 mm., av. 0.33 mm.

Material: Persaud No. 77; Field Museum No. 549,835; Yale No. 9480.

Eperua Schomburgkiana Benth. "Water wallaba." Pale reddish brown, turning darker on exposure; luster rather low. Odor and taste not distinctive. Hard and heavy; straight-grained; fine-textured; finishes fairly smoothly. Gummy exudations common.

Growth rings distinct, due to parenchyma lines or to rows of gum ducts. Parenchyma in fine and apparently terminal lines. Pores resemble small pinholes, numerous, evenly distributed, occurring either singly or in radially appressed groups of 2 or 3; frequently filled with red gum. Vessel lines fine, but very distinct, being much darker than background. Rays barely visible on cross and tangential sections; visible, but not conspicuous, on radial, being slightly darker than background. Vertical gum ducts, larger than pores, of normal occurrence in tangential rows.

Minute anatomy: Intervascular pits minute, numerous, not crowded, the borders oval and the apertures elliptic to slit-like. Gum ducts large, frequently surrounded with sclerosed parenchyma cells. Fibers polygonal in outline, thick-walled, with medium-sized lumina; in definite radial rows; pits numerous, small, simple. Rays 8 to 12 per mm.; 1 to 3 cells wide; decidedly heterogeneous; cells filled with red gum; pits into vessels small, elliptic, half-bordered. Parenchyma abundant; paratracheal and metatracheal, the latter 1 to 4 cells wide; brown gum deposits common. Tang. diam. of pores 0.07 mm. to 0.15 mm., av. 0.11 mm. Vessel segments 0.25 mm. to 0.58 mm. long, av. 0.42 mm. Fibers 0.75 mm. to 1.09 mm. long, av. 0.96 mm.; 0.011 mm. to 0.019 mm. wide, av. 0.014 mm. Rays 1 to 25 cells high, or 0.08 mm. to 0.73 mm., av. 0.38 mm.

Material: Persaud No. 14; Field Museum No. 549,759; Yale No. 9433.

Inga nobilis Willd. "Whykee" or "waikey." Pale yellowish brown; luster high. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; medium-textured; works easily and finishes smoothly.

Growth rings not visible. Parenchyma in distinct patches about the pores and connecting them irregularly. Pores prominent, due to parenchyma; numerous, evenly distributed, occurring singly or in radial groups of 2 to 5; tyloses and gum deposits occasionally present. Vessel lines distinct, being considerably darker than background. Rays not visible without lens on cross and tangential sections; visible, but inconspicuous, on radial.

Minute anatomy: Intervascular pits large, crowded, the borders round to polygonal, the apertures elliptic. Fibers in irregular radial rows; thick-walled and frequently mucilaginous, with small lumina; often septate, sometimes containing starch grains in sapwood; pits numerous, minute, simple. Rays 10 to 12 per mm.; 1 or 2 cells wide; homogeneous; partly in horizontal seriation; filled with red-brown gum; pits into vessels of same type as the intervascular. Parenchyma paratracheal, 6 to 20 cells wide, and often confluent; individual cells with fairly thick walls and larger than fibers in section; red gum abundant. Tang. diam. of pores 0.10 mm. to 0.18 mm., av. 0.15 mm. Vessel segments 0.30 mm. to 0.53 mm. long, av. 0.26 mm.; with horizontal to oblique end walls and short tips. Fibers 1.10 mm. to 1.46 mm. long, av. 1.29 mm.; 0.016 mm. to 0.022 mm. wide, av. 0.019 mm. Rays 2 to 35 cells high, or 0.033 mm. to 0.60 mm., av. 0.32 mm.

Material: Persaud No. 23; Field Museum No. 549,770; Yale No. 9440.

Ormosia coccinea Jacks. "Bara-kara." Color grayish brown; luster rather low. Odor and taste not distinctive. Medium hard and heavy; grain slightly wavy; texture medium; works easily and finishes fairly smoothly.

Growth rings not visible. Parenchyma in patches about pores and connecting them irregularly. Pores resemble large open pinholes, not numerous, evenly distributed, occurring singly or in radial groups of 2 to 8. Vessel lines conspicuous as long, deep, coarse scratches considerably darker than background; sometimes with gum deposits. Rays not visible on cross and tangential sections without lens; visible, but inconspicuous, on radial, being slightly darker than background. Local tendency to ripple marks.

Minute anatomy: Intervascular pits alternate, large, crowded, the borders hexagonal, the apertures oval to elongated. Fibers polygonal in section; fairly thick-walled, but with large lumina; in irregular radial rows; pits numerous, small, simple. Rays 8 to 12 per mm.; 1 to 2 cells wide; heterogeneous; cells filled with brown gum; pits into vessels either (1) small, elliptic, half-bordered, with large apertures, or (2) large and simple, elongated axially, a single pit covering 2 or 3 in the vessel. Parenchyma paratracheal, 2 to 10 cells wide. Tang. diam. of pores 0.15 mm. to 0.25 mm., av. 0.19 mm. Vessel segments 0.28 mm. to 0.60 mm. long, av. 0.44 mm. Fibers 1.19 mm. to 1.66 mm. long, av. 1.23 mm.; 0.016 mm. to 0.033 mm. wide, av. 0.026 mm. Rays 2 to 20 cells high, or 0.10 mm. to 0.45 mm., av. 0.35 mm.

Material: Persaud No. 26; Field Museum No. 549,773; Yale No. 9442.

Peltogyne pubescens Benth. "Purpleheart" or "sacka." General properties and gross anatomy described in *Timbers of Tropical America*, pp. 234–235.

Minute anatomy: Intervascular pits alternate, minute, the borders round to oval, the apertures slit-like. Fibers polygonal in section, fairly thick-walled; no definite arrangement; pits minute, inconspicuous, simple. Rays 1 to 4 cells wide; homogeneous; filled with red-brown gum; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, 3 to 25 cells wide, often confluent into fine wavy tangential lines. Tang. diam. of pores 0.07 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.20 mm. to 0.45 mm. long, av. 0.33 mm. Fibers 1.23 mm. to 1.49 mm. long, av. 1.36 mm.; 0.011 mm. to 0.022 mm. wide, av. 0.017 mm. Rays 3 to 50 cells high, or 0.07 mm. to 1.01 mm., av. 0.61 mm.

Material: Persaud No. 85; Field Museum No. 549,845; Yale No. 9483.

Pentaclethra macroloba (Willd.) Ktze. "Trysil." Heartwood pinkish brown; sapwood white; luster high. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; medium-textured; works easily but does not finish smoothly.

Growth rings present, but indistinct. Parenchyma in oval-shaped patches around pores; not abundant. Pores appear as small open pinholes, fairly numerous, evenly distributed, or in radial pairs. Vessel lines indistinct, being only slightly darker than background. Rays barely visible with lens on cross and tangential sections; visible, but very inconspicuous, on radial, being of same color as background.

Minute anatomy: Intervascular pits small, crowded, the borders oval to polygonal, the apertures dot-like. Fibers square to hexagonal in section, the walls of medium thickness; gum deposits common; in irregular radial rows; pits simple, small and inconspicuous. Rays 18 to 20 per mm.; uniseriate; heterogeneous; cells contain brown gum; pits into vessels small, oval, half-bordered. Parenchyma paratracheal, 2 to 4 cells wide; also sparingly diffuse; frequently chambered and containing crystals of calcium oxalate. Tang. diam. of pores 0.08 mm. to 0.17 mm., av. 0.10 mm. Vessel segments 0.32 mm. to 0.60 mm., av. 0.45 mm.; with horizontal to oblique end walls and short tips. Fibers 1.01 mm. to 1.53 mm. long, av. 1.26 mm.; 0.02 mm. to 0.03 mm. wide, av. 0.022 mm.

Material: Persaud No. 17; Field Museum No. 549,764; Yale No. 9436.

Pithecolobium. The specimens of *P. cauliflorum* Mart. and *P. latifolium* (L.) Benth. have the following characteristics in common:

Gross anatomy: Growth rings present, but inconspicuous; terminated by a fine line of parenchyma. Parenchyma in

patches about the pores and connecting them irregularly; also terminal. Pores small, but prominent because of parenchyma; numerous, evenly distributed, occurring singly or, less commonly, in radially appressed groups of 2 to 5. Vessel lines distinct as long whitish or pinkish scratches, due to parenchyma sheathes and gummy contents. Rays only visible with lens on cross and tangential sections; fine and inconspicuous on radial, being of same color as background.

Minute anatomy: Intervascular pits alternate, small, numerous, the borders oval to polygonal, the apertures elliptical. Fibers subcircular to polygonal in section, extremely thick-walled, frequently with mucilaginous layers and minute lumina; in irregular radial rows; middle lamella thickened at corners and sometimes around entire cell; starch grains and crystals occasionally present; pits small and simple. Rays 16 to 18 per mm.; uniseriate; homogeneous; cells filled with dark brown gum; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, metatracheal as tangential bands 6 to 20 cells wide, and terminal uniseriate; cells thick-walled, frequently containing red gum; marginal strands often chambered, containing diamond-shaped crystals of calcium oxalate.

Pithecolobium cauliflorum Mart. "Aliku." Color bluish brown; luster high. Odor and taste not distinctive. Very hard and heavy; this specimen curly-grained; fine-textured; not easy to work, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.07 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.30 mm. to 0.58 mm. long, av. 0.36 mm.; ends with nearly horizontal walls and tips. Fibers 0.73 mm. to 1.10 mm. long, av. 0.95 mm.; 0.011 mm. to 0.019 mm. wide, av. 0.014 mm. Rays 2 to 15 cells high, or 0.03 mm. to 0.23 mm., av. 0.14 mm.
Material: Persaud No. 106; Field Museum No. 549,867; Yale No. 9496.

Pithecolobium latifolium (L.) Benth. Color pale yellowish brown; luster dull. Odor and taste not distinctive. Hard and heavy; grain slightly interlocked; fine-textured; not easy to work, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.10 mm. to 0.13 mm., av. 0.12 mm. Vessel segments 0.13 mm. to 0.36 mm. long, av. 0.28 mm. Fibers 0.91 mm. to 1.16 mm. long, av. 0.53 mm.; 0.011 mm. to 0.022 mm. wide, av. 0.016 mm. Rays 2 to 25 cells high, or 0.03 mm. to 0.35 mm., av. 0.18 mm.
Material: Persaud No. 63; Field Museum No. 549,819; Yale No. 9471.

Pithecolobium trapezifolium Benth. Heartwood pale red-

brown; sapwood nearly white; luster dull. Odor and taste not distinctive. Moderately hard and heavy; grain interlocked; texture medium to fine; works fairly easily and finishes smoothly.

Growth rings not visible. Parenchyma in small oval patches around pores. Pores visible as large pinholes, numerous, evenly distributed, occurring singly or in radial groups of 2 to 8, mostly in pairs. Vessel lines distinct as short, deep scratches, darker than background. Rays not visible without lens on cross and tangential sections; visible, but indistinct, on radial, being of same color as background.

Minute anatomy: Vessels thick-walled; red gum deposits common; intervascular pits small, crowded, the borders oval to hexagonal, the apertures elliptical. Fibers polygonal in section, and arranged in irregular radial rows; thick-walled, the lumina small, though considerably larger than in the other two species, and frequently containing starch grains and crystals; pits minute and simple. Rays 12 to 14 per mm.; uniseriate; homogeneous; free of deposits; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, 3 to 8 cells wide and extending wing-like from pores; strands chambered and containing diamond-shaped crystals of calcium oxalate. Tang. diam. of pores 0.13 mm. to 0.22 mm., av. 0.18 mm. Vessel segments 0.25 mm. to 0.51 mm. long, av. 0.40 mm. Fibers 1.01 mm. to 1.38 mm. long, av. 1.21 mm.; 0.014 mm. to 0.022 mm. wide, av. 0.016 mm. Rays 2 to 15 cells high, or 0.03 mm. to 0.25 mm., av. 0.16 mm.
Material: Persaud No. 64; Field Museum No. 549,820; Yale No. 9472.

Tachigalea pubiflora Benth. Heartwood light olive-brown; sapwood gray; luster rather low. Odor and taste not distinctive. Hard and heavy; fairly straight-grained; medium-textured; not easy to cut, but finishes smoothly.

Growth rings not visible. Parenchyma in small oval patches around pores. Pores prominent because of parenchyma, numerous, solitary or occasionally in radial groups of 2 or 3; red gum deposits common. Vessel lines distinct as long, deep scratches, darker than background. Rays not visible without lens on cross and tangential sections; fairly distinct on radial, being considerably darker than background.

Minute anatomy: Intervascular pits large, with oval to polygonal borders and round to oval apertures. Fibers square to polygonal in section, very small, thick-walled, frequently containing starch grains; in irregular radial rows; pits inconspicuous and simple. Rays homogeneous; uniseriate; red gum deposits common; pits into vessels of same appearance as the intervascular.

patches about the pores and connecting them irregularly; also terminal. Pores small, but prominent because of parenchyma; numerous, evenly distributed, occurring singly or, less commonly, in radially appressed groups of 2 to 5. Vessel lines distinct as long whitish or pinkish scratches, due to parenchyma sheathes and gummy contents. Rays only visible with lens on cross and tangential sections; fine and inconspicuous on radial, being of same color as background.

Minute anatomy: Intervascular pits alternate, small, numerous, the borders oval to polygonal, the apertures elliptical. Fibers subcircular to polygonal in section, extremely thick-walled, frequently with mucilaginous layers and minute lumina; in irregular radial rows; middle lamella thickened at corners and sometimes around entire cell; starch grains and crystals occasionally present; pits small and simple. Rays 16 to 18 per mm.; uniseriate; homogeneous; cells filled with dark brown gum; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, metatracheal as tangential bands 6 to 20 cells wide, and terminal uniseriate; cells thick-walled, frequently containing red gum; marginal strands often chambered, containing diamond-shaped crystals of calcium oxalate.

Pithecolobium cauliflorum Mart. "Aliku." Color bluish brown; luster high. Odor and taste not distinctive. Very hard and heavy; this specimen curly-grained; fine-textured; not easy to work, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.07 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.30 mm. to 0.58 mm. long, av. 0.36 mm.; ends with nearly horizontal walls and tips. Fibers 0.73 mm. to 1.10 mm. long, av. 0.95 mm.; 0.011 mm. to 0.019 mm. wide, av. 0.014 mm. Rays 2 to 15 cells high, or 0.03 mm. to 0.23 mm., av. 0.14 mm.

Material: Persaud No. 106; Field Museum No. 549,867; Yale No. 9496.

Pithecolobium latifolium (L.) Benth. Color pale yellowish brown; luster dull. Odor and taste not distinctive. Hard and heavy; grain slightly interlocked; fine-textured; not easy to work, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.10 mm. to 0.13 mm., av. 0.12 mm. Vessel segments 0.13 mm. to 0.36 mm. long, av. 0.28 mm. Fibers 0.91 mm. to 1.16 mm. long, av. 0.53 mm.; 0.011 mm. to 0.022 mm. wide, av. 0.016 mm. Rays 2 to 25 cells high, or 0.03 mm. to 0.35 mm., av. 0.18 mm.

Material: Persaud No. 63; Field Museum No. 549,819; Yale No. 9471.

Pithecolobium trapezifolium Benth. Heartwood pale red-

brown; sapwood nearly white; luster dull. Odor and taste not distinctive. Moderately hard and heavy; grain interlocked; texture medium to fine; works fairly easily and finishes smoothly.

Growth rings not visible. Parenchyma in small oval patches around pores. Pores visible as large pinholes, numerous, evenly distributed, occurring singly or in radial groups of 2 to 8, mostly in pairs. Vessel lines distinct as short, deep scratches, darker than background. Rays not visible without lens on cross and tangential sections; visible, but indistinct, on radial, being of same color as background.

Minute anatomy: Vessels thick-walled; red gum deposits common; intervascular pits small, crowded, the borders oval to hexagonal, the apertures elliptical. Fibers polygonal in section, and arranged in irregular radial rows; thick-walled, the lumina small, though considerably larger than in the other two species, and frequently containing starch grains and crystals; pits minute and simple. Rays 12 to 14 per mm.; uniseriate; homogeneous; free of deposits; pits into vessels of same appearance as the intervascular. Parenchyma paratracheal, 3 to 8 cells wide and extending wing-like from pores; strands chambered and containing diamond-shaped crystals of calcium oxalate. Tang. diam. of pores 0.13 mm. to 0.22 mm., av. 0.18 mm. Vessel segments 0.25 mm. to 0.51 mm. long, av. 0.40 mm. Fibers 1.01 mm. to 1.38 mm. long, av. 1.21 mm.; 0.014 mm. to 0.022 mm. wide, av. 0.016 mm. Rays 2 to 15 cells high, or 0.03 mm. to 0.25 mm., av. 0.16 mm.

Material: Persaud No. 64; Field Museum No. 549,820; Yale No. 9472.

Tachigalea pubiflora Benth. Heartwood light olive-brown; sapwood gray; luster rather low. Odor and taste not distinctive. Hard and heavy; fairly straight-grained; medium-textured; not easy to cut, but finishes smoothly.

Growth rings not visible. Parenchyma in small oval patches around pores. Pores prominent because of parenchyma, numerous, solitary or occasionally in radial groups of 2 or 3; red gum deposits common. Vessel lines distinct as long, deep scratches, darker than background. Rays not visible without lens on cross and tangential sections; fairly distinct on radial, being considerably darker than background.

Minute anatomy: Intervascular pits large, with oval to polygonal borders and round to oval apertures. Fibers square to polygonal in section, very small, thick-walled, frequently containing starch grains; in irregular radial rows; pits inconspicuous and simple. Rays homogeneous; uniseriate; red gum deposits common; pits into vessels of same appearance as the intervascular.

Parenchyma paratracheal, 4 to 10 cells wide; chambered strands common, with diamond-shaped crystals of calcium oxalate. Tang. diam. of pores 0.08 mm. to 0.15 mm., av. 0.12 mm. Vessel segments 0.45 mm. to 0.66 mm. long, av. 0.55 mm. Fibers 0.95 mm. to 1.16 mm. long, av. 1.01 mm.; 0.011 mm. to 0.019 mm. wide, av. 0.015 mm. Rays 2 to 20 cells high, or 0.05 mm. to 0.44 mm., av. 0.28 mm.

Material: Persaud No. 24; Field Museum No. 549,771; Yale No. 9441.

Tounatea (**Swartzia**) sp. Heartwood not available; sapwood yellow or yellowish white; luster dull. Odor and taste not distinctive. Hard and heavy; straight-grained; fine-textured; difficult to cut, but finishes smoothly.

Growth rings not visible. Parenchyma in numerous fine, wavy, concentric lines. Pores not visible without lens, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 to 5; frequently contain yellow gum. Vessel lines indistinct. Rays not visible without lens on cross and tangential sections; scarcely visible on radial. Ripple marks uniform and distinct; all elements storied.

Minute anatomy: Intervascular pits large, numerous, crowded, the borders oval to polygonal in outline, the apertures large and elliptic. Fibers subcircular to hexagonal in section, very thick-walled, with small lumina; in no definite arrangement; pits numerous, simple. Rays 12 to 14 per mm.; 1 to 3 cells wide; slightly heterogeneous; cells filled with yellow gum; pits into vessel small, oval, half-bordered, the apertures elliptic. Parenchyma paratracheal and metatracheal, the latter in tangential bands 3 to 8 cells wide; cells thick-walled and larger than fibers in section. Tang. diam. of pores 0.07 mm. to 0.10 mm., av. 0.08 mm. Vessel segments 0.14 mm. to 0.29 mm. long, av. 0.24 mm.; with horizontal to oblique end walls and short tips. Fibers 0.78 mm. to 1.11 mm. long, av. 0.90 mm.; 0.01 mm. to 0.02 mm. wide, av. 0.015 mm. Rays 2 to 20 cells high, or 0.03 mm. to 0.22 mm., av. 0.15 mm.

Material: Persaud No. 73; Field Museum No. 549,831; Yale No. 9478.

Vouapa bifolia Aubl. "Sarabebe." Color uniform reddish brown; slightly lustrous. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; works easily and finishes fairly smoothly.

Growth rings present, but not very distinct; caused by zonate variation in fiber density. Parenchyma, which is not visible without lens, encircles the pores and extends wing-like to form tangential bands. Pores visible as small pinholes, numerous, evenly distributed, occurring singly or in radially

appressed groups of 2 or 3; frequently contain red gum. Vessel lines conspicuous as long fine scratches considerably darker than background.

Minute anatomy: Intervascular pits alternate, large, crowded, the borders oval to polygonal, the apertures elliptic. Fibers polygonal in outline, comparatively thin-walled, with large lumina; in definite radial rows; pits numerous and simple. Rays 10 to 12 per mm.; uniseriate; decidedly heterogeneous; marginal cells often are chambered and contain rhombohedral crystals of calcium oxalate; end walls densely pitted; red-brown deposits abundant; pits into vessels small, elliptic, half-bordered. Paratracheal parenchyma uniseriate; metatracheal 1 to 6 cells wide; cells filled with dark brown deposits; chambered strands with rhombohedral crystals of calcium oxalate common. Tang. diam. of pores 0.08 mm. to 0.17 mm., av. 0.12 mm. Vessel segments 0.36 mm. to 0.66 mm. long, av. 0.45 mm. Fibers 0.78 mm. to 1.15 mm. long, av. 0.96 mm.; 0.016 mm. to 0.024 mm. wide, av. 0.02 mm. Rays 1 to 25 cells high, or 0.07 mm. to 0.63 mm., av. 0.35 mm.

Material: Persaud No. 34; Field Museum No. 549,783; Yale No. 9449.

Malpighiaceae

Byrsonima rugosa Benth. "Arakadako." Color light to dark reddish brown; luster dull. Odor and taste not distinctive. Wood medium hard and heavy; grain roey, rather fibrous; medium-textured; does not finish smoothly.

Growth rings and parenchyma invisible. Pores barely visible without lens, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 or 3. Vessel lines not distinct. Rays barely visible without lens on cross section; not visible on tangential; visible, but inconspicuous, on radial, being slightly darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, small, numerous, not crowded, the borders oval, the apertures elliptic; pit membranes cribriform. Fibers polygonal in section, thick-walled, but with large lumina, septate; middle lamella thickened at corners; in irregular radial rows; pits small, simple, or very indistinctly bordered. Rays 10 to 12 per mm.; 1 to 3 cells wide; decidedly heterogeneous; marginal cells frequently conjugate; brown gum abundant; pits into vessels (1) of the same appearance as the intervascular or (2) small, rounded, half-bordered, with cribriform membranes. Parenchyma very sparingly developed, diffuse and paratracheal. Tang. diam. of pores 0.10 mm. to 0.15 mm., av. 0.12 mm. Vessel segments 0.41 mm. to 1.0 mm. long, av. 0.75 mm. Fibers 1.43 mm. to 2.41 mm. long, av. 1.79 mm.; 0.022 mm. to 0.041 mm. wide, av. 0.026 mm. Rays 1 to 56 cells high, or 0.08 mm. to 1.33 mm., av. 0.68 mm.

Material: Persaud No. 72; Field Museum No. 549, 829; Yale No. 9477.

Tetrapodenia glandifera Gleason. This wood is described in *Tropical Woods* 11: 22–24, Sept. 1, 1927.

Material: Persaud No. 53; Field Museum No. 549,807; Yale No. 9464.

MELASTOMACEAE (Meadow-beauty Family)

Bellucia grossularioides (L.) Triana. "Bartara silver balli"? Color light brown; luster dull. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings and parenchyma not visible. (Conspicuous lines resembling parenchyma are due to tangential grouping of fibers with larger lumina than the others and without mucilaginous layers.) Pores visible as small open pinholes, numerous, uniformly distributed, occurring singly or in radially appressed groups of 2 or 3. Vessel lines inconspicuous. Rays barely visible with lens on cross and tangential sections; visible, but indistinct, on radial.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, small, numerous, crowded, the borders oval to polygonal, the apertures elliptic; pit membranes cribriform. Fibers square or subcircular in section, thick-walled and frequently mucilaginous, but with large lumina, septate, and free of contents; in definite radial rows; pits numerous and simple. Rays 16 to 20 per mm.; uniseriate; slightly heterogeneous; filled with brown gum; pits into vessels half-bordered, of same size and shape as intervascular, the membranes cribriform. Parenchyma paratracheal, as a few isolated cells. Tang. diam. of pores 0.13 mm. to 0.18 mm., av. 0.16 mm. Vessel segments 0.50 mm. to 1.13 mm. long, av. 0.76 mm.; with oblique ends and long tips. Fibers 0.91 mm. to 1.48 mm. long, av. 1.21 mm.; 0.022 mm. to 0.038 mm. wide, av. 0.026 mm. Rays 2 to 50 cells high, or 0.10 mm. to 2.32 mm., av. 1.41 mm.

Material: Persaud No. 50; Field Museum No. 549,803; Yale No. 9461.

Miconia. The species represented in this collection have the following characteristics in common:

Gross anatomy: Color pale brown; luster dull. Odor and taste not distinctive. Wood hard and heavy to moderately so; straight-grained; fine-textured; finishes smoothly. Growth rings and parenchyma not visible. (Conspicuous lines resembling parenchyma are due to tangential grouping of fibers with larger lumina than the others and without mucilaginous layers.) Pores barely visible without lens, open, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 to 5. Vessel lines very fine and indistinct, being of same color as background. Rays not visible without lens on cross and tangential surfaces; visible, but indistinct, on radial, being of same color as background.

Minute anatomy: Vessel perforations simple; intervascular pits alternate, numerous, not crowded, small to minute, the borders round, the apertures slit-like and tending to coalesce; pit membranes cribriform. Parenchyma very sparingly developed as isolated cells about vessels; also diffuse. Fibers square or subcircular in section, thick-walled and frequently mucilaginous, the lumina minute to large, often with gum deposits; in definite radial rows; pits minute, simple or indistinctly bordered. Rays uniseriate, or a few partly biseriate, heterogeneous; gummy contents common; end walls of cells densely pitted; half-bordered pits into vessels have cribriform membranes.

Miconia guianensis (Aubl.) Cogn. "Wakradani."

Minute anatomy: Fibers frequently septate; small bordered pits numerous, some with lenticular apertures and apparently cribriform membranes; other pits simple or very indistinctly bordered. Vessel-ray pits (1) small, round to oval, half-bordered, and (2) large, elongated, and simple, with tendency to scalariform arrangement. Tang. diam. of pores 0.08 mm. to 0.13 mm., av. 0.10 mm. Vessel segments 0.35 mm. to 0.90 mm. long, av. 0.63 mm. Fibers 0.85 mm. to 1.33 mm. long, av. 1.10 mm.; 0.02 mm. to 0.035 mm. wide, av. 0.03 mm. Rays 10 to 12 per mm., 1 to 25 cells high, or 0.12 mm. to 1.33 mm., av. 0.76 mm.

Material: Persaud No. 66; Field Museum No. 549,822; Yale No. 9474.

Miconia longifolia DC.

Minute anatomy: Rays 16 to 18 per mm. Vessel-ray pits of same appearance as the intervascular. Tang. diam. of pores 0.033 mm. to 0.083 mm., av. 0.066 mm. Vessel segments 0.448 mm. to 0.83 mm. long, av. 0.597 mm. Fibers 0.78 mm. to 0.946 mm. long, av. 0.896 mm.; 0.0136 mm. to 0.0244 mm. wide, av. 0.019 mm. Rays 2 to 50 cells high, or 0.0996 mm. to 1.66 mm., av. 0.996 mm.

Material: Persaud No. 89; Field Museum No. 549,849; Yale No. 9486.

Miconia prasma (Swartz) DC.

Minute anatomy: Rays 18 to 20 per mm.; conjugate cells common. Vessel-ray pits of same appearance as the intervascular. Tang. diam. of pores 0.05 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.25 mm. to 0.75 mm. long, av. 0.40 mm.; with oblique ends and long tips. Fibers 0.88 mm. to 1.19 mm. long, av. 1.06 mm.; 0.019 mm. to 0.027 mm. wide, av. 0.021 mm. Rays 2 to 25 cells high, or 0.08 mm. to 1.09 mm., av. 0.50 mm.

Material: Persaud No. 5; Field Museum No. 549,748; Yale No. 9427.

Miconia tomentosa (Rich.) D. Don.

Minute anatomy: Rays 16 to 18 per mm. Vessel-ray pits (1) small and oval, half-bordered, and (2) large, simple and gash-like, with tendency to scalariform arrangement. Tang. diam. of pores 0.05 mm. to 0.10 mm., av. 0.07 mm. Vessel segments 0.40 mm. to 1.16 mm. long, av. 0.63 mm.; with oblique ends and long tips. Fibers 0.91 mm. to 1.36 mm. long, av. 1.11 mm.; 0.016 mm. to 0.032 mm. wide, av. 0.024 mm. Rays 1 to 35 cells high, or 0.05 mm. to 1.29 mm., av. 0.71 mm.

Material: Persaud No. 47; Field Museum No. 549,800 Yale No. 9458.

Meliaceae (Mahogany Family)

Carapa guianensis Aubl. "Crabwood." This wood is described in *Timbers of Tropical America*, pp. 357–358.

Minute anatomy: Pores diffuse, large, open, occurring singly or in radially appressed groups of 2 or 3; vessel perforations simple; intervascular pits minute (av. 0.002 mm. in diam.), crowded, the borders polygonal, the apertures slit-like and tending to coalesce. Fibers subcircular in section, with walls of medium thickness, the large lumina septate and frequently filled with red gum; in irregular radial rows; pits minute and simple. Rays 8 to 11 per mm.; 1 to 5 (mostly 3) cells wide; heterogeneous; filled with dark red gum; pits into vessels of the same appearance as the intervascular. Parenchyma not abundant; paratracheal and terminal 1 to 3 cells wide; individual cells larger than fibers in section; lumina filled with dark red gum. Tang. diam. of pores 0.12 mm. to 0.17 mm., av. 0.15 mm. Vessel segments 0.33 mm. to 0.46 mm. long, av. 0.38 mm.; with horizontal to oblique end walls and short tips. Fibers 0.83 mm. to 1.29 mm. long, av. 1.04 mm.; 0.01 mm. to 0.024 mm. wide, av. 0.018 mm. Rays 2 to 50 cells high, or 0.17 mm. to 1.03 mm., av. 0.59 mm.

Material: Persaud No. 33; Field Museum No. 549,780; Yale No. 9448.

Moraceae (Mulberry Family)

Ficus Gleasonii Standley. "Kumaka-balli." Color light red-brown, deepening on exposure; luster dull. Odor and taste not distinctive. Fairly light and soft; fibrous; consists of alternate bands of hard and soft tissue; straight-grained; medium-textured; does not finish smoothly.

Growth rings indistinct. Parenchyma very abundant, in concentric bands. Pores appear as large pinholes, scattered, occurring singly or in radially appressed groups of 2 or 3; tyloses common. Vessel lines distinct as short deep scratches considerably darker than background. Rays barely visible without lens on cross and tangential sections; visible on radial, being darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, large, crowded, the borders polygonal, the apertures elliptic. Fibers polygonal in section, cell thick-walled, often mucilaginous; not in definite arrangement; pits inconspicuous, simple. Rays 5 to 8 per mm.; 1 to 4 cells wide; heterogeneous; cells filled with red-brown gum; all cell walls densely pitted; pits into vessels large, irregular in outline, simple to half-bordered. Paratracheal parenchyma uniseriate; metatracheal in concentric bands, 2 to 6 cells wide; pits in end walls very large and irregular in outline; lumina filled with red-brown gum. Tang. diam. of pores 0.12 mm. to 0.20 mm., av. 0.16 mm. Vessel segments 0.23 mm. to 0.55 mm. long, av. 0.34 mm. Fibers 0.83 mm. to 1.24 mm. long, av. 1.11 mm., av. width 0.022 mm. Rays 1 to 54 cells high, or 0.13 mm. to 0.93 mm., av. 0.48 mm.

Material: Persaud No. 7; Field Museum No. 549,750; Yale No. 9429.

Myristicaceae (Nutmeg Family)

Virola sebifera Aubl. "Kiricowa" or "man-dalli." Heartwood cherry red; sapwood light golden brown; line of demarcation distinct; luster high. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; medium-textured; works easily and finishes smoothly.

Growth rings and parenchyma not visible. Pores barely visible without lens, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 to 4; deposits of red-brown gum common. Vessel lines distinct, being darker than background. Rays barely visible without lens on cross and tangential sections; very distinct on radial, producing conspicuous silver grain.

Minute anatomy: Vessel perforations in part simple and in part scalariform with a few heavy bars; intervascular pits (1) small, with oval borders and elliptical apertures, numerous, not crowded, arranged in radial rows, and (2) elongated and in scalariform arrangement. Fibers square or tangentially elongated in section, with walls of medium thickness, the lumina large and very rarely septate; in definite radial rows; pits inconspicuous and simple. Rays 7 to 10 per mm.; 1 or 2 cells wide; decidedly heterogeneous, with very large cells which are filled with red-brown gum; pits into vessels (1) small, round to oval, and half-bordered, and (2) simple, greatly elongated (up to 0.06 mm. in length), with tendency to scalariform arrangement. Parenchyma very scarce; paratracheal uniseriate. Tang. diam. of pores 0.10 mm. to 0.13 mm., av. 0.12 mm. Vessel segments 0.96 mm. to 1.66 mm. long, av. 1.31 mm. Fibers 1.58 mm. to 1.91 mm. long, av. 1.78 mm.; 0.02 mm. to 0.04 mm. wide, av. 0.03 mm. Rays 1 to 40 cells high, or 0.08 mm. to 1.49 mm., av. 0.88 mm.

Material: Persaud No. 117; Field Museum No. 549,881; Yale No. 9501.

Myrtaceae (Myrtle Family)

Calycolpus glaber (Benth.) Berg. "Wild guava." Color reddish brown; uniform; luster dull. Odor and taste not distinctive. Hard and heavy; wavy-grained; fine-textured; cuts hard, but finishes smoothly.

Growth rings present, but not very distinct; due to zonate variation in fiber density. Parenchyma in broken tangential lines, not visible without lens. Pores barely visible, open, not numerous, solitary, scattered or zonate. Vessel lines fairly conspicuous as long fine scratches. Rays barely visible without lens on cross section; visible, but inconspicuous on radial, being slightly darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, numerous, small, the borders oval and the apertures slit-like and tending to coalesce. Fibers subcircular to polygonal in section, thick-walled, the lumina very small; middle lamella thick at corners; in irregular radial rows; pits numerous, small, with distinct borders and slit-like apertures, occurring in both radial and tangential walls. Rays 10 to 16 per mm.; 1 to 3 cells wide; heterogeneous; marginal cells frequently conjugate; dark brown deposits present; all cell walls densely pitted; pits into vessels of same type as the intervascular, some appearing to have cribriform membranes. Paratracheal parenchyma one cell wide; metatracheal in broken uniseriate lines; individual cells of same size as fibers in section; frequently conjugate; dark red gum deposits common. Tang. diam. of pores 0.07 mm. to 0.13 mm., av. 0.1 mm. Vessel segments av. 0.73 mm. in length; with horizontal ends and long tips. Fibers 1.19 mm. to 2.07 mm. long, av. 1.68 mm.; 0.02 mm. to 0.03 mm. wide. Rays 1 to 15 cells high, or 0.12 mm. to 0.66 mm., av. 0.32 mm.

Material: Persaud No. 2; Field Museum No. 549,745; Yale No. 9424.

Polygonaceae (Buckwheat Family)

Triplaris surinamensis Cham. "Long John." Heartwood light pink; sapwood cream-colored. Odor and taste not distinctive. Light and soft; straight-grained; medium-textured; works easily and finishes smoothly.

Growth rings not visible. Parenchyma very sparingly developed. (Conspicuous lines resembling parenchyma are due to numerous crystals in the lumina of the fibers.) Pores barely visible without lens, open, numerous, evenly distributed occurring singly or in radially appressed groups of 2 to 6; reddish gum deposits frequently present. Vessel lines appear as fine scratches darker than background. Rays not visible without lens on cross and tangential sections; visible, but indistinct, on radial, being darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, large, numerous, not crowded, the borders oval, the apertures lenticular; pit membranes cribriform. Fibers square to hexagonal in section, thin-walled, with large lumina and frequently filled with reddish colored gum and rhombohedral crystals of calcium oxalate which are conspicuous as wide bands on cross section; septations numerous; middle lamella thickened at corners; in definite radial rows; pits numerous, minute, simple. Rays 15 to 22 per mm.; 1 or 2 cells wide; homogeneous; filled with red-brown gum; pits into vessels large, elliptical, half-bordered, the membranes cribriform. Paratracheal parenchyma 1 or 2 cells wide. Tang. diam. of pores 0.07 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.30 mm. to 0.63 mm. long, av. 0.48 mm. Fibers 0.50 mm. to 0.88 mm. long, av. 0.70 mm.; 0.016 mm. to 0.024 mm. wide, av. 0.02 mm. Rays 1 to 25 cells high, or 0.016 mm. to 0.36 mm., av. 0.18 mm.

Material: Persaud No. 148; Field Museum No. 549,914; Yale No. 9510.

Proteaceae

Panopsis cayennensis Kl. Heartwood reddish brown; sapwood pale yellow-brown. Odor and taste not distinctive. Fairly heavy and hard; straight-grained; medium-textured; fairly difficult to work, but finishes smoothly.

Growth rings not visible. Parenchyma in numerous fine tangential lines. Pores appear as small pinholes, open, fairly numerous, evenly distributed, occurring singly or in radially appressed groups of 2 to 4. Vessel lines distinct. Rays very coarse, conspicuous on all sections and producing conspicuous oak-like silver grain on radial.

Minute anatomy: Vessels with simple perforations; intervascular pits numerous, large, not crowded, the borders oval, the apertures elliptic and tending to coalesce. Fibers polygonal in section, thick-walled, the lumina large, with occasional brown deposits; small, numerous, bordered pits in tangential and radial walls, the apertures slit-like and extending beyond circular border. Rays uniseriate and multiseriate; heterogeneous; filled with red-brown gum; pits into vessels of same appearance as the intervascular. Paratracheal parenchyma uniseriate; metatracheal in concentric lines 1 to 6 cells wide; individual cells of same size as fibers in section. Tang. diam. of pores 0.08 mm. to 0.13 mm., av. 0.11 mm. Vessel segments 0.83 mm. to 1.0 mm. long, av. 0.93 mm.; oblique walls with long tips. Fibers 1.74 mm. to 2.07 mm. long, av. 1.87 mm.; 0.03 mm. to 0.04 mm. wide, av. 0.03 mm. Uniseriate rays 1 to 10 cells high, or 0.07 mm. to 0.36 mm., av. 0.21 mm. Multiseriate rays 5 to 15 cells wide; up to 140 cells high, or 1.08 mm. to 2.82 mm., av. 1.99 mm.; av. width 0.36 mm.

Material: Persaud No. 71; Field Museum No. 549,828; Yale No. 9476.

Rhizophoraceae (Mangrove Family)

Cassipourea guianensis Aubl. Heartwood light reddish brown; sapwood pale yellow. Odor and taste not distinctive. Moderately heavy and hard; straight-grained; fibrous; fine-textured; finishes smoothly.

Growth rings present, but indistinct; due to zonate variation in fiber density. Parenchyma in broken tangential lines, not visible without lens. Pores not visible without lens, open, numerous, solitary, tending to zonate arrangement. Vessel lines indistinct. Rays barely visible on cross and tangential sections; visible, but inconspicuous, on radial.

Minute anatomy: Vessel perforations in part simple, in part scalariform with many bars; intervascular pits either large with oval to elongated borders, or much elongated and in scalariform arrangement. Fibers small, almost square in section, very thick-walled, with minute lumina; middle lamella thickened around entire cell; in definite radial rows; numerous large bordered pits, screw-head type, on radial and tangential walls. Rays 8 to 10 per mm.; 1 or 2 cells wide; heterogeneous; cells thick-walled, frequently conjugate; diamond-shaped crystals of calcium oxalate common; pits into vessels (1) round or oval, simple to half-bordered, and (2) simple, elongated, tending to scalariform arrangement. Paratracheal parenchyma uniseriate; metatracheal in short broken tangential lines 1 or 2 cells wide; individual cells of the same size as fibers in section. Tang. diam. of pores 0.05 mm. to 0.07 mm., av. 0.06 mm. Vessel segments 0.95 mm. to 1.79 mm. long, av. 1.29 mm.; oblique end walls and long tips. Fibers 1.58 mm. to 2.07 mm. long, av. 1.87 mm.; 0.01 mm. to 0.02 mm. wide, av. 0.02 mm. Rays 3 to 50 cells high, or 0.13 mm. to 1.66 mm., av. 0.96 mm.

Material: Persaud No. 61; Field Museum No. 549,817; Yale No. 9469.

Rubiaceae (Madder Family)

Amioua guianensis Aubl. "Kumara-mara." Pale reddish brown, turning darker on exposure; not uniform; luster dull. Odor and taste not distinctive. Hard and heavy; fairly straight-grained, with a tendency to spiral; fine-textured; finishes smoothly and is capable of a high polish.

Growth rings not distinct. Parenchyma in numerous fine concentric lines. Pores not visible without lens, open, scattered, occurring singly or in radially appressed groups of 2 to 4. Vessel lines indistinct. Rays not visible without lens on

cross and tangential sections; barely visible on radial, being of same color as background.

Minute anatomy: Vessels thin-walled; perforations simple; intervascular pits alternate, numerous, minute, with round borders and slit-like apertures. Fibers polygonal in section, extremely thick-walled, with minute lumina; in no definite arrangement; pits large, bordered, the slit-like apertures extending beyond the border. Rays 8 to 10 per mm.; 1 or 2 cells wide; decidedly heterogeneous; cells thick-walled, often conjugate; dark brown gum abundant; pits into vessels same appearance as the intervascular. Parenchyma in concentric bands 2 to 5 cells wide, and sparingly diffuse. Tang. diam. of pores 0.03 mm. to 0.07 mm., av. 0.05 mm. Vessel segments 0.41 mm. to 0.75 mm. long, av. 0.50 mm. Fibers 1.31 mm. to 1.71 mm. long, av. 1.41 mm.; 0.022 mm. to 0.03 mm. wide, av. 0.03 mm. Rays 4 to 25 cells high, or 0.26 mm. to 1.41 mm., av. 0.85 mm.

Material: Persaud No. 139; Field Museum No. 549,905; Yale No. 9507.

Isertia hypoleuca Benth. "Mamayahooka." Color yellow-brown; not uniform; luster rather low. Odor and taste not distinctive. Medium hard and heavy; grain partly roey; texture fine; finishes fairly smoothly.

Growth rings fairly distinct, due to zones deficient in pores. Parenchyma in short, broken, tangential lines, not visible without lens. Pores barely visible, open, in fairly uniform to zonate arrangement, mostly solitary, but occasionally in radial pairs. Rays barely visible on cross section; visible, but not distinct, on radial, being of same color as background.

Minute anatomy: Vessels with minute, simple perforations; intervascular pits alternate, small, numerous, but not crowded, the borders oval, the apertures elliptic; pit membranes cribriform. Fibers square to polygonal in section, fairly thick-walled, with large lumina; in irregular radial rows; pits numerous, large, bordered, the slit-like apertures extending beyond border. Rays 19 to 22 per mm.; 1 to 4 cells wide, the multiseriate with very high uniseriate margins which frequently unite with those of other rays; decidedly heterogeneous; cell walls densely pitted; yellow deposits occasional; pits into vessels of same appearance as the intervascular, the membranes cribriform. Parenchyma metatracheal, in small tangential groups 1 to 3 cells long. Tang. diam. of pores 0.07 mm. to 0.12 mm., av. 0.09 mm. Vessel segments 0.99 mm. to 1.41 mm. long, av. 1.29 mm. Fibers 1.24 mm. to 1.71 mm. long, av. 1.49 mm.; 0.027 mm. to 0.04 mm. wide, av. 0.033 mm. Rays 1 to 39 cells high, or 0.5146 mm. to 2.158 mm., av. 0.9628 mm.

Material: Persaud No. 15; Field Museum No. 549,761; Yale No. 9434.

Palicourea guianensis Aubl. "Kamadani." Color creamy; luster dull. Odor and taste not distinctive. Moderately hard and heavy; straight-grained; fine-textured; finishes smoothly.

Growth rings not very distinct, due only to color variation. Parenchyma not visible. Pores not visible without lens, open, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 or 3. Vessel lines indistinct. Rays faintly visible on cross section; invisible on tangential; inconspicuous on radial.

Minute anatomy: Vessels thin-walled; perforations minute, simple; intervascular pits small, crowded, the borders oval to polygonal, the apertures elliptic; pit membranes cribriform. Fibers square or elongated radially in section, with medium-thick wall and large lumina, usually septate; in definite radial rows; numerous, large pits on radial walls, the slit-like apertures extending beyond the circular borders. Rays 5 to 15 per mm.; 1 to 3 cells wide, the latter with high uniseriate margins; decidedly heterogeneous; cells densely pitted; pits into vessels of same appearance as the intervascular, the membranes cribriform. Parenchyma absent or very sparingly developed. Tang. diam. of pores 0.05 mm. to 0.08 mm., av. 0.07 mm. Vessel segments 0.51 mm. to 1.19 mm. long, av. 0.98 mm. Fibers 1.19 mm. to 1.49 mm. long, av. 1.38 mm.; 0.03 mm. to 0.04 mm. wide, av. 0.033 mm. Rays 1 to 43 cells high, or 0.13 mm. to 1.44 mm., av. 0.78 mm.

Material: Persaud No. 19; Field Museum No. 549,766; Yale No. 9437.

Psychotria Mapourea R. & S. Color dark pink to almost red; luster dull. Odor and taste not distinctive. Moderately hard and heavy; grain straight to slightly wavy; medium-textured; finishes smoothly.

Growth rings and parenchyma not visible. Pores barely visible without lens, open, numerous, evenly distributed, occurring singly or in radially appressed groups of 2 to 8. Vessel lines not distinct. Rays visible on cross section; invisible on tangential; distinct on radial, being darker than background.

Minute anatomy: Vessels thin-walled, perforations minute, simple; intervascular pits minute, but not crowded, the borders round, the apertures elliptic; pit membranes cribriform. Fibers thick-walled, but with large, septate lumina; middle lamella thickened at corners; in irregular radial rows; numerous, small, simple or very indistinctly bordered pits on radial walls. Rays 10 to 12 per mm.; 1 to 6 cells wide, the rays multiseriate with exceedingly high uniseriate margins often joining those of other rays; decidedly heterogeneous; cell walls densely pitted; globules of brown gum common; pits into vessels of same appearance as the intervascular, the membranes

cribriform. Parenchyma absent or very sparingly developed. Tang. diam. of pores 0.04 mm. to 0.07 mm., av. 0.05 mm. Vessel segments 0.99 mm. to 1.66 mm. long, av. 1.28 mm. Fibers 1.83 mm. to 2.49 mm. long, av. 2.21 mm.; 0.03 mm. to 0.05 mm. wide, av. 0.04 mm. Rays 1 to 30 cells high, or 0.33 mm. to 2.16 mm., av. 1.48 mm.

Material: Persaud No. 57; Field Museum No. 549,812; Yale No. 9466.

Sapindaceae (Soapberry Family)

The genera *Cupania* and *Matayba* have the following characteristics in common.

Gross anatomy: Growth rings distinct, due to zonate variation in fiber density. Parenchyma not visible. Pores barely visible without lens, open, numerous, uniformly distributed, occurring singly or in radially appressed groups of 2 to 5. Rays barely visible with lens on cross and tangential sections; visible, but inconspicuous, on radial, being of same color as background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, minute, numerous, crowded, the borders oval to polygonal, the apertures elliptic. Fibers small, square to subcircular in section, thick-walled, frequently mucilaginous, with small, frequently septate lumina; long rows of small rhombohedral crystals of calcium oxalate common; middle lamella thickened at corners; in definite radial rows; pits minute and simple. Rays 10 to 15 per mm.; mostly uniseriate, occasionally partly biseriate; homogeneous; cells filled with chocolate-colored gum, occasionally containing large crystals of calcium oxalate; pits into vessels of same appearance as the intervascular. Parenchyma very scarce; paratracheal uniseriate.

Cupania scarbiculata L. C. Rich. Pale pinkish brown; luster high. Odor and taste not distinctive. Hard and heavy; straight-grained; fine-textured; cuts rather hard, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.04 mm. to 0.1 mm., av. 0.09 mm. Rays 1 to 30 cells high, or 0.04 mm. to 0.58 mm., av. 0.25 mm.

Material: Persaud No. 65; Field Museum No. 549,821; Yale No. 9473.

Matayba opaca Radlk. Light pinkish brown; uniform; luster high. Odor and taste not distinctive. Heavy and hard; straight-grained; fine-textured; cuts rather hard, but finishes smoothly.

Minute anatomy: Tang. diam. of pores 0.05 mm. to 0.13 mm., av. 0.09 mm. Vessel segments 0.06 mm. to 0.79 mm. long, av. 0.69 mm. Fibers 0.83 mm. to

1.16 mm. long, av. 0.99 mm.; 0.016 mm. to 0.027 mm. wide, av. 0.021 mm. Rays 1 to 30 cells high, or 0.03 mm. to 0.60 mm., av. 0.21 mm.

Material: Persaud No. 119; Field Museum No. 549,884; Yale No. 9503.

Sapotaceae (Sapodilla Family)

Chrysophyllum sp. "Bastard kookeriti-balli." Color deep red-brown; uniform; luster dull. Odor and taste not distinctive. Hard and heavy; grain straight to wavy; texture fine; finishes smoothly and is capable of taking a high polish.

Growth rings indistinct. Parenchyma in fine wavy concentric lines, producing a fine network with rays; barely visible without lens. Pores small, in distinct radial lines of 3 to 12, or occasionally in tangential groups. Vessel lines not distinct. Rays not visible without lens on cross and tangential sections; visible, but indistinct, on radial, being of same color as background.

Minute anatomy: Vessels thick-walled; sclerosed tyloses rare; perforations elongated, simple; intervascular pits alternate, large, numerous, not crowded, of screw-head type. Fibers square to subcircular in section, extremely thick-walled, frequently mucilaginous with minute lumina; in definite radial rows; pits minute, inconspicuous, and simple. Rays 15 to 18 per mm.; mostly uniseriate, a few partly biseriate; decidedly heterogeneous; marginal cells conjugate; reddish brown deposits abundant; pits into vessels (1) of same appearance as the intervascular, and (2) large, elliptic, simple to half-bordered. Parenchyma abundant; paratracheal uniseriate; metatracheal in numerous concentric lines, 1 to 4 cells wide, mostly uniseriate; conjugate cells common. Tang. diam. of pores 0.08 mm. to 0.17 mm., av. 0.12 mm. Vessel segments 0.46 mm. to 0.83 mm. long, av. 0.67 mm.; end walls sharply oblique, with short tips. Fibers 1.63 mm. to 1.74 mm. long, av. 1.68 mm.; 0.013 mm. to 0.027 mm. wide, av. 0.02 mm. Rays 1 to 26 cells high, or 0.08 to 1.0 mm., av. 0.44 mm.

Material: Persaud Nos. 21, 105; Field Museum Nos. 549, 768, 549, 866; Yale Nos. 9438, 9495.

Simarubaceae (Bitterwood Family)

Simaruba sp. Color light yellow, turning dark on exposure; luster high. No odor; taste bitter, resembling quinine. Fairly light and soft; fibrous; straight-grained; medium-textured; does not finish very smoothly.

Growth rings distinct, due to terminal parenchyma. Parenchyma about pores and in widely spaced concentric lines. Pores scattered, appearing as small, open, pinholes;

solitary or in radially appressed groups of 2 to 4. Vessel lines distinct as long coarse scratches slightly darker than background. Rays readily visible on cross section; indistinct on tangential; distinct on radial, though of the same color as background.

Minute anatomy: Vessels with simple perforations; intervascular pits alternate, large, numerous, but not crowded, the borders round to oval, the apertures elliptic. Fibers square to polygonal in section, with walls of medium thickness, and large lumina; in definite radial rows; numerous, small, bordered pits on radial walls, the apertures slit-like and extending beyond circular borders. Rays 1 to 6 cells wide, the individual cell exceptionally large, thin-walled, free of contents; homogeneous; pits into vessels elliptic and half-bordered, resembling the intervascular. Parenchyma paratracheal 1 to 3 cells wide; also in terminal bands 6 to 10 cells wide; individual cells slightly larger than fibers in section; lumina free of contents. Tang. diam. of pores 0.10 mm. to 0.23 mm., av. 0.17 mm. Vessel segments 0.55 mm. to 0.91 mm. long, av. 0.73 mm. Fibers 0.98 mm. to 1.36 mm. long, av. 1.16 mm.; 0.016 mm. to 0.024 mm. wide, av. 0.02 mm. Uniseriate rays 3 to 27 cells high, or 0.12 mm. to 1.11 mm., av. 0.60 mm.; multiseriate, 12 to 60 cells high, or 0.46 mm. to 2.32 mm.; av. 1.39 mm.

Material: Persaud No. 133; Field Museum No. 549,898; Yale No. 9504.

Sterculiaceae (Cocoa Family)

Sterculia sp. "Man mahoe." General properties and gross anatomy as described in *Timbers of Tropical America*, p. 430.

Minute anatomy: Pores solitary or in radially appressed groups of 2 or 3, thin-walled, open. Vessels with simple perforations; intervascular pits alternate, large, numerous, crowded, of screw-head type. Fibers in seriation, thus appearing on cross section to be of two distinct sizes, in alternate rows: (1) with very large lumina, the individual cell subscircular in section; (2) with very small lumina, the individual cells angular in outline; wall of medium thickness; pits small, simple, or indistinctly bordered. Rays 1 to 15 cells wide; mostly multiseriate; decidedly heterogeneous; on cross section center cells are narrow and elongated axially; filled with brown deposits; marginal cells very large and square or elongated tangentially, the lumina free of deposits; pits into vessels of same appearance as the intervascular, the membranes cribriform. Parenchyma abundant; paratracheal 3 to 10 cells wide and often confluent; metatracheal, as short tangential groups between rays, 2 to 6 cells wide; also diffuse; individual cells 2 or 3 times the size of the fibers in section. Tang. diam. of pores 0.18 mm. to 0.26 mm., av. 0.23 mm. Vessel segments 0.25 mm. to 0.45 mm. long, av. 0.36 mm. Fibers 1.24 mm. to 2.36 mm. long, av. 1.97 mm.; 0.01 mm. to 0.03 mm. wide, av. 0.02 mm. Multiseriate rays 5 to 100 cells high, or 0.36 mm. to 3.32 mm., av. 2.01 mm.

Material: Persaud No. 30; Field Museum No. 549,777; Yale No. 9445.

Tiliaceae (Linden Family)

Mollia sphaerocarpa Gleason. "Yawhooballi." This species is described in *Tropical Woods* 9: 8–10, March 1, 1927.

Material: Persaud No. 4; Field Museum No. 549,747; Yale No. 9426.

Violaceae (Violet Family)

Paypayrola guianensis Aubl. Heartwood not available; sapwood cream-colored. Odor and taste not distinctive. Fairly light and soft; straight-grained; fine-textured; works easily and finishes smoothly.

Growth rings not very distinct; due to zonate variation in fiber density. Parenchyma absent. Pores barely visible with lens, numerous, evenly distributed, arranged in distinct radially appressed groups of 2 to 5. Vessel lines not distinct. Rays plainly visible on cross section; not visible without lens on tangential; conspicuous on radial, being lighter than background.

Minute anatomy: Pores thin-walled, almost square in section; vessel perforations exclusively scalariform, with 35 to 50 bars; intervascular pits exclusively scalariform. Fibers square or flattened radially in section, very thick-walled, with gelatinous layers; frequently septate; arranged in definite radial rows; numerous distinctly bordered pits on radial walls, the apertures slit-like and extending beyond the circular border. Rays 1 to 6 cells wide, the multiseriate with high uniseriate margins; decidedly heterogeneous; diamond-shaped crystals of calcium oxalate common; pits into vessels (1) small, oval, simple to half-bordered, but mostly (2) large, simple, and in scalariform arrangement. Parenchyma absent or very rare. Tang. diam. of pores 0.02 mm. to 0.07 mm., av. 0.04 mm. Vessel segments 0.99 mm. to 1.66 mm. long, av. 1.29 mm.; end walls extremely oblique, with short tips. Fibers 1.83 mm. to 2.32 mm. long, av. 2.06 mm.; 0.02 mm. to 0.04 mm. wide, av. 0.03 mm. Multiseriate portion of ray up to 160 cells high or from 1.16 mm. to 4.48 mm., av. 2.84 mm.

Material: Persaud No. 43; Field Museum No. 549,795; Yale No. 9455.

Vochysiaceae

Vochysia curvata Klotzsch. "Eta-balli." Heartwood pale brown, with pinkish hue; sapwood gray; luster golden. Odor and taste not distinctive. Light and soft, but firm; grain slightly roey; texture medium; easy to work and finishes smoothly.

Growth rings not visible. Parenchyma abundant around

pores and extending wing-like to form concentric bands 4 to 25 cells wide. Pores visible as small pinholes or as white dots, well distributed, occurring singly or in radially appressed groups of 2 or 3; tyloses and gum deposits common. Vessel lines distinct as long, fine, scratches, darker than background. Rays barely visible without lens on cross section; invisible on tangential, fairly distinct on radial, being slightly darker than background.

Minute anatomy: Vessels with simple perforations; intervascular pits crowded, the borders hexagonal, the apertures slit-like with a tendency to coalesce; pit membranes cribriform. Fibers polygonal in section, thick-walled; in irregular radial rows; inconspicuous, simple or indistinctly bordered pits on radial walls. Rays 1 to 6 cells wide; uniseriate 10 per mm., multiseriate 1 to 3 per mm.; heterogeneous; cells filled with red-brown gum; pits into vessels of same appearance as the intervascular, though somewhat larger; pit membranes cribriform. Parenchyma cells frequently filled with globules of red-brown gum. Tang. diam. of pores 0.05 mm. to 0.13 mm., av. 0.10 mm. Vessel segments 0.21 mm. to 0.43 mm. long, av. 0.34 mm. Fibers 0.69 mm. to 1.16 mm. long, av. 1.03 mm.; av. width 0.02 mm. Uniseriate rays 1 to 15 cells high, or 0.05 mm. to 0.58 mm., av. 0.20 mm.; multiseriate 10 to 50 cells high, or 0.21 mm. to 0.85 mm., av. 0.47 mm.

Material: Persaud No. 1; Field Museum No. 549,744; Yale No. 9423.

CHECK LIST OF THE COMMON NAMES

Aliku	*Pithecolobium cauliflorum* Mart.	Leguminosae
Arakadako	*Byrsonima rugosa* Benth.	Malpighiaceae
Aramatta	*Diplotropis brachypetala* Tul.	Leguminosae
Awasakuli	*Tovomita Schomburgkii* Tr. & Pl.	Guttiferae
Bara-bara	*Diospyros guianensis* (Aubl.) Gürke	Ebenaceae
Bara-kara	*Ormosia coccinea* Jacks.	Leguminosae
Bats souari	*Caryocar glabrum* Pers.	Caryocaraceae
Bloodwood	*Caopia* (*Vismia*) sp.	Guttiferae
Buku-buku	*Hirtella hirsuta* Lam.	Amygdalaceae
Burhoorada	*Parinarium campestre* Aubl.	Amygdalaceae
Burhuda	*Endlicheria multiflora* (Miq.) Mez	Lauraceae
Cashew, Wild	*Anacardium giganteum* Hancock	Anacardiaceae
Cassava wood	*Alchornea triplinervia* (Spreng.) Muell. Arg.	Euphorbiaceae
Crabwood	*Carapa guianensis* Aubl.	Meliaceae
Duka	*Tapirira Marchandii* Aubl.	Anacardiaceae
Eta-balli	*Vochysia curvata* Klotzsch	Vochysiaceae
Greenheart	*Nectandra Rodiæi* Schomb.	Lauraceae
Guava, Wild	*Calycolpus glaber* (Benth.) Berg.	Myrtaceae
Hooboodia	*Anacardium giganteum* Hancock	Anacardiaceae

Kakarali	*?Escbweilera* sp.	Lecythidaceae
Kakatara	*Ilex Martiniana* D. Don	Aquifoliaceae
Kamadani	*Palicourea guianensis* Aubl.	Rubiaceae
Kiricowa	*Virola sebifera* Aubl.	Myristicaceae
Kookeriti-balli, Bastard	*Chrysophyllum* sp.	Sapotaceae
Koyetchi	*Rollinia multiflora* Spltz.	Anonaceae
Kauta-balli (not described)	*Licania* sp.	Amygdalaceae
Kufa	*Clusia colorans* Engl.	Guttiferae
Kumaka-balli	*Ficus Gleasonii* Standley	Moraceae
Kumara-mara	*Amioua guianensis* Aubl.	Rubiaceae
Lana-balli (not described)	?	Lauraceae
Long John	*Triplaris surinamensis* Cham.	Polygonaceae
Mahoe, Black	*Rollinia multiflora* Spltz.	Anonaceae
Mahoe, Man	*Sterculia* sp.	Sterculiaceae
Mamayahooka	*Isertia hypoleuca* Benth.	Rubiaceae
Man-dalli	*Virola sebifera* Aubl.	Myristicaceae
Man mahoe	*Sterculia* sp.	Sterculiaceae
Monkey pot, Small	*?Escbweilera* sp.	Lecythidaceae
Mora	*Dimorphandra* [*Mora*] *excelsa* Baill.	Leguminosae
Oolu	*Icica Schomburgkiana* (Engler)	Burseraceae
Purpleheart	*Peltogyne pubescens* Benth.	Leguminosae
Sacka	*Peltogyne pubescens* Benth.	Leguminosae
Sarabebe	*Vouapa bifolia* Aubl.	Leguminosae
Silver balli, Bartara?	*Bellucia grossularioides* (L.) Triana	Melastomaceae
Silver-balli, Bastard	*Endlicheria multiflora* (Miq.) Mez	Lauraceae
Trysil	*Pentaclethra macroloba* (Willd.) Ktze.	Leguminosae
Waikey	*Inga nobilis* Willd.	Leguminosae
Wakradani	*Miconia guianensis* (Aubl.) Cogn.	Melastomaceae
Wallaba, Water	*Eperua Schomburgkiana* Benth.	Leguminosae
Waramia	*Tapirira guianensis* Aubl.	Anacardiaceae
Whykee	*Inga nobilis* Willd.	Leguminosae
Yawhooballi	*Mollia sphaerocarpa* Gleason	Tiliaceae

Material Wanted

The editor is particularly desirous of obtaining correctly identified hand specimens of as many as possible of the woods of the Meliaceae for use in a study of the comparative anatomy of the family now being made by a competent graduate student.

CURRENT LITERATURE

Idle land: A wasting national asset in Cuba. By D. M. MATTHEWS. *Unifruitco* (Boston) 3: 2: 76–79, September 1927.

"The approximate area of Cuba is 26,600,000 acres. The census of 1899 estimated that about half of this area, or 13,000,000 acres, was uncleared forest land. Plantations and small farms were estimated at about 8,700,000 acres, of which something less than 900,000 acres were in cultivation, and the balance of the area was unclassified. Since then, largely due to the expansion of the sugar industry, there has been an enormous increase in the land actually cultivated and a concurrent decrease of forest area; but there has also been an increase in the area of unproductive land. No data exist which would permit of an accurate land classification for the Island. It is known that the area under cultivation to cane is about 2,500,000 acres, and a very rough estimate of the forest area indicates that to be about 4,500,000 acres. With these estimates as bases an approximate classification may be considered to be:

	Acres	Per Cent
Land under cultivation to cane	2,500,000	11.3
Other cultivation	500,000	
Forests	4,500,000	16.9
Pastures, savannahs and idle land	19,100,000	71.8
Total	26,600,000	

"The above classification is admittedly open to question and the prime requisite to an adequate understanding of the true economic condition of Cuba is the acquisition of more accurate data in this respect. But, although undoubtedly inaccurate in detail, the information at present available indicates plainly that the recent agricultural expansion in Cuba has been brought about at the expense of the forests and that the reduction of the forest area has been out of all proportion to the increased utilization of the land for agriculture. The forest asset has been largely destroyed and, although the pockets of the present generation have not yet felt it, the large areas of idle land represent a very great economic loss

which will have to be measured, not only by the cost of imported timber, but also by a gradual reduction in the value of the soil and the climatic factors upon which successful agriculture depends."

"Diversification of agriculture as a remedy for present conditions in Cuba is obviously a desirable thing and it will come in time. However, it will have to wait upon better means of transport and a gradual change in the attitude of mind of the public toward other forms of cultivation than sugar and tobacco. In the meantime the already large area of unproductive land will likely be increased as unsuitable cane lands have to go out of cultivation. It is suggested that the forests, much of the area of which was removed at a loss, can be replaced at a profit. The wild forests of Cuba which were destroyed to make way for cane cultivation were worth, acre for acre, in the value of their standing timber, only a fraction of the value of equal areas of first-class cane land. However, the planted forests which can be made to take their place will have a potential value on a parity with that of cane on average sites and a much greater value than marginal cane lands which, in the interests of low production costs, should go out of cultivation."

"Careful examination of the more accessible of the remaining forests in Cuba develops the fact that the annual wood increment per acre is very low, and that no cultural operations can be expected to increase their rate of growth within any economic period. The only species of value which hold out any promise of reasonably rapid growth, i.e., mahogany and cedar, have long since been practically exterminated. Species which are at present considered of value, such as Caguairán [*Copaifera hymenaefolia* Moric.], Acana [*Mimusops Wrightiana* (Pierre) Benth.], Jigüe [*Lysiloma latisiliqua* (L.) Benth.], Sabicú [*Pithecolobium arboreum* (L.) Urb.], Jucaro [*Bucida Buceras* L.], etc., are all woods of very great density and obviously of very slow growth. Doubtless many of the forests which were destroyed in Cuba in recent years were of similar character. Therefore, except for the value of the timber actually burned up, there was little loss. As productive areas their value was negligible.

"Such would not be the case with planted and managed forests of carefully selected species. The artificial propagation of valuable species such as mahogany, cedar and teak, has met with very considerable success in Trinidad and Venezuela and the work thus far done indicates that certain and large financial returns can be obtained from properly established plantations with those species. In both countries the present timber shortage has been foreseen for some years and a great deal of interest is being taken in the establishment of forest plantations, chiefly by private interests. The mounting cost of all timber products has induced this interest. However, the tendency in forest planting is toward the production of timbers of high value for export purposes, rather than toward any attempt to raise timber for general utility purposes. In other words, forest planters plan to raise a crop which will have so high a value on a reasonable rotation that it will be a sound investment and not only meet the current needs of the community for timber, but yield a surplus financial return which can be applied to the purchase of general utility woods from the outside as required. It seems clear that, in any work of reforestation, a similar policy should be followed in Cuba.

"Equally with Venezuela and Trinidad, Cuba has as an inducement a very real timber shortage within the country. As a further inducement, or rather as an economic requirement, she is faced with the necessity of bringing into production lands for which she has not as yet found a suitable agricultural crop. Additionally, there are to be taken into consideration the indirect benefits, from the standpoints of water and soil conservation, which the presence of forests confer, but which are somewhat beyond the scope of this article to discuss."

Forest research in British Honduras. By DUNCAN STEVENSON. *Bulletin of the Imperial Institute* (London) 25: 3: 313–320, Oct. 1927.

"*Tree improvement* consists simply in the freeing of the crowns of mahogany and cedar, and in some cases the more important secondary woods, from creepers, which are cut at 6

ft. from the ground and rot off, and the removal by girdling or killing of interfering trees of the less valuable species.

"*Seedling improvements.*—The seedlings of mahogany and cedar, which have a very characteristic appearance, are first located on the ground and marked by stakes from 4–6 ft. long, of which the top 6–9 in. is cleaned of bark. The labourer then cuts all the palms and small growth in the area allotted to him as a daily task. Small trees of up to 6–9 in. in diameter are felled and larger trees girdled. The large palms (chiefly 'cohune,' *Attalea Cohune* Morris) are bored to aid the attack of fungus and insects; if they are giving too much shade they are felled. While the smaller trees are being felled the new stakes marking the position of seedlings are easily seen and avoided.

"The slash is left on the ground to rot away. When this improvement has been done the area presents a very open appearance compared with the virgin 'bush' and may now be termed 'forest.' The seedlings appear to thrive with this drastic cleaning, provided the overhead canopy is broken sufficiently; and at the commencement of the growing season the leaders may put on 12–24 in. height growth in 2–3 weeks.

"Re-improvement is done from time to time, usually at yearly intervals, with a provisional limit at present of three re-improvement operations, until a sufficient seedling stock has been obtained. This may be from thirty to several hundred seedlings per acre. The dense undergrowth appearing as a result of the opening out will then be encouraged to force up the seedlings, the heads of which will be kept free of interference. This latter stage is now being reached in the oldest Forest Reserve.

"Seedling improvements are only done in the climax stages of the bush and the drastic cleaning reverses the succession to a stage more advantageous to the germination and growth of mahogany. Experiments have been started in various parts of the Colony under widely divergent conditions and the collected data will make a valuable addition to the knowledge of the silviculture of mahogany."

"With reference to the logging and extraction of mahogany and the secondary wood 'banak' (*Virola merendonis* Pittier),

specimens of the ambrosia beetles attacking the wood in the log, and locally known as 'pinworms,' have been collected and forwarded to Dr. R. S. MacDougall of Edinburgh for identification. Three species were reported to be present in a collection made from one truck load of six 'banak' logs. *Platypus* and *Xyleborus* spp. have been identified and the third species may or may not be entirely new. It may be the male of one of the above.

"Several sprays have been tried under all conditions with varying degrees of success. A Stanacola product, prepared by the Standard Oil Company (the formula for which is not obtainable), was used several years ago on barked logs with great success when carefully done, but failed completely with the rougher and more 'slip-shod' methods used in the bush. A solution of carbolineum and kerosene tried in various proportions was an absolute failure, the logs carrying the largest amount of carbolineum appearing to be most affected. The only safe measure at present appears to be to cut the wood in the dark of the moon and to get the logs into water with the least delay."

Lista preliminar de las plantas de el Salvador. Segundo suplemento. By PAUL C. STANDLEY and SALVADOR CALDERÒN. Pub. by Laboratorio de Agricultura, Sec. Botánico, San Salvador, 1927. Pp. 275–302; 6 x 9¼; 12 full-page half-tone plates.

The Lecythidaceae of Central America. By H. PITTIER. *Contr. U. S. Nat. Herb.* 26: 1: 1–14, May 2, 1927. Plates 12.

"Up to 1908, only four species, belonging to three genera of the family Lecythidaceae, and ranging from the Canal Zone to Nicaragua, had been reported from Central America. They were *Gustavia superba*, *Grias Fendleri*, and *Couroupita odoratissima* and *C. nicaraguensis*. In the course of that year three new species and two genera (*Lecythis costaricensis*, *Eschweilera Collinsii*, *E. calyculata*) were added to the list, and the southward extension of *Couroupita nicaraguensis* along the Pacific coast was reported. Northward, Nicaragua seems to remain the extreme limit reached by the family.

"The botanical explorations of Panama undertaken under the auspices of the Smithsonian Institution and started in 1909, led me to the magnificent forests of the southeastern parts of that country, in the district of Port Obaldía on the Caribbean side, and in the Sambú and Tuyra valleys of the Pacific watershed. The study of the flora of these extraordinarily rich plains and hills was only started, though with wonderful glimpses of its composition. The presence in our collections of representatives of genera such as *Brownea*, *Centrolobium*, *Mimusops*, and *Lucuma*, hitherto considered as almost exclusively South American, and, above all, the abundance of undescribed forms of Lecythidaceae, of which no less than 11 are here described for the first time, revealed the existence in that region of a real miniature of the Amazonian silva, miniature in extension but quite as majestic in the dimensions of its elements. In fact, the forests of the Panamanian Darién are the most perfect type of tropical rain forests which it has been my privilege to contemplate in forty years of neotropical exploration. This is not the place to discuss the causes which have given rise to the development of such a remarkable flora, or its relationships with that of the central and eastern sections of the South American continent. The facts at hand are not sufficient. In the first place, the study of the forests in question has only been initiated and they reserve innumerable surprises; moreover, our knowledge of the flora of the plains along the western Caribbean seaboard and the Pacific coast of Colombia is too scanty to allow even tentative conclusions.

"The present paper contains the description of all the species, pertaining to five genera, hitherto reported from Central America, including Panama. I do not consider the subject as exhausted. More species of the genera already represented will be found, and at least one genus, *Cariniana*, abundant in the forests of the Sinu and Atrato valleys, is likely to exist also in Darién."

The new species described are *Gustavia brachycarpa*, *G. pleurocarpa*, *G. nana*, *Couroupita darienensis*, *Lecythis Melliana*, *L. tuyrana*, *L. armilensis*, *Eschweilera reversa*, *E. panamensis*, *E. garagarae*, and *E verruculosa*.

Arboles y arbustos nuevos de Venezuela. By H. Pittier. Reprinted from *Boletin del Ministerio de Relaciones Exteriores* 8, 9: 75–103, Aug. and Sept. 1927.

Contains botanical descriptions of 30 new species of Venezuelan trees and shrubs as follows:

51. *Ruprechtia concinna*
52. *Annona guaricensis*
53. *Guatteria Saffordiana*
54. *Guatteria Knoopiana*
55. *Xylopia meridensis*
56. *Pithecolobium falconiense*
57. *Calliandra riparia*
58. *Calliandra Blakeana*
59. *Calliandra minutifolia*
60. *Piptadenia rubescens*
61. *Piptadenia pseudo-flava*
62. *Piptadenia robusta*
63. *Piptadenia Voronoffii*
64. *Baubinia mirandina*
65. *Baubinia mollifolia*
66. *Chamaefistula axillaris*
67. *Chamaefistula foliosa*
68. *Chamaefistula hemicardia*
69. *Peiranisia macrochlamys*
70. *Copaifera venezuelana* Harms & Pitt.
71. *Machaerium grandifolium*
72. *Machaerium cultratum*
73. *Machaerium latialatum*
74. *Pterocarpus ruprestris*
75. *Pterocarpus vernalis*
76. *Lonchocarpus Cruciisrubierae*
77. *Lonchocarpus mirandinus*
78. *Lonchocarpus stenurus*
79. *Lonchocarpus stenopteris*
80. *Lonchocarpus stramineus*

O problema florestal no Brasil, em 1926. Relatorio succinto, visando a phytotechnia e a phytogeographia, apresentado ao Congresso Internacional de Silvicultura de Roma, Abril-Maio 1926. By A. J. de Sampaio. Reprint, *Archivos do Muzeu Nacional* 28: 55–173, Rio de Janeiro, 1926.

A valuable compilation of data relative to the forest resources of Brazil and the problems involved in their constructive utilization. The extensive bibliography makes this indispensable as a reference work.

Comparative strength properties of the principal Philippine commercial woods. By José C. Espinosa. *The Philippine Journal of Science* 33: 4: 381–395, August 1927.

"Despite the fact that many kinds of wood are found in Philippine forests, only a very few are at present of commercial importance. It has been estimated that there are close to three thousand species of trees that reach a diameter of 30 centimeters or more. Luis J. Reyes, wood technologist of the Philippine Bureau of Forestry, estimated that more than six hundred distinct species are cut for timber, but only about

two hundred have been observed in the markets at one time or another. In general, from forty to fifty species are available in the larger markets, but in practice less-known timbers are included and sold as well-known species or as 'miscellaneous,' which practice reduces the number of commercial timbers to from fifteen to twenty.

"The increasing scarcity of some of the more durable and stronger species makes it imperative to find others which, by virtue of their strength, durability, and other properties, can be used in place of some of the more valuable species. Hence a knowledge of the strength characteristics of Philippine woods is of the utmost importance from the standpoint of economy and proper utilization of the timber resources."

"Following the standard methods used by the Forest Products Laboratory, Forest Service, United States Department of Agriculture, mechanical tests were made on some Philippine commercial woods, both in structural sizes varying from 2 inches by 4 inches by 5 feet to 8 inches by 8 inches by 15 feet, and in smaller specimens free of knots and other defects, 2 inches by 2 inches by 30 inches. Tables of adaptability numbers were prepared giving a comparison of the suitability as regards strength of the different species with red lauan, or 'Philippine mahogany,' which is one of the best-known woods of the Islands."

The lumber trade of British East Africa. By CHARLES H. ALBRECHT. *Commerce Reports* (Washington, D. C.), Oct. 31, 1927, pp. 295–6.

"Of the already demarcated forest reserves in the colony of Kenya, it is estimated that not more than 742,000 acres are at present carrying merchantable quantities of timber and much of this is at present inaccessible, owing to transportation difficulties.

"The demand for lumber and timber continues to be very active, but was more satisfactorily met in 1926 than in the previous year. Nearly all sawmills in Kenya colony largely increased their output last year, in spite of an exceptionally wet year which interfered considerably with logging over a great part of the colony. The total quantity of timber sold

from the forest reserves was 1,316,566 cubic feet, an increase of 44 per cent over the best previous year. This was obtained only from previously existing license areas—no new forests having been opened for cutting during 1926—and was accompanied by a correspondingly increased replanting program."

"Although the local demand for cedar timber can easily absorb the entire present output of the mills in scantling and boards, the production and export of pencil slats is being encouraged. Nevertheless, the exports decreased from 56,151 feet valued at $100,900 in 1925 to 43,484 cubic feet valued at $84,000 in 1926. British firms showed some interest in Kenya cedar as a cabinet wood, but inquiries for pencil slats came almost entirely from continental Europe, the United States, and India. About three-fourths of the exports of cedar go to Great Britain, the remainder being taken by 11 other countries, of which the most important are France, Germany, Italy, and the Netherlands. The greater part of the pencils now used in Kenya are made of Kenya cedar by a single British firm and they have proved to be of very satisfactory quality."

"Of the total forests of Tanganyika Territory, approximately one-third (892,373 acres) is merchantable and now reasonably accessible, one-half is protection forest, and one-sixth will be merchantable when increased means of communication render it accessible. On the low basis of an average stand of 500 cubic feet per acre and 1 per cent annual increment, the yearly growth increment is approximately 4,460,000 cubic feet, but not one-tenth of this amount has as yet been taken from the forests in any one year. . . .

"Exports of timber from Tanganyika Territory have increased from 105 tons valued at $4,800 in 1921 to 1,677 tons valued at $80,000 in 1926, and exports of mangrove poles from 2,309 score in 1921 to 3,872 score in 1926. On the other hand, imports of lumber have increased from 279 tons valued at $17,600 in 1921 to 3,003 tons valued at $136,000 in 1926. The exported timber includes 4,767 cubic feet of cedar, 952 cubic feet of 'mahogany' (*Lovoa* sp.), and 78,515 cubic feet of other sorts, chiefly podo and 'camphor' (*Ocotea usambaren-*

sis). Nearly 31 per cent of the cut of timber was exported, although the local consumption was in excess of the cut by some 66,000 cubic feet, over 150,000 cubic feet having been imported. Cedar pencil slats accounted for 5 per cent of the exports, this trade having revived on increased demand from the United States. Over 353 cases of pencil slats were exported in 1926—twelve times the quantity of the previous year."

The Gold Coast forest: A study in synecology. By T. F. CHIPP. *Oxford Forestry Memoirs* No. 7, Oxford, 1927. Pp. 94; 7½ x 10¾; figs. 37 (maps, charts, half-tones).

"No purely ecological study of the Gold Coast forest has been recorded, nor, so far as is known, has one hitherto been attempted. In fact, no intimate study has been possible so long as the component units forming the structure of this mass of tropical forest vegetation have remained undetermined and uninvestigated.

"Great strides have been made in the floristic study of this forest, especially during the last two decades. . . . The study of economic botany has gone forward in leaps and bounds with the establishment and expansion of the agricultural and forestry departments. . . . This progress has been made and investigations are actively being pursued in connection with certain important aspects of the study of the forest, but in the direction of ecology the study of this forest has stopped short with the preliminary contributions provided chiefly in the primary reconnaissances of forest officers. . . . At least for the ecologist, the forest has since remained simply as 'the forest'—an immense mass of tropical vegetation extending over nearly 30,000 square miles, without individuality, and with undetermined structural units.

"If any further progress were to be made in the study of this forest-mass it was apparent that the basic units of vegetation of which the forest was composed, their characteristics, the factors controlling them, and the scheme by which they joined together to constitute the whole, must be definitely worked out. This is where the present work breaks new ground."

The report consists of an introduction, from which the preceding is extracted, and three parts. Part I. A general account of the Gold Coast forest and its external relationships: The Gold Coast; the forest; climatology; soils; biotic factors. Part II. The units of vegetation: Types of vegetation; monsoon climax units—closed forest; succession; seral units; transition from closed forest to parkland; Sudanese climax—the parkland; edaphic climax units—maritime vegetation. Part III. Plants and plant-forms: Plant-forms; plant indicators.

The chemical nature of the middle lamella. By WILLIAM M. HARLOW. Technical pub. No. 21, N. Y. State College of Forestry, Syracuse, September 1927. Pp. 11; 5¾ x 9.

"In typical parenchymatous tissues (young cortex, unlignified pith, cambium, etc.), the middle lamella is composed of pectin in one or more of its forms, while in woody tissues this layer is heavily lignified."

De slijm—en oliecellen in het hout der Lauraceae in verband met zienswijze van Tschirch. By H. H. JANSSONIUS. Reprint, *Pharmaceutisch Weekblad* 39: 1053–5, 1927.

In previous issues of the *Pharmaceutisch Weekblad*, Professor Goester discussed the valuable researches of Tschirch and his students on secretions and excretions in plants and referred to the results of certain investigations which could not be satisfactorily explained by Tschirch's theories. In this he is sustained by Janssonius who gives the results of his study of oil and mucilage cells in the mature wood of Javanese Lauraceae. (See *Tropical Woods* 6: 3, June 1, 1926.)

A comparative study of lauraceous woods. By WALTER W. TUPPER. *American Journal of Botany* 14: 9: 520–524, November 1927. Illustrated with 13 photomicrographs.

The woods studied were of the genera *Litsea*, *Beilschmiedia*, *Cinnamomum*, *Umbellularia*, *Nectandra*, *Sassafras*, *Persea*, *Ocotea*, *Phoebe*, *Benzoin*, *Silvia*, *Micropora*, *Cryptocarya*, *Machilus*, and *Dehaasia*.

The writer is impressed with the heterogenity of lauraceous woods and, in the case of fossil woods, considers it more satisfactory and safer to refer specimens to existing genera and perhaps to species rather than to the whole family. He is also convinced that, "although many of the fossil woods described as *Laurinoxylon* are probably old sassafras, spice bush, and other lauraceous plants, many others so described come from entirely different and widely separated families."

The reviewer has not had enough experience with fossil woods to justify an opinion of Professor Tupper's conclusions, but he has found that the lauraceous woods in natural condition can be referred to the family without much difficulty, while distinctions between certain genera are at present impossible. The group exhibits less range of variation than the Leguminosae and one need rarely be at fault in determining that a wood is leguminous even though he cannot refer it with certainty to a particular sub-family.

"The writer found that prominent marginal ray cells were present in the wood of all genera and of all species examined. This seemed to be about the only constant character, however." He omitted reference to the pits of the wood fibers, which are exclusively simple, a feature sufficient to separate the family from certain others, such as the Canellaceae. Oil cells, so common in lauraceous woods, are found in only three or four other families. (See *Tropical Woods* 1: 9–12, March 1925.) Other important characters are color, odor, luster, pitting between vessels and between vessels and parenchyma, arrangement of parenchyma, etc., which though individually inconstant produce collectively a fairly harmonious whole. While every anatomical detail may be duplicated in woods of other families, the test is whether or not the combination of details, the structure as a whole, of a particular specimen of lauraceous wood can be paralleled in some other family. If the latter condition obtains anywhere in the family it is proof that the botanical classification is at fault. There are numerous cases where woods in unrelated families are remarkably similar, but if they are not distinguishable it is because of insufficient knowledge of differences which may be presumed to exist.

Tanning materials of the British Empire. Part I. *Bulletin of the Imperial Institute* (London) 25: 3: 250–286, Oct. 1927.

"For some time past the question of future supplies of vegetable tanning materials has been a matter of some anxiety in the leather industry, not only of the United Kingdom but throughout the world. During the war there was an enormous demand for such products, but certain countries were temporarily cut off from the world market, and the normal disposal of raw material underwent a considerable change. This dislocation of trade has gradually been overcome, and the consumption of tanning materials in the last two or three years may be taken as an index of the future requirements of the industry. These years show a steadily increasing consumption, and attention has been directed to a consideration of the world's resources with regard to the future.

"From the accompanying table, for which the Imperial Institute is indebted to Dr. Snow, Manager of the United Tanners' Federation, it will be seen that in the United Kingdom more than half the tanning materials consumed, expressed as tanning units, are derived from foreign countries, the largest item being quebracho extract from the Argentine. There is consequently a large field for the expansion of Empire production, not only in providing the additional tanning units required in the future, but in rendering the leather industries of the Empire as far as possible independent of foreign supplies. The Advisory Committee on Tanning Materials of the Imperial Institute are taking steps to encourage the production of tanning materials in British countries and to introduce new tanstuffs that are of promise.

"The present article has for its object a brief review of the tanning materials of the Empire, including those in established use and those worthy of consideration as new articles of commerce. The well-known materials will be described in the following order: barks, woods, leaves and fruits; a later section will be devoted to lesser known materials of these groups that are of interest. The first part of the article now published deals with the following barks: wattle, mangrove, mallet, hemlock, avaram, and babul barks."

Tanning materials of the British Empire. Part II. *Bulletin of the Imperial Institute* (London) 25: 4: 380–403, Jan. 1928.

The present part deals with oak bark and other oak products in Europe, India, and Burma; larch bark; chestnut (*Castanea*) in Europe and U. S. A. and the related genus (*Castanopsis*) in India and Burma; cutch, obtained from the heartwood of *Acacia Catechu;* gambier, from the leafy twigs of *Uncaria Gambier* Roxb.; leaves of sumach (*Rhus Coriaria* L.). "In 1925 the two chief vegetable tanning materials consumed in Great Britain and Ireland were wattle bark and myrobalans, and next in importance was chestnut extract, of which over 25,000 tons were absorbed by the tanning industry in that year." The world demand for gambier is about 25,000 tons and for sumach nearly 30,000 tons, annually.

Forests and water in the light of scientific investigation. By RAPHAEL ZON. Govt. Printing Office, Washington, D. C. 1927. Pp. 106; 6 x 9. Bibliography pp. 70–106. Price 20c.

"This paper aims to bring together impartially all the well-established scientific facts in regard to the relation of forests to water supply. Such a critical statement of our present knowledge of this subject should be helpful in separating what is definitely known of this relation from that which still needs to be determined."

SUMMARY OF EFFECTS OF FORESTS UPON CLIMATE

"Accurate observations, continued for many years in different parts of the world, establish with certainty the following facts in regard to the influence of forests upon climate:

"The forest lowers the temperature of the air inside and above it. The vertical influence of forests upon temperature extends in some cases to a height of 5,000 feet.

"Forests increase both the abundance and frequency of local precipitation over the areas they occupy, the excess of precipitation, as compared with that over adjoining unforested areas, amounting in come cases to more than 25 per cent.

"The influence of mountains upon precipitation is increased by the presence of forests. The influence of forests upon local precipitation is more marked in the mountains than in the plains.

"Forests in broad continental valleys enrich with moisture the prevailing air currents that pass over them, and thus enable larger quantities of moisture to penetrate into the interior of the continent. The destruction of such forests, especially if followed by weak, herbaceous vegetation or complete baring of the ground, affects the climate, not necessarily of the locality where the forests are destroyed, but of the drier regions into which the air currents flow.

"While the influence of mountain forests upon local precipitation is greater than that of forests in level countries, their effect upon the humidity of the region lying in the lee of them is not very great."

SUMMARY OF THE EFFECTS OF FORESTS IN CONSERVING PRECIPITATION

"The hydrological rôle of forests in level countries differs from that of forests in hilly or mountainous regions.

"In level country, where there is no surface run-off, forests, in common with other vegetation, act as drainers of the soil; hence their importance in draining marshy land and improving hygienic conditions. In such country their effect upon springs is unimportant.

"In hilly and mountainous country, forests are conservers of water for stream flow. Even on the steepest slopes they create conditions with regard to surface run-off such as obtain in a level country. Irrespective of species, they save a greater amount of precipitation for stream flow than does any other vegetable cover similarly situated. They increase underground storage of water to a larger extent than do any other vegetable cover or bare surfaces. The steeper the slope the less permeable the soil, and the heavier the precipitation the greater is this effect.

"In the mountains, the forests, by breaking the violence of rain, retarding the melting of snow, increasing the absorptive

capacity of the soil cover, preventing erosion, and checking surface run-off in general, increase underground seepage, and so tend to maintain a steady flow of water in streams."

SUMMARY OF EFFECTS OF FORESTS UPON STREAM FLOW

"The available observations upon the behavior of streams in this country and abroad have established the following facts:

"The total discharge of large rivers depends upon climate, precipitation, and evaporation. The observed fluctuation in the total amount of water carried by rivers during a long period of years depends upon climatic cycles of wet and dry years.

"The regularity of flow of rivers and streams throughout the year depends upon the storage capacity of the watershed, which feeds the stored water to the streams during the summer through underground seepage and by springs. In winter the rivers are fed directly by precipitation, which reaches them chiefly as surface run-off.

"Among the factors, such as climate and character of the soil, which affect the storage capacity of a watershed, and therefore the regularity of stream flow, the forest plays an important part, especially on impermeable soils. The mean low stages as well as the moderately high stages in the rivers depend upon the extent of forest cover on the watersheds. The forest tends to equalize the flow throughout the year by making the low stages higher and the high stages lower.

"Floods which are produced by exceptional meteorological conditions can not be prevented by forests, but without their mitigating influence the floods are more severe and destructive."

American forests and forest products. Prepared by the FOREST SERVICE. Statistical Bul. No. 21, U. S. Dept. Agr., Washington, D. C., Oct. 1927. Pp. 323; 6 x 9; 220 tables. Price 45c.

"This bulletin is a reference book for all persons interested in American forests and their products. It includes most of the general statistical tables used by the Forest Service, selected with the purpose of giving a broad view of forest conditions in the United States and of the industries dependent upon the forests. Although the information is presented largely from the national viewpoint, the growing need for State forest statistics has been recognized in the introduction of a newly compiled series of State lumber production tables, giving the complete census record for all but four of the States. Lumber production by kinds of wood is also shown for the first time in a series covering 13 of the most important woods.

"Most of the basic figures have been taken from bulletins issued in past years by the Bureau of the Census or the Forest Service or the two bureaus in cooperation. Drafts have also been made upon the records of the Bureau of Foreign and Domestic Commerce, the Bureau of Agricultural Economics, and several other organizations whose work has to do in one way or another with forest industries.

"Most production bulletins do not contain the cumulative record. In order to obtain long-time trends it has been necessary in the past to assemble a considerable number of bulletins, arranged in various ways, and take from them the needed figures. It is often difficult for a person unacquainted with the record to select correct and comparable figures for a considerable period. In the present compilation are provided, under one cover, tables which contain compiled figures covering long periods, some of which can not be had outside of departmental records. An effort has been made to give in each subject as complete an exhibit as possible of the usable Government records as far back as they extend. Statistics expressed in valuation are likely to prove misleading unless careful corrections are applied to compensate for the fluctuations in the value of money. For that reason statistics of quantity have been given preference over those of valuation where both are available.

"In brief, the general plan has been to put the principal existing data into the most convenient form for the use of foresters, economists, national and State officials, and others interested in the trends revealed."

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TROPICAL WOODS

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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, Yale University.*

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SOME INTERESTING TREES OF WESTERN PANAMA

By G. PROCTOR COOPER

Bloodwood Cacique

The name Cacique (meaning Indian Chieftain) is applied to more than one wood of western Panama, but the most highly prized and perhaps the rarest is the one best described by the term Bloodwood Cacique. The wood, as known to the Indians, is not obtained from living trees, but from old trunks which have lain partially buried in the putrescent forest floor until all but a core of heartwood has long since disappeared under the combined attack of insects and decay.[1]

[1] Similarly, much of the early supply of letterwood (a related species) was obtained in the Guianas from old logs, known as "tabukas." See *Timbers of Tropical America*, p. 132.

The Bloodwood Cacique is held in highest esteem by the Indians in Panama. It is believed to have both medicinal and supernatural properties and has been the favorite remedy of the tribal medicine man. A small piece or a chip placed over a wound is said to relieve the pain and quickly stop the bleeding, while if placed behind the ears and secured by a cord, it will overcome pains in the head. The fine chips or shavings are placed in rum, making a bitter drink which is considered an excellent remedy for malarial fevers.

The mountain tribes still believe that bodily ills are in some way connected with evil spirits entering the afflicted person, and the use of Cacique may be considered as a charm against the bad effects of the spirits. The old chiefs used the wood as a symbol of office and authority and it is said they carved out very weird designs from the old logs found half buried in the ground.

It is not easy for a visitor to locate a Bloodwood Cacique tree. Although nearly every inhabitant of the region is familiar with the wood, only occasionally does one meet an Indian who knows the tree and he naturally hesitates to impart this information to a stranger. I found it because I was familiar in advance with its probable appearance. Professor Record had shown me the leaves, twigs, fruit, bark, and wood of the "muirapiranga" (*Brosimum paraense* Huber) from the lower Amazon, which he believed to be much the same as the Panama tree in question, judging from a small fragment of the wood collected by Dr. Alvin G. Cox in Bocas del Toro in 1923. I was able to obtain only sterile botanical material, but it shows a very close resemblance to the Brazilian species. Dr. S. F. Blake, of the U. S. Bureau of Plant Industry, to whom it was submitted for determination, says: "It is *Brosimum* sp., near *Brosimum paraense*, but with different leaves. With little doubt it represents a new species, the description of which must be deferred until flowering material is available."

The tree apparently does not get very large, probably not over a foot in diameter and 40 feet in height. The bark is smooth and has a white latex. The buds are very long-pointed. The thick sapwood is white and sharply demarcated from the heart which is red, with black streaks and a golden luster.

In one of the trees felled there was a central core about an inch and a half thick that was of golden yellow color with streaks of light red. The wood from the old logs on the ground is of a considerably darker color than the fresh material, but retains its satiny luster. It is closely related to the "satiné" of French Guiana.[2]

Guayatil Colorado

This tree, noted for the peculiar color changes in its wood, is found in the typical wet lowland forest on flat, poorly drained land, and also along the banks of streams. In the forest it is straight and slender, about 50 feet high and a foot through, but when growing in the open, as along the creeks, the bole is short and thick, sometimes two feet in diameter, and the crown is spreading. Occasionally the bole divides near the ground, producing several small trunks. It is a common tree in clearings because the Indians leave it standing on account of its supposed medicinal properties.

The leaves are broad and very large, sometimes 30 inches long on new shoots; they have short, stout petioles and are opposite. The flowers, which are in large, compound, terminal cymes, are less than one-half inch long, the tubular greenish corolla notched at the edge into 4 or 5 lobes, the stamens with purple filaments tipped with yellow anthers which later change to reddish brown. The globose fruits, upward of two inches in diameter, have a leathery rind that becomes woody at maturity and splits open from the bottom, liberating the flat, pumpkin-like seeds.

The bark which is smooth except for a few furrows and warts is thick and brittle and contains a deep-red sap. It is used in native medicine as a purgative and, in the form of tea, as a febrifuge. When the tree is first cut the wood is light brown or tan, but in an hour or less the entire surface becomes blood red. If a log is barked and allowed to dry quickly the color will not strike in and when the dry log is sawed the tan color of the interior will remain. If, however, the fresh, unbarked log is left on the ground for some time the wood will

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[2] See *Tropical Woods* 9: 3, March 1, 1927.

become pinkish red, perhaps throughout. The red color bleaches to faint pink or even to yellow under prolonged exposure to strong light.

Guayatil Colorado, which is also known as "jagua de montana," has been identified by Mr. Paul C. Standley as *Genipa Maxonii* Standl., but a study of the wood convinced Professor Record that it was not *Genipa*, but *Sickingia*, a genus not known to occur in Central America. At the latter's suggestion, a successful effort was made to obtain complete botanical material, and from this it has been definitely determined that the so-called *Genipa Maxonii* belongs to the genus *Sickingia* and should be transferred to it. (See page 30.)

Black Manwood

Everyone familiar with Central American timbers has heard of Manwood, but my first attempts to locate the trees served to convince me that the name is rather indiscriminately applied. The identification of the real or so-called Black Manwood as a species of *Minquartia* was made from a study of wood specimens at the Yale laboratory, as stated in *Tropical Woods* 8: 10, Dec. 1, 1926. Only sterile botanical material has so far been collected, and it is not possible at present to determine positively whether the tree is *Minquartia guianensis* Aubl. or an undescribed species.

The tree is found in the hot lowland forests on both the Caribbean and Pacific watersheds, but it grows only on well-drained slopes and not on the low flat ground back of the mangrove. Occasionally it is found on islands where the land rises abruptly from the sea.

The leaves are simple, alternate, with the margins entire, broadly or oblong-oval, 5 to 8 inches long, and abruptly acuminate. The bark is brown, about an eighth of an inch thick, rather stringy or scaly, with fine furrows. There is a slightly milky juice in the twigs and buds, but it is not apparent in the bark when the bole is cut. The tree has low buttresses and the bole is somewhat squared or fluted and twisted, especially at the base. It grows to be 3 feet in diameter and 100 feet tall. The core often is hollowed out by ants, leaving a shell about a foot thick.

On a hill overlooking the upper Río Cricamola is a felled tree over 36 inches in diameter above the buttresses and the bole is over 75 feet long. This tree is on the property of a trader who has been living there for 23 years and when he first settled on the land the tree had already been felled and was greatly aged in appearance. It is quite possible that it has been on the ground for 30 or 40 years, but as yet there are no signs of decay beyond the sapwood surface. It is more likely that the yellow sapwood rots away with age than that it changes to the same color as the heart, but some samples have been observed by the writer in which the color varies.

Black Manwood is highly valued for its durability and strength. It is fairly easy to cut with an axe or machete, but the interlocked grain makes it difficult to split. The texture is very fine and the wood takes a high lustrous polish. The sapwood is from 1 to 2 inches thick and yellow-tan in color, but the heart is a deep chocolate or olive brown.

The tree is called "nispero negro" in Chiriquí. It is found scattered in the vicinity of La Cuesta ("The Hill") where the ground rises to a cliff along the Río Chiriquí Viejo. It is used for ties, posts, and timbers in that province.

In Bocas del Toro the wood has been used for ties, posts, and poles since the United Fruit Company began operations in 1900. The tree is found on the slopes of the Chiriquí Lagoon and also in spots of the Changuinola and Sixaola valleys near the low, bordering hills. It is said to be frequent on a point of the mainland, called "Secretary," which forms one of the projecting arms creating the huge Chiriquí Lagoon. It also occurs up the Cricamola Valley, the big tree at the trader's place being over 25 miles from the bar. The house of Mr. Edward Lange, a German planter and trader, is floored with hand-sawn Manwood planks and the house posts are of the same timber. The Cricamola Indians call the tree "urari" and the Spanish name is "criollo."

As Black Manwood is scattered and difficult to locate in the bush it can never be considered as a commercial possibility. It should find use for walking sticks and special articles of turnery and inlay.

Cativo

For miles along the Caribbean coast of western Panama and of Costa Rica, back of the mangrove fringe and up to the banana and cacao cultivation, lies the "cativale," a belt of land from one to three miles wide and also running back into the lower valleys of some of the larger rivers. It is so called because the forests of these lowlands and valleys are composed mainly of Cativo, *Prioria Copaifera* Gris. (Leguminosae). It is noteworthy that the only other broadleaf tree in Central America occurring in large groves or making up the bulk of any large stand is the "orey," which is also found in Western Panama.[3]

The soil on which Cativo grows so abundantly is rich and fertile bottomland that is overflowed annually or oftener. New silt and sand being continually deposited with the rotting leaves make an excellent seed-bed and germinating medium for the large flat pods. The pods lie flat as they fall, and from the basal end the young root pushes down to the earth, followed soon afterwards by the shoot which begins a rapid upward growth. The pods remain attached to the seedlings for some months unless torn away by water or animals. Sometimes seedlings are found with the old husk suspended two or three inches in the air, probably from a combined abnormal shoot-growth and a washing away of the soil from below. The seedlings are tolerant of shade and form a long taproot and a slender stalk with young leaves at the top only. The tree generally flowers in the spring, and the pods ripen in the late autumn and germinate soon after falling to the ground. Along the rivers the tree may flower at odd seasons. In the open along the San San River I found a tree which was in flower and in fruit in February, the pods being still deeply concave, but about half mature.

The leaves are compound and made up of from 1 to 4 pairs of large, rounded-oval, glossy leaflets 4 or 5 inches long. The large, flat, woody pods, each with a single seed made up of two meaty cotyledons, are in contrast to the long spike-like racemes of small, creamy, slightly fragrant flowers. The fruits

[3] See *Tropical Woods* 12: 6–12, Dec. 5, 1927.

hang down in small clusters from the ends of the upper branches.

Trees of all heights and diameters are found growing together, the bole always being clean and long, the crown confined to the upper third of the tree. The average sizes are from 24 to 36 inches in diameter and 75 to 100 feet in height, but larger specimens are not uncommon. Recently in a clearing of Cativo a stump was found which measured 64 inches in diameter 5 feet above the ground. There are no buttresses or basal swellings on the tree to interfere with low cutting. The bark is smooth or with fine warts and rather thick; it is mottled gray-green on the surface, but reddish brown beneath.

The sapwood, which is very thick, is a light cream or buff color when freshly cut, with fine darker flecks from the vessels and gum ducts; there is a gradual transition to the brownish tan heartwood and an abrupt change to the almost black core. When the sapwood dries out it becomes tan on the surface, but the color below remains unchanged. It has a considerable amount of gum of a deep brown color in the large ducts which makes it difficult to saw. This gum exudes freely when the tree is freshly cut, soon covering the axe or machete. It has a sharp, stinging taste, but attracts bees and insects of all kinds. The old stump soon becomes a veritable "fly-paper," and natives claim that bats and other small animals and birds will often become trapped in the gum. Some natives use the substance medicinally to soothe cuts and bites.

The wood is soft and easy to cut and is not heavy when dry. The grain is somewhat uneven toward the center and when the lumber is planed it "pulls" in long thread-like splinters. The larger splinters are very flexible and will bend double without breaking. When sawed on the tangent surface at the mill it cuts rough and "woolly," the fibers standing out almost half an inch above the surface.

The stand of timber has been variously estimated at from 10,000 to over 100,000 board feet per acre, some trees having 2000 or 3000 feet, log scale. No use is made of the wood at present, not even for firewood, but it seems likely that a detailed study of the properties, with a possibility of removing and recovering the gum, might lead to its adoption as material

for paper pulp. The woolly or stringy character of the grain also suggests its use for excelsior. Certainly there is an ample supply for many years' operation on a moderate scale. In the Estrella Valley in Costa Rica, the stand has been estimated at from 25 to 50 million feet, log scale, and from the Chiriquí Lagoon in Panama to the Costa Rican border there is probably an equal amount. Surely some valuable use can be found for this readily available material.

THE "PALO PRIETO" OF WEST CENTRAL MEXICO

By SAMUEL J. RECORD

A collection of woods recently received from Jesús González Ortega, Mazatlán, Sinaloa, Mexico, contains a specimen of Palo Prieto. This is one of the best known timbers of that region, though the tree was not described until a year ago when Paul C. Standley proposed for it a new genus, *Celaenodendron*[1] (Euphorbiaceae). The type of the genus and the species, *C. mexicanum* Standl., was collected by Mr. Ortega near Mazatlán in 1925, and additional collections are recorded from María Madre Island, Nayarit, and Manzanilla, Colima.

Standley says (*loc. cit.*): "At Mazatlán the tree is called Palo Prieto. Mrs. Ferris states that on María Madre Island it is a large forest tree, common at the summit of the island and along the coast. The bark is smooth and greenish red and breaks off in chips; the sap is slightly aromatic.

"The writer is unable to suggest the relationship of this tree within the family Euphorbiaceae, to which it belongs. It cannot be referred to any genus known from Mexico. Only imperfect material is available, including a single broken staminate flower, and until good flowering specimens have been collected the place of the proposed genus must remain doubtful. It is unsatisfactory to propose a new genus from such imperfect material, but at the same time it is desirable to have some name to which may be referred the five collections cited."

[1] *See* ROXANA STINCHFIELD FERRIS: Preliminary report on the flora of the Tres Marías Islands. *Contr. Dudley Herbarium of Stanford University* (California) 1: 2: 76–77, May 21, 1927.

In a letter accompanying the wood samples sent to Yale, Mr. Ortega states that the Palo Prieto was formerly abundant in the vicinity of Mazatlán and that all the houses are roofed with the wood. The tree is usually from 35 to 50 feet high, sometimes taller, with a thick trunk 20 to 28 inches in diameter. The range does not extend north of the Tropics or beyond an elevation of 200 meters above the sea. The wood, while being worked, gives off a characteristic and agreeable odor.

Mr. Ortega's sample has made possible the identification of a specimen collected in June 1913, by Dr. H. N. Whitford on María Magdalena Island, the middle one of Las Tres Marías group off the coast from San Blas, Nayarit. The following information is compiled from a manuscript copy of his report:

The island is about 10 miles long, five miles in greatest width, and has an area of about 33 square miles. The main drainage is northward from a ridge about 1200 feet above the sea, with some peaks extending to 1500 or 1700 feet. There is a series of coastal hills 100 to 300 feet in height and back of these are wet-weather streams (arroyos) in rather deep and rocky cañons, alternating with long steep ridges which terminate in the main axis. The rainy season is from the first of July to the last of October.

Ninety per cent of the merchantable timber on the island is Palo Prieto, the area covered being approximately 16,500 acres. Some of the associated species are "cedro" (*Cedrela occidentalis* Rose), "guayacán" (*Guaiacum Coulteri* Gray), "arrayán" (*Psidium sartorianum* [Berg] Nied.), "palo amarillo" (*Lonchocarpus sericeus* [Poir.] H. B. K.), "amapa prieta" (*Tabebuia Palmeri* Rose), "mauto" (*Lysiloma divaricata* [Jacq.] Macbr.), "polillo" (*Erythroxylon mexicanum* H. B. K.), "mora" (*Chlorophora tinctoria* [L.] Gaud.), and "tempisque" (*Karwinskia Humboldtiana* [R. & S.] Zucc.

Palo Prieto is one of the few species retaining its leaves in June and as these had turned to a dark red color, affording a sharp contrast with the other vegetation, it was very easy to distinguish the species from a distance and determine its distribution. The tree occupies all types of topography from near sea level to the tops of the highest peaks, except along the beach and for a short distance back from the mouths of the arroyos. It is at its best along the arroyos and on the gentle slopes adjoining them, and secondly on the saddles of the ridges. On the exposed ridges it occurs less frequently and is likely to be short-boled and defective. Only occasional trees were found on the steep slopes and none at all on those facing the south shore. There is a fair stand on the low coastal hills, though the diameters do not exceed 16 or 18 inches.

The form of the bole of Palo Prieto is quite regular, with the older trees having buttresses 2 to 4 feet in height. Trees 12 to 18 inches in diameter sometimes have a straight bole with little taper and a merchantable length of 24 to 30 feet, but more often the merchantable length is less than 20 feet. Trees 20 inches and above nearly always show defects of some kind, and many of the defective trees have sprouts from the base and some all the way up the bole. The largest tree noted was 30 inches in diameter, with a merchantable length of 30 feet.

A strip survey was made along lines crossing all types of topography and the trees were measured on 46 acres. Of a total of 633 trees, the numbers for the different diameters were as follows: 12 to 14 inches (breast high), 288; 15 to 18 inches, 242; 19 to 22 inches, 62; 23 to 26 inches, 36; 27 to 30 inches, 5. The range in number of trees per acre was from 4 to 26; average about 14.

About ten years ago the Bureau of Standards, U. S. Department of Commerce, made a series of tests on two specimens each of 32 common kinds of timber, including Palo Prieto, found in the Mazatlán consular district. The dimensions of the specimens were: for cross-bending, 2 by 2 by 20 inches; for compression, 2 by 2 by 6 inches; for moisture determination, 2 by 2 by ¾ inches. The results for Palo Prieto (Nos. 19a and 19b) are given as follows:[2] Rings per inch, (a) 20, (b) 20; moisture content per cent, (a) 12.07, (b) 12.23; sp. gr. (wt. oven-dry and vol. air-dry), (a) 0.951, (b) 0.95. Weight, lbs. per cu. ft. air-dry: (a) 59.39, (b) 59.33. Static bending (lbs. per sq. in.): fiber stress at elastic limit, (a) 9940, (b) 10,700; modulus of rupture, (a) 18,130, (b) 19,009; modulus of elasticity, (a) 1,814,000, (b) 2,129,000; elastic resilience (lbs. per cu. in.), (a) 3.00, (b) 2.99. Compression parallel to the grain (lbs. per sq. in.): fiber stress at elastic limit, (a) 4820, (b) 4845; modulus of elasticity, (a) 1,574,000 (b) 1,637,000; maximum crushing strength, (a) 8990, (b) 9800. Hardness (load in lbs. required to embed a 0.444-inch ball to one-half its diameter): in end, (a) 2210, (b) 1580; in side, (a) 2080, (b) 1700.

[2] *Report on physical tests of thirty-two species of Mexican hardwoods submitted by the Southern Pacific Railway Company of Mexico through the American consul at Mazatlán, Sinaloa, Mexico.* Manuscript, Bureau of Standards, Washington, D. C. (Results of the tests on twelve species were published in *Mexican West Coast and Lower California. A commercial and industrial survey.* Spl. Agents Ser. No. 220, Bu. For. and Dom. Commerce, Washington, 1923, pp. 183–4.)

The foregoing results compare very favorably with those from similar tests on good grades of northern-grown hickory.

TESTS BY J. G. ORTEGA

		Cargas de ruptura. Kilos por centimetro cuadrado. Min.	Max.	Media
Compresion:				
A lo largo de las fibras				
Cubos de 25 x 25 x 25 mm.	(10)	806.4	870.4	844.9
Prismas de 25 x 25 x 100 mm.	(5)	662.4	787.2	730.4
" de 25 x 25 x 250 mm.	(5)	565.6	648.8	599.3
Transversalmente a las fibras				
Cubos de 25 x 25 x 25 mm.	(10)	348.8	481.6	403.8
Tension:				
A lo largo de las fibras				
Sección de ruptura 1.6 cm.²	(5)	756.3	1578.1	1123.7
Flexion:				
Apoyos libres, carga central, claro 35 cm.				
Prismas de 500 x 25 x 25 mm.	(5)	1329.2	1848.5	1618.2
Esfuerzo cortante:				
A lo largo de las fibras	(10)	91.2	163.3	111.9
Normalmente a las fibras	(15)	266.2	337.9	307.9

Densidad: 0.966

(El numero entre paréntesis indica la cantidad de piesas rotas.)

DESCRIPTION OF THE WOOD

Color dark olive-brown, sometimes with alternating light and dark vertical stripes. Sapwood white, rather sharply defined. Has a waxy appearance and feel. (Bark smooth, grayish-olive, flaking off in irregular patches.)

Hard and heavy; sp. gr. (air-dry) 1.07; weight 66 lbs. per cu. ft.; very tough, strong, and elastic; difficult to split, easy to cut, takes a very smooth natural finish, but is not highly lustrous; apparently durable.

Growth rings fairly distinct under lens. Pores minute; not visible without lens; mostly in short radial rows. Parenchyma terminal, also in very numerous, fine, wavy, tangential lines connecting the pores into an ulmiform pattern distinct under the lens. Rays very fine, not visible to unaided eye on cross and tangential sections, and inconspicuous on radial.

Minute anatomy. Vessel perforations simple; intervascular pits alternate, small, very numerous, with oval borders and lenticular apertures. Rays small, very numerous, with oval borders and lenticular apertures. Rays heterogeneous; 1 or 2 seriate, 1 to 40 cells high; cells small, with thick walls, and abundantly pitted; pits into vessels of same appearance as the intervascular. Chambered parenchyma strands with small crystals of calcium oxalate common. Fibers very small; walls thick, gelatinous; cavities minute; pits indistinct.

Out of representatives of 48 genera of the Euphorbiaceae examined the wood most closely resembling *Celaenodendron* is *Gymnanthes lucida* Sw.

Material: Yale Nos. 2948 (collected by Dr. Whitford on María Magdalena Is.) and 1200 (Mr. Ortega). The former used for determination of specific gravity.

COMPRESSIVE TESTS ON BALSA WOOD

By A. H. Stang, *Engineer*

U. S. Bureau of Standards, Washington, D. C.[1]

Balsa Wood [*Ochroma* spp.] has been used on several occasions to insulate machinery so that the vibration of the machine would not be transmitted to the floor and has apparently proved successful for this purpose. Since few data are available on the compressive properties of Balsa Wood, the United States Bureau of Standards conducted tests to determine how much shortening took place under a uniformly distributed load, how much permanent set remained when the load was removed, and the compression time relations when the Balsa Wood was loaded by dead weights.

Eleven specimens furnished by the Balsa Wood Company, New York City, were used for these tests. Each was 12 by 12 inches and composed of three boards, side by side and dovetailed together. Three specimens were 1 inch thick, five were 2 inches thick, and three were 3 inches thick. Three of them,

[1] Published by permission of the Director, U. S. Bureau of Standards. This paper was presented at the National Meeting of the Wood Industries Division, American Society of Mechanical Engineers, Grand Rapids, Mich., October 17, 1927.

which had been coated with a black paint, apparently a bituminous compound, will be referred to as painted, the others as unpainted.

Nine of the specimens were tested in compression by applying the load to the 12 by 12 inch faces through a large spherical bearing attached to the moving head of the testing machine.

The decrease in the thickness of each specimen under load was measured at the middle of each of the four sides by dial micrometers which were graduated in thousandths of an inch. An initial load of 10 lbs. per sq. in. was applied, then the load was increased by increments of 10 lbs. per sq. in. until the proportional limit had been exceeded. After each increment, the load was decreased to the initial load. The deformations of the specimen were read at each load. The set due to a given load was taken as the difference between the readings at the initial load after the given load and the first readings taken at this initial load.

Properties of Balsa Wood Specimens

Specimen No.	Condition	Thickness *Inches*	Weight *Lbs. per cu. ft.*	Proportional limit *Lbs. per sq. in.*	Modulus of elasticity *Lbs. per sq. in.*
1–A	unpainted	1	7.76	85	2,550
1–B	"	1	7.53	70	2,400
1–C	painted	1	8.40	75	1,650
2–A	unpainted	2	7.90	65	4,200
2–B	"	2	7.68	95	3,900
2–C	painted	2	7.93	50	3,600
3–A	unpainted	3	5.06	36	3,500
3–B	"	3	5.14	45	2,500
3–C	painted	3	5.67	48	2,000

At low loads the proportionality between the stress and the shortening of these specimens was remarkably close. It was, therefore, possible to find fairly definite values for the proportional limit from the stress-strain curves. For stresses

higher than the proportional limit, the compression increased more rapidly than the load and, consequently, the load increments were increased and the tests were continued until the final thickness was about one-half of the original thickness. The proportional limits and moduli of elasticity together with the weights of the specimens are given in the table.

The specimens 3 inches thick were composed of pieces which contained the heart of the tree. They had lower density and lower proportional limits than the 1-inch and 2-inch specimens, which did not contain heartwood. The painted specimens had lower values for the modulus of elasticity and also a higher density than those that were unpainted.

No specimen was perfectly elastic. The set after each application of load was in every case a very appreciable part of the deformation under load and amounted, roughly, to one-half of this deformation up to the proportional limit. At higher loads the set became appreciably larger.

As with specimens of other materials having a large area compared to thickness, the Balsa Wood did not appear to have a definite maximum compressive strength. The load continued to increase as the thickness decreased.

Results of the tests on these nine specimens seemed to indicate that the density of the wood was an important factor in the strength properties of the material. In the use of Balsa Wood under heavy machinery, the different supports should have the same properties in order to preserve the level of the machine. With this point in view, two other specimens, 2–D and 2–E, were prepared, each 2 inches thick, and consisting of three boards joined together to make the 12 by 12 inch surface. The parts were selected so that both specimens had the same weight, viz. 9.76 lbs. per cu. ft.

Each specimen was for a week subjected to a dead load of 15,000 lbs. applied to the 12 by 12 inch face, thus producing a compressive stress of 104 lbs. per sq. in. Vertical compressometers, mounted at the center of each of the four sides of the specimen, indicated the shortening produced by the load. The readings show that the rate of compression was practically identical for both specimens and was about the same on the seventh day as it was on the third.

With material of this kind used for the support and insulation of heavy machinery, that is, under a constant load, it is probable that a stress about equal to the proportional limit could be safely used. Careful selection, based on uniform density of relatively heavy Balsa Wood blocks, appears to be well worth while for this purpose.

TESTS ON SIX ARGENTINE WOODS

By ARTHUR KOEHLER, *Wood Technologist*

U. S. Forest Products Laboratory, Madison, Wis.

In December 1926, a half-dozen small logs from Argentina were received at the Forest Products Laboratory for test. A sample cut from each log was sent to Professor Record of Yale University, who identified the woods as follows:

Common Name	*Scientific Name*	*Family*
Roble	*Torresia cearensis* Fr. Allem.	Leguminosae
Cedro	*Cedrela fissilis* Vell.	Meliaceae
Cebil colorado	*Piptadenia macrocarpa* Benth.	Leguminosae
Cebil moro	*Piptadenia communis* Benth.	Leguminosae
Palo blanco	*Calycophyllum multiflorum* Gris.	Rubiaceae
Palo amarillo	*Phyllostylon brasiliensis* Cap.	Ulmaceae

The logs, which were cut in July, arrived in Madison in a practically green condition.

Since the cost of thorough mechanical and physical tests of each species would have been high, and since the Forest Products Laboratory had no appropriation for such work, it was decided to limit the tests to those that could be made without much expense. Consequently determinations were made only on specific gravity, shrinkage, and seasoning qualities. Flitches cut from the logs were sent to a furniture company in Grand Rapids, for their opinion on the suitability of the woods for face veneers.

From each log two plain-sawed boards 1⅛ inches and 2¼ inches thick, respectively, and two quarter-sawed boards of the same thicknesses were cut. Shrinkage specimens were taken from both the plain-sawed and the quarter-sawed boards.

RESULTS OF TESTS AND EXPERIMENTS

Specific Gravity and Shrinkage

The following table gives the specific gravity and the shrinkage from the green to the oven-dry condition of several samples from each log. Inasmuch as each species is represented by specimens from only a single tree, these values cannot be considered as representative of the species; they are only a fair indication of the properties of the particular pieces of wood received for test.

SPECIFIC GRAVITY AND SHRINKAGE OF CERTAIN ARGENTINE WOODS

Species	Specific gravity at oven-dry weight and green volume	Shrinkage in per cent of green dimension		
		Volumetric	Radial	Tangential
Roble	0.49	6.4	2.6	5.7
Cedro	.36	11.0	4.1	5.6
Cebil colorado	.76	12.3	4.0	7.7
Cebil moro	.82	12.2	4.0	7.4
Palo blanco	.71	11.2	4.0	6.8
Palo amarillo	.74	12.3	3.4	7.0

Kiln Drying

Four boards of each species, two plain-sawed respectively 1⅛ inches and 2¼ inches in thickness, each about 4 feet long, and two quarter-sawed boards of about the same dimensions were dried in a kiln with 1-inch black walnut. The primary object of the kiln run was to demonstrate the drying of black walnut; consequently the kiln conditions were controlled particularly for black walnut rather than for the Argentine woods. Nevertheless the run showed what effect a moderate drying schedule has on these woods.

The initial and final drying conditions of the run, which continued for 22 days, were 121° F. and 80 per cent relative humidity, and 146° F. and 45 per cent relative humidity, respectively. At the end of the run the lumber was given a 22-hour conditioning treatment at 170° F. and 70 per cent relative humidity.

After the moisture contents of all pieces had been determined, stress sections were cut from the 1⅛-inch flat-sawed boards. The roble, cedro, and palo amarillo were practically free from stress and the three other species were rather severely stressed.

A negligible amount of cupping and checking occurred during kiln drying.

In view of the results obtained, the species dried do not appear to offer any unusual drying difficulties.

Veneering

No particular difficulty was encountered by the furniture company either in cutting veneer from the flitches or in laying it.

Among the panels finished, cebil colorado had an especially attractive appearance, on account of the wood being figured with irregularly-spaced dark streaks. Although the cebil moro has a similar structure, only two dark streaks showed in its panel; hence its figure was less attractive.

The veneered panels of roble and cedro had a noticeable growth-ring figure in the tangentially-cut parts of the veneer, which was sliced in this case. It is probable that a rotary-cut veneer would give a very pleasing figure. Although cedro (a species of Spanish cedar) is relatively soft, it undoubtedly could be used for face veneers in articles of furniture or of joinery that are not exposed to rough use.

The panel of palo blanco had a slightly wavy grain, but not enough to give it an attractive figure. The color of the wood was a plain yellowish brown, which was not attractive.

No veneer panels were made of palo amarillo.

GENERAL REMARKS

Roble (*Torresia cearensis* Fr. Allem.).—The samples tested averaged moderately heavy in weight, and were in approximately the same weight class as our native black walnut, red maple, western larch, and shortleaf pine.

The heartwood is golden brown in color with an olive-green tinge.

The grain is slightly interlocked, giving the wood a tendency to warp if not carefully dried.

Zonate layers, probably representing annual rings of growth, are marked by slightly darker bands which, however, are not sharply defined, although defined enough to give a figure to plain-sawed surfaces.

The pores are barely visible to the unaided eye. In the heartwood they contain a light cherry-red gum. They are surrounded by a layer of parenchyma cells conspicuous under a lens. The rays are hardly distinct without a lens.

This wood may be suitable for a variety of purposes that do not require a high degree of strength and need merely moderate hardness. Its medium density would make it desirable, from a production standpoint, in manufacturing plants.

Cedro (*Cedrela fissilis* Vell.).—This is one of the species of Spanish cedar, several of which are used largely in the manufacture of cigar boxes. It can readily be recognized by its fragrant odor. Probably its use can be developed in the form of veneered panels, although pieces from which oil exudes may offer difficulty in finishing.

The wood is light to moderately light in weight and ranks in this respect with our native species butternut, cottonwood, and yellow poplar.

The heartwood is plain reddish brown in color. The grain is straight and therefore the wood does not give the various types of figure found in mahogany, which belongs to the same family.

The pores are somewhat larger at the beginning of each year's growth, thereby making the annual rings distinct. Hence the wood has a conspicuous growth-ring figure when plain-sawed or when cut into veneer by the rotary process.

On a cross section the larger pores can readily be seen with the naked eye but the smaller ones are distinguishable with difficulty. The pores are partly filled with dark brown gum. The rays are barely visible on the cross section.

Cebil colorado (*Piptadenia macrocarpa* Benth.).—The wood of this species is hard and heavy, ranking in this respect above the hickories and equal to Osage orange. The heartwood is light reddish brown when fresh but soon changes

to a beef color on exposure to light. Dark streaks of coloring matter are irregularly distributed through the heartwood.

The grain is very much interlocked, which may cause trouble in warping unless the lumber is carefully seasoned.

The evenly distributed pores are scarcely visible without a lens. They are partly filled with dark amber-colored gum. Fine tangential lines of parenchyma occur at intervals as if delimiting seasonal growth.

Although this wood has an attractive figure, its hardness is a handicap to its extensive use for furniture and trim and in service requiring similar properties.

Cebil moro (*Piptadenia communis* Benth.).—This species of wood, which is even heavier than cebil colorado, is comparable with southern live oak in density.

Its structure and color are very much like that of cebil colorado except that its dark-colored streaks are less numerous. This, however, may be only an individual variation, one not necessarily holding for the species in general.

Palo blanco (*Calycophyllum multiflorum* Gris.).—In density this species ranks above hickory and dogwood. The wide sapwood is a pale and dingy yellowish brown in color, and the heartwood is light olive brown.

The wood has an exceedingly fine and uniform texture, which together with its great hardness and straight grain should make it an excellent material for certain exacting purposes such as rules, shuttles, shoe lasts, flooring, wood pulleys, and some of the other purposes for which boxwood is used. It belongs to the same botanical genus as the degame lancewood, which is used for shafts, spokes, and fishing rods, and in other service requiring a wood with a high degree of toughness. It should be tried out for each specific use, however, before definite recommendations are made.

The minute pores appear empty under a lens. On the cross section the rays are invisible without a lens.

Palo amarillo (*Phyllostylon brasiliensis* Cap.).—This wood resembles palo blanco considerably, although it is slightly heavier and has moderately interlocked grain. The wood is bright yellowish brown in color, resembling boxwood. The

sapwood grades into the heartwood without perceptible change in color.

The minute pores are evenly distributed and many of them contain a whitish deposit. (See *Tropical Woods* 12: 23.)

This species resembles boxwood even more closely than does palo blanco and consequently may be suitable for all the uses mentioned for the latter species, although the interlocked grain may cause warping in thin flat strips. Professor Record[1] says, "The wood is unsuited for engraving, and its principal use is for weavers' shuttles, though it is also employed to some extent for rulers and for piano keys."

TYPES OF FOREST GROWTH IN BRITISH HONDURAS

By Duncan Stevenson

Deputy Conservator of Forests

The forests of British Honduras are estimated to cover 87 per cent of the total area of the Colony which, including cayes, amounts to 8598 square miles. The forest growth may be divided into the following main classes: (1) Mangrove forests; (2) Savannah forests; (3) Pine forests; (4) Primary rain forests; (5) Secondary rain forests.

Mangrove Forests

The Mangrove forests occur in brackish water fringing the mainland and island coasts, certain inland lakes and swamps, and the river banks as far as the tidal limits. The species which make up the mangrove flora include *Rhizophora Mangle* L. (Red Mangrove), *Laguncularia racemosa* Gaertn. (White Mangrove), *Avicennia nitida* Jacq. (Black Mangrove), *Conocarpus erecta* L. (Buttonwood), *Chrysobalanus Icaco* L. (Coco-plum), *Pterocarpus belizensis* Standl. (Kaway), *Pachira macrocarpa* Walp. (Provision-tree), *Hibiscus tiliaceus* L. (Blue Moho), and *Bucida Buceras* L. (Bullet-tree). The man-

[1] *Timbers of Tropical America*, pp. 116–117.

groves do not grow to any great size except in the case of *Avicennia nitida* which may attain 80 feet in height and 7 feet in girth.

Savannah Forests

Wet Savannah.—The majority of the wet savannahs occur behind the mangrove belts, on the sites of previous lagoons and ponds which have become shallow pan areas, or on low lying tracts left by now definite river courses. The soil of the wet savannahs is usually a marly clay. The rushes and tall grass with sporadic clumps of *Chamaerops tomentosa* (Palmetto) are subject to inundation during the rains and to burning over during the short dry season. The stunted tree species which manage to survive in such situations include *Crescentia Cujete* L. (Calabash) and *Cameraria belizensis* Standl. (White Poisonwood).

Dry Savannah.—Alternating with the wet savannahs, on belts of good drainage, the dry savannahs occupy shallow arenaceous soils overlying a hard pan. These coarse grassy belts are subject to annual fires which have totally destroyed any original pine growth or have prevented its ingress. The type derives its park-like aspect from the dotted clumps of hardwoods, the chief species of which are included as the associates of pine in the pine forests.

Pine Forests

The colonization of dry savannahs by Pine (*Pinus caribæa* Mor.), has given rise to extensive forests of that species, occurring as isolated well-demarcated zones, separated by belts of rain forest inhabiting the deeper and richer soils. These pine forests are distributed (1) in the northern plains on alluvial sands and soils derived from the disintegration of flints and cherts; (2) along the southern coastal plain and cliffs on sandy soils produced from the upper carboniferous hill formations and siliceous springs; (3) on the Mountain Pine Ridge of 120 square miles at an average altitude of 2000 feet where the granites and siliceous slates are capped with sand. Other small pine belts occur on out-croppings of quartzite and porphory in the mountains and also on quartz detritus formed

at the base of the mountains where the northern river system impinges on the plain. Annual fires in the pine forests have reduced them, in many places, to little more than savannah country and at the same time the ingress of hardwoods on suitable soils has been retarded. Stunted tree associates of pine include *Byrsonima crassifolia* (L.) DC. (Craboo), *Curatella americana* L. (Yaha), *Quercus* spp. (Oak), and *Chrysobalanus Icaco* L. (Coco-plum).

The undergrowth consists of coarse grass, and amongst other plants are *Mimosa albida* H. &. B., *Helicteres guazumaefolia* H. B. K., *Icacorea compressa* (H. B. K.) Standl., *Russelia verticillata* H. B. K., *Hyptis lappacea* Benth., *Calliandra Houstoniana* (Mill.) Standl., and *Cassia flexuosa* L.

Primary Rain Forests

Swamp Forest.—The normal succession from wet savannah is to swamp forest, locally called by the Maya Indian name "Acaché." This type is mainly confined to the northern plains where it occurs in belts behind the raised banks of sluggish streams and skirting the pine forests. The tree growth is stunted and dense, and may be considered as an edaphic climax on account of the clay pan formation below and the water-logged nature of the soil during the greater part of the year. *Haematoxylon campechianum* L. (Logwood) occurs extensively and in gregarious stands as a colonizing agent on the sites of former rush ponds where the soil is calcareous. Typical species in the swamp forests include *Achras Zapota* L. (Sapodilla), *Swietenia macrophylla* King (Mahogany), *Metopium Brownei* (Jacq.) Urb. (Black Poisonwood), *Acacia Cookii* Safford (Cockspur), *Mouriria parvifolia* Benth. (Cacho Venado), *Chamaerops tomentosa* Fulch. (Palmetto), and *Bactris horrida* Oerst. (Pokenoboy).

Intermediate Forest.—This type constitutes the transition stage between pine forest and advanced rain forest, and between swamp forest and advanced rain forest. "Broken Ridge" is the term used locally for the early stages of the type in which "ridge" implies "belt" and has no connection with elevation. The soil has medium to good drainage, is of a clayey nature and supports a dense forest growth of commercial importance. The presence of *Sabal excelsa* Morris (Botan Palm) and *Acanthothrinax* sp. (Give-and-take Palm) are indicative of the type. Of the following species which obtain in the intermediate forests, some survive in the advanced forests: *Swietenia macrophylla* King (Mahogany), *Calophyllum Calaba* Jacq. (Santa Maria), *Bursera gummifera* Jacq. (Gombolimbo), *Metopium Brownei* (Jacq.) Urb. (Black Poisonwood), *Achras Zapota* L. (Sapodilla), *Vochysia hondurensis* Sprague (Yemeri), *Lucuma belizensis* Standl. (Silly Young), *Mosquitoxylum jamaicense* K. & U. (Redwood), *Zanthoxylum Kellermanii* P. Wils. (Prickly Yellow), *Cordia dodecandra* DC. (Ziricote), *Pimenta officinalis* Lindl. (Allspice), *Gliricidia sepium* (Jacq.) Steud. (Madre Cacao), *Gymnanthes lucida* Sw. (Lignum-vitae), *Andira inermis* H. B. K. (Cabbage Bark), *Sweetia panamensis* Benth. (Billy Webb), *Krugiodendron ferreum* (Vahl) Urban (Axemaster), *Terminalia obovata* (R. & P.) Eichl. (Nargusta), *Symphonia globulifera* L. f. (Waika Chewstick), *Simaruba glauca* DC. (Negrito), *Chrysophyllum Caimito* L. (Wild Star-apple), and *Xylopia frutescens* Aubl. (Polewood). The distribution of *Dalbergia Stevensonii* Standl. (Honduras Rosewood) is limited to the Toledo beds in the south of the Colony, and *Metopium Brownei*, *Krugiodendron ferreum*, and *Achras Zapota* are all confined to calcareous soils.

Advanced Forest.—This type might be called a climax as far as this term is applicable to tropical forests, in that they rarely, if ever, attain a state of equilibrium in respect to all of their constituent species. The forest growth is one of the most luxuriant in the world and is characterized by the prevalence of *Attalea Cohune* Morris (Cohune Palm) to a more or less marked degree. The so-called "Cohune" belts of the primary rain forests occupy the rich fertile soils of stream-alluvial and granitic basins. Common trees include *Ficus* spp. (Figs), *Terminalia* spp. (Nargusta), *Virola merendonis* Pittier (Banak), *Calocarpum mammosum* (L.) Pierre (Mamee Apple), *Cordia alliodora* (R. & P.) Cham. (Salmwood), *Enterolobium cyclocarpum* (Swartz) Gris. (Tubroos), *Ceiba pentandra* (L.) Gaertn. (Cotton-tree), *Tecoma pentaphylla* A. Juss. (Mayflower), *Dialium divaricatum* Vahl (Ironwood), *Calophyllum*

Calaba Jacq. (Santa Maria), *Mouriria* spp. (Jug), and *Achras Chicle* Pittier (Chicle Macho). *Swietenia macrophylla* King (Mahogany) has its lowest stock per acre in the advanced forest, and natural regeneration is so retarded by the dense shade that the species is gradually disappearing from many areas.

Mountain Forest.—The mountain area has received little attention on account of its inaccessibility. The knife-edged ranges above the limit of the Cohune Palm (2000 feet) support a luxuriant growth of palms, of which *Oreodoxa oleracea* (Mountain Cabbage) is the chief. Whilst occurring on the detritus at the foot of the mountains, *Podocarpus coriaceus* Rich. (Cypress) attains its best development at altitudes above 3000 feet along with *Quercus corrugata* Hook. (Oak), *Liquidambar Styraciflua* L. (Liquidambar), and *Calophyllum Calaba* Jacq. (Santa Maria).

Secondary Rain Forests

On the marls of the North, on a portion of the Toledo beds of the South, and on the accumulations of richer soil on the hill limestone of the South and West, the original primary advanced forest has now given place to secondary forest as a result of the cultivation of these areas during the ancient Maya civilization. The process of re-introduction of mahogany and its associates into the second-growth forest is somewhat obscure. It is surmised that the reconstitution of the forest crop took place, as far as the cultivation in the valleys of the hill limestone is concerned, by seeding from trees on the inaccessible ridges; the seeding up on the plains was no doubt from areas of swamp forest which were not suitable for cultivation. Typical species of the early stages of second growth, as evidenced by the modern shifting cultivation of Maya Indians on the same localities, include *Ochroma bicolor* Rowlee (Polak), *Belotia Campbellii* Sprague (White Moho), *Heliocarpus Donnell-Smithii* Rose (Yellow Moho), *Schizolobium parahybum* (Vell.) Blake (Quam), *Cecropia* sp. (Trumpet), *Cordia alliodora* (R. & P.) Cham. (Salmwood), *Guazuma ulmifolia* Lam. (Bay Cedar), *Miconia* spp. (Maya), *Inga* spp., and *Ceiba pentandra* (L.) Gaertn. (Cotton-tree).

These are in the nature of transition species and do not persist long, only isolated stems being met with in the later stages of the secondary rain forest. These later stages approximate to the primary advanced forest type and the majority of species are similar in both types. *Cedrela mexicana* Roem. (Cedar) occurs scattered in primary forest, but attains greater distribution in the second growth. *Brosimum alicastrum* Swartz (Breadnut) is a typical tree of the secondary forest, but grows only on calcareous soils.

TREES OF SANTA INÉS, GUATEMALA

By Samuel J. Record

During the latter part of January 1927, the writer and Mr. Henry Kuylen were the guests of Mr. Carlos Gallusser, Jr., at Finca Santa Inés. Mr. Gallusser's home is situated at an elevation of about 1700 feet and commands a wonderful view of the Río Motagua valley. The region is hilly and ranges in elevation from over 2000 feet to about 300 feet at the Santa Inés railway station. Bananas are grown near the river, coffee and maize at higher elevations, and there are great areas of open pasture land and of forests.

Three general types of country are recognized: (1) the "loma"—ridge tops with a scanty growth of timber, mostly oaks; (2) the "montaña"—the damp hillsides and valleys, heavily timbered with much the same kind of tree growth as that found in the lower part of the Motagua valley; (3) the "llano"—the dry, rolling or flat land with scanty and usually bushy tree growth.

There are many species of trees in the forest, but the kinds used locally are comparatively few. One of the most prized for general carpentry is the Spanish cedar or "cedro," of which there are said to be two kinds, alike in outward appearance, but different in wood, one being firm and mahogany-like, the other soft and inclined to shred in sawing. Mahogany or "caoba" is fairly common and the lumber is used for furniture, interior trim, and to some extent for general construction. Hard, figured wood is called "caracolillo."

The extensive buildings on the finca are constructed entirely of local timber, mostly whip-sawn, although the owner now operates a small sawmill near the railway station. The wide piazza is floored with planks of mahogany, not because of the beauty of the wood, but on account of its durability and resistance to the elements. Considerable pine or "pino" is used for framing and siding, but it must be protected from the weather and away from the ground; the lumber is lighter and less resinous than that of the lowlands, though apparently of the same species. Furniture and fittings are mostly of local construction and the woods used are mahogany, "matilisquate," "irayol de loma," "granadillo," "palo obero," and "hormigo." Spanish cedar is used for drawers and the lining of closets and presses.

"Matilisquate" is the wood known as "amapa" in Mexico and recently introduced into the west coast trade of the United States for interior trim and flooring. (See *Tropical Woods* 8: 8–9, Dec. 1, 1926.) "Irayol de loma" is a fine-textured, lustrous, yellowish white wood, having the appearance of old ivory. "Granadillo" is a kind of rosewood, beautifully variegated and fragrantly scented. "Palo obero" is the red-and-black wood well-known throughout Central America because of its coloring, good cabinet qualities, and strength.

There are two kinds of oak wood, "encino negro" and "encino blanco," one very hard and with a thin sapwood and a blackish heartwood, the other less dense, with a thick sapwood and brownish heart; the trees are said to be indistinguishable. Similarly there are two kinds of "laurel," but efforts to find a tree of "laurel negro" were unsuccessful; it may be that the differences in the wood are due to the age of the trees or to peculiarities of growth. There are two kinds of cockspur, "ixcanal" or "cacho de toro," one with white heartwood, the other with red. Three kinds of "guamo" are recognized; these trees make good shade for coffee and cacao. "Masico dulce" is said to have soft, white wood and sweet, edible fruit, while the "masico agrio" has hard, reddish wood and sour fruit. Of the rubber trees, the latex of the "ule de lagrino" runs freely, while that of the "ule de chorro" is sluggish and curdles. The fruit of "anona de montaña" is small and not edible, while that of "anona cincuya" is large, with edible yellow flesh, and prominent, pointed lobes; there is a local saying that there is "a fever for every point."

Among the timbers for special uses may be mentioned: the "morro," with its stout, crooked limbs useful for saddle trees; "chaperno," "chichipate," "cortés negro," and "tamarindo" for heavy, durable construction; "nispero" for axe handles. "Madre cacao" and "pito" are used for live fence posts; "encino negro" for gate posts. The latex of "chapupo" furnishes a kind of chewing gum.

The appended list of the trees is not complete. It is based upon collections made at the time of the writer's visit, supplemented by information and later collections from Mr. Gallusser. For further descriptions of the trees and woods the reader is referred to previous issues of this journal, particularly No. 7, pp. 10–29, No. 10, pp. 10–47, and No. 11, pp. 10–18.

CHECK LIST OF THE COMMON NAMES

Achotillo	*Vismia ferruginea* H. B. K.	Guttiferae
Aguacatillo (?)	*Hernandia guianensis* Aubl.	Hernandiaceae
Aguachivero	?	?
Almendro	*Andira inermis* H. B. K.	Leguminosae
Amate	*Ficus glabrata* H. B. K.	Moraceae
Anona cincuya	*Anona* sp.	Anonaceae
Anona de montaña	*Anona purpurea* M. & S.	Anonaceae
Cachimbo	*Platymiscium* sp.	Leguminosae
Cacho de toro	*Acacia* sp.	Leguminosae
Cajeto	*Ochroma* sp.	Bombacaceae
Camaco	*Parathesis serrulata* (Sw.) Mez	Myrsinaceae
Caoba	*Swietenia macrophylla* King	Meliaceae
Capulamate	*Ficus padifolia* H. B. K.	Moraceae
Capulín	*Muntingia Calabura* L.	Elæocarpaceae
Carboncillo	*Cupania guatemalensis* Radlk.	Sapindaceae
Caulote	*Guazuma ulmifolia* Lam.	Sterculiaceae
Cedrillo	*Virola merendonis* Pittier	Myristicaceae
Cedro	*Cedrela mexicana* Roem.	Meliaceae
Ceiba	*Ceiba pentandra* Gaertn.	Bombacaceae
Ceibillo	*Zanthoxylum Kellermanii* P. Wils.	Rutaceae
Cerel; cerelillo	*Inga leptoloba* Schl.	Leguminosae
Chaperno	*Lonchocarpus hondurensis* Benth.	Leguminosae
Chapupo	*Tabernaemontana citrifolia* L.	Apocynaceae
Chichipate	*Sweetia panamensis* Benth.	Leguminosae
Clavito	*Hamelia erecta* Jacq.	Rubiaceae

Cojón	*Tabernaemontana citrifolia* L.	Apocynaceae
Cojón de venado	*Saprantbus nicaraguensis* (Seem.) Standl.	Anonaceae
Cola de pava	*Cupania guatemalensis* Radlk.	Sapindaceae
Copalillo	*Eupatorium daleoides* (DC.) Hemsl.	Compositae
Corozo	*Attalea Cobune* Morris	Palmaceae
Cortés negro	*Tecoma Palmeri* (Rose)	Bignoniaceae
Coyolillo	*Matayba glaberrima* Radlk.	Sapindaceae
Cutujume	*Lippia myriocephala* S. & C.	Verbenaceae
Drago	*Virola merendonis* Pittier	Myristicaceae
Encino negro	*Quercus oleoides* C. & S.	Fagaceae
Frijol de mico	*Pithecolobium sophorocarpum* Benth.	Leguminosae
Fruta de chacha	*Callicarpa acuminata* H. B. K.	Verbenaceae
Granadillo	*Dalbergia cubilquitzensis* (D. Sm.) Pittier	Leguminosae
Guachipilín	*Diphysa robinioides* Benth.	Leguminosae
Guarumo	*Cecropia* spp.	Moraceae
Guayabo bolador	*Terminalia obovata* (R. & P.) Eichl.	Combretaceae
Guiscoyol	*Bactris* sp.	Palmaceae
Hormigo	*Platymiscium polystachium* Benth.	Leguminosae
Irayol de loma	*Genipa americana* var. *Caruto* (H. B. K.) Schum.	Rubiaceae
Irayol de montaña	*Coccoloba Tuerckheimii* D. Sm.	Polygonaceae
Ixcanal	*Acacia* sp.	Leguminosae
Izote de montaña	*Dracaena americana* D. Sm.	Liliaceae
Jocote jobo	*Spondias lutea* L.	Anacardiaceae
Lagarto	*Zanthoxylum Kellermanii* P. Wils.	Rutaceae
Lancitillo	*Chamaedora* sp.	Palmaceae
Lanillo	*Ochroma* sp.	Bombacaceae
Laurel blanco	*Cordia alliodora* (R. & P.) Cham.	Borraginaceae
Laurel negro	*Cordia* sp.	Borraginaceae
Limoncillo	*Trichilia havanensis* Jacq.	Meliaceae
Madre cacao	*Gliricidia sepium* (Jacq.) Steud.	Leguminosae
Madroño	*Calycophyllum candidissimum* (Vahl) DC.	Rubiaceae
Magaleto	*Xylopia frutescens* Aubl.	Anonaceae
Manaca	*Attalea Cobune* Morris	Palmaceae
Mancuernillo	*Tabernaemontana* sp.	Apocynaceae
Masico	*Brosimum* spp.	Moraceae
Matapalo	*Ficus padifolia* H. B. K.	Moraceae
Matasano de mico	*Diospyros ebenaster* Retz	Ebenaceae
Matilisquate	*Tecoma pentaphylla* Hemsl.	Bignoniaceae
Mecate blanco	*Heliocarpus Donnell-Smithii* Rose	Tiliaceae
Mecate colorado	*Belotia Campbellii* Sprague	Tiliaceae
Morro	*Crescentia Cujete* L.	Bignoniaceae
Mozote	*Heliocarpus glanduliferus* Rob.	Tiliaceae

Muñeco	*Bombax ellipticum* H. B. K.	Bombacaceae
Nispero	*Achras Chicle* Pittier	Sapotaceae
Ocote	*Pinus caribæa* Mor.	Pinaceae
Palo chino; p. jiote	*Bursera gummifera* Jacq.	Burseraceae
Palo obero	*Astronium Conzattii* Blake	Anacardiaceae
Pino	*Pinus caribæa* Mor.	Pinaceae
Pito	*Erythrina rubrinervia* H. B. K.	Leguminosae
Plumajillo	*Schizolobium parahybum* (Vell.) Blake	Leguminosae
Pumpunjuche	*Pachira aquatica* Walp.	Bombacaceae
Salamo	*Calycophyllum candidissimum* (Vahl) DC.	Rubiaceae
Sangre	*Virola merendonis* Pittier	Myristicaceae
San Juán	*Vochysia guatemalensis* D. Sm.	Vochysiaceae
Santa María	*Calophyllum Calaba* Jacq.	Guttiferae
Sapote	*Calocarpum mammosum* (L.) Pierre	Sapotaceae
Sapotón	*Swietenia macrophylla* King	Meliaceae
Sirín	*Miconia* sp.	Melastomaceae
Sirinón	*Miconia argentea* (Sw.) DC.	Melastomaceae
Tamarindo	*Dialium divaricatum* Vahl	Leguminosae
Tambor	*Ochroma* sp.	Bombacaceae
Tapaculo	*Guazuma ulmifolia* Lam.	Sterculiaceae
Taxixte	*Zexmenia frutescens* (Mill.) Blake	Compositae
Tinta	*Solanum nudum* H. B. K.	Solanaceae
Tontol	?	Anacardiaceae
Ule de charro; u. de lagrimo	*Castilla* spp.	Moraceae
Upay	*Cordia diversifolia* Pav.	Borraginaceae
Yaje	*Lysiloma* sp.	Leguminosae
Zapotón	*Pachira aquatica* Aubl.	Bombacaceae

Notes on Trinidad Trees

The trees of the Lauraceae here go by the common name of "laurier," with a distinguishing word hyphenated to it.

Astronium obliquum Gris. is a large timber tree of the forest here, known locally as "yoke." One of its characteristics is its unusually thick bark.

"Moussara" is the local name for *Brosimum alicastrum* Sw., the wood of which is made into handles by our country people for the indispensable cutlass. They assert that it is tough, durable, and will not split.—W. E. Broadway, *Port-of-Spain, Trinidad.*

SICKINGIA MAXONII

By PAUL C. STANDLEY

In 1918 I published a new species, *Genipa Maxonii*, based upon material collected along the Río Indio de Gatún, Canal Zone, by William R. Maxon. The tree attracted interest because of the fact that its wood assumed a bright pink color upon exposure to the air.

The type material of the new species consisted of fruiting branches only, but it did not occur to the writer, at the time of publication, that there could be any doubt as to its generic position. The same tree has been collected several times in recent years along the Atlantic coast of Panama and Costa Rica, and Professor Record, after examination of the wood, has suggested that it agreed rather with that of the genus *Sickingia*, a group unknown, until very recently, in Central America. In February of the present year Mr. G. Proctor Cooper collected in Panama excellent flowering and fruiting material of *Genipa Maxonii*, which is known there as "guayatil colorado." Examination of the flowers shows conclusively that the tree belongs to the genus *Sickingia*. Its synonymy is given below.

Sickingia Maxonii Standl.

Genipa Maxonii Standl. Journ. Washington Acad. Sci. 8: 642. 1918.

The "Longotra" of Madagascar—a Correction

In the article, The "Longotra" of Madagascar Classified (*Tropical Woods* 13: 1–2), the name of one of the newly described species of *Cryptocarya* was incorrectly given as *C. Loiselii*. It should have been *Cryptocarya Louvelii* P. Dang.[1] This species is based on Louvel's specimens of a tree known as "longotra mena." *Cryptocarya Perrieri* P. Dang. is based on two collections, one from Thouvenot of a tree called "longotra fotsy," the other, labeled "longotra mena," from Perrier de la Bathie.

[1] DANGUY, PAUL: Deux *Cryptocarya* nouveaux de Madagascar. *Bull. Mus. d'Hist. Nat.* (Paris) 1927, pp. 523–4.

THE USE OF BALSA WOOD IN THE REPRODUCTION OF TONE FREQUENCIES

By HUBERT G. GARMAN, *Radio Engineer*

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Much experimental and development work has been done in recent years on loudspeakers—devices for the conversion of electrical frequencies to the corresponding frequency of sound waves, musical and tonal frequencies—so essential to radios and electrical phonographs.

These devices consist of two main components: (1) the driving unit, which derives its power from electrical impulses supplied from the instrument to which it is connected; (2) the diaphragm, which, when vibrated or moved by the driving unit, will set up a sound wave by moving the column of air resting against its surface. A large number of driving units of conventional design are on the market, and the selection of one which is efficient is a fairly simple matter, but it is to the diaphragm that we owe the tonal quality of the instrument.

The essential requirements of a diaphragm capable of carrying a large volume of sound with efficiency are: (1) sufficient surface area; (2) lightness; (3) freedom from harmonics; (4) sufficient mechanical strength to prevent collapse. The commercial tendency has been to use pressed paper or fiber, made into the shape of a cone to obtain the necessary rigidity, but a diaphragm of this nature is deficient in that it has no natural acoustic properties and is replete with harmonics or with frequencies at which it will actuate more readily than at others.

In the search for material ideal for the construction of large diaphragms it is natural that wood should be considered, but on account of the weight of ordinary woods, and the consequent amount of energy required for vibration, their use for this purpose has been more or less neglected. The tropical Balsa Wood (*Ochroma* spp.), however, is extremely light and, as a result of considerable experimentation with it, the writer is convinced of the fitness of this material for diaphragm construction. It has natural acoustic or tonal qualities and is free from the tendency to overemphasize any particular

frequency. The latter property is apparently due to the slightly pithy nature and peculiar structure of the wood.

A diaphragm 20 ins. by 36 ins. by 3/32 in., driven by a unit of good quality, will give excellent and pleasing results. It will respond very readily and with remarkable fidelity to all the useful tone frequencies and will cover from 40 to 6000 cycles per second without apparent distortion and with an even characteristic.

The constructional details of this diaphragm, as made by the writer, are as follows: Three Balsa Wood boards, 7 ins. by 36 ins. by 3/32 in., are firmly cemented into a hardwood frame, which has been recessed to receive them. The boards do not touch each other, the middle one being separated from the other two by a space of 1/16 in. between the edges. Across these three boards are fastened edgewise, with strong but somewhat flexible cement, 8 strips of Balsa Wood, ¾ in. by 3/32 in., radiating from a point located in the middle of the center board and 14 inches from one end and 22 inches from the other, and extending to within about 2 inches of the frame. Two of these strips are vertical, two horizontal, and the other four run diagonally toward the corners. Over the axis of these strips is cemented a piece of cedar, an inch square and one-fourth inch thick, to hold the chuck for the stylus of the driving unit. The reason for placing the driving unit nearer one end of the frame than the other is that it tends to dampen or suppress harmonics.

It is the writer's opinion that the construction of diaphragms affords good opportunities for the utilization of Balsa Wood on a commercial scale.

Note on "Morabukea"

"Morabukea" is a timber tree of the Guianas which has recently been described as *Dimorphandra Gonggrijpi* Kleinhoote in honor of Mr. J. W. Gonggrijp, formerly Forestry Officer of Surinam. Mr. B. R. Wood, Conservator of Forests of British Guiana, in a letter to the editor, gives an account

of a valuation survey over a tract of previously unexplored forest situated away from the rivers, but offering no difficulties to railroad logging. The stand over considerable areas consists almost wholly of greenheart and Morabukea, about 7,000 feet B. M. per acre each. The nearest port where ships can load is about eight miles.

Mr. Wood believes that Morabukea will prove the equal of mora, if not its superior, and cites an instance where a log remained sound after lying in the forest for 26 years. The timber is practically unknown, except to the aboriginal Indians, who prefer it to mora, claiming that it splits less and is fully as strong and durable.

Note on the Peruvian Mahogany

As long ago as 1878 Alphonse De Candolle (*Monog. Phan.* 1: 723) recorded *Swietenia Mahagoni* ("*Mahogani*") from Peru, on the basis of specimens in the Berlin Herbarium collected many years before near Pozuzo by Ruiz. In 1926 leaf specimens collected by Mr. Georges H. Barrel, President of the Aguna Mahogany & Timber Company of Boston, on the Río Itaya, Peru, some 50 miles from its confluence with the Río Amazonas, were communicated by Professor Record to the writer and identified tentatively as *Swietenia macrophylla* King (*Tropical Woods* 6: 1, June 1926). This identification is now confirmed by the receipt of a nearly complete pod containing seeds, with portions of another, collected at Nancy, Río Amazonas, Peru, for Professor Record under direction of Mr. Barrel. This specimen, together with a foliage specimen collected previously by Mr. Barrel, is preserved in the Economic Herbarium of the United States Department of Agriculture.[1] De Candolle's record undoubtedly belongs to the same species.—S. F. Blake, *Bureau of Plant Industry, Washington, D. C.*

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[1] There are duplicates in the Yale collections and the herbarium of the Field Museum of Natural History, Chicago.—S. J. R.

TIMBER EXPORTS OF BRAZIL

AMOUNTS AND VALUES OF THE DIFFERENT KINDS OF TIMBERS

Kinds of Timber	1924		1925		1926	
	Tons	Value £	Tons	Value £	Tons	Value £
Acapú	559	3,658	62	399	44	311
Andiroba	2,623	15,207	2,440	21,385	727	4,294
Baguassú	1,460	8,739	640	3,916	284	2,049
Cedro	14,045	103,037	12,042	90,413	5,087	43,998
Freijó	2,214	14,053	2,414	13,169	2,836	16,226
Gonçalo Alves	50	293	71	676	149	1,158
Guajuvira	307	1,848	212	1,429	495	3,469
Imbuia	216	1,688	953	8,639	532	4,111
Itauba	138	896	2,794	16,116	2,527	14,114
Jacarandá	2,776	27,073	2,602	27,056	2,763	32,675
Lapacho	140	783	116	714	93	565
Louro vermelho	479	3,067	288	1,070	43	220
Macacahuba	2,083	12,815	1,093	6,393	740	4,641
Marupá	477	2,850	110	541	....	....
Massaranduba	1,247	9,635	1,346	7,284	460	2,323
Páo amarello	180	1,144	812	5,042	107	809
Páo brasil	262	1,924	51	394	21	168
Páo roxo	76	462	29	163	11	77
Peroba	213	1,831	82	594	129	1,070
Páo rosa	....	....	26	541	....	....
Pinho	112,907	479,818	95,844	453,250	79,939	435,445
Sebastião de arruda	458	2,160	469	2,108	199	1,100
Sucupira	388	2,465	790	4,353	862	6,070
Miscellaneous	5,170	26,879	7,003	38,606	8,440	43,567
Timber, prepared	1,604	9,485	983	7,713	802	7,433
Totals	150,072	731,910	133,272	711,964	107,292	625,893

EXPLANATION.—One ton equals 1000 kilograms. The values are F. O. B. Equivalent of a pound sterling in American dollars: 1924, $4.44; 1925, $4.74; 1926, $4.77. Authority: *Commercio exterior do Brasil*, Directoria de Estatistica Commercial, Rio de Janeiro, 1927.

TIMBER EXPORTS OF BRAZIL

Countries of Destination	1924	1925	1926
Germany	1,350	1,517	329
Argentina	105,771	92,893	79,007
Belgium	549	184	27
United States	8,642	5,834	4,416
France	1,975	1,319	705
Great Britain	1,667	1,084	707
Spain	744	1,602	300
Paraguay	....	375	2,411
Portugal	7,253	7,614	6,397
Uruguay	21,664	19,843	12,641
Miscellaneous	456	1,027	351
Total, Tons	150,072	133,293	107,292

CHECK LIST OF THE COMMON NAMES

Acapú	*Vouacapoua americana* Aubl.	Leguminosae
Andiroba	*Carapa guianensis* Aubl.	Meliaceae
Baguassú	?	?
Cedro	*Cedrela fissilis* Vell.	Meliaceae
Freijó	*Cordia Goeldiana* Huber	Borraginaceae
Gonçalo Alves	*Astronium fraxinifolium* Schott	Anacardiaceae
Guajuvira	*Patagonula americana* L.	Borraginaceae
Imbuia	*Nectandra* sp.	Lauraceae
Jacarandá	*Dalbergia nigra* Fr. Allem.	Leguminosae
Lapacho	*Tecoma* sp.	Bignoniaceae
Louro vermelho	*Nectandra* sp. or *Ocotea* sp.	Lauraceae
Macacahuba	*Platymiscium Ulei* Harms	Leguminosae
Marupá	*Simaruba amara* Aubl.	Simarubaceae
Massaranduba	*Mimusops amazonica* Huber	Sapotaceae
Páo brasil	*Caesalpinia echinata* Lam.	Leguminosae
Páo rosa	*Aniba parviflora* (Meissn.) Mez	Lauraceae
Páo roxo	*Peltogyne densiflora* Spruce	Leguminosae
Peroba	*Aspidosperma polyneuron* Muell. Arg.	Apocynaceae
Pinho	*Araucaria brasiliana* Lamb.	Araucariaceae
Sebastião de arruda	?	Leguminosae
Sucupira	*Bowdichia nitida* Spruce	Leguminosae

NOTE.—The scientific names in the above list have been supplied by the editor and in several instances are meant to be typical rather than specific.

U. S. A. TRADE IN MAHOGANY, CEDAR, AND PHILIPPINE WOODS

(From Department of Commerce Reports)

In M Feet, Board Measure, for Calendar Years

IMPORTS OF MAHOGANY LOGS INTO THE UNITED STATES

Sources	1923	1924	1925	1926	1927
United Kingdom	4,696	1,837	1,668	2,420	1,130
Central America	23,630	20,887	35,161	31,967	41,470
Mexico	4,265	7,372	8,391	5,244	6,005
Africa	10,453	19,483	24,090	26,650	22,340
Other countries	7,870	4,218	3,053	2,150	1,833
Totals	50,914	53,797	72,363	68,431	72,828

EXPORTS OF MAHOGANY LUMBER FROM UNITED STATES

All countries	....	15,842	19,002	17,955	17,043

IMPORTS OF SPANISH CEDAR INTO THE UNITED STATES

All sources	12,574	6,773	9,469	5,577	4,231

IMPORTS OF PHILIPPINE LOGS AND LUMBER INTO THE UNITED STATES

Logs	608	1,780	2,108	2,043	7,418
Lumber	7,731	16,562	25,097	26,347	32,931
Totals	8,339	18,342	27,205	28,390	40,349

CURRENT LITERATURE

Luquillo: Our tropical national forest. By WILLIAM P. KRAMER. *American Forests and Forest Life* 34: 410: 81–83, Feb. 1928. Illustrated.

"The Luquillo National Forest was created in 1903 by President Roosevelt. By his proclamation all the lands formerly belonging to the Spanish Crown, and lying within the Sierra de Luquillo range, were reserved as a National Forest. Little interest was manifested in this tropical forest until 1917, when a Forest Examiner was sent to the island in charge of this district. Since that year effective protection against trespass and unauthorized uses has been maintained and a comprehensive program of development has been worked out. To date thirty-four miles of foot and bridle trails have been constructed, and when the entire system is completed every part of the forest will be accessible. A good road from Mameyes to the boundary of the forest is now being constructed, and another year will see tourists and interested sight-seers motoring to the forest and viewing the delightful vistas that the region affords.

"The Luquillo forest, nearly 12,000 acres in area, extends along the crests and upper slopes of the Luquillo range, and contains the roughest and most inaccessible part of the eastern end of the island. It embodies the largest portion of virgin forest land of the pre-Columbian period to be found in Porto Rico. It is entirely of a tropical hardwood aspect, with a large variety of tree species. Some of the most important and more valuable timber trees of the island here attain splendid proportions and would yield considerable returns if properly exploited. However, because of the prevailing heavy rainfall, averaging more than 135 inches each year, the exceedingly rugged topography and the valuable agricultural lands surrounding it, this forest finds its chief importance as a protection forest, notwithstanding that it contains in the aggregate a large amount of commercially valuable timber. The forest affords protection to the many streams that have their sources within its boundaries and is of inestimable value in the prevention of destructive soil-erosion. If, for any pur-

pose whatever, this protective forest cover were removed, the thin soil covering would eventually wash away, leaving only the bare rocks. Thereafter, whenever a rain occurred the streams would rush through the lower valleys and coastal plains with great violence and in many cases would damage or completely destroy the valuable agricultural land. It can, therefore, be seen that our tropical National Forest is not of commercial value solely, but renders its greatest benefit to the people of Porto Rico through its value as a forest cover exerting direct influence upon soil and streamflow."

Preliminary report on the flora of the Tres Marías Islands. By Roxana Stinchfield Ferris. *Contr. Dudley Herbarium of Stanford University* 1: 2, May 21, 1927. Pp. 81; 4 plates. Price $1.00.

The collections made on the Tres Marías Islands, which form the subject of this paper, are the first made there during the rainy or growing season. Of the 185 species obtained, 135 have not been recorded previously from the islands, and several are new to science. The new trees are *Zanthoxylum Ferrisiae* Standl., *Esenbeckia nesiotica* Standl., *Gymnanthes insulata* Ferris, *Celaenodendron mexicanum* Standl., and *Matayba spondioides* Standl.

Guayacan: *Guaiacum Coulteri* A. Gray y *Guaiacum Palmeri* Vail. By Jesús González Ortega. *México Forestal* 5: 11–12: 139–141, Nov.–Dec. 1927.

The description applies particularly to *Guaiacum Coulteri* A. Gray, but *G. Palmeri* Vail exhibits only slight differences. The tree attains a height of 25 to 35 feet and a diameter of 16 to 28 inches. The bark is smooth, about one-eighth inch thick, gray with patches of white, exfoliating in plates varying from half an inch to two inches in diameter.

It occurs throughout the State of Sinaloa at elevations from near sea level to 325 feet and all along the Pacific Coast from Sonora to Oaxaca. Growth is slow, the diameter increasing at the rate of about 4 inches per decade.

The sapwood is yellowish white, the heartwood dark greenish. The heartwood is obtained in pieces 12 inches square and about 11 feet long. It is employed for the manufacture of pulleys and bearings and is highly esteemed for fuel. Splints of it are used for tapers. The tree is recommended for planting for ornamental purposes on account of its dainty foliage which is retained nearly the whole year and also because of its attractive and profuse flowering which continues two or three months.

The article includes a botanical description of the tree and results of mechanical tests on the wood.

The botanical identity of cascara amarga. By Oliver A. Farwell. *The American Druggist*, (Reprint) Feb. 1928.

"The honor of discovering 'cascara amarga' belongs to Dr. Henry Froehling, now of Richmond, Virginia. He traveled in Mexico from 1877 to 1880, inclusive, where he used this drug in the treatment of syphilis and scrofula with good success. During this time he sent small samples of the bark from time to time to Baltimore, Md., urging physicians there to try it out."

The first published account of its use was by Dr. A. Atkinson (*Therapeutic Gazette* 2: 1–3, Jan. 1881). Fluid extract of the drug was made available to physicians in 1881, by Parke, Davis & Company, and it was in their chemical laboratory two years later that F. A. Thompson discovered an alkaloid in the bark. The imperfect botanical material was identified at the U. S. Department of Agriculture as an unknown species of *Picramnia* (Simarubaceae) and Thompson named the alkaloid "picramnine" (*Therapeutic Gazette* 5: 8–9, Jan. 1884).

Fertile botanical specimens have only recently been obtained of the tree which is the source of cascara amarga, and these have been identified by the author as *Sweetia panamensis* Benth. (Leguminosae). This determination has been confirmed by Dr. F. V. Coville, U. S. Department of Agriculture. This tree is known in Mexico as "huesito" and "huesillo," in British Honduras as "Billy Webb," and in most of Central America as "chichipate."

Silvicultural treatment of mahogany forests in British Honduras. By NEIL S. STEVENSON. *Empire Forestry Journal* 6: 2: 219–227, 1927. Illustrated.

An interesting and constructive account of the various problems involved in the regeneration of mahogany (*Swietenia macrophylla* King) by the "taungya" and shelterwood systems. In the former method advantage is taken of shifting cultivation, "virtually the only form of agriculture, if such it can be called, practiced in the Colony on any extensive scale."

"As the mahogany seedling in the first few months of its existence is distinctly intolerant of strong light, the practice will probably be to dibble in a year after the plantation of the catch-crop, so that some measure of protection will be afforded by the development of the second growth. A small experiment in which pure stands of polak (*Ochroma bicolor* Rowlee) and quam (*Schizolobium parahybum* [Vell.] Blake) about 12 months old, were used for shelter may be quoted. It was found that seed dibbled under the quam failed, but seed thrown into an open seed bed produced a high percentage of germination. Seedlings were transplanted under the quam, and now a year later an excellent and rapid height growth is being made and the plants have not been attacked by any insect pest. The catch crop so far employed has been maize, and the value of this product has been found sufficient to cover at least the cost of clearing. The drawback of the method is the demand involved on an inadequate labor supply in clearing the sites for plantation, and for this reason, if for no other, the 'shelterwood' system . . . will probably remain the standard method of regeneration for a long time to come."

In the shelterwood system the first stage of the operation, known as "tree improvement," consists in removing lianas from desirable species and girdling or felling interfering trees of inferior species. In localities well stocked with mahogany trees, particularly in the north of the Colony, work is concentrated on tree improvement, but further south where the trees are fewer, special attention must be given to the reproduction brought about by the openings made in the forest canopy. "The [seedling] improvement work is done in two

stages; in the daily 'task' the mahogany seedlings are first located, marked by a stake, and then freed from the undergrowth, then the laborers work back over the same area, cutting and girdling the larger stems until the task is completed. The stakes used are of hard wood, about 4–8 ft. long and 2 ins. in diameter, and are 'planted' about 3 ft. away from the seedling; inserted nearer they were found to provide a means of access to the seedling by the always active growth of small creepers. . . .

"The general impression given immediately after improvement is of a forest rather than of raw 'bush,' and is strikingly different from the result of the original improvements, where the seedling improvement consisted simply in clearing round each seedling in a cylinder, at first of 6 ft. in height and 6 ft. radius. It was found that this early method produced inadequate response in the seedlings and the intensity of the cleanings was gradually increased. The ever-present fear of undue exposure of the young seedlings to insolation, insect attack, and drought delayed the establishment of the present relatively drastic technique. The condition produced by the latter will, it is hoped, allow for the more rapid growth of the seedling, while the shelterwood of valuable species will both afford enough shade to prevent insolation and produce seed for the regeneration of potentially valuable species in the second growth below.

"The improved bush may have to be treated once or twice again after the first cleaning until a sufficient stock per acre has been obtained, and the function of these re-improvements will be to free established seedlings from creepers and from the re-growth that has already appeared, and to discover new seedlings. Once an adequate stock of seedlings has been established the improvement will become more specialized, and the associated re-growth will be encouraged except where it is actually suppressing the mahogany saplings. In the latter case their crowns will be freed from interference by cutting only the tops of the 'huamil' growth."

"Sufficient data are not yet available as to the time and expenditure required to bring the young crop of mahogany to a stage at which intensive tending can be discontinued.

Much depends on the density of the crop aimed at. In favorable conditions the method described is certainly capable of producing a pure crop of mahogany, but, more particularly in view of the risk of severe insect attack, it seems desirable to retain a considerable admixture of secondary species. As to cost, the high stumpage value of mahogany even in its present scattered occurrence, and its much higher prospective value in closer stands allowing of intensive methods of exploitation, promise a wide margin of profit on the cost of establishing the crop."

Flora of the Panama Canal Zone. By PAUL C. STANDLEY. *Contr. U. S. National Herbarium* (Washington), Vol. 27, Jan. 31, 1928. Pp. 416; 6 x 9½; 67 full-page half-tone plates, 7 text figures. Price (Govt. Printing Office) 75c.

"The work is an annotated list of the flowering plants of the Isthmus of Panama. Although formal detailed descriptions of individual species are not given, keys are provided which will be helpful, as an aid to identification, to those having a technical knowledge of botanical science. In the case of the more important plants, those likely to prove of the greatest interest to the general public, more extensive notes are given which will assist in the recognition of such species. With the aid of the many English and Spanish common names, it should not be difficult for the casual visitor to identify most of the important plants of the Canal Zone.

"The flowering plants of the region number about 2,000 species. Among the plants of the Canal Zone are most of the common wide-spread species of the Central American lowlands. Besides the native plants, the keys include also the cultivated plants, which are represented in the Canal Zone by the majority of the species grown anywhere in Central America. Since there are treated in this work so many of the well-known plants, not only of Central America, but also of the West Indies, northern South America, and even of Mexico, the publication will provide a useful source of information regarding the conspicuous plants of those regions also."—From preface by FREDERICK V. COVILLE.

"It would be highly desirable to list all the plants known from the Republic of Panama, and such a report was contemplated when the Smithsonian Biological Survey of the Canal Zone was organized. Panama is still imperfectly known botanically. Little collecting has been done in eastern Panama, and the high mountains of the west, culminating in the rich Chiriquí region, are practically unexplored. Nearly all of the species known from Chiriquí are distinct from those of the lowlands of the Isthmus, and to have included those now known from that region would have increased greatly the volume of the present work. Many of the collections from remote parts of Panama remain to be studied, and among them there are many undescribed species whose publication may better await the revisional work necessary for the consideration of the flora of Central America as a whole. It, therefore, seems wiser to defer publication of a flora of all Panama." (Page 5.)

"The relationship of the flora of the Isthmus is undoubtedly very close to that of other parts of Central America, hence the botanist familiar with even a country so distant as Guatemala will find little that is strange to him. The importance of the Isthmus of Panama as a barrier between the floras of North and South America has been greatly exaggerated, for its comparative unimportance becomes every day more apparent as exploration continues in Colombia and Central America. The montane flora of Costa Rica, for example, evidently is closely related to that of Colombia and Ecuador. If the species are not identical—as is often the case—their genera are the same. Field work during the past few years in eastern Panama has discovered South American genera unknown north of the Isthmus, and there are many Central American genera which have not yet been found south of the canal. But the ranges of genera and species must end somewhere, and a similar record could be established for Nicaragua or Honduras.

"Recent work in Guatemala and British Honduras has demonstrated the existence there of several genera or even species otherwise unknown north of the Guianas, and in Costa Rica have been found South American plants not yet

reported from Panama. Detailed exploration along the neglected Atlantic coast will reveal a closer affinity between the flora of the Guianas and that of Central America than is now conceded. . . . In tropical America we have the same condition that still exists to a great extent in the United States: The flora has been studied from isolated centers, with little regard for the species accepted at other centers, but with the assumption that each area is floristically distinct. Correlation through monographic work, covering a group throughout its range, will reduce the species that have been multiplied unnecessarily. Such critical monographic work is scarcely practicable in the preparation of a flora of a limited region." (Pp. 30–32.)—From introduction by the author.

Arboles y arbustos del orden de las Leguminosas. I. Mimosaceas. By H. PITTIER. Reprinted from *Boletin del Ministerio de Relationes Exteriores* (Caracas) 10, 11, 12; Oct., Nov., Dec. 1927. Pp. 82; 6¼ x 9¼.

This is No. 1 of *Contribuciones a la dendrologia de Venezuela*. It contains botanical descriptions of the species of the 19 genera of Mimosaceae known to occur in Venezuela, together with keys to their identification, lists of vernacular names, and notes on miscellaneous subjects. Following is a list of the genera, the numerals in parentheses referring to the number of species described: *Pentaclethra* (1), *Parkia* (1), *Acacia* (9), *Inga* (24), *Lysiloma* (1), *Pithecolobium* (13), *Zygia* (4), *Calliandra* (21), *Enterolobium* (1), *Albizzia* (2), *Cathormium* (2), *Abarema* (2), *Samanea* (9), *Mimosa* (26), *Leucaena* (2), *Prosopis* (1), *Adenanthera* (1), *Piptadenia* (7), and *Entada* (2). The genus *Zygia* Browne = *Pithecolobium*, sect. *Caulanthon* Benth.; *Cathormium* Hassk. = *Pithecolobium*, sect. *Chloroleucon* Benth.; *Abarema* = *Pithecolobium*, sect. *Abaremotemo* (Benth.).

Oleos vegetaes Brasileiros (inclusive resinas, gommas, breus, ceras). 2nd edition. By EURICO TEIXEIRA DA FONSECA. Rio de Janeiro, 1927. Pp. 341; 6 x 9.

A valuable compilation of data and references on the vegetable oils, resins, gums, tars, and waxes of present or potential importance in Brazil. The information given includes sources, uses, chemical analyses, comparisons with other products, and exports.

Annual report of the Director of Forestry of the Philippine Islands for the fiscal year ended December 31, 1926. By FLORENCIO TAMESIS. Manila, 1927. Pp. 292; 6 x 9.

"The amount [of timber and lumber] shipped this year is considerably higher than that of last year, the figures being 62,709,600 board feet valued at 5,098,452 pesos as compared with 52,216,872 board feet values at 4,227,815 pesos in 1925, or an increase of about 20 per cent over that of the previous year. . . .

"The Japanese market has also learned to appreciate Philippine woods and the activities shown of late by certain powerful Japanese financial interests indicate that there is a fast growing demand in Japan for Philippine major forest products. In 1923 our export to the Japanese Empire amounted to about 300,000 board feet only. In 1926, however, our export to that country amounted to 12,000,000 board feet. The Japanese Empire has been importing from America recently at the rate of about 500,000,000 board feet a year, consisting mostly of Western red cedar and Douglas fir. Our apitong, tangile, and the lauans compare very favorably with these American woods and the prices of the American products do not differ very much from the prices of the Philippine products. Under the circumstances, there is reason to hope that as the Japanese wood consumers will learn to appreciate the superior qualities of Philippine woods, Philippine lumber will supplant a big portion of the amount now shipped to Japan from the United States Pacific coast. The Chinese market, another of our big markets, is so uncertain because of the civil strife now existing in that country; but China has always been one of our biggest customers and when peace finally prevails in that country, the amount of 12,000,000 board feet which was exported to China this year will most likely be increased several times over.

"While on the one hand Philippine trade with the United

States, Japan, and China shows bright prospects, lumber export to Great Britain, Australia and other British possessions, on the other, seems to decline. In fact, the trade with these countries in 1926 was considerably less than that of the previous year. The reason for this may be attributed mainly to the fact that the lumber industry for Borneo is being developed and the Bornean lumber is supplanting Philippine lumber in the markets under British control. Recent agitation in Australia for heavier import duty on imported lumber may also have something to do with the decline of that market. . . .

"Our import of lumber and timber in 1926 amounted to 4,425,712 board feet valued at 306,569 pesos. About 97 per cent of this, consisting principally of Douglas fir, came from the United States." (Pp. 95–96.)

"Data on the durability of untreated woods exposed to the weather and in contact with the ground are now available for the more common species and only the less known ones need to be tested. Additional information is needed on the comparative durability of wood exposed to different classes of marine wood borers. A wood which is durable in contact with the ground and exposed to the weather does not necessarily mean that it is also resistant to marine wood borers. Molave and ipil, which are considered very durable woods, fail in a relatively short time when exposed to the attacks of marine wood borers. . . .

"Most woods which fail in a relatively short time when exposed to the weather last longer and, in fact, are very rarely attacked by insects when used for interior work. Guijo, tangile, and apitong, which are not durable when exposed to the weather, will last for a very long time if properly used for interior work. Woods like pahutan, the various members of the family Burseraceae (kamingi, pagsahingin), members of the family Myristicaceae (duguan, tambalau), bakauan and pototan, while hard and heavy enough, fail in a relatively short time, even if employed in interior work, as they are subject to the attack of house termites (*Cryptotermes* and *Planocryptotermes*)." (P. 109.)

Commercial timber trees of the Malay Peninsula. By F. W. FOXWORTHY. Malayan Forest Records No. 3. Singapore, 1927. Pp. 195; 7 x 10½; 137 half-tone plates; 1 large map in colors. Price $5 or 12s.

This splendid volume,—with its carefully written descriptions supplemented by excellent photographs showing for about 70 species the appearance of the tree in the forest, the flowering or fruiting twigs, and close views of the bark and blaze,—meets the needs for a manual which can be used by forest officers and others in identifying the more important trees of the Malay Peninsula. "The work has been restricted, almost entirely, to those forms which are considered as commercial timber trees, or which are so conspicuous in appearance as to command attention in the forest, and the descriptive matter has been condensed and presented in a uniform manner."

There is an introduction which gives in a few pages a very clear picture of the country and the composition of the forest. This is followed by a key for use in identifying the trees in the forest which emphasizes the appearance and nature of the outer and inner bark and of the wood exposed by a blaze, and certain readily observable leaf characters such as size and arrangement. The individual tree descriptions follow a definite order: (1) The most generally recognized common name and the scientific name. (2) Other commonly used vernacular names. (3) Distribution, including abundance and manner of distribution. (4) Description: habit (including form and size); bark (in detail); leaves (non-technical descriptions); flower and fruit; seedling. (5) Products (general information). (6) Silviculture: deciduous habit and leaf-fall; flowering and fruiting; rate of growth; representation of size classes; reproduction. (7) Other forms likely to be confused with the form described.

The Malay Peninsula is about 700 miles long and its greatest breadth is about 200 miles. Nearly all of that portion of it south of 6° N., about 52,500 square miles, is under British influence, while the portion to the north, comprising about 20,000 square miles, is Siamese. The commercial trees in the two portions are for the most part the same.

"There are about 2,500 known species of trees in the Malay Peninsula. This is, perhaps, more than are recorded from all of British India and Burma. It is doubtful if we have yet learned as much as 75 per cent of our species. It is certain that we have many more tree species than are found in India or in Burma, or in the tropical portions of the two countries. The multiplication of species of woody plants is very marked, in the wet tropics, as the equator is neared, and ours is a nearly equatorial location and climate. It is not unusual to find in the Malay Peninsula single acres of forest which carry more than 100 species of trees. Much the largest part of these are trees of small size and do not have any present economic value."

"Although the number of tree species is so great, the proportion of species which are of economic importance is small. Most of the earlier writers who dealt with tropical forests strongly emphasized the extreme complexity, and it was only within the present generation that studies by foresters showed that, in spite of the great number of species, the greatest part of the volume of timber produced comes from but a few, often closely related, forms.

"Our forests are most closely related to those of the Netherlands Indies, Borneo, and the Philippines. Detailed studies in Borneo and the Philippines have shown that the forests in those countries have from 60 to 90 per cent of their volume produced by trees of one family, the Dipterocarpaceae. The indications are, from such studies as have been made in the Malay Peninsula, that our forests have about 60 per cent of their volume of timber in this group."

On page 10 is a table which gives a summary of the measurements of all of the trees 12 inches or more in diameter on 3,642.8 acres of forest in various parts of the States of Perak, Selangor, Negri Sembilan, and Pahang, and which "may be considered as fairly representative of the composition of average good forest in the Peninsula. . . .

"As will be seen from the table, our forests show a yield [2,085 cu. ft. per acre] considerably below the best yields of coniferous, and even below the best yields of mixed hardwood, forests of temperate regions. They are, however, considerably better than the average of mixed hardwood forests in temperate regions and contain more large trees. Many of our forests are overmature and are producing far less than they theoretically should. There is a much more complete canopy and use of light than is usually found in temperate climate forests. It is not known whether the possible production of wood per acre is greater than in temperate climates, but it is believed to be so. Our studies of growth need to go much further than they have thus far gone to prove or disprove this.

"It is possible to separate out a few types within our high forests, but most of these are not very sharply marked. The most distinct type is the Kapur forest, where the one species, *Dryobalanops aromatica* Gaertn. f., makes up a very large part (sometimes nearly 90 per cent) of the volume production. Even in the best Kapur forest, however, other species are also represented. In places towards the edge of the natural Kapur areas, the forest is more and more mixed and Kapur plays a less and less prominent part until finally it fades out. True Kapur forest is found only on the slopes and tops of ridges and it sometimes thrives on a limestone formation."

The anatomy of New Zealand woods. Part I: Laboratory technique. By C. S. Barker. *Te Kura Ngahere* (Christchurch, N. Z.) 2: 1: 10–15, Dec. 1926.

"The aim of the project is primarily to obtain an authentic system of wood identification; but further than this it includes a study of the whole basic structure of our native woods with a view to obtaining definite information regarding their anatomy—the types, arrangement, proportion and relative size of the component cells. These factors have a very distinct bearing on the possible use of the various woods for purposes such as wood pulp, the designing of saws, etc., and also have much to do with the ease or otherwise with which the woods may be seasoned or artificially impregnated against decay.

"In presenting the results of this study it has been thought advisable to commence right from the very beginning of the project, and explain in some detail the whole of the technique which has been evolved for preparing the woods for microscopic study."

Western Australia. Report on the operations of the Forests Department for the year ended 30th June, 1927. By S. L. KESSELL. Perth, 1927. Pp. 46; 8¼ x 13; 1 map.

"The total production of sawn and hewn timber for the year was 21,377,317 cubic feet, having an estimated value of £2,780,000. Of this total 8,797,055 cubic feet were used locally and the remainder, valued at £1,659,876, was exported, the largest buyers being the Eastern States of Australia. . . . The value of timber imported, principally softwood, was £162,193. . . . The quantity of sandalwood exported was 6,820 tons, valued at £199,700. . . . The value of tanning materials imported was £8,970, and £15,820 worth of mallet bark was exported."

"Research work has been continued, and a considerable advance made in our knowledge of air and kiln seasoning of local hardwood. Fluarising, the recently patented process for the preservative treatment of Karri, has proved satisfactory in practice in a large scale commercial plant. A new method for the treatment of Marri trees to give a greatly increased yield of kino has been evolved.

"Silvicultural research has resulted in a considerable advance being made in our knowledge of the factors governing natural regeneration of local species. The tracing of difficulties associated with the establishment of new pine nurseries to a missing soil organism may be regarded as a discovery of far-reaching importance. It appears that, without the aid of a mycorrhizal fungus, young pine seedlings of many species cannot be raised satisfactorily, and soil infection of new nursery sites is now carried out systematically with excellent results."

Les forêts du Maroc. *Revue Botanique Appliquée et Agriculture Coloniale* 72–73; 588–592, Aug.–Sept. 1927.

According to the Director of Forests of Morocco, the forested areas, comprising about five million acres, are divisible into four general types: (1) cork oak forests (*Quercus Suber* L.) along the coastal plains and plateaus; (2) cedar (*Cedrus atlantica* Man.) and holm oak (*Quercus Ilex* L.) forests of the Moyen-Atlas region; (3) forests of cedar, Aleppo pine (*Pinus halepensis* Mill.), thuya (*Tetraclinis articulata* [Vahl] Masters), holm oak, cypress (*Cupressus sempervirens* L.) and juniper (*Juniperus*) in the Grand Atlas region; (4) the southern forests, composed mostly of arganier or ironwood (*Argania Sideroxylon* R. & S.) with some mixture of thuya and sumac (*Rhus*), while further south there are good stands of gum-bearing acacia (*Acacia gummifera* Willd.).

***Tectona grandis* in the Gold Coast.** By J. R. P. GENT. *Empire Forestry Journal* 6: 2: 292–293, 1927.

The author located and measured six small plantations of teak, 11 to 18 years of age, in the Gold Coast Colony, South Ashanti, and South Togoland and found that the growth compares favorably with that of Indian plantation teak. In contrast to the prevailing opinion that teak will not grow to timber size in the Gold Coast, the author is convinced that the species "has done quite as well as it could possibly have been expected by its first introducers, and there is nothing at all to indicate that it will not continue as it has begun."

A visit to the Belgian Congo. By J. BURTT DAVY. *Journal of the Oxford University Forest Society* (1st ser.), 8: 28–34, 1928. Illustrated.

A report of a lecture dealing with a botanical trip to the Katanga Province of the Belgian Congo in July and August, 1919, to study the trees and to collect tree seeds for use in afforestation in the Hawaiian Islands.

"The main feature of the Great Plateau extending from Beaufort West, is its generally level character. Except where it is occasionally broken by intrusive rocks forming kopjes, randjes or mountain ranges, or where the erosive action of the larger rivers has brought it below the 3,500 ft. level, the Northern Rhodesia—Katanga extension is densely covered with open, dry, deciduous forest and woodland, unbroken save for the grass-covered marsh-lands or flood-plains bordering the larger rivers (e.g. the Zambesi and Kafue); the intermittent swamps or pans called damboes; and the very occasional low, bald, grass-covered hills which indicate copper

deposits and which are particularly striking because of their rarity in a wilderness of trees.

"The composition of this woodland vegetation differs entirely from that of the 'Bushveld' of the Transvaal. Plant-formations are not delimited by hard and fast lines, whether of altitude or soil, mountain divide or riverbed, unless these coincide with inhibiting climatic or edaphic conditions; so we find that one plant-formation usually merges gradually into another; it is difficult at times to say where one ends and the other begins. . . . The characteristic feature of the Katanga dry deciduous forest is the predominance of the Caesalpiniaceae, the genera *Brachystegia* and *Isoberlinia* being strongly in evidence, individuals of one or another species often forming practically pure stands over large areas, composing what the lecturer called 'Brachystegia Forest.' . . . Among the striking and characteristic features of much of the great plateau of Central Africa may be mentioned the scarcity of palms. . . . A fallacious impression, conveyed by many photographs, is that the Baobab (*Adansonia digitata*) is common all over Africa, whereas one may travel for hundreds of miles without seeing a single specimen of this strange tree. . . . An interesting feature of the flora is the appearance of 'Spring' flowers in the latter part of the long dry season before the seasonal rains commence, the species constituting a definite 'pre-rain flora;' a similar phenomenon is observed in Rhodesia and the Transvaal. These plants are found frequently on areas called 'burns,' where the grass has been burned in winter.

"Very striking is the occurrence, in a forest of trees, of treeless hills with which are associated copper-bearing properties; so constant are these hills in their copper-yielding character that prospectors locate them on sight as copper-mines. Is the absence of trees due to some property in the soil, occurring at a depth reached by tree-roots but absent (by leaching?) from the surface soil, thus enabling grasses and suffrutices to thrive where trees cannot? This is an interesting joint problem for the soil-chemist and the plant-physiologist."

CHECK LIST OF THE COMMON NAMES

Baobab	*Adansonia digitata* L.	Bombacaceae
Kankono or Ebony	*Diospyros mespiliformis* Hochst.	Ebenaceae
Kaputu	*Brachystegia Hockii* De Wild.	Leguminosae
Kifoo-umbië	*Baubinia Thonningii* Schum.	Leguminosae
Kimpampa	*Monotes glaber* Sprague	Dipterocarpaceae
Makoosu makooba	*Uapaca Kirkiana* Muell. Arg. (?)	Euphorbiaceae
Moo-aye	*Securidaca longepedunculata* Fres.	Polygalaceae
Moobanga	*Afrormosia angolensis* Harms	Leguminosae
Moo-enge	*Diplorrhynchus mossambicensis* Benth.	Apocynaceae
Moofungo	*Anisophyllea laurina* R. Br.	Rhizophoraceae
Moolamma	*Combretum odontopetalum* Engl. & Diels	Combretaceae
Moolumbwa	*Pterocarpus erinaceus* Poir.	Leguminosae
Moopaala	*Baphia Bequaertii* De Wild.	Leguminosae
Moosaalie	*Pseudolachnostylis glauca* Hutch.	Euphorbiaceae
Moosaasi	*Erythrophlæum africanum* Harms	Leguminosae
Moosesjie	*Marquesia macroura* Gilg	Flacourtiaceae
Mulanga	*Afrormosia angolensis* Harms	Leguminosae
Mwaifi or Ordeal tree	*Erythrophlæum guineense* Don	Leguminosae
N'Daale	*Swartzia madagascariensis* Desv.	Leguminosae
Sycamore fig	*Ficus Sycomorus* L.	Moraceae

Uganda Protectorate. Annual report of the Forestry Department for the year ended 31st December, 1926. Entebbe, 1927. Pp. 14; 8¼ x 13.

Out of a total of 129 native timber specimens with which durability tests were started in 1922, 113 have been completely destroyed by white ants. Following are the vernacular and scientific names and the condition of the 16 survivors:

Nkunya	*Mimusops cuneifolia* Baker	Perfectly sound.
Mugavu	*Albizzia coriaria* Welw.	" "

Nongo	*Albizzia* sp.	Slightly attacked.
Mukunzanume	*Warburgia ugandensis* Sprague	" "
Miovu	*Entandrophragma utilis* Sprague	" "
Mugavu	*Albizzia coriaria* Welw.	" "
Mpimbyi	*Maba abyssinica* Hiern.	" "
Mukoge	*Tamarindus indica* L.	" "
Mutumba	*Cordia unyorensis* Stapf	" "
Masale	———	Rather badly attacked.
Mbarebare	———	" " "
Mpimbyi	*Maba abyssinnica* Hiern.	" " "
Tokekulu	———	" " "
Tolokyo	*Juniperus procera* Hochst.	" " "
Eucalyptus	*Eucalyptus citriodora* Hook. f.	" " "
Miovu	*Entandrophragma utilis* Sprague	" " "

Forestry conditions in Ho District, Togoland. By J. R. P. Gent and H. W. Moor. *Empire Forestry Journal* 6: 2: 238–251, 1927.

"The area of Ho is approximately 2,600 square miles, with a population of 89,000, or 34 to the square mile. The main physical feature is a series of parallel hill ranges of an elevation up to 2,000 feet or more running roughly north and south, with undulating plains of greater or less width between them. The country is poorly watered and most of the stream beds are dry during the greater part of the year."

"Two main types of forest are found in the area: (a) Deciduous Rain Forest; (b) Savannah Forest.

"The deciduous rain forest is of practically the same composition as is this type in the [Gold Coast] Colony and Ashanti. Typical species found here are: *Afzelia africana*, *Bombax* sp., *Distemonanthus Benthamianus*, *Chlorophora excelsa*, *Eriodendron anfractuosum*, *Erythrophlœum guineense*, *Khaya* spp., *Terminalia superba* and other species, *Piptadenia africana*, *Pycnanthus Kombo*, *Alstonia congensis*, *Tetrapleura Thonningii*, *Ricinodendron africanum*, *Elæis guineensis*, *Myrianthus arboreus*, *Myristica* sp., *Spathodea campanulata* *Parinarium* sp., *Triplochiton Johnsoni*, *Antiaris* sp. (Chenchen), *Petersia viridiflora*, *Anthocleista nobilis*, *Sterculia* spp., *Pterygota* sp., *Macaranga* sp., *Alcornea* sp., *Albizzia* spp.

"The most notable differences between this Togoland forest and corresponding Ashanti forests are the absence, so far as we could observe, of *Raphia*, *Entandrophragma*, and *Celtis* spp., and the scarcity of *Musanga Smithii*.

"The deciduous rain forest type may be divided into (a) deciduous rain forest proper, i.e., the original forest unaffected by the depredations of man. . . . (b) Fringing forests (Galerie-wald) which occur in broad or narrow strips fringing the banks of river or stream beds or any natural drainage channel, where subsoil moisture is sufficient to compensate for a reduced atmospheric moisture. Belts of this type of forest are to be found everywhere threading their way through the savannah forests. . . . (c) Transition forest. The composition of this forest is nearer to that of the rain forest than to that of the savannah forests. . . . This transition forest is here always the direct result of the destruction of an original rain forest by the hand of man. It is a deterioration of rain forest towards savannah; never an improvement of savannah towards rain forest."

"The savannah forest is essentially adapted in all its elements to survive those two primary enemies of vegetation, aridity (whether of soil or air) and fire, which after all is only aridity intensified. In this it is fundamentally different from the rain forest which must have moisture and whose component species are individually in greater or less degree tender to fire. Savannah forest is characterized by a soil covering, less or more dense, of grass, and a tree cover varying in density from almost complete to nil."

"The savannah forest is not particularly rich in species. The following are typical: *Paradaniella Oliveri*, *Anogeissus leiocarpus*, *Bauhinia* spp., *Butyrospermum Parkii*, *Gardenia* sp., *Adansonia digitata*, *Afzelia africana*, *Stereospermum Kunthianum*, *Lonchocarpus sericeus*, *Entada sudanica*, *Erythrophlœum guineense*, *Parkia filicoidea*, *Cussonia* sp., *Lophira alata*, *Sarcocephalus Russegeri*, *Odina acida*, *Anona* sp., *Spondias lutea*, *Borassus flabellifer*. Though on the whole well distributed, these species are not universally found. . . . The commonest and most universally distributed savannah tree is Angwa (Twi), *Terminalia glaucescens*."

The collection and preparation of herbarium and timber specimens. By J. Burtt Davy and L. Chalk. Issued by the Imperial Forestry Institute, Univ. of Oxford, 1927. Pp. 28; 5 x 7¼.

A convenient manual for forest officers and other collectors, containing complete instructions for the selection and care of specimens, making field notes, etc. Some Forest Services have found it desirable to issue a concise and simple summary of the more detailed general instructions for the guidance of men employed to collect. The following extract is prepared from such a summary issued by the Forest Department in Burma.

COLLECTION AND PRESERVATION OF BOTANICAL SPECIMENS

In collecting and preserving specimens the following points should be noted:

(1) Full-sized leaves, fruits, and flowers should be collected, on one or more small branches.

(2) They should be placed (as soon as possible), arranged so as to get the leaves flat, in botanical drying paper, which must be changed daily, and oftener if the weather is wet.

(3) Thick fruits and stems may be cut in half.

(4) Thick bunches of leaves and flowers may be thinned out.

(5) Flowers and leaves should not as a rule lie one on the other. If this is unavoidable, pieces of botanical paper or blotting-paper may be put between them.

(6) In order to dry leaves attached to very thick fruits, place layers of doubled-up drying paper on the leaves so that the whole may be the same thickness.

(7) Drying paper not in use should be put out in the sun to dry.

(8) Small leaflets often fall off when drying. This may be prevented by putting them into boiling water for a few seconds. Thick fleshy plants (for example, some of the orchids) may be killed in the same way. Flowers should not be put into hot water.

(9) When specimens are quite dry, they may be put within doubled-up sheets of newspaper and carried in a box or in a separate press.

(10) Every specimen should have a number attached to it by thin string as soon as possible after collection. The numbers will refer to a page in a note-book; on this page should be written:

(a) Date.
(b) Elevation above sea.
(c) Name of forest division.
(d) Type of forest.
(e) Vernacular name if known. Scientific name if known.
(f) Notes regarding uses of the timber, etc., bark, appearance of tree, etc.

Price 40 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 15 SEPTEMBER 1, 1928

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TROPICAL WOODS

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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, Yale University.*

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THE FORESTS OF BRITISH GUIANA

By MILES HAMAN AND B. R. WOOD[1]

British Guiana has an area of 89,480 square miles, and is almost twice the size of the State of Pennsylvania. Eighty-six per cent of the total land area, or 49,450,000 acres, an area equivalent to the State of Nebraska, is forested. One fourth of this forested area, or roughly 12,800,000 acres, contains accessible timber, that is, timber between the sea coast and the

[1] The basis for this article is a portion of a report by Miles Haman, a technically trained forester, who was in British Guiana in 1916. It was submitted by the editor to B. R. Wood, Conservator of Forests of British Guiana, for revision and additions. He writes: "I have adhered very strictly to the form and even to the words of Mr. Haman's report where possible, but wherever I have substituted other information for what he gives it is done in the light of the latest knowledge on the subject and nearly always as a result of exact valuations carried out on very careful lines."

vicinity of the falls of the various rivers. The unforested portion consists of savannah land of various types, with a total area of 12,232 square miles.

Generally speaking the country rises from the coast towards the Brazilian and Venezuelan boundaries to the south and west, and the topography of the Colony may be divided into three roughly parallel belts running northwest and southeast. The first, the coastal belt of the north, forms an irregular coastal selvedge from 5 to 35 miles wide made up of a marine clay of recent origin. It rarely attains more than twelve feet above sea level and much of it is actually below high tide level. A few miles from the coast sand reefs form low hills 20 to 40 feet above the general level. The second belt consists of a sand-and-clay peneplain. This low plain extends from the inner margin of the coastal belt to the foot of the mountainous regions. It is rarely more than 200 feet above sea level, consists mostly of sand forming flat plateaus cut into by creeks, and is the region where the heaviest stands of timber occur. The third belt, the mountainous region, lies to the west and south of the sand-and-clay peneplain. It contains four principal ranges, viz., Imataka in the northwest, from 500 or 600 to 1,600 feet; Sierra Akarai in the south, from 3,000 to 4,000 feet, both being on the frontier; the Pakaraima, an extensive mass in the west from 1,200 feet up to 5,000 feet, with Mt. Roraima having an elevation of 8,600 feet, and Kanuku in the southwest rising to 2,000 feet above sea level. There are several irregularly distributed smaller ranges and isolated heights.

The average annual rainfall registered at Georgetown for the period 1880 to 1925 was 91.03 inches, rain falling on an average of 194 days in the year. The average annual rainfall is smallest on the coast and heaviest in the near interior, the average for sixteen stations inland varying from 74.78 inches (Bartica) to 151.24 inches (Potaro Road). There are two wet and two dry seasons. The first wet season is from mid-April to mid-August and is followed by a dry season lasting until the middle of November, from which time the second wet season commences and lasts until February. In the forested regions the seasons are less well marked. In the interior savannahs the rainfall is 58.51 inches and there is a well-marked dry season from October to February, the wettest months being from May to August. The relative humidity is highest in May and lowest in September and October and varies from 87.5 to 70.9 per cent. On the coastal regions the shade temperature varies from a mean maximum of 87° F. to a mean minimum of 74.5° F. The mean shade temperature is 80.4° F. Farther inland the variation is slightly greater, the range being between 73° F. and 89° F.

The vegetation of the Colony may be divided into four distinct types or plant formations: the Wet Savannah, the Dry Savannah, the Muri, and the Rain Forest.

The Wet Savannah

The wet savannah is characterized by a dense growth of coarse grasses, sedges, rushes, and aquatic plants. Few trees are found, and these only where the savannah merges into the rain forest. Here will be found an occasional White Cedar, Manni, and a few Ite and Manicole palms. The wet savannah is confined to the low and depressed areas of the coastal belt of the north. They are usually inundated from June to August, and the soils are clayey and heavy. West of the Essequebo they occur in small scattered areas within three to ten miles from the coast. Here they are found along the Moruca River, Wakapau Creek, and between the Pomeroon River and the mouth of the Essequebo. Their greatest extension is to the eastward, along the coast between the Essequebo and the Courantyne Rivers, where they extend inland from 15 to 25 miles. Their distribution along the outer coast is unbroken, but farther inland the wet savannah, as well as the dry savannah to the immediate south, is confined to areas well between the rivers, being separated by the forest which here follows the courses of the Demerara, Berbice, Canje, and Courantyne Rivers.

The Dry Savannah

The dry savannah is open grassy land, which is very sparsely timbered. In the southern limits of the wet savannah, near the headwaters of the Mahaicony and Abary Rivers, a distance of 25 miles from the coast, the land becomes more

elevated, the soil changes from clayey to sandy, and the wet savannah gives way to the dry savannah. Between the Demerara and the Berbice Rivers the dry savannah and patches of muri or scrub extend inland almost as far as the Cannister Falls, a distance of 130 miles from the coast. Between the Berbice and the Courantyne Rivers it extends inland 85 miles from the coast, that is, about 10 miles above the upper reaches of the Canje. Throughout its extension in the north it is limited to areas well away from the rivers, the courses of which are heavily forested for a distance of from three to ten miles from the banks.

The dry savannah lands of British Guiana are mainly confined to two widely separated regions. The first, in the northeastern section of the Colony, in the County of Demerara and in the northern half of the County of Berbice, as described above, and the second in the southwestern section of the Colony. These savannah lands of the interior comprise an area of about 3,968,000 acres. Here they are found from the Brazilian border, along the Ireng and Takatu Rivers eastward to the headwaters of the Quitaro. They skirt the base and lower contours of the Kanuku Mountains, and follow the upper reaches of the Rupununi above Annai.

These open grazing lands of the Rupununi savannah support the same open and straggling growth of *Curatella americana* that is found in the Orinoco llanos to the northwest. This tree, the "chaparro" of Venezuela, is here known as the Sandpaper Tree.

The Muri or Scrub

The vegetation of the muri is quite distinct and very different from that of the dry savannah. It is practically grassless and bears a low growth of scrubby, woody plants. In many places the deep, white sand is devoid of all vegetation. An occasional Dakama is found, but the scattered trees of the muri are poorly developed.

The muri is confined to the sand reefs, which vary in elevation from 50 to 300 feet. It occurs in small scattered areas north and south of the Supenaam River near the north coast, and in a strip varying in width from five to ten miles between the Essequebo and the Demerara Rivers. It extends here

from Wineperu Creek on the south to within 30 miles of the coast.

The Rain Forest

The rain forest of British Guiana may be divided into seven forest types, often sharply distinct, but sometimes gradually merging into each other, as follows: (1) Mangrove swamp, (2) Palm swamp, (3) Mora, (4) Greenheart, (5) Miscellaneous, (6) Wallaba, (7) Mainap and low bush. The first three types are confined to areas of low elevation, while the others occur on the higher elevated sites.

Mangrove Swamp Type.—This type, a continuation of the Mangrove swamp of the Orinoco Delta, extends as a narrow fringe along the entire coast from Venezuela to Dutch Guiana. It is widest in the northwest where it consists of *Rhizophora Mangle*, *Laguncularia racemosa*, and *Avicennia nitida*. In the east from the Pomeroon to the Courantyne it consists mainly and in some places entirely of the last-named species, locally known as Kurida. Its extension inland, even in the west, is limited to a very few miles.

The mangrove swamps of British Guiana are of very little importance commercially. The area occupied is comparatively small and the trees do not attain the size of those of the Orinoco Delta. The first species to come in where the land may be slightly less salt or where this type grades into the palm swamp are Manicole palm, Mora, and Crabwood.

Palm Swamp Type.—This type is confined to swampy sites, near the coast and rivers, which are generally below the level of high tides, and to low and depressed sites further in the interior, which are inundated during the greater part of the year. The water here is not brackish as in the mangrove swamp type. The most common species are Truli, Kokerit, Ite, Manicole, and Turu palms. The Truli, Manicole, and Turu occur pure in many places. These areas are without any particular economic importance at present and extend to 5,470 square miles, their greatest extension being in the Waini-Barima basin in the northwest and in the Pomeroon drainage and the drainage of the Canje in the east. The type is not uncommon in the Demerara.

The common hardwood associates of the palms in this type of forest seldom reach timber size and the stands of timber are small. Such as do reach that size do so usually in a fringe along the banks of streams, where the ground is slightly more elevated. A typical composition for the North West District (Waini-Barima basin) is 53 species of trees down to 6 inches diameter, giving 137 trees to the acre mixed with 62 palm trees, counting clumps of Manicole as individual palms. The commoner trees of 16 inches in diameter and above are: Mora, 20 per cent; Mani, 8 per cent; Kirikawa, 5 per cent; Kakarwa, 3 per cent; and thirteen other species, 54 per cent. The remaining species found in such areas do not attain a diameter of 16 inches at breast height.

Mora Type.—This type is found only on low-lying and moist, but not constantly inundated, sites above the level of high tide. It merges gradually into the palm swamp type, but is very sharply defined from all succeeding types. The Mora forest is not limited to any particular part of the Colony, but is found wherever these edaphic conditions exist, and most frequently on the banks of rivers and streams, from the larger of which the Mora forest may stretch inland a mile or more. The most common species are Mora, Trysil, Crabwood, Suradanni, Arisauru, Waikey, Dalli, Aramatta, Determa, Duka, Maho, Karapaballi, Buhurada, and Coffee Mortar.

In one survey in this type near the Demerara River, Mora was found to constitute 70 per cent of the stand, with an average of 10 sound trees to the acre; Trysil was next, making up 7 per cent. The average stand of Mora is from 12,000 to 15,000 feet B. M. per acre, but where many other species of this type enter, the stand will drop to as low as 3,000 feet per acre. This, however, is unusual, and where it occurs pure, in limited areas which are low and moist, stands of 25,000 to 30,000 feet per acre are not uncommon. Mora will average from 100 to 150 feet in height, and often will grow to a height of 200 feet. It is unquestionably the most distinctive tree of the low-lying Guiana forest. The huge buttresses and flanges at the base spread out, in the larger trees, a distance of 15 feet from all sides of the trunks, and diameters of eight feet, 20 feet above the ground, are not uncommon.

Greenheart Type.—These forests occur as soon as the coastal belt gives place to the sandy areas of the sand-and-clay peneplain. The Greenheart forest occurs on the slopes which are well drained and where the sand has a brown ferruginous stain. They attain their best development in the north central portions of the Colony, gradually giving place to miscellaneous forest in the far interior and also towards the eastern and western boundaries. In taking the averages over large areas, a certain proportion of other types occur as well,

Average Stand per Acre in Feet, B. M.

	Green-heart	Walla-ba	Mora-bukea	Kaker-alli	Mora	Miscellaneous		Total
						Heavy	Light	
Best square mile	8,190	406	5,579	847	805	1,757	945	18,529
Best 70 square miles	4,473	1,785	2,436	1,057	1,099	2,674	791	14,315

Relative Volumes, Based on Preceding Table

	Greenheart	Four timbers of known high quality	Miscellaneous
Best square mile	44 per cent	41 per cent	15 per cent
Best 70 square miles	31 " "	44 " "	25 " "

because the tops of the ridges contain Wallaba forest, while the flats near the creeks invariably hold forest of the Mora type. The Greenheart tree forms a high proportion of the stand, frequently mixed with quantities of Morabukea, a tree closely related to the Mora, but with probably a slightly better quality of timber. Results of valuations carried out in such areas are shown in the accompanying tables; only sound trees of a diameter of 16 inches and over at breast height, merchantable bole, were included. The best square mile is shown, also the best compact area of 70 square miles in a valuation of 335 square miles in all types of forest.

Miscellaneous Forest.—This is not an easy type to describe. In the north central portions of the Colony, where the Greenheart is absent or is no longer the dominant species on the slopes of brown soil, the forest can fairly be described as Miscellaneous. No particular tree is dominant, although certain species occur in "reefs," notably the Bullet Wood or Balata. The commonest trees are Kakeralli, Kautaballi, Baromalli, Yaruru, Itikibouraballi, Marishiballi, and Asipoko; there are occasional specimens of Silverballi, Crabwood, and Purpleheart. In some parts the Sawarri, or Butternut, and Locust are not uncommon, while Greenheart and Morabukea occur sporadically. In the North West District, Greenheart and Morabukea do not occur and the common species are Kakeralli and Haiariballi. This type of forest merges imperceptibly into the Greenheart type. Further in the interior a fresh species occurs in groups and also almost pure over considerable areas, with practically no undergrowth and a peculiar habit of growth in that the parent tree at a comparatively early age produces numerous coppice shoots at and just above the root collar, giving the appearance of a forest composed of clumps of trees. This has been identified as *Dicymbe corymbosa* Spruce (Leguminosae), hitherto only recorded from the Uapes River in Brazil, while a species of *Dimorphandra*, unknown so far in the Colony, but a larger tree than the Mora, is found in "reefs."

Wallaba Type.—This is a sharply differentiated type of the sands of the near interior. It is found wherever the brown sand of the Greenheart and Miscellaneous types gives place to the white sand. It can fairly be said that wherever the white sand is found the Wallaba type of forest will cover it. Greenheart never occurs in Wallaba forest and Morabukea rarely so. Yellow Silverballi and Purpleheart are sometimes found. The type covers very large areas of country, mostly flat plateaus and the flat tops of ridges and hills, where it extends sometimes for very many miles. The common associates of the Wallaba are the Moroballi—a fish poison—and the Kororo, while Baromalli is not uncommon, and Kakeralli and Yaruru are also found. This type of forest is worked for fuel,

poles, and shingles mostly, and a valuation of a large grant showed the following stand of first class fuel woods:

Wallaba	69.05	tons per acre
Moroballi	21.12	" " "
Kakeralli	1.01	" " "
Yaruru	2.32	" " "
Total	93.50	" " "

The great part of the sand-and-clay peneplain consists of the Wallaba, Greenheart, and Miscellaneous types, with the Mora type on the creek flats. In any large area all these types

Composition of a Tract of 214,500 Acres

Kind of timber	Average area		Area with Greenheart predominating		Area with Wallaba predominating	
	Stand per acre *Feet, B. M.*	Relative volumes *Per cent*	Stand per acre *Feet, B. M.*	Relative volumes *Per cent*	Stand per acre *Feet, B. M.*	Relative volumes *Per cent*
Greenheart	2,478	24.0	3,591	28.4	889	11.5
Morabukea	273	2.6	1,540	12.2	791	10.5
Wallaba	1,834	17.7	1,960	15.5	3,409	44.0
Kakeralli	749	7.2	805	6.4	161	2.0
Mora	959	9.3	868	6.9	273	3.5
Purpleheart	84	0.8	77	0.6	35	0.5
Silverballi	189	1.8	196	1.6	91	1.5
Misc.: Heavy	2,807	27.2	2,646	20.9	1,414	19.0
Misc.: Light	973	9.4	945	7.5	574	7.5
Total	10,346	100	12,628	100	7,637	100

appear, and it is interesting to compare the stands over a considerable tract of country where one or another type predominates, but where the other types all occur; in other words, to note the average composition of the stand over large areas. For this purpose there is available a tract of 214,500 acres on which exact valuations have been carried out. It is divisible

into three compact self-contained areas: (1) An average area of 68,500 acres; (2) an area of 64,500 acres where Greenheart predominates; (3) an area of 81,500 acres where Wallaba predominates. The measurements were limited to merchantable bole, sound wood, of trees 16 inches and over in diameter at breast height.

Mainap and Low Bush Type.—Mainap is the Indian name for second growth, and mainap forest is the result of biotic influences on the virgin forest, either from cutting the forest down or from an old burn. It is characterized in the first instance, on all but the poorer soils, by an inrush of razor grass and Congo Pump, an invasive and useless tree; also with very prickly shrubs or "pimplers," frequently solanaceous. On drier and poorer soils the Oralli, or Bloodwood, comes in, and the alternation back to the original climax vegetation is exceedingly slow. In places, also, very considerable areas are found which contain few or no large trees and are a tangle of small growth and bush ropes (lianas). This is characterized as low bush. The origin is obscure; in some places it has probably resulted from milpa cultivation by Indians. It is sometimes customary to refer to certain kinds of Miscellaneous forest as occurring on the "kabiokilli" or field soil of the Indians, and to say that this type of Miscellaneous forest occurs where that soil occurs. This is, however, not the case. Most of the soils of the Greenheart and Miscellaneous types are suitable for the formation of Indian fields. Where such suitable soils occur, the Indians search out small areas in the forest where those trees predominate which (1) are easily felled and (2) burn easily when comparatively green. They thus save labor in felling the forest and get a clean burn for their field. The designation "kabiokilli" therefore really means a patch of forest easily felled and burnt on a soil suitable for milpa cultivation.

LISTS OF WOODS USED FOR SPECIAL PURPOSES

(Arranged in the order of their relative suitability or preference.)

Piling, docks, ship-building, heavy planking, large construction timbers, and bridge-stringers: Greenheart and Mora.

Railway crossties: Mora, Morabukea, Trysil, Arisauru, Hurowassa, Suradanni, Dakama, Aramatta, Kabukalli, and Kakeralli.

Posts, poles, house-framing, heavy outside construction timbers not over 30 feet in length, and framing for punts: Mora, Kabukalli, Kakeralli, Arisauru, Suradanni, Hurowassa, Dakama, Sibadanni, Purpleheart, Buhurada, and Aramatta.

Planking for punt bottoms: Brown Silverballi, Yellow Silverballi, Kabukalli, Sawarri-skin Silverballi, Suradanni, Hububalli, Fukadi, and Determa.

House-boarding (outside): Kabukalli, Determa, Hurowassa, Crabwood, and Greenheart.

House-boarding (inside): Kabukalli, Determa, Keriti Silverballi, Yellow Silverballi, Brown Silverballi, Euraballi, Crabwood, and White Cedar.

Boxes, lath, house partitions (cheap), concrete forms, cheap coffins, and all purposes where a light, but not very strong and durable, wood will answer: Simaruba, Dalli, Fotui, Duka, Suyu, and Manni.

Shingles: Wallaba.

Flooring: Kabukalli, Arisauru, Mora, Fukadi, Brown Silverballi, Crabwood, and Greenheart. (Greenheart is excellent, but expensive.)

Furniture: Kabukalli, Dukalliballi, Itikibouraballi, Crabwood, Yuriballi, Aramatta, Yellow Silverballi, Brown Silverballi, Purpleheart, and Determa.

Telegraph poles, posts, and vat staves: Wallaba.

CHECK LIST OF THE COMMON NAMES

Aramatta	*Diplotropis brachypetala* Tul.	Leguminosae
Arisauru	*?Vatairea guianensis* Aubl.	Leguminosae
Asipoko	*Lucuma* sp.	Sapotaceae
Balata	*Mimusops globosa* Gaertn.	Sapotaceae
Baromalli	*Tabebuia* sp.	Bignoniaceae
Bloodwood	*Vismia macrophylla* H. B. K.	Guttiferae
Buhurada	*Parinarium campestre* Aubl.	Amygdalaceae
Butternut tree	*Caryocar tomentosum* Willd.	Theaceae
Cedar, Red	*Cedrela mexicana* Roem.	Meliaceae
Cedar, White	*?Tabebuia longipes* Baker	Bignoniaceae
Coffee mortar	*Terminalia* sp.	Combretaceae
Congo pump	*Cecropia peltata* L.	Moraceae
Corkwood	*Pterocarpus Draco* L.	Leguminosae

Courida	*Avicennia nitida* Jacq.	Verbenaceae
Crabwood	*Carapa guianensis* Aubl.	Meliaceae
Dakama	*Dimorphandra latifolia* Sul.	Leguminosae
Dalli	*Virola surinamensis* Warb.	Myristicaceae
Determa	*Nectandra* sp.	Lauraceae
Duka	*Tapirira* aff. *guianensis* Aubl.	Anacardiaceae
Dukalliballi	*Couma guianensis* Aubl.	Apocynaceae
Fotui	*Jacaranda Copaia* (Jacq.) D. Don	Bignoniaceae
Fukadi	*Terminalia Buceras* Bail.	Combretaceae
Greenheart	*Nectandra Rodiœi* Schomb.	Lauraceae
Haiariballi	?	?
Hububalli	*Loxopterygium Sagotii* Hook. f.	Anacardiaceae
Hurowassa	*Pithecolobium trapezifolium* Benth.	Leguminosae
Itikibouraballi	*?Machaerium Schomburgkii* Benth.	Leguminosae
Kabukalli	*Goupia glabra* Aubl. and *G. tomentosa* Aubl.	Celastraceae
Kairiballi	*Licania heteromorpha* Benth.	Amygdalaceae
Kakarwa	?	?
Kakeralli	*Eschweilera* and *Lecythis* spp.	Lecythidaceae
Karababalli	*?Guarea* sp.	Meliaceae
Kautaballi	*Licania venosa* Rusby	Amygdalaceae
Kirikawa	*Virola sebifera* Aubl.	Myristicaceae
Kokeritiballi	*?Sideroxylon* sp.	Sapotaceae
Korokororo	*?Diplotropis* sp.	Leguminosae
Locust	*Hymenæa Courbaril* L.	Leguminosae
Maho	*Sterculia* sp.	Sterculiaceae
Mani	*Symphonia globulifera* L. f.	Guttiferae
Mani-balli	*Moronobea coccinea* Aubl.	Guttiferae
Marishiballi	?	?
Mora	*Dimorphandra Mora* Baill.	Leguminosae
Morabukea	*Dimorphandra Gonggrijpii* Kleinh.	Leguminosae
Moroballi	*Cupania* sp.	Sapindaceae
Oralli	*Vismia macrophylla* H. B. K.	Guttiferae
Paddle wood	*Aspidosperma excelsum* Benth.	Apocynaceae
Palm, Ite or Aeta	*Mauritia flexuosa* L. f.	Palmaceae
Palm, Kokerit	*Maximiliana regia* Mart.	Palmaceae
Palm, Manicole	*Euterpe edulis* L.	Palmaceae
Palm, Troolie	*Manicaria saccifera* Gaertn.	Palmaceae
Palm, Turu	*Oenocarpus bacaba* Mart.	Palmaceae
Pump wood	*Cecropia* spp.	Moraceae
Purpleheart	*Peltogyne pubescens* Benth.	Leguminosae
Sand-paper tree	*Curatella americana* L.	Dilleniaceae
Sawarri	*Caryocar tomentosum* Willd.	Theaceae
Sibadanni	*Aspidosperma* sp.	Apocynaceae
Silverballi (See note, p. 13)	*Ocotea*, *Nectandra*, *Persea* and *Aniba* spp.	Lauraceae
Simaruba	*Simaruba amara* Aubl.	Simarubaceae
Suyu	?	?

Suradanni	*Hyeronymia laxiflora* Muell. Arg.	Euphorbiaceae
Trysil	*Pentaclethra filamentosa* Benth.	Leguminosae
Waikey	*Inga* spp.	Leguminosae
Wallaba, Ituri	*Eperua Jenmani* Oliv.	Leguminosae
Wallaba, Soft	*Eperua falcata* Aubl.	Leguminosae
Wanosoro	*Cecropia* spp.	Moraceae
Warakuri	*Tabebuia longipes* Baker	Bignoniaceae
Yaruru	*Aspidosperma excelsum* Benth.	Apocynaceae
Yuriballi	*?Protium* sp.	Burseraceae

NOTE: Classification of the Silverballis is still very imperfect. Following are identifications at the Herbarium of the Royal Botanic Gardens, Kew:

No. 30	Brown Silverballi	*Ocotea* sp. or *Nectandra* sp.
No. 169	Keriti "	*Ocotea* aff. *fasciculata* Mez
No. 388	" "	*Nectandra Pichurim* Mez
No. 86	Mainap "	" *globosa* Mez
No. 10	White "	*Ocotea acutangula* Mez
No. 484	" "	*Nectandra Pichurim* Mez
No. 368	" "	" *globosa* Mez, var.
No. 48	Yellow "	*Aniba Jenmani* Mez
No. 162	" "	*Persea* aff. *nivea* Mez
No. 236	Sirua	*Nectandra globosa* Mez

Various Kinds of Chinese "Pau Hoi"

"Pau Hoi," used by Chinese women to bandoline their hair, is made from the shavings of several trees. In South China nearly every species of *Machilus* and *Phoebe* supply material for this purpose and the shavings are sometimes sold in mixture. The two most important species are *Machilus ishangensis* R. & W. and *Phoebe Nanmu* (Oliv.) Gamble. *Phoebe macrophylla* (Hemsl.) Gamble is used to some extent, but *Machilus Thunbergii* S. & Z. rarely so, mostly because of the very small size of the tree. In Central China shavings of the wood of *Firmiana simplex* F. N. Meyer are sold as Pau Hoi, either alone or in mixture with the others just mentioned. In North China *Ulmus pumila* L. and *U. japonica* Sarg. are the favorite sources of Pau Hoi and are used almost to the exclusion of the others.—NGA KOK IP, *College of Agriculture and Forestry, University of Nanking.*

STUDIES OF SOME TROPICAL AMERICAN WOODS[1]

By LLEWELYN WILLIAMS, *Assistant in Dendrology*
Field Museum of Natural History

Ottoschulzia (ICACINACEAE)

The genus *Ottoschulzia* Urban (dedicated to Otto E. Schulz, German botanist) comprises three known species of the West Indies: (1) *O. rhodoxylon* Urban (=*Poraqueiba rhodoxylon* Urban), "palo de rosa," a little known endemic tree of Porto Rico, the wood of which is used to a limited extent for fancy articles of turnery; (2) *O. cubensis* Urban (=*P. cubensis* C. Wright), a small tree known as "rayo del sol" in eastern Cuba and used sometimes for railway crossties; (3) *O. domingensis* Urban, of Santo Domingo, which is the source of some logs which have recently been received in the New York market under the name of "palomino." The bark is finely wrinkled, smoothish, gray-blotched. The woods, which are notable on account of the very broad rays, are apparently indistinguishable.

DESCRIPTION OF THE WOOD

General properties.—Color yellowish brown, without much contrast between heartwood and sapwood. Luster rather dull. Odorless and tasteless. Hard and heavy; sp. gr. (oven-dry) of *O. domingensis* 0.83, *O. cubensis* (air-dry) 0.80; weight about 50 lbs. per cu. ft.; straight-grained; coarse-textured; has high moisture content when fresh, but dries out readily without serious checking or warping; brittle when dry and inclined to chip out when being worked.

Gross anatomy.—Growth rings not distinct. Parenchyma in numerous, fine, closely and irregularly-spaced, tangential lines, indistinct without lens. Pores minute, barely visible with lens, not numerous, occurring mainly in tangential zones, frequently solitary or in radial and tangential groups of 2 or 3.

[1] These studies were made in the laboratories of the Yale School of Forestry under direction of Professor Record and Mr. D. A. Kribs.

Vessel lines indistinct. Rays of two sizes, in the ratio of about seven of the small to one of the large: (1) exceedingly fine, barely visible with lens on cross section and indistinct on other surfaces; (2) very broad, conspicuous on cross section where they occupy about a third of the surface, appearing as spindle-shaped lines on tangential, and producing a silver grain on radial surface that is conspicuous only in proper light, due to the lack of pronounced color contrast with the fiber background.

Minute anatomy.—Pores fairly thick-walled, open, round to oval. Vessel perforations scalariform, with 4 to 10 bars; intervascular pits not numerous, arranged more or less in radial rows, with small oval apertures and round to oval borders. Rays 7 to 14 per mm., heterogeneous, of two kinds: (1) uniseriate, or rarely biseriate in part, from 2 to 21 cells high, the cells upright; (2) up to 25 cells broad and 3 mm. to 24 mm. high, the cells moderately thick-walled and abundantly pitted; pits into vessels of general appearance of the intervascular. Parenchyma abundant; metatracheal, in broken, tangential, uniseriate or biseriate lines, 1 to 5 rows of fibers apart; strands composed of 4 to 18 cells, mostly 9; cells about twice the size of the fiber in section. Fibers (fiber-tracheids) thick-walled, with very small lumina; not in definite arrangement; polygonal in section; pits large, numerous, on both radial and tangential walls, the apertures oval to slit-like, the borders circular.

Tangential diameter of pores, 0.03 mm. to 0.056 mm., av. 0.045 mm. Length of vessel segments (tips included), 0.11 mm. to 0.21 mm., av. 0.15 mm.; length of tips, 0.014 mm. to 0.069 mm., av. 0.034 mm. Uniseriate rays, 0.12 mm., to 1.14 mm., av. 0.53 mm., high. Fibers, 1.33 mm. to 2.56 mm., av. 1.88 mm., long and 0.015 mm. to 0.026 mm., av. 0.021 mm., broad.

Material.—Yale Nos. 9043 (*O. cubensis*) collected by Gill & Whitford (No. 32), identified by Percy Wilson; 9230, collected by Crosby & Matthews; 10,938 (*O. domingensis*), from C. H. Pearson & Son Hardwood Co., Inc., New York. Study was also made of *O. rhodoxylon* in collection of Rudolph Block, New York City.

Goethalsia meiantha (D. Sm.) Burret (TILIACEAE)

Goethalsia Pittier (Fedde's *Repertorium specierum regni vegetabilis* 13: 313–315, May 1914) was named in honor of Col. George W. Goethals, "as a tribute of admiration for his stupendous work as builder of the Canal of Panama, and in recognition of his kindly aid to the furtherance of the Isthmian Biological Survey." The genus is closely related to the eastern

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Gross anatomy.—Growth rings not distinct. Parenchyma in numerous, fine, closely and irregularly-spaced, tangential lines, indistinct without lens. Pores minute, barely visible with lens, not numerous, occurring mainly in tangential zones, frequently solitary or in radial and tangential groups of 2 or 3.

[1] These studies were made in the laboratories of the Yale School of Forestry under direction of Professor Record and Mr. D. A. Kribs.

Vessel lines indistinct. Rays of two sizes, in the ratio of about seven of the small to one of the large: (1) exceedingly fine, barely visible with lens on cross section and indistinct on other surfaces; (2) very broad, conspicuous on cross section where they occupy about a third of the surface, appearing as spindle-shaped lines on tangential, and producing a silver grain on radial surface that is conspicuous only in proper light, due to the lack of pronounced color contrast with the fiber background.

Minute anatomy.—Pores fairly thick-walled, open, round to oval. Vessel perforations scalariform, with 4 to 10 bars; intervascular pits not numerous, arranged more or less in radial rows, with small oval apertures and round to oval borders. Rays 7 to 14 per mm., heterogeneous, of two kinds: (1) uniseriate, or rarely biseriate in part, from 2 to 21 cells high, the cells upright; (2) up to 25 cells broad and 3 mm. to 24 mm. high, the cells moderately thick-walled and abundantly pitted; pits into vessels of general appearance of the intervascular. Parenchyma abundant; metatracheal, in broken, tangential, uniseriate or biseriate lines, 1 to 5 rows of fibers apart; strands composed of 4 to 18 cells, mostly 9; cells about twice the size of the fiber in section. Fibers (fiber-tracheids) thick-walled, with very small lumina; not in definite arrangement; polygonal in section; pits large, numerous, on both radial and tangential walls, the apertures oval to slit-like, the borders circular.

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Goethalsia meiantha (D. Sm.) Burret (Tiliaceae)

Goethalsia Pittier (Fedde's *Repertorium specierum regni vegetabilis* 13: 313–315, May 1914) was named in honor of Col. George W. Goethals, "as a tribute of admiration for his stupendous work as builder of the Canal of Panama, and in recognition of his kindly aid to the furtherance of the Isthmian Biological Survey." The genus is closely related to the eastern

Asiatic *Colona* Cav. (=*Columbia* Pers.), the type of which, *C. serratifolia* Cav., is endemic in the Philippine Islands. The type of the species was collected around Remedios, eastern Chiriquí, the flowers in March, the fruits in December. The size of the tree is given as about 50 feet high and 14 to 16 inches in diameter.

This tree was named *Goethalsia isthmica* Pittier, but Burret[2] concluded from a study of the descriptions that this is the same as *Luehea meiantha* Donn. Smith (*Botanical Gazette* 20: 4: 394. 1897). Burret did not have an opportunity to examine the types (which are in the U. S. National Herbarium), but Paul C. Standley did so and wrote to Professor Record on April 12, 1928, as follows: "I have compared the type material of *Goethalsia* with that of *Luehea meiantha* and there is no doubt that they represent the same tree. Burret therefore was right in making the new combination *G. meiantha*, of which *Goethalsia isthmica* is a synonym."

The wood specimen described below was collected last year by G. Proctor Cooper and George M. Slater in the Province of Chiriquí, Panama. The botanical specimens were identified by Mr. Standley. The collectors state that the tree, which is known locally as "guacima blanca," is of medium size, rarely more than 50 feet in height, and bears a general resemblance to *Luehea Seemannii* Tr. & Pl., a large forest tree called "guacima."

DESCRIPTION OF THE WOOD

General properties.—Color throughout specimen light gray, with slight tinge of pink; knot is brown. Luster dull. Odorless and tasteless. Sp. gr. (oven-dry) 0.30; weight about 19 lbs. per cu. ft. Straight-grained, medium-textured, of soft feel, easy to cut, saws rather woolly; subject to sapstain and is doubtless perishable in contact with the soil.

Gross anatomy.—Growth rings absent or poorly defined. Parenchyma in very numerous, exceedingly fine, tangential

[2] M. Burret: Berträge zur kenntniss der Tiliaceen. *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 9: 88: 814–817, July 22, 1926.

lines forming an irregular network on cross section, faintly visible with lens. Pores small and inconspicuous, rather few and scattered, mostly solitary, but occasionally in radial pairs. Vessel lines fine, somewhat darker than background. Rays of two sizes, the smaller invisible without lens, the larger fairly distinct on cross and tangential sections and conspicuous on the radial, suggesting basswood (*Tilia*). Ripple marks visible, about 52 per inch, fairly regular, all elements storied, although the larger rays occupy two to several tiers.

Minute anatomy.—Pores subcircular, thin-walled, open. Vessel perforations simple; intervascular pits alternate, crowded, the apertures lenticular. Rays 12 to 16 per mm., of two types: (1) uniseriate or occasionally biseriate in part, fairly uniform in height, distinctly storied in single tier, cells square to upright; (2) 3 to 8 cells wide and 20 to 520 cells high, occupying 1 to 4 tiers and frequently confluent vertically with uniseriate rays, the cells very irregular in size and shape throughout; rhombohedral crystals of calcium oxalate common, occupying about half of lumen, scattered through both types of rays; yellowish gum abundant; cell walls thin, the upper and lower entire, the ends sparingly pitted; pits into vessels of same appearance as the intervascular. Paratracheal parenchyma uniseriate, the strands irregularly 4 or 8-celled; metatracheal in broken, uniseriate lines spaced 1 to 5 rows of fibers apart, the strands composed of 8 or, less commonly, 4 cells which are not in secondary seriation; parenchyma cells of about the same size as the fibers in cross section; crystals occasionally present. Fibers thin-walled with large lumina, arranged in fairly definite radial rows, often appearing to be of two sizes on account of storied arrangement; pits numerous, confined to radial walls, minute, simple or indistinctly bordered.

Tangential diameter of pores, 0.10 mm. to 0.12 mm., av. 0.11 mm. Length of vessel segments (exclusive of tips), 0.28 mm. to 0.49 mm., av. 0.42 mm.; length of tips, 0.04 mm. to 0.06 mm., av. 0.05 mm. Uniseriate rays, 0.07 mm. to 0.86 mm., av. 0.47 mm., high; multiseriate, 0.38 mm. to 3.22 mm., av. 0.93 mm., high and 0.03 mm. to 0.15 mm., av. 0.08 mm., broad. Fibers, 0.59 mm. to 1.37 mm., av. 1.04 mm., long and 0.013 mm. to 0.032 mm., av. 0.023 mm., in diameter.

Material.—Yale No. 10,572; Cooper & Slater No. 219.

Trichanthera gigantea H. B. K. (ACANTHACEAE)

This is one of the very few representatives of the Acanthaceae which attain tree size, the only other one known to the writer being *Bravaisia*. *Trichanthera gigantea* H. B. K. is monotypic and, while credited with a range throughout Central America to Peru and the Guianas, is apparently of

rare occurrence. H. M. Curran collected it in 1916 in San Martin de Loba, Department of Bolivar, Colombia, and states that it is a tree 50 feet high and 10 inches in diameter. Another specimen in the Yale herbarium was collected in 1925 by H. Pittier (his No. 12,056) in a hedge at Paso del Guanare, Portuguesa, Venezuela. He says that it was a small tree, less than 15 feet high, with a flat crown and known locally as "naranjillo." The leaves are rather large, entire, long-petioled, and opposite. The flowers are wine-red, particularly on the inside, and in conspicuous panicles. The bark is thin, smooth, and of a greenish gray color. The pith is large and coarsely chambered.

DESCRIPTION OF THE WOOD

General properties.—Color pale brown or oatmeal throughout specimen which seems to be all sapwood. Fairly lustrous. Odorless and tasteless. Sp. gr. (oven-dry) 0.51; weight about 32 lbs. per cu. ft. Straight-grained, medium-textured, rather soft and easy to cut, is presumably perishable in contact with the soil.

Gross anatomy.—Growth rings visible, but not sharply defined. Parenchyma not visible. Pores barely visible without lens, open, scattered uniformly, mostly solitary, rarely in small groups. Vessel lines fine and inconspicuous. Rays distinct on cross section, faintly visible on tangential, conspicuous on radial, where they are darker than background. Ripple marks absent. No gum ducts observed.

Minute anatomy.—Pores thin-walled, oval or subcircular in outline. Vessel perforations simple; intervascular pits small, alternate, crowded, the borders oval to polygonal, the apertures lenticular. Rays decidedly heterogeneous, 4 to 9 per millimeter, of two types: (1) uniseriate, mostly low, often only 2 cells high and showing a distinct palisade arrangement on radial section, resembling parenchyma strands on tangential; (2) 2 to 4 cells wide and few to 200 high, the cells variable in size and shape, often large, square, or upright, the marginal ones tending to palisade arrangement; all cells thin-walled, the upper, lower, and end walls with few to many small pits; pits into vessels of two types: (1) of same appearance as the intervascular and (2) greatly elongated, simple, tending to scalariform arrangement, horizontally to nearly vertically; yellowish gum deposits common. Parenchyma sparingly developed about pores, the strands usually 4-celled. Fibers in irregular radial

rows, thin-walled with large lumina, angular to sub-circular in section; septate; pits minute, simple, fairly numerous in radial walls only.

Tangential diameter of pores, 0.05 mm. to 0.12 mm., av. 0.08 mm. Vessel segments (including tips), 0.39 mm. to 0.86 mm., av. 0.57 mm.; length of tips, 0.04 mm. to 0.12 mm., av. 0.08 mm. Uniseriate rays, 0.05 mm. to 0.98 mm., av. 0.46 mm., high; multiseriate, 0.025 mm. to 0.10 mm., av. 0.065 mm., wide and 0.26 mm. to 2.05 mm., av. 0.94 mm., high. Fibers, 0.12 mm. to 1.22 mm., av. 0.78 mm., long and 0.019 mm. to 0.034 mm., av. 0.027 mm., in diameter.

Material.—Yale No. 8689; Pittier No. 12,056.

Cybianthus venezuelensis Mez (MYRSINACEAE)

The material studied is from a small tree collected by H. Pittier in a humid forest between Maracay and Ocumare, Venezuela. The wood specimen is a young stem, with a smooth, thin, dark brown bark which shows on the inner surface, in contact with the wood, fine vertical striping due to high rays.

DESCRIPTION OF THE WOOD

General properties.—Color pinkish brown throughout, deepening upon exposure. Fairly lustrous. Odorless and tasteless. Sp. gr. (oven-dry) 0.72; weight about 45 lbs. per cu. ft. Straight-grained; fine-textured; works fairly easily and finishes smoothly.

Gross anatomy.—Growth rings fairly distinct in places, due to variation in color and fiber density. Parenchyma not visible. Pores minute, scarcely visible with lens, fairly numerous, uniformly distributed, solitary or in radial rows of 2–5, rarely more. Vessel lines very fine and indistinct. Rays visible only on moist cross section, invisible on tangential, inconspicuous on radial surface.

Minute anatomy.—Pores thin-walled, subcircular or frequently almost square. Vessel perforations minute and simple; intervascular pits small, crowded, alternate, with round to oval borders and slit-like apertures. Rays 2 to 4 per mm., decidedly heterogeneous, 1 to 4 cells wide and 3 to 120 cells high, the long uniseriate margins occasionally confluent vertically; procumbent cells mostly square, marginal cells square or upright; cell walls entire or slightly pitted; light to dark brown gum deposits abundant; pits into vessels resemble the intervascular. Parenchyma sparingly diffuse, with slight tendency to tangential aggregation; strands composed of 2 to 8 cells,

individual cells about the size of fibers in cross section; frequently filled with dark brown gum. Fibers septate; in irregular radial rows; moderately thick-walled, with large lumina; cells occasionally filled with yellow or light brown gum; pits numerous, conspicuous, simple or indistinctly bordered.

Tangential diameter of pores, 0.025 mm. to 0.046 mm., av. 0.035 mm. Vessel segments (including tips), 0.43 mm. to 0.65 mm., av. 0.53 mm., long; length of tips, 0.054 mm. to 0.09 mm., av. 0.081. Rays 0.32 mm. to 1.58 mm., av. 0.85 mm., high and 0.019 mm. to 0.063 mm., av. 0.034 mm., wide. Fibers 0.62 mm. to 1.05 mm., av. 0.85 mm., long and 0.02 mm. to 0.03 mm., av. 0.024 mm., in diameter.

Material.—Yale No. 7943; Pittier No. 11,826.

Remarks.—This wood differs from that of many of the Myrsinaceae in that only comparatively narrow rays are present and do not contain resinous aggregates of cells.

Clethra lanata Mart. & Gal. (Clethraceae)

Clethra, which some botanists include in the Ericaceae, is the only genus of the family Clethraceae. The several species are found in subtropical and tropical Asia, Madeira, southeastern and eastern United States, Mexico, Central America, and tropical South America.[3] Its wide distribution indicates that it is a very old genus, and fossil remains have been found in the Tertiary. (*Pflanzenfamilien* IV. I. 2.) The members are all shrubs or small trees.

Clethra lanata Mart. & Gal. (=*Kowalewskia integerrima* Turcz.) is a small tree, rarely 40 feet high and 12 inches in diameter, growing in the lowland forests of tropical Mexico, Central America, and northern South America. Its vernacular names are recorded as "jicarillo," "mameyito negro," and "mama malhuaztili" (Mexico); "tepezapote," "terciopelo," and "zapotillo de montaña" (Salvador); "nance" (Costa Rica); "sapo" (Venezuela). The specimen studied was collected by Henry Kuylen in the lower Río Motagua Valley in July 1927; identification by Paul C. Standley.

DESCRIPTION OF THE WOOD

General properties.—Heartwood rather lustrous reddish brown, without distinct line of demarcation from pinkish brown sapwood. Odorless and tasteless. Sp. gr. (oven-dry) 0.64; weight about 40 lbs. per cu. ft. Roe-grained; fine-textured; easy to work; and finishes fairly smoothly.

[3] For range map see J. Hutchinson: *The families of flowering plants. I. Dicotyledons.* London, 1926, p. 265.

Gross anatomy.—Growth rings and parenchyma not distinct. Pores small, numerous, uniformly distributed, occurring singly or in radial and tangential pairs and occasionally in groups of three. Vessel lines indistinct. Rays faintly visible on cross and tangential sections; low, but very distinct, on radial surface where they are darker than background.

Minute anatomy.—Pores angular to subcircular, thin-walled, tyloses common. Vessel perforations scalariform, with numerous (up to 32) bars; intervascular pits small, round to oval, with distinctly crossed slit-like apertures and elongated borders having a tendency to scalariform. Rays 7 to 10 per mm., decidedly heterogeneous; of two kinds: (1) a few uniseriate, composed of 1 to 7 rows of upright cells; (2) 2 to 6 cells wide and 15 to 170 cells high (0.3 mm. to 0.46 mm.), though usually fairly uniform in height. The procumbent cells very slender, the marginal ones large, squarish and in 2 or 3 rows; light to dark brown gum abundant; cell walls abundantly pitted; pits into vessels arranged in radial rows and resemble the small round to oval intervascular pits. Parenchyma sparingly diffuse, the strands composed of 4 to 9 cells, occasionally filled with brown gum; individual parenchyma cells about the size of the fiber-tracheids in cross section. Fibers (fiber-tracheids) not in definite arrangement; walls of moderate thickness; lumina large; cells radially elongated to subcircular in section; pits numerous, on both radial and tangential walls, large, with round to oval borders.

Tangential diameter of pores, 0.056 mm. to 0.084 mm., av. 0.069 mm. Length of vessel segments (including tips), 0.79 mm. to 1.71 mm., av. 1.22 mm.; length of tips, 0.116 mm. to 0.29 mm., av. 0.2 mm. Uniseriate rays, 0.054 mm. to 0.43 mm., av. 0.27 mm., high; multiseriate rays, 0.23 mm. to 0.85 mm., av. 0.51 mm., high and 0.028 mm. to 0.07 mm., av. 0.05 mm., wide. Fibers, 1.23 mm. to 2.7 mm., av. 1.94 mm., long and 0.023 mm. to 0.036 mm., av. 0.028 mm., in diameter.

Material.—Yale No. 10,744; Kuylen No. 151.

Remarks.—The above description corresponds closely with that given by Kanehira [4] for *Clethra barbinervis* S. & Z. The anatomy of the wood indicates the close affinity of *Clethra* with the Ericaceae.

[4] Ryozo Kanehira: *Identification of the important Japanese woods by anatomical characters.* Taihoku, 1921, p. 37.

Dipterodendron costaricense Radlk. (SAPINDACEAE)

This species, the only one of the genus, grows in the forests on the Pacific watershed of Costa Rica and Panama. Standley[8] says: "It is a large tree with fern-like foliage, the leaves twice pinnate and composed of very numerous small serrate leaflets. The flowers are borne in large panicles; the fruit is red and about 2 cm. broad. In Darién the tree is called 'harino' or 'jarino.'"

The specimen studied was collected in Chiriquí, Panama, in 1927 by G. Proctor Cooper and George M. Slater, of the United Fruit Company. The tree was 60 feet high and about 18 inches in diameter. According to the collector's notes, the sapwood is thick and of a light tan color, while the heartwood is darker and tinged with pink. The heavy and rather hard wood has an irregular grain, but is not difficult to cut. No vernacular name was known. The botanical material was identified by Paul C. Standley.

DESCRIPTION OF THE WOOD

General properties.—Color grayish brown, sapstained. Luster dull. Odorless and tasteless. Sp. gr. (oven-dry) 0.92; weight about 57 lbs. per cu. ft. Fairly straight-grained, medium-textured, tough and strong, not durable.

Gross anatomy.—Growth rings present, due to bands deficient in parenchyma. Parenchyma conspicuous as numerous, broad, wavy, tangential bands, of irregular width and including the pores. Vessel lines appear as fine brown scratches. Pores faintly visible to the naked eye, mostly open, solitary or in radially appressed rows of 2–5, scattered uniformly. Rays invisible without lens on cross and tangential sections; visible, but low and inconspicuous, on radial surface, where they are slightly darker than background.

Minute anatomy.—Pores rather thin-walled, oval to round in section; gum deposits abundant and crystalline material occasionally present. Vessels with simple perforations; intervascular pits numerous, fairly large, crowded, the borders polygonal to circular, the apertures elliptical. Rays 8 to 14 per mm., homogeneous, 2 or 3 cells broad, rarely uniseriate, and from 6 to 45 cells high; dark brown gum deposits common; pits into vessels of same appearance as the intervascular; minute, simple pits present on the lateral walls when in contact with fibers. Parenchyma paratracheal and extending in tangential bands 2 to 10 cells wide; strands composed of few to 8 cells each; individual cells about twice the size of the fibers in section; marginal parenchyma strands frequently chambered, containing crystals of calcium oxalate which occupy about half the lumen; globules of gum abundant. Fibers polygonal to subcircular in section, extremely thick-walled and with minute lumina; rarely septate; arranged in irregular radial rows. Pits fairly numerous, inconspicuous, simple, mainly confined to radial walls.

Tangential diameter of pores, 0.081 mm. to 0.156 mm., av. 0.128 mm. Vessel segments (including tips), 0.053 mm. to 0.108 mm., av. 0.075 mm., long; vessel tips, 0.01 mm. to 0.03 mm., av. 0.02 mm., long. Rays, 0.06 mm. to 0.55 mm., av. 0.28 mm., high and 0.009 mm. to 0.038 mm., av. 0.025 mm., wide. Fibers, 1.16 mm. to 1.77 mm., av. 1.4 mm., in length and 0.01 mm. to 0.023 mm., av. 0.015 mm., in diameter.

Material.—Yale No. 10,633; Cooper & Slater No. 280.

Remarks.—The wood differs from that of most of the Sapindaceae in having abundant parenchyma, suggesting certain Leguminosae and Combretaceae. In this respect it is like *Sapindus*, *Melicocca*, and *Magonia*.

[8] PAUL C. STANDLEY: Flora of the Panama Canal Zone. *Contr. U. S. Nat. Herb.* 27: 246. 1928.

Heisteria macrophylla Oerst. (OLACACEAE)

This is a small tree in the west coast forest of Central America, usually less than 20 feet in height, though occasionally up to 35 feet tall and 5 or 6 inches in diameter. The flowers are dark red and the fruit is a dark blue drupe. The vernacular names recorded for this and closely related species are as follows: "ajicillo" and "naranjillo colorado" (Panama); "manglillo" (Costa Rica); "sombrerito" and "cresta de gallo" (Salvador). The specimen studied was collected in Chiriquí, Panama, in 1927 by G. Proctor Cooper and George M. Slater, of the United Fruit Company. The botanical material was identified by Paul C. Standley.

DESCRIPTION OF THE WOOD

General properties.—Color light pinkish brown to dark brown. Luster dull. Odor and taste not distinctive. Hard and rather heavy; sp. gr. (oven-dry) 0.92; weight about 57 lbs. per cu. ft. Straight-grained, fine-textured, finishes smoothly and is capable of taking a high polish.

purposes for which the wood is seldom if ever used in New Zealand, owing to its low resistance to decay and to the house-borer (*Anobium domesticum*). It can be said definitely that the wood's greatest quality is its non-tainting properties, which makes it probably one of the best woods known for the packing of butter. It is also very probable that 75 per cent of the remaining Kahikatea will be used for butter emballage.

The wood is generally a uniform white, but many variations are met with, such as light sulphur yellow, brown streaks, and even light brown throughout. It is brittle and splits so easily, especially the heart portion of the tree, that it is generally necessary to bore a hole before nails can be used in this class of timber.

Owing to the limited supply, the timber has no commercial importance from an export point of view, and the main efforts are concentrated on supplying the demand for butter boxes.

Note on the East Indian "Rohituka"

Aphanamixis Rohituka (Roxb.) Pierre, the "Rohituka" of India, ranges from Ceylon into Burma, Cambodia, Cochin China, the Andamans, the Cocos Islands, the Malay Peninsula, and Sumatra. It was named *Andersonia Rohituka* by Roxburgh (*Hort. Bengal* 87, 1814). Wight & Arnott (*Prodr.* 1: 119; 1834) transferred the species to Roxburgh's genus *Amoora*. In this they were followed by Beddome, Brandis, Kurz, Gamble, Talbot, King, Hiern, and Trimen. Pierre, in his *Flore Forestière de la Cochinchine* (1883–1899), restored Blume's genus *Aphanamixis*, which had been sunk by some authors in *Amoora*, and transferred to it the *Amoora Rohituka* of Wight & Arnott. In this he has been followed by Ridley (*Flora of the Malay Peninsula* 1: 401; 1922). The late Mr. Gamble (*Manual of Indian Timbers* 150; 1902) noted that the wood of *A. Rohituka* differed from that of the other Indian species of *Amoora* in that the "pores are joined by wavy concentric bands of soft texture." It is useful to have this anatomical support for the taxonomic segregation of Rohituka from the genus *Amoora*.—J. Burtt Davy, *Imperial Forestry Institute, Oxford.*

UNITED STATES COURT AFFIRMS FEDERAL TRADE COMMISSION RULING ON "PHILIPPINE MAHOGANY"

On May 14, 1928, the United States Circuit Court of Appeals for the Second Circuit affirmed an order of the Federal Trade Commission requiring the Indiana Quartered Oak Company to desist from advertising, describing, or selling, or offering for sale under the term "Mahogany," "Philippine Mahogany," or any other term of similar import, any woods other than those derived from the Mahogany or Meliaceae family.

Charging unfair methods of competition in that the Indiana Quartered Oak Company sold wood other than Mahogany, but resembling Mahogany in general appearance, as "Mahogany" or "Philippine Mahogany," the Federal Trade Commission issued a complaint against this company on May 21, 1925. The date of the first hearing was set for July 10, 1925. On August 16, 1927, this firm was ordered to cease and desist from selling or offering for sale under the term "Mahogany" or "Philippine Mahogany," woods imported from the Philippine Islands.

Subsequently, on October 14, 1927, the Indiana Quartered Oak Company filed a petition for a review of the Federal Trade Commission's order in the United States Circuit Court of Appeals for the Second Circuit. The Government of the Philippine Islands intervened as co-petitioner.

The decision of the Court, written by Circuit Judge Manton, is as follows:

The Federal Trade Commission, after protracted hearings, resulting in a very large record, by its order restrained the petitioner from "advertising, describing or otherwise designating or selling, or offering for sale under the term 'Mahogany' or 'Philippine Mahogany,' . . . woods known under the common or trade names 'red lauan,' 'white lauan,' 'tanguile,' 'narra,' 'apitong,' 'bataan,' 'lamao,' 'orion,' 'batang,' 'bagaac,' 'batak,' and 'balacbacan,' . . . unless such wood . . . from which products are made is derived from the trees of the Mahogany or Meliaceae family."

The Commission made findings, supported by evidence, to which exceptions are taken, that the woods have been known and traded in for years, both in the Philippines and in the United States under the names of "lauan" and "tanguile" and having other trade names as referred to in the order of the Commission; that about 85 per cent of the Philippine woods sold as "Philippine Mahogany" is imported through the Pacific coast ports under the other trade names as set forth; that some importers sell these woods to lumber dealers and furniture manufacturers under their native or trade names. It also found that a substantial number of lumber dealers in this country use and deal in woods of the type sold by the respondent as Philippine Mahogany under such native or trade names. There is a conflict of evidence as to the tree family of these woods, but there is evidence to support the finding of the Commission that the lauan and tanguile sold by respondent as Philippine Mahogany is the product of the tree family scientifically known as Dipterocarpaceae, which tree family is not scientifically or botanically related to the tree family Meliaceae, the product of which constitutes true Mahogany. Of the genera of this Meliaceae family but one, *Swietenia*, produces true Mahogany and there are five known species of *Swietenia*. The Commission has found that trees of the *Swietenia* group producing mahogany grow principally in the West Indies, Southern Florida, Southern Mexico, Central America, Venezuela, and Peru, and it also has found that no species of the genus *Swietenia* of this tree family grows in the Philippine Islands except such as are planted for decorative or experimental purposes. There is evidence to support the finding that the Spanish words "Caoba des Filipinos," which means Philippine Mahogany, are used to designate native woods resembling Mahogany in grain, texture, and color, but while the term was known in the Philippines, it was not used in connection with the sale of lumber.

The term Philippine Mahogany was not used prior to the American occupation and it appears that prior to 1916 the Philippine Government, through its Director of Forestry, opposed the practice of American importers selling Philippine

hardwoods as "Philippine Mahogany." Woods of widely different kinds are shown to have properties and characteristics in common, but it is the differences in such properties and characteristics that distinguish one wood from the other and the ultimate fact is made known by the test which consists in comparison or contrast of such properties and characteristics. Men engaged in the lumber business or wood working trade recognize different woods by certain characteristics which are peculiar to these woods and since such characteristics are produced in the growth of the tree, they are regarded as botanical characteristics and are considered in classifying or identifying the different kinds of wood which the lumber or wood working trade handles.

The Commission has found that laborers in the lumber yard who distinguish between the different kinds of lumber by considering the grain, pores, scent, weight, or other identifying characteristics are guided by botanical properties and differences inherent in the wood as formed in the tree, and these characteristics correspond with like characteristics placed by nature in the trees of the same species. Wood technologists, by reason of their expert knowledge, compare these and other qualities and characteristics with such precise results as to satisfy the requirements of both science and commerce and, according to such identification, neither lauan nor tanguile are Mahogany botanically or otherwise. It is found that many of the characteristics and virtues possessed by Mahogany are lacking in the Philippine hardwood sold by the respondent as "Philippine Mahogany" and this prevents such hardwoods from serving such uses for which Mahogany is particularly adapted, and there is evidence to support the finding that such woods are not suitable for cabinet-making because of the prevalence of worm holes which constitute serious defects and that they are too soft for flooring, and not suitable for the construction of lamps because they do not take the required finish; that they are not susceptible to the finish required by piano manufacturers on the exposed surface of pianos nor are they suitable for carving. When used in furniture it is necessary to fill the worm holes before the wood is stained or varnished and such filling de-

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stroys the even appearance of the surface. They do not retain the sub-surface luster peculiar to Mahogany and, unlike Mahogany, they do not beautify with age. The Commission has found that the general public is deceived when lauan or tanguile is sold for Mahogany.

It is now well settled that findings of fact by the Commission, having any evidence to support them, are conclusive and binding upon the courts reviewing the weight of the testimony. Fed. Trade Comm. *v.* Beech-Nut Co., 257 U. S. 441; Harriet Hubbard Ayer, Inc. *v.* Fed. Trade Comm., 15 Fed. (2d) 274, 276; Oppenheim Oberndorf & Co. *v.* Fed. Trade Comm., 5 Fed. (2d) 574; Natl. Biscuit Co. *v.* Fed. Trade Comm., 299 Fed. 733.

It is established that not all trees, shrubs, or bushes belonging to the Meliaceae, the Mahogany tree family, produce Mahogany lumber. But there is ample expert testimony establishing that no wood is Mahogany unless it is wood from the tree of the Mahogany tree family and no wood is true Mahogany unless it is of the genus *Swietenia* of that family. It becomes unnecessary for us to discuss here the difference of expert opinion as to whether the trade designation "Mahogany" should be confined to one or more species of the genus *Swietenia*, for wood from trees which in no way belong to either the genus or Mahogany tree family, is neither true Mahogany nor any kind of Mahogany. And the experts justified the findings of the Commission that the woods imported from the Philippine Islands and sold by the respondent as "Philippine Mahogany" are not from any tree of the Meliaceae tree family. The Commission found that the representation of these woods as Philippine Mahogany has caused dealers in the furniture and allied commodities to purchase such wood products in the belief that they are Mahogany woods and in turn to sell to retail dealers articles of furniture and allied commodities for articles of Mahogany woods which, when they ultimately reach the consuming public, become a fraud upon it. It found that such sales and practices deceived a substantial portion of the trade and the purchasing public in substantial numbers, because such purchases were made or induced under the belief that they

were products made of true Mahogany and therefore there was injury to the purchasing public and to the honest competitors of the petitioner. To support this finding there was much testimony of witnesses who were engaged in the furniture business for a long period of years.

If, as argued by the petitioner, the term "Philippine Mahogany" has acquired a secondary meaning in that the trade does not understand it to mean genuine Mahogany, but a wood having some of the characteristics and qualities of Mahogany, that will not permit the petitioner to escape the charge of deception or misleading the public. The trade, as a whole, does not understand that "Philippine Mahogany" is not Mahogany, but such understanding is limited to dealers who actually sell the rough lumber. Retailers of furniture, builders of houses and boats, testified that they understood the word to mean genuine Mahogany. Indeed, some of the manufacturers of furniture who used the lumber as a raw material, do not understand that it is not true Mahogany. If the term deceives the purchasing public, its use may not be continued. As said in Federal Trade Comm. *v.* Winsted Hosiery Co., 258 U. S. 483:

"While it is true that a secondary meaning of the word 'Merino' is shown, it is not a meaning so thoroughly established that the description which the label carries has ceased to deceive the public; for even buyers for retailers, and sales people, are found to have been misled. . . .

"The fact that misrepresentation and misdescription have become so common in the knit underwear trade that most dealers no longer accept labels at their face value does not prevent their use being an unfair method of competition. A method inherently unfair does not cease to be so because those competed against have become aware of the wrongful practice. Nor does it cease to be unfair because the falsity of the manufacturer's representation has become so well known to the trade that dealers, as distinguished from consumers, are no longer deceived."

False advertising and selling the commodity as and for a different commodity has been denounced by the courts as a method of unfair competition within the meaning of the stat-

ute here invoked. Proctor & Gamble Co. *v.* Fed. Trade Comm., 11 Fed. (2d) 47; Guarantee Veterinary Co. *v.* Fed. Trade Comm., 285 Fed. 853; Royal Baking Powder Co. *v.* Fed. Trade Comm., 281 Fed. 744. The same rule obtains in the English courts (Lemy *v.* Watson, 31 L. T. 612 [1915] and Steinway *v.* Henshaw, 5 R. P. C. 79).

It was the petitioner's advertising of lauan and tanguile woods as "Philippine Mahogany" that has worked deception upon the public. Purchasers from petitioner have relied upon its representations and have sold the products made from these Philippine woods as Mahogany. Mahogany wood has had a long established reputation; deception on the public in the sale of inferior woods which are not true Mahogany (which deception reaches the ultimate purchaser even though the intermediate customers know that the woods were not Mahogany) is an unfair method of competition in commerce under Sec. 5 of the Trade Commission Act (38 Stat. 717, 719). Warner & Co. *v.* Lilly & Co., 265 U. S. 526; Coca Cola Co. *v.* Gay-Ola Co., 200 Fed. 720.

It was not necessary for the Commission to establish intent to deceive the purchasing public. For the test of unfair competition was whether the natural and probable result of the use by the petitioner of such woods was deceptive to the ordinary purchaser and made him purchase that which he did not intend to buy. Fed. Trade Comm. *v.* Balme, 23 Fed. (2d) 615; Straus *v.* Notaseme Hosiery Co., 240 U. S. 179, 182.

It is argued that there is a want of public interest and that the Federal Trade Commission was not justified in assuming jurisdiction under Sec. 5 of the Federal Trade Commission Act (38 Stat. 717, 719). That act provides that "if it shall appear to the commission that a proceeding by it in respect thereof would be to the interest of the public" jurisdiction may be taken by the commission. Trade practices here involved affect the public who buy furniture and other products manufactured from Mahogany wood as well as intermediate dealers in Mahogany, and this was sufficient to sustain the Trade Commission in assuming jurisdiction. Federal Trade Comm. *v.* Winsted Hosiery Co., 258 U. S. 483.

Order affirmed.

CURRENT LITERATURE

Diccionario botanico de nombres vulgares Cubanos. By Juan Tomas Roig y Mesa. Boletin No. 54, Estacion Experimental Agronomica, Santiago de las Vegas, Cuba, Feb. 1928. Pp. 247; 6 x 9; 8 plates.

This is the first part (A to D) of a comprehensive work in which all of the known vernacular names of Cuban plants are listed alphabetically, with corresponding scientific names and a great deal of information about the plants. The author is well qualified for this exacting task and he has made full, but discriminatory, use of all of the various sources of information available. The result is a dictionary of great convenience and usefulness.

Forestry and agriculture in Porto Rico. By N. L. Britton. *Journ. N. Y. Botanical Garden* 29: 341: 101–104, May 1928.

"The progress of tree-planting and reforestation in Porto Rico is of great interest and importance, not alone to the island, but of much wider significance, as the requirements for tropical forest products increase. From the nurseries of the Forest Service under the administration of Mr. W. P. Kramer and his assistants, Messrs. Bates and Brush, over 900,000 young trees are now annually distributed for planting on private lands and in the government forests, and this replenishment of trees will soon be materially increased. Farsighted citizens are recognizing trees as a valuable long-time investment on lands not available for agriculture, for the regulation of the flow of rivers and streams and for the decrease of destructive washing of soil from mountain sides. Large areas of such lands are in evidence in many parts of Porto Rico, for deforestation has been extreme; the need for more abundant firewood is acute. That means have come to be taken to repair this damage to the country is a noteworthy contribution to the future welfare of the colony. The local forest officials have the cordial coöperation and highly valued advice of the Federal Forest Service. During our visit an important examination of existing conditions was made by Messrs. Sherman and Kelley of the Washington office, from which noteworthy results will ensue.

"At present there is a Federal Forest Reserve of about 12,000 acres in the Luquillo Mountains, in eastern Porto Rico, a typical rain-forest; insular government reserves of about 6,000 acres, near Maricao, toward the western end of the Central Cordillera, also a region of relatively high rainfall; the Guanica Forest of about 5,000 acres, at low elevations, along the dry southern coast; small isolated areas elsewhere, and the extensive coastal mangrove swamps are also controlled by the Forest Service. It is probable that nearly all the mountain area above about 2,000 feet, aggregating over 150,000 acres, now mostly bare of trees, would be valuable in forest; coffee plantations reach profitably only to about that elevation, and the upper slopes furnish only indifferent grazing.

"Careful consideration is now being given to the material increase in area of both the Federal forests and those of the insular government. Valuable information about the development of many kinds of exotic trees has been obtained during the past few years, and this study is being continued, as well as observations upon the growth of native species. The diverse rainfall, ranging from over 150 inches annually where the trade-winds impinge upon the higher mountains, to 20 inches or less along the southwestern coast, requires the use of different trees. Important additions to dendrology would result from the proposed establishment of a Federal Forest Experiment Station."

Costa Rican balsa. By F. A. Tenny. *Unifruitco* (Boston) 4: 1: 3–5.

"Balsa, or *Ochroma lagopus*, its botanical name, is one of the lightest woods known. It is very common in the West Indies and Central America. When first discovered by Spanish colonists the wood was being used by the Indians in the construction of rafts; hence the name 'balsa,' which is Spanish for 'raft.'

"Balsa is used extensively in the manufacture of buoyancy and insulation products, such as life-boats, hydroplane pontoons, and stream-lining of struts and braces in airplanes, for which, because of its porous structure, it is well adapted. It is lighter than cork and is soft and spongy. It has a specific gravity of 0.12 to 0.30 and weighs from 7½ to 12 pounds per cubic foot.

"Although it is sometimes found in the forests, balsa is a second-growth tree. In its natural state it attains when fully grown a height of about 70 feet and a trunk diameter of some 30 inches. It may be distinguished by its smooth bark of mottled white and gray, which is entirely free of parasites. It has large, solitary leaves—especially large on the young trees—and a very conspicuous fruit, not unlike cotton balls, but considerably larger. In Costa Rica the flowering of the tree usually commences in the month of February. When the fruit matures and before it bursts, it greatly resembles a rabbit's-foot, and it is undoubtedly from this similarity in appearance that the word 'lagopus' in the botanical name is derived. The pods, which burst during the months of March and April, contain a very fine silky cotton. There is no demand for this cotton in the manufacture of textiles, probably because of its short staple. It is, however, used locally for mattresses, pillows and upholstering in general. When the pods burst, the cotton, in which the seeds are enveloped, falls to the ground. The seeds, which resemble small grape seeds, are propagated by being carried by the wind on the cotton to which they adhere—though seldom more than one seed remains on each piece of cotton. The seed germinates immediately on reaching clean ground. Germination takes from eight to ten days. Frequently, however, fallen seed will lie suspended in grass or bush for a considerable period without germinating. One can, therefore, readily understand why the burning of an area is usually sufficient to start a dense growth of balsa. From 100 pounds of cotton, 10 to 12 pounds of seed may generally be obtained.

"Balsa grows rapidly. During the first five or six years it may attain a trunk diameter of 60 to 75 cm. and an average increase in thickness of 12 to 13 cm. per year. In height it may attain 16 to 20 meters in five or six years. The maximum size of the tree may be reached in ten years, but the wood at this age would be worthless commercially, since lightness is essential, and as the tree ages the wood loses its porous property. The balsa of commerce is for the most part obtained from

trees of rapid growth—either natural or cultivated—of from four to six years.

"The cultivation of balsa is as yet in its infancy. It was first practiced in Costa Rica during the war, when it appeared that the supply of good natural growth balsa would not meet the demand over an extended period. Uncertain how long hostilities would last, the United Fruit Company started cultivating on an extensive scale around the vicinity of Guacimo, where balsa is found at its best. In order to obtain the very best wood possible, a number of experimental plots were planted with seed obtained from various locations in Costa Rica, Jamaica and other sources. To date the Guacimo balsa has been found superior in both lightness and texture.

"Balsa occurs most frequently in the lowlands and foothills, though rarely, if ever, where the soil is at all affected by brackish or salt water. It has not been discovered at altitudes higher than 1000 meters above sea level. It grows best in loamy soil, in perfectly drained areas.

"The method of cultivation is similar to that of other tropical plants. The land is cleaned, felled and burned during January and February; burning is essential. Then follows lining and planting. The best results have been obtained by lining 20 x 20. Wider planting usually results in trees of much limb-spread and consequent knots in the wood. Furthermore, the wood from the limbs is harder than that from the trunk. Closer planting produces a tall tree of small girth. The ideal is a straight tree with as few limbs as possible. The young trees must be cared for during a period of two years; this consists of cleaning the bush and circling around the young plants until they outgrow the weeds and vines. Cuts from machetes and other implements must be closely guarded against, as a wound inflicted on the young tree is often the starting point of decay.

"From five to six years after planting, the trees are ready for felling. Logs are cut into suitable lengths—from 7 to 14 feet—and hauled by oxen to the railroad, whence they are conveyed to the mills. It is necessary to supply logs to the mills as freshly cut as possible, as the wood is very perishable

when exposed to decay. If kept too long it is affected by borers and becomes discolored. Exposed to the action of the sun, it is liable to split at the time of sawing.

"Production varies greatly. Merchantable lumber to the extent of 5000 board feet per acre would be considered an especially fine yield, one seldom obtained, in fact; 2500 feet per acre would be considered a fair average; while in many instances Costa Rican plantations have failed to yield over 1200 feet.

"From the point of view of the producer, the future of the balsa business depends on the demand for this wood. That balsa can be cultivated successfully has been proven, and suitable lands are available over large areas. At the present time, the demand is limited and the requirements are very stringent. Only the best wood is accepted and there is considerable waste of wood of inferior grade or small size. Efforts have been made to work up a market for 'hogged' material for insulation purposes similar to those for which granulated cork is being used, but to date these efforts have been unsuccessful."

Arboles y arbustos del orden de las Leguminosas. II. Cesalpiniaceas. By H. PITTIER. Reprinted from *Boletin del Ministerio de Relationes Exteriores* 1, 2, 3; Jan., Feb., March 1928. Pp. 83–148; 6¼ x 9.

This is No. 2 of *Contribuciones a la dendrologia de Venezuela*, and follows the plan of No. 1 which described the Mimosaceae. (See *Tropical Woods* 14: 44, June 1, 1928.) Following is a list of the genera, the numerals in parentheses referring to the number of species enumerated: *Bauhinia* (16), *Swartzia* (13), *Dimorphandra* (4), *Haematoxylon* (2), *Moldenhauera* (1), *Parkinsonia* (1), *Cercidium* (1), *Delonix* (1), *Caesalpinia* (6), *Peltophorum* (1), *Dialium* (1), *Apuleia* (1), *Dicorynia* (1), *Cassia* (4), *Chamaefistula* (10), *Herpetica* (1), *Isandrina* (1), *Peiranisia* (7), *Chamaesenna* (2), *Cynometra* (2), *Copaifera* (2), *Poeppigia* (1), *Sclerolobium* (1), *Campsiandra* (1), *Crudia* (1), *Hymenæa* (1), *Peltogyne* (3), *Tachigalia* (1), *Tamarindus* (1), *Eperua* (2), *Macrolobium* (6), *Heterostemon* (1), and *Brownea* (6).

Contribution à l'étude chimique des Malvales. II. Une Bombacée intéressante: Le *Pachira aquatica* Aubl. Sa signification à titre d'oléagineux. By J. Pieraerts, N. Ipatieff, and E. Simar. *Les Matières Grasses* 20: 237: 8056–8, Jan. 15, 1928. Illustrated.

An account of the local uses of the fruits and nuts, followed by analyses and suggestions for commercial utilization of these products.

L'huile de *Carpotroche*. By M. Pio Corrêa. *Les Matières Grasses* 20: 237: 8054–5, Jan. 15, 1928.

The author, the well-known Brazilian authority, concludes that the oil from the seeds of *Carpotroche brasiliensis* Endl. (=*Mayna brasiliensis* Raddi) is so similar to chaulmoogra oil that it can be used instead of the latter in the treatment of leprosy.

The common oaks and chestnuts of Maymyo and Kalaw. By C. W. Scott and C. E. Parkinson. Burma Forest Bulletin No. 19, Botanical series No. 1. Rangoon, 1928. Pp. 16; 6 x 9½; 24 plates.

"The authors' object is to provide a simple key to the identification of the common Maymyo and Kalaw oaks and chestnuts [*Castanopsis* spp.] and to describe and illustrate these trees. In 1920–21 an investigation was conducted by Mr. J. A. Pilgrim, at that time Tannin Expert to the Government of India, into the tannin values of the Burma oaks and chestnuts. The results of that investigation are available in *Indian Forest Records*, Volume X, Part XI, 'Burma Oak and Chestnut Tans,' by J. A. Pilgrim, published in 1924 and obtainable from any bookseller. It was in connection with Mr. Pilgrim's work that interest in the identification of these trees first became really active.

"Mr. Pilgrim proved that the tannin yield and quality of some of the Burma species was excellent. The weakness of these trees as a commercial proposition lies not in their quality but in the quantities available. It is true that the Maymyo plateau and large areas in the Shan States are covered with oaks and chestnuts, but much of this covering

is only a torn and ragged remnant, the result of centuries of taungya or shifting cultivation. Moreover, plantations do not promise a facile solution, for labor is dear and the rate of growth of most of the trees is probably very slow."

Illustrations of Indian forest plants. Part I. Five species of *Dipterocarpus*. By R. H. Parker. *The Indian Forest Records* (Botany Series), Vol. XIII, Part I, 1927. Pp. 29; 5 full-page plates. Price 1s. 9d.

"The reason for the publication of this series of illustrations is that much useful information not generally known is locked up in the form of specimens accumulated in the Dehra Dun Herbarium. Indian plants described in Europe are almost always described on fragmentary and incomplete material and this is not infrequently the case with species described in India. There are numerous instances of Indian plants described from incomplete specimens, where adequate material is now available. Botanical workers are so much devoted to the description of new species that the amplification of inadequate descriptions receives little attention. It is intended, therefore, to use these plates to figure species which have been confused hitherto or are incompletely known rather than for the description of new species."

The illustrations have been made from excellent drawings prepared by Babu Ganga Singh, Artist at the Forest Research Institute. The five species are: *Dipterocarpus costatus* Gaertn., *Dipterocarpus turbinatus* Gaertn., *Dipterocarpus pilosus* Roxb., *Dipterocarpus tuberculatus* Roxb., *Dipterocarpus alatus* Roxb.

An investigation of the soil conditions in Compartment I, Bwet Reserve, Prome Division, with reference to the dying off of *Tectona grandis*. By H. E. Castens. Burma Forest Bulletin No. 18, Silviculturist Series No. 12. Rangoon, 1927. Pp. 14; 6 x 9½; illustrated.

"Compartment No. 1, Bwet Reserve, Prome Division, was examined in order to investigate the soil conditions in the dead crops of teak and in the live ones, and to see as far as is possible by looking at and feeling the soil (1) why the dead crops

died, (2) the probable future of the present young taungyas, and (3) what localities (soil and situation) it is likely to pay to plant with teak in Bwet."

"In conclusion it seems certain that in Bwet there is no justification for planting teak anywhere but in the alluvial valley soil (where the drainage should be attended to in the cleaning stage, *e.g.* till a closed canopy keeps the grass down naturally) and on the rarely occurring deep loamy sand and loam on the broader ridges. No teak planted on clay will do well, while on the narrow ridges and moderate to steep slopes it will almost certainly die in later years, *e.g.* from about twenty-five onwards. Large areas of the new teak taungyas will probably die."

Notes on the comparative economic cost of wood and metal sleepers in India, and cost of treatment. By J. H. Warr and H. Trotter. Forest Bulletin No. 68 (Economy Series). Calcutta, 1926. Pp. 29; 6½ x 9¾; 8 plates (graphs).

"The general conclusions arrived at show that, at present prices, wooden sleepers are slightly more economical than metal ones. Seeing that the original cost of the former is at present higher than it will be in the near future it would seem clear that in this country metal sleepers will not have a great future unless it becomes possible to reduce their price considerably."

"The experiments undertaken at the Forest Research Institute have shown that a great number of the lesser-known timbers are suitable for sleepers if correctly treated, and are actually more economical than sal, deodar, teak, or jarrah. The figures used to establish these facts are all on the conservative side and there is little doubt that the sleepers will have a considerably longer life than has been estimated."

"In Burma the supplies of 'gurjun' [*Dipterocarpus* spp.] are almost inexhaustible; in Assam 'hollong' [*Dipterocarpus pilosus*], 'panisaj' [*Terminalia myriocarpa*], 'makai' [*Shorea assamica*], 'jarul' [*Lagerstroemia Flos-Reginae*], needle-wood [*Schima Wallichii*] and other allied timbers can supply the needs of the railways for many years to come, probably for

ever. In North India the 'chir' [*Pinus longifolia*], blue pine [*Pinus excelsa*], spruce, and silver fir will never give out. In Madras and Bombay the evergreen forests can produce an unending supply of 'karani' [*Cullenia excelsa*], 'pali' [*Dichopsis elliptica*], the *Eugenia* spp., and other suitable woods, to supplement the supplies of *Mesua*, teak, and laurel, while the forests of Central India and Bihar can yield a sufficiency of 'sal,' laurel [*Terminalia tomentosa*], 'kusum' [*Schleichera trijuga*], 'arjun' [*Terminalia Arjuna*], 'padri' [*Stereospermum chelonoides*], axle-wood [*Anogeissus latifolia*], 'mohwa' [*Bassia latifolia*], etc.

"What is now needed is a combination of effort, by the railways on the one hand, and by the Forest Department on the other, the former undertaking the capital expenditure required for the erection of suitable treating plants, and the latter the supply of sleepers in sufficient quantities at economic prices."

Annual progress report on the forest administration in the Presidency of Bengal for the year 1926–27. By O. E. Shebbeare. Calcutta, 1928. Pp. 50; 8½ x 13.

"The last ten or twelve years has seen a complete change in forestry methods almost throughout the province (except the Sundarbans) by the introduction of the 'taungya system,' that is to say, replanting by means of field crops. This means the gradual replacement of our natural forests by pure plantations of valuable species.

"Our natural forests are, for the most part, of no great value as timber crops go, partly because they are not fully stocked but chiefly because they are not composed of two or three species, like European or American forests, but of two or three hundred. The difficulty in marketing a mixture of hardwoods and softwoods, valuable timber and stuff only fit for firewood, can best be realized by picturing similar conditions applied to the stock-in-trade of any other industry. The plantations which we are putting out, on the other hand, consist of even-aged crops of valuable species only and will be of very great value when they come to maturity."

The mechanical and physical properties of Himalayan spruce and silver fir. By L. N. SEAMAN assisted by C. R. RANGANATHAN. Forest Bulletin No. 69 (Economy Series). Calcutta, 1926. Pp. 26; 7 x 9¾; 5 plates (graphs). Price 1s. 9d.

"The conclusions to be drawn from this research may be summarized as follows:

"Himalayan spruce [*Picea Morinda* Link] and silver fir [*Abies Pindrow* Spach] are somewhat stronger than the spruces and firs already tested in Canada and the United States.

"Himalayan spruce red-wood, when obtained from healthy living trees, is in no way inferior to spruce white-wood.

"Himalayan silver fir, judged by the material so far received at the Forest Research Institute, is less knotty than Himalayan spruce, and is also somewhat stronger than that timber.

"Up to the present time, the use of Himalayan spruce and fir in aeroplane construction has been rendered impossible by the presence of knots and resin pockets in the material supplied. If, however, these timbers can be obtained reasonably free from the defects in question, there is no reason why they would not make excellent substitutes for Sitka spruce.

"The strength of Himalayan spruce and silver fir varies with the density of the wood. Unfortunately, on account of the lack of a pronounced difference in the appearance of spring wood and summer wood in these timbers, it is impossible to form a visual estimate of the relative density of various pieces, therefore no density specification can be included in the grading rules for these timbers. All that it is possible to say is that very rapidly grown timber, *i.e.*, timber containing fewer than six annual growth rings per inch, is almost sure to be defective in strength and should therefore be placed in the grade next below that in which it would be placed when judged by defects only."

Forestry in the Dutch East Indies. By C. O. R. SPALTEHOLZ. *Journal of Forestry* 26: 5: 697–701.

An interesting account of the development of a forestry policy of an island area of 473,109,000 acres, of which 64 per cent is forested. The supervisors are educated at the Agricultural College of Wageningen, Holland, and the secondary staff gets its training in Buitenzorg, Malang, and Soekaboemi, Java.

The moisture content of some Eucalyptus woods. By M. B. WELCH. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 61: 296–306, Jan. 1928.

An interesting account of some investigations of the variations in moisture content of the wood of four species of *Eucalyptus*, namely, *E. eugenioides* Sieber, *E. piperita* Smith, *E. haemastoma*, var. *micrantha* Benth. (=*E. micrantha* DC.), and *E. Sieberiana* F.v.M. The trees, which were about six inches in diameter inside bark, were of very slow growth on poor siliceous soil and had very dense wood. The heartwood and sapwood were well defined. The tests were to determine (1) the differences in moisture content in inner and outer heartwood and the sapwood; (2) seasonal variations; (3) effect of rainfall.

"Undoubtedly there is possible a considerable variation in moisture content between the heartwood and sapwood, or in different parts of the heartwood, but there is nothing to indicate that this variation is or is not more or less constant during different periods of the year, in any particular tree. The variations are too great to be accounted for by any change in density of the wood.

"The variation in moisture content which occurs in individual trees between the heartwood and sapwood, and in the same species, at different periods, is such that it appears only possible to regard it as being due to physiological or ecological factors affecting the particular tree."

"It does not appear that there is any very noticeable relationship, as far as the figures given are concerned, between rainfall and moisture content, especially where individual trees are considered. Thus one species may show a considerable increase in moisture content and another a reduction, although both are felled at the same time, in the same locality, and have been subject to the same conditions."

The wood structure of some species of kauri (*Agathis* spp.). By M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 61: 248–266, Nov. 1927. Five text figures.

The species of *Agathis* which supply lumber of the Sydney market are *A. robusta* Masters (Southern or Queensland Kauri or Dundathu Pine), *A. Palmerstoni* F.v.M. (Queensland Kauri), *A. microstachya* Bailey & White (Black Pine), *A. macrophylla* Masters (Vanikoro Kauri), *A. lanceolata* Pancher (Noumean Kauri), and *A. australis* Salisbury (N. Z. Kauri).

The first three, the Queensland Kauris, are usually lighter in weight and softer than the others, while the next two are intermediate between the Queensland and the New Zealand. The anatomical features of the several species are not very distinct, but with the aid of the author's careful descriptions it ought to be possible to distinguish the commercial woods.

Some mechanical properties of Australian grown *Pinus insignis* (*P. radiata*), with notes on the wood structure. By M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 61: 354–370, Feb. 1928. Ill. with photomicrographs.

"*Pinus insignis* Douglas (or more correctly *P. radiata* Don, although the former name has come into almost general use) is popularly regarded as a timber of comparatively little value. The prejudice is apparently due to the fact that trees grown in the open naturally possess numerous lateral branches and the timber is therefore knotty. Apart from this, however, it is commonly believed in Australia that the wood is devoid of strength, but the criticism is usually from those who have not had the opportunity of actually testing the wood. A few years ago, through the courtesy of the Forestry Commission of New South Wales, arrangements were made to obtain some of the timber from Gosford and Sutton Forest, New South Wales, from Creswick, Victoria, and from Wirrabara and Mt. Gambier, South Australia, in order to conduct a series of mechanical tests."

"The results of the tests show that some variation in density and strength occur in the wood grown under different conditions, but even the lightest and most rapidly grown material possesses considerable strength, and where more slowly grown, may possess remarkable toughness. There is evidently a fairly definite relationship between rate of growth, weight, and strength. Apart from the wood near the heart, there is no justification for the belief that the timber is brittle."

Notes on wattle barks. Part II. By F. A. Coombs, W. McGlynn, and M. B. Welch. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 60: 360–371, Apr. 1927.

"Analyses of a number of wattle barks stored for over 30 years in a dry place seem to indicate that no loss of tannin has occurred. The ratio of tannins to non-tannins is much higher than that obtained in freshly stripped bark and suggests the possibility of an actual increase in tannin at the expense of the non-tannins. The high tannin contents also show that, although the barks have changed in color from pale yellow, or at most a light pink, to a deep red, there has been no apparent decrease in the solubility of the tannins; this is confirmed by a microscopic examination.

"The suggestion that high temperatures are necessary for the extraction of the difficultly-soluble red tannins in wattle bark can be discarded; it seems rather that the high temperature necessary to overcome adsorption forces actually turns the tannins red. There is no proof that difficultly-soluble red tannins occur in fresh wattle bark, and at temperatures above 40° a color change to red occurs. Below 40°, however, a complete extraction of these tannins is impossible, so that any process giving approximately a complete extraction must use a higher temperature, and must therefore bring about this change to the reds.

"The loss shown by various writers when solutions of wattle tannins in contact with partially spent bark are exposed to high temperatures is probably due to an insoluble starch-tannin combination, and not to a want of stability of the tan-

nins under these conditions. This starch-tannin compound is partially soluble at temperatures approaching boiling point, but separates out on cooling."

Les tanins végétaux et en particular les écores tannantes de Madagascar. By HERVÉ CHAUVEL. Notice No. 3, Travaux de l'Association Colonies-Sciences (Sous-Commission R), Paris, 1927. Pp. 178; 6 x 9½: 13 text figures. Price 18 francs.

The subject headings of this work are as follows. PART I. Chap. 1, Historical; Chap. 2, Tanning materials; Chap. 3, Tannin extracts. PART II. Chap. 1, Tanbarks of Madagascar and their origin; Chap. 2, Microscopy of these barks; Chap. 3, Qualitative and quantitative chemical analyses; Chap. 4, Comparison of Madagascar tanbarks and other tanning agents; Chap. 5, Conclusions.

Notice sur quelches bois du Katanga. By G. DELEVOY. Published by Comité Spécial du Katanga, Brussels, 1926. Pp. 61; 6 x 9; 16 half-tone plates.

The territory under the management of the Comité Spécial du Katanga extends approximately from 5° to 13° south latitude and from 23° 54′ to 30° 30′ east longitude; its area is about fifteen times that of Belgium. The altitude ranges between 500 and 1800 meters. The variations in soil and climate give rise to more or less sharply defined types of vegetation.

The province may be compared in a general way to a vast plateau inclined to the northwest and crossed by three great valleys (the Tanganika, Lufira, and Lualaba) and some of less importance (the Lomami and Lulua) running north and south, as well as certain others (the Lukuga and Luvua) extending east and west. The great valleys divide the mountainous masses irregularly and constitute extensions of the equatorial and tropical botanical flora into the tropical and subtropical regions which cover the larger part of the country.

The three principal zones of vegetation, from the standpoint of the practical farmer and forester, are: (a) the eastern part, (b) the western part; and (c) the highlands. The divisions are irregular and tend to intergrade. The most important formations are: (1) the equatorial forest or alluvial fringes and the mountain forest; (2) the wooded savannah with its variants—

the park, the scrub, and the intermediate; (3) the herbaceous savannah or the steppe; (4) the marsh.

The principal kinds of trees are described with reference to their size and abundance and the properties and uses of their timber.

CHECK LIST OF THE COMMON NAMES

Adolumbi	*Klainedoxa ovalifolia* Verm. (?)	Simarubaceae
Alumbi	*Klainedoxa ovalifolia* Verm. (?)	Simarubaceae
Boleko	*Ongokea Klaineana* Pierre	Oleaceae
Kabamba Katoka	*Brachystegia* sp.	Leguminosae
Kabamba lungwaluole	*Brachystegia* sp.	Leguminosae
Kabi	*Swartzia madagascariensis* Desyr.	Leguminosae
Kabulungu	?	?
Kafi	?	?
Kahimbi	*Erythrophloeum africanum* Harms	Leguminosae
Kako kiba	?	?
Kakulu	*Pseudocedrela* sp. (?)	Meliaceae
Kalewalewa	?	?
Kamema	?	?
Kasuku	*Pachylobius* (?)	Burseraceae
Kawasawasa	?	?
Kayombo	?	?
Kekele	?	?
Kibalebale	*Afzelia Cuanzensis* Welw.	Leguminosae
Kikobwa	*Stereospermum katangensis* De Wild. (?)	Bignoniaceae
Kimpampa	*Monotes Katangensis* De Wild.	Dipterocarpaceae
Libuyu	*Entandrophragma* sp. (?)	Meliaceae
Limbali	*Macrolobium Dewevrei* De Wild.	Leguminosae
Lumwangamasase	?	?
Moabi	*Sterculia quinqueloba* (Garcke) K. Schum.	Sterculiaceae
Mofwe	*Pseudocedrela* sp. (?)	Meliaceae
Mohamma	*Borassus flabellifer* Murr. var. *Ethiopica*	Palmaceae
Mpopwe	*Fagara Homblei* De Wild.	Rutaceae
Mubanga	*Ormosia Brasseuriana* De Wild.	Leguminosae
Mubanga des eaux	?	?
Mufinsa des bois	*Syzygium Oweriensis* (P. B.) Benth. (?)	Myrtaceae
Mufula	*Chlorophora excelsa* Benth.	Moraceae
Mufutu	*Vitex* sp.	Verbenaceae
Mukula	*Pterocarpus odoratus* De Wild., *P. Delevoyi* De Wild., and *P. tinctorius* Welw.	Leguminosae

Mukusu	*Ricinodendron Rautaneni* Schinz	Euphorbiaceae
Mukuwe	*Parinarium polyandrum* Benth.	Rosaceae
Mulela	?	?
Mulombwa	*Pterocarpus angolensis* DC. and *P. erinaceus* Poir.	Leguminosae
Munyenye	*Tetrapleura* sp.	Leguminosae
Muonga	?	Meliaceae
Mupundu	*Parinarium Mobola* Oliv.	Rosaceae
Mupundu blanc	*Parinarium* sp.	Rosaceae
Mupundu gris	*Parinarium* sp.	Rosaceae
Musamba	*Brachystegia* sp.	Leguminosae
Musase	*Albizzia katangensis* De Wild. or *A. Brownei* Walp.	Leguminosae
Musesji	*Parinarium* sp.	Rosaceae
Mutobo des eaux	?	?
Mutondo	*Pterocarpus angolensis* DC. and *P. erinaceus* Poir.	Leguminosae
Mutondo blanc	?	?
Mutontwe	*Parinarium* sp.	Rosaceae
Mutumbu	?	?
Mwabi	*Sterculia quinqueloba* (Garcke) K. Schum.	Sterculiaceae
Mwafi	*Erythrophlœum guineense* Afz.	Leguminosae
Ndale	*Swartzia madagascariensis* Desv.	Leguminosae
Ngalati	*Brachystegia* sp.	Leguminosae
Nyandwe	*Erythrophlœum africanum* Harms	Leguminosae
Saninga	*Faurea saligna* Harw. and *F. discolor* Welw.	Proteaceae
Sokolobe	*Uapaca nitida* Muell. Arg.	Euphorbiaceae
Ulundu	*Chlorophora excelsa* Benth.	Moraceae

Contribution a l'étude de la flore du Katanga. Supplement I. By E. DE WILDEMAN. Published by Comité Spécial du Katanga, Brussels, Dec. 1927. Pp. 99; 6¾ x 10¼.

The original contribution by the same author was published in July 1921 and enumerated 1910 species representing 582 genera and 113 families. The supplement increases these totals to 2090 species, 611 genera, and 117 families.

Études systématiques des bois du Katanga. I, II, III. By G. DELEVOY. Pub. by Comité Spécial du Katanga, Brussels, 1928. Pp. 24, 37, and 36, resp.; 6 x 9.

The first of this series of pamphlets is devoted to general considerations, definitions of terms, and explanation of

methods followed in the investigations. The chapter headings are: A. Technical properties (nature of the wood, defects, chemical properties, durability). B. Physical properties (density, hygroscopicity). C. Mechanical properties (factors affecting the properties, outline of timber tests).

Each of the other two contains detailed descriptions and test data of six woods, following a uniform outline, namely, scientific name, vernacular names, source, abundance and size, characteristics of specimen, description of the wood (gross anatomy), timber tests, workability, and conclusions. The following species are described:

1. *Afzelia cuanzensis* Welw. (Leguminosae) "Kipapa."
2. *Erythrophlœum guineense* Don. (Leguminosae) "Mwafi."
3. *Pterocarpus Delevoyi* De Wild. (Leguminosae) "Mukula."
4. *Vitex Cienkowskii* Kotsch & Peyr. (Verbenaceae) cf. "Mufutu."
5. *Brachystegia mimosaefolia* Hutch. & B. Davy. (Leguminosae) "Ngalati."
6. *Faurea discolor* Welw. (Proteaceae) "Saninga."
7. *Brachystegia Bequaeti* De Wild. (Leguminosae) "Musamba."
8. *Brachystegia* sp. (Leguminosae) "Kabamba Katoka."
9. *Chlorophora excelsa* (Welw.) Benth. & Hook. (Urticaceae) "Mufula."
10. *Entandrophragma* sp. (Meliaceae) "Libuyu."
11. *Fagara Homblei* De Wild. (Rutaceae) "Mpopwe."
12. *Pterocarpus angolensis* DC. (Leguminosae) "Mulombwa."

Études systématiques des bois du Katanga. I, II, III. By G. DELEVOY. Publication du Comité Spécial du Katanga, Brussels, 1928. Pp. 24, 37, 36; 5¾ x 7¾.

The first of this series of pamphlets is introductory to the others and outlines the nature of the investigations and defines the terms used. The outline is as follows: (a) Technological properties—general features (anatomy, color, grain, etc.), faults and defects, chemical composition, and durabil-

ity; (b) Physical properties—density and hygroscopicity; (c) Mechanical properties—results of timber tests.

Part II is concerned with the following species: (1) *Afzelia cuanzensis* Welw., (2) *Erythrophlœum guineense* Don, (3) *Pterocarpus Delevoyi* De Wild., (4) *Vitex Cienkowski* K. & P., (5) *Brachystegia mimosaefolia* Hutch. & B. Davy, (6) *Faurea discolor* Welw. Part III: (7) *Brachystegia Bequaerti* De Wild., (8) *Brachystegia* sp., (9) *Chlorophora excelsa* (Welw.) B. & H., (10) *Entandrophragma* sp., (11) *Fagara Homblei* De Wild., (12) *Pterocarpus angolensis* DC.

Avodiré, ein nutzholz Westafrikas. By H. MEYER. *Tropenpflanzer* 31: 1: 15–16, Jan. 1928.

"Avodiré" is the name applied in the French timber trade to a commercial wood from West Africa, particularly the Ivory Coast, where it is known also as "hagué" and "hakué." The wood was introduced in the German market about 1923.

The tree has been identified as *Turræanthus africanus* Pellegrin (=*Bingeria africana* A. Chev.=*Guarea africana* C. DC.) of the family Meliaceae. It attains a height of 80 feet and over, with a clear length of about 50 feet, and a diameter of three feet or more. There is considerable waste in utilization because of irregularities of growth. The logs are imported in the round, free of bark.

The wood, unlike that of most members of the Meliaceae, is of a pale yellowish color throughout. No growth rings are visible. There is a tendency to curly and roe grain; the texture is uniform. The pores are fairly numerous, readily visible, uniformly distributed, mostly solitary but sometimes in radial groups of two or three. The rays are scarcely visible without the lens.

Sp. gr., fresh wood, 0.70; air-dry (11.1 per cent moisture), 0.50 to 0.60. The dry wood was found to have the following composition: ash, 4.56 per cent; fats and waxes, 0.80 per cent; cellulose, 62.15 per cent; lignin, 32.49 per cent. In practical operations about 37 per cent of cellulose could be obtained from the dry wood.

The comparatively light wood stands well, is easily and readily worked with tools, and is suitable for the lighter types of furniture, especially the interior fittings, as well as for construction lumber. Figured wood is prized for veneers.

Le Bossé, *Trichilia cedrata* A. Chev.[1] By AUG. CHEVALIER, ET AL. *Actes et Comptes-Rendus de l'Association Colonies-Sciences* 3: 23: 89–99, May 1927.

A monograph, upon which several scientists collaborated, dealing with an important commercial timber from the Ivory Coast, Africa, under the headings: History, Botanical Description, Habitat and Distribution, Vernacular and Commercial Names, Appearance of the Wood, Gross Anatomy, Minute Anatomy, Mechanical Properties, Manufacture and Utilization.

The tree is well-formed, usually 80 to 115 feet high and 24 to 28 inches in diameter, exceptionally 130 feet high and 39 inches in diameter, breast high, growing fairly abundantly in the humid virgin forests. Its most common vernacular name is "bossé" or "mbossa"; others are "mbossé" (Agni), "anokué" (Mbomoi), "n'ganaké" or "hagué" (Abé), "ibotou" (region of the Béréby); also, according to Salesses, "krassé" (Abé) and "dozana" (Attié). The commercial names are "bossé," "cèdre," "cedar," "santal d'Afrique," and "acajou rosé."

The freshly cut wood is yellowish and has a density of about 0.90, but when dry it is light red and the density ranges from 0.58 to 0.69, average about 0.60. The sapwood is of lighter color and approximately 4 inches thick. Some specimens have a characteristic cedar odor, but it tends to disappear in time. The wood is roe-grained, often attractively figured, easy to work, holds its place well, and is well-suited for furniture, cabinet-work, interior finish, and in general for the same purposes as mahogany. It is also suitable for cigar boxes.

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[1] At the time this was published the flowers of the tree were unknown and the generic status was in doubt. The missing botanical material was secured in March 1928 and the species has been transferred by Pellegrin to *Guarea*, according to information given the editor upon the occasion of his recent visit to the office of the Association. *Trichilia cedrata* A. Chevalier thus becomes *Guarea cedrata* (A. Chev.) Pellegr.

Okoumé, *Aucoumea Klaineana* Pierre. By A. BERTIN, AUG. CHEVALIER, ET AL. *Actes et Comptes-Rendus de l'Association Colonies-Sciences* 3: 30: 245–261, Dec. 1927; 4: 31: 13–21, Jan. 1928. Ill. with map, text figures, and graphs.

A comprehensive study of a West African wood which has become of great economic importance in Europe, especially for the manufacture of plywood for a wide range of uses. The exports, from Gaboon, which began in 1902 with about 5000 tons, had risen to over 134,000 tons in 1913. Trade was discontinued during the war, but the exports of round and square logs (and a small amount of lumber) afterward were as follows:

Year	1920	1921	1922	1923	1924	1925	1926	1927
Tons	33,365	47,795	70,120	93,227	180,891	202,499	222,105	300,000[1]

The subject matter is treated under the following headings: I. The Tree, from the Botanical and Forestry Standpoint. A. History. B. Names. C. Habitat (range, site and growth, abundance, native uses). D. Morphological Characters and Botanical Description. II. The Wood. A. Gross Anatomy. B. Minute Anatomy. C. Chemical Properties. D. Physical Properties. E. Mechanical Properties. F. Technical Properties. G. Uses. H. Commercial Consideration. III. Substitutes: A. *Canarium* spp. B. *Pachylobus* spp.

Nos bois coloniaux (Côte d'Ivoire, Cameroun et Gabon). Iroko (*Chlorophora excelsa* Benth. & Hook.). Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 4; 5¼ x 6¼; 2 plates; 2 veneer samples.

Nos bois coloniaux (Gabon et Moyen-Congo). Evino (*Vitex pachyphylla* Bak.). Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 4; 5¼ x 6¼; 2 plates; 1 veneer sample.

[1] This last figure is taken from a leaflet on Okoumé in the series *Nos Bois Coloniaux* published by the Association Colonies-Sciences.

Nos bois coloniaux (Gabon et Moyen-Congo). Okoumé (*Aucoumea Klaineana* Pierre). Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 4; 5¼ x 6¼; 2 plates; 2 veneer samples.

Nos bois coloniaux (Côte d'Ivoire). Bossé (*Trichilia cedrata* A. Chev.).[1] Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 4; 5¼ x 6¼; 2 plates; 2 veneer samples.

Nos bois coloniaux (Cameroun, Gabon et Moyen-Congo). Limbo (*Terminalia superba* Engl. & Diels). Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 4; 5¼ x 6¼; 2 plates; 2 veneer samples.

This and the four preceding publications belong to a series of leaflets prepared by the Association Colonies-Sciences, 44 Rue Blanche, Paris (IX[e]), to acquaint the public and the trade with the more important timbers of the French colonies. They are uniform in design: on the front cover are line drawings of the leaves, flowers, fruits, etc.; on the back cover a lithograph showing the natural appearance of the wood; on the second page a description of the tree from the standpoint of the botanist and forester; on the third page an account of the properties and uses of the wood. Samples of the veneers are included, usually both tangential and quartered. (Although the price is not stated, the editor is informed that it is 15 cents [U. S. currency] for each leaflet.)

Notes on the forest flora of South Central Africa. By P. J. GREENWAY. *Kew Bull. Misc. Information* 5: 193–208, 1928. Illustrated.

The specimens enumerated were collected in Northern Rhodesia, Nyasaland and surrounding country by members

[1] *Guarea cedrata* (A. Chev.) Pellegr.

of the staffs of the Imperial Forestry Institute and the Forest Services of the Colonies mentioned.

"The collections represent 131 species, comprised in 80 genera and 34 families. The three families of Leguminosae furnish the largest number of species; the Caesalpiniaceae contain 26, including two new species of *Brachystegia*, *B. Bournei* Greenway and *B. nchangensis* Greenway; Mimosaceae 9 species, of which 5 are Acacias; and Papilionaceae 12 species. In the Myrtaceae there is a new species of *Syzygium*, *S. mumbwaense* Greenway.

"Only two genera of the Dipterocarpaceae, *Monotes* and *Marquesia*, are met with in tropical Africa; of the former there are several reputed species, which are fairly common in the dry savannah-forest. *Marquesia macroura* Gilg, the 'musesjie,' is one of the most abundant trees in Northern Rhodesia and the Katanga, where it attains a height of 65 to 80 feet; the wood is described as very hard and of good quality and is used for finishing houses and in carriage-building. In view of the great economic interest of the Dipterocarps in the Indo-Malayan Region, the African species are worth careful investigation."

Pinus patula Schl. & Cham.: Its introduction and growth in South Africa. By J. J. Kotze. *South African Journal of Science* 23: 455–466, Dec. 1926. Three plates. (Reprinted as part of Bulletin No. 19, Forest Department, Union of South Africa.)

Pinus patula, so far as is definitely known, is confined to elevations of about 6000 to 8000 feet on the moist mountains on the eastern side of the Mexican plateau between latitudes 19° N. to 21° N. The climate of its natural habitat is very similar to that of the mountains of eastern South Africa up to moderate elevations and it is one of the main species upon which reliance is being placed to meet the soft-wood requirement of that country. Plantings have continued since 1907, first from seed obtained in Mexico and later from the plantations. The report contains an account of the nursery treatment and the results so far obtained in the various plantations.

Report on the physical and mechanical properties of _Pinus patula_. By Nils B. Eckbo. *South African Journal of Science* 23: 467–471, Dec. 1926. (Reprinted as part of Bulletin No. 19, Forest Department, Union of South Africa.)

The material for testing was obtained from the Cedara and the Belfast plantations. The age of the trees was 10 years and the rate of growth was about one inch in diameter a year.

"The physical quality tests carried out show the wood of *Pinus patula* to be white, of very light weight, easily worked by machine or hand, almost non-resinous, with no odor nor taste, readily stained or painted, suitable for glueing, and nailing without splitting.

"The mechanical quality tests carried out show the wood of *Pinus patula* to be weak, brittle, and soft; but the strength values of more mature trees are likely to be greater.

"The foregoing properties indicate that the wood is best suited for box-making at this present time and will enjoy a very great demand for this purpose; but that the market will be increased to include many items in the general building trade, and that even Clear Pine may be replaced by *Pinus patula* to a certain extent. The future market outlook for *Pinus patula* seems very good."

Dendrographic experiments: _Ocotea bullata_ E. Mey ("Stinkwood"). By John F. V. Phillips. Reprint, *South African Journal of Science* 24: 227–243, Dec. 1927.

"No definite periods of rest are detectable, but periodic checks in increment certainly do occur, according to the nature of the prime factors—chiefly soil moisture—obtaining. Such checks are shown in the formation of wood containing vasa and other elements smaller than the usual, or wood equivalent in structure with the 'autumn wood' of European trees. By means of diameter-increment data and microscopic examination of tissues from the same trees as supplied the former, it has been possible to establish the fact that the number of growth rings formed within 12 months is entirely an outcome of the habitat complexes experienced by the particular tree during that period. The number of rings formed ranges from

1 to 3, while indistinct or 'shadow' rings are associated frequently with their more definite fellows. This feature, so far as the writer has been able to ascertain, is by no means confined to *Ocotea*, but is common to at least half a dozen of the other tree species at Knysna. Obviously, then, determinations of the numbers of rings in trees of given diameter are of little value in establishing their approximate ages."

Tree planting in South Africa, including the Union of South Africa, Southern Rhodesia, and Portuguese East Africa. By T. R. Sim. Pietermaritzburg, 1927. Pp. 452; 5½ x 7¼; 74 plates (line drawings).

An interestingly written book containing a wealth of material and by no means limited in its application to South Africa. The chapter headings are as follows: (1) Introduction; (2) South African timber demands; (3) The coming timber famine; (4) What government has done; (5) What the public has done and what it requires to do; (6) Timbers and their qualities and their preservation; (7) Utilization of timbers; (8) Eucalypts; (9) Pine trees; (10) Acacia trees and wattle bark; (11) Cedar and cypress woods, and other conifers; (12) Deciduous trees; (13) Miscellaneous trees; (14) Trees for experimental culture; (15) Trees for ornamental use, street trees, avenues and hedges; (16) Trees for certain localities; (17) Tree planting for the farm; (18) Indigenous trees; (19) Climatic conditions and erosion; (20) Selection of site, preparation for, and planting of trees; (21) Maintenance during growth; (22) Harvesting of timber; (23) Tree planting in Southern Rhodesia; (24) Tree planting in Portuguese East Africa; (25) Bye-products and possible industries; (26) Pests and troubles of trees; (27) Wattle pests; (28) Crown swelling in Eucalyptus; (29) Bibliography; (30) Index.

The examination and testing of colonial timbers by the Imperial Forestry Institute (University of Oxford) and the Forest Products Research Laboratory. Published by the Department of Scientific and Industrial Research, F. P. R. Laboratory, Princes Risborough, England. Pp. 14; 6 x 9½; 2 text figures.

An outline of the coöperative timber investigations of the two institutions and instructions to collectors of material to be studied and tested.

Descriptive list of some Empire timbers recommended by the Imperial Institute Advisory Committee on Timbers. Published by The Imperial Institute, London, 1928. Pp. 77; 6 x 9½. Price 2 shillings.

"The Imperial Institute Advisory Committee on Timbers was established in 1916 to consider the question of the wider utilization in this country of new or relatively little-known Empire timbers, and to advise in connection with the work on timbers carried out at the Imperial Institute. The committee has been considering in turn the timber resources of the principal overseas countries of the Empire and has collected information regarding a considerable number of timbers which have been selected as worthy of full consideration by the timber-using professions and trades, either as 'new' timbers or as substitutes for woods of foreign origin already in common use. In some cases the timbers are already in use, but merit a far wider utilization than at present obtains. In other instances, the woods are comparatively little known. . . .

"The introduction of 'new' timbers is not an easy task. Apart from useful technical qualities, a timber must be able to compete in price with established timbers of the same class, while supplies must be available regularly in quantity and offered in sound condition; if manufactured, it is essential for the timber to be true to size and specification. For various reasons it is often difficult to comply with all these requirements. The coöperation of the timber trade in organizing the new business is essential, and, if it is agreed that the trade is not wholly free from conservatism, it will be conceded that the position taken up is not infrequently based on reasonable commercial considerations. Again, architects and other timber-users hesitate to take risks with woods of which they have no experience, and hence the trade receives no demands for new woods which otherwise they might be stimulated to supply; further, the predilection of the workman for a relatively small number of well-tried timbers is no small factor in

the situation. Such a position is not satisfactory and can be best improved by demonstration to the parties interested that excellent new timbers, or timbers used less extensively than their merits warrant, are available from Empire sources and can be recommended for a variety of purposes.

"The committee's recommendations have been based on a careful examination of representative examples of the timbers concerned, supplied in most cases by the respective overseas governments or from the timber collections at the Imperial Institute. In other instances experience has been gained as a result of commercial trials carried out by firms represented on the committee.

"Throughout the investigations opportunity has been taken to obtain expert evidence from overseas forestry officers when on leave, from members of the trade, and from other sources. These enquiries have been supplemented by practical trials and strength tests carried out, according to circumstances, at the Imperial Institute or at the works of members of the committee or by other special arrangements. Wherever possible, information has been obtained regarding the commercial questions of prices of the selected timbers, and as to the quantities and sizes available.

"The committee consider that the time has arrived when it would serve a useful purpose to bring together the results of their investigations in a form admitting of wide distribution among the various interests and industries concerned with the utilization of timbers. It has therefore been decided to publish the present descriptive list which affords particulars regarding the first selection of timbers from Canada, Australia, New Zealand, India, North Borneo, West Africa, British Guiana, and British Honduras recommended by the committee.

"The timbers selected vary widely in character and uses, and among them will be found woods of interest to architects, builders, furniture and cabinet-makers, joinery manufacturers, railway carriage, wagon and motor-body builders, and other users of timber, whilst other woods are suitable for sleepers, plywood manufacture, and veneers. In each case the names of the timber and the country of origin are given together with a statement of the general character and present

or suggested uses of the timber. Particulars of the sizes in which the timber is usually available and probable average prices at the time of preparing the list are also given."

Some woods of the Magnolia family. By R. P. McLaughlin. *Journal of Forestry* 26: 5: 665–677.

Contains two keys to the identification of the woods, one based on the gross anatomy, the other upon microscopic features. The family is considered in a broad sense as including four tribes—Magnolieae, Schizandreae, Illicieae, and Trochodendreae—and some of the systematic difficulties of this classification are briefly considered.

Die vermehrung der radialen reihen im cambium. By Johannes Jacob Beijer. Reprinted from *Recueil des Travaux Botaniques Néerlandais* 24: 631–786, 1927. Ill. with 33 text figures, 1 plate.

A dissertation on the secondary growth of the stem of *Herminiera elaphroxylon* Guill. & Perr. with particular reference to the storied or tier-like arrangement of the elements of the wood.

Contributions to the chemistry of the plant cell wall. II. Lignification in the secondary and tertiary layers of the cell walls of wood. By William M. Harlow. Technical pub. No. 24, N. Y. State College of Forestry, Syracuse, July 1928. Pp. 12; 5¾ x 9; 5 half-tone plates.

Der heutige stand botanisch-mikrotechnischer schneidenmethoden. By Joseph Kisser. *Biologia Generalis* 4: 1, 2: 131–180, 1928. Illustrated with 9 text figures and 3 plates.

A chlorination method for macerating woody tissues. By William M. Harlow. *Botanical Gazette* 85: 2: 226–227, April 1928.

Mikrochemische untersuchungen des mit kupfervitriol umprägnierten holzes von *Cryptomeria japonica* Don. By K. Ohara. *Japanese Journal of Botany* (Tokyo) 3: 4: 324–333, 1927.

The chemistry of wood. I. Analysis of wood rays of two hardwoods. By WILLIAM M. HARLOW and LOUIS E. WISE. *Journ. Industrial and Engineering Chemistry* 20: 7: 720–722, July 1928.

The large rays of *Quercus alba* L. and *Casuarina inophloia* F. Muell. & Bail. were removed in amounts sufficient for quantitative work. In the latter the rays averaged 0.8 by 20 mm. in width and height, respectively, while in the white oak the average was 0.3 x 25 mm.

There was no appreciable difference in the ash content of rays and total wood in white oak, but ash was higher in the rays of the Australian wood. In both woods the content of cellulose was lower and that of lignin higher in the rays than in the woods as a whole.

"In this study the microscopic evidence is in harmony with the quantitative results and suggests that microchemical methods may be entirely trustworthy provided reagents are chosen which will react in an understandable manner. In this instance the differences in cellulose and lignin content of rays and wood may be correlated with (1) thickness of the middle lamella, (2) width of the secondary cell wall, (3) the ray volume of the wood."

Over het gehalte van in alcohol oplosbare stoffen in het kernhout van verschillende boomsorten. By A. TE WECHEL. Reprinted from *De Indische Mercuur*, March 24, 1928.

A report, mostly in tabular form, of a series of tests on the extracts from the heartwood of 132 species chosen at random and representing 46 families, nearly all from Surinam and Java. The substances were not qualitatively analyzed, but characteristic properties and reactions are given which should prove of great assistance in identification. The quantitative figures given show a range from less than 1 to more than 40 per cent, the average being 5.85 per cent. The average for 36 woods of the Leguminosae was 8.5 per cent, and the two specimens with the greatest content, namely 40.6 and 39.1 per cent respectively, belong to that group. The report, which is intended only as preliminary, is exceedingly interesting and serves to call attention to an almost virgin field of investigation.

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Yale University School of Forestry

TROPICAL WOODS

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

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THE FORESTS OF WESTERN PANAMA

By G. PROCTOR COOPER

Field Assistant in Tropical Forestry, Yale University

The Republic of Panama, with an area of over 30,000 square miles and a population of about half a million people, is divided into nine provinces and one department, namely, Bocas del Toro, Colón, and the Department of San Blas on the north coast, and Chiriquí, Veraguas, Los Santos, Coclé, Herrera, Panama, and Darién on the south coast. The older maps showing the Provinces of Chiriquí and Veraguas extending to the Caribbean and the Province of Panama running to the Colombian border are now obsolete, as a re-arrangement of the boundaries gives Bocas del Toro the entire Caribbean coastline to where it joins with the Province of Colón. From the very large Province of Panama the new Province of Darién has been created,—still inhabited by savage Indian tribes

which seldom acknowledge the sovereignty of the federal government and who still make frequent use of the poisoned arrow against their enemies, whether man or beast.

To those who examine the map of Central America closely for the first time it is a source of surprise to find that the Republic of Panama has its longer axis nearly east and west and that in passing through the Canal from the Atlantic side on the north to the Pacific Ocean on the south one travels in a southeasternly direction,—Panama City being actually eastward of Colón. The Panama Canal, running with the short axis, divides the republic almost in half, while the Cordilleras traverse the long axis and form an almost impassible barrier between the north and south coasts, except at the Canal.

In studying the area west of the Canal one sees the decided effect of rainfall. On the Caribbean Coast the climate is regulated by the trade winds, generally heavily moisture-laden during the winter months. The precipitation is heavy at this time and flood conditions often prevail on the low coastal banana lands. But on the Pacific Coast and on the Gulf of Darién on the Caribbean this period (January to April) is the dry season, and in places it does not rain for two or three months' duration. The grasses and small plants often turn brown from lack of water and the cattle ranges have a semi-arid appearance. Naturally, this difference in the precipitation has a marked effect on the plants and forests of each region. The more open park-like stands above the mangrove fringe on the Pacific Coast are nowhere to be found on the north, which has an evenly distributed rainfall, or at least no regular dry season, and consequently a heavy, luxurious tropical forest growth throughout.

The moisture factor also determines to a large extent the use to which the land is put. The Pacific Coast provinces west of the Canal are great cattle regions, while on the opposite side of the mountains to the north are the banana lands of the United Fruit Company, spread along the narrow coastal plain from the Chiriquí Lagoon to and beyond the Costa Rican border, and east of the Canal to the Colombian border.

Except in the case of one or two relatively small protected areas, the velocity of the wind on the Pacific slope makes it impossible to raise bananas without considerable "blow-down" hazard. The higher altitudes are suitable for sugar cane and coffee and some excellent grades of bean are raised in the vicinity of Boquete at 4000 feet. The soil is very rich and fertile over most of the watershed of the Chiriquí Volcan, a peak rising over 11,000 feet above the sea, and the climate during most of the year is delightful. There is one spot on the Volcan, at about 6000 feet, where one can view both the Pacific and the Caribbean by a turn of the head, perhaps the only place in all the Americas that this is possible.

In contrast to the Pacific aspect, the mountain slopes running down into the Caribbean are mostly of red clay and unfit for cultivation. The continual heavy precipitation over this region gives it a rank, impenetrable growth of jungle. The rather evenly distributed rainfall on the north coast seems also to affect the woods of the forest trees in that they are generally less dense and not considered as strong or durable as identical species from the Pacific side where an annual dry season occurs. For example, mahogany from the vicinity of Puntarenas, Costa Rica, sells for $150 gold per thousand feet in San José yards, while that from the Caribbean lowlands, although costing more to log and transport up the mountains by rail, brings only $125 gold. Many more species are made use of on the Pacific side than on the Caribbean, perhaps because the woods are more accessible and the population greater in the former region, aside from the better quality of the woods themselves.

The woods considered in the following account were collected for the Yale School of Forestry from two distinct regions: (1) Vicinity of the United Fruit Company plantations, in the Province of Bocas del Toro, representing the western Caribbean conditions, and (2) vicinity of Progreso and Divalá, in the Province of Chiriquí, representing one of the few possible banana regions on the Pacific slope of the Republic, where the winds are moderate, the soil good to excellent, and the dry season only moderately pronounced.

The Province of Bocas del Toro

The Province of Bocas del Toro has a population of about 30,000, mostly West Indians (imported many years ago by the banana companies for work on the farms) and Indians living in the bush. The latter often raise small patches of bananas for sale to provide such of their requirements as they cannot readily supply themselves from the jungle and the soil. In the two or three towns there are some Panamanians of the upper classes, mostly in charge of government administration. Bocas del Toro, the provincial capital, has a population of about 3000. An English patois is more generally spoken than Spanish.

The only means of transportation on land is by the banana railroad and a few poor horse-trails. The main railroad runs from the deep-water port of Almirante up the coast 20 miles and then turns inland along both sides of the Río Sixaola, which, at the moment, forms the international boundary line between Panama and Costa Rica. The end of this line is not far from the foothills and has an elevation of 300 feet. Several kinds of trees grow at this altitude which are not found in the coastal plain.

The work done in this province by George MacKay Slater and the writer, both in the employ of the United Fruit Company at the time, was begun in the autumn of 1926 and carried through until July 1927, when operations were shifted to the Pacific side. The region known as Changuinola is typical of the banana area, and most of the specimens were gathered from the virgin lands adjacent to the banana farms, the second-growth land which was abandoned some years ago, and the pastures on which many interesting trees were left for shade. The writer returned alone to this region in the winter of 1927 and spring of 1928 and gathered over 300 additional specimens, as well as supplementary material for the many doubtful numbers of the first lot. A number of specimens were gathered from Columbus Island, on which the town of Bocas del Toro is located, and it was found to be an ideal region for many unusual trees. This expedition was under the direction of the Yale School of Forestry and in coöperation

with the Field Museum of Natural History, the New York Botanical Garden, and the United Fruit Company.

The Changuinola region is made up of four kinds of lands: (1) The old abandoned banana plantations and pastures that are now cleared, all above the lower Changuinola river; (2) a strip which could be called marginal land, not good enough for bananas, though not swampy; (3) the "catival," where the stand is almost pure Cativo in places; (4) the "yulial," which is under water most of the year.

In the first type are found Chaperno or Dogwood, Guácimo Molenillo, Guácimo del Ternero or Bastard Cedar, Guarumo or Trumpet Trees, Balsa, Ceiba, Sandbox or Javillo, Guavo, Guayabo, Wild Fig, Jobo or Hog Plum, Capulín, Wild Tamarind, Laurel Negro, Lagarto or Prickly Holly, Ramoon, Burío or Majagua, Bribrí, Stinking-toe or Carao, Ebo or Almendro (left because too hard to cut), Breadnut (left for same reason), and a few others.

In the second type there are some trees which are also present in the first type, there being a gradual transition throughout; also some Cativo, Tamarind, Figs, Cedro Macho, Sangrillo, Mastate, Bogum or Barillo, Madroño, Mata-palo, Garoche, Fruta Dorado or Bogamani, Fiddlewood or Llema de Huevo, John Crow Wood, Camfine or Fosforito, Anona, Mata Cansada, Ajoche Macho, Guayatil Blanco and G. Colorado, Cabbage Palm, Pilón, Palo de Leche, Zapote de Mono, Jagua, Aguacatillo, Wild Cacao, Wild Guavo, Monkey Tamarind, Manwood, Nispero, Bully Tree, María (rare), Cedro (rare), and several others for which no vernacular names were learned.

In the third type the stand is over 75 per cent Cativo, with Bogum, Tamarind, Guayatil, Cedro Macho, Silica Palm, and Sangrillo scattered with others throughout.

In the fourth type, which is called "yulial" by the Indians because of the predominance of Silica Palms, there are few trees of importance. This area extends to the mangrove swamps on the coast.

Specimens taken from the Talamanca Valley at an elevation of above 300 feet are from the slopes of the foothills and the woodlands around the farms. This region, although

in Costa Rica, is reached via the railroad from the Panamanian port of Almirante, and geographically should be included in Panama.

There is no export trade in the woods of this region, and only a few find local use in the operations of the United Fruit Company. Ties are cut from Nispero, Bully Tree, Manwood (at least three woods by this name), Llema de Huevo, Fiddlewood, Sigua Canelo, Cabbage Bark, Alcornoque, Sur Espino, and Guayacán (from the hills back of Talamanca, where it is called Yellow Manwood). Fence posts split from the shell of an old log on the ground proved to be identical with the Cuajada (*Vitex Cooperi*) of Chiriquí. The majority of posts and piles for houses and also some railway ties are made from this wood or from the Black Manwood. Orey and Mangrove are used for most of the piling in salt water. For rough construction lumber a wood called Cedro Macho or Saba (probably two woods) is now generally used since the Spanish Cedar (*Cedrela*) has been exhausted. This wood is also used for bridge boards, as are Bogum or Barillo and Laurel. For finer construction and furniture Spanish Cedar and Mahogany are brought in, and the Laurel Negro is also used to a limited extent. Most of the buildings, that is, the "white" houses, are made of Georgia pine, as it was found cheaper to import this lumber than to log and mill the questionable local timber.

An examination of the banana ports on one short spur showed no less than seven different woods used as posts, namely, the Black Manwood, the Yellow Manwood, Sur Espino or Alcornoque, *Clarisia* sp. (new for Panama), *Mouriria parviflora*, and two unidentified woods.

The Province of Chiriquí

The Province of Chiriquí runs from the Montañas de Santa Clara, a range lying north and south and forming a part of the disputed Costa Rica-Panama border, to the Río Tabasara forming the provincial boundary with Veraguas. It is separated from Bocas del Toro on the north by the Serrania de Tabasara of the Cordilleras. The high peaks, beginning at the Costa Rican frontier, are Cerro Pondo, Cerro del Picacho, Volcan de Chiriquí (the highest point in Panama), Cerro

Horqueta, Cerro Hornito, and Cerro Santiago (the second highest peak).

In contrast to the high percentage of West Indians in Bocas del Toro, there are scarcely any in Chiriquí. The government discourages the blacks from settling in the country, preferring to keep the blood as near Spanish and Indian as possible. The Chiriquí Indians have been living in the region for hundreds of years and the remains of their pottery in old burial mounds show that in the past they were more cultured than today. The towns have a good class of Panamanians and a lower mixed peon type. Spanish is the only language spoken, although there are many natives who speak some English. The Chiricano considers himself quite an aristocrat, claiming descent from the family of Christopher Columbus through the Duke of Veraguas. The land has passed from family to family for many generations—even the squatter Indian lands. The federal government, when it came into existence, recognized most of the rights of the inhabitants of the province. There is probably less federal land in Chiriquí than in any other province of the republic; when one wishes to purchase a tract he must first buy out the squatter and record the deed, and then pay the federal government charge of six pesos per hectare. Of course, all the large cattle ranches are now titled land.

The region around and below the Volcan contains the bulk of the total population of the province—76,000. David, the capital, with over 6000 people, is a cattle and coffee exporting center. It is reached through the tidal port of Pedregal and the small steamers and schooners which risk the breakers and reefs can go up and down the channel only at the crest of the tides.

From David a government narrow-gauge railroad runs north to Boquete, over 4000 feet above the sea, and west to La Conçeption at an elevation of 800 feet. Large motor trucks mounted on iron wheels are used for most of the passenger service and a low-geared engine takes two or three small freight cars at one haul up the Boquete line. The Panamanian government is now building a deep-sea port at Puerto Armuellas or Puerto Rabo de Puerco, where an old abandoned

sugar-company railroad formerly started inland to Progreso. From this new port, which will accommodate all large ocean-going vessels, a government railroad is being built by the J. G. White Company to run north through Progreso where new banana operations are under way, and then swing east to join the present line at Conçeption. Upon completion of this double project, a large heavily forested area will be thrown open between the port and La Cuesta, beyond Progreso. It should be possible to bring out many valuable woods, such as the Espavé, Cero or Bogum, María, Chuchupate, Cedro Batteo, Guayacán, Mora, Cedro, and others, which are at present inaccessible.

The collections from Chiriquí were made for the most part in the vicinity of Progreso where the virgin forest prevails. The elevation is 80 feet above the sea at this point and, travelling along the Chiriquí Viejo River toward La Cuesta, the land rises to 200 or 300 feet. There does not seem to be a heavy undergrowth in this forest and in places one can even go short distances from the trail on horseback. It is dark and damp, with very little sunlight reaching the ground, except along the trails.

The largest and most frequent tree of the upper story is the Espavé, which grows to 150 feet in rare instances, but is generally not over 100 feet tall, with an unbuttressed bole 4 or 5 feet through and clear of limbs for about 50 feet, except when grown in the open. This wood, although inferior to the Spanish Cedar, should make satisfactory building material in all places not exposed to the direct effect of the rains. The sapwood is thick, sometimes over 6 inches, and is brownish in color. As many as ten trees per acre can be found over fairly large areas. Where the soil is heavier and wetter the trees grow poorly and to a smaller size. The Cedars are still scattered over the area, there being at least two varieties, the red and the brown. Cedro Cebolla, C. Grenadine, and C. Real are the common names. A tree called here Cedro Batteo is identical with the Cedro Macho of the Bocas region. Aguacatón is almost as durable as Cedar and is used for the same purposes. It grows to a larger size and more abundantly in the mountains, where it almost entirely replaces Cedar for

building. Chuchupate is a beautiful wood used for furniture and building; the trees are not over 50 or 60 feet tall and 12 inches in diameter, as a rule, and are scattered. Zapatero is used for lumber, but warps badly. Arenillo and Cañafistulo are used for interiors. María is a good wood for building and furniture, but is not plentiful. Railway ties are made from several woods, notably Cuajada, Guayacán, Mora, Nispero, María, Quira, Cañafistulo, and Guachapelí.

The region around Progreso, from the Montañas de Santa Clara to Divalá, is fortunately protected from the high winds which often sweep through the mountain passes and down into the David valley. For this reason it is possible to grow bananas there without danger of wind damage. This area is also less susceptible to drought than the land on the other side of the Volcan. Although there is a pronounced dry season lasting three or four months, it often rains during this period to relieve the baked soil and refresh the vegetation. In the rainy season the rivers become impassable for days, but the run off is rather rapid. In the immediate vicinity of Progreso the land is quite sandy and in two hours after a heavy downpour one can walk around dry shod. During the months of July and August, when the writer was in the country, it rained almost daily, generally commencing about four o'clock in the afternoon and ceasing about eight in the evening or earlier. Only rarely did a shower come in the morning.

CONTRIBUTIONS TO THE ARBORESCENT FLORA OF WESTERN PANAMA

Following is a list of the specimens of trees and larger shrubs referred to by Mr. Cooper in the preceding article. Those in his regular series, Nos. 1–630,[1] are from western

[1] Nos. 631–661 (Yale Nos. 12,264–12,293) were collected by Mr. Cooper near Permé, Department of San Blas, eastern Panama. These are listed separately.

Panama and in most cases consist of wood samples and fertile botanical material. They were collected as follows:

1—133, Bocas del Toro, December 1926–May 1927, by Cooper & Slater.
134—155, Bocas del Toro, May 1927, by Cooper.
156—319, Chiriquí (Progreso), June–August 1927, by Cooper & Slater.
320—338, Bocas del Toro, August 1927, by Cooper.
339—630, Bocas del Toro, December 1927–March 1928, by Cooper.

A second series, nearly all herbaceous plants and low shrubs, was collected by Mr. Cooper near Cartago, Costa Rica (Nos. 1–67), and in Bocas del Toro (Nos. 68–239) during the winter of 1927–1928. Only a few of these are included in the list below and they are distinguished by the word "plant" before the collector's number. A third series, T. 1–17, was obtained by Mr. Cooper in May 1927 in the Talamanca valley, just over the Panama line in Costa Rica.

In the check list of common names the locality is indicated by letters in parentheses: (B) = Bocas del Toro, (C) = Chiriquí, (T) = Talamanca. The names are of three origins: West Indian (mostly English), native Indian, and Spanish. As in all similar cases, too much reliance should not be placed on vernacular names for purposes of identification, though effort was made to secure as high a degree of accuracy as attending circumstances would permit.

The determinations of the botanical material are by Paul C. Standley, who found in the total collection (including the specimens from Permé) 80 new species, three new genera, and many notable records of extension in range. Most of the descriptions of the new species are in course of publication in the botanical series of the Field Museum of Natural History, Chicago.

Acknowledgment is made to the United Fruit Company for their generous coöperation, which was largely responsible for the success of these investigations. Also to Dr. Eusebio A. Morales, Secretaria de Hacienda y Tesoro, Panama, for letters of introduction to the provincial officers and for placing the government launches at the disposal of the collector.

ACANTHACEAE (Acanthus Family)

Bravaisia integerrima (Spreng.) Standl. MANGLÉ DE AGUA. Nos. 25a, and 269; Yale Nos. 10,125 and 10,622.

AMYGDALACEAE (Almond Family)

Hirtella triandra Sw. CHICHARRÓN. No. 279; Yale No. 10,632.

Licania platypus (Hemsl.) Fritsch. WILD PEAR; ZAPOTE. No. 256; Yale No. 10,609.

Prunus annularis Koehne (probably). BASTARD CACIQUE. No. 506; Yale No. 12,125.

ANACARDIACEAE (Sumac Family)

Anacardium Rhinocarpus DC. ESPAVÉ. No. 206; Yale No. 10,559.

Campnosperma panamensis Standl. OREY WOOD. No. 154; Yale No. 10,500.

Spondias Mombin L. JOBO; PLUM. Nos. 101 and 207; Yale Nos. 10,282 and 10,560.

Spondias purpurea L. JOBITO; WILD PLUM. Nos. 202 and 355; Yale Nos. 10,555 and 11,948.

ANONACEAE (Custard-Apple Family)

Anona purpurea Moc. & Sessé. TORETO. No. 314; Yale No. 10,665.

? Anona sp. ANONA. No. 9; Yale No. 10,109.

Desmopsis panamensis (Rob.) Safford. ANONILLO. No. 47; Yale No. 10,146.

Duguetia panamensis Standl., sp. nov. (in ed.). No. 418; Yale No. 12,037.

Guatteria aeruginosa Standl., sp. nov. (in ed.). MALAGUETO. No. 526; Yale No. 12,145.

Guatteria amplifolia Tr. & Pl. Nos. 70 and 382; Yale Nos. 10,167 and 11,975.

Guatteria Slateri Standl., sp. nov. (in ed.). MALAGUETO PRIETO. No. 177; Yale No. 10,530.

? Guatteria sp. No. 426; Yale No. 12,045.

Rollinia Jimenezii Safford. ANONA; TORETO. No. 211; Yale No. 10,564.

Rollinia Pittieri Safford. No. 102; Yale No. 10,283.

Stenanona panamensis Standl., gen. et sp. nov. (in ed.). No. 427; Yale No. 12,046.

Unonopsis Pittieri Safford. YAYA BLANCA. No. 198; Yale No. 10,551.

APOCYNACEAE (Dogbane Family)

Malouetia guatemalensis (Muell.) Standl. No. 113; Yale No. 10,294.

Odontadenia speciosa Benth. No. 610; Yale No. 12,243.

Rauwolfia macrocarpa Standl., sp. nov. (in ed.). FRUTA DEL DIABLO (?). No. 200; Yale No. 10,553.

Rauwolfia purpurascens Standl., sp. nov. (in ed.). No. 516; Yale No. 12,135.

Stemmadenia macrantha Standl., sp. nov. (in ed.). MOUNTAIN JASMINE. No. 510; Yale No. 12,129.

Tabernaemontana arborea Rose. WILD ORANGE. No. 63; Yale No. 10,160.

Tabernaemontana citrifolia L. MILKWOOD. No. 550; Yale No. 12,183.

Tabernaemontana grandiflora Jacq. COJÓN DE MICO; WILD ORANGE. Nos. 233, 319, and 364; Yale Nos. 10,586, 10,670, and 11,957; also 63a, without wood specimen.

Thevetia nitida (H.B.K.) A. DC. CHIRCO. Nos. 16 and 255; Yale Nos. 10,116 and 10,608.

AQUIFOLIACEAE (Holly Family)

Ilex panamensis Standl., sp. nov. (in ed.). GARLIC WOOD. No. 469; Yale No. 12,087.

ARALIACEAE (Ginseng Family)

Gilibertia gonatopoda D. Sm. No. 380; Yale No. 11,973.

Gilibertia Smithiana Johnston. PALOMA. No. 173; Yale No. 10,526.

Nothopanax Guilfoylei (Cogn. & Marché) Merrill. Plant No. 186; Yale No. 10,462.

BIGNONIACEAE (Catalpa Family)

Crescentia Cujete L. CALABASH; JÍCARO. Nos. 83 and 288; Yale Nos. 10,264 and 10,641.

Enallagma latifolia (Mill.) Small. WILD CALABASH. Nos. 36 and 277; Yale Nos. 10,136 and 10,630.

Jacaranda Copaia (Aubl.) Don. No. T. 17; Yale No. 10,479.

Parmentiera macrophylla Standl., sp. nov. (in ed.). WILD CALABASH. No. 402; Yale No. 12,023.

Tecoma Guayacan Seem. (probably). GUAYACÁN. No. 311; Yale No. 10,662.

Tecoma pentaphylla Juss. ROBLE. No. 268; Yale No. 10,621.

BIXACEAE (Arnotto Family)

Bixa orellana L. ACHOTE; ANATTO. No. 10; Yale No. 10,110.

BOMBACACEAE (Cotton-Tree Family)

Ceiba pentandra (L.) Gaertn. CEIBA; COTTON TREE. Nos. 21 and 216; Yale Nos. 10,121 and 10,569.

Hampea panamensis Standl., sp. nov. (Journ. Wash. Acad. Sci. 17: 15: 394). AZOTE; BURÍO. Nos. 8, 15, 15a, and 599; Yale Nos. 10,108, 10,115, 10,502, and 12,232.

Matisia dolichesiphon Schum. No. T. 2; Yale No. 10,464.

Ochroma limonensis Rowlee. BALSA. No. 77; Yale No. 10,258.

Ochroma velutina Rowlee. BALSA. No. 253; Yale No. 10,606.

Quararibea asterolepis Pittier. CINCO DEDOS; GUAYABO (?). Nos. 285 and 413; Yale Nos. 10,638 and 12,032.

Quararibea pterocalyx Hemsl. WILD PALM. No. 452; Yale No. 12,070.

Quararibea stenophylla Pittier. No. 99; Yale No. 10,280.

BORRAGINACEAE (Borage Family)

Cordia alliodora (R. & P.) Cham. LAUREL; LAUREL NEGRO. No. 22; Yale No. 10,122.

Cordia Collococca L. MUÑECA AMARILLA. Nos. 307 and 429; Yale Nos. 10,659 and 12,048.

Cordia corymbosa (L.) Don. Plant No. 83. No wood specimen.

Cordia diversifolia Pav. JUG TREE; TIGÜILOTE. Nos. 61, 112, and 342; Yale Nos. 10,158A, 10,293, and 11,935.

Cordia heterophylla R. & S. LENGUA DE BUEY; NIGÜITO. Nos. 224 and 317; Yale Nos. 10,577 and 10,668.

Cordia nitida Vahl. Nos. 300, 372, 372a, and 406; Yale Nos. 10,653, 11,965, 11,966A, and 12,026.

Tournefortia Billbergiana Beurl. Plant No. 146. No wood specimen.

Tournefortia glabra L. No. 376; Yale No. 11,969.

BURSERACEAE (Torchwood Family)

Bursera Simaruba (L.) Sarg. ALMÁCIGO. No. 313; Yale No. 10,664.

Protium panamense (Rose) Johnston. Nos. 433 and 517; Yale Nos. 12,052 and 12,136.

Protium sessiliflorum (Rose) Standl. CHUTRAS; COMIDA DEL MONO. Nos. 169 and 259; Yale Nos. 10,522 and 10,612.

CAPPARIDACEAE (Caper Family)

Crataeva Tapia L. ESTRELLA. Nos. 238 and 267; Yale Nos. 10,591 and 10,620.

CARICACEAE (Papaya Family)

Carica dolichaula D. Sm. WILD CUCUMBER; PAPAYA. Plant No. 437. No wood specimen.

CHLORANTHACEAE

Hedyosmum scaberrimum Standl., sp. nov. (in ed.). No. 595; Yale No. 12,228.

COMBRETACEAE (White Mangrove Family)

Bucida Buceras L. AMARILLA; MARIÔN. No. 159; Yale No. 10,512.

Terminalia Hayesii Pittier. GUAYABO DE MONTÁÑA No. 55; Yale. No. 10,153.

COMPOSITAE (Aster Family)

Vernonia patens H.B.K. PALO BLANCO; SANALEGO. Nos. 291 and 530; Yale Nos. 10,644 and 12,150.

DICHAPETALACEAE

Dichapetalum Donnell-Smithii Engl. BLANCITO. No. 172; Yale No. 10,525.

ELÆOCARPACEAE

Muntingia Calabura L. MAJAGÜILLO. No. 222; Yale No. 10,575.

Sloanea anisophylla Standl., sp. nov. (in ed.). No. 352; Yale No. 11,945.

Sloanea longicuspis Standl., sp. nov. (in ed.). No. 234; Yale No. 10,587.

Sloanea megaphylla Pittier. Nos. 104 and 536; Yale Nos. 10,285 and 12,156.

ERYTHROXYLACEAE

Erythroxylon amplum Benth. No. 494; Yale No. 12,112.

EUPHORBIACEAE (Spurge Family)

Acalypha diversifolia Jacq. No. 114; Yale No. 10,295.

Adelia triloba (Muell.) Hemsl. Nos. 394, 428, and 431; Yale Nos. 12,015, 12,047, and 12,050.

Alchornea costaricensis Pax & Hoffm. Nos. 103, 134, 155, 348, and 443; Yale Nos. 10,284, 10,480, 10,501, 11,941, and 12,061.

Caryodendron angustifolium Standl., sp. nov. (in ed.). No. 192; Yale No. 10,645.

Cleidion denticulatum Standl., sp. nov. (in ed.). No. 606; Yale No. 12,239.

Croton glabellus L. COLPACHÍ. Nos. 165, 416, 489, and 591; Yale Nos. 10,518, 12,035, 12,107, and 12,224.

Hieronyma alchorneoides Allem. BULLY TREE (?); PALO CHANCHO (?); PILÓN; SCOTCH EBO; ZAPATERO. Nos. 27, 190, 209, 271, 334, 368, and 537; Yale Nos. 10,127, 10,543, 10,562, 10,624, 10,720, 11,961, and 12,157.

Hura crepitans L. JAVILLO; NUNE; SANDBOX. Nos. 30 and 273. Yale Nos. 10,130 and 10,626.

Phyllanthus carolinensis Walt. Plant No. 5. No wood specimen.

Phyllanthus Conami Sw. JOBITILLO. No. 223; Yale No. 10,576.

Phyllanthus nobilis (L. f.) Muell. No. 381; Yale No. 11,974.

Sapium jamaicense Sw. WILD FIG; OLIVO. Nos. 197 and 350; Yale Nos. 10,550 and 11,943.

Tetrorchidium euryphyllum Standl., sp. nov. (in ed.). No. 621; Yale No. 12,254.

FLACOURTIACEAE (Venezuelan Boxwood Family)

Carpotroche platyptera Pittier. Nos. T. 11, 367, and 377; Yale Nos. 10,473, 11,960, and 11,970.

Casearia guianensis (Aubl.) Urban. Plant No. 548a. No wood specimen.

Casearia nitida (L.) Jacq. CARAÑO; COMIDA DE LORO. Nos. 14 and 199; Yale Nos. 10,114 and 10,552.

Casearia sylvestris Sw. CORTA LENGUA. Nos. 213 and 587; Yale Nos. 10,566 and 12,220.

Oncoba laurina (Presl) Warb. UVRE. No. 167; Yale No. 10,520.

Xylosma panamensis Turcz. NEEDLEWOOD. No. 548; Yale No. 12,181.

GESNERIACEAE

Besleria sp. No. 584; Yale No. 12,217.

Drymonia spectabilis (H.B.K.) Mart. (probably). CALABASH VINE. No. 472; Yale No. 12,090.

GUTTIFERAE

Calophyllum Rekoi Standl. MARÍA. No. 204; Yale No. 10,557.

Clusia Cooperi Standl., sp. nov. (in ed.). POISON DOGWOOD. No. 460; Yale No. 12,078.

Clusia minor L. FIG; TAR GUM TREE. Nos. 145, 559, and 562. Yale Nos. 10,491, 12,192, and 12,195.

Clusia odorata Seem. COPÉ. No. 533; Yale No. 12,153.

Clusia stenophylla Standl., sp. nov. (in ed.). No. 468; Yale No. 12,086.

Rheedia edulis Tr. & Pl. CERO. Nos. 6a and 160; Yale Nos. 10,106A and 10,513.

Rheedia Madruno (H.B.K.) Tr. & Pl. No. 310; Yale No. 10,661.

Symphonia globulifera L.f. BARILLO; BOGUM; CERO; SAMBO GUM. Nos. 6, 183, and 459; Yale Nos. 10,106, 10,536, and 12,077.

Tovomitopsis multiflora Standl., sp. nov. (in ed.). COLORIDITO; MANGLÉ COLORADO. Nos. 171 and 274; Yale Nos. 10,524 and 10,627.

Tovomitopsis nicaraguensis (Oerst.) Tr. & Pl. Nos. 68, 71, 482, and 617; Yale Nos. 10,165, 10,252, 12,100, and 12,250.

HERNANDIACEAE

Hernandia guianensis Aubl. CEBO BURRO; CEBO MACHO; LEMPA. Nos. 220, 272, and 618; Yale Nos. 10,573, 10,625, and 12,251.

HIPPOCRATEACEAE

Hippocratea malpighiaefolia Rudge. No. 474; Yale No. 12,092.

ICACINACEAE

Calatola costaricensis Standl. HAGUEY. No. 371; Yale No. 11,964.

Discophora panamensis Standl., sp. nov. (in ed.). No. 613; Yale No. 12,246.

Mappia racemosa Jacq. No. 563; Yale No. 12,196.

LACISTEMACEAE

Lacistema aggregatum (Berg.) Rusby. Nos. 78 and 524; Yale Nos. 10,259 and 12,143.

Lacistema pedicellatum Standl. No. 568; Yale No. 12,201.

LAURACEAE (Laurel Family)

Nectandra glabrescens Benth. SIGUA. No. 488; Yale No. 12,106.

Nectandra globosa (Aubl.) Mez. SWEETWOOD (?). No. 86; Yale No. 10,267.

Nectandra Laurel Kl. & Karst. SWEETWOOD; YAYA. Nos. 96, 498, and 512; Yale Nos. 10,277, 12,116, and 12,131.

Nectandra membranacea Gris. ROCK SWEETWOOD. No. 551; Yale No. 12,184.

Nectandra sp. TIMBER SWEETWOOD. No. 458; Yale No. 12,076.

Ocotea cernua (Nees) Mez. No. 105; Yale No. 10,286.

Ocotea pentagona Mez. WILD NUTMEG (?); SIGUA (?). Nos. 339, 449, and 603; Yale Nos. 12,020, 12,067, and 12,236.

Ocotea stenoneura Mez. & Pitt. SWEETWOOD. No. 32; Yale No. 10,132.

Ocotea sp. SIGUA. No. 612; Yale No. 12,245.

Persea americana Mill. AGUACATE; AVACADO PEAR. Nos. 90 and 356; Yale Nos. 10,271 and 11,949.

Undetermined. AGUACATÓN. Nos. 218 and 309; Yale Nos. 10,571 and 10,660. CAMARÓN AMARILLO. No. 170; Yale No. 10,523. SIGUA AMARILLA. No. 262; Yale No. 10,615.

LECYTHIDACEAE (Monkey-Pot Family)

Couratari panamensis Standl., sp. nov. (in ed.). No. 542; Yale No. 12,162.

Couroupita darienensis Pittier. ZAPOTE DE MONO. No. 385; Yale No. 11,976.

Couroupita odoratissima Seem. (probably). ZAPOTE DE MONO. Nos. 45 and 302; Yale Nos. 10,144 and 10,655.

Couroupita parviflora Standl., sp. nov. (in ed.). ZAPOTE DE MONO. No. 11; Yale No. 10,111.

Eschweilera calyculata Pittier. MATA CANSADA; OLLITO. Nos. 57, 346, 475, 525, and 541; Yale Nos. 10,155, 11,939, 12,093, 12,144, and 12,161.

Grias Fendleri Seem. HAGUEY; MEMBRILLO; SAPO. Nos. 191 and 228; Yale Nos. 10,544 and 10,581.

LEGUMINOSAE (Bean Family)

Andira inermis H.B.K. ARENILLO; QUIRA. Nos. T. 9, 147, 215, 265, and 294; Yale Nos. 10,471, 10,493, 10,568, 10,618, and 10,647.

Cajanus bicolor DC. Plant No. 403. No wood specimen.

Calliandra Tonduzii Britt. & Rose. AROMO. No. 318; Yale No. 10,669.

Cashalia panamensis Standl., sp. nov. (in ed.). CITRÓN. No. 520; Yale No. 12,139.

Cassia bacillaris L. Nos. 109 and 130; Yale Nos. 10,290 and 10,310.

Cassia grandis L.f. CARAO; STINKING TOE. Nos. 133 and 521; Yale Nos. 10,313 and 12,140.

Cassia reticulata Willd. WILD SENNA. No. 37; Yale No. 10,137.

Cassia stenocarpa Vog. Plant No. 22. No wood specimen.

? Cassia sp. CAÑAFISTULO. No. 303; Yale No. 10,656.

Dipteryx panamensis Pittier. ALMENDRO; EBO. Yale Nos. 9716 and 10,504.

Enterolobium cyclocarpum (Jacq.) Gris. CORATÚ; GUANACASTE. Nos. 94 and 287; Yale Nos. 10,275 and 10,640.

Erythrina glauca Willd. IMMORTAL. No. 471; Yale No. 12,089.

Erythrina panamensis Standl. PALO SANTO. No. 179; Yale No. 10,532.

Erythrina rubrinervia H.B.K. MACHETE. No. 473; Yale No. 12,091.

Gliricidia sepium (Jacq.) Steud. MADRE DE CACAO. No. 528; Yale No. 12,148.

Inga edulis Mart. GUAVO; GUAVO MACHETE; GUAJINIQUIL. Nos. 38, 65, 527, and 527a; Yale Nos. 10,138, 10,162, 12,146, and 12,147.

Inga panamensis Seem. BRIBRÍ No. 108; Yale No. 10,289.

Inga punctata Willd. BRIBRÍ; GUAVO. Nos. 73, 100, and 492; Yale Nos. 10,254, 10,281, and 12,110.

Inga Ruiziana Don. BRIBRÍ. No. 76; Yale No. 10,257.

Inga Ruossoviana Pittier. BRIBRÍ. No. 13; Yale No. 10,113.

Inga spectabilis Willd. BRIBRÍ; GUAVO. Nos. 124 and 203; Yale Nos. 10,304 and 10,556.

Inga spuria H. & B. (probably). CORALILLO. No. 483; Yale No. 12,101.

Inga sp. SABA. No. 546; Yale No. 12,179.

? Leucaena sp. IGUANO; TAMARIND BLANCO. No. 266; Yale No. 10,619.

Lonchocarpus latifolius H.B.K. No. 141; Yale No. 10,487.

Lonchocarpus lucidus Pittier (probably). CHAPERNO; DOGWOOD. Nos. 17 and 549; Yale Nos. 10,117 and 12,182.

? Lonchocarpus sp. COME NEGRO. No. 276; Yale No. 10,629.

? Lysiloma sp. ARAMILLO. No. 251; Yale No. 10,604.

Ormosia panamensis Benth. ALCORNOQUE; SUR ESPINO. Nos. 125, 243, and 327; Yale Nos. 10,305, 10,596, and 10,712.

Pentaclethra filamentosa Benth. GAVILÁN; TAMARIND. Nos. 23a, 126, and 430; Yale Nos. 10,123A, 10,306, and 12,049.

Pithecolobium pseudo-Tamarindus Standl., sp. nov. (in ed.). WILD TAMARIND. No. 461; Yale No. 12,079.

Pithecolobium Saman (Jacq.) Benth. GUANGO; SAMAN. No. 442; Yale No. 12,060.

Pithecolobium Vahlianum DC. RIVERWOOD; SOTA-CABALLO. No. 54; Yale No. 10,152.

Platymiscium polystachium Benth. (probably). SWAMP KAWAY; SANGRILLO. No. 281; Yale No. 10,634.

Prioria Copaifera Gris. CATIVO. Nos. 46, 111, and 345; Yale Nos. 10,145, 10,292, and 11,938. (See *Tropical Woods* 14: 6.)

Pterocarpus belizensis Standl. (probably). BLOODWOOD; HUEVOS DE GATO. No. 496; Yale No. 12,114.

Pterocarpus Hayesii Hemsl. (probably). No. 150; Yale No. 10,496.

Pterocarpus officinalis Jacq. No. 128; Yale No. 10,308.

Pterocarpus reticulatus Standl. (Trop. Woods 16: 38). BLOODWOOD. No. 573; Yale No. 12,206.

Tamarindus indica L. TAMARIND. No. 23; Yale No. 10,123.

Undetermined. ARAMILLA. No. 251; Yale No. 10,604. DOGWOOD. No. 321; Yale No. 10,706.

MALPIGHIACEAE

Bunchosia cornifolia H.B.K. Nos. 138 and 556; Yale Nos. 10,484 and 12,189.

Byrsonima crassifolia (L.) DC. WILD CHERRY. Nos. 152 and 316; Yale Nos. 10,498 and 10,667.

Malpighia glabra L. Nos. 182 and 293; Yale Nos. 10,535 and 10,646.

MALVACEAE (Mallow Family)

Malvaviscus arboreus Cav. MAPOLA. No. 26; Yale No. 10,125; also Plant No. 54, without wood specimen.

Malvaviscus grandiflorus H.B.K. Plant No. 103. No wood specimen.

MARCGRAVIACEAE

Marcgravia rectiflora Tr. & Pl. No. 146; Yale No. 10,492.
Norantea subsessilis (Benth.) D. Sm. No. 467; Yale No. 12,085.

MELASTOMACEAE (Meadow-Beauty Family)

Conostegia micrantha Standl., sp. nov. (in ed.). Nos. 578 and 619; Yale Nos. 12,211 and 12,252.
Conostegia puberula Cogn. MACRELEAF (?). Nos. 91, 412, 486, 487, and 581; Yale Nos. 10,272, 12,031, 12,104, 12,105, and 12,214.
Conostegia subcrustulata Tr. No. 341; Yale No. 11,934.
Henriettea brunnescens Standl., sp. nov. (in ed.). No. 594; Yale No. 12,227.
Henriettella densiflora Standl., sp. nov. (in ed.). No. 575; Yale No. 12,208.
Leandra dichotoma Cogn. No. 514; Yale No. 12,133.
Maieta tococoidea Cogn. No. 480. No wood specimen.
Miconia astroplacama D. Sm. No. T. 14; Yale No. 10,476.
Miconia globuliflora Cham. No. 614; Yale No. 12,247.
Miconia impetiolaris (Sw.) Don. Nos. 110 and 110a; Yale Nos. 10,291 and 10,291A.
Miconia laevigata DC. No. 580; Yale No. 12,213.
Miconia lamprophylla Tr. (probably). SEARCH-MY-HEART. No. 62; Yale No. 10,159.
Miconia longifolia DC. (probably). No. 476; Yale No. 12,094.
Miconia nervosa (Sm.) Tr. No. T. 8; Yale No. 10,470.
Miconia pteropoda Benth. No. T. 6; Yale No. 10,468.
Miconia Schlimii Tr. No. 297; Yale No. 10,650.
Miconia sp. Nos. 579 and 602; Yale Nos. 12,212 and 12,235.
Mouriria parvifolia Benth. CIERITO. Nos. 248 and 361; Yale Nos. 10,601 and 11,954.
Ossaea ciliata Cogn. No. 593; Yale No. 12,226.
Ossaea diversifolia (Bonpl.) Cogn. No. 410. No wood specimen.
Ossaea micrantha (Sw.) Macfad. Nos. 115, 478, and 495; Yale Nos. 10,296, 12,096, and 12,113.
Tococa guianensis Aubl. No. 151; Yale No. 10,497.

MELIACEAE (Mahogany Family)

Carapa Slateri Standl., sp. nov. (Trop. Woods 10: 48). CEDRO BATTEO; CEDRO MACHO. Nos. 59, 59a, and 282; Yale Nos. 10,157, 10,503, and 10,635.
Cedrela fissilis Vell. CEDRO; CEDRO GRENADINE; CEDRO REAL. Nos. 180, 252, and 423; Yale Nos. 10,533, 10,605, and 12,042; also 305, without wood specimen.
Cedrela mexicana Roem. CEDAR; CEDRO CEBOLLA. Nos. 74 and 306; Yale Nos. 10,255 and 10,658.
Guarea chiricana Standl., sp. nov. (in ed.). DORITA; MAMECILLO BLANCO. Nos. 164 and 229; Yale Nos. 10,517 and 10,582.

Guarea longipetiola C. DC. CHUCHUPATE. No. 208; Yale No. 10,561.
Guarea sp. Nos. 386 and 454; Yale Nos. 11,977 and 12,072.
Melia Azedarach L. CHINABERRY; PERSIAN LILAC. Nos. 43 and 290; Yale Nos. 10,142A and 10,643; also Plant No. 43, without wood specimen.
Trichilia hirta L. (probably). CONEJO COLORADO; HUESITO; SOUCA. Nos. 168, 212, and 250; Yale Nos. 10,521, 10,565, and 10,603.
Trichilia montana H.B.K. No. 235; Yale No. 10,588.
Trichilia polyneura C. DC. No. 194; Yale No. 10,547.
Trichilia propinqua (Miq.) C. DC. ALFAJEO. No. 217; Yale No. 10,570.
Trichilia tuberculata (Tr. & Pl.) C. DC. ALFAJEO COLORADO; CAMFINE; FOSFORITO. Nos. 52, 56, 131, and 240; Yale Nos. 10,151, 10,154, 10,311, and 10,593.
Trichilia yzabalana Blake (probably). No. 214; Yale No. 10,567.

MONIMIACEAE

Mollinedia costaricensis D. Sm. No. T. 16; Yale No. 10,478.
Siparuna nicaraguensis Hemsl. No. 616; Yale No. 12,249.
Siparuna pauciflora (Beurl.) A. DC. Nos. 69, 422, 513, and 589; Yale Nos. 10,166, 12,041, 12,132, and 12,222.
Siparuna Tonduziana Park. No. 596; Yale No. 12,229; also Plant No. 194, without wood specimen.

MORACEAE (Mulberry Family)

Brosimum caloxylon Standl., sp. nov. (in ed.). BLOODWOOD CACIQUE. Nos. 535 and 607; Yale Nos. 12,155 and 12,240. (See *Tropical Woods* 14: 1.)
Brosimum costaricanum Liebm. Nos. 425 and 601; Yale Nos. 12,044 and 12,234.
Brosimum terrabanum Pittier. BREADNUT. No. 441; Yale No. 12,059.
Castilla fallax Cook. CAUCHO; RUBBER TREE; ULE. No. 196; Yale No. 10,549.
Castilla panamensis Cook. CAUCHO; ULE. No. 523; Yale No. 12,142.
Cecropia arachnoidea Pittier. GUARUMO; TRUMPET TREE. No. 48; Yale No. 10,147.
Cecropia mexicana Hemsl. GUARUMO; TRUMPET TREE. No. 49; Yale No. 10,148.
Cecropia sp. GUARUMO; TRUMPET TREE. No. 304; Yale No. 10,657.
Chlorophora tinctoria (L.) Gaud. MORA; FUSTIC. No. 237; Yale No. 10,590.
Clarisia sp. No. 359; Yale No. 11,952. Wood specimen only.
Coussapoa panamensis Pittier. No. 538; Yale No. 12,158.
Ficus Colubrinae Standl. FIG; WILD FIG; HIGO. Nos. 404 and 519; Yale Nos. 12,024 and 12,138.
Ficus glabrata H.B.K. WILD FIG. No. 444; Yale No. 12,062.
Ficus involuta (Liebm.) Miq. STRANGLER FIG. No. 436; Yale No. 12,055.
Ficus radula Willd. FIG. No. 92; Yale No. 10,273.
Ficus Tonduzii Standl. FIG.; HIGUERÓN. No. 249; Yale No. 10,602.
? Ficus sp. NISPERO BLANCO. No. 232; Yale No. 10,585.

Helicostylis latifolia Pittier. BERBÁ. Nos. 239 and 263; Yale Nos. 10,592 and 10,616.

Inophloeum armatum (Miq.) Pittier. MASTATE. Nos. 88, 132, and 455; Yale Nos. 10,269, 10,312, and 12,073.

Trophis macrostachya D. Sm. LECHOSO; RAMOON. Nos. 28, 107, 174, 326, and 554; Yale Nos. 10,128, 10,288, 10,527, 10,711, and 12,187.

Trophis racemosa (L.) Urb. BREADNUT; OJOCHE MACHO; RAMOON. Nos. 4, 4a, 324, 329, and 349; Yale Nos. 10,104, 10,104A, 10,709, 10,714, and 11,942.

Trophis sp. MORILLO. No. 188; Yale No. 10,541.

Undetermined. GALLOTE. No. 221; Yale No. 10,574.

MYRISTICACEAE (Nutmeg Family)

Compsoneura costaricensis Warb. WILD COFFEE. Nos. T. 10 and 397; Yale Nos. 10,472 and 12,018.

Compsoneura Sprucei (A. DC.) Warb. Nos. 84 and 420; Yale Nos. 10,265 and 12,039.

Dialyanthera acuminata Standl., sp. nov. (in ed.). SABA. No. 395; Yale No. 12,016.

Dialyanthera Otoba (H. & B.) Warb. BOGAMANI VERDE; WHITE CEDAR; ROBLE; SABA. Nos. 7, 257, and 451; Yale Nos. 10,107, 10,610, and 12,069.

Virola laevigata Standl., sp. nov. (in ed.). No. 308. Without wood specimen.

Virola merendonis Pittier. BOGAMANI. No. 175; Yale No. 10,528.

Virola panamensis (Hemsl.) Warb. FRUTA DORADA. No. 24; Yale No. 10,124.

MYRSINACEAE

Ardisia compressa H. B. K. CRABWOOD. Nos. 463 and 547; Yale Nos. 12,081 and 12,180.

Ardisia oblanceolata Standl., sp. nov. (in ed.). Nos. T. 12 and 370; Yale Nos. 10,474 and 11,963.

Parathesis serrulata Mez. (probably). BLACK CHERRY. No. 464; Yale No. 12,082.

Parathesis sp. No. 153; Yale No. 10,499.

Stylogyne laevis (Oerst.) Mez. Nos. 67 and 119; Yale Nos. 10,164 and 10,299.

MYRTACEAE (Myrtle Family)

Calyptranthes chytraculia (L.) Sw. No. 143; Yale No. 10,489.

Eugenia axillaris (Sw.) Willd. No. 366; Yale No. 11,959.

Eugenia cricamolensis Standl., sp. nov. (in ed.). WHITE CACIQUE. No. 511; Yale No. 12,130.

Eugenia Jambos L. Plant No. 56. No wood specimen.

Eugenia Oerstediana Berg. SEQUARRA. No. 158; Yale No. 10,511.

Eugenia sp. No. 623; Yale No. 12,256.

Myrcia Oerstediana Berg. PIMENTO. Nos. 292, 567, and 570; Yale Nos. 10,645, 12,200, and 12,203.

Psidium Araça Raddi. Plant No. 55. Without wood specimen.

Psidium Friedrichsthalianum (Berg.) B. & H. WILD GUAVO; GUAYABO DE AGUA. Nos. 97, 97a, and 278; Yale Nos. 10,278, 10,278A, and 10,631.

NYCTAGINACEAE

Neea amplifolia D. Sm. Nos. 184 and 491; Yale Nos. 10,537 and 12,109.

Neea Pittieri Standl. Nos. 58, 60, and 140; Yale Nos. 10,156, 10,158, and 10,486.

Neea psychotrioides D. Sm. Nos. 106, 340, 544, and 572; Yale Nos. 10,287, 11,933, 12,177, and 12,205.

Neea urophylla Standl., sp. nov. (in ed.). Nos. 373 and 545; Yale Nos. 11,966 and 12,178.

OCHNACEAE

Cespedesia macrophylla Seem. JOHN CROW WOOD. No. 121; Yale No. 10,301.

Ouratea Wrightii (Van Tiegh.) Riley. WILD PIGEON PLUM. No. 465; Yale No. 12,083.

OLACACEAE (Olax Family)

Heisteria longipes Standl. No. 569; Yale No. 12,202.

Heisteria macrophylla Oerst. NARANJILLO COLORADO. Nos. 127 and 166; Yale Nos. 10,307 and 10,519. (See *Tropical Woods* 15: 23.)

Minquartia guianensis Aubl. CRIOLLO; MANWOOD; BLACK MANWOOD; NISPERO NEGRO; UR. Nos. 312, 360, and 497; Yale Nos. 10,663, 11,953, and 12,115. (See *Tropical Woods* 14: 4.)

PALMACEAE (Palm Family)

Astrocaryum sp. ROWER PALM. No. 85; Yale No. 10,266.

Bactris (section **Trichobactris**) sp. CAÑA CAIJINO; PALMA BRAVA. No. 189; Yale No. 10,542.

Geonoma sp. COCK'S TAIL PALM. No. 493; Yale No. 12,111.

PIPERACEAE (Piper Family)

Piper auritum H.B.K. No. 408; Yale No. 12,028.

Piper elongatum Vahl. PIPER. No. 531; Yale No. 12,151.

Piper peltatum L. Plant No. 170. No wood specimen.

Piper smilacifolium C. DC. CAÑOTILLO. No. 185; Yale No. 10,538.

Piper sp. PIPER. Nos. 374 and 407; Yale Nos. 11,967 and 12,027.

POLYGONACEAE (Buckwheat Family)

Coccoloba caracasana Meissn. PAPATURRO BLANCO. No. 270; Yale No. 10,623.

Coccoloba Schiedeana Lindau (probably). No. 421; Yale No. 12,040.

Coccoloba Tuerckheimii D.Sm. PAPATURRO. No. 322; Yale No. 10,707.

Coccoloba uvifera (L.) Jacq. SEA GRAPE. Nos. 82 and 558; Yale Nos. 10,263 and 12,191.

QUIINACEAE

Quiina panamensis Standl., sp. nov. (in ed.). No. 609; Yale No. 12,242.

RHAMNACEAE (Buckthorn Family)

Colubrina panamensis Standl., sp. nov. (in ed.). WILD COFFEE (?); PICHY PANG. Nos. 365, 411, and 456; Yale Nos. 11,958, 12,030 and 12,074.

Colubrina rufa Reiss. SPANISH ELM. No. 564; Yale No. 12,197.

Rhamnidium caloneurum Standl., sp. nov. (in ed.). No. 434; Yale No. 12,053.

RHIZOPHORACEAE (Mangrove Family)

Cassipourea elliptica Poir. No. 51; Yale No. 10,150.

Cassipourea macrodonta Standl. Nos. 446 and 447; Yale Nos. 12,064 and 12,065.

Cassipourea podantha Standl., sp. nov. (in ed.). GOATWOOD. Nos. 462, 504, and 608; Yale Nos. 12,080, 12,122, and 12,241.

Rhizophora Mangle L. MANGROVE. No. 466; Yale No. 12,084.

RUBIACEAE (Madder Family)

Bertiera guianensis Aubl. No. 586; Yale No. 12,219.

Calycophyllum candidissimum DC. MADROÑO. No. 339. No wood specimen.

Cephaelis elata Sw. Nos. T. 7 and 505; Yale Nos. 10,469 and 12,123.

Cephaelis tomentosa (Aubl.) Vahl. No. 505a; Yale No. 12,124.

Chimarrhis latifolia Standl., sp. nov. (in ed.). JAGUA AMARILLA. Nos. 260 and 448; Yale Nos. 10,613 and 12,066.

Chimarrhis parviflora Standl., sp. nov. (Trop. Woods 11: 26). FIDDLEWOOD; LLEMA DE HUEVO; PLÁTANO. Nos. 2, 120, 323, 347, and 401; Yale Nos. 10,102, 10,300, 10,708, 11,940, and 12,022.

Coussarea latifolia Standl., sp. nov. (in ed.). No. 585a. No wood specimen.

Coussarea paniculata (Vahl) Standl. No. T. 4; Yale No. 10,466.

Faramea bullata Standl., sp. nov. (in ed.). No. 507; Yale No. 12,126.

Faramea salicifolia Presl. (probably). No. 582; Yale No. 12,215.

Genipa americana L. GUAYATIL BLANCO; JAGUA BLANCA; JAGUA DE MONTAÑA; JAGUA NEGRA. Nos. 1, 31, 80, 161, and 258; Yale Nos. 10,101, 10,161, 10,261, 10,514, and 10,611.

? **Genipa** sp. JAGUA AMARILLA. No. 176; Yale No. 10,529.

Guettarda foliacea Standl. ESPINO; GUAYABO. Nos. 227 and 236 Yale Nos. 10,580 and 10,589.

Hamelia axillaris Sw. GUAYABO NEGRO. No. 187; Yale No. 10,540.

Hamelia erecta Jacq. Nos. 142 and 289; Yale Nos. 10,488 and 10,642.

Hamelia magnifolia Wernham. No. 296; Yale No. 10,649.

Hamelia nodosa M. & G. RED BERRY. No. 560; Yale No. 12,193.

Hamelia Storkii Standl. No. 295; Yale No. 10,648.

Isertia Haenkeana DC. No. 518; Yale No. 12,137.

Ixora rauwolfioides Standl., sp. nov. (Trop. Woods 11: 25). OGÜITO. Nos. 93, 95, 205, 245, and 419; Yale Nos. 10,274, 10,276, 10,558, 10,598, and 12,038.

Oregandra panamensis Standl. gen. et sp. nov. (in ed.). Nos. 144 and 149; Yale Nos. 10,490 and 10,495.

Palicourea guianensis Aubl. Nos. 123 and 136; Yale Nos. 10,303 and 10,482.

? **Palicourea.** sp. No. 378; Yale No. 11,971.

Pentagonia macrophylla Benth. WILD GRAPE. No. 122; Yale No. 10,302.

Pentagonia magnifica Krause. TOBACCO. No. 50; Yale No. 10,149.

Posoqueria grandiflora Standl. No. T. 5; Yale No. 10,467.

Posoqueria latifolia (Rudge) R. & S. WILD COFFEE; MONKEY APPLE; MOSQUITOWOOD. Nos. 72, 75, 502, and 552; Yale Nos. 10,253, 10,256, 12,120, and 12,185.

Psychotria brachiata Sw. COCOBOLO. No. 485; Yale No. 12,103.

Psychotria carthaginensis Jacq. No. 566; Yale No. 12,199.

Psychotria chiapensis Standl. COCOBOLITO. Nos. 299 and 534; Yale Nos. 10,652 and 12,154.

Psychotria Cooperi Standl., sp. nov. (in ed.). COCOBOLITO. Nos. 540 and 577; Yale Nos. 12,160 and 12,210.

Psychotria cuspidata Bredem. Nos. 79 and 583; Yale Nos. 10,260 and 12,216.

Psychotria eurycarpa Standl. No. 522; Yale No. 12,141.

Psychotria grandis Sw. Nos. 33, 35, and 186; Yale Nos. 10,133, 10,135, and 10,539.

Psychotria involucrata Sw. Nos. 193 and 477; Yale Nos. 10,546 and 12,095.

Psychotria limonesis Krause. No. 453; Yale No. 12,071.

Psychotria patens Sw. No. 604; Yale No. 12,237.

Psychotria suerrensis D. Sm. No. T. 3; Yale No. 10,465.

Psychotria undata Jacq. No. 148; Yale No. 10,494.

Psychotria sp. No. 585; Yale No. 12,218.

Randia armata (Sw.) DC. No. 66; Yale No. 10,163.

Randia grandifolia (D. Sm.) Standl. No. 424; Yale No. 12,043.

Randia Pittieri Standl. No. 135; Yale No. 10,481.

Rondeletia bertieroides Standl., sp. nov. (in ed.). No. 598; Yale No. 12,231.

Rondeletia buddleioides Benth. (probably). No. 615; Yale No. 12,248.

Rondeletia Cooperi Standl., sp. nov. (in ed.). No. 600; Yale No. 12,233.

Rudgea thyrsiflora D. Sm. No. 98; Yale No. 10,279.

Sickingia Maxonii Standl. (Trop. Woods 14: 30). GUAYATIL; GUAYATIL COLORADO; JAGUA DE MONTAÑA; WYTIL. Nos. 3, 284, 328, 417, 438, and 484; Yale Nos. 10,103, 10,637, 10,713, 12,036, 12,056, and 12,102. (See *Tropical Woods* 14: 3.)

Sickingia sp. ALCARRETO. No. 391; Yale No. 11,982.

Warscewiczia coccinea (Vahl) Kl. No. T. 15; Yale No. 10,477.

RUTACEAE (Satinwood Family)

Zanthoxylum panamense P. Wils. ALCABÚ; LAGARTO; PRICKLYHOLLY; PRICKLY YELLOW. Nos. 41, 162, and 231; Yale Nos. 10,141, 10,515, and 10,584.

SABIACEAE

Meliosma panamensis Standl., sp. nov. (Trop. Woods 10: 49). Nos. 29, 379, and 565; Yale Nos. 10,129, 11,972, and 12,198.

SAPINDACEAE (Soapberry Family)

Cupania cinerea Poepp. No. 351; Yale No. 11,944.

Cupania Cooperi Standl., sp. nov. (in ed.). No. 543; Yale No. 12,176.

Dipterodendron costaricense Radlk. No. 280; Yale No. 10,633. (See *Tropical Woods* 15: 22.)

Matayba ingaefolia Standl., sp. nov. (in ed.). No. 597; Yale No. 12,230.

Talisia nervosa Radlk. No. 500; Yale No. 12,118.

SAPOTACEAE (Sapodilla Family)

? Achras sp. No. 387; Yale No. 11,978.

Calocarpum mammosum (L.) Pierre. RED MANWOOD. No 336; Yale No. 9712.

Calocarpum viride Pittier. No. 499; Yale No. 12,117.

Chrysophyllum argenteum Jacq. WILD STAR APPLE. No. 353; Yale No. 11,946.

Chrysophyllum Cainito L. CAIMITO; STAR APPLE. Nos. 247 and 264; Yale Nos. 10,600 and 10,617.

Labatia Standleyana Pittier. No. 509; Yale No. 12,128.

Lucuma calistophylla Standl., sp. nov. (in ed.). MAMECILLO. No. 481; Yale No. 12,099.

Lucuma chiricana Standl., sp. nov. (in ed.). NISPERO; NISPERO COLORADO. Nos. 230, 254, 445, and 457; Yale Nos. 10,583, 10,607, 12,063, and 12,075.

Lucuma euryphylla Standl., sp. nov. (in ed.). No. 611; Yale No. 12,244.

Lucuma lucentifolia Standl., sp. nov. (in ed.). No. 13; Yale No. 10,475.

Lucuma pentasperma Standl., sp. nov. (in ed.). WILD SAPOTE. No. 369; Yale No. 11,962.

? Lucuma sp. NISPERO. No. 335; Yale No. 10,505.

Undetermined. MONKEY TAMARIND (?). No. 392; Yale No. 11,983. NISPERO. Nos. 333 and 333a; Yale Nos. 10,718 and 10,719.

SIMARUBACEAE (Bitterwood Family)

Picramnia latifolia Tul. Nos. 64 and 375; Yale Nos. 10,161 and 11,968.

SOLANACEAE (Potato Family)

Capsicum asterotrichum Standl., sp. nov. (in ed.). No. 576; Yale No. 12,209.

Cestrum macrophyllum Vent. Nos. 42, 415, and 490; Yale Nos. 10,142, 12,034, and 12,108; also No. 89, without wood specimen.

Cestrum nocturnum L. Nos. 409 and 574; Yale Nos. 12,029 and 12,207; also Plant No. 151, without wood specimen.

Cestrum panamense Standl. YEDI. No. 226; Yale No. 10,579; also Plant No. 90, without wood specimen.

Cyphomandra caudata Standl., sp. nov. (Trop. Woods 10: 50). WILD CUCUMBER. No. 398; Yale No. 12,019.

Cyphomandra heterophylla D. Sm. MONCA PRIETO. No. 181; Yale No. 10,534.

Cyphomandra homalophylla Standl., sp. nov. (in ed.). Nos. 39 and 118; Yale Nos. 10,139 and 10,298.

Lycianthes cuneata Standl., sp. nov. (in ed.). No. 405; Yale No. 12,025.

Lycianthes synanthera (Sendtn.) Bitter. Nos. 298 and 396; Yale Nos. 10,651 and 12,017.

Solanum bicolor Willd. No. 515; Yale No. 12,134.

Solanum salviifolium Lam. No. 590; Yale No. 12,223.

Solanum umbellatum Mill. Plant No. 57. No wood specimen.

Solanum sp. No. 620; Yale No. 12,253; also Plant No. 29, without wood specimen.

STERCULIACEAE (Cacao Family)

Buettneria aculeata Jacq. Plant No. 90. No wood specimen.

Guazuma ulmifolia Lam. BASTARD CEDAR; GUÁCIMO DE TERNERO. Nos. 20, 315, and 354; Yale Nos. 10,120, 10,666, and 11,947.

Sterculia apetala (Jacq.) Karst. PANAMÁ WOOD. No. 301; Yale No. 10,654.

Theobroma angustifolium DC. CACAO CIMARRÓN. No. 242; Yale No. 10,595.

Theobroma purpureum Pittier. CACAO MANI; WILD CACAO. Nos. 12 and 283; Yale Nos. 10,112 and 10,636.

TILIACEAE (Linden Family)

Apeiba Tibourbou Aubl. PEINECILLO. No. 163; Yale No. 10,516.

Goethalsia meiantha (D. Sm.) Burret. GUÁCIMO BLANCO. No. 219; Yale No. 10,572. (See *Tropical Woods* 15: 15.)

Luehea Seemannii Tr. & Pl. GUÁCIMO; GUÁCIMO MOLENILLO. Nos. 19 and 210; Yale Nos. 10,119 and 10,563; also Plant No. 29a, without wood specimen.

ULMACEAE (Elm Family)

Trema micrantha (L.) Bl. CAPULÍN MACHO. Nos. 18 and 129; Yale Nos. 10,118 and 10,309.

URTICACEAE (Nettle Family)

Myriocarpa yzabalensis (D. Sm.) Killip. COW ITCH. No. 414; Yale No. 12,033.

Urera elata (Sw.) Gris. PALO ORTIGO. No. 178; Yale No. 10,531.

VERBENACEAE (Teak Family)

Aegiphila martinicensis L. WILD JASMINE. Nos. 40, 117, and 571; Yale Nos. 10,140, 10,297, and 12,204.

Avicennia nitida Jacq. WHITE MANGROVE. No. 81; Yale No. 10,262.

Callicarpa acuminata H.B.K. BLACKBERRY. No. 555; Yale No. 12,188.

Citharexylum caudatum L. WILD CHERRY. Nos. 139 and 561; Yale Nos. 10,485 and 12,194.

Citharexylum Cooperi Standl., sp. nov. (Trop. Woods 10: 50). CORRIMIENTE; WILD LIME. Nos. 34, 157, 201, and 384; Yale Nos. 10,134, 10,510, 10,554, and 11,975Y.

Cornutia grandifolia (S. & C.) Schauer. MORCIELAGO. Nos. 225 and 529; Yale Nos. 10,578 and 12,149.

Vitex Cooperi Standl., sp. nov. (in ed.). CUAJADA; YELLOW MANWOOD. Nos. 156, 195, 241, 332, 338, and 363; Yale Nos. 10,509, 10,548, 10,594, 10,717, 10,717A, and 11,956.

VIOLACEAE (Violet Family)

Amphirrhox longifolia Spreng. No. 605; Yale No. 12,238.

Rinorea squamata Blake. GUAYACILLO. No. 44; Yale No. 10,143.

Rinorea sylvatica (Seem.) Kuntze. No. 400; Yale No. 12,021.

CHECK LIST OF THE COMMON NAMES

Achote (B)	*Bixa orellana* L.	Bixaceae
Aguacate (B)	*Persea americana* Mill.	Lauraceae
Aguacatón (C)	?	Lauraceae
Alcabú (C)	*Zanthoxylum panamense* P. Wils.	Rutaceae
Alcarreto (B, C)	*Sickingia* sp.	Rubiaceae
Alcornoque (B)	*Ormosia panamensis* Benth.	Leguminosae
Alfajeo (C)	*Trichilia propinqua* (Miq.) C. DC.	Meliaceae
Alfajeo colorado (C)	*Trichilia tuberculata* C. DC.	Meliaceae
Almácigo (C)	*Bursera Simaruba* (L.) Sarg.	Burseraceae
Almendro (B)	*Dipteryx panamensis* Pittier	Leguminosae
Amarillo (C)	*Bucida Buceras* L.	Combretaceae
Anatto (B)	*Bixa orellana* L.	Bixaceae
Anona (B)	*?Anona* sp.	Anonaceae
Anona (C)	*Rollinia Jimenezii* Safford	Anonaceae
Anonillo (B)	*Desmopsis panamensis* (Rob.) Safford	Anonaceae
Aramillo (C)	*?Lysiloma* sp.	Leguminosae
Arenillo (B, C)	*Andira inermis* H. B. K.	Leguminosae
Aromo (C)	*Calliandra Tonduzii* Britt. & Rose	Leguminosae
Avacado pear (B)	*Persea americana* Mill.	Lauraceae
Azote (B)	*Hampea panamensis* Standl.	Bombacaceae
Balsa (B)	*Ochroma limonensis* Rowlee	Bombacaceae
Balsa (C)	*Ochroma velutina* Rowlee	Bombacaceae
Barillo (B)	*Symphonia globulifera* L. f.	Guttiferae
Berbá (C)	*Heliocostylis latifolia* Pittier	Moraceae
Blackberry (B)	*Callicarpa acuminata* H. B. K.	Verbenaceae
Blancito (C)	*Dichapetalum Donnell-Smithii* Engl.	Dichapetalaceae
Bloodwood (B)	*Pterocarpus belizensis* Standl. (?)	Leguminosae
Bloodwood (B)	*Pterocarpus reticulatus* Standl.	Leguminosae
Bloodwood cacique (B)	*Brosimum caloxylon* Standl.	Moraceae

Bogamani (C)	*Virola laevigata* Standl. and *V. merendonis* Pittier	Myristicaceae
Bogamani verde (B, C)	*Dialyanthera Otoba* (H. & B.) Warb.	Myristicaceae
Bogum (B)	*Symphonia globulifera* L. f.	Guttiferae
Breadnut (B)	*Brosimum terrabanum* Pittier	Moraceae
Breadnut (B)	*Trophis racemosa* (L.) Urb.	Moraceae
Bribrí (B)	*Inga panamensis* Seem., *I. punctata* Willd., *I. Ruiziana* Don., *I. Ruossoviana* Pittier, and *I. spectabilis* Willd.	Leguminosae
Bully tree (B)	*Hieronyma alchorneoides* Allem. (?)	Euphorbiaceae
Burío (B)	*Hampea panamensis* Standl.	Bombacaceae
Cacao cimarrón (C)	*Theobroma angustifolium* DC.	Sterculiaceae
Cacao mani (C); wild cacao (B)	*Theobroma purpureum* Pittier	Sterculiaceae
Cacique, Bastard (B)	*Prunus annularis* Koehne (?)	Amygdalaceae
Cacique, White (B)	*Eugenia cricamolensis* Standl.	Myrtaceae
Caimito (C)	*Chrysophyllum Cainito* L.	Sapotaceae
Calabash (B)	*Crescentia Cujete* L.	Bignoniaceae
Calabash vine (B)	*Drymonia spectabilis* (H. B. K.) Mart. (?)	Gesneriaceae
Calabash, Wild (B, C)	*Enallagma latifolia* (Mill.) Small	Bignoniaceae
Calabash, Wild (B)	*Parmentiera macrophylla* Standl.	Bignoniaceae
Camarón amarillo (C)	?	Lauraceae
Camfine (B)	*Trichilia tuberculata* (Tr. & Pl.) C. DC.	Meliaceae
Caña caijino (C)	*Bactris* (sec. *Trichobactris*) sp.	Palmaceae
Caña fistula (C)	*?Cassia* sp.	Leguminosae
Cañotillo (C)	*Piper smilacifolium* C. DC.	Piperaceae
Capulín macho (B)	*Trema micrantha* (L.) Bl.	Ulmaceae
Caraño (C)	*Casearia nitida* (L.) Jacq.	Flacourtiaceae
Carao (B)	*Cassia grandis* L. f.	Leguminosae
Cativo (B)	*Prioria Copaifera* Gris.	Leguminosae
Caucho (C)	*Castilla fallax* Cook	Moraceae
Caucho (B)	*Castilla panamensis* Cook	Moraceae
Cebo macho; c. burro (C)	*Hernandia guianensis* Aubl.	Hernandiaceae
Cedar (B, C)	*Cedrela mexicana* Roem.	Meliaceae

Cedar, Bastard (B, C)	*Guazuma ulmifolia* Lam.	Sterculiaceae
Cedar, White (B, C)	*Dialyanthera Otoba* (H. & B.) Warb.	Myristicaceae
Cedro (C)	*Cedrela fissilis* Vell.	Meliaceae
Cedro batteo (C)	*Carapa Slateri* Standl.	Meliaceae
Cedro cebolla (B, C)	*Cedrela mexicana* Roem.	Meliaceae
Cedro grenadine (C)	*Cedrela fissilis* Vell.	Meliaceae
Cedro macho (B)	*Carapa Slateri* Standl.	Meliaceae
Cedro real (C)	*Cedrela fissilis* Vell.	Meliaceae
Ceiba (B, C)	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Cero (B, C)	*Rheedia edulis* Tr. & Pl.	Guttiferae
Cero (C)	*Symphonia globulifera* L.f.	Guttiferae
Chaperno (B)	*Lonchocarpus lucidus* Pittier (?)	Leguminosae
Cherry, Black (B)	*Parathesis serrulata* Mez (?)	Myrsinaceae
Cherry, Wild (C)	*Byrsonima crassifolia* (L.) DC.	Malpighiaceae
Cherry, Wild (B)	*Citharexylum caudatum* L.	Verbenaceae
Chicharrón (C)	*Hirtella triandra* Sw.	Amygdalaceae
Chinaberry (B, C)	*Melia Azedarach* L.	Meliaceae
Chirco (B, C)	*Thevetia nitida* (H. B. K.) A. DC.	Apocynaceae
Chuchupate (C)	*Guarea longipetiola* C. DC.	Meliaceae
Chutras (C)	*Protium sessiliflorum* (Rose) Standl.	Burseraceae
Cierito (C)	*Mouriria parvifolia* Benth.	Melastomaceae
Cinco dedos (B)	*Quararibea asterolepis* Pittier	Bombacaceae
Citrón (B)	*Casbalia panamensis* Standl.	Leguminosae
Cocobolito (B)	*Psychotria chiapensis* Standl.	Rubiaceae
Cocobolo (B)	*Psychotria brachiata* Sw.	Rubiaceae
Coffee, Wild (?) (B)	*Colubrina panamensis* Standl.	Rhamnaceae
Coffee, Wild (B)	*Compsoneura costaricensis* Warb.	Myristicaceae
Coffee, Wild (B)	*Posoqueria latifolia* (Rudge) R. & S.	Rubiaceae
Cojón de mico (C)	*Tabernaemontana grandiflora* Jacq.	Apocynaceae
Coloridito (C)	*Tovomitopsis multiflora* Standl.	Guttiferae
Colpachí (C)	*Croton glabellus* L.	Euphorbiaceae
Come negro (C)	*?Lonchocarpus* sp.	Leguminosae
Comida de loro (B)	*Casearia nitida* (L.) Jacq.	Flacourtiaceae
Comida del mono (C)	*Protium sessiliflorum* (Rose) Standl.	Burseraceae
Conejo colorado (C)	*Trichilia hirta* L. (?)	Meliaceae

Copé (B)	*Clusia odorata* Seem.	Guttiferae
Coralillo (B)	*Inga spuria* H. & B. (?)	Leguminosae
Coratú (C)	*Enterolobium cyclocarpum* (Jacq.) Gris.	Leguminosae
Corrimiente (C)	*Citharexylum Cooperi* Standl.	Verbenaceae
Corta lengua (C)	*Casearia sylvestris* Sw.	Flacourtiaceae
Cotton tree (B, C)	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Cow itch (B)	*Myriocarpa yzabalensis* (D. Sm.) Killip	Urticaceae
Crabwood (B)	*Ardisia compressa* H. B. K.	Myrsinaceae
Criollo (B)	*Minquartia guianensis* Aubl.	Olacaceae
Cuajada (C)	*Vitex Cooperi* Standl.	Verbenaceae
Cucumber, Wild (B)	*Carica dolichaula* D. Sm.	Caricaceae
Cucumber, Wild (B)	*Cyphomandra caudata* Standl.	Solanaceae
Dogwood (B)	*Lonchocarpus lucidus* Pittier (?)	Leguminosae
Dogwood, Poison (B)	*Clusia Cooperi* Standl.	Guttiferae
Dorita (C)	*Guarea chiricana* Standl.	Meliaceae
Ebo (B)	*Dipteryx panamensis* Pittier	Leguminosae
Ebo, Scotch (T)	*Hieronyma alchorneoides* Allem.	Euphorbiaceae
Elm, Spanish (B)	*Colubrina rufa* Reiss.	Rhamnaceae
Espavé (C)	*Anacardium Rhinocarpus* DC.	Anacardiaceae
Espino (C)	*Guettarda foliacea* Standl.	Rubiaceae
Estrella (C)	*Crataeva Tapia* L.	Capparidaceae
Fiddlewood (B)	*Chimarrhis parviflora* Standl.	Rubiaceae
Fig (B)	*Clusia minor* L.	Guttiferae
Fig (B)	*Ficus Colubrinae* Standl. and *F. radula* Willd.	Moraceae
Fig (C)	*Ficus Tonduzii* Standl.	Moraceae
Fig, Strangler (B)	*Ficus involuta* (Liebm.) Miq.	Moraceae
Fig, Wild (B)	*Ficus Colubrinae* Standl. and *F. glabrata* H. B. K.	Moraceae
Fig, Wild (B)	*Sapium jamaicense* Sw.	Euphorbiaceae
Fosforito (B)	*Trichilia tuberculata* (Tr. & Pl.) D. DC.	Meliaceae
Fruto del diabla (?) (C)	*Rauwolfia macrocarpa* Standl.	Apocynaceae
Fruta dorada (B)	*Virola panamensis* (Hemsl.) Warb.	Myristicaceae
Fustic (C)	*Chlorophora tinctoria* (L.) Gaud.	Moraceae
Garlic wood (B)	*Ilex panamensis* Standl.	Aquifoliaceae
Gallote (C)	?	Moraceae
Gavilán (B)	*Pentaclethra filamentosa* Benth.	Leguminosae
Goatwood (B)	*Cassipourea podantha* Standl.	Rhizophoraceae
Grape, Sea (B)	*Coccoloba uvifera* (L.) Jacq.	Polygonaceae
Grape, Wild (B)	*Pentagonia macrophylla* Benth.	Rubiaceae

Guácimo (C); g. molenillo (B, C)	*Luehea Seemannii* Tr. & Pl.	Tiliaceae
Guácimo blanco (C)	*Goethalsia meiantha* (D. Sm.) Burret	Tiliaceae
Guácimo de ternero (B, C)	*Guazuma ulmifolia* Lam.	Sterculiaceae
Guajiniquil (B)	*Inga edulis* Mart.	Leguminosae
Guanacaste (B)	*Enterolobium cyclocarpum* (Jacq.) Gris.	Leguminosae
Guango (B)	*Pithecolobium Saman* (Jacq.) Benth.	Leguminosae
Guarumo (B)	*Cecropia arachnoidea* Pittier	Moraceae
Guarumo (B)	*Cecropia mexicana* Hemsl.	Moraceae
Guarumo (C)	*Cecropia* sp.	Moraceae
Guavo (B)	*Inga edulis* Mart. and *I. punctata* Willd.	Leguminosae
Guavo (C)	*Inga spectabilis* Willd.	Leguminosae
Guavo machete (B)	*Inga edulis* Mart.	Leguminosae
Guavo, Wild (B)	*Psidium Friedrichsthalianum* (Berg.) B. & H.	Myrtaceae
Guayabo (C)	*Guettarda foliacea* Standl.	Rubiaceae
Guayabo (C)	*Quararibea asterolepis* Pittier (?)	Bombacaceae
Guayabo de agua (C)	*Psidium Friedrichsthalianum* (Berg.) B. & H.	Myrtaceae
Guayabo de montaña (B)	*Terminalia Hayesii* Pittier	Combretaceae
Guayabo negro (C)	*Hamelia axillaris* Sw.	Rubiaceae
Guayacán (B, C)	*Tecoma Guayacan* Seem. (?)	Bignoniaceae
Guayacillo (B)	*Rinorea squamata* Blake	Violaceae
Guayatil; g. colorado (B, C)	*Sickingia Maxonii* Standl.	Rubiaceae
Guayatil blanco (B, C)	*Genipa americana* L.	Rubiaceae
Haguey (B)	*Calatola costaricensis* Standl.	Icacinaceae
Haguey (C)	*Grias Fendleri* Seem.	Lecythidaceae
Higo (B)	*Ficus Colubrinae* Standl.	Moraceae
Higuerón (C)	*Ficus Tonduzii* Standl.	Moraceae
Huesito (C)	*Trichilia hirta* L. (?)	Meliaceae
Huevos de gato (B)	*Pterocarpus belizensis* Standl. (?)	Leguminosae
Iguano (C)	*?Leucaena* sp.	Leguminosae
Immortal (B)	*Erythrina glauca* Willd.	Leguminosae
Jagua amarilla (C)	*Chimarrhis latifolia* Standl.	Rubiaceae

Jagua amarilla (C)	*?Genipa* sp.	Rubiaceae
Jagua blanca; j. de montaña; j. negra (B, C)	*Genipa americana* L.	Rubiaceae
Jagua de montaña (B, C)	*Sickingia Maxonii* Standl.	Rubiaceae
Jasmine, Mountain (B)	*Stemmadenia macrantha* Standl.	Apocynaceae
Jasmine, Wild (B)	*Aegiphila martinicensis* L.	Verbenaceae
Javillo (B)	*Hura crepitans* L.	Euphorbiaceae
Jícaro (C)	*Crescentia Cujete* L.	Bignoniaceae
Jobitillo (C)	*Phyllanthus conami* Sw.	Euphorbiaceae
Jobito (C)	*Spondias purpurea* L.	Anacardiaceae
Jobo (B, C)	*Spondias Mombin* L.	Anacardiaceae
John crow wood (B)	*Cespedesia macrophylla* Seem.	Ochnaceae
Jug tree (B)	*Cordia diversifolia* Pav.	Borraginaceae
Kaway, Swamp (C)	*Platymiscium polystachium* Benth. (?)	Leguminosae
Lagarto (C)	*Zanthoxylum panamense* P. Wils.	Rutaceae
Laurel negro (B)	*Cordia alliodora* (R. & P.) Cham.	Borraginaceae
Lechoso (C)	*Trophis macrostachya* D. Sm.	Moraceae
Lempa (C)	*Hernandia guianensis* Aubl.	Hernandiaceae
Lengua de buey (C)	*Cordia heterophylla* R. & S.	Borraginaceae
Lilac, Persian (B, C)	*Melia Azedarach* L.	Meliaceae
Lime, Wild (B)	*Citharexylum Cooperi* Standl.	Verbenaceae
Llema de huevo (B)	*Chimarrhis parviflora* Standl.	Rubiaceae
Machete (B)	*Erythrina rubrinervia* H. B. K.	Leguminosae
Macreleaf (B)	*Conostegia puberula* Cogn. (?)	Melastomaceae
Madre de cacao (B)	*Gliricidia sepium* (Jacq.) Steud.	Leguminosae
Madroño	*Calycophyllum candidissimum* DC.	Rubiaceae
Majagüillo (C)	*Muntingia Calabura* L.	Elaeocarpaceae
Malagueto (B)	*Guatteria aeruginosa* Standl.	Anonaceae
Malagueto prieto (C)	*Guatteria Slateri* Standl.	Anonaceae
Mamecillo (B)	*Lucuma calistophylla* Standl.	Sapotaceae
Mamecillo blanco (C)	*Guarea chiricana* Standl.	Meliaceae
Manglé de agua (C)	*Bravaisia integerrima* (Spreng.) Standl.	Acanthaceae

Manglé colorado (C)	*Tovomitopsis multiflora* Standl.	Guttiferae
Mangrove (B)	*Rhizophora Mangle* L.	Rhizophoraceae
Mangrove, White (B)	*Avicennia nitida* Jacq.	Verbenaceae
Manwood; black manwood (B)	*Minquartia guianensis* Aubl.	Olacaceae
Manwood, Red (B)	*Calocarpum mammosum* (L.) Pierre	Sapotaceae
Manwood, Yellow (B)	*Vitex Cooperi* Standl.	Verbenaceae
Mapola (B)	*Malvaviscus arboreus* Cav.	Malvaceae
María (C)	*Calophyllum Rekoi* Standl.	Guttiferae
Marión (C)	*Bucida Buceras* L.	Combretaceae
Mastate (B)	*Inophloeum armatum* (Miq.) Pittier	Moraceae
Mata cansada (B)	*Eschweilera calyculata* Pittier	Lecythidaceae
Membrillo (C)	*Grias Fendleri* Seem.	Lecythidaceae
Milkwood (B)	*Tabernaemontana citrifolia* L.	Apocynaceae
Monca prieto (C)	*Cyphomandra beterophylla* D. Sm.	Solanaceae
Monkey apple (B)	*Posoqueria latifolia* (Rudge) R. & S.	Rubiaceae
Mora (C)	*Chlorophora tinctoria* (L.) Gaud.	Moraceae
Morcielago (B, C)	*Cornutia grandifolia* (S. & C.) Schauer	Verbenaceae
Morillo (C)	*Trophis* sp.	Moraceae
Mosquitowood (B)	*Posoqueria latifolia* (Rudge) R. & S. (?)	Rubiaceae
Muñeca amarilla (C)	*Cordia Collococca* L.	Borraginaceae
Naranjillo colorado (C)	*Heisteria macrophylla* Oerst.	Olacaceae
Needlewood (B)	*Xylosma panamensis* Turcz.	Flacourtiaceae
Nigüito (C)	*Cordia beterophylla* R. & S.	Borraginaceae
Nispero; n. colorado (C)	*Lucuma chiricana* Standl.	Sapotaceae
Nispero (B)	*?Lucuma* sp.	Sapotaceae
Nispero (B)	?	Sapotaceae
Nispero blanco (C)	*?Ficus* sp.	Moraceae
Nispero negro (C)	*Minquartia guianensis* Aubl.	Olacaceae
Nune (C)	*Hura crepitans* L.	Euphorbiaceae
Nutmeg, Wild (B)	*Ocotea pentagona* Mez (?)	Lauraceae
Ogüito (B, C)	*Ixora rauwolfioides* Standl.	Rubiaceae
Ojoche macho (B)	*Trophis racemosa* (L.) Urb.	Moraceae
Olivo (C)	*Sapium jamaicense* Sw.	Euphorbiaceae

Ollito (B)	*Eschweilera calyculata* Pittier	Lecythidaceae
Orange, Wild (B)	*Tabernaemontana arborea* Rose and *T. grandiflora* Jacq.	Apocynaceae
Orey wood (B)	*Campnosperma panamensis* Standl.	Anacardiaceae
Palma brava (C)	*Bactris* (sec. *Trichobactris*) sp.	Palmaceae
Palm, Cock's tail (B)	*Geonoma* sp.	Palmaceae
Palm, Rower (B)	*Astrocaryum* sp.	Palmaceae
Palm, Wild (B)	*Quararibea pterocalyx* Hemsl.	Bombacaceae
Paloma (C)	*Gilibertia Smithiana* Johnston	Araliaceae
Palo blanco (C)	*Vernonia patens* H. B. K.	Compositae
Palo chancho (B)	*Hieronyma alchorneoides* Allem. (?)	Euphorbiaceae
Palo ortigo (C)	*Urera elata* (Sw.) Gris.	Urticaceae
Palo santo (C)	*Erythrina panamensis* Standl.	Leguminosae
Panamá wood (C)	*Sterculia apetala* (Jacq.) Karst.	Sterculiaceae
Papaturro (B)	*Coccoloba Tuerckheimii* D. Sm.	Polygonaceae
Papaturro blanco (C)	*Coccoloba caracasana* Meissn.	Polygonaceae
Papaya (B)	*Carica dolichaula* D. Sm.	Caricaceae
Pear, Wild (C)	*Licania platypus* (Hemsl.) Fritsch.	Amygdalaceae
Peinecillo (C)	*Apeiba Tibourbou* Aubl.	Tiliaceae
Pichy pang (B)	*Colubrina panamensis* Standl.	Rhamnaceae
Pigeon plum, Wild (B)	*Ouratea Wrightii* (Ván Tiegh.) Riley	Ochnaceae
Pilón (B, C)	*Hieronyma alchorneoides* Allem.	Euphorbiaceae
Pimento (B)	*Myrcia Oerstediana* Berg.	Myrtaceae
Piper (B)	*Piper elongatum* Vahl	Piperaceae
Plátano (B)	*Chimarrhis parviflora* Standl.	Rubiaceae
Plum (B, C)	*Spondias Mombin* L.	Anacardiaceae
Plum, Wild (B)	*Spondias purpurea* L.	Anacardiaceae
Prickly holly; p. yellow (B)	*Zanthoxylum panamense* P. Wils.	Rutaceae
Quira (B, C)	*Andira inermis* H. B. K.	Leguminosae
Ramoon (B)	*Trophis macrostachya* D. Sm.	Moraceae
Red berry (B)	*Hamelia nodosa* M. & G.	Rubiaceae
Riverwood (B)	*Pithecolobium Vahlianum* DC.	Leguminosae
Roble, (B, C)	*Dialyanthera Otoba* (H. & B.) Warb.	Myristicaceae
Roble (C)	*Tecoma pentaphylla* Juss.	Bignoniaceae
Rubber tree (C)	*Castilla fallax* Cook	Moraceae
Saba (B)	*Dialyanthera acuminata* Standl.	Myristicaceae
Saba (B, C)	*Dialyanthera Otoba* (H. & B.) Warb.	Myristicaceae
Saba (B)	*Inga* sp.	Leguminosae

Saman (B)	*Pithecolobium Saman* (Jacq.) Benth.	Leguminosae
Sambo gum (B)	*Symphonia globulifera* L. f.	Guttiferae
Sanalego (B)	*Vernonia patens* H. B. K.	Compositae
Sandbox (B)	*Hura crepitans* L.	Euphorbiaceae
Sangrillo (C)	*Platymiscium polystachium* Benth. (?)	Leguminosae
Sapo (C)	*Grias Fendleri* Seem.	Lecythidaceae
Sapote, Wild (B)	*Lucuma pentasperma* Standl.	Sapotaceae
Search-my-heart (B)	*Miconia lamprophylla* Tr. (?)	Melastomaceae
Senna, Wild (B)	*Cassia reticulata* Willd.	Leguminosae
Sequarra (C)	*Eugenia Oerstediana* Berg.	Myrtaceae
Sigua (B)	*Nectandra glabrescens* Benth.	Lauraceae
Sigua (B)	*Ocotea pentagona* Mez (?)	Lauraceae
Sigua amarilla (C)	?	Lauraceae
Sota-caballo (B)	*Pithecolobium Vahlianum* DC.	Leguminosae
Souca (C)	*Trichilia hirta* L. (?)	Meliaceae
Star apple (C)	*Chrysophyllum Cainito* L.	Sapotaceae
Star apple, Wild (B)	*Chrysophyllum argenteum* Jacq.	Sapotaceae
Stinking toe (B)	*Cassia grandis* L. f.	Leguminosae
Sur espino (B)	*Ormosia panamensis* Benth.	Leguminosae
Sweetwood (?) (B)	*Nectandra globosa* (Aubl.) Mez	Lauraceae
Sweetwood (B)	*Nectandra Laurel* Kl. & Karst.	Lauraceae
Sweetwood (B)	*Ocotea stenoneura* Mez & Pitt.	Lauraceae
Sweetwood, Rock (B)	*Nectandra membranacea* Gris.	Lauraceae
Sweetwood, Timber (B)	*Nectandra* sp.	Lauraceae
Tamarind (B)	*Pentaclethra filamentosa* Benth.	Leguminosae
Tamarind (B)	*Tamarindus indica* L.	Leguminosae
Tamarind blanco (C)	*?Leucaena* sp.	Leguminosae
Tamarind, Monkey (?) (B)	?	Sapotaceae
Tamarind, Wild (B)	*Pithecolobium pseudo-Tamarindus* Standl.	Leguminosae
Tar gum tree (B)	*Clusia minor* L.	Guttiferae
Tigüilote (B)	*Cordia diversifolia* Pavón	Borraginaceae
Tobacco (B)	*Pentagonia magnifica* Krause	Rubiaceae
Toreto (C)	*Anona purpurea* Moc. & Sessé	Anonaceae
Toreto (C)	*Rollinia Jimenezii* Safford	Anonaceae
Trumpet tree (B)	*Cecropia arachnoidea* Pittier and *C. mexicana* Hemsl.	Moraceae
Trumpet tree (C)	*Cecropia* sp.	Moraceae
Ule (C)	*Castilla fallax* Cook	Moraceae

Ule (B)	*Castilla panamensis* Cook	Moraceae
Ur (B)	*Minquartia guianensis* Aubl.	Olacaceae
Uvre (C)	*Oncoba laurina* (Presl) Warb.	Flacourtiaceae
Wytil (B, C)	*Sickingia Maxonii* Standl.	Rubiaceae
Yaya (B)	*Nectandra Laurel* Kl. & Karst.	Lauraceae
Yaya blanca (C)	*Unonopsis Pittieri* Safford	Anonaceae
Yedi (C)	*Cestrum panamense* Standl.	Solanaceae
Zapatero (B, C)	*Hieronyma alchorneoides* Allem.	Euphorbiaceae
Zapote (C)	*Licania platypus* (Hemsl.) Fritsch	Amygdalaceae
Zapote de mono (B)	*Couroupita darienensis* Pittier and *C. parviflora* Standl.	Lecythidaceae
Zapote de mono (C)	*Couroupita odoratissima* Seem. (?)	Lecythidaceae

TREES COLLECTED BY G. PROCTOR COOPER NEAR PERMÉ, PANAMA

After leaving the Province of Bocas del Toro, Mr. Cooper spent a week, April 3–10, 1928, in the vicinity of Permé, Department of San Blas, on the Panama-Colombia border. It was an inopportune time for collecting, being the dormant interval at the end of the three months' dry season when most of the trees are sterile, but 31 specimens were obtained, nine of which, according to Mr. Standley, are new to science.

Mr. Cooper says: "I saw many interesting and strange-looking trees in the forest and as this region has not been studied by botanists I am sure that further investigation would yield a great deal of new and interesting specimens and information. The Darién Mountains separating Panama and Colombia are nearby and the migration of species could be readily noted. The best time to collect, according to the natives, would be from November to February, as the fruits of the early-flowering trees and the flowers of the late-blooming species would both be available. It would be possible to make a trip over the mountains and down the Chucunaque River 150 miles to the Pacific, as the once hostile Indians are now willing to allow peaceful penetration to certain travelers. An invitation was extended to me by a mountain chief who offered to furnish guides and cayucas for the river trip."

ANONACEAE

Guatteria hypoglauca Standl., sp. nov. (in ed.). No. 661; Yale No. 12,294.

Rollinia permensis Standl., sp. nov. (in ed.). No. 645; Yale No. 12,278.

APOCYNACEAE

Plumeria microcalyx Standl., sp. nov. (in ed.). WILD JASMINE. No. 642; Yale No. 12,275.

Tabernaemontana grandiflora Jacq. No. 643; Yale No. 12,276.

BIGNONIACEAE

Jacaranda Copaia (Aubl.) Don. No. 631; Yale No. 12,264.

BORRAGINACEAE

Cordia alliodora (R. & P.) Cham. LAUREL. No. 649; Yale No. 12,282.

CAPPARIDACEAE

Capparis crotonantha Standl., sp. nov. (in ed.). No. 660; Yale No. 12,293.

FLACOURTIACEAE

Carpotroche subintegra Standl., sp. nov. (in ed.). No. 638; Yale No. 12,271.

GUTTIFERAE

Tovomita stylosa Hemsl. No. 637; Yale No. 12,270.

Vismia latifolia Choisy. No. 659; Yale No. 12,292.

LACISTEMACEAE

Lacistema aggregatum (Berg.) Rusby. No. 636; Yale No. 12,269.

LECYTHIDACEAE

Gustavia rhodantha Standl., sp. nov. (in ed.). No. 633; Yale No. 12,266.

LEGUMINOSAE

Inga monticola Pittier (probably). No. 651; Yale No. 12,284.

Swartzia simplex Sw. No. 650; Yale No. 12,283.

MELASTOMACEAE

Miconia argentea (Sw.) DC. No. 657; Yale No. 12,290.

Miconia laevigata DC. JOINT BUSH. No. 635; Yale No. 12,268.

Miconia sp. No. 635a; Yale No. 12,268A.

MORACEAE

Ficus Proctor-Cooperi Standl., sp. nov. (in ed.). FIG. No. 641; Yale No. 12,274.

Perebea laevigata Standl., sp. nov. (in ed.). WILD RUBBER. No. 634; Yale No. 12,267.

MYRISTICAECAE

Virola panamensis (Hemsl.) Warb. No. 648; Yale No. 12,281.

MYRTACEAE

Eugenia sp. No. 632; Yale No. 12,265.

NYCTAGINACEAE

Neea laetevirens Standl., sp. nov. (in ed.). No. 639; Yale No. 12,272.

POLYGONACEAE

Triplaris americana L. Nos. 644 and 647; Yale Nos. 12,277 and 12,280.

RUBIACEAE

Isertia Henkeana DC. No. 653; Yale No. 12,286.

Palicourea guianensis Aubl. No. 658; Yale No. 12,291.

SOLANACEAE

Solanum asperum Rich. No. 646; Yale No. 12,279.

STERCULIACEAE

Sterculia apetala (Jacq.) Karst. No. 652; Yale No. 12,285.

TILIACEAE

Belotia panamensis Pittier. No. 655; Yale No. 12,288.

VERBENACEAE

Callicarpa acuminata H.B.K. No. 654; Yale No. 12,287.

EXPORTS OF QUEBRACHO FROM ARGENTINA

(Based upon table in *Anuario de la Republica Argentina, 1927*)

Year	Extract	Logs	Total
1905.....	$1,213,886	$2,137,582	$3,351,468
1910.....	2,214,679	2,802,215	5,016,894
1915.....	7,936,686	1,342,204	9,278,890
1918.....	6,835,660	123,267	6,958,927
1919.....	11,784,498	566,414	12,350,912
1920.....	8,311,114	891,709	9,202,823
1921.....	5,676,893	513,177	6,190,070
1922.....	6,558,241	1,373,303	7,931,544
1923.....	7,474,137	1,092,431	8,566,568
1924.....	7,054,580	914,373	7,968,953
1925.....	9,024,863	1,368,533	10,393,396
1926.....	8,493,763	765,375	9,259,138

NOTE.—Values are in American dollars.

NEW TREES FROM BRITISH HONDURAS

By PAUL C. STANDLEY
Field Museum of Natural History

Further exploration of the forests of British Honduras, undertaken by the forestry department of that Colony in coöperation with the Yale School of Forestry, continues to yield many additions to its flora. The flora of British Honduras is certainly a distinct one, in view of present data, but presumably it must bear a close relationship to those of Petén and southern Yucatán, both of which, unfortunately, are still unknown.

Of the species here described as new, the *Pterocarpus* is doubtless the most important and interesting.

Coccoloba belizensis Standl., sp. nov.

Arbor parva; folia magna, brevipetiolata, oblongo-elliptica, acuta, basi breviter cordata, supra glabra, subtus ad nervos minute puberula vel fere omnino glabra; spicae paniculatae, rhachi glabra, floribus sessilibus.

A small tree, the young branchlets subterete, densely puberulent; ocreae about 1.8 cm. long, broadened and flaring above, densely puberulent; petioles 2.5 cm. long, densely brown-puberulent; leaf blades oblong-elliptic, 16–33 cm. long, 7.5–19 cm. wide, acute, at base rounded or obtuse and shallowly cordate, coriaceous, glabrous above, the nerves shallowly impressed, beneath minutely puberulent along the nerves or glabrate, the lateral nerves slender, prominent, about 12 on each side, arcuate; spikes stout, short-pedunculate, 17 cm. long or shorter, 5 mm. thick, forming a large terminal panicle, the rachis densely and minutely puberulent; ocreae 1 cm. long or less, brown, the ocreolae densely puberulent; flowers sessile, the buds 1.5 mm. long, glabrous.

BRITISH HONDURAS: Tipperary Road to Silk Grass, Stann Creek Valley, August, 1927, *Neil S. Stevenson 7;* Yale No. 10, 689 (Herb. Field Mus. No. 572,668, TYPE).

Related to the Guatemalan *C. Tuerckheimii* Donn. Smith, in which the leaves are acute at base, and the flowers pedicellate.

Pterocarpus reticulatus Standl., sp. nov.

Foliola 7–10, alterna vel subopposita, oblonga vel elliptico-oblonga, apice breviter acuminata, acumine obtuso, reticulato-nervata, puberula; racemi simplices vel pauciramosi, laxiflori, floribus graciliter pedicellatis; calyx dense tomentulosus, petalis luteis.

Branchlets slender, subterete, brownish-tomentulose; petioles 4–5.5 cm. long, the leaf rachis 13–14 cm. long, tomentulose; leaflets 7–10, alternate or subopposite, the petiolules stout, 4–5 mm. long, brown-tomentulose, the blades oblong or elliptic-oblong, 7–9.5 cm. long, 3–4.5 cm. wide, or the lower much reduced, abruptly acute or acuminate, with short, rounded or subemarginate tip, at base broadly rounded, chartaceous, bright green above, slightly paler beneath, tomentulose or puberulent, or in age glabrate, the venation slightly elevated and closely reticulate on both surfaces; racemes solitary or in small panicles, many-flowered, 2 cm. long or shorter, the rachis slender, tomentulose; pedicels very slender, 6–7 mm. long, densely and minutely pilose with brownish ascending hairs, bearing just below the calyx 2 minute subulate bractlets; calyx curved downward, turbinate, densely brownish-tomentulose, 7–8 mm. long, acute at base, 4 mm. broad above, the lobes broadly ovate, 2 mm. long, obtuse or rounded; petals bright yellow, the standard 13–14 mm. long, glabrous; filaments unequal, glabrous; ovary lance-ovoid, short-stipitate, densely appressed-pilose, the long slender style glabrous above.

BRITISH HONDURAS: Boca, 1927, *C. S. Brown 15;* Yale No. 12,306 (Herb. Field Mus. No. 579,201, TYPE).

To be referred here, apparently, and differing only in somewhat scantier pubescence, is *G. Proctor Cooper 573* (Yale No. 12,206), from Farm 8 Pasture, region of Almirante, Panama. The collector's notes as are follows: A tree 15–18 m. high, the trunk 45–60 cm. in diameter, with low narrow buttresses. Flowers orange-yellow, fragrant. Sap blood-red and sticky, soon hardening into a brittle shining mass. The bark has black and red strands running through it vertically. Common name, "bloodwood."

By its foliage characters *P. reticulatus* is easily distinguished from the other Central American species of *Pterocarpus*.

Trichilia minutiflora Standl. Trop. Woods 11: 20. 1927.

This species has been recollected recently, in flower, at Freshwater Creek, British Honduras, *H. H. Heyder & J. B. Kinloch 13*. The local name is "wild lime."

Allophylus longeracemosus Standl., sp. nov.

Folia petiolata, foliolis 3, oblongo-ellipticis vel obovato-ellipticis, acutis vel breviter acuminatis, basi acuminatis, inaequaliter crenatis vel subintegris, subtus ad axillas barbatis; racemi elongati, simplices, floribus breviter pedicellatis; ovarium adpresse pilosulum.

Branchlets slender, dark brown, conspicuously lenticellate, glabrous or

nearly so, the internodes short or elongate; petioles 1–1.5 cm. long, slender, glabrous; leaflets 3, oblong-elliptic to obovate-elliptic, 4–8.5 cm. long, 2–3.5 cm. wide, acute or short-acuminate, with obtuse tip, rarely obtuse at apex, gradually or abruptly acuminate below and decurrent into a short petioliform base, coarsely and irregularly crenate near the apex or nearly entire, deep green above, glabrous, beneath slightly paler, densely barbate in the axils of the lateral nerves, elsewhere glabrous, the venation elevated on both surfaces, closely reticulate, the lateral nerves about 7 on each side, arcuate, percurrent; racemes very slender, 7–17 cm. long, pedunculate, laxly many-flowered, the rachis sparsely puberulent or glabrate, the stout pedicels 2–3 mm. long; ovary minutely appressed-pilose; fruit subglobose, 7 mm. in diameter, terete, smooth, broadly rounded at apex, constricted at base, glabrate.

BRITISH HONDURAS: Columbia to Toledo, 1927, *Donald & Balderamos 10;* Yale No. 12,304 (Herb. Field Mus. No. 579,196, TYPE).

The local name is "bastard axemaster."

Cupania belizensis Standl., sp. nov.

Folia pinnata, foliolis c. 7, oblongis, petiolulatis, apice rotundatis, basi acutis vel obtusis, adpresse serratis, subcoriaceis, subtus molliter pilosulis, pilis brevibus, patentibus; paniculae multiflorae, tomentulosae.

Young branchlets stout, obtusely angulate, densely and minutely tomentulose or finally glabrate, with short or elongate internodes; petioles 3.5–4 cm. long, the leaf rachis 8–11 cm. long, grayish-tomentulose; leaflets about 7, on petiolules 2–9 mm. long, the blades oblong, 8–12 cm. long, 3–4.5 cm. wide, broadly rounded at apex, acute to obtuse at base, rather coarsely appressed-serrate nearly to the base, subcoriaceous, puberulent above along the nerves, beneath softly pilosulous with grayish spreading hairs, the nervation prominent beneath, closely reticulate; panicles terminal and axillary, much branched, many-flowered, about 13 cm. long and broad, the branches densely grayish-tomentulose; bracts about 2 mm. long, triangular, rigid; flower buds 1–1.5 mm. in diameter, densely tomentulose.

BRITISH HONDURAS: Cohune Ridge, Vaca, western Cayo District, 1927, *Duncan Stevenson 15;* Yale No. 11,995 (Herb. Field Mus. No. 572,639, TYPE).

The local name is "Grande Betty."

Bourreria oxyphylla Standl., sp. nov.

Folia graciliter petiolata, oblongo-elliptica, acuta vel breviter acuminata, basi obtusa vel acuta, nitida, ad nervos parce puberula vel glabrata; cymae multiflorae, floribus pedicellatis, pedicellis adpresse pilosulis; calyx extus minute adpresso-pilosulus, lobis late ovatis, obtusis; corollae lobi extus sparse adpresso-pilosuli.

Branchlets slender, terete, with short or elongate internodes, when young very sparsely short-hirtellous or glabrate; petioles slender, 8–12 mm. long,

sparsely hirtellous or glabrate; leaf blades oblong-elliptic or oblong, 7.5–11.5 cm. long, 3.5–5.5 cm. wide, acute or short-acuminate, rarely obtuse, at base acute or obtuse, entire, thin, lustrous, sparsely puberulent above along the nerves, beneath usually glabrous, the nerves slender, slightly elevated beneath, about 6 on each side, arcuate, irregularly anastomosing near the margin; cymes many-flowered, about 7.5 cm. long and broad, pedunculate, the branches grayish-puberulent, the pedicels 2–4 mm. long; calyx campanulate, 5 mm. long, obtuse at base and abruptly contracted, minutely and sparsely appressed-pilosulous, the 4 lobes ovate, obtuse, shorter than the tube; corolla 8 mm. long, the tube equaling the calyx, the lobes broadly obovate, rounded at apex, grayish-strigillose outside, spreading; filaments glabrous; anthers oblong, 2 mm. long; ovary glabrous, the style glabrous, 6 mm. long, its 2 branches 2–2.5 mm. long; fruit subglobose, about 12 mm. in diameter.

BRITISH HONDURAS: San José, northwestern Cayo District, November, 1927, *J. B. Aitken 4* (Herb. Field Mus. No. 572,622, TYPE). Indian guamil, Camp VI, Vaca, western Cayo District, 1927, *Duncan Stevenson 6* (Yale No. 11,988). Yoloch, *Stevenson 9* (Yale No. 11,989).

HONDURAS: La Ceiba, December, 1927, *Holger Johansen 5.*

Called "roble" in British Honduras, and the name "sac-bay-eck," evidently Maya, also is reported. The species is distinguished by its acute leaves and numerous pubescent flowers.

Aegiphila pauciflora Standl., sp. nov.

Folia graciliter petiolata, oblongo-elliptica, acute acuminata, basi acuta vel acuminata, subnitida, minute cinereo-strigillosa vel glabrata; cymae axillares, pedunculatae, pauciflorae, cinereo-strigillosae, floribus pedicellatis; calyx turbinato-campanulatus, strigillosus, limbo truncato; corollae tubus calyce duplo longior, glaber, filamentis longe exsertis.

Branchlets slender, obtusely quadrangular, ochraceous, densely and minutely cinereous-strigillose or finally glabrate, the internodes 2 cm. long or shorter; petioles slender, 1.5–2 cm. long, cinereous-strigillose; leaf blades oblong-elliptic, 7–10 cm. long, 3–4 cm. wide, rather abruptly acuminate, with acute tip, gradually or abruptly acute or acuminate at base, subcoriaceous, somewhat lustrous above, when young densely and minutely cinereous-strigillose on both surfaces, in age glabrate, the lateral nerves prominent on both surfaces, 7 or 8 on each side, arcuate-ascending, irregularly anastomosing near the margin; cymes axillary, few-flowered, on peduncles 6–15 mm. long, the branches strigillose, the flowers partly sessile and partly on pedicels 1–2.5 mm. long, the bracts minute, subulate or filiform; calyx broadly turbinate-campanulate, 3 mm. long and broad, acute at base, grayish-strigillose, the limb truncate, remotely and minutely 5-denticulate; corolla glabrous outside, the tube 4 mm. long, broadened upward, the lobes rounded, 2.5 mm. long, spreading; filaments very slender, exserted about 3 mm., glabrous; style glabrous.

BRITISH HONDURAS: Indian guamil, Camp VI, Vaca, western Cayo District, 1927, *Duncan Stevenson 5;* Yale No. 11,987 (Herb. Field Mus. No. 572,629, TYPE).

Palicourea Stevensonii Standl., sp. nov.

Frutex glaber; stipulae lineari-oblongae, magnae, apice bilobatae, deciduae; folia brevipetiolata, elliptico-oblonga, abrupte cuspidato-acuminata, basi abrupte acuta, nervis lateralibus plurimis, elevatis; paniculae terminales, longipedunculatae, multiflorae, bracteis anguste lanceolatis, pallide viridibus, floribus brevipedicellatis vel sessilibus; calycis lobi lanceolati, attenuati, inaequales; corolla bracteas vix excedens, filamentis longe exsertis.

Shrub, glabrous throughout, the branches stout, green, subterete; stipules linear-oblong, 1.5–2.5 cm. long, 4 mm. wide, shallowly bilobate at apex, with acute lobes, in age deciduous; leaves opposite, the petioles slender, 7–10 mm. long; leaf blades elliptic-oblong, 11–18 cm. long, 4–7 cm. wide, abruptly acuminate or cuspidate-acuminate, with a long-attenuate acumen 1.5 cm. long, at base abruptly acute, bright green above, slightly paler beneath, the lateral nerves elevated on both surfaces, slender, about 20 on each side, arcuate; panicles terminal, about 5.5 cm. long, the peduncle 6 cm. long, the primary branches about 12 mm. long, verticillate, several-flowered, the bracts lance-linear, pale green, the larger ones equaling the corolla tube, acutish, ciliolate; calyx and hypanthium scarcely 1 mm. long, the limb shallowly dentate; corolla tube 5 mm. long, 1.5 mm. thick, the lobes oval, rounded at apex, 2 mm. long, spreading; filaments exserted 3 mm. beyond the corolla tube.

BRITISH HONDURAS: Middlesex, July, 1927, *Neil S. Stevenson C;* Yale No. 10,683 (Herb. Field Mus. No. 572,673, TYPE). Cockscomb Branch of South Stann Creek, March, 1928, *D. Stevenson VIII.*

A well-marked species because of the numerous nerves of the leaves and the large bracts of the inflorescence.

Mexican Export Duties on Forest Products

According to the presidential decree of July 21, 1928, the Mexican export duties on forest products are as follows: CABINET WOODS (logs in the round), up to 32 inches maximum diameter, 1 peso per linear meter; 32 to 40 inches, 2 pesos; 40 to 48 inches, 3 pesos; 48 to 56 inches, 4 pesos; over 56 inches, 5.20 pesos. COMMON WOODS (logs in the round), up to 32 inches maximum diameter, 2.50 pesos per cubic meter or 0.70 peso per linear meter; 32 to 40 inches, 1.20 pesos per linear meter; 40 to 48 inches, 1.90 pesos; 48 to 56 inches, 2.60 pesos; over 56 inches, 3.50 pesos.

FIVE NEW TREES AND SHRUBS FROM NICARAGUA

By PAUL C. STANDLEY
Field Museum of Natural History

Among the most interesting Central American collections received recently for study is one made on the east coast of Nicaragua by Mr. F. C. Englesing, of the Bragmans Bluff Lumber Company, for the Yale School of Forestry. Little is known of the flora of Nicaragua, and practically nothing of that of the Atlantic coast. Mr. Englesing's specimens include numerous new records for the Nicaraguan flora, and the new species described below.

Ravenia rosea Standl., sp. nov.

Arbor parva; folia simplicia, brevipetiolata, oblongo-elliptica, apice caudato-acuminata, basi acuta, ad nervos hirtella; inflorescentia terminalis, pauciflora, prophyllis 2 foliaceis fulcrata, floribus magnis, longipedicellatis, subumbellatis; sepala ovata, obtusa.

A small tree or large shrub, the slender branchlets green, sparsely hirtellous or glabrate, the internodes 1.5–3.5 cm. long; leaves simple, the petioles stout, 3–5 mm. long, hirtellous or glabrate; leaf blades oblong-elliptic, 10–13 cm. long, 4–5 cm. wide, caudate-acuminate, with long narrow obtuse tip, at base acute, thin, densely glandular-punctate with minute pellucid glands, deep green above, hirtellous along the nerves, the lateral nerves conspicuous beneath, about 16 on each side, subarcuate; flowers terminal, subumbellate, the umbels 2 to 5-flowered, pedunculate, subtended by 2 broadly ovate, leaflike, sessile bracts 6–12 mm. long; pedicels stout, 6–12 mm. long, puberulent or glabrate, thickened above; sepals 12 mm. long, imbricate, unequal, broadly ovate, obtuse, densely glandular, glabrous, persistent in fruit; corolla 3 cm. long, sparsely hirtellous outside, the tube 1.5 cm. long, 4 mm. thick, the lobes oblong, unequal, broadly rounded at apex, short-hirtellous within; carpels of the fruit 5.9 mm. long, rounded at apex, glabrous.

NICARAGUA: On low hill in rear of Camp 14, north side of Río Kukalaya, Bragmans Bluff region, in rich clayey soil, Dec. 2, 1927, *F. C. Englesing 48;* Yale No. 1232 (Herb. Field Mus. No. 572,607, TYPE).

The collector furnishes the following information concerning the tree: A tree or shrub 4.5 m. high, with trunk diameter of 6.5 cm.; rarely exceeding 10 cm. in diameter and 8 m. in height; abundant in the lower story of the forest from Rawawas to the Ocongwas, seeming to prefer the hill country but only slightly less abundant on the lower levels. It

frequently branches from only a short distance above the base to a height of 2 or 3 m. It is rather showy in blooming, from September into late December. Flowers deep rose, the anthers light yellow. Bark smooth, black-brown.

The genus *Ravenia* has not been known previously from the continent of North America, although four species occur in the West Indies.

Tetrorchidium rotundatum Standl., sp. nov.

Arbor laticifera, fere omnino glabra; folia longe petiolata, oblanceolato-oblonga, apice rotundata, versus basin longe attenuata, petiolo supra medium glandulis 2 parvis orbicularibus instructo.

A large laticiferous tree, glabrous except in the inflorescence; young branchlets stout and thick, green, densely leafy, or the internodes sometimes elongate; petioles slender, 2–4 cm. long, bearing above the middle, but remote from the blade, 2 small, sessile, unequally inserted, orbicular glands; leaf blades obovate-oblong, 7.5–13.5 cm. long, 2.5–5.5 cm. wide, rounded at apex, gradually long-attenuate to the base, thick-membranaceous, bright green above, slightly paler beneath, entire, the lateral nerves very slender, about 7 on each side, divergent at an angle of 45 degrees or more, subarcuate; staminate panicles spiciform, pedunculate, 7–11 cm. long, the rachis thinly puberulent; flowers green, sessile, in dense, remote or crowded clusters, the sepals broadly triangular, concave, 2 mm. long, densely puberulent.

HONDURAS: Lancetilla Valley, near Tela, Dept. of Atlántida, alt. 100 m., *Paul C. Standley 52,892* (Herb. Field Mus. No. 579,698, TYPE), *52,691*.

NICARAGUA: Region of Bragmans Bluff, *F. C. Englesing 53;* Yale No. 1236.

Mr. Englesing states that in Nicaragua this is a tree of 30 m., with a trunk diameter of 60 cm. above the high buttresses. The trunk is slightly grooved, the bark pitted and greenish gray below, smoother above. The wood is creamy white and odorless. The tree is common in the hillside forests of the Lancetilla Valley.

Tetrorchidium rotundatum is closely related to *T. rubrivenium* Poepp., of the West Indies and South America. A variety of the latter is reported from Costa Rica. *T. rubrivenium* differs from *T. rotundatum* in its acute or merely obtuse leaves, whose glands are inserted at the base of the blade.

Schlegelia nicaraguensis Standl., sp. nov.

Frutex scandens; folia simplicia, oblongo-elliptica, acuminata, basi acuta, subcoriaceae, glabra; flores laterales, fasciculati, pedicellati; calyx late campanulatus, sparse puberulus vel glabratus; corolla glabra.

A large scandent shrub, the branchlets stout, obtusely angulate, ochraceous, glabrous, with short internodes; leaves simple, glabrous, the petioles 5–8 mm. long, much thickened toward the base; leaf blades oblong-elliptic, 8–14 cm. long, 3–6 cm. wide, acuminate, often abruptly so, acute at base, subcoriaceous, somewhat paler beneath, the nerves elevated beneath, the costa stout, the principal lateral nerves 4–6 on each side, ascending at an acute angle, irregularly anastomosing near the margin, the intermediate nerves irregularly reticulate; flowers fascicled on the older branches below the leaves, the pedicels 7–8 mm. long, puberulent or hirtellous; calyx broadly campanulate, 11 mm. long and wide, sparsely puberulent below, abruptly contracted at base, the limb truncate, obscurely 5-denticulate; corolla 4.7 cm. long, glabrous outside, the tube slightly exceeding the calyx, 4 mm. thick, the throat gradually ampliate, 12 mm. broad at the oblique mouth, the lobes rounded, 6–7 mm. long, puberulent within.

NICARAGUA: On hill north of Camp 14, region of Bragmans Bluff, in red clayey loam under dense forest shade, alt. 66 m., Dec. 24, 1927, *F. C. Englesing 99* (Herb. Field Mus. No. 572,559, TYPE).

The collector's notes are as follows: A liana, supported by a small tree to a height of 5 m. Stem long, twining and looping, with light gray bark. Leaves dull dark green above and light yellow-green beneath. Calyx light purple with minute lighter spots. Outside of corolla yellowish, shading into lavender; inside of lobes deep lavender; inside of lower tube yellow, flecked with red-brown lines and spots. Anthers white. Local name, "coralmeca."

Only one species of this genus, the Guatemalan *S. cornuta* Donn. Smith, has been reported from Central America, and that, according to description, is not closely related to the present plant.

Chomelia Englesingii Standl., sp. nov.

Arbor parva; folia late elliptica vel ovato-elliptica, abrupte et breviter obtuso-acuminata vel obtusa, basi rotundata, supra ad costam hirtella, subtus ad nervos pilis adpressis vel patentibus pilosa, in axillis barbata; flores pauci, sessiles; calycis lobi lineares; corollae tubus fere filiformis, pilis adpressis indutus, limbo quadrilobato.

A small tree, the branchlets slender, terete, hirtellous or glabrate, with short internodes; stipules 2.5–3 mm. long, broadly ovate, obtuse, subulate-cuspidate, scarious, sericeous on both surfaces; petioles 2–3 mm. long, hirtellous; leaf blades broadly elliptic or ovate-elliptic, 3–5 cm. long, 2–3.2 cm. wide, abruptly acute or short-acuminate, with very obtuse tip, or sometimes merely obtuse or rounded, at base rounded or very obtuse, thin, deep green above, glabrous except along the costa, there usually sparsely hirtellous,

beneath paler, pilose along the nerves with whitish, mostly appressed hairs, barbate in the axils of the lateral nerves, these about 6 on each side, elevated, arcuate; flowers few, sessile; hypanthium 1.5 mm. long, the 4 lobes 2.5 mm. long, oblong-linear, erect, both lobes and hypanthium densely white-sericeous; corolla tube very slender, 18 mm. long, scarcely 1 mm. thick, densely sericeous with white ascending hairs; corolla lobes 4, narrowly oblong, obtuse, sericeous outside, glabrous within.

NICARAGUA: On slope of hill falling away to Kukalaya River bank, west of Camp No. 14, region of Bragmans Bluff, in dark red, clayey soil, under deep shade of upperstory of forest, Dec. 2, 1927, *F. C. Englesing 49;* Yale No. 1233 (Herb. Field Mus. 572,606, TYPE).

The collector furnishes the following notes: Small shrubby tree, abundant on hills at 60 to 180 m. elevation. Diameter 7 cm. at 30 cm. above the base; height 6 m. Trunk usually crooked, and ranges from erect to almost horizontal. Bark a medium gray with patches of a pale green. Leaves sparse. Flowers white. Wood light yellow when fresh.

Cephaelis nicaraguensis Standl., sp. nov.

Suffrutex simplex; folia longipetiolata, oblongo-elliptica, abrupte acuminata, basi acuta vel breviter acuminata, supra glabra, subtus ad nervos hirtella; inflorescentia terminalis, capitiformis, pedunculata, bracteis purpureis, molliter pilosis.

A simple shrub about 14 cm. high, from a creeping rootstock, the stem green, sparsely puberulent or glabrate, terete, the internodes 0.8–1.8 cm. long; stipules distinct, green, persistent, 5–6 mm. long, bilobate nearly to the base, the lobes oblong-linear, spreading or recurved, attenuate to the apex, ciliolate; petioles slender, 1.2–3 cm. long, glabrate; leaf blades oblong-elliptic or obovate-elliptic, 7.5–10 cm. long, 2.7–4 cm. wide, abruptly acuminate, with acute tip, acute or abruptly acuminate at base, thin, deep green above and glabrous, paler beneath, hirtellous along the nerves, the lateral nerves very slender but evident, 10 or 11 on each side, arcuate; flowers congested in a single dense terminal head 2 cm. in diameter, this borne on a slender, sparsely puberulent peduncle 2 cm. long; bracts purple, the outer ones paler, broadly rounded at apex, densely appressed-pilose with whitish hairs; inner bracts and bractlets varying from broadly obovate to narrowly oblong, obtuse or rounded at apex, short-pilose on both surfaces; hypanthium 1 mm. long, puberulent; calyx lobes 4, triangular, acute or acuminate, puberulent, distinct nearly to the base.

NICARAGUA: In rich soil on bank of Kukalaya River, near Camp No. 14, region of Bragmans Bluff, alt. 60 m., *F. C. Englesing 58* (Herb. Field Mus. No. 572,595, TYPE).

TWO NEW TREES FROM HONDURAS

By PAUL C. STANDLEY
Field Museum of Natural History

The two trees described below were included in a small collection made in the vicinity of La Ceiba, Honduras, for the Yale School of Forestry by Dr. Holger Johansen, director of the experiment station of the Standard Fruit and Steamship Company. At this station, which the present writer had the opportunity of visiting last March, there is being assembled a highly interesting and important collection of plants of possible economic or ornamental value in tropical America. Since the flora of La Ceiba is quite unknown, it is certain that further collections of the native plants of the region will contain many new or otherwise interesting species.

Pithecolobium Johanseni Standl., sp. nov.

Pinnae unijugae, foliolis unijugis, oblique elliptico-obovatis, apice rotundatis vel obtusis, subcoriaceis, subtus glaucescentibus; flores spicati, spicis paniculam densam terminalem efformantibus; staminum tubus longe exsertus; ovarium sessile.

Tree, the branchlets terete, dark brown, densely furnished with small, slightly elevated, whitish lenticels, when young sparsely short-pilose; petioles 6–7 mm. long, pilose with short subappressed brownish hairs, shallowly channeled on the upper side, bearing at the apex a sessile cupuliform gland; pinnae one pair, the leaflets one pair, the rachis 5–6 mm. long, minutely pilose, broadened upward, bearing at the apex a small cupuliform gland; petiolules stout, puberulent, about 1 mm. long; leaflets obliquely elliptic-obovate, 3.5–5 cm. long, 2–2.8 cm. wide, rounded to obtuse at apex, at base very unequal, on the inner side cuneately acute, on the outer side obtuse or rounded, subcoriaceous, dull green above, glabrous except on the nerves, there puberulent, beneath glaucescent, sparsely and minutely pilose, especially on the nerves, the nerves salient beneath, 5 or 6 on each side; flowers numerous, spicate, the spikes 2–3 cm. long, short-pedunculate, very dense, solitary or fascicled, forming a terminal leafy panicle 7 cm. long; rachis and peduncle densely fulvous-puberulent; bracts subulate from a triangular base, spreading, much exceeding the buds and equaling or exceeding the calyx; calyx tubular-campanulate, 2–2.5 mm. long, appressed-pilosulous, the teeth triangular, acute, half as long as the tube; corolla 7 mm. long, whitish-sericeous, the tube slender, abruptly dilated into the broad throat, the lobes 2.5 mm. long, ovate, apiculate; stamen tube very slender, exserted nearly 1 cm. beyond the corolla; ovary sessile.

HONDURAS: La Ceiba, December, 1927, *Holger Johansen 1* (Herb. Field Mus. No. 572,609, TYPE).

Related to *P. insigne* Micheli, which was described from San Pedro Sula, Honduras. That species differs in having larger, narrower, acute or acuminate leaflets, longer spikes, and a less exserted stamen tube.

Alseis hondurensis Standl., sp. nov.

Folia oblongo-oblanceolata vel anguste oblongo-obovata, abrupte acuta vel breviter acuminata, nervis subtus minute puberulis; spicae remotiflorae, rhachi minute puberula; calycis lobi ovati, obtusi, inaequales, glabri.

Tree, the branchlets stout, subterete, grayish or ochraceous, densely leafy, minutely puberulent when young, the internodes about 3 mm. long; stipules not seen; petioles slender, 1.5–2 cm. long, subterete, obscurely and minutely puberulent; leaf blades oblong-oblanceolate or narrowly oblong-obovate, 9–17 cm. long, 3–5 cm. wide, abruptly acute or short-acuminate, with acute tip, gradually long-attentuate to the acute or acuminate base, thin, bright green, glabrous and slightly lustrous above, beneath minutely puberulent on the nerves, the lateral nerves slender, about 14 on each side, nearly straight; spikes stout, short-pedunculate, 11–20 cm. long, forming a terminal panicle, many-flowered, the flowers remote, subsessile, the rachis minutely puberulent; bracts linear-acuminate, shorter than the calyx; hypanthium narrowly oblong-turbinate, minutely puberulent, 2–2.5 mm. long, in age increasing to 7 mm. or more; calyx lobes ovate, 1 mm. long, obtuse, unequal, glabrous.

HONDURAS: La Ceiba, December, 1927, *Holger Johansen 9* (Herb. Field Mus. No. 572,615, TYPE).

Alseis Blackiana Hemsl., the only other species of this Rubiaceous genus known from Central America, differs in its narrow acute calyx lobes, and in the spreading pubescence of the rachis of the spike.

YALE–FIRESTONE INVESTIGATION OF WEST AFRICAN FORESTS

G. Proctor Cooper, Field Assistant in Tropical Forestry at Yale, is now in Liberia, West Africa, where he is collecting botanical and wood specimens for Yale University in coöperation with the Firestone Plantations Company, Akron, Ohio. Determinations of the material will be made at the Royal Botanic Gardens, Kew, England.

Dr. T. F. Chipp, Assistant Director of Kew Gardens, says: "I am very interested in the Yale-Firestone plan for collecting in Liberia. The forest all along the West Coast of Africa is very similar so that any information obtained from Liberia is likely to be of use over a wide area. A collector on the Firestone concessions where virgin forest is being felled has a unique opportunity, and I only wish I could go with him!

"With the approaching shortage of temperate softwoods with which the world is threatened, every investigation into tropical timbers must be of importance and I think the Yale-Firestone investigation will be a valuable contribution. We shall be very pleased at Kew to help determine the specimens."

IDENTITY OF THE PERUVIAN MAHOGANY

By J. FRANCIS MACBRIDE

Field Museum of Natural History

The Peruvian mahogany, which was recently collected by Mr. Georges H. Barrel on the Río Itaya, Peru, near Iquitos, and identified by Dr. S. F. Blake as *Swietenia macrophylla* King (Trop. Woods 6: 1, June 1926; 14: 33, June 1928), is probably the same tree that has been described as *S. Tessmannii* Harms (Notizb. 10: 180. 1927). The specimen upon which Dr. Harms of the Berlin Botanical Garden based his new species came from Yarina Cocha on the Middle Ucayali, about a thousand kilometers south of Iquitos but from the same type of country. *S. Tessmannii* is distinguished by its author from *S. macrophylla* by the longer leaflet-petioles (5–12 mm. long) and the looser inflorescence. The latter species, according to Harms, also generally has larger but narrower leaflets with somewhat broader acumen. He also compares *S. Tessmannii* with *S. Candollei* Pittier of Venezuela to which he thinks it may be most nearly related and remarks that it may be separated by the shorter leaflet-petioles. According to the original descriptions, though, there seems to be no essential difference in this respect between the Peruvian and Venezuelan trees. There is a possibility, of course, that their pods may differ so greatly, particularly in proportionate measurements, that the two trees may indeed represent distinct species. On the other

hand, *S. Tessmannii* is certainly very closely related to *S. macrophylla* of Columbia, Panama, and Honduras,—the species to which Dr. Blake referred it, apparently with confidence. It seems to me that the characters relied upon at present to separate these species are not convincing and not unlikely may prove to be relative in nature and valueless for purposes of classification.

The native name of *S. Tessmannii*, according to the collector for whom it is named, is "aguano."

THE WOOD OF *CARYA TONKINENSIS* H. LECOMTE

By DAVID A. KRIBS

Sterling Research Fellow in Botany, Yale University

At the time of publication of the writer's paper on the "Comparative anatomy of the woods of the Juglandaceae" (*Tropical Woods* 12: 16–21, Dec. 5, 1927) no specimen of the Asiatic species of *Carya* (*Hicoria*) was available for study. Through the courtesy of Professor Henri Lecomte a specimen of *Carya tonkinensis* has recently been added to the Yale collections and investigation of it reveals that the wood differs in several important characters from that of the North American hickories and shows affinities to *Juglans* and *Platycarya*.

Carya tonkinensis H. Lecomte is indigenous to the province of Tonkin, Indo-China, and the tree grows scattered throughout the forest in the vicinity of the Black River. Its vernacular name is "may chau." The leaves are alternate, 15 to 25 cm. in length; leaflets 5 to 7, opposite, sub-sessile, serrated. It blossoms in May and the male flowers are in catkins, in groups of 2 or 3, while the female are in short, terminal, few-flowered spikes; the stamens, 5 or 6 in number, are in two series and have hairy anthers. The fruit ripens in September and is sub-spherical, the dehiscent husk opening into four valves. The nut is sub-spherical, depressed, and obscurely 4-sided. The kernels are the source of an oil used for illuminating purposes.[1]

[1] HENRI LECOMTE: *Les bois de l'Indochine*, Paris, 1926, p. 39.

DESCRIPTION OF THE WOOD

General properties: Sapwood pinkish gray, turning light brown on exposure; heartwood darker; slightly lustrous. Odor and taste not distinctive. Moderately hard and heavy; sp. gr. (oven-dry) 0.56, weight 35 lbs. per cubic foot; medium-textured; grain slightly undulating; cuts easily and finishes smoothly.

Gross Anatomy: Ring-porous, but with a marked tendency towards diffuse-porous. Parenchyma in numerous, fine, broken, concentric lines. Large pores in uniseriate concentric row beginning the growth ring, open, mostly single, occasionally in radially appressed groups of 2 or 3; small pores in late wood numerous, open, solitary or in radial groups of 2 to 5; all pores and pore groups in echelon arrangement. Vessel lines distinct as coarse scratches, slightly darker than background. Rays invisible on cross and tangential sections; low, but distinct, on the radial, being darker than the background.

Minute Anatomy: All vessels comparatively thin-walled; perforations simple; intervascular pits alternate, large, not numerous, the borders round to oval, the apertures lenticular. Fibers in irregular radial rows; subcircular to angular in section; walls of medium thickness; lumina large; pits on both tangential and radial walls, numerous, with slit-like apertures which extend to edge of round border. Rays 8 to 10 per mm.; 1 to 5 cells wide; decidedly heterogeneous; middle cells procumbent, marginal ones square to rectangular and upright, several cells high; upper and lower walls entire to slightly pitted; end walls densely pitted; small diamond-shaped crystals in marginal cells rare; lumina filled with globules of red gum; pits into vessels (1) of the same appearance as the intervascular and (2) larger, round to oval, simple to half-bordered. Paratracheal parenchyma 1 or 2 cells wide; metatracheal and terminal 1 to 3 cells wide; individual cells of two kinds: (1) the same size as the fibers in section, the lumina filled with dark brown gum, and (2) extremely large barrel-shaped cells containing greatly elongated rhombohedral crystals of calcium oxalate which are up to 0.154 mm. in length. Tangential diam. of large pores 0.192 mm., to 0.308 mm., av. 0.280 mm.; small pores, 0.154 mm. to 0.254 mm., av. 0.20 mm. Vessel segments with horizontal to slightly oblique terminal walls; length, 0.43 mm. to 0.63 mm., av. 0.52 mm. Fibers 1.17 mm. to 1.63 mm. long, av. 1.47 mm.; 0.016 mm. to 0.025 mm. wide, av. 0.018 mm.; av. thickness of fiber wall, 0.0046 mm. Rays 1 to 30 cells high, measuring 0.0616 mm. to 0.662 mm., av. 0.48 mm.; width, 0.023 mm. to 0.077 mm., av. 0.058 mm.

Remarks: The wood of *Carya tonkinensis* resembles that of *Platycarya* in having decidedly heterogeneous rays and nu-

merous small thin-walled vessels. It also resembles the North American hickories belonging to the division *Apocarya*, the characteristics of which are medium weight, comparatively thin-walled elements, and a tendency to be diffuse-porous. Characteristics which serve to distinguish this wood from the American hickories are (1) decidedly heterogeneous rays, (2) numerous small thin-walled pores, and (3) very large barrel-shaped wood parenchyma cells containing elongated rhombohedral crystals of calcium oxalate. These crystals are so much larger than those observed in any other wood of the Juglandaceae that this feature alone appears sufficient for purposes of identification. The wood also bears a close resemblance to *Juglans* in (1) its marked tendency to be diffuse-porous, (2) the echelon arrangement of the pores, and (3) the common occurrence of crystals in the wood parenchyma.

Material: Yale No. 13,317, from Professor Lecomte.

Abstracts wanted by British Empire Vegetation Committee

The British Empire Vegetation Committee, appointed by the Imperial Botanical Conference, London, 1924, wishes to give effectiveness to Resolution 9 which stated that all future work published on the vegetation of the Dominions and Colonies should be registered and abstracted, the abstracts being made generally available by periodical publication.

Through the courtesy of the British Ecological Society, publication of these abstracts will take place by way of supplement to *The Journal of Ecology*, which is published twice a year, and this supplement will appear as a part of each number. The supplements will also be obtainable separately.

Authors are requested to send in a *separate copy of every paper* dealing with the vegetation of the Empire Overseas, of which an abstract is desired. This may take the form either of a press proof or of a finished separate when these are printed, but it is desirable for the smooth and punctual working of the scheme that all separates should reach the Secretary as early as possible. They should be addressed to Dr. T. F. Chipp, Royal Botanic Gardens, Kew, England.

CURRENT LITERATURE

Ecological survey of the flora of Porto Rico. By Melville T. Cook and Henry Allan Gleason. *Journal of the Department of Agriculture of Porto Rico* 12: 1–2: 1–139, July 1928. 75 plates.

"This survey was made possible by the coöperation of the New York Botanical Garden and the Insular Department of Agriculture of Porto Rico. . . . The greater part of the field studies were made between January 16 and April 30, 1926, during which time the authors devoted practically all of their time to the work. The plans for the work were made largely by the senior author previous to the field work and the herbarium studies were made largely by the junior author after the field work was finished."

"Since the Island of Porto Rico includes some 3400 or more square miles of territory, it was impossible to study all parts of it or to make statistical or experimental studies within the short period of four months allotted to us. Therefore, the time was devoted to the making of field studies of selected areas which are believed to be representative. The soil, climatic, and other environmental factors have been noted, the dominant and secondary species listed so far as possible, their inter-relations described, and the successional trends determined as far as possible from observational studies."

"The survey of the plant life in Porto Rico indicates the presence of a large number of different plant associations. Some of these occupy large areas and were probably continuous before they were partly destroyed by man. Some cover small areas and are scattered and frequently isolated. Some have had a precarious existence because of the changes in their environments. Some do not show evidence of any changes except those brought about by man. Some are the results of the activities of man in cutting, burning, clearing, and agriculture. The past history of the associations of short duration can be traced with reasonable degree of accuracy and their futures may be predicted with some degree of certainty. The study of the history of associations of long duration is much more difficult.

"The many plant associations of the limited areas of Porto Rico make some system of classification necessary. We have, therefore, designated three primary groups which are geographical and based on the broad features of soils and climates. They are as follows: (1) The plant life of the northern coastal regions which are of limestone or alluvial soil and have heavy rainfall. (2) The plant life of the central mountain regions in which the soils are mostly volcanic and over which the rainfall is heavy. (3) The plant life of the south coastal region in which the soils are diverse and the rainfall low.

"In the central mountain regions there are five major plant associations and practically no evidence of successional relationships. In the two coastal regions there are many associations which we have grouped according to their successional relationship. The island also shows many secondary associations in which the changes are due to the activities of man. In some cases the larger plants have been cut for fuel and nature permitted to proceed in her own manner. In others the original vegetation has been removed for the promotion of agriculture and the native vegetation now restricted largely to waste areas and roadsides. These have been omitted from these studies.

"An ecological survey of Porto Rico is necessarily very incomplete because of the extensive development of agriculture and the density of rural population. Some associations were found in the natural or semi-natural state in but a single locality; similar habitats which might have supported the same or similar plant life being under cultivation. These cases led us to believe that the original vegetation was uniform, and therefore we have described these individual stations as typical of the original condition. In other cases we can only refer to the natural vegetation as extinct."

Concluding this excellent report is a check list of nearly 700 common names of the trees and other plants compiled from various sources. They are arranged alphabetically and numbered and there are cross reference numbers for all plants having more than one vernacular name. The work is illustrated with maps, graphs, and many half-tone photographs.

Trinidad and Tobago. Administration report of the Conservator of Forests for the year 1927. By R. C. MARSHALL. Port-of-Spain, 1928. Pp. 18; 8½ x 13.

"During the past five years the need of a more complete knowledge of the forests of the Colony has become more and more pressing and towards the end of the year a scheme for a proper investigation of the forests was drawn up." This provides for a strip survey which will give a 2 per cent enumeration.

"In the forests of Trinidad and Tobago, and of most other tropical countries too, it is practically impossible to choose by eye an area which shall be a typical sample of the average type of forest, but it has been found by experience in other countries that by enumerating 2 per cent or so of the forests by a strip or linear survey, as indicated above, a sufficiently accurate idea is obtained, for all practical purposes, of the state of the forests.

"As this work progresses, information will become available which will show what amount of the various species is available for exploitation and what is the true state of the younger age classes on which the future of the forest depends.

"In 1927, for instance, nearly 1,000 Balata trees were felled. At present there is no means of knowing whether we are exhausting our supplies of Balata or what the current yearly ratio should be. Again, Mora is a timber which is receiving increasing attention both locally and in other markets. There are large areas of Mora in the Colony ripe for exploitation. We know there is a lot of Mora, we believe that in Mayaro there is something like 100,000,000 cubic feet of mature timber, but until we have made a proper survey we have no complete data to work on."

The collection of herbarium and wood specimens through the agency of forest rangers was continued during the earlier months of the year and 79 sets of herbarium specimens and 53 corresponding wood samples were forwarded to the Imperial Forestry Institute, Oxford, for determination. A list of the identifications received by the end of the year is given in Appendix C.

CHECK LIST OF THE COMMON NAMES

Acoma	*Sideroxylon quadrilocutare* Pierre	Sapotaceae
Angelin	*Andira inermis* H. B. K.	Leguminosae
Balata	*Mimusops Balata* Crueg., var. *Cruegeri* Pierre	Sapotaceae
Bois bande	*Roupala montana* Aubl.	Proteaceae
Bois canon	*Cecropia peltata* L.	Moraceae
Bois mulatre	*Pentaclethra filamentosa* Benth.	Leguminosae
Bois pois	*Swartzia pinnata* Willd.	Leguminosae
Cajuca	*Virola surinamensis* Warb.	Myristicaceae
Cocoa, Wild	*Warscewiczia coccinea* Kl.	Rubiaceae
Coffee, Wild	*Casearia sylvestris* Sw.	Flacourtiaceae
Coffee, Wild	*Coussarea paniculata* (Vahl) Standl.	Rubiaceae
Coffee, Wild	*Faramea occidentalis* (Jacq.) A. Rich	Rubiaceae
Cooperhoop	*Brownea latifolia* Jacq.	Leguminosae
Cypre	*Cordia alliodora* Cham.	Borraginaceae
Guatacare	*Lecythis laevifolia* Gris.	Lecythidaceae
Jereton	*Didymopanax Morototoni* D. & Pl.	Araliaceae
Kiskidee or La crai	*Vismia cayennensis* Pers.	Guttiferae
Laurier cypre	*Ocotea glomerata* (Nees) Pers.	Lauraceae
Lay lay	*Cordia Lochartii* O. Ktze. and *C. sulcata* DC.	Borraginaceae
L'Épinet	*Zanthoxylum microcarpum* Gris.	Rutaceae
Mahogany	*Swietenia Mahagoni* (L.) Jacq.	Meliaceae
Mangrove, Black	*Avicennia nitida* Jacq.	Verbenaceae
Mountain rose	*Brownea latifolia* Jacq.	Leguminosae
Pois doux	*Inga ingoides* Willd. and *I. venosa* Gris.	Leguminosae
Poui	*Tecoma* aff. *serratifolia* G. Don	Bignoniaceae
Puni	*Pithecolobium trapezifolium* Benth.	Leguminosae
Redwood	*Guarea glabra* Vahl	Meliaceae
Roble	*Platymiscium polystachyum* Benth.	Leguminosae
Sage, Black	*Cordia cylindrostachya* R. & S.	Borraginaceae
Sugar apple, Wild	*Rollinia multiflora* Spltz. and *R. muscosa* (Jacq.) Baill.	Anonaceae
Tobacco, Wild	*Acnistus arborescens* Schl.	Solanaceae
Toporite	*Hernandia sonora* L.	Hernandiaceae
Trumpet wood	*Cecropia peltata* L.	Moraceae
Wak-a-my	*Warscewiczia coccinea* Kl.	Rubiaceae

Forests and forestry in Trinidad and Tobago. By R. C. MARSHALL. Port-of-Spain, 1928. Pp. 26; 8½ x 13. Ill. with maps and graphs.

This report was prepared, in accordance with a questionnaire, for the third British Empire Forestry Conference, held in Australia and New Zealand in 1928. It summarizes the available information in readily usable form and the maps and graphs add to the clearness of the text.

Las plantas más útiles que existen en la República Mexicana. By MAXIMINO MARTÍNEZ. Mexico, 1928. Pp. 381; 6½ x 9; illustrated.

In this useful work there are described and illustrated 100 Mexican plants of economic importance. Most of the species treated are indigenous, but some introduced ones are included. After the technical description of each plant there are cited synonyms and vernacular names, followed by notes upon distribution, chemical composition, and economic uses, and extensive bibliographic notes.

The numerous illustrations, reproduced from photographs and drawings, make it easy to recognize the plants described. Most of the figures are original, and some are of unusual interest. The book brings together a large amount of valuable information from widely scattered sources, some of which are not accessible in northern libraries.

Many of the plants listed are trees. Among those of particular interest may be mentioned the Wild Figs, the Hand-tree (*Chiranthodendron*), Bonete (*Pileus heptaphyllus*), Mexican Rubber (*Castilla*), *Calatola mollis*, and *Talauma mexicana*. —PAUL C. STANDLEY, *Field Museum of Natural History*.

Some errors and mistakes in taxonomic botany. By H. PITTIER. *Journal of the Washington Academy of Sciences* 18: 8: 206–212, Apr. 19, 1928.

"*Monopteryx Jahnii* Pittier is to be relegated to the synonymy of *Fissicalyx Fendleri* Benth."

Adenocalymna anomalum Pittier, "a psuedo-new species, . . . was presumably *Memora caracasana* K. Schum."

Humboldtiella ferruginea (H. B. K.) Harms and *Coursetia caracasana* Pittier are considered as properly belonging to the synonymy of *Robinia ferruginea* H. B. K. "As far as the

general habit and microscopic characters are concerned, there is little resemblance between our *Robinia ferruginea* and *Robinia pseudo-Acacia*, the only other species of the genus with which I am familiar."

The author proposes the segregation of *Coursetia arborea* Grisebach under the name *Callistylon arboreum* (Gris.) Pittier and gives a description of the new genus and of the species.

British Guiana. Report on the Forestry Department for the year 1927. By B. R. Wood. Georgetown, 1928. Pp. 13; 8½ x 13.

One of the interesting items of this report is in connection with seasoning experiments of Crabwood (*Carapa guianensis* Aubl.). "Some 12,800 board feet of Crabwood lumber were purchased from the Waini saw mill at a cost of $837.71 and stacked in the basement of the office during August, for the purpose of seasoning tests. A portion of this lumber had been stacked at the mill since May, while the remainder was direct from the saw.

"The Director of Science and Agriculture very kindly assisted by determining the moisture content of the wood in test specimens cut from lumber in the stacks at intervals of 50 days. These tests showed that the moisture content in the first specimens averaged 22.2 per cent for the boards off the saw and 19½ per cent for those which had been partially seasoned at the mill. The conclusion arrived at from this experiment is that Crabwood lumber 1 inch thick will season to a moisture content of 15 per cent in a period of three months in the stack, at which stage shrinkage has virtually ceased and the timber is fit for shipping or use.

"In the seasoning the boards have behaved remarkably well. The shrinkage of the boards has been very even, few new end splits have been noted and the old splits have not lengthened appreciably; the loss in lumber would, therefore, be comparatively small.

"This experiment should be of very great interest to the general public when it is considered that on the average over 1,450,000 board feet of Crabwood is used locally every year; that all of this lumber is used in a more or less unseasoned condition; and that, consequently, there is very great waste in lumber, time, and money in having to strip and replace Crabwood boarding on account of the shrinkage which occurs after the boards have been nailed in place.

"The market price of Crabwood lumber is $75 per thousand feet off the saw; if to this the cost for stacking and unstacking and interest at the rate of 6 per cent for, say, three months, be added, Crabwood lumber could be sold for about $80 per thousand board feet (an increase of only, say, $5 per 1,000 feet) and it would still be well below the market price of imported New York lumber which is quoted at about $95 per thousand feet.

"Crabwood lumber is very much more durable under weather conditions than the imported lumber and a further point in favor of the local wood is its apparent immunity from attack of wood ants. This pest has been a constant trouble in the basement of this building, but, so far, they have left the Crabwood stacks untouched, although they have built runs through the Purpleheart stack and damaged some of the sapwood of that lumber."

"The total export of Greenheart last year was 235,822 cubic feet, valued at $184,919, as against 328,479 cubic feet, valued at $275,329, for 1926. . . . Greenheart formed 85.1 per cent of the total export of timber and lumber during last year and 80.6 per cent averaged over five years. The difference between the timber and lumber exported ($196,393) and that imported ($166,939) is only $29,354, in favor of the exports, and it is satisfactory to note that although the balance for the quinquennium is adverse, for the last two years it has been favorable. Attention has again to be drawn to the large imports of foreign lumber; lumber imports averaged 3,735,559 board feet valued at $218,444 annually during the past five years. An import which is unnecessary as for many purposes local wood is both better and cheaper; for instance, Crabwood, *if seasoned*, makes a better, more durable and as pleasant a floor and as good walls and partitions as any Pitch Pine or White Pine."

"The export of Mora sleepers numbered 18,756 valued at

$10,343. . . . The export during 1926 numbered 10,794 sleepers valued at $6,654 which means an increase during last year of 7,962 sleepers exported valued at $3,689. One pleasing feature of this is that the export of Mora sleepers is gradually being extended to other British West Indian Islands as towards the end of the year over 350 were shipped to Jamaica and further inquiries have resulted from that quarter.

"A small shipment of telegraph poles was made to Porto Rico during the year, with satisfactory results, and inquiries for a larger order have resulted. These will be shipped during the present year.

"Signs are not wanting of an increasing interest in our forests abroad, and it is certain that the present year will see definite applications being received for considerable areas. It has been found that the exact information which our valuation surveys enables us to give to intending applicants has had a decisive effect in focussing interest.

"Some botanical collections were made during the year and others were forwarded to the Royal Botanic Gardens at Kew for identification. A list is attached to this report as Appendix A which gives identifications received from Kew in 1925 and last year." Following is a check list which has been compiled from the report, the specimens for which no vernacular names are given being omitted. The plants included are trees, small trees, and shrubs.

CHECK LIST OF THE COMMON NAMES

Apikara	*Campsiandra laurifolia* Benth.	Leguminosae
Arakadak	*Byrsonima ceranthera* Benth. and *B. rugosa* Benth.	Malpighiaceae
Assachi	*Rheedia Madruno* Pl. & Tr. and *R. virens* Pl. & Tr.	Guttiferae
Awasakuli	*Tovomita guianensis* Aubl. and *T. obovata* Engl.	Guttiferae
Baridikutshi	*Rinorea* sp.	Violaceae
Bloodwood	*Vismia* sp.	Guttiferae
Buri	*Mollia lepidota* Spruce	Tiliaceae
Cocoa, Wild	*Pachira aquatica* Aubl.	Bombacaceae
Hitchia-balli	*Archytaea multiflora* Benth.	Theaceae
Huria	*Byrsonima coccolobaefolia* H. B. K.	Malpighiaceae
Irriariadan (?)	*Cassia* sp.	Leguminosae
Kaiarima	*Ternstroemia* sp.	Theaceae

Kamadanni	*Glandonia* sp.	Malpighiaceae
Kamakutshi	*Bombax* sp.	Bombacaceae
Konaheri	*Pachira aquatica* Aubl.	Bombacaceae
Kufa	*Clusia* spp.	Guttiferae
Kula	*Caryocar glabrum* Pers.	Caryocaraceae
Kupé	*Clusia* spp.	Guttiferae
Kurahara	*Calophyllum lucidum* Benth.	Guttiferae
Lukunanju	*Cassia bacillaris* L. f.	Leguminosae
Madaburi	*Clusia cuneata* Benth.	Guttiferae
Maduburi	*Ternstroemia* aff. *delicatula* Choisy	Theaceae
Mamusaru	*Rinorea* sp.	Violaceae
Mani	*Symphonia globulifera* L. f.	Guttiferae
Maniballi	*Moronobea coccinea* Aubl.	Guttiferae
Muri kupé	*Clusia nemorosa* G. F. W. Mey.	Guttiferae
Oralli	*Vismia* sp.	Guttiferae
Sapodilla, Wild	*Tovomita brevistaminea* Engl.	Guttiferae
Sawari, Water	*Caryocar glabrum* Pers.	Caryocaraceae
Sherabuli-balli	*Sloanea* sp.	Elæocarpaceae
Wallaba	*Eperua rubiginosa* Miq.	Leguminosae
Wallaba, Clump	*Dicymbe corymbosa* Benth.	Leguminosae
Wallaba, Ituri	*Eperua Jenmani* Oliv.	Leguminosae
Wallaba, Yoboko	*Eperua* sp.	Leguminosae
Warua	*Cassia leiandra* Benth.	Leguminosae
Yawrukunan	*Tephrosia toxicaria* Pers.	Leguminosae

Cornaceae and allies in the Marquesas and neighboring islands. By FOREST B. H. BROWN. Bul. No. 52, Bernice P. Bishop Museum, Honolulu, Hawaii, 1928. Pp. 22; 7 x 10; 5 text figures.

Contains a description of the genus *Lautea* F. Brown and three new species and new varieties, viz. *Lautea serrata* and *Lautea Stokesiana*, the latter with varieties *integrifolia*, *denticulata*, and *primaeva*. There are studies of the comparative morphology, venation, anatomy of the wood, and geological history. The distinguishing characters of the wood are given as follows:

"Wood without growth rings, reddish in color, of medium hardness and fine uniform texture; elements serried but without distinct ripple effect; vessels isolated or, rarely, grouped in twos, extremely small in diameter; perforations scalariform; vessel-pits rather large, circular, elliptical or elongated in outline, and opposite, alternate or sub-scalariform in

arrangement; walls spirally thickened; rays considerably broader than the vessels, plainly visible in radial section; fibers septate, with oblique, slit-like bordered pits; wood-parenchyma absent or sparingly developed."

Strength properties in relation to specific gravity of Philippine woods. By José C. Espinosa. *The Philippine Journal of Science* 36: 1: 55–69, May 1928.

"From a study of data covering about 45,000 tests, these relations in the case of Philippine woods have been found and it is the object of this paper to express the above-mentioned relations in simple forms in order that, the specific gravity of a species being known, the corresponding strength values can be readily calculated. Consequently, it is possible to compare the different species as regards strength and determine which species are especially adapted for certain purposes."

"It is emphasized that no absolute accuracy is claimed for the figures obtained, following the methods herein presented, when innumerable factors are involved in the determination of the strength of wood. It is, however, true that these simple methods give a certain degree of precision, which is sufficient for all rough predictions of the properties of new species by simply determining the oven-dry specific gravity of the specimen. It is certain that the only reliable figures are those obtained from actual tests on the species; but to obtain these obviously requires a greater amount of time and expense than the purpose would justify, inasmuch as a large number of tests must be made in order to obtain reliable values."

Report of the forest authority for Ceylon for the British Empire Forestry Conference, Australia and New Zealand, 1928. By J. D. Sargent. Sessional Paper 29, Colombo, 1928. Pp. 23; 8¼ x 13.

"The salient feature of all the Ceylon forests, whether in the dry zone, wet zone, or up-country zone, is that no pure forests of merchantable species anywhere exist, and except in cases where the whole contents of the forests can be utilized for timber and firewood, a comparatively rare occurrence, forest reconstruction is not only a matter of great

difficulty, but of heavy expenditure. This applies especially to the extensive forests of the dry zone, which have been very heavily exploited in the past for sleepers and timber, without due consideration for continuity of supplies, and, although confined largely to non-reserves and non-productive forests, without any corresponding internal work or stock-mapping in the reserves, which thus contain an unknown yield, both as regards quantity and quality. This is now engaging the attention of the Department, and sufficient knowledge has been gained, from work carried out to date, to lay the foundations of systematic exploitation and, it is hoped, reconstruction in areas dedicated to the purpose, and the tentative fixing of a rotation, provided that the lower age classes respond, as expected, to improvement fellings. Even in the best of these forests, it is not safe to estimate the yield of sound hardwood timbers, over 5 feet in girth, at an average of more than 20 to 25 cubic feet per acre. The merchantable species in these forests consist of Satinwood (*Chloroxylon Swietenia*), Palu (*Mimusops hexandra*), Wewarana (*Alseodaphne semi-carpifolia*), Milla (*Vitex altissima*), Halmilla (*Berrya ammonilla*), and Ebony (*Diospyros ebenum*). The lower age classes of these species may, locally, be as much as 25 to 30 per acre, but are usually less, and are for the most part in a suppressed condition, and there has been insufficient time to date to test the results of climber cutting and canopy opening, which is now proceeding in three blocks, each 80 square miles in extent, in which forest reconstruction is definitely planned."

"The wet zone forests contain a vast array of species known and unknown to use, which are found among soft woods and moderately hard woods in Appendix II of the 1923 report. There is a large demand for timber in the accessible areas of these forests, which is mainly met by the license system, at fixed rates of royalty, the license holder selecting the species he requires. Here again no difficulty exists when the whole crop can be utilized for timber and firewood, and in such areas the coupe system has been successfully introduced, regeneration being by means of coppice fellings where permanent fuel areas are required, or by the planting, in con-

junction with field crops, of favored species. The more remote forests in this zone lie untapped, and their utilization awaits the introduction of improved communications and impregnating plant, which should bring large quantities of timber, and dipterocarps in particular, which abound freely in these forests and are often gregarious, into regular use.

"The up-country zone, above 5,000 feet, contains a few species which are in demand for building purposes, including Kina (*Calophyllum Walkerii*), Mihiriya (*Gordonia zeylanica*), and Wal-sapu (*Michelia nilagirica*), and find a ready market at Badulla. The remainder are fuel species, and exploited areas, utilized originally for railway fuel supplies, have been planted up, to an extent of nearly 3000 acres, with Australian gums and acacias for this purpose, while attention has been turned more recently to exotic conifers, with which 1393 acres have been stocked to date, and of which *Cupressus Lawsoniana* appears to be remarkably adapted to local conditions."

Malayan plant names. By J. G. Watson. *Malayan Forest Records* No. 5, Kuala Lumpur, F. M. S., 1928. Pp. 277; 7¼ x 10½; price $2 or 5s. postpaid.

"This list is a compilation of vernacular names from published and unpublished sources, begun in 1916 and continued at irregular intervals. . . . Since the publication of Ridley and Curtis' original lists, romanized Malay spelling has been standardized. An effort has been made (with due regard to dialectic variations) to bring the spelling in the present work into line with that officially adopted. There are, however, many names that defy such treatment and that are obviously unacceptable as Malay words, but these have been given in the hope that they will provide a clue to the real names. Others are undoubtedly of aboriginal origin, and yet many others are the outcome of the efforts of ignorant scribes. Many, no doubt, are wrong identifications, and a large proportion must be regarded as pure inventions. The Malay is notoriously polite and will invent a name rather than disappoint the earnest enquirer. As it would be quite impossible

to sift the wheat from the chaff, the general principle adopted has been to include everything. The invented names are usually apt descriptions of the appearance or of some quality of the plant and, as such, are of undoubted value."

"The list is intended primarily for the use of, and was compiled largely with the help of forest officers, and for that reason the forest forms predominate. It was originally intended to restrict it to woody plants, but such curtailment would have involved a good deal of extra work and would, at the same time, have considerably narrowed its field of usefulness. The list has, therefore, been modelled more or less on the lines of Ridley and Curtis' original work and includes not only all classes of flowering plants and gymnosperms, but the commoner ferns as well."

Mikrographie des holzes der auf Java vorkommenden baumarten. By H. H. Janssonius. Leiden: E. J. Brill, 1928. Pp. 1–292; 5½ x 9; text figs. 297–309.

This is the first part of Volume V, which, when completed, will conclude the descriptive portion of this great work which has engaged the attention of Dr. Janssonius for 25 years. The families considered are Nyctagineae, Myristiceae, Monimiaceae, and Laurineae.

Notes illustrées sur les bois de Nouvelle-Calédonie et sur les arbres qui les fournissent. By Kuno Mezger. *Annales du Musée Colonial de Marseille* (ser. 4) 4: 2: 1–29, 1926. 81 half-tone plates.

The collections upon which this report is based were made by the author January to April 1924 in the vicinity of Noumea, the wooded region of the district of Païta, and the hills around Pirouges Bay to an altitude of 400 meters. The determinations were made by A. Guillaumin and published in Part 3 of the *Annales* (1925). The information obtained by the author in the field has been supplemented by subsequent observations of the woods, but all of the descriptions are brief.

The plates are reproductions of photographs of the botanical specimens.

CHECK LIST OF THE COMMON NAMES

Acacia	*Leucaena glauca* Benth.	Leguminosae
Acajou blanc	*Semecarpus atra* Vieill.	Anacardiaceae
Arbre à cire	*Gardenia Aubryi* Vieill.	Rubiaceae
Arbre à tabous	*Pycnandra Benthamii* Baill. (?)	Sapotaceae
Arbre-candélabre	*Pterochrosia Vieillardi* Baillon	Apocynaceae
Arbre-carotte	*Myodocarpus fraxinifolius* Brongn. & Gris.	Araliaceae
Arbre-orseille	*Montrouziera sphaeroidea* Panch.	Guttiferae
Azou	*Chrysophyllum Balansae* Baill.	Sapotaceae
Azou noir	*Chrysophyllum Wakere* Panch. & Sébert	Sapotaceae
Bancoulier	*Aleurites triloba* Forst.	Euphorbiaceae
Bois d'absinthe	*Canariellum oleiferum* Engler	Burseraceae
Bois de fer	*Casuarina equisetifolia* Forst. var. *incana* J. Poiss.	Casuarinaceae
Bois de fer	*Casuarina Cunninghamiana* Miq.	Casuarinaceae
Bois de fer de montagne, Petit	*Casuarina Poissoniana* Schltr.	Casuarinaceae
Bois de forêt	*Aglaia elaeagnoidea* Benth.	Meliaceae
Bois de rose	*Thespesia populnea* Cav.	Malvaceae
Bois de sang	*Haematoxylon campechianum* L.	Leguminosae
Bois moucheté	*Dysoxylum* sp. (?)	Meliaceae
Bois-pétrole	*Pycnandra Benthamii* Baill. (?)	Sapotaceae
Bourao	*Hibiscus tiliaceus* L.	Malvaceae
Brosse à dents	*Grevillea heterochroma* Brongn. & Gris.	Proteaceae
Cerisier	*Elæocarpus persicifolius* Brongn. & Gris.	Tiliaceae
Chêne blanc	*Flindersia Fournieri* Panch. & Sébert	Meliaceae
Chêne-gomme	*Spermolepis gummifera* Brongn. & Gris.	Myrtaceae
Chêne gris	*Pancheria Sebertii* Guill.	Saxifragaceae
Chêne rouge	*Codia floribunda* Brongn. & Gris.	Saxifragaceae
Chêne tigré	*?Dysoxylum* sp.	Meliaceae
Faux-chêne	*Syzygium wagapense* Vieill.	Myrtaceae
Faux-figuier	*Guettarda speciosa* L.	Rubiaceae
Faux gaïac	*Acacia spirorbis* Labill.	Leguminosae
Faux-mac	*Geissois pruinosa* Brongn. & Gris.	Saxifragaceae
Faux-santal	*Dysoxylum minutiflorum* DC. var. *parvifolium* DC.	Meliaceae
Faux-santal	*Myoporum crassifolium* Forst.	Myoporaceae
Faux-vanilier	*Duranta Plumieri* Jacq.	Verbenaceae
Flamboyant	*Poinciana regia* Boj.	Leguminosae

Frêne	*Storckiella Pancheri* Baill.	Leguminosae
Gommier	*Cordia Myxa* L.	Borraginaceae
Hêtre blanc; h. gris	*Grevillea Gillivrayi* Hook. f.	Proteaceae
Hêtre noir	*Stenocarpus trinervis* Guill.	Proteaceae
Hêtre rouge	*Grevillea rubiginosa* Brongn. & Gris.	Proteaceae
Houp	*Montrouziera sphaeroidea* Panch.	Guttiferae
Jamblonnier or jamelonnier	*Syzygium multipetalum* Panch.	Myrtaceae
Kaoris	*Agathis ovata* Warb.	Araucariaceae
Lantana	*Lantana camara* L.	Verbenaceae
Niaouli blanc de plaine; n. rouge de montagne	*Melaleuca Leucadendron* L.	Myrtaceae
Nul ne s'y frotte	*Xanthostemon rubrum* Nied.	Myrtaceae
Nul ne s'y frotte frisé	*Pleurocalyptus Deplanchei* Brongn. & Gris.	Myrtaceae
Olivier	*Elæodendron curtipendulum* Endl.	Celastraceae
Palétuvier	*Bruguiera eriopetala* W. & Arn.	Rhizophoraceae
Palétuvier	*Rhizophora mucronata* Lam.	Rhizophoraceae
Palétuvier	*Sonneratia alba* Son.	Lythraceae
Palétuvier blanc	*Avicennia officinalis* L.	Verbenaceae
Palétuvier rouge	*Lumnitzera racemosa* Willd.	Combretaceae
Pin colonnaire	*Araucaria Cookii* R. Br.	Araucariaceae
Poivrier	*Schinus terebinthifolius* Raddi.	Anacardiaceae
Pommier canaque	*Jambosa pseudo-malaccensis* Vieill.	Myrtaceae
Santal	*Santalum austro-caledonicum* Vieill.	Santalaceae
Santal citrin	*Cryptocarya odorata* Guill.	Lauraceae
Savonnette	*Cryptocarya odorata* Guill.	Lauraceae
Tamanou de rivière	*Geissois hirsuta* Brongn. & Gris. (?)	Saxifragaceae
Tamarin	*Casuarina nodiflora* Forst.(?)	Casuarinaceae
Troène d'Amérique	*Duranta Plumieri* Jacq.	Verbenaceae
Wakere	*Chrysophyllum Balansae* Baill.	Sapotaceae

The most valuable tree in the world. By P. J. SEARLES. *The Scientific Monthly*, Sept. 1928, pp. 271–280. Illustrated.

An interesting account of the many and varied uses of the coconut tree and its products. "The coconut is perhaps the most desirable tree in existence as it provides food, drink, shelter, and profit to millions; it can be made to serve innumerable necessary purposes; and without it the future of tropical lands would be dark indeed."

Catalogue of a private collection of walking sticks. By RUDOLPH BLOCK, New York, 1928. Pp. 149; 5½ x 8¼.

A previous catalogue of this remarkable collection was published in 1926 (see *Tropical Woods* 7: 48) and embraced 700 sticks. Since then the collection has exactly doubled in size and multiplied many times in interest and importance.

In the words of the collector: "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.

"Inasmuch as most of the woods here represented do not find their way into commercial channels this collection would have been impossible without the help and sympathetic coöperation of friends, acquaintances, and random correspondents in all parts of the world." These coöperators may now have the added satisfaction of knowing that their contributions, wrought into beautiful and artistic specimens, are on public display. The collection, as a loan exhibit, has been placed in the U. S. National Museum, Washington, where it occupies 14 special cases in the Wood Technology Hall.

One cannot view this collection without being impressed, not only with the amount of work involved in gathering together, classifying, designing, and finishing the specimens, but also with the natural beauty and wide range of variability of the woods in color, grain, figure, and other properties. A great many of the sticks have special handles, mostly the work of European artisans from original designs by the collector, and every appropriate material available was utilized —burls and fancy woods, precious metals, semi-precious stones, ivory, horn, and leathers and skins of all sorts.

Aside from its value as a guide to the collection, the catalogue serves the useful purpose of an index to many unfamiliar vernacular and trade names and their scientific equivalents.

GENERAL INDEX

No. 9, March 1, 1927, to No. 16, December 1, 1928.