

LCLL  
M. M. CHATTAWAY. Price 25 cents

Yale University

School of Forestry

# TROPICAL WOODS

NUMBER 9

MARCH 1, 1927

## CONTENTS

	<i>Page</i>
Notes on Cabinet Woods By KARL SCHMIEG	1
Poisonous Trees of Central America By PAUL C. STANDLEY	3
Timber Exports of Brazil	7
A New Species of <i>Mollia</i> of British Guiana	8
Three New Species of Plants Collected in British Honduras by Harry W. Winzerling By PAUL C. STANDLEY	10
<i>Calderonia salvadorensis</i> found in British Honduras	12
Occurrence of "Ripple Marks" in Woods	13
The Wood of <i>Tapura cubensis</i> (Poepp. & Endl.) Grisebach	18
Current Literature	20

The publication of  
this journal is made possible  
by a gift to Yale University from the  
UNITED FRUIT COMPANY

Yale University

School of Forestry

## TROPICAL WOODS

NUMBER 9

March 1, 1927

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

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

*Subscription price One Dollar per year of four numbers. Single copies 25 cents.*

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

### NOTES ON CABINET WOODS

By KARL SCHMIEG, *President*

*Schmieg, Hungate & Kotzian, Inc., New York City*

In a previous article (*Tropical Woods* 5: 1-4, March 1, 1926), I gave a short account of our experience with four new cabinet woods from Brazil. One of these in particular, the Cordia Wood or Jenny Wood,<sup>1</sup> is proving highly satisfactory and, what is always a matter of concern to the manufacturer, the supply is adequate. This wood is of a neutral color, suggesting chestnut, has about the same density as American walnut, takes a stain very well, and, on account of its close texture and even grain, receives a soft patina finish

<sup>1</sup> *Cordia Goeldiana* Huber, or closely related species. (All of the footnotes to this article are by the editor.)

with comparatively little effort. It is especially well adapted for interiors of club rooms, for bank fittings, and for furniture of Spanish design. For many purposes it satisfactorily replaces oak. We recently built a complete room, including the furniture, of Cordia Wood and were gratified with the results. I have been impressed with the resemblance of the Brazilian wood to that used by the ancient Egyptians for some of their mummy cases and certain objects of furniture,<sup>2</sup> as exhibited in museums, and I feel confident that Cordia Wood will resist well the ravages of time.

An interesting wood, somewhat similar to the foregoing, has very recently been brought to our attention for the first time. It comes from Panama and is called Cautivo.<sup>3</sup> The wood is not of prepossessing appearance in unfinished condition and shows a number of narrow oily streaks or veins. With no other finish than wax, however, there are revealed a subsurface luster and a rich striping of brown with many nicely blended tones and shades, such as one sees in English brown oak. Cautivo is somewhat lighter in weight than walnut, is very uniform in texture, rather open-grained, easy to work, not inclined to warp or check, and the natural oil content seems to give no trouble in working or finishing the dry wood.<sup>4</sup> It is worthy of attention from architects and interior decorators, as it would make beautiful woodwork for a hall, living room, or library.

One of the finest and most precious of tropical woods is the

<sup>2</sup> One of the woods much used by the ancient Egyptians for the purposes mentioned was *Cordia Myxa* L. There are a great many species of *Cordia* inhabiting the tropical and warm extra-tropical regions of the world. There is a good supply of the timbers in various parts of tropical America.

<sup>3</sup> *Prioria Copaifera* Gris. (Leguminosae). Mr. H. C. Kluge states in *Tropical Woods* 5: 8 that "in the Atrato River region, as well as in the drainage areas of the rivers and creeks flowing into the Gulf of Darien or Uraba, it composes pure, dense stands, the trunks averaging three feet in diameter and free of limbs for 50 feet." Variants in spelling are: cativo, cautiva, kartiva.

<sup>4</sup> Oil or gum exudes from the lumber in process of drying, sometimes forming ridges half an inch thick. Mr. Kluge says (*loc. cit.*): "This gum is little in evidence on dry lumber and seems not to hinder the application of paint; in fact, the wood takes paint readily."

Satiné<sup>5</sup> of French Guiana. It has long been used in France and is found in some of the finest furniture of the Louis X and Louis XI periods, but is little known in America and England. It has a wonderful satiny luster and there are different hues and colors varying from gray to a rich strawberry red overlaid with a golden sheen. It is obtainable only in small logs, which rarely exceed 8 inches in diameter, and is straight-grained, fine-textured, hard and heavy, receives a beautiful polish, and takes glue very well. The Muirapiranga of the Lower Amazon and the Palo de Sangre of the Peruvian Amazon are like the Satiné in many ways, but the samples I have seen lack the rich coloration of the French Guiana wood.<sup>6</sup>

#### POISONOUS TREES OF CENTRAL AMERICA

By PAUL C. STANDLEY

Plants that cause any harm to human beings, unless some part be eaten, fortunately are rare in all parts of the earth, and in Central America little care is needed to avoid them. There are some plants with vicious spines or thorns, and others, particularly members of the Nettle Family (Urticaceae), *Jatropha urens* L. of the Euphorbiaceae, and the *Loasa* species (Loasaceae), which are provided with stinging hairs. Most widespread of the stinging plants is the "ortiga" or "chichicaste," *Urera baccifera* (L.) Gaud. and its allies, whose slightest contact instantly causes excruciating pain which may persist several hours.

At the present moment I have in mind only those trees poisonous to the skin, either by the mere contact of their foliage or by their corrosive sap. It will be noted that nearly all the poisonous trees mentioned below have a milky latex, and that they represent three families, Euphorbiaceae, Anacardiaceae, and Apocynaceae.

<sup>5</sup> *Brosimum paraense* Huber (Moraceae). The identity of the tree was definitely determined in 1926 by Dr. S. F. Blake from fertile botanical material collected, together with a specimen of the wood, for the Yale School of Forestry by Forest Ranger L. Junker in Dutch Guiana. The wood is identical with commercial samples of Satiné from French Guiana.

<sup>6</sup> These three woods, if not the same species, are very closely related.

One of the giants of the forests of Central America is *Hura crepitans* L., the sand-box, or "javello" as it is known nearly everywhere. It is easily recognized by its trunk, often buttressed at base and densely covered with short sharp spines, and by its curious fruit resembling a miniature pumpkin, which, when ripe, explodes violently and splits into numerous sections, like those of an orange. The milky sap of the "javello" is highly irritant when it falls upon the skin, consequently caution is necessary in felling the trees, which furnish lumber of good quality. There is, naturally, danger in handling the leaves, although in Port au Prince, Haiti, where the sand-box is almost the only shade tree, little attention seems to be paid to its poisonous qualities, nor is it much feared in Central America. In Mexico, however, the tree is considered a dangerous one. In that country the milk, mixed with corn meal or similar substances, is thrown into streams or ponds to stupefy fish so that they may be caught with the hands. The large flat seeds, although known to have violent purgative properties and said to be employed for poisoning coyotes and other animals, are, strangely enough, a favorite food of the red and blue macaws so abundant in Guanacaste, Costa Rica.

The worst of all the Euphorbiaceous trees is *Hippomane Mancinella* L., the manchineel (the word a derivative of the Spanish name, "manzanillo"), but happily it never grows outside a narrow belt fringing the seashore. The early Spanish explorers were delighted to find the manchineel, certain that they had discovered wild apples, for the fruits closely resemble green crab apples. They ate them, sometimes with fatal results, and the survivors gave the tree an even worse reputation than it deserves. They affirmed that to sleep beneath a tree would result fatally, and it is probable that dew dripping from the foliage might blister the skin. Manchineel trees are bad enough at best and should be avoided so far as possible. Their wood is of good quality and has been much used in tropical America, in the West Indies even for sugar pots. It is claimed that when thoroughly dried the wood loses its dangerous properties, but it is stated at the same time that smoke from the burning wood produces serious inflammation of the eyes.

Evidence concerning trees of the genus *Sapium* is contradictory. In Mexico the milky sap is reputed harmful, and it is reported on good authority that the Indians utilized it for poisoning their arrows, a probability attested by the fact that the name "palo de la flecha," arrow-wood, is current for some of the species. In Salvador, also, the sap is claimed to be poisonous and blistering if in contact with the skin, for which reason the trees often are left standing when land is cleared. The popular name in Salvador is "chilamate," an Aztec word, from "amate," fig-tree (which *Sapium* much resembles in general appearance), and "chile," the common hot pepper, a word used also to express the idea of burning or smarting.

In Costa Rica, where the *Sapiums* are called "yos," they are not reported poisonous, and the same is true in Panama, where the name "olivo" is usually applied to the trees. Mr. James Zetek tells me that he was under the impression that the milk was highly poisonous until informed otherwise, but being still skeptical, he tested the fact with a boy, who showed no hesitation in chewing some of the gum. In Panama it is a common practice among the boys to chew the gum, which consists largely of rubber, and apply it as bird lime to twigs.

It seems probable that the species of *Sapium* differ as to their properties, and that while some may be harmful, others are innocuous. The trees of this genus are easily recognized by the two glands borne on the petiole near the base of the leaf blade.

Two Central American species of *Euphorbia* are condemned as poisonous. One of these, *E. cotinifolia* L., is planted extensively for hedges about Guatemala City, but is rare elsewhere in Central America. The other species, *E. Hoffmanniana* (Kl. & G.) Boiss., abundant in central Costa Rica, especially in fence rows, is said to cause swelling and inflammation, but the people seem to pay little attention to the shrub, and I do not believe it very noxious.

The Sumac Family (Anacardiaceae) bears an evil reputation in the United States because of two plants, the poison ivy and poison sumac. A very close relative of the latter exists in Central America, a shrub or small tree with pinnate leaves, the rachises of which have the same reddish tinge that

makes our poison sumac (*Rhus vernix* L.) so conspicuous in the swamps which it frequents. The Central American plant, *Rhus juglandifolia* Willd., as I have seen it, does not grow in such situations but rather upon exposed dry hills. It is found only at rather high altitudes, of 3,000 to 5,000 feet or more, and ranges from southern Mexico to Venezuela and Peru. It is all too common in Costa Rica on the open hills south of Cartago, where its toxic properties, exactly like those of our United States species, are well known. The plant bears the significant name of "hinchador" (sweller), and people take pains to avoid it.

Of the same family is *Metopium Brownei* (Jacq.) Urban, the black poison wood of British Honduras. On the continent this tree is known also from Guatemala, Yucatán, and Vera Cruz, and it is widely distributed in the Greater Antilles. It is reported to be quite as harmful as poison sumac, and to cause enduring and painful inflammation of parts of the body exposed to it.

The genus *Comocladia*, also of the Anacardiaceae, is not known to occur in Central America, although it may well grow in Guatemala. There are several species in Mexico, and the highly poisonous nature of the West Indian species is well established. Oviedo writes that in Santo Domingo the Indian women, in order to obtain a white skin, used to apply to their faces and arms a paste made from the roots, thus removing the outer skin, as one great blister presumably, and procuring a fresh white skin which could scarcely have been of long duration. Such self-inflicted torture as that attributed to the Dominican women seems almost beyond belief, and Oviedo agrees that it is a striking example of the extremes to which women will resort for the sake of improving their physical beauty!

Of the trees of the Dogbane Family (Apocynaceae) the one with the worst reputation is the recently described *Cameraria belizensis* Standl., known in British Honduras as white poison wood. It is reported to be highly poisonous, and to be shunned by everyone. (See *Tropical Woods* 7: 8, Sept. 1, 1926.)

The copious milky sap which streams from the broken stems of the frangipannis (*Plumeria* spp.) and species of

*Thevetia* is commonly reputed to be poisonous, and the large seeds are known to be dangerous if taken internally, although under what circumstances any person would swallow one it is difficult to imagine. I have had the milk of the various species of both genera repeatedly upon my hands without injurious effects, although I was always careful to remove it as quickly as possible.

This list may seem a rather formidable one, but I have personally collected, without any harmful result, specimens of most of the plants mentioned, and the danger of happening unexpectedly upon the worst of these plants is not great. Most dangerous, probably, is *Rhus juglandifolia*, since it is usually a low shrub of just the right height to brush against the face and hands, and without any peculiarity in appearance that might draw one's attention to it.

#### Timber Exports of Brazil

The timber exports of Brazil in 1924 amounted to 150,072 tons, having a value (F. O. B.) equivalent to \$3,281,046 in U. S. currency. A little over 70 per cent of this material went to Argentina, about 11 per cent to Uruguay, and less than 6 and 5 per cent, respectively, to the United States and Portugal. The following kinds are listed separately for the first time: andiroba, baguassú, freijo, guajuvira, imbuia, itauba, lapacho, louro vermelho, macacahuba, marupá, pau amarello, pau roxo, peroba, and sucupira. The others are acapú, cedro, Gonçalves Alves, jacarandá (rosewood), massaranduba, pau brasil (brazil wood), pinho (Paraná pine), and sebastião de arruda (tulip wood). Over 75 per cent of the timber exported was pinho. Timber exports in 1925 amounted to 130,458 tons; imports, 27,865 tons; exports Jan.-June 1926, 59,476 tons.

#### Radial Canals in *Poupartia*

Mr. Yôichi Sugiura has found small intercellular canals in the rays of the wood of *Poupartia Fordii* Hemsl. (Anacardiaceae). The wood (Yale No. 9288) is distinctly ring-porous.

A NEW SPECIES OF *MOLLIA* OF BRITISH GUIANA

During the summer of 1926 a study was made in the Yale tropical laboratory of a number of woods collected in British Guiana by the late Mr. A. C. Persaud for the Field Museum of Natural History, Chicago. In this collection was an unidentified specimen labeled "yawhooballi" (Persaud No. 4; Field Mus. No. 549,747). Its structure indicated *Tiliaceae*, but did not conform with that of any genus known to the editor. Through a process of elimination it was tentatively identified as *Mollia* sp. This determination was subsequently confirmed by Dr. H. A. Gleason, Curator, New York Botanical Garden, who reported that the Persaud botanical specimen precisely matched in foliage a specimen of *Mollia* collected by Jenman on the upper Demerara River in 1888. Attempt to determine the species led to the conclusion that it had not been described, and, at the editor's suggestion, the following description was prepared:

*Mollia sphaerocarpa* Gleason, n. sp.

Arborescent, 9-15 m. high; older twigs glabrous, the younger closely ferruginous-lepidote; petioles 5 mm. long, lepidote like the stem; leaf-blades firm, shining above, ferruginous beneath, oblong-elliptic, 8-10 cm. long, 2.5-4 cm. wide, sharply acuminate, entire, narrowed to a broadly cuneate base, thinly lepidote above, densely so beneath; lateral veins 3 or 4 pairs, ascending at an angle of 45°, obscure above, elevated beneath, the veinlets inconspicuous; inflorescence of 3-flowered cymes, solitary or paired in the upper axils, lepidote like the twigs, the peduncle 8-10 mm., the pedicels 15-25 mm. long; sepals valvate, narrowly linear-oblongate, 25 mm. long, densely and closely lepidote; petals narrowly oblongate, 25-30 mm. long when fully expanded, glabrous within, lepidote without; stamens about 130, aggregated in 5 outer phalanges of 6 each and 5 inner phalanges of about 20, those of the outer series 25 mm. long, connate for 16-18 mm., the inner 20 mm. long, connate for about one third of their length; filaments capillary; anthers linear, conspicuously sagittate at base, 2-celled, opening lengthwise; ovary bicarpellate, nearly terete, densely lepidote, tapering gradually into a slender glabrous style 20 mm. long, tipped with a slender clavate stigma; fruit a woody, subglobose, slightly 2-lobed, somewhat retuse, sparsely lepidote, loculicidal capsule 12-15 mm. long, the numerous seeds separated by horizontal false dissepiments.

Type, *Jenman* 4132, collected on the upper Demerara River, September, 1888, and deposited in the herbarium of the New York Botanical Garden. The type is in flower; a second sheet, *Persaud* 4, is in fruit.

Only nine species of *Mollia* have been described and some of these are still imperfectly known. In all but one of them the fruit, if known at all, is more or less flattened and usually distinctly winged. In the ninth and most recently published species, *M. Ulei* Burret, the fruit is globose, and for this reason Burret has made it the type of a new subgenus *Schizosphaera*, leaving the eight earlier species in the subgenus *Eumollia*. *M. sphaerocarpa* is accordingly a second species of the subgenus *Schizosphaera*, and differs from *M. Ulei* in its distinctly lepidote indument; in *M. Ulei* the pubescence is tomentose. Of the species of *Eumollia*, *M. lepidota* Spruce most closely resembles *M. sphaerocarpa* in flower and leaf, but Spruce's species has larger and bluntly acuminate leaves rounded at the base, smaller flowers, and larger and somewhat flattened capsules.

DESCRIPTION OF THE WOOD<sup>1</sup>

*General properties*.—Heartwood pale pinkish brown; sapwood lighter and rather sharply defined. Luster dull. Odor and taste not distinctive. Sp. gr. (air-dry) 0.80; wt. 50 lbs. per cu. ft. Rather fine-textured, straight-grained, easy to work, finishes smoothly, is apparently not durable.

*Gross anatomy*.—Growth rings indistinct. Parenchyma extending wing-like from pores, often confluent into irregular, narrow, tangential bands; barely visible without lens. Pores small, at limit of vision; numerous, but not crowded, uniformly distributed, occurring singly or in radial pairs; mostly open. Vessel lines fine, straight, not conspicuous. Rays fine, faintly visible on cross and tangential sections, distinct on the radial where they appear darker than background. Ripple marks present, irregular, visible; all elements storied, although some of the rays occupy more than one tier; no. of markings per inch 56-60.

*Minute Anatomy*.—About two-thirds of the pores in radial groups of 2 or occasionally more; others solitary and circular or oval in outline; tangential diameter 0.10 to 0.13 mm. (av. 0.12 mm.). Vessel perforations simple. Intervascular pits

<sup>1</sup> By the editor.

minute. Parenchyma paratracheal and irregularly metatracheal, the bands 1 to 6 cells wide; cells with thin walls and dark-colored contents. Rays in part uniseriate and 1 to 20 cells high; in part 3 to 4 cells wide and up to 70 cells (1.50 mm.) high; cells fairly uniform in height, with some larger marginal and interspersed cells, and there are numerous interspersed rows of very small square or palisade cells; pits into vessels resemble the intervacular; gum deposits abundant; small rhombohedral crystals occasionally present. Fibers small, rather thick-walled; length 1.13 mm. to 1.54 mm. (av. 1.38 mm.), diameter 0.011 mm. to 0.027 mm. (av. 0.019 mm.); pits abundant, minute, simple or indistinctly bordered. (Measurements by Mr. D. A. Kribs.)

*Material*.—Yale No. 9426; Persaud No. 4.

### THREE NEW SPECIES OF PLANTS COLLECTED IN BRITISH HONDURAS BY HARRY W. WINZERLING

By PAUL C. STANDLEY<sup>1</sup>

The three species of woody plants described below have been found in recent sendings of specimens from Mr. Harry W. Winzerling, of the Belize Estate and Produce Company, to Prof. Samuel J. Record, in connection with their studies of the forest flora of British Honduras. In view of our lack of knowledge of the British Honduras flora, and of the discriminating manner in which these collections have been made, it is not remarkable that they have yielded an unusually high percentage of species never recorded previously from Central America.

#### *Hyperbaena Winzerlingii* Standl., sp. nov.

Tree about 6 m. tall, the trunk 15 cm. in diameter; young branchlets slender, angulate, minutely and sparsely hirtellous; petioles 5-6 mm. long, puberulent on the upper side; leaf blades cuneate-oblong, 7.5-12 cm. long, 3-5 cm. wide near the apex, gradually narrowed from near the apex to the acute or cuneate base, shallowly 3-lobed near the apex, the lateral lobes broadly triangular or sometimes rounded, usually acutish, spinose-mucronate, the

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

terminal lobe triangular or ovate-triangular, 2-3 cm. long, obtuse or acute, tipped with a sharp stiff spine-like mucro 1-1.5 mm. long; blades thick-coriaceous, dull and concolorous, glabrous, the margin cartilaginous-thickened, the costa salient on both surfaces, the lateral nerves obscure, 5 or 6 on each side, irregularly arcuate, the other venation obsolete.

Type in the U. S. National Herbarium, No. 1, 266, 105, collected in Orange Walk District, British Honduras, in 1926 by H. W. Winzerling (No. V-12).

Although only sterile specimens are at hand, I do not hesitate to describe this tree as new, since the leaf characters are quite unlike those of any Central American or West Indian species examined. Mr. Winzerling reports the vernacular names as "knock me back" and "tcan-sick," the latter Mayan. He describes the wood as very hard, porous, and pale yellow. [Structure suggests *Avicennia*—Ed.]

Another species of this genus, *Hyperbaena guatemalensis*, which I described (*Journ. Washington Acad. Sci.* 15: 475. 1925) from sterile specimens, was collected the past year (1925) in flower by C. A. Purpus (No. 10516) at Monserrate, Chiapas.

#### *Banisteria heterocarpa* Standl., sp. nov.

Small tree about 4.5 m. high, the trunk 3.5 cm. in diameter; branchlets terete, grayish brown, bearing numerous small elevated lenticels, when young appressed-pilose; leaves opposite, the petioles stout, 4-5 mm. long, strigose, bearing on each side at about the middle an elevated sessile gland; leaf blades lanceolate or narrowly lanceolate, 7.5-10 cm. long, 2.5-3 cm. wide, gradually narrowed to the obtuse apex, obtuse at base, entire, coriaceous, glabrous in age but when young brownish-sericeous, at least beneath, lustrous above, the venation evident but not elevated, beneath dull, the costa salient, the lateral nerves 7 or 8 on each side, prominent, the ultimate nerves closely and prominently reticulate; panicles terminal, 8-11 cm. long, narrow, the branches densely covered with short brown appressed hairs, the bracts elliptic, 2-3 mm. long, densely sericeous on both surfaces; pedicels 4-8 mm. long; sepals oblong, obtuse, 3-3.5 mm. long, eglandular, densely brown-pubescent outside, the tips recurved; samaras 2 or 3, about 1 cm. long and broad, densely appressed-pubescent, the body irregularly transverse-ridged, the wing dorsal, thin, extending from base to apex, 3-4 mm. wide, conspicuously veined.

Type in the U. S. National Herbarium, No. 1, 266, 107, collected in Orange Walk District, British Honduras, in 1926 by H. W. Winzerling (No. V-15).

In leaf and sepal characters this resembles *Banisteria laurifolia* L., a common species of Central America, but the samaras, with low dorsal crests rather than long spatulate wings, are very different from those of any species known to

me. Mr. Winzerling reports that the tree grows in low places, and that it has hard wood.

*Lycianthes hypoleuca* Standl., sp. nov.

Shrub, the stem about 5 cm. in diameter; branchlets terete, slender, flexuous, dark reddish brown, when young sparsely tomentose with microscopic whitish stellate hairs; leaves subequal, but a few small ones (with blades 1.5-2 cm. long) present; petioles slender, 3-7 mm. long, minutely tomentose; leaf blades elliptic or elliptic-ovate, 5-7.5 cm. long, 2-3.5 cm. wide, acuminate or long-acuminate, at base acute, entire, thin, deep green above and appearing quite glabrous but really bearing scattered stellate hairs visible only under a microscope, the lower leaf surface whitish, densely covered with an appressed tomentum of minute stellate hairs; umbels sessile, mostly 2-flowered, the pedicels slender, 2.5-3 cm. long, very sparsely furnished with minute stellate hairs; fruiting calyx saucer-shaped or shallowly campanulate, 7 mm. broad, glabrate, the margin truncate; fruit subglobose, red, 7-8 mm. in diameter.

Type in the U. S. National Herbarium, No. 1,266,106, collected in Orange Walk District, British Honduras, in 1926 by H. W. Winzerling (No. V-14).

This distinct species is well marked by the dense, minute, pale tomentum of the lower leaf surface, in contrast with the deep green upper surface, which to the naked eye appears quite glabrous. Mr. Winzerling states that the plant is a small tree, but judging from further statements in his notes it may be assumed that it is a woody vine, like most other members of the genus. *Lycianthes* is a well-defined group of Solanaceae segregated recently by Bitter from the vast genus *Solanum*.

*Calderonia salvadorensis* found in British Honduras

The occurrence in British Honduras of *Calderonia salvadorensis* Standl. has been brought to light by specimens (Yale No. 9705) collected in the Stann Creek District recently by Forest Ranger F. G. Burns. The tree is known locally as "redwood," in allusion to the bright red or pink color of the freshly dried wood, a coloration which fades with continued exposure to light. "Heretofore," says Dr. Standley, "this tree has been known only from Salvador, but since there seems to be a rather marked relationship between the flora of Salvador and that of Yucatán, and presumably, therefore, also that of British Honduras, the occurrence there of *Calderonia* is not surprising, although unexpected."

OCCURRENCE OF "RIPPLE MARKS" IN WOODS

"Ripple marks" are the fine transverse markings appearing on the tangential surfaces of woods having some or all of their elements in horizontal seriation. Such a structure is said to be storied or tier-like (*stockwerkartiger aufbau* or *etagenbau*). The feature is of great service in the identification of woods.

The subject has already been covered in considerable detail by the writer (*Bul. Torrey Botanical Club* 46: 253-273, July 1919) and the purpose of this paper is to supplement previous publications and summarize the information now available.

Below is a list of the natural orders and families, together with the number of genera in each family, in which woods with storied structure have been seen by the writer or reported by others. The arrangement is according to the Engler and Gilg (1912) system of classification.

1. PIPERALES: Piperaceae (1).
2. URTICALES: Ulmaceae (2), Moraceae (1).
3. CENTROSPERMAE: Amarantaceae (1), Nyctaginaceae (1).
4. RHOEADALES: Moringaceae (1).
5. ROSALES: Leguminosae (70 to 73).
6. GERANIALES: Zygophyllaceae (4), Rutaceae (1), Simarubaceae (3), Surianaceae (1), Meliaceae (2 to 7).
7. SAPINDALES: Hippocastanaceae (1).
8. MALVALES: Elæocarpaceae (1), Tiliaceae (12), Malvaceae (4 or 5), Bombacaceae (5), Sterculiaceae (8).
9. PARIETALES: Dipterocarpaceae (2 to 5), Bixaceae (2).
10. PRIMULALES: Myrsinaceae (1).
11. EBENALES: Ebenaceae (1).
12. TUBIFLORAE: Borriginaceae (1), Bignoniaceae (4), Gesneriaceae (1).
13. CAMPANULATAE: Compositae (5).

Comparison of the above list with that published in 1919 (*loc. cit.*, p. 257) shows that one order and two doubtful families have been eliminated, while three orders, nine families, and 42 genera have been added, making the present totals 13 orders, 26 families, and 148 genera (including some that are doubtful).



A new type of secondary seriation was observed in *Muntingia* (Elæocarpaceae), due to the fact that the wood fibers are septate in the middle.

The following classifications of woods with ripple marks may prove helpful in identification. The characterizations of the families are not intended to apply beyond the present field of investigation.

Anomalous structure, i.e., interxylary bast strands, present: Amarantaceae, Nyctaginaceae.

Vertical resin or gum ducts present normally: Dipterocarpaceae, Simarubaceae (*Simaruba*); abnormally (traumatic): Bombacaceae in part, Leguminosae (*Andira*, *Herminiera*), Meliaceae, Moringaceae, Sterculiaceae (*Heritiera*, *Sterculia*, *Tarrietia*).

Radial gum ducts present: Bixaceae (*Maximiliana*).

Broad rays present: Gesneriaceae, Leguminosae (*Erythrina*), Myrsinaceae, Piperaceae.

Lapachol present in vessels: Bignoniaceae (*Tecoma* in part).

Calcium carbonate present in vessels: Ulmaceae.

Woods very light and soft: Bixaceae, Bombacaceae, Leguminosae (*Aeschynomene*, *Herminiera*, *Erythrina* in part).

Woods light and soft to moderately so: Bignoniaceae in part, Elæocarpaceae, Hippocastanaceae, Leguminosae in small part, Malvaceae, Moraceae, Simarubaceae, Sterculiaceae in part, Tiliaceae in part.

Woods with bitter taste: Simarubaceae.

Concentric bands of unligified tissue present: Tiliaceae (*Apeiba*, *Heliocarpus*).

Aggregates of resinous cells present in rays: Myrsinaceae.

Markings more than 200 per inch: Zygophyllaceae.

Vascular pits with distinct cribriform membranes: Leguminosae.

#### THE FAMILIES AND GENERA

**Amarantaceae.**—*Charpentiera ovata* Gaud. of Hawaii. Markings visible under lens; no. per inch 110-115. Fibers and parenchyma strands, but not rays, storied. Wood of anomalous structure, having numerous strands of soft bast.

**Bignoniaceae.**—*Crescentia*, *Enallagma*, *Tabebuia*, and *Tecoma*. Woods variable from medium soft to extremely hard; color nearly white, brownish, or olive-green. Lapachol present in certain species of *Tecoma*. Markings very

regular to fairly so, often distinct without lens. No. per inch, 75-145. All elements usually storied. Tendency to storied structure noted by Janssonius in *Dolichandrone Rheedii* Seem. (*Mikrographie des Holzes der auf Java vorkommenden baumarten*, IV, p. 740).

**Bixaceae.**—*Bixa* and *Maximiliana*. Woods light and soft. Intercellular canals in some of the rays of *M. vitifolia* (Willd.) Kr. & Urb.

**Bombacaceae.**—*Bombacopsis*, *Bombax*, *Cavanillesta*, *Ceiba*, and *Cumingia*. Woods exceedingly light and soft to moderately so; color pale brown to dull red. All elements storied in *Cumingia philippinensis* Vid.; rays not storied in others. Markings rather irregular; scarcely visible without lens; no. per inch, 35-75.

**Borraginaceae.**—*Cordia suaveolens* Blume has, according to Janssonius (*loc. cit.*, p. 693), more or less distinct markings. Vessel segments, libriform fibers, wood parenchyma strands, substitute fibers, and some of the smaller rays in seriation. Many of the rays rather coarse; pores scattered; parenchyma abundant, in irregular tangential bands. Tier-like structure not observed by present writer in any woods of this family.

**Compositae.**—*Artemisia tridentata* Nutt., *Baccharis sarothoides* Gray, *Bigelovia graveolens* Gray, *Synchodendron ramiflorum* DC., *Vernonia Merana* Baker, and *V. arborea* Buch.-Ham. and varieties. First three are shrubs of western U. S. A.; rays not storied; markings irregular; lens required; no. per inch, 120-200. For next two see H. Lecomte's *Madagascar: Les bois de la forêt d'Analamazaotra*, pp. 144-6, pl. 54; according to the photomicrographs, all elements are storied, the markings regular and distinct in *Vernonia*. Ripple marks are absent in *V. Vidalii* Merr. of Phil. Is. (No. 17543 B. F.; Yale No. 2239). Structure distinct in parenchyma strands only in Javanese species and varieties of *Vernonia*, according to Janssonius (*loc. cit.*, p. 248).

**Dipterocarpaceae.**—Two Javanese specimens of *Sborea*: "pooti," a very dense, brown wood, and "kedontang item," a yellowish wood of medium density. (Yale Nos. 8178 and 8173, resp.) Markings irregular and more or less local; readily visible; no. per inch, 50-55. Reported by Den Berger & Endert (*Belangrijke houtsoorten van Nederlandsch-Indië*, I, pp. 104-130) as occurring more or less irregularly and sporadically in certain species of *Dryobalanops*, *Hopea*, *Sborea*, and *Isoptera*; mostly 2-3 markings per mm. Observed by present writer in "seraya," *Sborea* sp., and "chengal," *Balanocarpus* sp., of Federated Malay States (Yale Nos. 6328 and 6273, resp.). In the latter the elements are all very uniformly storied; no. per inch, about 75. Woods of this family characterized by vertical resin ducts, usually in uniseriate concentric rows or arcs.

**Ebenaceae.**—Characteristic of persimmon, *Diospyros virginiana* L., of U. S. A. Markings visible; fairly regular to irregular; no. per inch, 55-80; all elements storied. Reported by Kanehira (*Anatomical characters and identification of the important woods of the Japanese Empire*, p. 18) in *Diospyros Kaki* L., *D. Lotus* L., and *D. Morrisiana* Hance. The woods of this family are very dense, few-pored, and have wood parenchyma in closely spaced, wavy, uniseriate, tangential lines.

**Elæocarpaceae.**—*Muntingia Calabura* L. of Panama. (Yale No. 7130.)

Wood light and soft, with distinct rays; suggests *Tilia*. Markings faintly visible without lens; very fine; due mainly to storied wood fibers, which are septate in middle, giving rise to secondary seriation. Rays not storied.

**Gesneriaceae.**—In *Cyrtandra cuneata* Blume, according to Janssonius (*loc. cit.*, p. 717), storied structure involving vessel segments, fibers, and parenchyma strands is more or less distinct. Rays in part very broad; pores small and inconspicuous; parenchyma sparingly developed.

**Hippocastanaceae.**—*Aesculus octandra* Marsh. (U. S. A.) and *A. turbinata* Bl. (Japan). Woods nearly white, light and soft, fine-textured; rays uniseriate. All elements storied; no. of markings per inch, 55–70.

**Leguminosae.**—Markings more or less regular and distinct in some or all of the species of the following: MIMOSOIDEAE: *Albizzia* (?), *Enterolobium* (?), *Parkia*, *Platymenia*, *Pitbecolobium*, *Wallacodendron*. CAESALPINIOIDEAE: (*Amburana*), *Apuleia*, *Baubinia*, *Caesalpinia*, *Cassia* (?), *Cercis*, *Copaifera bymenaeifolia*, *Dialium*, *Dicorynia*, *Distemonanthus*, *Haematoxylon*, *Holocalyx*, *Koompassia*, *Martuisia*, *Melanoxylon*, \**Mezoneurum*, *Poeppigia*, *Pterogyne*, *Swarzia*, *Tamarindus*, *Torresia*, (*Tounatea*), *Zollernia*. PAPILIONATAE: \**Aeschynomene*, *Andira*, *Artrocarpum*, *Baphia*, *Belairia*, *Bowdichia*, *Brya*, *Butea*, *Canavalia*, *Castanospermum*, *Centrolobium*, (*Coumarouna*), *Dalbergia*, *Dalea*, *Derris*, (*Dipbaca*), \**Dipbysa*, *Dipteryx*, \**Erythrina*, *Eysenhardtia*, *Genista*, *Gliricidia*, *Gourliea*, \**Herminiera*, *Hymenolobium*, *Icthyometbia*, *Indigofera*, *Inocarpus*, \**Laburnum*, *Lonchocarpus*, *Machaerium*, *Milletia*, *Myrocarpus*, *Myrospermum*, *Myroxylon*, \**Olneya*, *Ormosia*, *Ougeinia*, *Phylloxylon*, (*Piscidia*), *Pictetia*, *Platymiscium*, *Platycomus*, *Platypodium*, *Pongamia*, *Pterocarpus*, \**Sopora*, *Sweetia*, *Tipuana*, (*Toluifera*). In genera marked with an asterisk the rays are not storied. (Synonyms in parentheses.)

The woods of the Leguminosae vary from exceedingly light and soft (e.g. *Aeschynomene*, *Herminiera*, and some species of *Erythrina*) to exceedingly hard and heavy, and represent the widest possible range in colors. Usually parenchyma is distinct about the pores and in tangential or concentric lines or bands, but in some cases (e.g. *Myrospermum*) it is very indistinct. Certain woods of the Moraceae and Combretaceae resemble Leguminosae, but ripple marks are absent in the Combretaceae and limited to a few species of *Ficus* in the Moraceae. The Leguminosae are characterized by cribriform pit membranes in the intervacular and vessel-parenchyma pits (see *Tropical Woods* 2: 10, June 1925), a condition not found in the Moraceae. Rays mostly homogeneous or nearly so, usually fine and inconspicuous, but sometimes rather coarse as in *Erythrina*. No. of markings per inch, 40–200.

**Malvaceae.**—*Gossypium*, *Hibiscus*, *Paritium*, *Sida* (?), and *Thespesia*. In some cases all elements are storied and the markings are fairly regular and distinct, in others (*Gossypium* and certain species of *Hibiscus*) the rays are not storied or only in part. Woods rather soft or only moderately hard, of somewhat the same consistency and, in the case of *Paritium* spp., having the same coloration as *Liriodendron*. No. of markings per inch, 85–110.

**Meliaceae.**—Best developed in *Swietenia* and *Xylocarpus*; often absent in *Swietenia*; may be present, at least locally, in *Carapa*, *Cedrela*, *Cbickrassia*, *Entandropbragma*, and *Kbaya*, in which case they are usually irregular. Woods vary in density from soft (*Cedrela*) to rather hard and heavy, and in

color from salmon to red or reddish brown, sometimes yellowish. Parenchyma usually in tangential bands, often limiting growth rings, but is poorly developed in *Kbaya*. All elements storied; no. of markings per inch, 50–80.

**Moraceae.**—A few species of *Ficus*. All elements storied; markings visible, fairly regular; no. per inch, 60–65. Woods of grayish color, rather coarse-textured; parenchyma in distinct concentric bands.

**Moringaceae.**—All elements said to be storied in certain species of *Moringa* of the Far East. Markings regular to fairly so. Parenchyma paratracheal and metatracheal; vertical gum ducts, gummosis type, may be present. Specimens not seen by writer.

**Myrsinaceae.**—In *Aegiceras corniculatum* Blanco, according to Janssonius (*loc. cit.*, p. 348), all elements are plainly storied, though most of the rays usually occupy two or three tiers. Rays in part very coarse, and distinguished by aggregates of resinous cells, which are very common throughout the family; pores small. Storied structure not observed in other members of this family.

**Nyctaginaceae.**—Fine markings, due principally to storied parenchyma strands and fibers, may be distinguished more or less clearly in various species of *Pisonia*. Wood of anomalous structure, being characterized by numerous strands of soft bast which sometimes equal in volume the remainder of the wood. In old specimens the contents of the cavities may be lost, leaving the wood finely honey-combed.

**Piperaceae.**—*Piper aduncum* L. Rays very large; not storied. Markings not very plain; visible under lens; due mostly to fibers.

**Rutaceae.**—Markings distinct and regular in *Chloroxylon Swietenia* DC.; also in specimens of a similar wood supposedly of Brazilian origin (Yale Nos. 3907A and 4926). All elements storied, though some of the rays may occupy more than one story; no. of markings per inch, 78–85. A rather dense wood, yellowish, the pores very small and in radial rows, the growth rings terminated by narrow band of parenchyma.

**Sapindaceae.**—The reported occurrence of storied structure in a species of *Sapindus* requires verification. The structure has not been found by the writer in *Sapindus* or in any other members of the family so far examined.

**Simarubaceae.**—*Picraena*, *Picrasma*, and *Simaruba*; all elements storied, though in *Picraena* some of the rays may occupy more than one tier; no. per inch, 50–60. Woods rather soft, yellowish, with bitter taste. *Simaruba* usually has vertical resin ducts of normal occurrence in tangential series, but they may be absent in small specimens.

**Sterculiaceae.**—*Guazuma*, *Heritiera*, *Kleinbovia*, *Melocbia*, *Pterocymbium*, *Pterospermum Sterculia*, and *Tarrietia*. Markings fairly regular and distinct; in most cases the rays are not storied or occupy more than one tier; no. of markings per inch, 50–95. Woods variable from light, soft, and coarse-textured, to moderately hard and rather fine-textured; parenchyma developed in various amounts, often in very fine lines not visible without a lens and sometimes also in coarse and irregular bands. Vertical gum ducts, gummosis type, may occur in *Heritiera*, *Sterculia*, and *Tarrietia*.

**Surianaceae.**—In *Suriana maritima* L., the only species in the family, all elements storied. Markings fairly regular, barely visible without lens; no. per

inch, about 120. Wood red, hard, fine-textured, the pores not visible without lens. Parenchyma is invisible and the rays are minute.

**Tiliaceae.**—*Apeiba*, *Belotia*, *Berrya*, *Columbia*, *Diplodiscus*, *Grewia*, *Heliocarpus*, *Luebea*, *Mollia*, *Pentace*, *Schoutenia*, and *Tilia*. In most instances the rays are not storied or occupy more than a single tier. In *Berrya*, *Diplodiscus*, *Luebea*, and *Pentace* all elements are usually storied. Markings fairly regular and distinct, being least so in *Tilia* and *Mollia*; no. per inch, 55–105. Woods vary from light and soft to hard and heavy; fine-textured; parenchyma typically in fine tangential lines not visible to unaided eye. In *Apeiba* and *Heliocarpus* there are often concentric bands of unligified tissue of variable width.

**Ulmaceae.**—*Holoptelea integrifolia* (Roxb.) Planch. and *Phyllostylon brasiliensis* Cap. Wood of the first rather light, of a yellowish-gray color, the pores small and connected tangentially by fine parenchyma lines; all elements storied, the markings regular, faintly visible; no. per inch, 110–115. Wood of *Phyllostylon* is in the boxwood class, fine-textured, hard, yellowish; parenchyma in irregular tangential lines scarcely visible with lens; rays often occupy more than one tier; markings fairly regular, but not always distinct; no. per inch, about 140. In both woods some of the pores are filled with calcium carbonate which effervesces noticeably upon the application of HCl.

**Zygophyllaceae.**—*Bulnesia*, *Guaiacum*, *Larrea*, and *Porlieria*. All elements storied; markings very regular, invisible without lens; no. per inch, 250–300. Woods extremely dense, oily, mildly scented; color olive to very dark brown. The exceeding fineness of the markings serves to distinguish the woods of this family from the others having all elements serried.

#### THE WOOD OF *TAPURA CUBENSIS* (POEPP. & ENDL.) GRISEBACH

*Tapura* is one of the three genera of the tropical family Dichapetalaceae (Chailletiaceae). There are about 10 species, one in eastern and one in western Africa, the others occurring from the Amazon region of Brazil to the Greater Antilles. *Tapura cubensis* (Poepp. & Endl.) Gris., a small tree of Cuba, has smooth, leathery, alternate leaves that are sometimes two inches wide and five inches long, but more commonly about an inch wide and three inches long, with entire and slightly involute margins, and with anastomosing veins prominent on the under side. The thick, ashy gray petioles are adnate to the inflorescence, so that the axillary flower clusters appear to spring from the base of the leaf blade. The flowers are small and the petals are two-lipped. The vernacular names of the tree are "vigueta naranja" and "aura."

#### DESCRIPTION OF THE WOOD

**General properties:** Color pale brown (small stem); sapwood white.

Odor and taste absent or not distinctive.

Hard and heavy, fairly straight-grained, fine-textured.

**Growth rings:** Absent or poorly defined. Sometimes indicated by more abundant parenchyma.

**Parenchyma:** Rather abundantly developed; faintly visible to unaided eye; under lens appears in very irregular network with the rays; occasionally in concentric bands.

**Pores:** Minute, not visible without lens; numerous, fairly well distributed, occurring singly or in radial rows; open.

**Vessel lines:** Very fine and indistinct.

**Vessel contents:** None observed.

**Rays:** Of two sizes, the larger fairly numerous, readily visible, suggesting those of *Tilia*, the smaller visible only with lens. The rays are a single pore-width apart.

**Ripple marks:** Absent.

**Gum ducts:** None observed.

**Minute anatomy:** Diameter of pores 0.033 mm. to 0.05 mm., av. 0.044 mm. Vessel perforations simple, rarely scalariform with numerous, fine, anastomosing bars. Intervascular pits minute, with linear to lenticular orifices. Rays of two types: (1) uniseriate, with all of the cells upright or square; (2) multiseriate in median portion, the margins uniseriate and high; median portion 3 to 6 (mostly 5) cells wide (most of the cells procumbent) and 30 to 100 or more high (measuring about 0.10 x 1.64 mm.), the uniseriate margins consisting of upright or square cells and often continuous with those of the rays above and below; pits into vessels half-bordered, those in the ray cell sometimes covering two in the vessel, the apertures lenticular. Many of the wood parenchyma and ray cells are conjugate. Wood fibers very small, with very thick, laminated, gelatinous walls and minute cavities, the pits few, with slit-like apertures extending beyond the indistinct circular borders. The intervacular pits and those between the vessels and the ray and wood parenchyma cells appear to have cribriform membranes.

**Material:** Yale No. 9146, collected by Mr. Thomas H. Gill.

## CURRENT LITERATURE

**Catalogo alfabetico de nombres vulgares y cientificos de plantas que existen en México.** Pub. por la Dirección de Estudios Biológicos, Secretaría de Agricultura y Fomento. Mexico, 1923—. Incomplete. Fols. Nos. 1-15, pp. 478;  $5\frac{1}{2}$  x  $9\frac{1}{4}$ .

This valuable work consists of two parts: the first an alphabetical list of the vernacular names, the second a corresponding list of the scientific names. It is issued in "folletos" consisting of several sheets each, and the first fifteen of these comprise 478 pages of Part I and contain the names up to "pareira brava." On each page are five columns: (1) vernacular name; (2) scientific name; (3) family; (4) localities where found, unless cultivated or naturalized; (5) authorities. Part II will have three columns to the page: (1) scientific name; (2) family; (3) vernacular name. The work is based on Herrera's "La sinonimia vulgar y científica de plantas silvestris y de varias que cultivan en México" (*La Naturaleza* II, III, IV, VI, 1873-1884).

**Arellano o palo colorado.** By JESÚS GONZÁLEZ ORTEGA. *México Forestal* 4: 7-8: 84-85, July-Aug. 1926.

The "arellano" (*Caesalpinia platyloba* Wats.) is a small, unarmed tree growing at altitudes of 15 to 1000 feet above sea level in the southwest coast region of Mexico. It is usually less than 25 feet high, with a trunk 8 to 16 inches in diameter which is covered with a smoothish, silver-gray or pearl-gray bark finely pitted from exfoliating particles. The sapwood is of a canary-yellow color and about an inch thick. The heartwood is red; macerated in water, the extract is garnet; in alcohol, it is topaz. The wood has a specific gravity (air-dry) of 1.047, and on account of its strength and resistance to decay is highly esteemed for fence posts, house posts, railway cross-ties, and mine props; also for fuel and charcoal.

**Tecomate, ayele o guaje cirial.** By JESUS GONZÁLEZ ORTEGA. *México Forestal* 4: 9-10: 98-100, Sept.-Oct. 1926.

The "tecomate" (*Crescentia alata* H. B. K.) is a tree oc-

curing in the southwest coast region of Mexico at elevations from sea level to 650 feet. It grows slowly and is usually only 15 to 20 feet high, occasionally up to 35 feet, with a trunk 16 to 32 inches, rarely 40 inches, in diameter that is covered with a smooth or somewhat fissured gray bark. The limbs are stout, sparingly branched, and crooked, giving the tree a highly characteristic appearance. The wood is white throughout, has a specific gravity (air-dry) of 0.713, and is tough, strong, and not likely to split. Its principal uses are for knees and ribs of boats (for which the natural shapes of the limbs are peculiarly fitted), hubs and felloes of wheels, and for saddle trees, firewood, and charcoal.

**British Honduras. Annual report of the Forest Trust for the year ended 31st March, 1926.** By J. N. OLIPHANT. Belize, 1926. Pp. 24;  $7\frac{1}{2}$  x 13.

"Work on the Crown forests proceeded on much the same lines as during the previous year. Exploration and the collection of topographical data were continued and the material gathered is gradually being worked up into regional maps, usually on a scale of one mile to the inch. Towards the close of the year a start was made with the most important exploration project of all—the examination of the practically unknown territory of the Western highlands. At the time of writing a reliable base line has been established between Vaca and the Rio Grande and a good general idea of the forests of this region obtained. The investigation has brought to light the presence of tree species hitherto unknown to occur in the Colony, and types of forest which, though mentioned in the narratives of Fowler and Sapper, have never been closely studied or described."

"Silvicultural operations are now in progress . . . in the Crown forests of five districts of the Colony. . . . The original improvement work at Silk Grass Reserve has settled down on a routine basis, with an 'output' of from 3000 to 4000 improved mahogany seedlings per week."

"The season's work gave useful experience as to the degree of light required for the best development of mahogany seedlings. With too drastic removal of the overhead cover

damage by insects is severe, whereas where the cover is dense the seedlings remain in a condition of stagnation of which the small size and deep green colour of the leaves are symptomatic. An irregularly broken canopy seems to give the best results. The development of the seedlings, to anyone who has studied the work from its inception, is very marked, and a number of them are already well into the sapling stage."

"An examination of unit expenditure during 1925 indicates that the cost of improvement per tree is 19.4 cents and per seedling 6.4 cents, these figures including not only the labour cost, but also the distributed cost of the local overhead.

"While it is too early to draw definite conclusions it would appear that a natural mahogany seedling can, by successive cleanings, be brought up to the sapling stage, after which it will require little or no further attention, at an aggregate cost of not more than 25 cents. If this sum were to accrue at compound interest at 6 per cent over the period of 40 years estimated to be required for the tree to reach marketable size, it would amount to \$2.57. As the present stumpage value is not overstated at \$7 per tree, and as the future stumpage value of mahogany in fully stocked stands will be far greater owing to the greater ease and lower cost of logging in comparison with present methods, the investment, albeit a 'lock-up,' is clearly a very profitable one."

The total value of the forest produce exported in 1925 was \$1,269,488. The timber exports (logs and lumber) were as follows:

Mahogany ( <i>Swietenia macrophylla</i> King)	9,545,426 S. feet.
Banak ( <i>Virola merendonis</i> Pittier)	377,920 " "
Santa Maria ( <i>Calophyllum Calaba</i> Jacq.)	111,716 " "
Yemeri ( <i>Vochysia hondurensis</i> Sprague)	40,274 " "
Pine ( <i>Pinus caribaea</i> Mor.)	137,049 " "
Misc.	2,844 " "
Logwood ( <i>Haematoxylon campechianum</i> L.)	609 tons
Rosewood ( <i>Dalbergia</i> sp.)	248 "

De houtsoorten van Suriname. I. By J. PH. PFEIFFER. Med. No. 23, Koninklijke Vereeniging Koloniaal Instituut, Amsterdam, 1926. Pp. 505; 6¼ x 9; price f 10. Atlas (printed separately); pls. 24, with 96 half-tones.

The first three chapters (100 pages) are concerned with technique and explanations of the anatomical features used in the descriptions and keys. Chapter IV contains a key to the families and another to the principal species, both based upon such characteristics of the woods as can be determined without the use of other apparatus than a sharp knife and a hand lens magnifying 10 diameters. Chapter V (pp. 139-460) is devoted to descriptions of the woods of 31 families. There are brief generalizations of the woods of each family, a key (if there are two or more woods in a family), lists of vernacular names, references, and descriptions which follow a uniform outline and cover general properties, pores, rays, parenchyma, and special features such as gum ducts and ripple marks. The remainder of the publication includes lists of collectors and materials, literature cited, and an index. The atlas contains pictures of the woods, for the most part cross sections under a magnification of 10x. Although the book is intended primarily for the layman rather than the technologist and does not contain a great deal that is new, it is the first publication dealing with the woods of Dutch Guiana as a whole and is cordially welcomed by all interested in that subject.

#### Mechanical properties of Dutch East Indian timbers. By

L. G. DEN BERGER. No. 12, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1926. Pp. 63; 6¼ x 9½; figs. 2; table.

A new and revised edition of an earlier publication in Dutch (now out of print); original data presented in somewhat modified form and amplified by results of new tests. A special chapter dealing with the terminology used in defining the mechanical properties has been added. The tables include results of tests on 53 woods, including two species each of North American spruce and mahogany. The results of some investigations, which are to be published separately, indicate that the elastic limit in bending may in certain timbers far exceed the proportional one.

There are strong indications that "teakwood with an average width of annual rings of 1-5 mm., which represents

a normal growth, possesses the greatest specific gravity and the best mechanical properties and that these properties are most unfavorable in slowly grown wood, which shows an average width of annual ring of less than 1 mm."

In the wood of "rengas," *Gluta Rbengas* L., "the proportional and ultimate bending strength and the shearing strength in radial as well as in tangential direction are considerably lower for the air-dry than for the green wood. Perhaps these anomalies may be explained by the anatomical structure of this wood, in which layers of light-colored, rather thin-walled fiber tissue alternate with darker-colored layers of thick-walled fibers. These zones probably show differences in shrinking properties and consequently the cohesion between these layers must loosen gradually. In air-dry condition this wood, which otherwise is beautiful and durable, is apt to split off in large parts for a comparatively insignificant impact; the split takes place along the border of the lighter- and darker-colored zones."

**Houtsoorten der cultuurgebieden van Java en van Sumatra's Oostkust.** By L. G. DEN BERGER. No. 13, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1926. Pp. 186; 7 x 10½. With Platenatlas (printed separately); pls. 31, with 124 half-tones.

Contains descriptions, according to a definite outline, of 124 woods, representing 53 families. There are lists of vernacular names, information regarding the properties and uses of the timbers, and a key for identification. The photographs in the "platenatlas" showing the cross sections of the woods under a magnification of 10 diameters are very clear and add greatly to the value of this important work.

**Swietenia Mahagoni Jacq. en Swietenia macrophylla King.** By A. C. NOLTÉE. No. 15, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1926. Pp. 125; 7 x 10½; 30 half-tone plates.

This publication begins with a general account of the different species of *Swietenia*—history, distribution, names, exploitation, etc., followed by some notes on the introduction

of two species into British India. The main portion of the book is with reference to experience with the two species of mahogany in the Dutch East Indies, but the information is of much wider application. Mahogany is cultivated at present in nearly all forest districts in Java, mostly in the plains, but sometimes at higher elevations up to about 1000 meters above sea level, and also on some private estates and along streets and occasionally country roads.

The best way to collect the seeds is to gather the fruits after they have fallen to the ground. The viability of ripe, fresh seeds is high and the germinating power is preserved for a considerable time in storage. In the teak forest region mahogany is one of the most useful trees for cultivation on soils too poor for satisfactory growth of teak. Fire is very dangerous to young plantations. The most serious insect pest is the top-borer, *Hypsipyla robusta* Moore, which retards the growth of the trees and makes them crooked. The present method of avoiding heavy attacks is to grow mahogany in mixture with other trees which provide shelter. These borers also attack the seeds. The pinhole borers of twigs and seedlings are species of *Xyleborus*. *Swietenia macrophylla* seems to exceed *S. Mahagoni* in resistance to insects and is also less branchy. The woods of the two kinds, when grown in Java, show only small differences.

**Onderzoek naar bruikbare kenmerken ter identificate van boomen naar hun bast.** By A. THORENBAAR. Wageningen, Holland, 1926. Pp. 207; 7¼ x 10¾. Platenatlas (printed separately), with 60 half-tones.

A dissertation dealing with the anatomy of bark in general and with the barks of 60 Javanese tree species in particular, together with a key to the identification of the latter. The separate "platenatlas" contains photographs of sections of the barks under a magnification of 10x.

**The forest resources of the Territories of Papua and New Guinea.** By C. E. LANE-POOLE. Commonwealth Report, Victoria, 1925. Pp. 209; 8 x 13; 23 plates; 7 maps. Price 7s. 6d.

An interesting detailed account of investigations of representative portions of the two Territories which comprise the western half of the island of New Guinea. There is no botanical boundary between the two countries and the forests are so much alike that, while the descriptions are recorded separately, the technical descriptions of the species met with in both countries are combined.

"Australia's tropical dependencies, while offering no prospects of immediate gain to large saw-milling interests, possess forest potentialities of a high order. The range of forest regions extends from the mangrove swamp at sea level through the rain forests of the lowlands on to the oak of the hills and the pine forests of the mountains. It is nature's very abundance that has made the forests of these Territories unprofitable. Less species and some pure strands are what are wanted and here is where the forester can assist nature. In that splendid growing climate there is no reason why Australia should not establish forests to supply a large part of her timber requirements."

**Notes on the principal indigenous timbers of the natural order Saxifrageae.** By M. B. WELCH. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 59: 276-292, April 1926. Nine photomicrographs.

In the eastern states of Australia, more particularly New South Wales and Queensland, the following genera are of commercial interest: *Quintinia*, *Polyosma*, *Callicoma*, *Ceratopetalum*, *Schizomeria*, *Ackama*, *Weinmannia*, and *Geissois*. The paper contains detailed descriptions of the woods of nine species and concludes with a key to their identification.

1. **Opossum Wood, Corkwood, Pink Alder** (*Quintinia Seiberi* A. DC.). Medium-sized tree; wood pinkish brown to reddish brown, weight 32 lbs. per cu. ft., texture fine, without distinctive figure. Easily worked and suitable for interior joinery such as moldings and linings; not usually available in large quantity.

2. **Feather Wood** (*Polyosma Cunninghamsii* Benn.). Medium-sized tree; wood pale yellowish, weight 43 lbs. per cu. ft., fine-textured, with distinct rays on quarter-sawn material.

Used for interior joinery, cabinet work, handles, turnery, etc. Rarely seen on Sydney market.

3. **Black Wattle, Coach Wood, Butterwood** (*Callicoma serratifolia* Andr.). Usually small or medium-sized tree, though attaining large dimensions in northern rain forests; wood pale to pinkish brown, weight 40 lbs. per cu. ft., fine-textured, roe-grained. Suitable for brush stocks, small tool handles, turnery, and interior joinery; rarely seen on the market.

4. **Coachwood, Leather Jacket, Lightwood** (*Ceratopetalum apetalum* D. Don). Large tree; wood pale brown to pinkish brown, with darker striping of parenchyma, coumarin-scented, weight 40 lbs. per cu. ft., fine-textured, tough and strong, resistant to powder-post beetle. Used for furniture and cabinet work, motor-body work, coach and carriage building, railway-car construction, broom and other light handles, brush-backs, broom stocks, machine-framing, etc.

5. **Crab Apple, White Cherry, Whitewood, Humbug** (*Schizomeria ovata* D. Don). Very large tree; wood pale to pinkish brown, weight 37 lbs. per cu. ft., fine-textured, without distinctive figure; subject to powder-post injury. Suitable for case material, toys, small turned articles, and, if paraffined, for butter boxes. Should not be used for joinery and carpentry work without antiseptic treatment.

6. **Corkwood, Brown Alder, Sugar Bark, Pencil Cedar** (*Ackama Muellieri* Benth.). Large tree; wood pinkish brown to reddish brown, weight 38 lbs. per cu. ft., fine-textured, without distinctive figure, requires care in seasoning. Suitable for joinery, flooring, moldings, carving, brush stocks, boot heels, etc.

7. **Brown Alder, Pencil Cedar** (*Ackama quadrivalvis* C. T. White). Large tree; wood pinkish brown to reddish brown, weight 39 lbs. per cu. ft., moderately fine-textured, without distinctive figure. Uses similar to preceding.

8. **Mararie, Marara** (*Weinmannia lachnocarpa* F. v. M.). Large tree; wood pinkish to pinkish brown, weight 54 lbs. per cu. ft., hard, very fine-textured, without distinctive figure. Has been used for heavy coach and carriage construction, general building purposes, mallets, chisel handles, golf-club heads, machinery bearings, etc.

9. **Red Carrabeen** (*Geissois Benthami* F. v. M.). Large tree; wood pinkish to pinkish brown, weight 36 to 40 lbs. per cu. ft., fine-textured, moderately soft, without distinctive figure. Used for general building purposes, furniture and cabinet work, turnery, etc., often as a substitute for Queensland Maple (*Flindersia Chatawaiana* Bail.).

Taken as a whole the woods are without pronounced coloration and figure, the texture fine and uniform, the rays usually distinct. Vessel perforations were found to be simple in *Ceratopetalum*, *Schizomeria*, *Weinmannia*, and *Geissois*; scalariform in *Quintinia*, *Polyosma*, and *Callicoma*; either or both together in *Ackama*. Wood parenchyma varies from diffuse and paratracheal to prominent tangential bands. Both uniseriate and multiseriate rays occur in all species examined, they are heterogeneous, and the pits into the vessels are in several instances scalariform. The fibers have rather inconspicuous bordered pits.

#### A further contribution to the knowledge of the silky oaks.

By M. B. WELCH. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 58: 255-267, Feb. 1925. Six photomicrographs.

The woods of the following species of Dilleniaceae are described in detail: *Carnarvonia araliaefolia* F. v. M. ("Ather-ton red oak"), *Grevillea gibbosa* R. Br. ("rose oak"), *Darlingia spectatissima* F. v. M. ("brown oak"), *Musgravea stenostachya* F. v. M. ("brown oak"), and *Stenocarpus sinuatus* Endl. ("white silky oak" or "fire-tree"). There are also shorter descriptions of five others, namely, *Grevillea robusta* A. Cunn., *G. Hilliana* F. v. M., *Embotrium Wickami* F. v. M., *Cardwellia sublimis* F. v. M., and *Orites excelsa* R. Br. (For detailed descriptions of the last five see R. T. BAKER: On the technology and anatomy of some silky oak timbers. *Journ. & Proc. Royal Soc. N. S. W.* 52: 362-376, 1918.)

The woods are characterized by conspicuous oak-like rays, and exhibit considerable variation in colour and in density. The pores have a typical tangential arrangement and the parenchyma is in curved tangential lines or bands between the large rays, the concave side being outward. (In *Embotrium Wickami*, however, the pores are large, single, or in small

groups, and the parenchyma is not in tangential bands.) The vessel perforations are exclusively simple, the rays are heterogeneous, and the wood fibers have bordered pits. The paper concludes with a key based chiefly on macroscopic characters seen on cross section.

#### The useful trees of Northern Nigeria. By H. V. LELY.

London, 1925. Pp. 128; 8½ x 10½; price 10s.

"The text and plates of this volume have been prepared with the primary object of identification of the trees of the savannah forests of Northern Nigeria. . . . Some 30 families are represented by the 120 species included, in one of which [Leguminosae] there are as many as 36 species. . . . The text is arranged in paragraphs, the first giving a general description of the form, height, girth, locality, etc., successive paragraphs describing in detail the bark and slash, thorns, wood, leaves, flowers, fruits and seeds, with a few notes on uses where these are known. These paragraphs are in uniform order for rapid reference. The text is supplemented by drawing of the flower, leaf, thorn, fruit, and seed, sketched from the living specimens." The publication concludes with an index to the native (Hausa) names.

#### Timbers from the Gold Coast. I. *Bulletin of the Imperial Institute* (London) 24: 3: 417-443, November 1926.

This is the first installment of a report of a systematic investigation of about 30 of the more important woods of the Gold Coast. The specimens are from the collection displayed at the British Empire Exhibition. The report includes descriptions of the woods, full mechanical test data, and results of working tests.

1. **Subaha** (*Mitragyna macrophylla* Hiern.).—A medium-sized tree fairly common in fresh-water swamps. Wood brownish yellow, soft, fairly light (wt. 36 lbs. per cu. ft.), works easily with all machine and hand tools, but lacks character and does not readily finish to a fine surface.

2. **Attabini** or **Niankuma** (*Tarrietia utilis* Sprague).—Wood reddish brown, soft, fairly light (wt. 35 lbs. per cu. ft.), coarse-textured, easy to work, finishes fairly well. Quarter-



sawn material has an attractive figure. Appears identical with a timber exported from the Ivory Coast under the name of Nyankon and sold as African Mahogany.

3. **Baku** (*Mimusops* sp.).—One of the largest trees of the Gold Coast. Wood reddish brown, of plain appearance, rather hard, moderately heavy (wt. 44 lbs. per cu. ft.), works fairly easily, finishes well, and is strong. Considered suitable for construction of motor bodies, frames and interior work of furniture.

4. **Kaku** or **Ironwood** (*Lophora procera* A. Chev.).—Wood reddish brown, of ornamental appearance, coarse-textured, very heavy (wt. 68.5 lbs. per cu. ft.), very hard and strong, requires care in seasoning. Same kind of timber exported from Nigeria under the names of West African Ironwood, Red Ironwood, African Oak, and Ekki. Chiefly valuable for heavy and durable construction.

5. **Odum** (*Chlorophora excelsa* B. & H.).—One of the largest and most valuable timber trees of the Gold Coast. Wood greenish brown, of good appearance, coarse-textured, moderately heavy (wt. 38.5 lbs. per cu. ft.), finishes fairly well, resistant to decay and attacks of white ants. Suitable for furniture, motor bodies, joinery and construction work of all kinds. Timber of same species exported from Nigeria under the names of African Teak or Iroko.

6. **Penkwa** or **African Cedar** (*Entandropbragma* spp.).—Trees reach large size, but are not very common. Wood pinkish brown, somewhat figured, rather coarse-textured, of moderate density (wt. 42 lbs. per cu. ft.), easily worked, finishes well. Suitable for less expensive furniture and interior work of better grades.

7. **Konkruma** (?*Morinda citrifolia* L.).—Wood brown, of ornamental appearance, moderately hard, of medium density (wt. 41 lbs. per cu. ft.), works easily, requires care in finishing. Suitable for furniture and cabinet work.

**East African pencil cedar.** By H. M. GARDNER. *Empire Forestry Journal* 5: 1: 39-53, 1926.

East African cedar (*Juniperus procera* Hoch.) is "the only

genuine pencil cedar in the world of which any considerable stocks remain." Its wood is almost identical in appearance and qualities with that of the American junipers. Mechanical tests show the following results: Weight per cu. ft., 39 lbs.; modulus of rupture, 4800 lbs. per sq. in.; crushing strength, 6900 lbs. per sq. in.; shearing stress, 440 lbs. per sq. in.; splitting stress, 31 lbs. per sq. in.

The area of exploitable cedar forest in the surveyed regions is roughly estimated at 325,000 acres. This forest varies from practically pure stands to mixtures in which cedar amounts to not more than 15 per cent. The average yield over the entire area has not been determined, but such measurements as have been made show a range from 1346 to 11,460 cu. ft. per acre. "Many old trees appear to be quite cylindrical or with a very slight taper, the diameter being 3 ft.-4 ft. and the length of clean bole being 50 ft. or 60 ft. In favorable localities the length of bole may be 100 ft. and the total height 130 ft. or more."

The cedar suffers almost universally from two serious defects—heart rot and ingrowing bark. "In some forests the proportion of unsound trees reaches fully 99 per cent, but there are a few favored localities where the cedar is exceptionally sound, as few as 20 per cent or less being affected." The soundest timber is usually found in the wetter districts. Trees are seldom completely hollow, but the heartwood is eaten out in pockets by a fungus (*Fomes juniperinus*). "Many cedars ravaged with heart rot and badly corrugated by ingrowing bark can by judicious splitting before sawing be made to yield many gross of first-class pencil slats." The former difficulties of utilizing this timber are in the way of being largely overcome.

**Union of South Africa. Report of the forest department for the year ended 31st March, 1925.** By C. E. LEGAT. Pretoria, 1926. Pp. 30; 6 x 9.

The total area of plantations now under the care of the department is 123,305 acres, of which 28,572 belong to the Railway Administration. The total value of major and minor produce from all forest reserves for the year was £112,654,

including gratis issues amounting to £10,220. The forestry expenditure was £384,667, including £30,027 for railway plantations.

The imports of lumber and wood manufactures were valued at £2,583,874. The exports were 1,057 tons of "kamassi" (*Gonioma Kamassi* E. Mey.) valued at £5,315; 194 tons of Cape boxwood (*Buxella Mac-Owanii* Van Tiegh.), £945; manufactured wooden goods, £4,500; 2,098 cu. ft. of misc. wood; 101,825 tons of wattle bark, £583,972, and 17,046 tons of wattle bark extract, £256,800.

"Good progress is to be recorded in research work in connection with the seasoning, preservation, and testing of timber. As the value of the method of seasoning timber in kilns is becoming better known, it is being more widely adopted by commercial firms throughout the country, who are either installing new plants or are modifying old designs to bring them up to date and make them more efficient. In timber preservation there is a very wide field for increasing the value and uses of wood, and the department, during the year, has initiated many service tests that in time should throw much light on the numerous problems connected with the subject."

**Bibliography of the woods of the world (exclusive of the temperate region of North America) with emphasis on tropical woods.** A revision and extension by GEORGE P. AHERN and HELEN K. NEWTON of a bibliography compiled in 1923 and 1924 by SAMUEL J. RECORD. Washington, D. C., Nov. 1926. Mimeographed. Pp. 121 plus 6 pp. index; 8½ x 11. Price \$1.50, postpaid.

This bibliography follows the same scheme of classification as the original, but the references have increased in number from 758 to 1341. All titles not in English are translated. The work was done by the Tropical Plant Research Foundation primarily for the Main Research Committee of the American Society of Mechanical Engineers, but is of great value to all interested in the field covered. Copies are for sale by the Foundation, 1350 B Street, S. W., Washington, D. C.

*L. Chubb*

M. M. CHATTAWBY. Price 50 cents

Yale University

School of Forestry

# TROPICAL WOODS

NUMBER 10

JUNE 1, 1927

## CONTENTS

	<i>Page</i>
The Editor Again Visits Central America	1
New or Otherwise Interesting Trees and Shrubs Collected in Guatemala and Honduras in 1927 by Samuel J. Record and Henry Kuylen	4
<i>By</i> PAUL C. STANDLEY	
The Pine Forests of Honduras	8
<i>By</i> WILLIAM D. DURLAND	
Trees of Honduras	10
<i>By</i> SAMUEL J. RECORD	
New Trees Collected in Panama by George P. Cooper and George M. Slater	47
<i>By</i> PAUL C. STANDLEY	
Walnut in Amazonas	51
<i>By</i> GEORGES H. BARREL	
Note on the Identity of the Chinese "Pau-Hoi"	53
<i>By</i> RYOZO KANEHIRA	
Current Literature	55

The publication of  
this journal is made possible  
by a gift to Yale University from the  
UNITED FRUIT COMPANY

Yale University

School of Forestry

## TROPICAL WOODS

NUMBER 10

June 1, 1927

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

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

*Subscription price One Dollar per year of four numbers. Copies of this issue 50 cents each.*

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

### THE EDITOR AGAIN VISITS CENTRAL AMERICA

The editor's second visit to Central America was in continuation of the one of last year to British Honduras and Guatemala. Beginning at Puerto Barrios it extended to Guatlán at the edge of the desert in Guatemala, and from Cuyamel overland to Black River in Honduras.

The detailed plans for the trip were made by Mr. Henry Kuylen, Superintendent, Los Andes District, United Fruit Company, and he was the editor's companion throughout. Mr. Kuylen's name is well known to the readers of this journal as he has made valuable contributions to the knowledge of the forest flora of eastern Guatemala. His wide acquaintance, his familiarity with local conditions and means of transportation, and his ability to distinguish readily the various kinds of trees all made for rapid progress of our work.

The first new station for collecting in Guatemala was at

Finca Santa Inés, where exceptional facilities were afforded by the proprietor, Mr. Carlos Galusser, Jr. Thirty trees, nearly all unfamiliar or rare kinds, were collected. Mr. Galusser accompanied us to Gualán where we were joined by Mr. Alberto Viau, who has very extensive holdings in that vicinity. Specimens from over 30 kinds of trees were obtained. (A report on the trees and forests of the Santa Inés-Gualán region, which marks the transition from the wet lands to the desert, is in preparation.)

The work in Honduras was greatly facilitated by the Honorable Luis Bográn, Minister of Honduras (in Washington), who gave the editor an official certificate which enlisted the cordial coöperation of the civil and military authorities of the country. Entrance was made at Puerto Cortés, and the manager of the Cuyamel Fruit Company arranged for the accommodation of the party while within their concession. The first station was at Cuyamel and excursions were made in all directions from that point under the personal guidance of Supt. A. J. McKinnon and Dr. R. Bográn.

From Puerto Cortés the trip was made by special motor on the National Railway of Honduras to San Pedro Sula, thence over the lines of the Cortés Development Company to La Lima, where, with Supt. McLeause (of the Cuyamel Fruit Co.) as guide, excellent opportunity was afforded to see the natural vegetation and also the extensive areas in bananas and sugar cane.

The second station was at Progreso where the local facilities of the Tela Railroad Company were made available through the courtesy of Supt. E. M. Cobb, Asst. Supt. Watson, and Supt. of Agriculture E. A. Ames. Nineteen trees were found which we had not collected elsewhere. The trip to Tela included a stop at Guaymas to see the clearings being made in the virgin forest there under direction of Supt. H. F. Sharp. While in Tela the editor had the privilege of addressing the Ulua Society (members of the Research Department), and of seeing some of the beautiful furniture and other woodwork made from native timbers in the Company's shops. Through the courtesy of General Manager Goodell, of the Tela and the

Truxillo Railroad Companies, arrangements were made for our transportation from Jilamo Junction to the end of the line near Descombro as guests of the Standard Fruit and Steamship Co. The latter company is opening up one of the finest stands of mahogany in Central America.

At Descombro we were met by Asst. Supt. Vernon, of the Maloa District, Truxillo Railroad Company, and the trip from the point of rails to Savá, a short distance beyond the Aguan River, was made with saddle and pack mules. Rail-motor transportation was afforded to the home of Supt. H. S. Bailey, at Maloa. Excursions by motor, by mule, and afoot were made in that locality, including the dry region about Olanchito. We collected 20 unfamiliar trees, three of which have proved to be new to science.

From Maloa to Corocito, Black River, and intermediate points we had at our disposal the commodious motor car of Mr. Walter E. Brown, Manager of the Truxillo Railroad Company, and this was used to good advantage for collecting along the right of way. Mr. Brown and Mr. F. J. Aycock, Asst. Supt. of Agriculture, were unsparing in their efforts to promote our investigations. In the Black River District our forest excursions were under the guidance of Supt. R. V. Waterhouse, and included a trip by launch around Bakalar Lagoon. Our stay in Honduras concluded with a visit to the old town of Truxillo, after which we sailed from Puerto Castilla for Puerto Barrios. The last week was spent in the vicinity of Entre Ríos, Guatemala.

As a result of this second trip to Central America much first-hand information has been secured regarding the forest resources of two important Central American Republics. The tropical wood collections in Yale University, now containing 10,250 catalogued specimens, have been enriched by the addition of 152 new specimens (nearly all with fertile botanical material), representing 46 natural families, 104 genera, and 134 species. The editor takes this opportunity to express his gratitude to all those who in one way or another contributed so generously toward making his visit pleasant and successful.

NEW OR OTHERWISE INTERESTING TREES  
AND SHRUBS COLLECTED IN GUATEMALA  
AND HONDURAS IN 1927 BY SAMUEL J.  
RECORD AND HENRY KUYLEN

By PAUL C. STANDLEY<sup>1</sup>

The rich forest flora of the Atlantic coast of Central America has received so little attention from collectors that even a small collection of the trees is almost certain to reveal a few novelties and extensions of range. The important collection of timber trees made along the coast of Guatemala and Honduras by Prof. Record and Mr. Kuylen during the past winter has proved to be of exceptional interest. It includes as new at least the two species described below, and probably one or two others, which I have not been willing to describe at present because they belong to difficult groups which need critical revision before any additional new species are proposed. Several of the species collected establish notable extensions of range, one being a South American species new to the North American flora, another a South American genus unknown previously from the North American continent.

The Honduran trees, which are listed elsewhere, are of special interest. Little is known of the botanical features of Honduras, and every collection from that country furnishes additions to the recorded flora.

*Coccoloba Browniana* Standl., sp. nov.

Medium-sized tree, the branchlets stout, terete, brown, glabrous, bearing few small elevated lenticels; ultimate branchlets often short and spurlike, annulate toward the base; ocreae sheathing, glabrous, deciduous, the tube 5-6 mm. long, the free blade-like apical portion ovate, obtuse, 3-4 mm. long; petioles slender, terete, glabrous, 12-20 mm. long; leaf blades suborbicular to orbicular-ovate, 5.5-9 cm. long, 4.5-8 cm. wide, rounded at apex and abruptly and shortly obtuse-acuminate, the acumen broadly triangular, at base shallowly cordate, with broad open sinus, papyraceous, glabrous, deep green above, slightly paler beneath, the larger nerves scarcely elevated above, prominent beneath, the lateral nerves 5 or 6 on each side, very slender, ascending, slightly arcuate, obscurely anastomosing toward the margin, the

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

ultimate nerves forming on both surfaces a fine close prominulous reticulation, this visible only under a lens; fruiting racemes lateral, hard and ligneous, stiff, 2 cm. long, borne on a peduncle about 8 mm. long, the flowers few (about 15), the rachis densely covered with elevated lenticels; pedicels very stout and thick, 5 mm. long, divaricate, glabrous; calyx tube accrescent and enclosing the fruit; fruit subglobose, 1.5 cm. long and nearly as broad, smooth, glabrous; nut subglobose, 1-1.2 cm. long.

Type in the U. S. National Herbarium, No. 1,269,755, collected in the dry region of Olanchito, Honduras, February 14, 1927, by Samuel J. Record & Henry Kuylen (No. H.54; Yale No. 10,000). The vernacular name is "tolondrón."

This is an unusually well-marked *Coccoloba*, easily recognized among the Central American species by its broad cordate leaves, short racemes, and very large fruit.

At Prof. Record's request, this tree is named for Mr. Walter E. Brown, Manager of the Truxillo Railroad Company.

*Coccoloba Tuerckheimii* Donn. Smith

The type of this species was collected at Cubilquitz, Alta Verapaz, Guatemala. A second collection has been obtained at Finca Santa Inés, Guatemala, by Record & Kuylen (No. G.92; Yale No. 10,043). The vernacular name is reported as "irayol de montaña." The name "irayol" is applied commonly in many parts of Central America to species of the Rubiaceae genus *Genipa*.

*Ruprechtia Deamii* Robinson

Of this species *R. Kellermanii* Donn. Smith, described from the same region, is evidently a synonym. The species has been re-collected by Record & Kuylen (Nos. G.103 and 113; Yale Nos. 10,054 and 10,064, resp.) at the type locality, Gualán, Guatemala. The local names are "carreto" and "sangre de toro." It is interesting to note that the latter name is applied to an undescribed species of the same genus collected recently in the State of Guerrero, Mexico.

*Abutilon Chittendenii* Standl., sp. nov.

Small or medium-sized tree, the branchlets brownish or grayish, rimose, glabrate, the youngest branchlets stout, densely stellate-tomentose with fulvous, rather coarse hairs, the internodes short; petioles slender, 1-4 cm. long, densely stellate-tomentose; leaf blades ovate-orbicular, sometimes

broader than long, 7-12.5 cm. long, 5-8.5 cm. wide, abruptly long-acuminate, the acumination narrow, attenuate, obtuse, at base shallowly or deeply cordate, the basal lobes broadly rounded, entire or nearly so, thin, above green, minutely stellate-pubescent, the pubescence sparse, rather soft to the touch, beneath slightly paler, more densely stellate-pubescent, the pubescence grayish or fulvous, the blades 7-nerved at base; flowers axillary, solitary or fasciculate, the pedicels 8-13 mm. long, jointed near the apex, densely stellate-tomentose with brownish pubescence, ascending; calyx campanulate, terete, about 12 mm. long, densely stellate-tomentose with brownish pubescence, deeply 5-lobate, the lobes ovate-triangular, attenuate to a slender subulate apex; corolla bright yellow, glabrous, the petals orbicular-obovate, broadly rounded at apex, 3.5 cm. long.

Type in the U. S. National Herbarium, No. 1,269,756, collected in the dry region of Olanchito, Honduras, February 14, 1927, by Samuel J. Record & Henry Kuylen (No. H.63; Yale No. 10,009). Here may be referred also Pittier 1823, collected between Jocotán and Jumusna, Department of Zacapa, Guatemala, at 600 meters, January, 1907.

The present *Abutilon* is related to *A. Peyritschii* Standl., of Veracruz. The latter differs in the nodding flowers, borne on very long pedicels, and in having much more deeply cordate leaves. The Central American species must be a handsome tree when in full flower, for the flowers are very large and brightly colored.

In accordance with Prof. Record's suggestion, I am glad to name this species for Mr. George P. Chittenden, Vice-president of the United Fruit Company, who, by his continued interest, has aided very materially in the assembling of information regarding the forest flora of Central America.

#### *Grislea secunda* Loefl.

This genus of Lythraceae consists of a single species, a shrub or small tree with brown-punctate leaves and axillary clusters of small purple-red flowers. The plant has been known hitherto only from Venezuela and Colombia. A new generic record for North America is established by specimens of *Grislea secunda* collected in the Aguán Valley, Honduras, by Record & Kuylen, February 12, 1927. The Honduran vernacular name is "coloradillo."

#### *Tococa guianensis* Aubl.

Although two endemic species of *Tococa* (Melastomaceae)

have been described from Central America, the South American *T. guianensis* seems not to have been reported from the region. It was collected by Record & Kuylen at Entre Ríos, Guatemala, February 23, 1927, and has been found also in Panama.

#### *Diospyros ebenaster* Retz

*Diospyros ebenaster*, one of the ebonies or persimmons, has been supposed by some writers to be introduced in Mexico, where it is often cultivated for its unattractive fruit, called "zapote negro." It is grown also in the Philippines, to which it is said to have been carried from Mexico. I have seen the tree in cultivation in Salvador, and in 1926 found it apparently wild in dry forest at Tilarán, Guanacaste, Costa Rica. Lumbermen at the latter place were not familiar with the tree, but expressed interest when informed that its wood was one of the ebonies. The same species has now been found in forest at Finca Santa Inés, Guatemala, by Record & Kuylen (No. G.77; Yale No. 10,028), and it seems to be established definitely as a native Central American tree. Probably it is indigenous also in Mexico. It is a species very distinct from all the other American persimmons.

#### *Rondeletia Deamii* (Donn. Smith) Standl.

Described from Guatemala and occurring also in Salvador, this species may be recorded from Olanchito, Honduras, where it is called "candelillo." Collected by Record & Kuylen (No. H.57; Yale No. 10,003), February 14, 1927.

#### Large Radial Canals in *Couma*

To the list of woods in the Apocynaceae having large radial canals (*Tropical Woods* 4: 19) should be added that of *Couma guatemalensis* Standley. These were observed for the first time in a specimen collected last January by Record & Kuylen near Entre Ríos, Guatemala. They are of the type of *Alstonia* and are few and scattering. No latex tubes have been observed.

## THE PINE FORESTS OF HONDURAS

By WILLIAM D. DURLAND

*In charge of the New Orleans office of James D. Lacey & Co.*

Honduras is hilly and mountainous. The character and composition of the forests vary with changes in altitude, rainfall, and soil conditions. From sea level to about 1500 feet is found what is commonly termed the "hot zone" belt, including, for the most part, the littoral and the hardwood types. An exception to this is the pine ridge area located in the Department of Mosquitia. The Republic has but a short frontage along the Pacific Coast, and, due to the limited rainfall of that region, in contrast to that of the Caribbean side, the forests there are much less extensive.

As is the case with most, if not all, Central American countries, the forests near the coast and along the rivers have been exploited for the useful and more valuable tree species and forest products, such as mahogany, cedar, rubber, and dyewoods. Beyond a point of immediate and convenient accessibility, however, they remain in practically a virgin condition.

Above 1500 feet and extending to an elevation of some 5700 feet, more or less, is located the "temperate zone" belt, which, as its name indicates, has a cooler climate than the "hot zone" belt of the lowlands; hence a greater diversity in forest composition. Pine is the principal tree species of this region, occurring in mixture with hardwoods at the lower elevations and gradually emerging into practically pure stands as the higher slopes and elevations are attained.

Although the proper botanical classification of these pines appears to be in doubt, two kinds are in prominence, namely, "pino ocote" and "pino veta." The former occurs below 2500 feet in elevation, while the latter is, for the most part, higher up. Both are rich in gum resin and give indications of good turpentine possibilities.

The northern pine belt is about 50 miles inland from the coast and is composed of open, park-like stands on the slopes of the hills and mountains, and on the ridges and plateaus. This forest extends southward and eastward, reaching the coast at Cape Gracias in the southeastern part of the Repub-

lic. Hardwoods often are in association with the pine, but in all cases pine is the dominant tree. An undergrowth of herbaceous and grassy vegetation is plentiful and even dense in some places, and scanty or lacking entirely in others. No regularity was observed in the volume of the stand; 2000 to 10,000 board feet per acre being representative, though some acres will tally more and some less. The size of the trees is also variable. On the lower elevations 14 to 18 in. diameters and one or two 16 ft. logs per tree are representative, while on the higher elevations the diameters increase to 30 and 34 in. or more, with three or more 16 ft. logs per tree.

At the heads of the draws, in the gully bottoms and stream beds where there is an accumulation of fertile top soil washed down from the higher slopes, patches of hardwoods grow to the exclusion of pine. The soil on which the pine grows is for the most part a red subsoil or laterite located on the exposed ridges and slopes. With increase in elevation above 1500 feet the hardwood patches become fewer, and above 2500 feet the pine is permitted to occupy more fertile sites than at lower altitudes within the particular type location.

The Honduras pine area is a portion of a forest extending from British Honduras through Guatemala into Nicaragua. It is interesting, therefore, to note the results of tests on a shipment of logs from Bragman's Bluff, Nicaragua. These logs, containing 100,000 board feet of lumber, were sawed in a mill on the Gulf Coast in the United States. The various merchants to whom the product was shipped state that the lumber has the general properties of southern longleaf pine, is of satisfactory quality, and readily salable. In the writer's opinion, the Honduras pine closely approaches longleaf pine in density and texture. The wood of "pino ocote" seems to contain more pitch than that of the "pino veta."

From what the writer saw on a reconnaissance trip last winter he believes that there are several billion board feet of pine timber which can be successfully logged, if the work is properly organized and the right methods are used. No attempt has yet been made to exploit these pine forests on an extensive scale, but the interest in them now being shown by American lumbermen gives promise of a considerable development of the lumber industry in Honduras in the near future.



## TREES OF HONDURAS

By SAMUEL J. RECORD

The Republic of Honduras, Central America, has a total area of approximately 46,000 square miles (including some disputed territory) and a population of less than 700,000. The interior tableland, attaining in places an elevation of 6000 feet above the sea, slopes abruptly toward the Gulf of Fonseca on the Pacific side and more gradually to the northern expanse of coast along the Caribbean Sea.

The north coast is wet, the interior tableland is dry part of the year or semi-arid, and the limited west coast region is low and hot. There is a corresponding variation in the vegetation. In the north coastal lowlands and valleys one finds the general type of mixed hardwood forest common to British Honduras and eastern Guatemala. There is much arable land now being utilized for growing bananas and, to less extent, sugar cane and other crops; in portions of the region irrigation is necessary during the dry season. In clearing the land nearly all of the timber is destroyed, most of the construction lumber being imported from the United States. The only timber now being exported in any quantity is mahogany.

The woods used locally are not very numerous and the amounts consumed are not very great. Chief among them are "paleta" and "chichipate" for fence posts, railway ties, and other durable purposes; "laurel" for bridge planking, largely because of the ease of splitting large logs; mahogany, rosewood, "hormigo," and "ciruelillo" for best quality furniture; pine, "San Juan," "Santa María," "cedro," and a few others for house construction. Many kinds, now wasted, could be used to advantage if their properties were better understood or if provision were made for their preservative treatment.

Pine occurs, for the most part, in the interior uplands, and over great stretches the stands are open and park-like, with hardwoods in the ravines and better-watered coves. Fires are of common occurrence during the dry months. The pine has not been extensively exploited and remains about the only timber in quantity of much commercial promise. There are many trees in the interior with beautiful woods, but they are

too scattered and difficult of access to be of more than local value.

Very little has been written about the forest flora of Honduras and the descriptions of the trees in the following pages have been prepared almost entirely from first-hand information. There are in the Yale collections over 300 specimens of wood obtained from all parts of the Republic for an exhibit at the Pan American Exposition in Buffalo, N. Y., in 1901. The author has studied these woods from time to time over a period of several years, and many identifications have been possible through the accessions of authentic material from other parts of Central America and the West Indies.

The first scientific collection of woods was made by Dr. H. N. Whitford, then Assistant Professor of Tropical Forestry in Yale University, and Mr. L. R. Stadtmiller (M.F. Yale 1911), who accompanied the Economic Survey Mission sent out in the spring of 1919 by the U. S. Department of State for the purpose of making a survey of the economic resources of the region in eastern Honduras and Guatemala lying between the Chamelecón and Motagua Rivers. The determinations of botanical specimens were made by Dr. S. F. Blake, of the U. S. Department of Agriculture.

During the past winter the author, accompanied by Mr. Henry Kuylen, made a collecting trip overland from the Guatemala border to Black River. Notes were made regarding the occurrence of the known species, and botanical and wood samples secured of 75 other kinds. Identifications were made at the U. S. National Herbarium by Dr. Paul C. Standley, assisted in some instances by Dr. J. N. Rose and Dr. S. F. Blake.

The author is indebted to Mr. P. H. Meyers, of the Cuyamel Fruit Company, and Mr. W. D. Durland (M.F. Yale 1922), of James D. Lacey & Co., for numerous wood specimens, and to Mr. Luis Landa, of Tegucigalpa, who, through the courtesy of Mr. Geo. P. Shaw, American Consul, was interested in the work of correcting and elaborating the original draft of the check list. Special mention should also be made of the splendid set of wood samples supplied by Dr. Salvador Calderón, Laboratorio de Agricultura, El Salvador, which has been of

great assistance in comparative study of the trees common to the two Republics.

It is hoped that this work will prove helpful to all who would become better acquainted with the trees of the Republic and that its publication will serve to bring to light much additional information. The descriptions of the trees are in non-technical language and are intended to help in applying the native names to particular trees, since very often such names are rather loosely used and vary in different localities. The report should be read in connection with the one entitled, "Trees of the Lower Río Motagua Valley, Guatemala" (*Tropical Woods* 7: 10-29, March 1, 1926), since all of the species mentioned there probably occur also in Honduras and may be known locally by the same native names. All of the important woods are described in detail in the author's book<sup>1</sup> and the rarer kinds will be reported upon later.

#### ACTINIDIACEAE

*Sarauia villosa* DC. "Sapocillo" or "zapotillo." Medium-sized tree, with large leaves (6" to 14" long and 2" to 4" broad), the young twigs, buds, and under side of leaves covered with rusty brown hairs. Wood pale reddish brown, rather light, straight-grained, medium-textured, feels rather harsh. Not utilized. Collected by Whitford & Stadtmiller at elevation of about 2000 ft. near El Limón. (No. 25; Yale No. 3692.) (See *Tropical Woods* 8: 11-13, Dec. 1, 1926.)

#### AMYGDALACEAE (Almond Family)

*Couepia dodecandra* (DC.) Hemsl. "Zapotillo," according to Landa. Specimen in U. S. National Herbarium; locality, Ceiba.

*Hirtella racemosa* Lam. Authority, Standley. Locality, San Pedro Sula. Related to "wild coco plum" or "grenada" of British Honduras.

*Licania arborea* Seem. Collected at Macuelizo by Whitford & Stadtmiller (No. 66) at elevation of 1000 feet. Tree 60 feet high and 18 inches in diameter.

*Licania hypoleuca* Benth. ("Pigeon plum" of British Honduras.) Specimen in U. S. National Herbarium; locality, San Pedro Sula. Collected also in Quebradas, Guatemala, by Whitford & Stadtmiller (No. 68; Yale No. 3727) under name of "chozo." Medium-sized tree, with rather small, pointed leaves, whitish on underside; flowers small, in racemes. Wood grayish brown, with purplish tinge; about as hard and heavy as oak; is fairly straight-grained,

<sup>1</sup> *Timbers of Tropical America*, Yale University Press, New Haven, Conn., 1924. Pp. 628; 6½ x 10; 51 full-page plates. For sale by "Tropical Woods." Price \$10 postpaid.

easy to split, finishes smoothly, is not very durable in contact with the ground. (See *Timbers of Tropical America*, pp. 198-9.)

Yale No. 201 is probably this species; collected at Concordia, Olancho; name, "borraco" or "urraco."

#### ANACARDIACEAE (Sumach Family)

*Anacardium occidentale* L. "Marañón" or "jocote marañón." ("Cashew" of British Honduras and West Indies.) Small, spreading tree with elliptical leaves (2" x 4") and terminal clusters of small flowers; common in old pastures. Wood moderately hard, light-colored, and with rather large, scattered pores; not utilized.

*Astronium graveolens* Jacq. "Ciruelillo," "ronrón," "palo obero," and "masicarán." Probably more than one species involved. Tree attains large size; has compound leaves suggesting ash (*Fraxinus*); is widely, though sparingly, distributed and supplies one of the best known cabinet woods in the Republic. Wood reddish, with dark striping; sometimes plain; similar to the "Gonçalo Alves" of Brazil. (See *T. of T. A.*, p. 389; *Tropical Woods* 5: 2, March 1, 1926.) Wood specimens in Yale collections: Nos. 32, 93, 103, 125, 149, 159, 180, 211, 253, 3687, 6630. No. 3687 collected by Whitford and Stadtmiller (No. 20) at Francia; height of tree given as 120 feet; diam. 38 inches.

*Spondias lutea* L. and *S. purpurea* L. "Jobo," "jocote," "ciruelo," "plum," "hog plum," etc. Common small to medium-sized trees, with compound leaves, and light, coarse-textured wood that quickly decays in contact with the ground; often planted for live fence posts. Wood not utilized. (See *T. of T. A.*, pp. 381-2.)

#### ANONACEAE (Custard-apple Family)

*Anona reticulata* L. "Anona de redecilla," according to Mr. Landa. Specimen in U. S. National Herbarium; locality, San Pedro Sula.

*Anona testudinea* Safford. Specimen in herbarium of New York Botanical Garden.

*Duguetia leiophylla* Donn. Smith. Specimen in U. S. National Herbarium.

*Xylopia frutescens* Aubl. "Palanco." ("Polewood" of British Honduras.) A small, slender tree, common in hardwood forest along north coast. The narrow, willow-like leaves are crowded along the twigs. Stems used for poling boats.

#### APOCYNACEAE (Dogbane Family)

*Malouetia panamensis* H. & M. Specimen in herbarium New York Botanical Garden.

*Plumeria acutifolia* Poir. Specimen in U. S. National Herbarium; locality, San Pedro Sula.

*Tabernaemontana amygdalifolia* Jacq. "Cojón de mico." Small tree similar to next species, but apparently less common, and with smaller and more elongated fruits. Collected by Record & Kuylen near Aguan River, Maloa District of Truxillo R. R. Co. (No. 50; Yale No. 9996.)

*Tabernaemontana citrifolia* L. "Cojón de mico" and "chanchito de flores blancas." Small or medium-sized tree, with smooth bark containing a sticky white latex; common in lowland forest along north coast. Flowers small, white, star-shaped; fleshy fruits large, smooth, usually in pairs. Wood yellowish, moderately hard, fine-textured, not resistant to decay and insects; not utilized. (Yale No. 8848, Guatemala.)

#### ARALIACEAE (Ginseng Family)

*Gilibertia arborea* March. Specimen in U. S. National Herbarium; locality, San Pedro Sula.

*Gilibertia stenocarpa* Donn. Smith. "Palo de agua." Small tree, with simple, long-stalked leaves clustered near the ends of the twigs, which are terminated by umbels of tiny flowers or small black berries. Wood grayish, moderately hard, medium-textured, of about the consistency of yellow poplar (*Liriodendron*); not utilized. Collected by Record & Kuylén in village of Agua Blanca, Progreso District. (No. 33; Yale No. 9979.)

#### BETULACEAE (Birch Family)

*Carpinus caroliniana* Walt. The authority for including this tree is a single specimen of wood (Yale No. 259) of Honduras origin, probably from San José Potrero, Dept. of Comay. The wood is brownish, hard and heavy, fine-textured; broad, aggregate rays typically clustered. The tree is known to occur in Guatemala, Mexico, eastern United States and Canada. It is usually a small tree, rarely 40 feet high and 20 inches in diameter, with a fluted trunk and smooth bark.

#### BIGNONIACEAE (Catalpa Family)

*Crescentia Cujete* L. "Morro" or "calabash tree." A small, crooked tree, with long and often drooping branches. Leaves narrow and spatulate, or in one form having the shape of a cross. Fruits large and gourd-like, borne along the trunk and coarse branches. Wood hard and tough; used for saddle-trees. Common in West Indies, Mexico, and Central and South America. (See *T. of T. A.*, pp. 544-5.)

*Enallagma latifolia* (Mill) Small. Specimen in herbarium of New York Botanical Garden.

*Tabebuia Donnell-Smithii* Rose. "San Juan." ("Prima vera" of U. S. timber trade.) A large tree, with large, palmately compound leaves which fall before the advent of the great masses of showy, yellow flowers. Wood pale yellowish, moderately hard, easy to work, takes a beautiful polish, and has a fine feather grain. (Yale No. 6636.) A well-known timber used for furniture, interior trim, and general construction. Formerly known to American furniture trade as "white mahogany." (See *T. of T. A.*, pp. 533-4.)

*Tecoma pentaphylla* Juss. "Macuelizo" or "roble blanco." A medium-sized to rather large tree, widely distributed throughout the Republic; occurs also in other parts of Central America, Mexico, northern South America, and

the West Indies. Tree very showy in flower, the color of the blossoms ranging from nearly white to deep purplish pink. Wood moderately hard, straight-grained, easy to work; color light brown with penciling of darker brown conspicuous on tangential surface. (Yale Nos. 58, 87, 90, 97, 167, 291.) (See *T. of T. A.*, pp. 534-6; *Tropical Woods* 8: 8-11, Dec. 1, 1926.)

*Tecoma stans* (L.) H.B.K. "Sardinillo," according to Mr. Landa. Specimen in U. S. National Herbarium; locality, Ceiba. Small tree of no commercial importance.

*Tecoma chrysantha* DC. "Cortés," "quebracho," and "masicarán." A fairly common medium-sized to large tree occurring from Mexico to Venezuela. Flowers yellow and conspicuous. Wood very hard and strong, fine-textured, not very easy to work, takes a high polish, is highly durable; color olive-brown, more or less striped; surface often covered with yellow powder (lapachol). (Yale Nos. 6, 14, 27, 85, 193, 194, 209, 260, 261, 295.) Used for heavy and durable construction, cart wheels, handles, implements, etc.

A closely related species with similar wood, but having pink or purplish flowers is *Tabebuia (Tecoma) Palmeri* Rose. The fact that it was found by Record & Kuylén in the uplands of eastern Guatemala, where it is known as "cortés colorado," indicates that its presence is likely in Honduras. (Yale No. 10,068.) (See *T. of T. A.*, pp. 538-544.)

#### BIXACEAE (Arnotto Family)

*Bixa Orellana* L. "Achiote." Small tree or shrub. One of the best known of tropical American plants because of the yellow-red dye obtained from the seeds. Wood light and soft; not utilized.

#### BOMBACACEAE (Cotton-tree Family)

*Bombacopsis Fendleri* (Seem.) Pittier. "Cedro espino." A large, coarse tree, having a light and soft, but comparatively firm and tough, wood suggesting "cedro" (*Cedrela*) in appearance and properties. The rays show conspicuously on radial surface, ripple marks are present, and the wood is not scented. (Yale No. 30.) (See *T. of T. A.*, pp. 415-7.)

*Ceiba pentandra* (L.) Gaertn. "Ceiba" or "cotton tree." Largest and best known tree of the hardwood forest. Wood grayish, light and soft, but tough, coarse-textured, not durable. (See *T. of T. A.*, pp. 419-420.)

*Hampea integerrima* Schlecht. Specimen in U. S. National Herbarium; source, San Pedro Sula.

*Hampea stipitata* Wats. "Majao colorado." A small tree with large, simple, alternate leaves. Flowers in axillary clusters; fruits, which resemble miniature tennis balls, split into three parts, liberating the shiny black seeds. Wood pinkish, light and soft, not durable; rays very distinct on radial surface; ripple marks present. Collected by Record & Kuylén near Cuyamel. (No. 17; Yale No. 9963.)

*Ochroma bicolor* Rowlee and *O. concolor* Rowlee. "Balsa." Common tree of second-growth stands, with large to very large leaves, coarse flowers, and elongated, downy pods. Wood white or brownish, exceedingly light and soft, especially that of young trees. Not utilized locally, except for rafting pur-

poses, but employed in United States for insulation (as in refrigerators), floats, packing blocks, etc.

*Pachira aquatica* Aubl. "Zapotón." ("Provision tree" of British Honduras.) Common tree along water courses. Flowers conspicuous, with five large, recurved, white petals and a central cluster of long, purplish stamens. Fruits large, brown, round or elongated, hanging from branches. Leaves digitately compound. Wood grayish, light and soft, but tough and fibrous, not durable; ripple marks present. (Yale No. 118.)

*Quararibea funebris* (Llave) Standley. Small tree with simple, alternate, coarse leaves having the odor of licorice. Flowers axillary, rather large, yellowish. Fruit (about 1 in. long) resembles an acorn, the nut half inclosed in a cup. Wood white, moderately hard, medium-textured, not durable; rays rather coarse; ripple marks absent. Collected by Record & Kuylen near Black River; no vernacular name known. (No. 66; Yale No. 10,012.) (See *T. of T. A.*, pp. 422-4.)

#### BORRAGINACEAE (Borage Family)

*Cordia alba* (Jacq.) R. & S. "Tigüilote." ("Jackwood" of British Honduras.) Small tree with alternate, rounded, rather rough leaves and open, terminal cymes of small white or yellowish flowers. Wood brownish, rather light, firm, fibrous, not durable. Not utilized. Collected by Record & Kuylen near Aguan River, Maloa Dist. (No. 47; Yale No. 9993.) Specimen in U. S. National Herbarium from San Pedro Sula.

*Cordia alliodora* (R. & P.) Cham. "Laurel," "laurel blanco," "laurel negro." ("Salmwood" of British Honduras.) Large tree with elongated and pointed leaves clustered at the ends of the twigs, the latter swollen at the forks and sheltering ants. Flowers white and conspicuous. Wood apparently of two kinds (perhaps depending upon age of tree or locality of growth), namely, (1) grayish or yellowish and (2) variegated brown, suggesting walnut, and fragrantly scented when fresh. There may be more than one species involved, but attempts to distinguish the trees in the forest have not been successful either in Honduras or Guatemala. (Yale Nos. 23, 33, 38, 51, 61, 71, 72, 100, 105, 9973. The last collected in flower by Record & Kuylen near Cuyamel.)

The wood is well known and is much used for rived planking on the small bridges over drainage and irrigation canals as it splits readily and is fairly durable. It is similar to a Brazilian timber known to the New York furniture trade as "Cordia wood" or "Jenny wood." (See *Tropical Woods* 5: 3, March 1, 1926; 9: 1, March 1, 1927.)

*Cordia diversifolia* Pavón. "Chachalaco." Small tree, with hairy twigs and rough leaves. Wood grayish, moderately hard; not utilized. Collected by Record & Kuylen at Cuyamel. (No. 4; Yale No. 9950.)

*Cordia ferruginea* Roem. & Sch. "Bejuco negro." A shrub, sometimes climbing. Specimen in U. S. National Herbarium from San Pedro Sula.

#### BURSERACEAE (Torchwood Family)

*Bursera gummifera* L. (= *Elaphrium Simaruba* (L.) Rose). ("Gombolimbo" or "West Indian birch" of Florida.) "Chinacahuite," "chino," or "palo chino," "copón," "indiodesnudo," "jicote," "jinicuite," "jiote," "palo jiote," and "mulato." A very common, well-known tree of the lowland forest, usually with a crooked bole covered with a shiny, copper-colored, exfoliating bark. Often planted for live fence posts. Wood light-colored, fairly soft, perishable; not utilized. (See *T. of T. A.*, pp. 337-9.)

*Protium* (*Icica*) spp. "Copal," "fontolo," "frotón," "jocomico" (?). Known from wood samples only. Reddish brown, hard, fine-textured, easy to work, takes a high polish. Looks like an excellent wood for the same purposes as birch (*Betula lenta* L.) which it resembles. Uses unknown. (Yale Nos. 45, 155, 188, 212, 288.)

#### CAPPARIDACEAE (Caper-tree Family)

*Capparis* sp. "Azaharillo" and "olivo." (Same or related species called "caper tree" in Florida.) Small tree. Known only from wood specimen. White or yellowish, hard, rather fine-textured, easy to work, not durable; rays fine, pores small and in radial rows, parenchyma in fine concentric or terminal lines. (Yale No. 54.)

*Crataeva Tapia* L. (Called "tortuga" in Guatemala, and "manzana de playa" in Nicaragua.) Specimen in U. S. National Herbarium. Medium-sized tree of irregular shape; leaves with long petioles and three pointed leaflets; flowers showy, with four white petals and long-exserted stamens. Wood yellowish, coarse-textured, easy to work, not durable. (See *T. of T. A.*, pp. 190-1.)

#### CARICACEAE (Papaya Family)

*Carica Papaya* L. "Papayo." Slender, unbranched, pale green, pithy tree, with large, deeply lobed leaves borne at top of trunk. The melon-like fruit, "papaya," is one of the best known in tropical America.

#### CLETHRACEAE (Clethra Family)

*Clethra lanata* Mart. & Gal. Specimen in U. S. National Herbarium from San Pedro Sula. Small tree, with hard, pale brownish, very fine-textured wood. (Yale Nos. 6679, 6886 from Venezuela.)

#### COCHLOSPERMACEAE

*Cochlospermum vitifolium* (Willd.) Spreng. "Jicarillo." ("Comasuche" in Guatemala.) Small tree, with large, deeply and palmately lobed leaves which fall before the appearance of the showy, golden-yellow blossoms. Wood very soft, spongy, brittle, laminated; not utilized. Collected by Record & Kuylen at Cuyamel. (No. 2; Yale No. 9948.)

## COMBRETACEAE (White Mangrove Family)

*Conocarpus erecta* L. ("Buttonwood" of British Honduras.) Specimen in U. S. National Herbarium from Ceiba. Small to medium-sized tree growing in mangrove swamps. Wood olive brown, very hard, heavy, tough and strong.

*Laguncularia racemosa* (L.) Gaertn. "Mangle blanco." ("White mangrove" of British Honduras.) Small tree in the coast mangrove formation, with thin reddish-brown bark, smooth, leathery, opposite leaves, and hard, yellowish brown wood.

*Terminalia obovata* (R. & P.) Eichl. "Guayabo" and "almendro." Large tree, with long trunk and high root spurs, and very smooth grayish bark. Common in hardwood forest. Wood light to dark olive, often streaked, feather-grained, tough and strong, not easy to work, takes a high polish, is durable. (Yale No. 6639.) (See *T. of T. A.*, pp. 476-7; *Tropical Woods* 7: 17, Sept. 1, 1926.)

## COMPOSITAE (Aster Family)

*Eupatorium Pittieri* Klatt. "Tiñe anzuelo." Small tree, with rather large, opposite, pointed leaves and large, pyramid-like, open panicles of small, purplish flower heads. Wood brown, hard, heavy, strong, fine-textured; pores minute, scattered singly or in short radial rows; rays narrow, but very distinct on radial surface; parenchyma not visible. Not utilized. Collected by Record & Kuylen at elevation of 2000 feet near Progreso. (No. 29; Yale No. 9975.)

*Montanoa subtruncata* A. Gray. Small tree or a shrub. Specimen in U. S. National Herbarium from San Pedro Sula.

*Perymenium strigillosum* (Rob. & Greenm.) Greenm. "Con" (?). ("Tatascame" of Salvador.) Determination from wood specimen (Yale No. 11, Santa Rosa, Copán), which agrees perfectly with one of this species (Yale No. 8050) supplied by Dr. S. Calderón, of Salvador. Wood yellowish red, deepening upon exposure; rather hard, straight-grained, easy to work, takes a high polish; has tendency to be ring-porous; rays prominent on radial surface. A high-grade furniture wood, but probably rare. (See *T. of T. A.*, p. 553.)

## DILLENIACEAE

*Curatella americana* L. "Chaparro." ("Yaha" of British Honduras.) A small, scaly-barked, crooked tree of savannas, with coarse and very harsh leaves. Wood reddish brown, rather hard and heavy, with conspicuous rays suggesting oak.

## ELÆOCARPACEAE

*Muntingia calabura* L. Small tree, with slender twigs, alternate leaves velvety on under side, axillary white flowers, and small, reddish, sweet fruits which are edible. Very common in lowlands near La Lima and Progreso. Wood pale brown, light and soft, rather coarse-textured; rays narrow, but prominent on radial surface. Bark very fibrous. Collected by Record & Kuylen near Progreso. (No. 46; Yale No. 9992.)

## EUPHORBIACEAE (Spurge Family)

*Acalypha diversifolia* Jacq. "Costilla de danto." Small tree or shrub, with yellowish-brown, compact, fine-textured wood. Not utilized. Collected by Record & Kuylen at Cuyamel. (No. 8; Yale No. 9954.)

*Adelia triloba* (Muell.) Hemsl. "Agajo" and "escambrón." Small tree or a shrub with spiny branchlets and small, spatulate leaves. Wood yellowish or pale brown, hard, fine-textured; not utilized. Collected by Record & Kuylen at Agua Blanca (No. 38; Yale No. 9984) and at Mendez near Aguan River (No. 48; Yale No. 9994.)

*Alchornea latifolia* Swartz. "Canelito." Small or medium-sized tree, with rather large, firm, long-stalked, smooth, coarsely-toothed leaves, and branching sprays of minute yellow flowers. Wood brown, rather light and soft, medium-textured; with numerous radial canals the size of pinholes. Collected by Record & Kuylen at Cuyamel. (No. 13; Yale No. 9959.)

*Croton glabellus* L. "Barenillo." Small or medium-sized tree, with rather small leaves, slender twigs, and axillary racemes of very small flowers. Wood brownish, moderately hard, rather fine-textured. Occasional large radial canals present. Collected by Record & Kuylen at Cuyamel. (No. 16; Yale No. 9962.)

*Croton panamensis* (Klotzch) Muell. Arg. Specimen in U. S. National Herbarium from San Pedro Sula.

*Croton* sp. "Pela nariz." A shrub, collected by Record & Kuylen near Olanchito.

## FAGACEAE (Beech Family)

*Quercus brachystachys* Benth., *Q. citrifolia* Liebm., and *Q. oleoides* Cham. & Schl. "Encino," "encino negro," and "roble." These oaks are medium to large-sized trees, common in the uplands, often in association with pine. Wood similar to live oak of southern United States. Variable in color from pale brown to dark reddish brown. First two species collected by Whitford & Stadtmiller at elevation of 2500 feet near Macuelizo. (Nos. 55 and 56; Yale Nos. 3716 and 3717.) The third collected by Record & Kuylen in foothills near Olanchito. (No. 53; Yale No. 9999.)

## FLACOURTIACEAE

*Casearia arguta* H.B.K. Specimen in herbarium of New York Botanical Garden. Small tree.

*Casearia javitensis* H.B.K. (from San Pedro Sula), *C. nitida* (L.) Jacq. (from Puerto Cortés), and *C. ramiflora* Vahl (from San Pedro Sula). Specimens in U. S. National Herbarium. Second species called "comida de culebra," according to Mr. Landa.

*Casearia sylvestris* Sw. "Sombra de armado." Small tree, with rough bark, slender twigs, rather small, alternate leaves, and small, white flowers in axillary clusters. Wood pale brown, hard and heavy, fine-textured; pores

numerous, minute; rays very fine. No known uses. Collected by Record & Kuylen at Agua Blanco, 10 mi. south of Progreso. (No. 39; Yale No. 9985.)

*Hasseltia mexicana* (Gray) Standley. "Guatuso." Small tree, with smooth bark, thin, 3-nerved leaves, and terminal racemes of very small flowers. Wood yellowish brown, moderately hard, fine-textured; pores minute, in short radial rows. No known uses. Collected by Record & Kuylen near Progreso. (No. 43; Yale No. 9989.)

*Hasseltia pyramidalis* Hemsl. Specimen in U. S. National Herbarium.

*Prockia crucis* L. Ditto.

*Xylosma elliptica* Clos. Ditto.

## GUTTIFERAE

*Calophyllum Calaba* Jacq. "María," "Santa María," "palo de María." Large tree, with well-formed bole, resembling mahogany; fairly common in hardwood forest. Leaves opposite, narrow, finely feather-veined. Fruits nut-like with one sculptured seed. Bark with yellow, sticky juice. Wood reddish, moderately hard, fairly easy to work, though inclined to warp, takes high polish. Is used locally for construction work. Known in United States market from other parts of Central America. Collected by Whitford & Stadtmiller at elevation of 2000 feet near El Limón. (No. 24; Yale No. 3691.) Other specimens: Yale No. 130 from Esquias, Comayagua, and No. 6632 from Puerto Cortés. (See *Tropical Woods* 4: 13-15, Dec. 1, 1925; also *T. of T. A.*, pp. 439-442.)

*Clusea rosea* Jacq. Specimen in herbarium of New York Botanical Garden. (See *T. of T. A.*, pp. 437-8.)

*Symphonia globulifera* L.f. "Leche amarilla." ("Waika chewstick" of British Honduras.) Large tree of limited occurrence in hardwood forest, with opposite, narrow, pointed, yellowish-green leaves, and clusters of globular, red flowers. Bark with yellow resin. Wood greenish brown, moderately hard, coarse-textured, finishes fairly smoothly. Exported in limited amount from British Honduras to United States for plywood.

Tree seen by author, but not collected, en route from Descombro to Savá. Specimen in U. S. National Herbarium from Puerto Cortés.

## HAMAMELIDACEAE (Witch Hazel Family)

*Liquidambar styraciflua* L. "Liquidambar." ("Red gum" or "sweet gum" of southern United States.) Medium-sized to large tree of the mountains, with corky twigs, star-shaped leaves, and pendant burr-like fruits. The source of a resin or balsam used for medicinal purposes. Wood brown or variegated, of medium hardness and density, fine-textured, easy to work though requiring care in seasoning to prevent warping. Collected by Whitford & Stadtmiller at elevation of 4000 feet near Tarros. (No. 52; Yale No. 3713.) Other specimens in Yale collections: Nos. 28, 40, 60, 246, 269, indicating a wide range.

## HERNANDIACEAE

*Gyrocarpus americanus* Jacq. ("Titirillo" of Guatemala.) Medium-sized

to large tree, with thick branches, large, usually lobed leaves, and pendant clusters of shuttlecock-like fruits, each consisting of a nutlet with two long, slender wings at one end. Wood brown, light and soft, coarse-textured, perishable. (Yale No. 10,063 collected by Record & Kuylen near Gualán, Guatemala.) Specimen of tree in U. S. National Herbarium from Amapala.

*Hernandia guianensis* Aubl. "Hoja tamal," "mano de león," and "tambor." Medium-sized tree, with long-petioled, ovate, entire leaves, and greenish white flowers in long-stalked cymes. Wood gray or brownish, light and soft, coarse-textured, perishable. Collected by Record & Kuylen near Cuyamel (No. 21; Yale No. 9967) and Black River Valley (No. 68; Yale No. 10,014).

## HYDROPHYLLACEAE (Waterleaf Family)

*Wigandia caracasana* H.B.K. "Chichicaste." Small tree, with fuzzy twigs and leaves, the latter large and ovate, the flowers conspicuous along slender stems that unroll as they come into blossom. The hairs of this plant are very irritating to the skin. Wood brownish, light and rather soft, medium-textured; pith large. Collected by Record & Kuylen near Progreso. (No. 45; Yale No. 9991.)

## JUGLANDACEAE (Walnut Family)

*Juglans* sp. "Nogal" and "cedro negro." Determined from two wood specimens from Copán. Both have the characteristic appearance of black walnut (*Juglans nigra* L.), but one of them (Yale No. 136) is considerably harder, heavier, and finer-textured than the other (Yale No. 300). The latter is much like the "cedro negro" of Colombia (Yale No. 399).

## LACISTEMACEAE

*Lacistema aggregatum* (Berg.) Rusby. "Cera vegetal," according to Mr. Landa. Small tree, with elliptical leaves having clusters of small flower spikes in their axils. Wood brown, light, tough and fibrous, suggesting willow (*Salix*). Not utilized. (Yale No. 10,090, collected by Record & Braham in eastern Guatemala.) Specimen from Honduras in U. S. National Herbarium.

## LAURACEAE (Laurel Family)

*Nectandra glabrescens* Benth. and *N. sanguinea* Rottb. Specimens in U. S. National Herbarium from San Pedro Sula. Former known as "aguacatillo" in eastern Guatemala. (See *Tropical Woods* 7: 17, Sept. 1, 1926.)

*Persea amplifolia* Mez & Donn. Smith. "Aguacatillo." Medium-sized tree, with large, elliptical leaves (up to 4" x 9") covered with brown pubescence and bearing in their axils a long-stalked cluster of small brownish flowers. Wood lustrous, greenish yellow, light and soft, very easy to work, takes a smooth waxy polish, and is probably durable. Collected by Record & Kuylen in lower Black River Valley. (No. 69; Yale No. 10,015.)

*Phoebe ambigens* Blake. "Aguacatillo." Large tree, with long, well-formed

trunk. Sheds its leaves at time of flowering and is covered with purple blossoms. Woods of light olive color, lustrous, moderately hard, uniform textured, easy to work; an excellent timber. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno. (No. 7; Yale No. 3674.) (See *T. of T. A.*, pp. 175-6; *Tropical Woods* 7: 17, Sept. 1, 1926.)

#### LECYTHIDACEAE (Monkey-pot Family)

*Grias Fendleri* Seem. "Irayol." ("Cayilla" of eastern Guatemala.) Small, slender tree, common in swamps and sometimes comprising nearly pure stands. Readily distinguished by its very large, spatulate leaves clustered at the ends of the stem and coarse branches. Flowers and fruits along the trunk and limbs. Wood yellow, rather light, fairly hard, coarse-textured; rays very prominent on radial surface; parenchyma in very fine tangential lines. Collected by Record & Kuylen near Cuyamel (No. 10; Yale No. 9956), and in eastern Guatemala (No. 48; Yale No. 8879).

#### LEGUMINOSAE (Bean Family)

*Acacia Farnesiana* (L.) Willd. "Cachito de aroma," according to Mr. Landa. Specimen in U. S. National Herbarium from San Pedro Sula.

*Acacia glomerosa* Benth. "Espino blanco." ("Wild tamarind" of British Honduras.) Large tree, with spiny branches, fine spray, and very thin pods (1" x 4"). Wood nearly white, hard, tough and strong, medium-textured, not difficult to work, not durable. Collected by Record & Kuylen near Cuyamel. (No. 18; Yale No. 9964.) (See *Tropical Woods* 4: 16, Dec. 1, 1925.)

*Acacia Hindsii* Benth. "Ixcanal." ("Bullhorn acacia.") Small, slender tree, with fine spray and numerous, two-horned, sharp spurs that harbor ants.

*Acacia macracantha* H. & B. "Espino de playa." Small tree, with exceedingly fine spray and narrow, plump, woody pods (1/2" x 4"). Wood dark red, hard and heavy, rather coarse-textured. Collected by Record & Kuylen near Olanchito. (No. 52; Yale No. 9998.)

*Acacia paniculata* Willd. "Bisquite." Small or medium-sized tree, with fine spray and thin, flat pods. Wood dark brown, hard, heavy and strong, fine-textured, probably durable. Collected by Record & Kuylen near Olanchito. (No. 60; Yale No. 10,006.)

*Albizia adinocephala* (Donn. Smith.) Britt. & Rose. Small tree, with rather small, compound leaves (mostly 7 leaflets) and thin pods (3/4" x 5"). Wood brownish, moderately hard, strong, coarse-textured; not utilized. Collected by Record & Kuylen near Cuyamel. (No. 20; Yale No. 9966.)

*Andira inermis* H.B.K. "Almendro." ("Cabbage bark" of British Honduras.) Large tree, with large leaves (9 to 11 leaflets), panicles of small purplish to pinkish flowers, and rounded, oval, woody fruits (1" to 2" across). Wood reddish or brown, with fine, light-colored striping, very hard, heavy, strong, and durable. Used for heavy construction, logging-cart wheels, etc. (Yale Nos. 191, 254, 6628; the last from vicinity of Puerto Cortés.) (See *T. of T. A.*, p. 300.)

*Andira* sp. "Amargoso" and "guacamayo." ("Frijolillo" of Guatemala.)

Large tree similar to preceding, but with yellowish brown wood that is intensely bitter. Collected by Whitford & Stadtmiller at elevation of 1800 feet near El Limón (No. 23; Yale No. 3690), and by Kuylen in upland near Entre Ríos, Guatemala (No. 62; Yale No. 8893). Also No. 6635 from vicinity of Puerto Cortés. (See *Tropical Woods* 7: 17-18, Sept. 1, 1926; *T. of T. A.*, pp. 301-3.)

*Bauhinia cumanensis* H.B.K. Specimen in U. S. National Herbarium from San Pedro Sula.

*Bauhinia divaricata* L. "Casco de venado." Small tree or a shrub, often forming thickets, with palmately veined leaves notched at the tip (when partly folded along the middle suggesting a deer's hoof), showy white flowers having long exserted stamens, and with flat, narrow pods. Wood brown, hard, heavy, medium-textured. Collected by Record & Kuylen at Agua Blanca, Progreso District. (No. 35; Yale No. 9981.)

*Caesalpinia pulcherrima* (L.) Swartz. "Guacamayo" and "Santa Rosa." Small tree or a shrub, widely cultivated for ornamental purposes because of its gorgeous, sweet-scented blossoms, sometimes known in English as "bird-of-paradise" flowers. Wood orange, somewhat variegated, rather hard and heavy, fine-textured. Collected by Record & Kuylen in Olanchito; wood sample from Gualán, Guatemala (No. 116; Yale No. 10,067).

*Cassia biflora* L. "Comayagua." Small tree or a shrub, sometimes forming thickets, with rather small pinnate leaves, very showy, golden yellow flowers, and very slender, thin pods. Wood yellowish, very hard and heavy, rather fine-textured. Collected by Record & Kuylen at Agua Blanca, Progreso District. (No. 36; Yale No. 9982.)

*Cassia grandis* L. "Carao." ("Stinking-toe" of British Honduras.) Large, spreading tree, with long, coarse leaves having 10 to 20 pairs of rather large leaflets, racemes of showy white or pink flowers, and long, heavy pods (up to 2 feet in length and 1 1/2 inches in diameter) squarish in cross section. Wood brownish yellow, hard, coarse-textured; not utilized. Collected by Record & Kuylen in Cuyamel. (No. 3; Yale No. 9949.) Probably also 6640 from Puerto Cortés.

*Cassia oxyphylla* Kunth. Specimen in U. S. National Herbarium from San Pedro Sula.

*Cassia reticulata* Willd. (Called "barajo" in eastern Guatemala.) Large, coarse, spreading shrub with large leaves and showy, yellow flowers. Common in open lowlands.

*Cassia spectabilis* DC. "Candelillo." Small or medium-sized tree, with long leaves having many pairs of long-pointed leaflets, and long, black, rounded fruits, with many narrow transverse partitions. Wood yellow, light, rather soft, medium-textured; not utilized. Tree sometimes planted for live fence posts. Collected by Record & Kuylen in Cuyamel. (No. 1; Yale No. 9947.)

*Centrolobium* sp. Known only from wood specimen (Yale No. 144) from Tegucigalpa region. Wood variegated (yellow, red, and purple), not very heavy, medium-textured, works easily, takes high polish, appears durable. Resembles "putumujú" of Brazil and "guayacán jobo" of Colombia. (See *T. of T. A.*, pp. 292-3.)

*Chloroleucum guatemalense* Britt. & Rose. "Guayabo de montaña." Small tree, with very smooth bark, doubly-pinnate leaves (leaflets small), and slender, flat, slightly scalloped pods showing the seeds plainly. Wood bright yellow, lustrous, hard, fairly heavy, easy to work, fine-textured, takes a very high polish, probably durable; not utilized. Collected by Record & Kuylen near Olanchito. (No. 59; Yale No. 10,005.) Wood very similar to the "barba jalote" of British Honduras (Yale No. 7415), and has the general appearance of that of *Cassia emarginata* L.

*Dalbergia* aff. *lineata* Pittier. "Granadillo" and "palo negro." ("Cocobolo" of the United States trade.) Known only from wood specimens from Departments of Tegucigalpa and Comayagua. (Yale Nos. 73, 95, 131.) (See *T. of T. A.*, pp. 281-4; *Tropical Woods* 1: 6, March 1925.)

*Dalbergia* spp. "Granadillo," "rosewood" or "rosul." Two of the well-known furniture woods of Honduras remain unidentified, though from a study of the wood samples they seem to be produced by species of *Dalbergia*. (Yale Nos. 49, 104, 284, 285, 286, 317, 6634.)

*Dialium divaricatum* Vahl. "Paleta," "tamarindo," and "tamarindo prieto." ("Ironwood" of British Honduras.) Large and valuable timber tree, with smooth bark, compound leaves having 5 to 7 long-ovate leaflets, and a small tamarind-like fruit. Wood dark reddish brown, hard, heavy and strong, straight-grained, rather fine-textured, takes a high polish, is very resistant to decay and insect attack. Highly appreciated throughout the fruit belt for fence posts, bridge timbers, and other purposes requiring strength and durability. Collected by Whitford & Stadtmiller at elevation of 400 feet at Rodezno (No. 1), at elevation of 2500 feet near Paraiso (No. 20; Yale No. 3696), and at elevation of 100 feet at Quebradas (No. 47; Yale No. 3710). Also No. 67 from Dept. of Copán. (See *T. of T. A.*, pp. 239-240.)

*Diphysa carthaginensis* Jacq. or *D. robinoides* Benth. "Guachipilín" and "quebracho de cerro." Small or medium-sized, irregular tree, with leaves and flowers suggesting "black locust" (*Robinia pseudacacia* L.), and inflated, flattened pods. Widely distributed throughout the mountainous region. Wood greenish yellow to olive-brown, very hard, heavy, strong, medium-textured, highly durable. Local uses unknown; suitable for same purposes as black locust. Trees sometimes planted for live fence posts. (Yale Nos. 7, 8, 18, 55, 79, 86, 112, 168, 198, 202, 231, 250, 272, 282; representing Departments of Comayagua, Copán, Intibucá, La Paz, Olanchito, Paraiso, and Yoro.) (See *T. of T. A.*, pp. 275-6.)

*Erythrina glauca* Willd. "Guiliqueme." Large, spreading, short-boled tree, resembling a wild-fig tree, with coarse, brittle twigs, compound leaves having 3 large, rounded or ovate leaflets. Wood brownish, light, soft, fibrous, very coarse-textured, has harsh feel, perishable; parenchyma abundantly developed in tangential bands. Collected by Record & Kuylen along the shore near Cuyamel. (No. 24; Yale No. 9970.)

*Erythrina rubrinervia* H. B. K. "Pito." Small, spreading tree or a shrub, with coarse, spiny branches, 3-foliolate leaves, terminal cone-like racemes of showy, red, machete-shaped flowers, and long pods constructed between the scarlet seeds. Often planted for live fence posts. (There is also a smaller species

used for fencing purposes.) Wood light-colored, soft, fibrous, coarse-textured, not durable; not utilized. (See *T. of T. A.*, pp. 306-8.)

*Enterolobium cyclocarpum* (Jacq.) Gris. "Guanacaste." Very large, spreading tree, with bi-pinnate leaves having very numerous leaflets, dense heads of small, white flowers, and flat, coiled, ear-shaped pods. Wood walnut-brown, very light and soft to moderately so, easy to work, finishes smoothly, is durable; has prominent vessel lines. Suitable for general carpentry, the harder kinds for furniture. Timber of this species from Mexico enters markets of the United States to a limited extent. (Yale Nos. 80, 203, 6629.) (See *T. of T. A.*, pp. 204-7.)

*Gliricidia sepium* (Jacq.) Steud. "Madre cacao," "madrial," and "caca-gua." Small to medium-sized tree, with the outline of an apple tree, having rather pale, pinnate leaves which are shed before the appearance of the showy clusters of bright pink, pea-like blossoms. Extensively planted for live fence posts and to shade coffee and cacao. Wood light to dark olive-brown, becoming russet upon exposure, with pencil-stripping of parenchyma, very hard, heavy, and strong, medium-textured, takes high polish, is durable; is of the general type of "black locust." (Yale Nos. 4, 98, 148, 160, 244, 298, 302, 314.)

*Haematoxylon campechianum* L. "Brasil," "palo brasil," "tinta," and "logwood." Small or medium-sized tree of the north coast regions, with very irregular and fluted trunk. Wood bright red, deepening upon exposure, sweet-scented, very hard, rather fine-textured, very durable. Well-known as a dye-wood. Little information is available concerning this tree in Honduras and no trees were seen by the author. Considerable quantities of the wood were formerly exported from the region of Bakalar Lagoon. *H. Brasileto* Karst., which closely resembles the other species, probably occurs on the west coast.

*Hymenaea Courbaril* L. "Guapinol." ("Locust" of British Honduras.) Large evergreen tree, with rather large leaves, each with a pair of smooth, leathery leaflets, whitish or purplish flowers, and large, heavy, rough, blackish pods. An amber-like gum exudes from the trunk. Wood variable from orange-brown to reddish, hard and heavy, rather coarse-textured, durable. Collected by Whitford & Stadtmiller at elevation of 800 feet near Macuelizo (No. 57) and at elevation of 50 feet near Cacao (No. 63; Yale No. 3723). Also Nos. 264 and 283 from Concordia. (See *T. of T. A.*, pp. 231-3.)

*Inga* spp. "Guamo" and "cuajinicuil." ("Bri-bri" of British Honduras.) Several species. Medium-sized or low trees, very common in hardwood forest, with large leaves having few leaflets (the petiole often winged), tufts of floss-like, white flowers, and large, pulpy pods. Trees often used as shade in coffee and cacao plantations. Wood grayish to pinkish-brown, moderately hard, medium- to coarse-textured, not durable. Not utilized. (See *T. of T. A.*, p. 203; *Tropical Woods* 7: 19, Sept. 1, 1926.)

*Lonchocarpus guatemalensis* Benth. "Chapel." Small tree, with large, pinnate leaves having 7 to 11 leaflets, pinkish or purplish flowers, and clusters of flat, brown, velvety pods. Wood yellow, hard, coarse-textured, laminated; not used. Collected by Record & Kuylen near Cuyamel. (No. 14; Yale No. 9960.)



*Lonchocarpus latifolius* H. B. K. (probably). "Cincho." Large timber tree, with large pinnate leaves having 7 to 11 leaflets. Well known in north coast region. Wood yellow, deepening to russet brown, hard, heavy, tough, strong, coarse-textured; pores few, in heavy parenchyma bands; resistant to decay. Used for heavy and durable construction. Collected (with sterile botanical material) by Record & Kuylen in lower Black River Valley. (No. 42; Yale No. 9988.) Also wood sample No. 6637 from vicinity of Puerto Cortés. Other wood samples of same or closely related species: Yale Nos. 43, 81, 92, 101, 109, 119, 156, 241, 257.

*Lonchocarpus luteomaculatus* Pittier. Specimen in U. S. National Herbarium.

*Lysiloma acapulcense* Benth. (?). Specimen in U. S. National Herbarium from San Pedro Sula. Some wood samples labeled "quebracho" (Yale Nos. 59, 132) may prove to be from species of *Lysiloma*.

*Machaerium latifolium* (Benth.) Pittier. "Mato piojo." Medium-sized tree, with rather large, pinnate leaves having few, alternate leaflets, flowers in axillary clusters, and flat, curved pods with a single large seed at one end, the other forming a wing, as in maple (*Acer*). Wood very hard, heavy, strong, rather fine-textured, with few pores and closely spaced parenchyma lines; sapwood yellow, old heartwood probably purplish brown. Not utilized. Collected by Record & Kuylen near Olanchito. (No. 64; Yale No. 10,010.)

*Mimosa* sp. Small or medium-sized tree, common on a very limited area near the coast about midway between Coracito and Black River, with orange-brown, shreddy bark, fine spray, rusty pubescent twigs and leaf stalks, and prominent spike-like clusters of very small tawny flowers terminating the branches. Wood pale reddish-brown, very hard, heavy, and strong, medium-textured, hard to cut. Not utilized. Collected by Record & Kuylen near the tracks of the Truxillo Railroad Company. (No. 73; Yale No. 10,019.)

*Ormosia nitida* Vog. Specimen in herbarium of New York Botanical Garden.

*Pithecolobium discolor* Pittier. Specimen in U. S. National Herbarium from Ceiba.

*Pithecolobium insigne* Micheli. Ditto from San Pedro Sula.

*Pithecolobium ligustrinum* Klotzsch. Ditto from unspecified locality.

*Pithecolobium microstachyum* Standley. (Called "jaguay cimarrón" and "jaguay de llano" in eastern Guatemala.) Small tree, with clustered leaves each having one or two pairs of leathery leaflets; flowers very small and in short spikes. Wood reddish brown, exceedingly hard, fine-textured, difficult to cut, takes high polish, is apparently durable. (Yale No. 10,071, Gualán, Guatemala.) Also collected by Record & Kuylen near Olanchito.

*Platymiscium polystachium* Donn. Smith. "Hormigo" and "granadillo" (?). Large tree, with opposite, pinnate leaves with 5 large leaflets, and showy racemes of rather small yellow flowers. Wood roseate, often with dark streaks and varying shades, moderately hard, medium-textured, easy to work, takes a high polish, is durable. Used for bridge planking, durable construction, carpentry, and furniture. Collected by Whitford & Stadtmiller at elevation of 400 feet at Rodezno (No. 5; Yale No. 3672), and at elevation of 2500 feet at Paraiso (No. 31). Other specimens: Yale Nos. 110 (Comayagua), 310 (Con-

cordia), 316 (Santa Barbara), 6627 (Puerto Cortés). Specimen in U. S. National Herbarium from Ceiba. (See *T. of T. A.*, pp. 296-8.)

A flowering specimen of "hormigo" collected along the lower Río Motagua, Guatemala, by Record & Kuylen (No. 141; Yale No. 10,092) has been identified by Standley as *Platymiscium dimorphandrum* Donn. Smith.

*Platymiscium trifoliatum* Benth. "Hormigo." Tree of the interior region, with large leaves having 3 rounded leaflets. Known only from wood specimens which appear to be the same as the "ñambar bastardo" of Nicaragua, known to be produced by this species. Wood of deeper reddish color, somewhat striped and variegated, hard, heavy, highly resonant, takes a high polish, is durable. Used for bars of marimbas. Specimens as follows: Yale Nos. 65 (Intibucá), 114 (Tegucigalpa), 134 (Comayagua), 183 (Copán), 265 (La Paz).

*Prosopis chilensis* (Molina) Stuntz (= *P. juliflora* (Swartz) DC.). "Algarroba." ("Mesquite" of southwestern United States.) Small or medium-sized tree in dry localities, sometimes forming thickets, with doubly pinnate leaves having numerous small leaflets, spikes of very small, fragrant, greenish-yellow flowers, and slender pods, thick at maturity. Wood rich dark brown, fragrant, hard and heavy, rather coarse-textured, easy to work, highly durable. Used for fuel and fence posts. (No. 10,056, Gualán, Guatemala.) Specimen in U. S. National Herbarium from Amapala. (See *T. of T. A.*, pp. 216-220.)

*Pterocarpus belizensis* Standley. "Cow-ee." ("Kaway" of British Honduras.) Tall tree with slender trunk, thin and crooked buttresses, smooth bark containing a blood-like sap, large leaves having 7 to 9 pointed leaflets, and irregularly flattened, winged, woody fruits 2 to 4 inches in diameter. Tree found in nearly pure stand over small area in swampy land at edge of Bakalar Lagoon; ground carpeted with sprouting fruits. Type collected in British Honduras (Yale Nos. 8769, 8780); species also seen in lower Río Motagua Valley, Guatemala. Wood dingy white throughout, becoming rich reddish brown near injuries, rather light and soft (except colored portions, which are very hard), medium-textured, easy to work, perishable; not utilized. (See *Tropical Woods* 7: 6, Sept. 1, 1926.)

*Schizolobium parahybum* (Vell.) Blake. "Plumajillo" and "zorra" (?). ("Quam" of British Honduras.) Tall tree of the northern hardwood forest, with high buttresses and very large, doubly pinnate leaves which are shed before the appearance of the great masses of showy, golden-yellow flowers, the fruit a flattened, broadly spatulate pod. Wood nearly white, with brown streaks, very light and soft to moderately hard and tough, perishable, not utilized. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno. (No. 18; Yale No. 3685.) (See *Tropical Woods* 2: 2-5, June 1925.)

*Sweetia panamensis* Benth. "Chichipate." ("Billy Webb" of British Honduras.) Medium-sized to tall tree, often rather poorly formed, with pinnate leaves having 7 or 9 ovate, leathery leaflets, panicles of small yellowish flowers usually obscured by the foliage, and thin, flat, few-seeded pods. Wood of variable shades of brown, lustrous, very hard, heavy, tough, and strong, not easy to work, takes a high polish, is very durable. Well known for heavy and durable construction, wheels, implements, etc. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno (No. 6; Yale

No. 3673). Also the following wood specimens: Yale Nos. 62 (La Paz), 124 (Choluteca), 138 (Comayagua), 145 (Intibucá), 173 (Copán), 174 (La Paz), 187 (Comayagua), 197 (Olancho), 230 (Copán). (See *T. of T. A.*, pp. 261-3.)

**Toluifera Pereirae** (Klotzsch) Baill. (= *Myroxylon Pereirae* Klotzsch). "Bálsamo." Medium-sized to large tree of the uplands, with pinnate leaves having 7 to 11 rather large leaflets, racemes of whitish flowers, fruit a pod (1" by 3") having a plump seed at one end, the other forming a wing. Source of the "balsam of Peru." Wood reddish or purplish, fragrantly scented, very hard, heavy, and strong, finely feather-grained, medium-textured, rather harsh, not very easy to work, highly durable. Local uses unknown, but it is suitable for all sorts of heavy and durable construction, implements, etc. Known only from wood samples: Nos. 96 (Trinidad), 158 (Yoro), 204, 304, 312. (See *T. of T. A.*, pp. 265-7.)

#### LYTHRACEAE (Loosestrife Family)

**Grislea secunda** Loeffl. "Coloradillo." Shrub or small tree, with showy flowers collected by Record & Kuylen near Savá.

#### MALPIGHIACEAE

**Bunchosia nitida** Rich. Specimen in U. S. National Herbarium.

**Byrsonima crassifolia** H. B. K. "Nancito," according to Mr. Landa. Specimen in U. S. National Herbarium from San Pedro Sula. (See *T. of T. A.*, pp. 363-5.)

**Malpighia glabra** L. Ditto from San Pedro Sula.

#### MALVACEAE (Mallow Family)

**Abutilon Chittendenii** Standley, sp. nov. (See p. 5.) Small or medium-sized tree, with thin rounded or heart-shaped leaves (3 in. in diam.), and conspicuous, large, yellow blossoms. Wood pale yellow to white, hard, heavy, very fine-textured, takes a glossy finish; all elements storied, producing fine, somewhat irregular ripple marks visible with lens. Tree apparently rare. Collected by Record & Kuylen near Olanchito. (No. 63; Yale No. 10,009.)

**Hibiscus tiliaceus** L. "Majagua." ("Mahoe" of British West Indies.) Small tree or shrub very common in places along the shore (e.g., between Cuyamel and Omoa), with large heart-shaped leaves, and yellow flowers. Bark very fibrous. Wood purplish, variegated, silky lustrous, light and rather soft, fine-textured; not utilized. (See *T. of T. A.*, pp. 410-11.)

**Malvaviscus arboreus** Cav. Specimen in U. S. National Herbarium from San Pedro Sula.

#### MELASTOMACEAE (Meadow-beauty Family)

**Conostegia xalapensis** (Bonpl.) D. Don. "Capiroto" and "sirín." Small tree, with large, opposite, toothed leaves, dark green above and white below, and having 5 to 7 longitudinal nerves connected by numerous parallel cross veins; flowers small, crowded in large and conspicuous terminal panicles; fruit a small berry. Wood brownish, moderately heavy and hard, rather fine-

textured, saws finely woolly, is not durable. Collected by Record & Kuylen near coast about half way between Black River and Corocito. (No. 72; Yale No. 10,018.)

**Miconia argentea** (Swartz) DC. "Sirín" or "sirínón." ("White maya" of British Honduras.) Small tree, with rather slender, pointed, opposite leaves, green above and whitish below; panicles with comparatively few flowers which are individually distinct; fruit a tawny berry. Wood brown, hard and heavy, rather fine-textured, not durable. Collected by Record & Kuylen, same locality as preceding. (No. 71; Yale No. 10,017.)

**Miconia hondurensis** Donn. Smith. Specimen in U. S. National Herbarium from Puerto Sierra.

**Miconia impetiolaris** (Swartz) D. Don. Ditto from San Pedro Sula.

**Miconia laevigata** (L.) DC. Ditto from Ceiba.

**Miconia stenostachya** DC. Ditto from San Pedro Sula.

**Mouriria parviflora** Benth. Ditto from San Pedro Sula. ("Half crown" or "cacho venado" of British Honduras.) Medium-sized tree, with very slender twigs, small, ovate-pointed, opposite, sessile leaves, inconspicuous flowers, and small, globose fruits. Wood reddish, exceedingly hard, heavy, tough, and strong, difficult to work, durable, characterized by narrow strands of interxylary bast. (Yale Nos. 7580, 8790, 8805, 9702, 9703, British Honduras.)

#### MELIACEAE (Mahogany Family)

**Carapa guianensis** Aubl. ("Crabwood" of British Guiana and "andiroba" of Brazil.) Specimen in herbarium of New York Botanical Garden. (See *T. of T. A.*, pp. 356-8.)

**Cedrela longipes** Blake. "Cedro." Specimen in U. S. National Herbarium from Department of Copán.

**Cedrela** spp. "Cedro." ("Spanish cedar" or "cigar-box cedar" of United States trade.) Several species of medium-sized to very large trees, with large, pinnate leaves, flowers in panicles, fruit a capsule, 1 to 2 inches long, splitting into 5 parts and liberating the papery-winged seeds. Wood reddish, fragrantly scented, very light and soft to moderately so, very easy to work, is highly resistant to insects and decay; often ring-porous. One of the best known and most highly prized woods for general carpentry. Wood specimens as follows: Yale Nos. 2 (La Paz), 3 (Tegucigalpa), 9 (Copán), 22 (Comayagua), 41 (La Paz), 47 (Intibucá), 107 (La Paz), 170 and 175 (Comayagua), 177 (La Paz), 227 (Santa Barbara), 256, 299, and 306 (Olancho), 6633 (Cortés).

**Guarea longipetiolata** C. DC. "Carbón." Tall tree, with very large, pinnate leaves, and panicles of woody, fig-shaped fruits about 1 inch in diameter. Wood pale reddish or reddish yellow, of medium density and weight, rather coarse-textured, straight-grained, finishes smoothly, is fairly durable. Useful for general carpentry. Collected by Record & Kuylen in lower Black River Valley. (No. 67; Yale No. 10,013.)

**Melia Azederach** L. "Paraiso" and "China berry." Small or medium-sized tree, native of the Old World, but planted for live fence posts and decorative purposes, and often escaped from cultivation. Very common throughout north coast region. Leaves bi-pinnate, with toothed leaflets; flowers sweet-

scented, pinkish, in panicles; fruit berry-like, translucent, with four large seeds. Wood reddish, light, soft, weak.

*Swietenia macrophylla* King. "Caoba" and "mahogany." Very large and important timber tree, with large, shiny, pinnate leaves, flowers small, paniced, fruit a large, woody capsule splitting into 5 parts to liberate the winged seeds. Wood variable from light and soft to hard and heavy, with white vessel lines; otherwise too well known to need description. It is probable that the small-leaved form (*S. humilis* Zucc.) occurs in the interior, but authentic specimens are lacking; other species common in north coast country lowlands and mountain sides up to elevations of at least 2000 feet. Wood specimens (without regard to exact species) as follows: Yale Nos. 46, 152, and 236 (Comayagua), 133 (Intibucá), 140 (Yoro), 157 (La Paz), 165 (Choluteca), 207 (Copán), 213, 235, 237, 249, and 294 (Paraiso), 229, 276, and 293 (Olancho), 278 (Santa Barbara), 6631 (Cortés).

*Trichilia havanensis* Jacq. "Barre-horno" and "limoncillo." Small tree, with pinnate leaves having mostly 5 rather large, wedge-shaped leaflets, small, cream-colored, fragrant flowers in axillary clusters. Wood brownish, rather light and soft, straight-grained, fairly fine-textured, easy to work, not durable. Collected by Record & Kuylen along coast near Cuyamel. (No. 22; Yale No. 9968.)

#### MENISPERMACEAE

*Hyperbaena Tonduzii* Diels. Specimen in U. S. National Herbarium from Amapala.

#### MORACEAE (Mulberry Family)

*Castilla elastica* Cerv. "Ule" or "hule," and "rubber tree." Medium-sized to large tree common in open lowlands, with smooth, gray bark, large, simple, fuzzy leaves, two separate kinds of flowers, and fleshy, dark red fruits. Latex used to limited extent for manufacture of rubber. Wood light brown, light, fairly soft, not strong, perishable, not used. (See *T. of T. A.*, pp. 128-130.)

*Cecropia asperrima* Pittier. "Guarumo." ("Trumpet" of British Honduras.) Small to medium-sized trees, very common in open lowlands, with slender, whitish, hollow trunks, very large, lobed, long-stalked, peltate leaves that are white on underside, and flowers in coarse, clustered spikes. Pure stand covering several acres observed near Cuyamel. Wood grayish or brown, light, soft, coarse-textured, perishable, not utilized. There are probably several species, but they are all very much alike in general appearance. (See *T. of T. A.*, pp. 144-7.)

*Chlorophora tinctoria* (L.) Gaud. "Mora." ("Fustic" of dyewood trade.) Small or medium-sized tree, with brownish-gray bark containing a milky juice; branches sometimes spiny; leaves dark green, not very large, pointed, entire or toothed; male flowers in rather long and dense catkins, the female in little heads, which ripen into fleshy fruits. Wood bright yellow, becoming brownish upon exposure, very hard, heavy, tough, and strong, medium-textured, takes a high polish, is very durable. Used as a source of yellow dye-stuff, and for fence posts and fuel. Trees seen by author near Olancho.

Specimen in U. S. National Herbarium from Amapala. Wood samples as follows: Yale Nos. 82 and 315 (Olancho), 99, 274, and 349 (Yoro), 111, 206, 240, and 277 (Paraiso), 122 (Comayagua), 126 (Copán), 186 (Intibucá), 279 (Santa Barbara). (See *T. of T. A.*, 118-122.)

*Coussapoa panamensis* Pittier. Specimen in U. S. National Herbarium.

*Coussapoa Ruizii* Klotzsch. Medium-sized tree, with smooth, gray, lactescent bark, large, heavy, ovate, entire, conspicuously nerved leaves that are green above and whitish beneath, flowers in small heads, developing to a fleshy fruit. Wood reddish, moderately hard and heavy, rather coarse-textured, not highly durable. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno. (No. 15; Yale No. 3682.) (See *T. of T. A.*, pp. 143-4.)

*Ficus glabrata* H. B. K. "Amate" or "wild fig." Large tree with wide-spreading crown, common along river banks and in pastures, with smooth bark containing milky juice, fairly large, simple leaves, minute flowers borne within a fleshy receptacle which ripens into a fleshy, globose fruit. Wood gray or brownish, laminated, light, coarse-textured, perishable; not used. Many trees seen by author in northern coast region. Specimen in U. S. National Herbarium. (See *T. of T. A.*, pp. 142-3.)

*Ficus Hemsleyana* Standley. "Mato palo." Strangler fig common on trees in lowlands. Specimen in U. S. National Herbarium.

*Ficus panamensis* Standley. Specimen in U. S. National Herbarium.

*Pourouma aspera* Trécul. Ditto.

*Sahagunia urophylla* Donn. Smith. Ditto, from Puerto Sierra.

*Trophis racemosa* (L.) Urban. "Ramón" (?). Small or medium-sized tree, with smooth, greenish-gray bark, slender twigs, green, entire, oblong leaves (1" to 2" wide and up to 6" long), minute flowers in slender racemes, small, round fruit with large seed and thin flesh. Source of fodder for cattle. Wood yellowish brown (in specimen), hard, heavy, tough, and strong, straight-grained, medium-textured; parenchyma in numerous, irregular, tangential lines. Collected by Record & Kuylen at Agua Blanca, Progreso District. (No. 40; Yale No. 9986.)

#### MORINGACEAE

*Moringa oleifera* Lam. ("Horse-radish tree.") Specimen in U. S. National Herbarium. Small African and East Indian tree, cultivated and naturalized.

#### MYRISTICACEAE (Nutmeg Family)

*Compsonura Sprucei* (A. DC.) Warb. "Sangre." Small tree, with smooth, brownish bark containing a red sap; leaves large (up to 2" x 8"), oblong, bright green, smooth; flowers very small, in panicles; fruit smooth, brown, about 1/2" x 1", the woody shell inclosing a large, speckled seed. Wood yellowish brown (in specimen), rather hard, not very heavy, straight-grained, even-textured, not durable; pores very small, mostly paired; parenchyma apparently terminal. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno. (No. 16; Yale No. 3683.)

*Viola merendonis* Pittier. "Sangre." ("Banak" of British Honduras.) Very tall tree, with well-formed, smooth trunk covered with brown bark containing a red sap; crown with few, coarse, horizontal branches; leaves large, rusty pubescent below; flowers small, yellowish, racemose; fruits rounded, having a woody husk and a nut-like seed with a bright-red web indenting it. Wood brownish, becoming dark red upon exposure, suggesting mahogany, straight-grained, easy to work, medium-textured, not resistant to decay or insects. Imported into United States from British Honduras for plywood; may prove satisfactory for storage battery separators. Many trees seen by author in northern Honduras. Collected by Whitford & Stadtmiller at elevation of 400 feet near Rodezno. (No. 12; Yale No. 3679.) (See *Tropical Woods* 4: 12-13, Dec. 1, 1925.)

## MYRSINACEAE

*Ardisia compressa* H. B. K. "Cucuyul." Small tree, with rather large (up to 2" x 7"), alternate, entire leaves, small, white flowers in terminal panicles, and small, dark-colored berries. Wood reddish-brown, oak-like, hard and heavy, medium-textured; pores very small, not crowded; rays conspicuous. Collected by Record & Kuylen in lower Black River Valley. (No. 70; Yale No. 10,016.)

*Ardisia paschalis* Donn. Smith. Specimen in U. S. National Herbarium from San Pedro Sula.

*Parathesis* spp. (Called "chimiche" and "machador" in eastern Guatemala.) Small trees similar to preceding. Wood rather soft to moderately hard, oak-like in appearance, easily worked; conspicuous figure on radial surface. Suitable for furniture. Several trees seen by author, but not collected. Wood sample: Yale No. 251 ("fuyugal"?) from Concordia.

## MYRTACEAE (Myrtle Family)

*Calyptanthus bullata* DC. Specimen in U. S. National Museum.

*Eugenia guatemalensis* Donn. Smith. "Fierillo." Small tree, with opposite, elliptical leaves ( $\frac{3}{4}$ " to 2" x  $1\frac{1}{2}$ " to  $3\frac{1}{2}$ " ), green above and whitish below; small flowers in racemes; fruit  $\frac{1}{2}$ " long, dark red or black, one-seeded. Wood pale purplish-brown, very hard, heavy, tough, and strong, fine-textured, not durable. Not used. Collected by Record & Kuylen near Olanchito. (No. 55; Yale No. 10,001.) (See *T. of T. A.*, pp. 479-482.)

## NYCTAGINACEAE

*Neea psychotrioides* Donn. Smith. Specimen in U. S. National Herbarium from San Pedro Sula. Slender shrub, with opposite or whorled, oblong leaves, and coarse-textured wood containing strands of soft bast.

*Pisonia aculeata* L. Specimen ditto, but locality not specified. Densely branched shrub, often with thick trunk, and long, drooping, spiny branches, and small opposite leaves. Wood very coarse-textured, containing strands of soft bast.

## OLACACEAE

*Schoepfia Schreberi* Gmel. "Sombra de armado." Small tree; bark grayish-brown outside and black within; slender twigs, with small, alternate, elliptical leaves, having dense clusters of small flowers in their axils. Wood yellow or yellow-brown, lustrous, rather hard and heavy, fine-textured; pores very small and connected tangentially by irregular parenchyma lines, the cells of which are storied. Collected by Record & Kuylen near Olanchito. (No. 58; Yale No. 10,004.)

*Ximenia americana* L. "Chocomico" and "manzanilla." Specimen in U. S. National Herbarium from Amapala. Spiny shrub or small tree, with edible, plum-like fruits.

## PHYTOLACCACEAE (Pokeweed Family)

*Achatocarpus nigricans* Triana. Specimen in U. S. National Herbarium, locality not specified.

## PINACEAE (Pine Family)

*Abies religiosa* (H. B. K.) Schl. & Cham. "Pino." A fir tree growing in the high mountains, at the limit of its southern range. Wood brownish, light, moderately hard, fine-textured, non-resinous; has distinct growth rings; resin ducts, resin cells, and ray tracheids absent. Known only from wood sample, No. 216, from San Sebastian, Gracias.

*Cupressus Benthamii* Endl. "Ciprés." Evergreen tree resembling the red cedar (*Juniperus virginiana* L.) of eastern United States, but with cones opening when ripe and shedding the small, winged seeds. Grows in the interior highlands. Wood pale brown, fragrantly scented, light, soft, very fine-textured, easy to work, finishes very smoothly, is durable. Wood sample, No. 121 (Tegucigalpa).

*Pinus caribæa* Morelet. "Ocote," "pino ocote," and "pino veta." ("Cuban pine" of Southern Florida.) Large tree, very common throughout Honduras, mostly on uplands and in the mountains; leaves long, stiff, and in clusters of 3 each; cones 2" to 3" long. Wood variable from moderately hard and heavy and poor in resin to very dense and resinous, resembling longleaf yellow pine of the United States; growth rings distinct, variable from very narrow to broad. Wood used locally for carpentry work and interior construction. Collected by Record & Kuylen near Olanchito. Also wood specimens, Nos. 75 (Tegucigalpa), 123 (La Paz), 248 (Olancho), and misc.

*Pinus oöcarpa* Schiede. "Ocote" and "pino blanco." Medium-sized or large tree, with coarse branches and long leaves (up to 12"), which are usually in clusters of 5, sometimes 3 or 4. Wood pale yellowish, rather light and soft, not highly resinous; resin ducts very conspicuous on longitudinal surface; transition from early to late wood of growth rings gradual. Collected by Whitford & Stadtmiller at elevation of 2500 feet near Macuelizo (No. 54; Yale No. 3715), and at elevation of 1800 feet near Florida (No. 76; Yale No. 3735).

*Pinus Pseudostrobus* Lindl. Specimen in U. S. National Herbarium, locality not specified. Leaves in clusters of 5, long and pendent; cones with weak prickles and not persistent on tree.

## POLYGONACEAE (Buckwheat Family)

*Coccoloba acuminata* H. B. K. "Rabo de león" and "tapatamal." Small tree, with elliptical, pointed, alternate leaves, very small flowers in little clusters on long terminal spikes, the fruits small and 3-cornered. Wood pinkish brown; not very hard and heavy, fine-textured; pores very small and scattered. Collected by Record & Kuylen in lowlands near Progreso. (No. 44; Yale No. 9990.)

*Coccoloba barbadensis* Jacq. Specimen in U. S. National Herbarium.

*Coccoloba caracasana* Meisn. Ditto, from Puerto Cortés.

*Coccoloba floribunda* (Benth.) Lindau. Ditto, locality not specified.

*Coccoloba uvifera* (L.) Jacq. "Uva" or "uva de la playa"; also "papaturo extranjero," according to Mr. Landa. ("Sea-grape" of Florida and British West Indies.) Small tree or a shrub, in coastal thickets, with very thick, large, rounded, red-veined leaves, white flowers and purple fruits in dense, heavy racemes. Wood red or reddish brown, hard, heavy, fine-textured. Common plant along north coast, for example, between Cuyamel and Omoa. (See *T. of T. A.*, pp. 151-3.)

*Coccoloba Browniana* Standley, sp. nov. (See p. 4.) "Tolondrón." Small tree, with smooth, heart-shaped leaves on lateral spurs, and racemes of dark red, plum-like fruits. Wood reddish brown, hard and heavy, straight-grained, fine-textured; pores small and scattered. Collected by Record & Kuylen near Olanchito. (No. 54; Yale No. 10,000.)

*Neomillspaughia paniculata* (Donn. Smith) Blake. "Amarro jabón." Small tree, with very large, thin, slightly velvety leaves, deeply notched at both ends; fruits small, brown, dry, 3-winged, in large terminal panicles suggesting "sorrel dock" (*Rumex*). Wood pinkish (in specimen), moderately heavy, hard, strong, straight-grained, fine-textured, not durable; pores minute, in short radial rows. Collected by Record & Kuylen near Aguan River, Maloa District.

## RHAMNACEAE (Buckthorn Family)

*Karwinskia Calderoni* Standley. Specimen in U. S. National Herbarium from Amapala.

## RHIZOPHORACEAE (Mangrove Family)

*Rhizophora Mangle* L. "Mangle," "mangle colorado," and "mangrove." Medium-sized tree, forming dense forests or thickets near brackish water along both coasts, with arching prop roots forming impenetrable tangles. Bark very rich in tannin. Wood red or reddish brown, very hard, heavy, and strong, fine-textured, durable. Used for fuel and construction purposes. (See *T. of T. A.*, pp. 472-4.)

## RUBIACEAE (Madder Family)

*Alibertia edulis* (L. Rich.) A. Rich. Specimen in U. S. National Herbarium from Ceiba.

*Calderonia salvadorensis* Standley. "Brasil." Known only from wood specimens which are similar to those from Salvador. Wood bright pink, yellow on the surface, hard, heavy, fine-textured, easy to work, takes a high polish. Yale Nos. 195 (Sensenti, Copán), 258 (Camasca, Intibucá). (See *T. of T. A.*, p. 552.)

*Calycophyllum candidissimum* (Vahl) DC. "Madroño" and "salamo." Slender, medium-sized tree, with reddish gray, shreddy bark, and large, terminal clusters of showy, white flowers. Common on hillsides and very conspicuous when in bloom (February). Wood yellowish brown, hard, heavy, tough, and strong, fine-textured, straight-grained, takes a high polish, not durable. Used for fuel and in form of poles for construction of huts. Wood of this species from West Indies well-known in the trade as "degame," "degamme," and "lemonwood"; used principally for archery bows and fishing rods. Many trees seen by author but not collected in Honduras, abundant in foothills near Olanchito. (No. 95; Yale No. 10,046, Finca Santa Inés, Guatemala.) Honduras wood specimens as follows: 5A, 56, and 84 (Choluteca), 15 and 185 (Olanchito). (See *T. of T. A.*, pp. 547-8.)

*Genipa americana* L. "Jagua." Medium-sized to rather large tree, with large, opposite leaves, yellowish white flowers, and brownish fruit having a leathery skin, scant, tart pulp, and containing a juice that stains blackish violet. Wood pale brownish, sometimes with bluish stain, hard, heavy, tough and strong, fine-textured, takes a high polish, is not durable. Used for tool handles, implements, etc. Wood samples: Yale Nos. 76 (La Paz), 296 (Olanchito). (See *T. of T. A.*, pp. 549-550.)

*Genipa americana* L. var. *Caruto* (H. B. K.) Schum., a form of the preceding distinguished by its copious pubescence, presumably occurs in Honduras as it was collected by Record & Kuylen in the uplands of Guatemala near Santa Inés (No. 133; Yale No. 10,084), where it is known as "irayol" or "irayol de loma." The wood is tawny white, takes a high polish, and is used for articles of turnery and cabinet work.

*Hamelia erecta* Jacq. "Coral" or "coralillo." (Called "Clavito" in Eastern Guatemala.) Shrub or small tree, very common in lowlands of north coast region, with conspicuous, terminal clusters of bright red flowers, and small red fruits. Wood orange-brown, of medium density and hardness, fine-textured, easy to cut, not durable. Collected by Record & Kuylen near Cuyamel. (No. 5; Yale No. 9951.)

*Hamelia Rovirosae* Wernh. "Clavillo." Small tree or a shrub, with thin, opposite leaves tapered at both ends, and clusters of red flowers. Wood deep orange, rather light, fairly hard, fine-textured. Collected by Record & Kuylen in lowlands near Progreso. (No. 41; Yale No. 9987.)

*Isertia Haenkeana* DC. Small tree or a shrub, with large, opposite, oblong leaves having prominent parallel veinlets, large, terminal, showy panicles of small orange-red flowers and purplish fruits. Wood brownish, with pink streak (in specimen), of medium density and weight, fine-textured; pith large and white. Collected by Record & Kuylen along railroad midway between Black River and Corocito. (No. 74; Yale No. 10,020.)

*Posoqueria latifolia* (Lam.) Roem. & Schl. Specimen in U. S. National Herbarium from San Pedro Sula. (See *Tropical Woods* 5: 10, March 1, 1926.)

*Randia armata* (Swartz) DC. "Jazmín cimarrón." Small tree. Specimen in herbarium of New York Botanical Garden.

*Rondeletia Deamii* (Donn. Smith) Standley. "Candelillo." Small tree or a shrub, with fine, many-branched twigs, small, opposite leaves, inconspicuous flowers in clusters of 3, the fruits little, globular capsules. Wood brownish, hard, heavy, and very fine-textured. Collected by Record & Kuylen near Olanchito. (No. 57; Yale No. 10,003.)

#### RUTACEAE (Satinwood Family)

*Amyris elemifera* L. "Chillo," "pimienta," and "taray" (?). ("Torchwood" of Florida.) Small tree, with opposite, compound leaves having 3 small leaflets; flowers small, white, clustered; fruit fleshy, bluish black. Wood yellowish brown, more or less streaked, rather oily, hard, heavy, very fine-textured, takes a glossy finish. Collected by Record & Kuylen near Olanchito. (No. 65; Yale No. 10,011.) Also two wood specimens: Yale Nos. 219 (Paraiso), 270 (Comayagua).

*Casimiroa tetrameria* Millsp. "Matasano." Specimen in U. S. National Herbarium from Cortés.

*Decazyx macrophyllus* Pitt. & Blake. Ditto from Dept. of Copán.

*Zanthoxylum Fagara* (L.) Sarg. "Chincho." Small tree, with slender twigs armed with curved prickles, pinnate leaves having 5 to 7 small leaflets and broadly winged petioles, and very small flowers in short, 4-rowed axillary spikes. Wood yellowish brown, moderately hard and heavy, fine-textured, takes high polish; pores minute; parenchyma sparingly developed. Collected by Record & Kuylen near Olanchito. (No. 62; Yale No. 10,008.)

*Zanthoxylum Kellermanii* P. Wils. "Lagarto amarillo." ("Prickly yellow" of British Honduras.) Large tree, with thick, usually prickly bark, pinnate leaves having several pairs of large, elliptical leaflets; flowers in panicles; fruit a small capsule containing a single glossy black seed. Wood yellowish, of moderate density, very coarse-textured; parenchyma abundantly developed. Collected by Record & Kuylen at Cuyamel. (No. 26; Yale No. 9972.) Also Yale Nos. 8895, 8928, eastern Guatemala.

#### SALICACEAE (Willow Family)

*Salix chilensis* Molino (= *S. Humboldtiana* Willd.) "Sauce." This willow tree is common along streams in northern Honduras. It has a thick, furrowed bark, slender, pendulous twigs, and slender, pointed leaves. Wood brown, light, firm, coarse-textured, perishable. Many trees seen by author, but not collected.

#### SAPINDACEAE (Soapberry Family)

*Matayba glaberrima* Radlk. "Carbón." Medium-sized tree, with alternate, pinnate leaves having large, elliptical leaflets, and large panicles of small flowers; fruit a 3-angled, blackish capsule. Wood brown, rather hard and heavy, fine-textured, not durable; pores small and scattered; parenchyma not visible. Collected by Record & Kuylen near Agua Blanca, Progreso District. (No. 37; Yale No. 9983.)

*Sapindus Saponaria* L. (Called "jaboncillo" in Nicaragua and Costa Rica and "soapberry" in Florida.) Medium-sized tree, with pale green pinnate leaves having few to many, rather large leaflets, very small, whitish flowers in large, terminal panicles, and yellow, one-seeded berries. Wood yellow or brown, hard, heavy, coarse-textured, not durable; pores rather large, scattered; parenchyma abundantly developed in tangential bands. Collected by Record & Kuylen near Aguan River, Maloa District. (No. 51; Yale No. 9997.)

#### SAPOTACEAE (Sapodilla Family)

*Achras Chicle* Pittier (probably). "Zapotillo." Tall tree of the interior uplands, with smooth, elliptical, feather-veined, leathery leaves, clusters of white flowers, and rather large, edible fruits. The bark yields a sticky, white latex similar to that of the true "chicle tree," *Achras Zapota* L. Known in Honduras only from wood samples: Yale Nos. 57 (La Paz), 164 and 208 (Comayagua), 220, 225, and 255 (western Olanchito).

#### SIMARUBACEAE (Bitterwood Family)

*Alvaradoa amorphoides* Liebm. "Zorra." Small or medium-sized tree, with long, pinnate leaves having many small, narrowly oblong leaflets, long racemes of small flowers, and very drooping racemes of purplish-yellow, chaff-like fruits; highly ornamental. Wood brown, of medium density, hard, rather fine-textured; pores small, in irregular tangential lines or chains; parenchyma in numerous concentric lines. Collected by Record & Kuylen in village of Agua Blanca, Progreso Dist. (No. 32; Yale No. 9978.) Specimen in U. S. National Herbarium from Amapala.

*Picramnia Bondplandiana* Tul. (?). Specimen in U. S. National Herbarium from San Pedro Sula.

*Simaruba glauca* DC. "Aceituno" and "negrito." ("Bitterwood" of southern Florida.) Medium-sized to large tree, with large, pinnate leaves having many, rather large, leathery leaflets that are pale on underside and glossy green above; flowers small, greenish, in large, rather loose panicles; fruits fleshy, red or dark purple. Wood yellowish white, very bitter, light, firm, straight-grained, very easy to work, holds its place when manufactured, is not durable. Similar to the "marupá" of the Lower Amazon. Tree known in Honduras from wood samples only; Yale Nos. 24 (Comayagua), 91 (La Paz).

#### SOLANACEAE (Potato Family)

*Cestrum nocturnum* L. "Huele de noche." Specimen in U. S. National Herbarium from Santa Barbara.

*Cestrum panamense* Standl. "Huele de noche." Small tree, with alternate, long-pointed, rather large leaves, flowers with a long tube and 5 spreading lobes; fruits are small berries in terminal or axillary clusters. Flowers fragrant, especially at night. Wood white (in specimen), rather light, firm, coarse-textured, perishable; pores in short radial groups; parenchyma not

visible. Collected by Record & Kuylen near Cuyamel. (No. 7; Yale No. 9953.)

*Cestrum vespertinum* L. Specimen in U. S. National Herbarium from San Pedro Sula.

*Solanum umbellatum* Mill. "Friga-plato." Small tree or a shrub, with rather large, opposite leaves, tapering at each end, very rough above and fuzzy beneath; flowers in densely pubescent cymes; fruit small, yellow berries. Wood white (in specimen), rather light, firm, medium-textured; pores small, scattered. Collected by Record & Kuylen near Cuyamel. (No. 15; Yale No. 9961.)

#### STERCULIACEAE (Cacao Family)

*Guazuma ulmifolia* Lam. "Guácimo" and "caulote." ("Bay cedar" of British Honduras.) Medium-sized tree, with alternate, finely toothed, ovate leaves, oblique at the base; small, yellowish green flowers in axillary cymes, and fruits that are round, woody, many-seeded, warty capsules. Wood pinkish, fairly light, firm, tough, rather coarse-textured, perishable. Many trees seen by author in northern Honduras, but not collected. Specimen in U. S. National Herbarium from Choluleca. (See *T. of T. A.*, pp. 428-9.)

*Helicteres guazumaefolia* H. B. K. Shrub with slender, tubular, salmon-red flowers and spirally-twisted pods. Specimen in U. S. National Herbarium from San Pedro Sula.

*Theobroma cacao* L. "Cacao." Small tree, growing wild and in plantations. Too well known to need description. (See *T. of T. A.*, p. 428.)

#### TAXACEAE

*Podocarpus coriaceus* Rich. "Cedro" (?) and "chilca" (?). Medium-sized to rather large, evergreen tree of the uplands, with narrow, long-pointed, leathery leaves, quite distinct in appearance from most other conifers. Wood brown, not fragrant, rather heavy, firm, very fine-textured, easy to work, finishes smoothly, is fairly durable. Wood sample, Yale No. 127 (La Paz).

#### THEACEAE (Tea Family)

*Ternstroemia tepezapote* Schl. & Cham. Small tree. Specimen in U. S. National Herbarium from San Pedro Sula.

#### THEOPHRASTACEAE

*Jacquinia aurantiaca* Ait. (Called "luruche" in eastern Guatemala.) Small tree or a shrub, with small, oblong, hard, spiny-tipped leaves, orange-colored flowers in small clusters, and hard fruits having the appearance of little oranges. Crushed fruits used for stupefying fish. Wood yellow, hard, heavy, rather fine-textured; pores very small, clustered or in radial arrangement; rays very coarse. (Yale No. 10,069, collected by Record & Kuylen near Gualán, Guatemala.) Specimen in U. S. National Herbarium from Amapala, Honduras. (This genus is sometimes included with the Myrsinaceae. See *T. of T. A.*, p. 486.)

#### TILIACEAE (Linden Family)

*Belotia campbellii* Sprague. "Sirín de paloma." ("White moho" of British Honduras.) Small tree, with alternate, elliptical, sharp-pointed leaves having 3 prominent nerves arising at the base and whitish on underside, white flowers in terminal panicles, fruit a small capsule. Wood brownish, very light and soft, medium-textured, perishable; irregular ripple marks visible without lens. Bark fibrous. Collected by Record & Kuylen near Cuyamel. (No. 9; Yale No. 9955.)

*Heliocarpus appendiculatus* Turcz. "Majao" and "mecate de agua." Medium-sized tree, with large, heart-shaped, finely toothed leaves having rusty petioles, small flowers in conspicuous terminal sprays, and small fruits with fringe of radiating hairs. Wood gray or brownish, exceedingly light and soft, stringy, coarse-textured, perishable; ripple marks visible without lens. Inner bark used for tying dried tobacco. Collected by Record & Kuylen near Cuyamel. (No. 12; Yale No. 9958.)

*Heliocarpus donnell-smithii* Rose. "Majao." ("Yellow moho" of British Honduras.) Medium-sized tree, very common on uplands and hillsides of north coast region. Similar to preceding. (See *Tropical Woods* 7: 26, Sept. 1, 1926.)

*Heliocarpus glanduliferus* Rob. "Majao blanco." Small or medium-sized tree, similar to preceding, with velvety leaves, varying from heart-shaped to long and slender. Wood brownish, light, but firm, coarse-textured, perishable. Collected by Record & Kuylen along coast near Cuyamel. (No. 25; Yale No. 9971.)

*Luehea candida* (DC.) Mart. "Caulote blanco." Medium-sized tree, with large, alternate, oval leaves, rusty velvety beneath, and clusters of long-stalked, 5-ribbed, hairy, woody fruits (up to 2½" long and 1¼" in diameter). Wood yellowish or pinkish brown, rather hard, heavy, tough, and strong, fine-textured, not durable; ripple marks present. Collected by Record & Kuylen near Olanchito. (No. 56; Yale No. 10,002.)

*Luehea seemanii* Tr. & Pl. "Guácimo colorado." (Called "tapasquit" in eastern Guatemala and "cotonrón" in Salvador.) Large tree, with irregular, high-buttressed trunk, common in dense lowland forest. Many of the trees seen by author but not collected. Specimen in herbarium of New York Botanical Garden. (See *T. of T. A.*, pp. 407-8.)

#### ULMACEAE (Elm Family)

*Celtis iguanaea* (Jacq.) Sarg. Specimen in U. S. National Herbarium.

*Trema micrantha* (L.) Blume. "Capulín negro." Small tree, with pliable twigs, alternate, 3-nerved, long-pointed leaves, axillary clusters of very small, greenish white flowers, and small, globose, green or reddish fruits. Wood pinkish, light, firm, straight-grained, medium-textured, perishable. Collected by Record & Kuylen at elevation of 2000 feet near Progreso. (No. 31; Yale No. 9977.)

## URTICACEAE (Nettle Family)

*Myriocarpa obovata* Donn. Smith. Small tree, with rather large, alternate, 3-nerved, finely-granular leaves, very small, greenish flowers in long-stalked, finely-divided sprays, and tiny nutlet fruits. Wood grayish brown, light, fibrous, very coarse-textured, due to strands of soft bast, perishable; similar to wood of the Nyctaginaceae. Collected by Record & Kuylen at elevation of 2000 feet near Progreso. (No. 28; Yale No. 9974.)

*Myriocarpa yzabalensis* (Donn. Smith) Killip. "Chichicastillo." Small tree, with very large, alternate, harsh and hairy leaves, and clusters of long, slender threads of little, white, globular flowers, suggesting strings of tiny beads. Wood brown, moderately hard and heavy, very coarse-textured, due to numerous strands of soft bast; perishable. Collected by Record & Kuylen in swamp land near Cuyamel. (No. 11; Yale No. 9957.)

*Urera caracasana* Gris. Specimen in U. S. National Herbarium from San Pedro Sula.

*Urera elata* Gris. Ditto from Puerto Cortés.

## VERBENACEAE (Teak Family)

*Aegiphila elata* Swartz. Specimen in U. S. National Herbarium from San Pedro Sula.

*Aegiphila fasciculata* Donn. Smith. Small tree or a shrub, with very large, elliptical, opposite leaves, clusters of small, white flowers springing from older parts of the plants, and fleshy fruits having a cup-like calyx. Wood pinkish gray, very light and soft, medium-textured, perishable. Pith of young stems large and square or rectangular. Collected by Record & Kuylen near Cuyamel. (No. 19; Yale No. 9965.)

*Avicennia nitida* Jacq. "Palo de sal." ("Black mangrove" of Florida.) Small to medium-sized tree of the mangrove swamps along both coasts, with thin, dark brown bark, opposite, leathery leaves that are smooth and green above and whitish beneath, flowers white, in small heads, fruit a 2-valved capsule. Wood dark brown, very hard, heavy, laminated with layers of soft bast.

*Cornutia grandifolia* (Schl. & Cham.) Schauer. "Zopilote." Small tree, with large, tawny, velvety leaves, pointed at both ends, terminal clusters of small white flowers, and small, round, fleshy fruits. Wood brownish, fairly heavy and hard, coarse-textured, with harsh feel, not durable; rays very distinct. Collected by Record & Kuylen near Cuyamel. (No. 6; Yale No. 9952.)

*Vitex* spp. Two or three species undoubtedly occur in northern hardwood region, as they are found just across the line in Guatemala where they are known as "barbás" and "rajate bien." They are medium-sized to large trees, with opposite, palmately compound leaves having 3 or 5 leaflets. Wood yellowish or brown, moderately hard and heavy, medium-textured, easy to work, and suitable for general carpentry. (See *Tropical Woods* 7: 26, Sept. 1, 1926, *T. of T. A.*, pp. 526-7.)

## ZYGOPHYLLACEAE

*Guaiacum* sp. "Guayacán." ("Lignum-vitae" of the trade.) Small or medium-sized, thick-boled tree, occurring on the west coast. Leaves opposite, pinnate; flowers blue or purple; fruit an angled capsule. Wood brown or olive, becoming dark green upon exposure, fragrantly scented, has waxy appearance and feel, is exceedingly hard and heavy, very fine-textured, has interlocked grain, highly durable. Principal commercial use is for bearings of propeller shafts in steamships. Wood specimen No. 297; also unnumbered sample collected by W. D. Durland. (See *T. of T. A.*, pp. 313-6.)

## CHECK LIST OF COMMON NAMES

Aceituno	<i>Simaruba glauca</i> DC.	Simarubaceae
Achiote	<i>Bixa Orellana</i> L.	Bixaceae
Agajo	<i>Adelia triloba</i> (Muell.) Hemsl.	Euphorbiaceae
Aguacatillo	<i>Persea amplifolia</i> Mez. & D. Sm.	Lauraceae
Aguacatillo	<i>Pboebe ambigens</i> Blake	Lauraceae
Algarroba	<i>Prosopis chilensis</i> (Molina) Stuntz	Leguminosae
Almendro	<i>Andira inermis</i> H. B. K.	Leguminosae
Almendro	<i>Terminalia obovata</i> (R. & P.) Eichl.	Combretaceae
Amargoso	<i>Andira</i> sp.	Leguminosae
Amarro jabón	<i>Neomillspaughia panicu- lata</i> (Donn. Smith) Blake	Polygonaceae
Amate	<i>Ficus glabrata</i> H. B. K.	Moraceae
Anona de redecilla	<i>Anona reticulata</i> L.	Anonaceae
Azaharillo	<i>Capparis</i> sp.	Capparidaceae
Balsa	<i>Ocroma</i> spp.	Bombacaceae
Bálsamo	<i>Toluifera Pereirae</i> (Kl.) Baill.	Leguminosae
Barenillo	<i>Croton glabellus</i> L.	Euphorbiaceae
Barre-horno	<i>Trichilia bavanensis</i> Jacq.	Meliaceae
Bejuco negro	<i>Cordia ferruginea</i> R. & S.	Borraginaceae
Bisqueite	<i>Acacia paniculata</i> Willd.	Leguminosae
Brasil	<i>Calderonia salvadorensis</i> Standley	Rubiaceae
Brasil	<i>Haematoxylon</i> sp.	Leguminosae
Bullhorn acacia	<i>Acacia Hindsii</i> Benth.	Leguminosae
Cacagua	<i>Gliricidia sepium</i> (Jacq.) Steud.	Leguminosae
Cacao	<i>Theobroma cacao</i> L.	Sterculiaceae
Cachito de aroma	<i>Acacia Farnesiana</i> (L.) Willd.	Leguminosae
Calabash tree	<i>Crescentia Cujete</i> L.	Bignoniaceae



Candelillo	<i>Cassia spectabilis</i> DC.	Leguminosae
Candelillo	<i>Rondeletia Deamii</i> (Donn. Smith) Standl.	Rubiaceae
Canelito	<i>Alchornea latifolia</i> Swartz.	Euphorbiaceae
Caoba	<i>Swietenia macrophylla</i> King.	Meliaceae
Capiroto	<i>Conostegia xalapensis</i> (Bonpl.) D. Don	Melastomaceae
Capulín negro	<i>Trema micrantha</i> (L.) Blume	Ulmaceae
Carao	<i>Cassia grandis</i> L.	Leguminosae
Carbón	<i>Guarea longipetiolata</i> C. DC.	Meliaceae
Carbón	<i>Matayba glaberrima</i> Radlk.	Sapindaceae
Casco de venado	<i>Bauhinia divaricata</i> L.	Leguminosae
Caulote	<i>Guazuma ulmifolia</i> Lam.	Sterculiaceae
Caulote blanco	<i>Luebea candida</i> (DC.) Mart.	Tiliaceae
Cedro	<i>Cedrela</i> spp.	Meliaceae
Cedro (?)	<i>Podocarpus coriaceus</i> Rich.	Taxaceae
Cedro espino	<i>Bombacopsis Fendleri</i> (Seem.) Pittier	Bombacaceae
Cedro negro	<i>Juglans</i> sp.	Juglandaceae
Ceiba	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae
Cera vegetal	<i>Lacistema aggregatum</i> (Berg.) Rusby	Lacistemaceae
Chachalaco	<i>Cordia diversifolia</i> Pavón	Borraginaceae
Chanchito de flores blancas	<i>Tabernaemontana citrifolia</i> L.	Apocynaceae
Chaparro	<i>Curatella americana</i> L.	Dilleniaceae
Chapel	<i>Lonchocarpus guatemalensis</i> Benth.	Leguminosae
Chichicaste	<i>Wigandia caracasana</i> H. B. K.	Hydrophyllaceae
Chichicastillo	<i>Myriocarpa yzabalensis</i> (Donn. Smith) Killip	Urticaceae
Chichipate	<i>Sweetia panamensis</i> Benth.	Leguminosae
Chilca (?)	<i>Podocarpus coriaceus</i> Rich.	Taxaceae
Chilillo	<i>Amyris elemifera</i> L.	Rutaceae
China berry	<i>Melia Azederach</i> L.	Meliaceae
Chinacahuite	<i>Bursera gummifera</i> L.	Burseraceae
Chincho	<i>Zanthoxylum Fagara</i> (L.) Sarg.	Rutaceae
Chino	<i>Bursera gummifera</i> L.	Burseraceae
Chocomico	<i>Ximenia americana</i> L.	Olacaceae
Cincho	<i>Lonchocarpus latifolius</i> H. B. K.?	Leguminosae
Ciprés	<i>Cupressus Benthamii</i> Endl.	Pinaceae

Ciruelillo	<i>Astronium graveolens</i> Jacq.	Anacardiaceae
Cirucllo	<i>Spondias</i> spp.	Anacardiaceae
Clavillo	<i>Hamelia Rovirosae</i> Wernham	Rubiaceae
Cocobolo	<i>Dalbergia</i> aff. <i>lineata</i> Pittier	Leguminosae
Cojón de mico	<i>Tabernaemontana</i> spp.	Apocynaceae
Coloradillo	<i>Grislea secunda</i> Loeff.	Lythraceae
Comayagua	<i>Cassia biflora</i> L.	Leguminosae
Comida de culebra	<i>Casearia nitida</i> (L.) Jacq.	Flacourtiaceae
Con (?)	<i>Perymenium strigillosum</i> (R. & G.) Greenm.	Compositae
Copal	<i>Protium (Icica)</i> spp.	Burseraceae
Copón	<i>Bursera gummifera</i> L.	Burseraceae
Coral	<i>Hamelia erecta</i> Jacq.	Rubiaceae
Coralillo	<i>Hamelia erecta</i> Jacq.	Rubiaceae
Cortés	<i>Tecoma chrysantha</i> DC.	Bignoniaceae
Costilla de danto	<i>Acalypha diversifolia</i> Jacq.	Euphorbiaceae
Cotton tree	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae
Cow-ee	<i>Pterocarpus belizensis</i> Standley	Leguminosae
Cuajinicuil	<i>Inga</i> spp.	Leguminosae
Cucuyul	<i>Ardisia compressa</i> H. B. K.	Myrsinaceae
Encino; encino negro	<i>Quercus</i> spp.	Fagaceae
Escambrón	<i>Adelia triloba</i> (Muell.) Hemsl.	Euphorbiaceae
Espino blanco	<i>Acacia glomerata</i> Benth.	Leguminosae
Espino de playa	<i>Acacia macracantha</i> H. & B.	Leguminosae
Fierrillo	<i>Eugenia guatemalensis</i> Donn. Smith	Myrtaceae
Fig, wild	<i>Ficus glabrata</i> H. B. K.	Moraceae
Fontolo	<i>Protium (Icica)</i> spp.	Burseraceae
Friega-plato	<i>Solanum umbellatum</i> Mill.	Solanaceae
Frotón	<i>Protium (Icica)</i> spp.	Burseraceae
Fustic	<i>Chlorophora tinctoria</i> (L.) Gaud.	Moraceae
Granadillo	<i>Dalbergia</i> aff. <i>lineata</i> Pittier	Leguminosae
Granadillo	<i>Dalbergia</i> sp.	Leguminosae
Granadillo (?)	<i>Platymiscium</i> sp.	Leguminosae
Guacamayo	<i>Andira</i> sp.	Leguminosae
Guacamayo	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Leguminosae
Guachipilín	<i>Diphysa</i> sp.	Leguminosae
Guácimo	<i>Guazuma ulmifolia</i> Lam.	Sterculiaceae
Guácimo colorado	<i>Luebea Seemanii</i> Tr. & Pl.	Tiliaceae
Guamo	<i>Inga</i> spp.	Leguminosae

Guanacaste	<i>Enterolobium cyclocarpum</i> (Jacq.) Gris.	Leguminosae
Guapinol	<i>Hymenaea Courbaril</i> L.	Leguminosae
Guarumo	<i>Cecropia asperrima</i> Pittier	Moraceae
Guatuso	<i>Hasseltia mexicana</i> (Gray) Standl.	Flacourtiaceae
Guayabo	<i>Terminalia obovata</i> (R. & P.) Eichl.	Combretaceae
Guayabo de montaña	<i>Chloroleucum guatemalense</i> Britt. & Rose	Leguminosae
Guayacán	<i>Guaiacum</i> sp.	Zygophyllaceae
Guilique	<i>Erythrina glauca</i> Willd.	Leguminosae
Hog plum	<i>Spondias</i> spp.	Anacardiaceae
Hoja tamal	<i>Hernandia guianensis</i> Aubl.	Hernandiaceae
Hormigo	<i>Platymiscium</i> sp.	Leguminosae
Horse-radish tree	<i>Moringa oleifera</i> Lam.	Moringaceae
Huele de noche	<i>Cestrum</i> spp.	Solanaceae
Hule	<i>Castilla elastica</i> Cerv.	Moraceae
Indio desnudo	<i>Bursera gummifera</i> L.	Burseraceae
Irayol	<i>Grias Fendleri</i> Seem.	Lecythidaceae
Ixcanal	<i>Acacia Hindsii</i> Benth.	Leguminosae
Jagua	<i>Genipa americana</i> L.	Rubiaceae
Jazmín cimarrón	<i>Randia armata</i> (Swartz) DC.	Rubiaceae
Jicarillo	<i>Coccolobium vitifolium</i> (Willd.) Spreng.	Cochlospermaceae
Jicote; jiote	<i>Bursera gummifera</i> L.	Burseraceae
Jinicuite	<i>Bursera gummifera</i> L.	Burseraceae
Jobo	<i>Spondias</i> spp.	Anacardiaceae
Jocomico (?)	<i>Protium (Icica)</i> spp.	Burseraceae
Jocote	<i>Spondias</i> spp.	Anacardiaceae
Jocote marañón	<i>Anacardium occidentale</i> L.	Anacardiaceae
Lagarto amarillo	<i>Zantboxylum Kellermanii</i> P. Wils.	Rutaceae
Laurel; l. blanco; l. negro	<i>Cordia alliodora</i> (R. & P.) Cham.	Borraginaceae
Leche amarilla	<i>Symphonia globulifera</i> L. f.	Guttiferae
Lignum-vitae	<i>Guaiacum</i> sp.	Zygophyllaceae
Limoncillo	<i>Trichilia havanensis</i> Jacq.	Meliaceae
Liquidámbar	<i>Liquidambar styraciflua</i> L.	Hamamelidaceae
Logwood	<i>Haematoxylon campechi- anum</i> L.	Leguminosae
Macuelizo	<i>Tecoma pentaphylla</i> Juss.	Bignoniaceae
Madre cacao	<i>Gliricidia sepium</i> (Jacq.) Steud.	Leguminosae
Madrial	<i>Gliricidia sepium</i> (Jacq.) Steud.	Leguminosae
Madroño	<i>Calycophyllum candidissi- mum</i> (Vahl) DC.	Leguminosae
		Rubiaceae

Mahogany	<i>Swietenia macrophylla</i> King	Meliaceae
Majagua	<i>Hibiscus tiliaceus</i> L.	Malvaceae
Majao; m. blanco	<i>Heliocarpus</i> spp.	Tiliaceae
Majao colorado	<i>Hampea stipitata</i> Wats.	Bombacaceae
Mangle; m. colorado	<i>Rhizophora Mangle</i> L.	Rhizophoraceae
Mangle blanco	<i>Laguncularia racemosa</i> (L.) Gaertn.	Combretaceae
Mangrove	<i>Rhizophora Mangle</i> L.	Rhizophoraceae
Mangrove, black	<i>Avicennia nitida</i> Jacq.	Verbenaceae
Mano de león	<i>Hernandia guianensis</i> Aubl.	Hernandiaceae
Manzanilla	<i>Ximena americana</i> L.	Oleaceae
Marañón	<i>Anacardium occidentale</i> L.	Anacardiaceae
María	<i>Calophyllum Calaba</i> Jacq.	Guttiferae
Masicarán	<i>Astronium graveolens</i> Jacq.	Anacardiaceae
Masicarán	<i>Tecoma chrysantha</i> D.C.	Bignoniaceae
Matasano	<i>Casimiroa tetrameria</i> Millsp.	Rutaceae
Mato palo	<i>Ficus Hemsleyana</i> Standley	Moraceae
Mato piojo	<i>Macbaerium latifolium</i> (Benth.) Pittier	Leguminosae
Mecate de agua	<i>Heliocarpus appendiculatus</i> Turcz.	Tiliaceae
Mora	<i>Chlorophora tinctoria</i> (L.) Gaud.	Moraceae
Morro	<i>Crescentia Cujete</i> L.	Bignoniaceae
Mulato	<i>Bursera gummifera</i> L.	Burseraceae
Nancito	<i>Byrsonima crassifolia</i> H. B. K.	Malpighiaceae
Negrilo	<i>Simaruba glauca</i> DC.	Simarubaceae
Nogal	<i>Juglans</i> sp.	Juglandaceae
Oak	<i>Quercus</i> sp.	Fagaceae
Ocote	<i>Pinus</i> spp.	Pinaceae
Olivo	<i>Capparis</i> sp.	Capparidaceae
Palanco	<i>Xylopi frutescens</i> Aubl.	Anonaceae
Paleta	<i>Dialium divaricatum</i> Vahl	Leguminosae
Palo brasil	<i>Haematoxylon</i> sp.	Leguminosae
Palo chino	<i>Bursera gummifera</i> L.	Burseraceae
Palo de agua	<i>Gilibertia stenocarpa</i> Donn. Smith	Araliaceae
Palo de María	<i>Calophyllum Calaba</i> Jacq.	Guttiferae
Palo de sal	<i>Avicennia nitida</i> Jacq.	Verbenaceae
Palo jiote	<i>Bursera gummifera</i> L.	Burseraceae
Palo negro	<i>Dalbergia aff. lineata</i> Pittier	Leguminosae
Palo obero	<i>Astronium graveolens</i> Jacq.	Anacardiaceae
Papaturo extranjero	<i>Coccoloba wifera</i> (L.) Jacq.	Polygonaceae
Papayo	<i>Carica Papaya</i> L.	Caricaceae
Paraíso	<i>Melia Azederach</i> L.	Meliaceae

		No. 10
Pela nariz	<i>Croton</i> sp.	Euphorbiaceae
Pimienta	<i>Amyris elemifera</i> L.	Rutaceae
Pino	<i>Abies religiosa</i> (H. B. K.) S. & C.	Pinaceae
Pino blanco; p. ocote; p. veta	<i>Pinus</i> spp.	Pinaceae
Pito	<i>Erythrina rubrinervia</i> H. B. K.	Leguminosae
Plum	<i>Spondias</i> spp.	Anacardiaceae
Plumajillo	<i>Sebizolobium parabybum</i> (Vell.) Blake	Leguminosae
Quebracho	<i>Tecoma cbrysantha</i> DC.	Bignoniaceae
Quebracho de cerro	<i>Diphysa</i> sp.	Leguminosae
Rabo de león	<i>Coccoloba acuminata</i> H. B. K.	Polygonaceae
Ramón (?)	<i>Tropis racemosa</i> (L.) Urb.	Moraceae
Roble	<i>Quercus</i> spp.	Fagaceae
Roble blanco	<i>Tecoma pentaphylla</i> Juss.	Bignoniaceae
Ronrón	<i>Astronium graveolens</i> Jacq.	Anacardiaceae
Rosewood	<i>Dalbergia</i> spp.	Leguminosae
Rosul	<i>Dalbergia</i> spp.	Leguminosae
Rubber tree	<i>Castilla elastica</i> Cerv.	Moraceae
Salamo	<i>Calycophyllum candidissimum</i> (Vahl) DC.	Rubiaceae
San Juan	<i>Tabebuia Donnell-Smithii</i> Rose	Bignoniaceae
Sangre	<i>Compsoeura Sprucei</i> (A. DC.) Warb.	Myristicaceae
Sangre	<i>Virola merendonis</i> Pittier	Myristicaceae
Santa María	<i>Calophyllum Calaba</i> Jacq.	Guttiferae
Santa Rosa	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Leguminosae
Sapocillo	<i>Sarauia villosa</i> DC.	Actinidiaceae
Sardinillo	<i>Tecoma stans</i> (L.) H. B. K.	Bignoniaceae
Sauce	<i>Salix chilensis</i> Molino	Salicaceae
Sirín	<i>Conostegia xalapensis</i> (Bonpl.) D. Don	Melastomaceae
Sirín	<i>Miconia argentea</i> (Swartz) DC.	Melastomaceae
Sirín de paloma	<i>Belotia Campbellii</i> Sprague	Tiliaceae
Sirinón	<i>Miconia argentea</i> (Swartz) DC.	Melastomaceae
Sombra de armado	<i>Casearia sylvestris</i> Swartz	Flacourtiaceae
Sombra de armado	<i>Schoepfia Schreberi</i> Gmel.	Olacaceae
Tamarindo; t. prieto	<i>Dialium divaricatum</i> Vahl	Leguminosae
Tambor	<i>Hernandia guianensis</i> Aubl.	Hernandiaceae
Tapatamal	<i>Coccoloba acuminata</i> H. B. K.	Polygonaceae
Taray (?)	<i>Amyris elemifera</i> L.	Rutaceae

		47
Tigüilote	<i>Cordia alba</i> (Jacq.) R. & S.	Borraginaceae
Tiñe anzuelo	<i>Eupatorium Pittieri</i> Klatt.	Compositae
Tinta	<i>Haematoxylon campechianum</i> L.	Leguminosae
Tolondrón	<i>Coccoloba Browniana</i> Standley	Polygonaceae
Ule	<i>Castilla elastica</i> Cerv.	Moraceae
Uva; u. de la playa	<i>Coccoloba uvifera</i> (L.) Jacq.	Polygonaceae
Walnut	<i>Juglans</i> sp.	Juglandaceae
Willow	<i>Salix chilensis</i> Molino	Salicaceae
Zapotillo	<i>Achras Cbicle</i> Pittier (?)	Sapotaceae
Zapotillo	<i>Couepia dodecandra</i> (DC.) Hemsl.	Amygdalaceae
Zapotillo	<i>Sarauia villosa</i> DC.	Actinidiaceae
Zapotón	<i>Pachira aquatica</i> Aubl.	Bombacaceae
Zopilote	<i>Cornutia grandifolia</i> (S. & C.) Schauer	Verbenaceae
Zorra	<i>Alvaradoa amorphoides</i> Liebm.	Simarubaceae
Zorra (?)	<i>Sebizolobium parabybum</i> (Vell.) Blake	Leguminosae

NEW TREES COLLECTED IN PANAMA BY  
GEORGE P. COOPER AND GEORGE M. SLATER

By PAUL C. STANDLEY<sup>1</sup>

Although the flora of Panama has been explored more extensively than that of most of the Central American countries, there remain large areas which have never been visited by a botanist. The region of Almirante and Bocas del Toro, an important center of banana production, is little known botanically, and no large collection of plants has ever been made there. Presumably the flora is little different from that of adjacent Atlantic Costa Rica, yet in the small collections made about Almirante there have appeared many species which have not been found in Costa Rica.

I have been greatly interested in the study of a series of 70 trees collected in the Almirante region by Messrs. George P. Cooper and George M. Slater, of the United Fruit Company,

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

for the Yale School of Forestry. Nearly all the specimens were in good condition, and their identification therefore comparatively simple. Several of the trees belong to species apparently unknown, and these are described below. One or two other trees represented only by imperfect material are probably without names. The collection is of special value because for most of the trees there are given vernacular names, many of which have not been reported previously from Panama. Two of the species here described represent genera new to the Panama flora.

*Trophis macrostachya* Donn. Smith.

This tree, described from the Atlantic slope of Costa Rica, has been collected in the Almirante region of Panama, by Cooper & Slater (No. 28; Yale No. 10,128). The only other Central American species is the widespread *T. racemosa* (L.) Urban.

*Carapa Slateri* Standl., sp. nov.

Tree; leaves equally pinnate (only the upper portion of a leaf, without petiole, seen), the rachis stout, terete, brown, bearing numerous small elevated lenticels, sparsely and minutely brownish-tomentulose; leaflets 6 pairs (perhaps more), opposite, the petiolules stout and thick, 8-10 mm. long, the blades oblong-oval to oblong, 12.5-20 cm. long, 5.5-6.5 cm. wide, rounded or very obtuse at base and subequal, sometimes slightly narrowed toward the base, broadly rounded at apex and submarginate, tipped with a short thick blunt mucro about 1 mm. long, entire or slightly undulate, coriaceous, green above, slightly paler beneath, glabrous but apparently with traces of a minute tomentum along the nerves, the costa stout, salient, the lateral nerves about 13 on each side, ascending, nearly straight, anastomosing close to the margin, the intermediate nerves obsolete; inflorescences (only imperfect ones seen) paniculate, narrow, about 14 cm. long, many-flowered, the panicles pedunculate, the branches compressed, sparsely brown-tomentulose, the flowers clustered, sessile; sepals 4, suborbicular, about 1 mm. long, strongly imbricate, rounded at apex, brown-puberulent on the outer surface; petals 4, oval, 3-3.5 mm. long, imbricate, rounded at apex, glabrous, the margins minutely scaberulo-ciliate; stamen tube broadly urceolate, 2 mm. long, glabrous, the 8 lobes 0.8 mm. long, erect, oval, somewhat narrowed toward the base, rounded to subtruncate at apex; anthers 8, minute, sessile within the tube at the base of the sinuses; disk annular, short; ovary glabrous, ovoid-globose, 1.6 mm. broad, 5-celled; style very short, the stigma nearly 1 mm. broad, thick, cap-like.

Type in the U. S. National Herbarium, No. 1,269,811, collected in the Almirante region, Province of Bocas del Toro, Panama, in 1927 by George P.

Cooper & George M. Slater (No. 59; Yale No. 10,157). Vernacular name, "cedro macho."

Evidently referable to the same species is another specimen in the National Herbarium from Hamburg Finca on the Río Reventazón below El Cairo, Costa Rica, Standley 52493. The specimen was given me by Mr. Ferdinand Nevermann. It had been rolled in paper and dried, consequently it is in poor condition, but the leaves and flowers are exactly like those of the Panama tree. The petioles are about 12 cm. long. The Costa Rican vernacular name is the same as that used in Panama.

Only a single species of *Carapa* has been recorded from Central America, *C. nicaraguensis* C. DC., described from Chontales, Nicaragua. No material of it is available for comparison, but it is described as having 6 or 8 leaflets, and glabrous sepals.

*Carapa guianensis* Aubl., a species occurring in the West Indies and in South America, also may be reported now from Central America. Specimens agreeing well with West Indian material were collected at Finca Montecristo, near El Cairo, Costa Rica, altitude about 25 meters, February, 1926, Standley & Valerio 48535. *C. guianensis* is a tree of large or medium size. It differs from *C. Slateri* in having glabrous flowers and acute or acuminate leaflets.

*Meliosma panamensis* Standl., sp. nov.

Tree, the branchlets subterete, ochraceous, bearing few small, pale, slightly elevated lenticels, at first minutely hirtellous but soon glabrate, the internodes 1.5 cm. long or shorter, the leaf buds hirtellous; petioles slender, glabrous, 1.3-1.8 cm. long; leaf blades narrowly oblong-oblongate, 2.5-3.2 cm. long, 6.5-8.5 cm. wide, broad at apex and shortly cuspidate-acuminate, the acumination 2 cm. long, obtuse, cuneately long-attenuate to the base, thin, glabrous, deep green above, the costa and lateral nerves impressed, beneath paler, somewhat lustrous, the costa slender, salient, the lateral nerves about 15 on each side, ascending, arcuate, extending to the margin, the intermediate nerves slender, prominent, coarsely reticulate, the margins entire below the middle, above coarsely and remotely salient-serrate, the teeth subulate-cuspidate; panicles axillary, 5 cm. long or larger (no perfect ones seen), narrow, sparsely branched, the lower branches 2 cm. long, spreading, the upper branches short, spreading, the rachises slender, sordid-puberulent; flowers solitary, sessile or nearly so; bracts minute, ovate-orbicular, rounded at apex, ciliate; sepals orbicular, 0.8 mm. long, ciliate; ovary glabrous, trun-

cate or submarginate at apex; style slender, glabrous, slightly exceeding the ovary; panicle branches in fruit hard and ligneous, the fruit sessile or nearly so, obliquely subglobose, about 2.3 cm. long and 1.8 cm. broad.

Type in the U. S. National Herbarium, No. 1,269,805, collected in the Almirante region, Province of Bocas del Toro, Panama, in 1927 by G. P. Cooper & G. M. Slater (No. 29; Yale No. 10,129).

This, apparently the first species of *Meliosma* to be reported from Panama, is related to the Costa Rican *M. Tonduzii* Donn. Smith, which has merely denticulate or nearly entire leaves.

*Citharexylum Cooperi* Standl., sp. nov.

Tree, the branchlets sharply quadrangular, stout, ochraceous, when young short-pilose with spreading hairs but finally glabrate, the internodes 5 cm. long or shorter; leaves opposite, the petioles 8-10 mm. long, short-pilose; leaf blades ovate to oblong-ovate or oblong-elliptic, broadest at or below the middle, acuminate, often abruptly so, narrowed to the acute and decurrent base, entire, subcoriaceous, when dry pale green on the upper surface, glabrous or nearly so, the nerves impressed, beneath slightly paler, densely velutinous-pilose with short stiff spreading hairs, the costa slender, salient, the lateral nerves slender, salient, 8 or 9 on each side, ascending, slightly arcuate, irregular, anastomosing close to the margin, the intermediate nerves prominent, coarsely and irregularly reticulate; racemes paniculate, few in each panicle, short-pedunculate, the peduncle of the panicle 1-1.5 cm. long; racemes densely flowered, 2-5 cm. long, the rachis slender, flexuous, angulate, short-pilose, the bracts subulate, equaling or slightly exceeding the pedicels; pedicels less than 1 mm. long, hirtellous; calyx narrowly campanulate, 4 mm. long, 2.5-3 mm. broad, sparsely hirtellous, conspicuously nerved, the 5 lobes broadly ovate, obtuse, scarcely 1 mm. long; corolla tube broadly obconic, 2.5 mm. long, glabrous outside, the lobes rounded-ovate, obtuse, 2 mm. long, minutely puberulent on both surfaces.

Type in the U. S. National Herbarium, No. 1,269,807, collected in the Almirante region, Province of Bocas del Toro, Panama, in 1927 by George P. Cooper & George M. Slater (No. 34; Yale No. 10,134).

Among the Central American species of *Citharexylum* this Panama tree is distinguished by the dense velvety pubescence of the leaves.

*Cyphomandra homalophylla* Standl., sp. nov.

Shrub or tree, the young branches subterete, dark brown, smooth, puberulent with extremely minute, rather sparse hairs; petioles stout, 1.5-3 cm. long, subterete, deeply sulcate on the upper side, minutely puberulent; leaf blades uniform, oblong-elliptic, broadest at or near the middle, 18-29 cm. long, 7.5-11 cm. wide, acute with obtuse tip, acute at base or abruptly short-decurrent, thick-herbaceous, deep green on the upper surface, microscopically

scaberulous, smooth to the touch (whole leaf appearing glabrous to the naked eye), the costa and lateral nerves prominent, beneath slightly paler, very minutely and copiously puberulent, the costa stout, prominent, the lateral nerves slender, prominent, about 11 on each side, ascending, arcuate, anastomosing close to the margin, the intermediate nerves slender, prominent, coarsely and irregularly reticulate; inflorescences axillary, solitary, bifurcate, the peduncle 2 cm. long, stout, terete, minutely puberulent, the 2 branches stout, about 3 cm. long, recurved or coiled, the flowers numerous, secund, the pedicels slender, 4-8 mm. long, straight or curved, glabrous or nearly so; calyx broadly campanulate, glabrous or nearly so, 4 mm. long, 5-lobate to the middle or less deeply, the lobes oval or oval-ovate, obtuse to subtruncate at apex; corolla stelliform, rounded at apex in bud, puberulent at apex and along margins of the lobes, elsewhere glabrous, the tube and throat together 2-2.5 mm. long, the 5 lobes 7 mm. long, lance-oblong, obtuse or acutish, 2-2.5 mm. wide; stamens 5, the filaments less than 1 mm. long, the anthers equal, 4.5 mm. long, narrowly oblong, broadest at apex, dehiscent by 2 short slits on the inner surface near the apex, the connective strongly thickened; style stout, glabrous, 9 mm. long.

Type in the U. S. National Herbarium, No. 1,269,809, collected in the Almirante region, Province of Bocas del Toro, Panama, in 1927 by G. P. Cooper & G. M. Slater (No. 39; Yale No. 10,139).

Among the very few species of *Cyphomandra* known from Central America, this is distinguished by its narrow uniform leaves.

WALNUT IN AMAZONAS

By GEORGES H. BARREL

President, *Aguna Mabogany & Timber Co., Boston*

Very few people are aware that genuine walnut grows in large quantities in the upper reaches of the Amazon basin.

Between the Ucayali River and the Cordillera Oriental of the Andes in about latitude 8, longitude 76, there is a heavily timbered mountain range which is largely "terra incognita" to the white man. Innumerable rivers and creeks are born among these hills and find their way to the largest tributaries of the Ucayali. It is in the valleys dividing these mountains—some of which rise to 10,000 feet—that walnut is found, but mostly on the western slopes, in the shadow of the mighty Cordillera.

The country thereabout is inhabited by three distinct uncivilized tribes of Indians, the "Cachibos," the "Campas,"

and the "Ameuxias," totally rebellious to the white man's inducements to work. The "Cachibos" who dwell in the territory stretching between the Pachitea and the Aguaitia rivers have locally the ugly reputation of being cannibals, though I have good personal reasons for discrediting this belief. At any rate, from the timberman's point of view, labor conditions are at their worst.

I had occasion recently to cross overland by the Pichis trail from the Azupizú River to the Chanchamayo Valley and thus to make a first-hand study of the timber resources of that region. As a layman and basing my belief upon a non-scientific examination of the trees encountered en route, also upon the information volunteered by the Indians and half-breeds, I venture the opinion that there are several varieties of walnut in that region. Two local names given by the Indian intelligentsia were "nogal blanco" and "nogal negro" (white walnut and black walnut), thus differentiating at least two subspecies. Many trees were well over 36 inches in diameter, not a few very large, straight, and free from lateral branches for a considerable height. No less than thirty trees were counted along the trail within a few hundred yards. Their distribution is very erratic. On some slopes walnut is decidedly abundant, on others rare, on still others totally wanting. I can give no satisfactory explanation for this irregular dissemination.

Although, as a whole, large walnut trees are abundant, logging them seems impossible in view of the topography of that remote land. While the vast net of streams furrowing through these immense forests is part of the big Amazon drainage, yet hundreds of miles of rapids would have to be negotiated before reaching rivers of sufficient depth and subdued turbulence to permit rafting. The Pacific Ocean, it is true, is only 300 miles away, but access to it is impeded by that most formidable of barriers, the Cordillera of the Andes, soaring to 20,000 feet and more.

EDITOR'S NOTE.—Mr. Barrel has forwarded a wood sample and sterile botanical material of one of the walnut trees (Yale No. 10,168). The wood appears to be of excellent quality and

of the type of North American black walnut. As to its botanical status, Dr. Paul C. Standley writes as follows: "The walnut specimen agrees best with *Juglans boliviana* Dode. These are several species of walnuts along the Andes and they are not very well understood. Mr. Barrel's specimen agrees exactly with the specimen thus determined in the U. S. National Herbarium, and is unlike the other species represented there."

#### NOTE ON THE IDENTITY OF THE CHINESE "PAU-HOI"

By RYOZO KANEHIRA

In previous issues of this journal (*Tropical Woods* 3: 1, and 6: 11) the question was raised as to whether or not the Chinese "pau-hoi" or bandoline wood had been correctly identified. I found good reasons for doubt when a microscopic examination of a wood specimen of "pau-hoi" revealed a lack of agreement with *Macbilus Thunbergii* Sieb. & Zucc., to which it has been referred, and wood shavings from a tree of that species grown in Japan failed to yield any mucilaginous material when soaked in water.

Through the courtesy of Mr. Y. Shimada, of Formosa, I have received a botanical specimen (No. C. 2854) of the real bandoline-wood tree which was collected by him in Fokien, China, Jan. 13, 1926. I forwarded this material to the Arnold Arboretum, Jamaica Plain, Massachusetts, and on the occasion of my recent visit to that institution I found that Mr. Shimada's specimen conformed exactly with three specimens of the bandoline-wood tree collected by Prof. H. H. Chung (of Amoy University) at Yenping, Cha-ping, Aug. 5, 1924, No. 2897; at Minhow Hsien, Aug. 21, 1923, No. 2327; and No. 3569 (no date). Mr. Shimada's specimen includes immature flowers, and one of Prof. Chung's is in fruit, the others sterile, so that while they can be referred with certainty to the genus *Macbilus*, it has not been possible to name the species and it may prove to be undescribed. The evidence is conclusive, however, that it is not *Macbilus Thunbergii* Sieb. & Zucc.

Further confirmation of this conclusion appears in *Plantae Wilsonianae*, II, p. 622, 1916, as follows: "Hemsley in a note (Hooker's Icon. Sub. t. 2538) states that according to 'G. M. Playfair, Esq., H. B. M. Consul at Ningpo, shavings of the wood of the Chinese species yield a mucilage, when soaked in water, which is used by Chinese ladies in "bandolining" their hair.' According to Wilson the wood of neither the Ichang tree (*M. Ichanensis* Rehder & Wilson) nor that of the Japanese tree (*M. Thunbergii* Siebold & Zuccarini) is used for any such purpose."

*Macbilus Thunbergii* grows naturally, but sparingly, in Formosa. The bandoline tree, on the contrary, is neither indigenous nor cultivated, and the shavings available on the market are entirely of Chinese origin.

#### Note on "Ripple Marks" in Compositae

In *Tropical Woods* 9: 15 reference was made to photomicrographs in Lecomte's *Madagascar: Les bois de la forêt d'Analamazaotra* showing storied structure in two woods of two different genera of Compositae. In a recent letter to the editor Prof. Lecomte states that according to H. Humbert (*Les Composées de Madagascar*, 1923) both of these species properly belong to the genus *Brachylaena*, thus: *Synbodendron ramiflorum* DC. = *Brachylaena ramiflora* (DC.) Humb. and *Vernonia Merana* Baker = *Brachylaena Merana* (Baker) Humb. He further states that his specimens of the woods of *Vernonia arborea* Ham. and *V. volkameriaefolia* DC. from Indo-China do not have storied rays. (In this connection see also Lecomte's *Les bois de l'Indochine*, 1926, p. 207.)

#### New Collections

New and important collections of British Honduras trees have recently been received from Mr. Duncan Stevenson, Acting Conservator of Forests, and Capt. H. M. Heyder, Assistant Conservator. Messrs. G. P. Cooper and G. M. Slater have forwarded specimens of 40 more trees of Bocas del Toro, Panama.

#### CURRENT LITERATURE

**El haba o habilla de San Ignacio.** By JESÚS GONZÁLEZ ORTEGA. *México Forestal* 5: 1-2; 8-11, Jan.-Feb. 1927.

The "haba" or "habilla" (*Hura polyandra* Bail.) is a Euphorbiaceous tree very closely related to the West Indian sand-box tree. It is common in southern Sinaloa and its northern range is the Quelite River at the line of the Tropics.

It is usually a spreading, flat-topped tree 30 to 65 feet high and 16 to 32 inches in diameter. The gray bark is beset with spines and contains a large quantity of caustic latex. Growth is slow and from 100 to 150 years are required for full maturity. The foliage is dense from July to January, but all of the leaves are cast during the dry season. The woody fruit capsules, which resemble miniature pumpkins, dehisce with an explosive force which scatters the wafer-like seeds a great distance.

The wood is of a pale yellow color and has a specific gravity (air-dry) of 0.56. It is extensively used in the southern part of Sinaloa for beams and doors of houses, boxes for carts, and other purposes. When used for marine piling the wood is said to outlast creosoted pine.

The latex is much in demand in Sinaloa and Nayarit for stupefying fish and consequently there is scarcely a tree that is not annually "bled" for this product. Some woodsmen cannot work with the trees without suffering an attack of poisoning which lasts two or three days.

The article contains data on the mechanical properties of the wood, a complete botanical description, and a list of the vernacular names of the tree in different parts of Mexico and in Guatemala.

**British Honduras. Royalty rate list for forest produce, 1927.**  
Reprint, *British Honduras Gazette*, Dec. 11, 1926.

The royalty rates are prescribed as standard for the calendar year 1927 and, except insofar as may be otherwise authorized by the Governor in Council, shall apply to all licenses and permits issued under the Forest Rules 1927 to cut, collect, prepare, use, or remove forest produce on or from the Crown

lands of the Colony. The list is of interest because of the number of secondary woods included and also because the royalty rates afford a criterion of the relative importance of the different species.

Of the three primary woods, mahogany and cedar are listed at \$7.00 per tree; pine at 25 cents. Logwood and rosewood are rated at \$2.00 per ton; fustic (*Cblorophora tinctoria* (L.) Gaud.) and ziricote (*Cordia dodecandra* DC.) at \$1.00. The rates per tree for the secondary woods are given below. (Scientific names are inserted by the editor.)

Banak ( <i>Virola merendonis</i> Pittier)	\$2.00
Salmwood ( <i>Cordia alliodora</i> (R. & P.) Cham.)	2.00
Tubroos ( <i>Enterolobium cyclocarpum</i> (Swartz) Gris.)	2.00
Santa María ( <i>Calophyllum Calaba</i> Jacq.)	1.00
Yemeri ( <i>Vochysia hondurensis</i> Sprague)	1.00
Billy Webb ( <i>Sweetia panamensis</i> Benth.)	.75
Bullet Tree ( <i>Bucida Buceras</i> L.)	.75
Cabbage Bark ( <i>Andira inermis</i> H. B. K.)	.75
Sapodilla ( <i>Achras Zapota</i> L.)	.75
Cotton Tree ( <i>Ceiba pentandra</i> (L.) Gaertn.)	.50
Waika Chewstick ( <i>Symphonia globulifera</i> L. f.)	.50
Wild Tamarind ( <i>Acacia glomerosa</i> Benth.)	.50
Axemaster ( <i>Krugiodendron ferreum</i> (Vahl) Urb.)	.25
Botan ( <i>Sabal excelsa</i> Morris)	.25
Cabbage Palm ( <i>Oreodoxa oleracea</i> Morris)	.25
Cortez ( <i>Tecoma</i> sp.)	.25
Cypress ( <i>Podocarpus coriaceus</i> Rich.)	.25
Fiddlewood ( <i>Vitex longeracemosa</i> Pittier)	.25
Granadillo (? <i>Platymiscium</i> sp.)	.25
Ironwood ( <i>Dialium divaricatum</i> Vahl)	.25
Lignum-vitae ( <i>Gymnanthes lucida</i> Sw.)	.25
Redwood (ridge) ( <i>Mosquitoxylum jamaicense</i> K. & U.)	.25
Silion or Silly Young ( <i>Lucuma belizensis</i> Standl.)	.25
Mangrove ( <i>Rhizophora Mangle</i> L.)	.20
Dogwood ( <i>Ichthyomethia piscipula</i> Hitch.)	.12
Madre Cacao ( <i>Gliricidia sepium</i> (Jacq.) Steud.)	.12
Moho ( <i>Belotia</i> and <i>Heliocarpus</i> )	.12
Poison Wood ( <i>Metopium Brownei</i> (Jacq.) Urb.)	.12
Polak ( <i>Occhrosia bicolor</i> Rowlee)	.12

Prickly Yellow ( <i>Zantboxylum Kellermanii</i> P. Wils.)	.12
Quamwood ( <i>Schizolobium parabybum</i> (Vell.) Blake)	.12
Redwood (swamp) ( <i>Erythroxylon affine</i> A. Rich.)	.12

Datos sobre el viaje botánico de los Profesores Paul C. Standley y Samuel J. Record a Costa Rica y Guatemala en 1925-1926. Translation, summary, and notes by SALVADOR CALDERÓN. Sec. Bot., Dirección General de Agricultura San Salvador, 1926. Pp. 33; 4½ x 6¾; 5 half-tone plates.

El estudio de las productos forestales en Venezuela. By H. PITTIER. *Boletín del Museo Comercial de Venezuela* (Caracas) 1: 1-44, Jan. 1927.

This article comprises nearly the whole of the initial issue of this new journal. There is an account of the Museo Comercial and the important work being done there to collect and classify the woody plants of Venezuela and straighten out the tangle of vernacular names. Emphasis is placed upon the woods of present or potential commercial importance and instances are cited of confusions in commerce due to the indefiniteness of nomenclature of timbers.

Pp. 9 to 32 contain a preliminary list of the woody plants, arranged by families in natural order. The list contains the scientific names of 603 species, and 956 common names corresponding to them. The latter are also listed in an index (pp. 34-44). Lists of this sort are exceedingly helpful.

British Guiana. The valuation of the forests of the Bartica-Kaburi area. By B. R. Wood. Combined Court No. 40, 1926; Georgetown. Pp. 25; 8 x 13; 1 large map.

This report by the Conservator of Forests deals with the investigation of the forests and the valuation of the timber on the first section of the proposed route for a railway from the coast to a point at the beginning of safe navigation on the Mazaruni River. The work of surveying the main line, fixing the cross lines, and preparing the topographic map was done by L. S. Hohenkirk, Superintendent of Forest Surveys.

The area examined forms roughly a triangle with Bartica as



its apex, the Essequibo and Mazaruni Rivers as its sides, and the Kaburi River from Mazaruni to Roth's trace, and thereafter Roth's trace, as its base. The rainfall, amounting to 105 inches annually, is well distributed, the soil is coarse-textured, and the temperature ranges between 65° and 90° F., thus making the locality well suited for the growth of trees.

Greenheart (*Nectandra Rodiæi* Schomb.) is the most important timber. The average volume per acre of merchantable greenheart timber on the best square mile was found to be 1170 cu. ft., or 44 per cent of the total, and over the best compact area of 70 square miles, 639 cu. ft., or 31 per cent of the total. The principal species in mixture are "wallaba" (*Eperua falcata* Aubl.), "morabukea" (*Dimorphandra* sp., probably *D. Gonggrijpii* Kleinh.), "kakeralli" (*Lecythis* spp.), and "mora" (*Dimorphandra Mora* B. & H.), all woods of good quality. "Greenheart never occurs on the white wallaba sands, but in most places comes in when those sands give place to the brown sand with slight admixture of clay, and in most cases it was possible to step in one stride from the white sand where greenheart never occurred to the brown soil where it did, generally at some point on the slopes down from the flat ridge to the creeks. . . . Greenheart is not exacting as regards moisture conditions. Where the brown soil occurs it is found in the swampy flats near the streams, but is not of good quality. From the beginning of the slope the greenheart will go right up to the top of the hill provided the brown soil does so also; in fact when driven off the lower slopes by the morabukea it appears to hold its own better up on drier ground. Where the true greenheart forest occurs it is the dominant tree and few other large trees are found except the kakeralli and the morabukea. The latter, however, occurs in very considerable quantities on the moister ground and regenerates in great profusion, in some places to the exclusion of the greenheart."

The "soft wallaba" (*Eperua falcata* Aubl.) and the "ituri wallaba" (*E. fenmani* Oliver) grow in intimate mixture and are much alike in appearance, properties of their woods, and in their silvicultural requirements. They grow almost anywhere and on any soil that is not too dry, especially on the barren white sand areas, where they form almost pure forests

of large extent. The trees are shallow-rooted, rarely attain dimensions greater than 24 inches in diameter and 80 feet in height, and in a natural state are of relatively slow growth because of suppression. When, however, the first growth is cut over the poles remaining grow rapidly and the area is ready for another cutting in about 30 years. In the absence of trees old enough to produce seed, the second cutting may largely eliminate the species from the area. The average stand per acre in the wallaba forest is 800 cu. ft., of which 75 per cent is wallaba.

Within the wallaba forests were found two elevated areas of very dry and loose sand bearing a shrubby growth of "muri" (*Humiria* sp.), and encircled by belts of much-coppiced "dakama" trees (*Dimorphandra latifolia*), which in turn gradually give way to wallaba of poor quality. The formations are considered the result of natural causes and in a state of equilibrium, rather than the result of fires or of clearing for cultivation.

Forests classed as "miscellaneous" occur chiefly on the "kabiokilli," or field soil of the Indians, on the swampy flats and on soils suitable, apparently, for greenheart but not dominated by that species. There are many trees in mixture, of which the more common are "kautiballi" (*Licania mollis* Benth.), "itikibourballi" (*Machaerium Schomburgkii* Benth.), and "kokeritiballi" (*Sideroxylon* sp.); in the swampy places the mora and the "white cedar" (*Tabebuia* sp.) make their appearance.

In general, the forests are rich in exploitable timbers, can be made readily accessible, and have a potential value in revenue to the State estimated at more than \$16,000 per square mile. Since the soil is on the whole unsuitable for agriculture, it is recommended that the lands be held intact, for the most part, pending the development of better market conditions for the timber.

**Economic plants of the Tropics.** (In Japanese.) By RYOZO KANEHIRA. Pub. by South-Sea Society, Govt. Bldg., Taipei, Formosa. Pp. 736 plus index of 62 pp.; 6 x 8¾; 116 plates, 2 in color. Price \$4.

This book brings together in one attractive volume a great wealth of material, much of which is based upon personal knowledge gathered by the author in his travels in South China, Malay Peninsula, Philippine Islands, Java, Celebes, Dutch and British Borneo, Moluccas, and Dutch New Guinea in 1913; in Mariana, Caroline and Marshall Islands, 1914-15; and in British India, Burma, Ceylon, Java, and Malay Peninsula, 1921-22. With few exceptions, the many interesting and instructive photographs reproduced are original.

Chapter I, Vegetation of the Tropics (pp. 1-116). Includes climate, soils, plant growth, physiological and morphological features of the tropical flora, useful plant immigrants, brief sketches of the botanical gardens of Buitenzorg in Java; Peradeniya, Henarotgoda, and Hakgala in Ceylon; Calcutta and Darjeeling in British India; and Hongkong, Penang, Singapore, and Taipei.

Chapter II, Tropical forests and forest products (pp. 117-212). General descriptions of the forests and their products in the various tropical countries of the Old World.

Chapter III, Tropical woods (pp. 213-297). Detailed account with reference to their anatomy, identification, properties, and uses of the commercial woods of the Tropics of both hemispheres, such as rosewood, satinwood, boxwood, incense woods, teak, mahogany, cedar, and the woods known in Japan as "karaki."

Chapter IV, Medicinal plants (pp. 298-369). Includes cinchona, coca, sandalwood, ipecacuanha, castor oil, gum Benjamin, poppy, strychnos, tuba, chaulmoogra, quassia, and many other medicinal and poisonous plants.

Chapter V, Spices and perfumes (pp. 370-428). Among others considered are nutmeg, mace, cloves, cinnamon, cardamon, pepper, capsicum, pimento, ilang-ilang, lemon grass, vetiver, patchouly, and geranium.

Chapter VI, Rubber, gutta percha, balata, jelutong, etc. (pp. 429-454).

Chapter VII, Resin and oil plants (pp. 455-474). Deals with damar, copal, Peru and tolu balsams, Copaifera, gum arabic, Pisang wax, Burma lacquer, Borneo camphor, Ngai camphor, manila elemi, chicle, gum copal, tragacanth, and oil-yielding seed plants.

Chapter VIII, Dyestuffs and tannins (pp. 475-502). Includes logwood, sappan wood, annatto, gamboge, dragon's blood, tumeric, lac, cutch, gambier, catechu, divi-divi, wattle bark, myrobalan, and quebracho.

Chapter IX, Textile fibers (pp. 503-522). Among these are sisal, henequin, Mauritius hemp, Manila hemp, kapok, ramie, and jute.

Chapter X, Palms (pp. 523-566). The principal palms described are the coconut, oil, date, sago, sugar, palmyra, talipot, ivory-nut, double-coconut, areca, bastard sago, royal, and nippa; canes are also included.

Chapter XI, Edible fruits and plants (pp. 567-676). These are the banana, pineapple, breadfruit, jackfruit, papaya, mangosteen, drian, mango, avocado, anona, sapodilla, cola, Brazil nut, cacao, tea, coffee, cassava, arrowroot, Polynesian arrowroot, horse-radish tree, red sorrell, tobacco, kava, etc.

Chapter XII, Tropical gardens, ornamental and curious plants (pp. 677-736). Includes descriptions of gardens, shade trees, flowering and foliage plants, sacred plants, etc. With notes on source, history, cultivation, and utilization.

**Wood preservation in the Philippines.** By A. M. AMEND.  
*Wood Preserving News* (Chicago) 4: 11: 137-9, Nov. 1926.

"Probably the first attempt at wood preservation by a pressure process in the Philippine Islands was made in 1909, when the Bureau of Science treated two pieces of wood,  $\frac{1}{2}$  in. by 4 in. by 12 in., with tar obtained from coconut shell. These test pieces, after thorough pressure treatment, were placed where they would be exposed to the attacks of termites and fungi. Examination after a period of thirteen years in the testing grounds showed that the pieces were still sound, and even this incomplete service excelled in length the life of naturally durable woods subjected to similar conditions."

Tests made in 1921-22 under direction of the Bureau of Forestry "disclosed that very few species of Philippine woods were suitable for proper impregnation." A treating plant was put into operation in Manila in 1923 and the use of creosoted timber for railway ties, bridge timbers, poles, and piling is increasing. A bulkhead of untreated timber failed in three

years; "lauan" piling was completely riddled by teredo. "Dungon" is considered the best Philippine hardwood for marine piling untreated, but one timber from the bulkhead just mentioned was badly attacked by teredo in the sapwood and to some extent in the heartwood, while a fender pile which had been in use elsewhere for an indefinite period (perhaps 10 years) failed from attacks of a wood borer (martesia). "Molave" is highly resistant to insects and decay, but not to marine borers, and "yakal" is durable when exposed to the elements.

"The waters surrounding the Philippine Islands are heavily infested with teredo, limnoria, and martesia. White ants and other boring insects are very active throughout the Islands. Rainfall is very heavy during the rainy season, which is followed by a dry, hot period. Wood is therefore subjected not only to insect attack, but to long periods when conditions are ideal for the development of wood-destroying fungi. When confronted with all these active agents of destruction, the value of wood preservation is readily demonstrated."

**Durability tests of Malayan and other timbers.** By F. W. FOXWORTHY. *The Indian Forester* 53: 1: 25-33, Jan. 1927.

A report on a series of tests continued since 1918 to determine the resistance of different woods to the attacks of insects and fungi. More than 5000 samples have been tested; these are 2 feet long and 2 inches square, preferably sound and seasoned. They were set in the ground to a depth of 18 inches on the lower part of a hillslope in a region of uniformly high humidity, and were dug up and examined at intervals of six months. It was found that "white ants," or termites, are the chief cause of damage; they are so plentiful and active that very few woods perish from decay.

The most durable local woods were: "giam" (*Hopea nutans*), "resak" (*Shorea* spp.), "chengal" (*Balanocarpus Heimii* King), "tempinis" (*Sloetia Sideroxylon* T. & B.), "tembusu" (*Fagraea gigantea* Ridley), "merbau" (*Intsia* sp.), and "betis" (*Payena utilis* Ridley). The most resistant foreign woods were: "billian" (*Eusideroxylon Zwageri* T. & B.),

greenheart (*Nectandra Rodiei* Schomb.), and "ingyin" (*Pentacme siamensis* Kurz).

None of these woods is immune to the attack of termites. "It seems that a wood which is regarded as very durable in one country may not prove to be so in another country and climate. Thus teak, which is in many places highly regarded, has proved to be distinctly subject to white ant attack in this country. The pieces of teak included in the tests were selected with special care and seemed to be the very best quality obtainable. . . . It is quite probable that our white ants are local species and it is quite conceivable that some of our local woods have developed a certain amount of resistance to their attack."

**The sleeper problem in India, with appendix on air-seasoning of sleepers.** By J. H. WARR. *Empire Forestry Journal* 5: 2: 235-248, 1926.

An interesting discussion of the climatic and other factors affecting the life of railway crossties in India, with suggestions for meeting the situation. Lists of timbers suitable for crossties (both treated and untreated) are given. The appendix outlines a series of experiments to determine the best methods of air-seasoning.

**An elementary manual on Indian wood technology.** By H. P. BROWN. Calcutta, 1925. Pp. 121; 9½ x 6¾; 16 plates; 33 text figures and plates. Price 6s. 9d.

"An elementary treatise of wood anatomy, couched in terms of Indian timbers and supplemented by keys for pocket lens identification of a restricted number of species." The subject is treated under the following headings: (1) Plants versus animals. (2) Classification of plants. (3) The cell. (4) Cell aggregates or tissues. (5) The gross structural features of wood. (6) Physical properties of wood of value in identification. (7) The microscopy of wood. (8) The identification of woods, including a key to 60 of the most important Indian woods. The work is illustrated with many line drawings and photomicrographs.

An interim report on the progress of investigations into the origin of twisted fibre in *Pinus longifolia* Roxb. By H. G. CHAMPION. *The Indian Forester* 53: 1: 18-22, Jan. 1927.

"Sowings of seed of known parentage have demonstrated clearly that spirally twisted fibre in *Pinus longifolia* in Kumaon is inherited from the parents. Seedlings of all ages up to ten seasons (excluding one-season old plants) exhibit a percentage of twisted stems and a degree of twist proportional to that of the parent crop from which they are derived. This result is obtained with protection from all the ordinary forms of damage, showing that the latter cannot be the immediate cause of twist, and it has also been shown that coppicing once or twice by fire or other means does not appreciably alter the proportions of straight and twisted plants." (For reports of earlier experiments see *Indian Forest Records*, Vol. XI, part 2, 1925; also *Tropical Woods* 2: 14, June 1925.)

Waste kauri wood as a source of paper pulp and resin. *Bulletin of the Imperial Institute* (London) 24: 4: 654-664, Feb. 1927.

The results show that kauri wood represented by the present samples could be converted into paper pulp of satisfactory quality, either in the original condition or after removal of the resin.

The conditions necessary to produce bleachable pulps were somewhat severe and the soda consumption was rather high, except in one case. The pulps were composed of coarser and longer fibers than those of commercial coniferous wood pulps and furnished papers of excellent strength. They did not bleach satisfactorily with the amount of bleaching powder that is sufficient for spruce pulp, but furnished pale cream-colored papers. The yields of pulp varied with the amount of resin in the wood. De-resinated woods pulped readily and gave very satisfactory yields. Chips of so-called "fossil" kauri wood produced paper of good quality and strength.

Tests on the resin extracted from kauri woods were not conclusive, but the indications were favorable.

The wood structure of certain eucalypts belonging chiefly to the "ash" group. By M. B. WELCH. Reprint, *Journ.* 3

*Proc. Royal Soc. N. S. W.* 60: 147-166, Jan. 1927. Eight photomicrographs.

"The term 'ash' is used in Australia to denote trees belonging to widely different natural orders, which have no connection botanically with the European ash (*Fraxinus*). The chief resemblance is usually one of colour, the majority of the Australian woods being pale-coloured, but exceptions such as the red ash, *Alphitonia excelsa*, and *Tarrietia argyrodendron* var., occur. In this paper the wood structure of certain eucalypts, namely, *Eucalyptus Dalrympleana* J. H. M., *E. Delegatensis* R. T. B., *E. fastigata* Deane & Maiden, *E. fraxinoides* Deane & Maiden, *E. obliqua* L'Her, *E. oreades* R. T. B., and *E. regnans* F. v. M., some of which possess the vernacular name of 'ash,' is described. The reason for the inclusion of several other species, not strictly classed in this group, is that they possess timber closely resembling the 'ashes' and occur in the same districts, so that confusion is likely to arise. The woods are pale-coloured, normally of moderate weight and hardness and possess, in general, remarkable strength; they are therefore an important commercial group which must eventually play an important part as a substitute for Oregon as a scantling timber. The species generally occur in large quantities, especially in southern New South Wales, Victoria, and Tasmania; moreover, they regenerate readily and there is no reason why supplies of timber should not be assured for all time. The trees grow in regions of comparatively high rainfall and often attain an enormous size; in fact, probably the largest trees in Australia belong to this group, forest giants exceeding 300 feet having been measured in the Gippsland district of Victoria.

"On account of their increasing commercial importance, it was thought desirable to examine the woods microscopically to see whether any reliable method could be found whereby they could be identified with accuracy. . . . As perhaps might have been anticipated, the results have proved rather disappointing from the point of view of identification, on account of the variation found to occur in the wood of the same species, but it was thought advisable to place them on record."

In *Eucalyptus Delegatensis* (= *E. gigantea* Hook.) the pores are "very irregularly distributed, due to their complete absence in some specimens in the late wood, this being possibly the nearest approach to a ring-porous timber in the eucalypts." This is the timber mentioned by the editor in *Tropical Woods* 8: 34-5 as being ring-porous. Mr. Welch states in a letter that this character is not constant and that as this species grows in high altitudes "the absence of pores in certain zones is apparently an indication of the rigor of the winter."

NOTE.—In the review of Mr. Welch's paper on the "silky oaks" (*Tropical Woods* 9: 28, March 1927) the editor inadvertently referred to them as belonging to the Dilleniaceae instead of rightly to the Proteaceae.

**Protection forests in Nyasaland.** By J. B. CLEMENTS. *Empire Forestry Journal* 5: 2: 211-217, 1926.

Discussion of the factors involved in forest destruction, the serious consequences experienced, and methods of control through the establishment of protection forests.

**Re-forestation in Mauritius.** By PAUL KOENIG. *Empire Forestry Journal* 5: 2: 218-222, 1926.

The island of Mauritius, situated about 600 miles east of Madagascar, has a total area of about 720 square miles. It is of volcanic origin, and nearly all the rivers have their source in a central tableland having an altitude of between 1000 and 2000 feet. The indigenous evergreen trees are of two distinct types, namely, those found on the lowland dry areas (15,892 acres), and those on the highland moist ones (33,184 acres), the division between the two being roughly the 1000-ft. contour.

Some of the principal species in the dry forests are:

Puant	<i>Foetidia mauritiana</i> Lam.	Lecythidaceae
Benjoin	<i>Terminalia Benzoin</i> L.	Combretaceae
Natte legentil	<i>Labourdonnaisia calophylloides</i> Bojer	Sapotaceae
White makak	<i>Imbricaria petiolaris</i> A. DC.	Sapotaceae

Among the secondary species are:

Bois d'olive	<i>Elaeodendron orientale</i> Jacq.	Celastraceae
Pomme	<i>Eugenia cymosa</i> Lam.	Myrtaceae
Black ebony	<i>Diospyros tessellaria</i> Poir.	Ebenaceae
Fer	<i>Stadmannia Sideroxylon</i> DC.	Sapindaceae
Ronde	<i>Erythroxylon laurifolium</i> Lam.	Erythroxylaceae

In the humid forests the ruling species include:

Natte	<i>Imbricaria maxima</i> Poir.	Sapotaceae
Makak	<i>Imbricaria petiolaris</i> A. DC.	Sapotaceae
Colophane	<i>Canarium Colophania</i> Baker	Bursereaceae
Tambalacoque	<i>Sideroxylon grandiflorum</i> A. DC.	Sapotaceae

The secondary species are:

Pomme	<i>Eugenia cymosa</i> Lam.	Myrtaceae
Clou	<i>Eugenia cotinifolia</i> Jacq.	Myrtaceae
Bois d'olive	<i>Elaeodendron orientale</i> Jacq.	Celastraceae
Ébène marbré	<i>Diospyros melanida</i> Poir.	Ebenaceae
Bigaignon	<i>Psiloxylon mauritianum</i> (Hook. f.) Baill.	Flacourtiaceae
Tatamaka	<i>Calophyllum inophyllum</i> L.	Guttiferae
Balais	<i>Quivisia laciniata</i> Balf. f.	Meliaceae
Loustau	<i>Antirrhoea verticillata</i> DC.	Rubiaceae
Riviere	<i>Homalium paniculatum</i> O. Hoffm.	Flacourtiaceae

The indigenous forests have been largely affected by clearing for crops, particularly sugar cane, and in many places exotic species, mostly of Indian origin, have taken possession of openings and are prominent in the second growth. Forestry work is largely with a view to the protection of the watersheds which have been seriously denuded. The tree found best suited for planting on the windswept plains of the interior is the Chinese pine, *Pinus Massoniana* var. *sinensis*. Along the seacoast, where the sand is calcareous, *Casuarina equisetifolia* is used successfully and the plantations are supplying construction timber and fuel. Under this tree the buffalo grass grows freely and provides good pasturage for cattle. Keeping streams well shaded with tree growth has been found highly

advantageous in combating malaria, "the fact being now scientifically proved that *Anopheles costalis* propagates on algae, etc., growing in water where the sun's rays strike the surface of the same."

**Marketing problems of tropical hardwood exploitation.** By ARTHUR W. BETTS. *The Timberman* (Portland, Ore.) 27: 9: 178-182, July 1926.

The conclusions of the author, who is a consulting engineer specializing in tropical timber properties, are as follows: "First, there is no doubt that tropical hardwoods will be imported in ever increasing amounts and that they eventually will dominate the market. Second, both the production and marketing of these woods present new problems. Third, these problems are interrelated and must be treated as a whole.

"The producing problem involves cutting a large part of the stand, as opposed to selective logging. This requires the adaptation of local conditions and practices to the greatest possible extent, and improving these conditions and practices as rapidly as possible. It also involves the adapting of existing marketing methods wherever possible. While this cannot be done with respect to species, it can and must be done as regards the simpler manufacturing methods, and the already universally accepted standards of dimension and grade.

"The consumption problem involves the solving of the one condition that the producer cannot solve, that of species. The consumer cannot scrap his entire business, plant, and accumulated trade practice, even though it is founded on the ability to find, in unlimited supply, certain woods of one or a few species and grades. He cannot even dream of satisfying this condition in the Tropics in the near future, if ever. Therefore he will be compelled to adopt a physical rather than a botanical classification, permitting him to use interchangeably a number of varieties as they may be available and suitable."

advantageous in combating malaria, "the fact being now scientifically proved that *Anopheles costalis* propagates on algae, etc., growing in water where the sun's rays strike the surface of the same."

**Marketing problems of tropical hardwood exploitation.** By ARTHUR W. BETTS. *The Timberman* (Portland, Ore.) 27: 9: 178-182, July 1926.

The conclusions of the author, who is a consulting engineer specializing in tropical timber properties, are as follows: "First, there is no doubt that tropical hardwoods will be imported in ever increasing amounts and that they eventually will dominate the market. Second, both the production and marketing of these woods present new problems. Third, these problems are interrelated and must be treated as a whole.

"The producing problem involves cutting a large part of the stand, as opposed to selective logging. This requires the adaptation of local conditions and practices to the greatest possible extent, and improving these conditions and practices as rapidly as possible. It also involves the adapting of existing marketing methods wherever possible. While this cannot be done with respect to species, it can and must be done as regards the simpler manufacturing methods, and the already universally accepted standards of dimension and grade.

"The consumption problem involves the solving of the one condition that the producer cannot solve, that of species. The consumer cannot scrap his entire business, plant, and accumulated trade practice, even though it is founded on the ability to find, in unlimited supply, certain woods of one or a few species and grades. He cannot even dream of satisfying this condition in the Tropics in the near future, if ever. Therefore he will be compelled to adopt a physical rather than a botanical classification, permitting him to use interchangeably a number of varieties as they may be available and suitable."

Yale University

School of Forestry

## TROPICAL WOODS

NUMBER 11

September 1, 1927

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

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

*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.*

## NOTES ON AMAZONIA

By GEORGES H. BARREL

*President, Aguna Mabogany & Timber Co., Boston*

Almost everybody knows that the Amazon valley lies between the 10th degrees of latitude north and south and extends across South America from the Atlantic to within a few hundred miles of the Pacific. But because the climate is almost identical in all parts of that immense expanse of tropical forest, it has been taken more or less for granted that the same species of trees are common to the whole region.

Nothing is further from the truth. While many species of trees occur from the mouth of the Amazon to the headwaters of its higher tributaries, others are well delimited to certain regions. For instance, the Pará rubber tree, *Hevea brasiliensis*

Muell. Arg., is found only on the south side of the Amazon River, yet climatic conditions, soil, etc., are apparently identical on the other bank. The "castanha" or Brazil-nut tree, *Bertholletia excelsa* Bondpl., does not grow west of longitude 70. Genuine mahogany, *Swietenia macrophylla* King, is not found nearer than 200 miles or farther than 600 miles from the Andes; it follows that chain of mountains, but the eastern limits of its range are by no means easy to explain.

For a study of its timber resources, the Amazon watershed should be divided into three regions: (1) The delta region or "island country." (2) The central region, consisting of the drainages of the Río Negro and Japura-Caqueta from the north, and the Tapajoz, Madeira, Purus, and Jurua from the south, to mention only the very large streams. (3) The upper Amazon, roughly represented by a strip of land some 600 miles wide parallel to the Andes and bisected by the Ucayali River. The first two regions are in Brazil, the last in Peru.

Probably the most interesting region of Amazonia (as the whole Amazon country is sometimes called) is the central part of the third region sketched above, or, to be more specific, the country encompassed by the Ucayali and the Huallaga rivers. Part of it is known locally as the Pampas del Sacramento. It is the watershed of many streams, some flowing eastward to the Ucayali, the others westward to the Huallaga. The higher parts rise probably to three or four thousand feet, although it is unsafe to venture a definite opinion as the country has been only partially explored.

It is known, however, to be very rich in tropical woods of commercial value, but the region is so sparsely settled, the coöperation of the native firms so uncertain, and the means of communication so precarious that no really practical attempt has yet been made to exploit its timber resources in a large way. Here is a field for the enterprising and for the courageous, for the trained and experienced logging engineer.

Barter is the system now used by native firms for securing logs from their indebted customers of the interior, or, to be more charitable, from their protégés. It is the method also used for obtaining rubber, balata, ivory nuts, and other forest products. Necessary and well suited to conditions

when rubber was the black gold of Amazonia, it is evidently a procedure totally lacking in constructive elements.

The native dweller of the interior fastness does not feel the pang of his more civilized brethren at the outcry of his creditors. He will produce just enough to keep body and soul together, and the needs of his body are so negligible, so ridiculously insignificant—a piece of calico or so from time to time—that the timber production of the country at large is appallingly small in comparison with its potential productivity. Obviously, however, other elements would enter into consideration if one were attempting a thorough study of the ills of the timber business in upper Amazonia.

Nevertheless, modern methods—the establishment of logging camps, the use of simple machinery, the logging engineer supported by the reliable "capataz" or gang boss—should replace the heartbreaking custom of trading a flintlock musket and some of Dr. Ross' pills (the panacea for all ailments in upper Amazonia) for tropical woods. Thus the country would reap a rich harvest through increased exports. A steady supply of timber from its almost inexhaustible forests would do much to put the Peruvian Amazon among the leaders in tropical timbers.

The native under expert coaching is a very capable woodsman. Born and reared in the forest, struggling with the jungle all life long, he can use the axe dexterously and has far more natural aptitude for felling and logging trees than he has for cultivating the soil.

What is lacking is precisely that technical knowledge which may direct the efforts of a group of men in concerted achievement in lieu of disassociated and individual effort. More than mere aptitude and good will are needed to skid short logs of Aguna mahogany, measuring not infrequently up to 70 inches in diameter and weighing sometimes 10 tons, to the edge of a stream whence they can be rafted to the loading point.

The modern sawmill of Nanay Mills (Aguna) Ltd., recently completed at the confluence of the river Nanay with the Amazon, is doing much to encourage the native husbandman in cutting marketable timber and selling it for cash. It has



created a market for big and small, good and poor logs. Steel derricks of great lifting power, a storage pond of immense capacity, and a modern band mill under expert management permit the proper selection of logs before shipment and the conversion of logs unsuitable for export into merchantable lumber of the quality, grade, and dimensions used in Europe and North America. And all this is done at the source of supply before the very long and costly haul to markets, thus reducing waste in freight and general transportation expenses.

This is only one step toward the exploitation of the tremendous timber resources of upper Amazonia. Logging on a large scale, on a scientific basis, is waiting for the genius of someone, perhaps yet unborn.

---

#### THE BUTTERFLY TREE OF BRITISH HONDURAS

Mr. Duncan Stevenson, Acting Conservator of Forests, B. H., has forwarded specimens of the so-called "butterfly tree," collected by him near Deep River, and identified by Dr. Paul C. Standley as *Erblichia odorata* Seem. (Turneraceae). Apparently it is very rare, though it has been found in Panama, Costa Rica, and southern Mexico. The bright orange flowers are large and showy.

The sapwood (heart not available) is yellowish white, rather hard, fine-textured, and tough. Pores barely visible, in scattered radial rows of 2-6. Rays crowded; visible on cross and radial sections. Parenchyma in very numerous, short, tangential lines forming an irregular network with the rays; not visible without lens.

*Minute anatomy:* Tips of vessel segments usually overlapping; perforations simple; pits minute, crowded. Rays very heterogeneous; 1-5, mostly 3-5, cells wide and few to 40 cells high; pits into vessels resemble the intervascular ones. Fibers with rather thick walls and numerous, very small, distinctly bordered pits. Parenchyma lines uniseriate. *Material:* Yale No. 10,506.

#### WOODS WITH CONSPICUOUSLY LARGE RAYS<sup>1</sup>

By WALTER W. TUPPER

*Assistant Professor of Botany at the University of Michigan*

The size and prominence of the rays in a wood have long been recognized as important criteria for identification and classification. Several of our temperate genera which have large and conspicuous rays, such as *Quercus*, *Fagus*, *Platanus*, *Alnus*, and *Carpinus*, can usually be identified easily, even without a hand lens, by these characters alone. There are some exceptions to this rule, however, as in the case of oaks which rarely have only narrow rays, but in general the rays in these five genera are the most striking and most characteristic features of the woods.

Among the woods of the Tropics there is an even larger number of genera having conspicuously large rays. It is, of course, impossible to draw any hard and fast line between the woods which have conspicuously large rays and those which do not. The rays in woods show a complete line of gradation from those that are exceedingly large and prominent and are composed of solid masses of parenchymatous tissue, such as characterize the oaks, to only uniseriate rays, as in the willows and poplars. Nevertheless, the rays in some instances are so strikingly prominent without any magnification that segregation of such woods is quickly and easily accomplished. Associated with the large rays are also many smaller ones, frequently uniseriate. The relative prominence of rays on cross and tangential sections is largely dependent upon their breadth, but on a radial surface the determining factors are depth and color contrast.

The author has observed conspicuously large rays in woods of 24 different families. Certain genera of these and of four additional families have been included on the authority of

---

<sup>1</sup> Paper No. 258 from the Botanical Department of the University of Michigan. This work was carried on in the laboratories of the School of Forestry, Yale University, and the author is greatly indebted to Professor Samuel J. Record for advice and aid throughout the investigation.

other investigators. Janssonius<sup>2</sup> has noted and diagrammed similar broad rays in one genus of the Gesneriaceae from Java; Lecomte<sup>3</sup> has reported them in two genera of the Anonaceae; Perrot<sup>4</sup> has done the same for a member of the Monimiaceae; and Gamble<sup>5</sup> likewise for the Dichapetalaceae (Chailletiaceae). No attempt has been made to include all references to "conspicuous" rays, since that term is a comparative one and may or may not conform to the standard the author has in mind. Among the woods arbitrarily excluded, although the prominence of their rays closely approximates that of some that are included, are species of *Aucuba*, *Bischoffia*, *Euptelea*, *Firmiana*, *Ternstroemia*, *Tilia*, and *Trochodendron*. The lianas are omitted, except in a few cases where arborescent representatives of the same family are in the list, e.g., *Doliocarpus* (Dilleniaceae).

A list of the natural orders to which these families belong, arranged according to the Engler and Gilg (1912) system of classification, is given below. The numerals in parentheses indicate the respective number of genera in which broad rays have been noted, either by the author or by other investigators.

1. VERTICILLATAE: Casuarinaceae (1).
2. PIPERALES: Piperaceae (1), Chloranthaceae (1).
3. FAGALES: Betulaceae (2 or 3), Fagaceae (5).
4. PROTEALES: Proteaceae (24).
5. RANALES: Berberidaceae (1), Magnoliaceae (1), Anonaceae (2), Monimiaceae (1).
6. GERANIALES: Dichapetalaceae (1).
7. ROSALES: Platanaceae (1), Leguminosae (1).
8. SAPINDALES: Aquifoliaceae (1), Icacinaceae (3), Sabiaceae (2).

<sup>2</sup> H. H. JANSSONIUS and J. W. MOLL: *Mikrographie des Holzes der auf Java vorkommenden baumarten. IV*. Leiden, 1920-26, p. 717.

<sup>3</sup> HENRI LECOMTE: *Les bois de l'Indochine*. Paris, 1926, p. 54 and pl. XIII.

<sup>4</sup> EMILE PERROT: *Les bois de Madagascar. I*. Paris, 1921, p. 1.

<sup>5</sup> J. S. GAMBLE: *A manual of Indian timbers*. London, 1922, p. 162.

9. MALVALES: Malvaceae (2), Sterculiaceae (6).
10. PARIETALES: Dilleniaceae (9).
11. OPUNTIALES: Cactaceae (5).
12. MYRTIFLORAE: Lecythidaceae (2), Rhizophoraceae (4).
13. UMBELLIFLORAE: Araliaceae (1).
14. ERICALES: Epacridaceae (1).
15. PRIMULALES: Theophrastaceae (2), Myrsinaceae (6).
16. TUBIFLORAE: Verbenaceae (1), Gesneriaceae (1).

In the identification of woods having broad rays the following general characteristics, applicable only to the genera and species in the above list, may prove of value.

**Woods with distinctly yellow color:** Berberidaceae (*Berberis*), Cactaceae, Icacinaceae, Lecythidaceae (*Gustavia*), and Theophrastaceae.

**With fetid odor:** Lecythidaceae (*Gustavia*).

**Without vessels:** Magnoliaceae (*Drimys*).

**With wood parenchyma abundant and generally in characteristic arrangement:** Anonaceae, in concentric lines forming a cobwebby network with the rays; Cactaceae, surrounding the vessels; Casuarinaceae, Fagaceae (*Castanopsis* and *Quercus*), and Lecythidaceae, in concentric lines or bands; Proteaceae, in tangential lines or bands usually outwardly concave and including the pores; Leguminosae (*Erythrina*) and Sterculiaceae (in part), about pores and in thick, irregular bands; Rhizophoraceae, diffuse.

**With ripple marks:** Gesneriaceae (*Cyrtandra*), Leguminosae (*Erythrina*), Malvaceae (*Hibiscus*), Piperaceae (*Piper*), and Sterculiaceae (in part). (See *Tropical Woods* 9: 13.)

**With aggregate rays:** Betulaceae and Fagaceae (*Castanopsis*).

**With aggregates of resinous cells in the rays:** Myrsinaceae.

**With heterogeneous rays:** Anonaceae, Aquifoliaceae, Cactaceae, Chloranthaceae (*Hedyosmum*), Dilleniaceae, and Magnoliaceae (*Drimys*).

**With spiral vessels:** Aquifoliaceae (*Ilex* usually), and Malvaceae (*Plagianthus*).

**With exclusively scalariform vessel perforations:** Aquifoliaceae (*Ilex*), Berberidaceae (*Berberis*), Betulaceae (*Alnus*

and *Betula*), Chloranthaceae (*Hedyosmum*), Epacridaceae (*Dracophyllum*), Icacinaceae, and Monimiaceae (*Tambourissa*).

With exclusively simple vessel perforations: Anonaceae, Betulaceae (*Carpinus*), Cactaceae, Dichapetalaceae (*Dichapetalum*), Lecythidaceae (*Gustavia*), Malvaceae, Proteaceae, Rhizophoraceae Legnotideae, Sterculiaceae, and Verbenaceae.

With cribriform pit membranes: Leguminosae (*Erythrina*). (See *Tropical Woods* 2: 10.)

With only libriform wood fibers: Araliaceae (*Pseudopanax*), Cactaceae, Gesneriaceae, Lecythidaceae, Monimiaceae, Malvaceae, Piperaceae, and Verbenaceae.

With septate wood fibers: Araliaceae (*Pseudopanax*), Gesneriaceae (*Cyrtandra*), Monimiaceae (*Tambourissa*), and Verbenaceae (*Petræa*).

With silica in all elements of the heartwood: Verbenaceae (*Petræa*).

#### THE FAMILIES AND GENERA

Anonaceae.—*Mitrephora* spp. and *Polyalthia jucunda* Fiet. & Gagnep. have conspicuously broad rays, according to Lecomte (*loc. cit.*).

Aquifoliaceae.—Several species of *Ilex* have large and conspicuous rays.

Araliaceae.—*Pseudopanax crassifolium* C. Koch has strikingly conspicuous, widely spaced rays.

Berberidaceae.—Apparently all species of *Berberis* have large and clearly defined rays.

Betulaceae.—The rays in *Abies* and *Carpinus* may be aggregated and conspicuous; similar rays occur abnormally in species of *Betula*.

Cactaceae.—Representatives of *Cephalocereus*, *Cereus*, *Lemaireocereus*, *Neoabbotia*, and *Pereskia* have very prominent broad rays.

Casuarinaceae.—Several species of *Casuarina* have broad, almost oak-like rays, while in other species the rays are not visible without a lens.

Chloranthaceae.—*Hedyosmum nutans* Swartz has beech-like rays.

Dichapetalaceae.—*Dichapetalum gelonoides* (Hook. f.) Engl. has very large, oak-like rays, according to Gamble (*loc. cit.*).

Dilleniaceae.—Conspicuous rays, sometimes oak-like, have been seen by the author or reported by others in species of *Candollea*, *Curatella*, *Davilla*, *Delima*, *Dillenia*, *Doliocarpus*, *Schumacheria*, *Tetracera*, and *Wormia*. Only narrow rays are reported in *Acrotrema*, *Hibbertia*, and *Pachynema*.

Epacridaceae.—*Dracophyllum latifolium* A. Cunn. has almost oak-like rays.

Fagaceae.—Some species of *Castanopsis*, *Pasania*, and *Pasaniopsis* have comparatively few, very large, sometimes aggregate rays. *Fagus* (excluding *Notofagus*) has moderately large, but fairly conspicuous rays, while those of *Quercus* are well known.

Gesneriaceae.—*Cyrtandra cuneata* Blume has very broad rays, according to Janssonius (*loc. cit.*).

Icacinaceae.—Species of *Gonocaryum*, *Ottoschulzia*, and *Urandra* have large and conspicuous rays.

Lecythidaceae.—*Grias Fendleri* Seem. and an unknown species of *Gustavia* from Venezuela have beech-like rays.

Leguminosae.—*Erythrina* is the only genus known to have conspicuous rays.

Magnoliaceae.—*Drimys Winteri* Forst. has beech-like rays.

Monimiaceae.—*Tambourissa purpurea* DC. has very large rays, according to Perrot (*loc. cit.*).

Myrsinaceae.—*Ardisia* (incl. *Icacorea* and *Pimelandra*), *Embelia*, *Myrsine*, *Paratibesia*, *Suttonia*, and *Wallenia* (all belonging to the group Myrsinoideae), have large, conspicuous rays. *Aegiceras* and *Maesa* are reported to have small rays only.

Piperaceae.—*Piper aduncum* Linn. has very large rays.

Platanaceae.—*Platanus* has rather low, thick rays which are conspicuous on the longitudinal surfaces particularly because of their depth and coloration.

Proteaceae.—*Adenanthos*, *Banksia*, *Cardwellia*, *Carnarvonnia*, *Conospermum*, *Darlingia*, *Dryandra*, *Embotrium*, *Faurea*, *Grevillea*, *Guevina* (?), *Hakea*, *Helicia*, *Knightsia*, *Lomatia*, *Macadamia*, *Musgravea*, *Orites*, *Panopsis*, *Protea*, *Roupala*, *Stenocarpus*, *Synaphea*, and *Telopea* have large, often oak-like rays. The only woods in which broad rays are reported to be absent belong to the genera *Franklandia*, *Persoonia*, and *Symphyonema*.

Rhizophoraceae.—*Anisophyllea*, *Carallia*, *Gynotroches*, and *Poga* have large, conspicuous rays. In several other genera large rays are entirely absent.

Sabiaceae.—*Meliosma* and *Sabia* have beech-like rays.

Sterculiaceae.—Species of *Cola*, *Firmiana*, *Pterocymbium*, *Pterygota*, *Sterculia*, and *Theobroma* have strikingly large rays.

Theophrastaceae.—*Jacquinia aurantiaca* Ait. and *Theophrasta americana* L. have low, thick, somewhat *Platanus*-like rays.

Verbenaceae.—*Petræa arborea* H. B. K. has rays barely large and prominent enough to justify the inclusion of the species.

#### More Woods of Araliaceae with Radial Canals

Prof. Mitsunaga Fujioka, Tokyo Imperial University, writes that one of his students, Mr. Chûzo Kaneshi, who is studying the woods of the Liutchu Islands, has discovered intercellular canals in the rays of two woods of the Araliaceae not previously reported, namely, *Gilibertia trifida* Makino ("kakure-mino") and *Schefflera octophylla* Harms. ("fukunoki").

## TREES OF GUALÁN, GUATEMALA

By SAMUEL J. RECORD

The town of Gualán, situated in the Motagua Valley, is on the eastern edge of the arid region of Guatemala. The elevation of the railroad station is 600 feet above sea level. The valley is narrow and flanked by high hills supporting an open scrubby growth of hardwood trees and shrubs which are mostly deciduous. The courses of the river and smaller streams are marked by narrow strips of forest which contain a larger percentage of evergreen species, being a continuation of the growth of the moist valleys below. Away from the streams flat or rolling lands which have not been cleared for cultivation and pasturage are sparsely covered with a bushy and mostly thorny growth in which the Leguminosae predominate.

The region was visited by the writer in the latter part of January, 1927. He was accompanied by Mr. Henry Kuylen, of the United Fruit Company, and Mr. Carlos Galusser, Jr., of Santa Inés. Collections were made of all flowering or fruiting specimens of the native trees found in the immediate vicinity of Gualán, and later a few miles east at Los Limones, a ranch and country home of Mr. Alberto Viau, of Guatemala City. The success of the work was very largely due to the hearty coöperation of Mr. Viau. Further collecting was done en route to Finca Santa Inés, some 25 miles eastward. (See *Tropical Woods* 10: 1, June 1, 1927.)

The most conspicuous trees in the landscape were "matilisquate" and "cortés colorado," which dotted the hillsides with their gorgeous masses of bloom. The only new tree discovered was the "yaje," a species of *Leucaena* not yet described. "Zarza," another leguminous tree, whose pods are fringed with prickles, has only once before been collected in fruit, according to Dr. J. N. Rose, and that specimen is at Kew, England. The tree known as "vainillo," whose fruits are reputed to cause horses and mules feeding upon them to lose their hair, proved to be the well-known *Cassia emarginata* which has not been so accused before. Several specimens of large, spreading "javillos" were found but not collected, the

trees bearing many of the explosive pods, while the ground beneath was thickly strewn with the claw-like segments. "Ceiba" and "amate" trees were common along the streams, and further eastward were open grasslands with many crooked-stemmed, bushy "chaparros," and beyond this were open stands of pine.

The lumber used in the local carpenter shops is mostly mahogany, cedar (*Cedrela*), and pine, the first two shipped in by rail. Small quantities of "cortés colorado," "matilisquate," and a few others are also used. The railroad buildings and crossties are of materials imported from the United States. Fences are mostly of barbed wire, and "madre cacao" is extensively employed for live posts. Fuel for cooking purposes is obtained from various hard-wooded species and is brought into the village on pack mules or oxcarts. Poles for house-framing are dragged in by oxen.

In the laboratory study of the woods of this region there has been noted a very wide range in density, color, and gross structure. In some instances parenchyma is very abundantly developed, in others it is apparently wanting. Growth rings are usually fairly distinct, but no wood was found to be distinctly ring-porous. Rays are fine and inconspicuous in all except *Curatella*, *Jacquinia*, and *Pereskia*. Ripple marks occur in representatives of the Bignoniaceae, Cochlospermaceae, Leguminosae, Nyctaginaceae, and Simarubaceae; they are reported here for the first time in *Godmania* (Bignoniaceae). Vessel perforations are exclusively simple except in *Curatella*, which has both simple and scalariform kinds. The pits of the wood fibers are simple in all cases except in *Curatella*, where they are distinctly bordered, and in *Simaruba*, where they are inconspicuously bordered.

Following are brief descriptions of the trees and woods of the various species arranged by families. The determinations of the Leguminosae were made by Dr. J. N. Rose, the others by Dr. Paul C. Standley, both associate curators of the U. S. National Museum. In collecting the specimens, special effort was made to assure the correctness of the vernacular names, and to this end the party had the intelligent coöperation of many of the local inhabitants.

## BIGNONIACEAE (Catalpa Family)

*Godmania aesculifolia* (H. B. K.) Standl. "Palo blanco." ("Cortés blanco" in Salvador.) Small or medium-sized tree, with corky, gray bark and large, long-stalked, digitate leaves having 5 to 9 obovate leaflets; flowers about  $\frac{1}{2}$  inch long, yellow, striped with brown; pods clustered, very long, slender, spirally curved; *Catalpa*-like seeds flat, with thin wing extending nearly 2 inches at either side. Wood brownish, with elm-like pattern on tangential surface; moderately hard and tough, medium-textured, finishes smoothly, is not durable. Pores small, associated with parenchyma, and arranged in irregular tangential bands, suggesting elm (*Ulmus*). Rays fine and inconspicuous. Ripple marks present, all elements rather irregularly storied; lines faintly visible, about 100 per inch. No known uses of wood. (Collected near Tierra Blanca, Jan. 26, 1927. No. 129; Yale No. 10,080.)

*Tabebuia (Tecoma) Palmeri* Rose. "Cortés Colorado." Medium-sized, deciduous tree, with thin, hard, smoothish bark and large, long-stalked, digitate leaves having 5 oblong leaflets; flowers large, rose-colored, very showy; pods a foot or more in length and  $\frac{1}{2}$  inch thick, with flat, winged seeds. Wood brown or olive, with yellow deposits (lapachol); very hard and heavy, fine-textured, finely roe-grained, durable. Pores very small, numerous, with narrow wings of parenchyma which is more or less confluent. Ripple marks faintly visible, regular, all elements storied; about 120 markings per inch. Wood suitable for heavy and durable construction and for tool handles and spokes of wagon wheels. (See *Timbers of Tropical America*, p. 542.) (Collected near Los Limones, Jan. 25, 1927. No. 117; Yale No. 10,068.)

*Tecoma pentaphylla* Juss. "Matilisquate." One of the best known trees in the family. (See *Tropical Woods* 10: 14, June 1, 1927.) (Collected at Los Limones, Jan. 26, 1927. No. 127; Yale No. 10,078.)

*Tecoma stans* (L.) H. B. K. "Chanté." A small tree or a shrub, with opposite, pinnate leaves having 5 to 13 willow-like leaflets; flowers bright yellow, in showy terminal clusters; pods slender, 5 to 10 inches long; seeds flat, with papery wing. Wood brown, moderately heavy and hard, fine-textured, is not durable. Pores very small, solitary or in pairs; parenchyma sparingly developed; rays very fine; ripple marks irregular. (Collected along railroad just east of Gualán, Jan. 24, 1927. No. 110; Yale No. 10,061.)

## BORRAGINACEAE (Borage Family)

*Cordia alba* (Jacq.) R. & S. "Upay." ("Jackwood" in British Honduras.) Small tree, with alternate, ovate, coarse leaves; flowers small, whitish, in terminal clusters; fruit a white, sweet berry containing a mucilaginous substance used locally for adhesive purposes. Wood brownish, rather light but firm, coarse-textured, saws woolly, is not durable. Rays distinct; pores small, often more or less grouped, and connected tangentially by parenchyma. Vertical gum ducts present in peripheral row as result of injury. Wood not utilized, except for fuel. (Collected near Gualán, Jan. 24, 1927. No. 109; Yale No. 10,060.)

*Cordia Gerascanthus* L. "Palo de asta." Large deciduous tree, with smooth, hard bark and simple, elongated, alternate leaves; flowers white,

fragrant, showy, in compact terminal clusters. Sapwood pale brown; heartwood absent in specimen, probably very dark; hard, heavy, strong, fine-textured. Rays distinct; pores small, numerous but not crowded, often connected tangentially by parenchyma. (This is the species described in *T. of T. A.*, p. 517, under the name of *Cordia gerascantboides* H. B. K.) (Collected one mile east of Gualán, Jan. 24, 1927. No. 115; Yale No. 10,066.)

## CACTACEAE (Cactus Family)

*Pereskia autumnalis* (Eichlam) Rose. "Manzanote." Small, coarse, spiny tree, with birch-like bark, small, alternate, somewhat fleshy leaves, wheel-shaped flowers, and yellow, pear-shaped, fleshy fruits. Common in lowlands. Wood yellowish, rather light but firm, coarse-textured, not durable; not utilized. Rays coarse and conspicuous; pores small, solitary or grouped, variable in size; parenchyma about pores and in indistinct tangential bands of variable width. (Collected at Los Limones, Jan. 26, 1927. No. 122; Yale No. 10,073.)

## COCHLOSPERMACEAE

*Cochlospermum vitifolium* (Willd.) Spreng. "Tecomatillo." Small deciduous tree, with large leaves, very showy yellow flowers (borne when leaves are off), and very soft, laminated, perishable wood. (See *Tropical Woods* 10: 17, June 1, 1927.) (Collected along railroad just east of Gualán, Jan. 24, 1927. No. 114; Yale No. 10,065.)

## HERNANDIACEAE

*Gyrocarpus americanus* Jacq. "Titirillo." Rather large deciduous tree, with pendant clusters of shuttlecock-like fruits, each consisting of an elongated, velvety nutlet with two slender wings 3 to 4 inches long. Wood brown, light, and fairly soft, rather coarse-textured, not durable. Rays fine, barely visible; pores small, visible, occurring singly or in clusters; parenchyma poorly developed, tending to terminate growth rings. Pith septate. (Collected one mile east of Gualán, Jan. 24, 1927. No. 112; Yale No. 10,063.)

## LEGUMINOSAE (Bean Family)

*Acacia Farnesiana* (L.) Willd. "Subín." Small, spiny tree, with sparse, fine, feathery foliage; tiny, yellow, sweet-scented flowers in heads the size of a pea; pods small, purplish. Wood reddish brown, very hard and heavy, rather fine-textured, probably durable. Rays visible; pores small, occurring singly or in pairs, surrounded by parenchyma which often forms conspicuous tangential bands. Wood used for fuel. (Collected at Los Limones, Jan. 26, 1927. No. 124; Yale No. 10,075.)

*Acacia paniculata* Willd. "Orotoguaje." Small tree, with short, recurved spines and fine, feathery foliage; flowers white; pods thin, flat, dark brown. Wood dark brown, hard and heavy, fine-textured. Rays barely visible; pores small, mostly solitary; parenchyma in diamond-shaped patches about pores, sometimes confluent, and also in concentric lines, apparently terminal.

Wood used for fuel. (Collected near Gualán station, Jan. 24, 1927. No. 106; Yale No. 10,057.)

*Albizia longipedata* (Pittier) Britt. & Rose. "Cadenó." Medium-sized, unarmed tree, with rough bark and large doubly pinnate leaves having 5 or 6 pairs of pinnae and rather few, obliquely oblong leaflets; flowers yellowish white, in long-stalked tufts suggesting *Inga*; pods flat. Wood dark brown, hard and heavy, medium-textured, probably fairly durable. Rays minute; pores visible, scattered; parenchyma in circles or diamond-shaped patches about the pores and occasionally confluent. No special use for wood. (Collected at Los Limones, Jan. 26, 1927. No. 126; Yale No. 10,077.)

*Caesalpinia affinis* Hemsl. "Carcaño." Small tree, with doubly pinnate leaves having 3 to 5 pairs of pinnae and rather few elliptical leaflets  $\frac{3}{4}$  inch long; flowers orange-colored, in showy terminal racemes. Color of heartwood doubtful, probably orange (absent in specimen). Wood hard and heavy, coarse-textured. Rays barely visible; pores small, occurring singly or in groups of 2 or 3; parenchyma very abundant, about pores, in irregular masses and tangential bands; ripple marks absent. Tree planted for decorative purposes. (Collected in Gualán, Jan. 24, 1927. No. 104; Yale No. 10,055.)

*Caesalpinia pulcherrima* (L.) Swartz. "Santa Rosa." Well-known ornamental shrub or small tree, with very showy flowers. Wood beautiful variegated orange, hard and heavy, fine-textured, takes a beautiful polish. Rays minute; pores very small, occurring singly or in short radial rows; parenchyma very sparingly developed at limits of growth rings; ripple marks irregular and indistinct. This wood resembles some other well-known woods of the genus *Caesalpinia*, but is very unlike that of the preceding species. (Collected in Gualán, Jan. 24, 1927. No. 116; Yale No. 10,067.)

*Cassia emarginata* L. "Vainillo." Medium-sized deciduous tree, with dark brown bark and pinnate leaves having a few pairs of rather large, oval, somewhat downy leaflets; large yellowish flowers in racemes; pods narrow (about  $\frac{1}{2}$  inch wide), thin, flat, often 1 foot or more long. It is said that these pods cause the loss of the manes and tails of horses and mules eating them. This property has not previously been ascribed to this species though, according to Standley, it is pretty well authenticated for some of the species of *Leucaena*, especially the widespread *L. glauca* (L.) Benth. Wood bright greenish yellow, hard and heavy, fine-textured, takes a beautiful polish, appears durable. Rays indistinct; pores small, solitary or in pairs; parenchyma in narrow wings about pores, often confluent and also in fine terminal lines; ripple marks absent. (Collected at Los Limones, Jan. 26, 1927. No. 125; Yale No. 10,076.)

*Gliricidia sepium* (Jacq.) Steud. "Madre de cacao." Small or medium-sized bushy tree extensively planted for live fence posts and for decorative purposes; leaves pinnate, with elliptical, pointed leaflets; bright pink flowers appearing in showy racemes after the leaves have fallen; pods long, flat, about  $\frac{1}{2}$  inch wide. Wood olive or russet brown with pencil striping of parenchyma; very hard, heavy, strong, and durable; rather coarse-textured. Rays very fine; pores small, scattered singly or in small radial groups; tyloses present; parenchyma abundant about pores and often confluent in irregular bands and also terminal; ripple marks present, irregular, not visible without lens. Timber

used for fence posts, heavy construction, and for fuel. (Collected in Gualán, Jan. 24, 1927. No. 108; Yale No. 10,059.)

*Leucaena* sp. nov. "Yaje." Small tree, with feathery foliage, and thin, flat, smooth, dark brown pods 6 inches or more in length and a little over  $\frac{1}{2}$  inch wide. Wood dark brown, hard, heavy, tough, rather fine-textured. Rays minute; pores small, round, rather unevenly distributed; parenchyma fairly abundant, but not conspicuous, being associated with pores, in terminal lines, and diffuse; ripple marks absent. Wood used for fuel. (Collected in Gualán, Jan. 24, 1927. No. 102; Yale No. 10,053.)

*Mimosa polycarpa* Benth. "Zarza." Small tree, with fibrous bark, prickly branches, and sparse, feathery leaves; pods dark brown, thin, flat, about 2 inches long and  $\frac{1}{2}$  inch wide, the margins beset with sharp prickles. Wood yellowish brown, lustrous, hard, heavy, tough, fine-textured. Rays minute; pores small, round, unevenly distributed; parenchyma associated with pores and in short tangential lines, being very irregularly disposed; ripple marks absent. (Collected one mile east of Gualán, Jan. 24, 1927. No. 111; Yale No. 10,062.)

*Pithecolobium littorale* Britt. & Rose. "Jaguay." Small, spiny tree, with small leaves, each having 2 pairs of leaflets 1 to 1  $\frac{1}{2}$  inches long and half as wide; minute flowers in small, dense heads in racemes. Heartwood probably dark brown (only sapwood in specimen), rather light and soft, moderately fine-textured. Rays minute; pores small, round, mostly single, not crowded; parenchyma in coarse, irregular bands including the pores, and also in occasional fine concentric lines; ripple marks absent. (Collected in Gualán, Jan. 24, 1927. No. 107; Yale No. 10,058.)

*Pithecolobium microstachyum* Standl. "Jaguay cimarrón" or "j. de llano." Small tree, with sparse foliage, the leaves similar to preceding, only larger. Wood reddish brown, exceedingly hard and heavy, fine-textured, not easy to cut, probably durable. Rays minute; pores very small, round, solitary or in pairs, well distributed; parenchyma rather sparingly developed, in diamond patches about pores and in fine terminal lines; ripple marks absent. Wood of entirely different type from that of the preceding species. Used for fuel. (Collected at Los Limones, Jan. 26, 1927. No. 120; Yale No. 10,071.)

*Prosopis chilensis* (Mol.) Stuntz (= *Prosopis juliflora* [Sw.] DC.). "Divi-divi," "nacascol," "nacascolote." (These names are more commonly applied elsewhere to *Caesalpinia coriaria* Willd.) Small tree, known as "mesquite" in southwestern United States; forms thickets at Los Limones; has bipinnate leaves, with few pinnae and numerous small leaflets; flowers fragrant, in compact, slender racemes; pods pulpy and sweet. Wood chocolate-brown, mildly scented, hard, heavy, strong, durable, rather coarse-textured. Rays fine; pores readily visible, scattered, sometimes showing tendency to ring-porous structure; parenchyma encircling pores and in terminal lines; ripple marks absent. Used for fuel, fence posts, and durable construction. Flowers are a source of honey and the pods provide food for domestic animals. (Collected at Gualán, Jan. 24, 1927. No. 105; Yale No. 10,056.)

## NYCTAGINACEAE

*Pisonia macranthocarpa* Donn. Smith. "Clavo." Small tree, with opposite, simple, elliptical leaves, long-tapering at the basal end; flowers very small, in little axillary heads, fruits 5-sided. Wood brown, rather light but hard, very coarse-textured, perishable. Rays minute; pores very small, not very numerous, mostly in short radial rows; parenchyma not visible; ripple marks present, but indistinct. Wood is anomalous in structure, having many small, regularly distributed bast strands which appear like large vessels on longitudinal surface. No known uses. (Collected at Los Limones, Jan. 26, 1927. No. 121; Yale No. 10,072.)

## POLYGONACEAE (Buckwheat Family)

*Ruprechtia Deamii* Rob. "Carreto," "sangre de toro." Small tree, with slender twigs and simple, alternate, elliptical leaves prominently veined beneath; flowers small, in numerous, axillary, mouse-colored spikes. Wood pale reddish brown, of medium density and hardness, fine-textured, not durable. Rays minute; pores very small, mostly in radial groups of 2 to 5; parenchyma not visible. (Collected near Gualán, Jan. 24, 1927. Nos. 103 and 113; Yale Nos. 10,054 and 10,064 resp.)

## RHAMNACEAE (Buckthorn Family)

*Zizyphus guatemalensis* Hemsl. "Mocoso." Small tree, with simple, alternate, rounded leaves that are prominently 3-nerved. Heartwood probably reddish brown (specimen all sapwood), hard and heavy, fine-textured, takes a high polish. Rays very fine; pores small, scattered singly or, less frequently, in radial groups of 2 or 3; parenchyma in exceedingly numerous short lines forming network with the rays and not visible without lens, and also in fine terminal lines. Wood used for fuel. (Collected in Los Limones, Jan. 26, 1927. No. 119; Yale No. 10,070.)

## SAPOTACEAE (Sapodilla Family)

*Bumelia retusa* Swartz. "Huele de noche" (?). (Common name perhaps incorrect, as elsewhere species of *Cestrum* are usually so called.) Small tree, with checkered, brown, lactescent bark, gray, spinose twigs, and rather few, simple, alternate leaves rounded at apex and broadly wedge-shaped at the base; flowers very small, greenish yellow, clustered along the branchlets. Wood pale yellow, very hard, heavy, strong, fine-textured, straight-grained, takes a high polish. Rays very fine; pores very small, arranged in wavy, radial chains; parenchyma abundant, in closely spaced, irregular, concentric lines or narrow bands. An excellent wood for tool handles and turnery. (Collected at Los Limones, Jan. 26, 1927. No. 123; Yale No. 10,074.)

## SIMARUBACEAE (Bitterwood Family)

*Simaruba glauca* DC. "Jocote de mico." Medium-sized tree, with alternate, pinnate leaves, small flowers in panicles, and fleshy, dark red fruits. Wood yellowish white, light, firm, straight-grained, medium-textured, easy to work, not durable, has bitter taste. Rays fine; pores small, but visible,

scattered singly or more often in compressed groups; parenchyma about pores and connecting them with very irregular tangential lines or narrow bands; ripple marks present, irregular, not very distinct. (See *Tropical Woods* 10: 37, June 1, 1927.) (Collected at El Sitio, 3 miles east of Gualán, Jan. 26, 1927. No. 128; Yale No. 10,079.)

## THEOPHRASTACEAE

*Jacquinia aurantiaca* Ait. "Luruche." A small tree or a shrub, with stiff, spine-tipped leaves, and hard-shelled fruits which have the appearance of little oranges. Wood yellow, hard, heavy, brittle, medium-textured. Rays broad and conspicuous; pores very small to minute, the larger ones in single row at periphery of growth ring, the others in small radial rows or clusters elsewhere; parenchyma not visible. Crushed fruits used for stupefying fish. (Collected at Los Limones, Jan. 25, 1927. No. 118; Yale No. 10,069.)

## CHECK LIST OF COMMON NAMES

Amate	<i>Ficus</i> spp.	Moraceae
Cadeno	<i>Albizia longipedata</i> (Pittier) Britt. & Rose	Leguminosae
Carcaño	<i>Caesalpinia affinis</i> Hemsl.	Leguminosae
Carreto	<i>Ruprechtia Deamii</i> Rob.	Polygonaceae
Ceiba	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae
Chanté	<i>Tecoma stans</i> (L.) H. B. K.	Bignoniaceae
Chaparro	<i>Curatella americana</i> L.	Dilleniaceae
Clavo	<i>Pisonia macranthocarpa</i> Donn. Smith	Nyctaginaceae
Cortés colorado	<i>Tabebuia Palmeri</i> Rose	Bignoniaceae
Divi-divi	<i>Prosopis chilensis</i> (Mol.) Stuntz	Leguminosae
Huele de noche (?)	<i>Bumelia retusa</i> Swartz	Sapotaceae
Jabillo	<i>Hura crepitans</i> L.	Euphorbiaceae
Jaguay	<i>Pitbecolobium littorale</i> Britt. & Rose	Leguminosae
Jaguay cimarrón; j. de llano	<i>Pitbecolobium microstachyum</i> Standl.	Leguminosae
Jocote de mico	<i>Simaruba glauca</i> DC.	Simarubaceae
Luruche	<i>Jacquinia aurantiaca</i> Ait.	Theophrastaceae
Madre de cacao	<i>Gliricidia sepium</i> (Jacq.) Steud.	Leguminosae
Manzanote	<i>Pereskia autumnalis</i> (Eich.) Rose	Cactaceae
Matilisquate	<i>Tecoma pentaphylla</i> Juss.	Bignoniaceae
Mocoso	<i>Zizyphus guatemalensis</i> Hemsl.	Rhamnaceae
Nacascal; nacascalote	<i>Prosopis chilensis</i> (Mol.) Stuntz	Leguminosae
Ocote	<i>Pinus</i> sp.	Pinaceae
Orotogujaje	<i>Acacia paniculata</i> Willd.	Leguminosae

Palo blanco	<i>Godmania aesculifolia</i> (H. B. K.) Standl.	Bignoniaceae
Palo de asta	<i>Cordia Gerascanthus</i> L.	Borraginaceae
Pino	<i>Pinus</i> sp.	Pinaceae
Sangre de toro	<i>Ruprechtia Deamii</i> Rob.	Polygonaceae
Santa Rosa	<i>Caesalpinia pulcherrima</i> (L.) Swartz	Leguminosae
Subín	<i>Acacia Farnesiana</i> (L.) Willd.	Leguminosae
Tecomatillo	<i>Cochlospermum vitifolium</i> (Willd.) Spreng.	Cochlospermaceae
Titirillo	<i>Gyrocarpus americanus</i> Jacq.	Hernandiaceae
Upay	<i>Cordia alba</i> (Jacq.) R. & S.	Borraginaceae
Vainillo	<i>Cassia emarginata</i> L.	Leguminosae
Yaje	<i>Leucaena</i> sp. nov.	Leguminosae
Zarza	<i>Mimosa polycarpa</i> Benth.	Leguminosae

#### SIX NEW TREES FROM BRITISH HONDURAS AND GUATEMALA

By PAUL C. STANDLEY, *U. S. National Museum*<sup>1</sup>

In a small lot of woody plants collected in British Honduras by Duncan Stevenson and H. M. Heyder, of the Forestry Department, and received for identification from Prof. Samuel J. Record, there has been found material of the two Sapotaceae trees described below. The discovery of these two well-marked trees proves that the recent enumeration of the Central American Sapotaceae<sup>2</sup> was incomplete, and there is every reason to expect that other additions to the list will be made when a representative collection is formed of the chicle-yielding trees of the Yucatán Peninsula. There is certainly no group of economic American trees which stands in more urgent need of thorough study.

Further collections made in northern British Honduras by Harry W. Winzerling have yielded new species of *Trichilia* and *Eugenia*, and there is described here also a new *Hirtella* from Guatemala. The diagnosis of an *Anneslia* has been furnished by Drs. N. L. Britton and J. N. Rose.

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

<sup>2</sup> *Tropical Woods* 4: 1-11, Dec. 1, 1925.

#### *Hirtella guatemalensis* Standl., sp. nov.

Branches slender, subterete, dark reddish brown, the young ones densely hispid with stiff spreading fulvous hairs about 2 mm. long, the internodes elongate; petioles stout, about 3 mm. long, hispid; leaf blades oblong, 14-21.5 cm. long, 5-7.5 cm. wide, abruptly long-acuminate or cuspidate-acuminate (acumen 1.5-2 cm. long, obtuse), at base rounded or very obtuse, often slightly unequal, subcoriaceous, deep green on the upper surface, when young sparsely hirsute, glabrate in age, the costa and lateral nerves prominent, beneath paler, hirsute along the principal nerves with sparse spreading fulvous hairs, the costa and lateral nerves slender, prominent, the lateral nerves about 13 on each side, ascending, arcuate, irregularly anastomosing remote from the margin, the intermediate nerves prominent, coarsely reticulate; inflorescences terminal and axillary, thyrsoid-paniculate, the peduncle 2-3 cm. long, the panicles about 18 cm. long, the lower flowers sterile, the upper branches of the panicle 5-10 mm. long, brownish-hirsute, bearing 1 to 4 flowers, the pedicels 7 mm. long or less; lower bracts large and leaflike, 9 cm. long or shorter, the upper bracts lance-linear, 3-8 mm. long, hirsute; bractlets 2 mm. long, linear-lanceolate, hirsute, glandular-ciliate, the glands stipitate; hypanthium obconic, 2.5 mm. long, hirsute; sepals oval-ovate to orbicular, 4-5 mm. long, obtuse or rounded, the outer ones hirsute outside, the inner hirsutulous and tomentulose, densely and minutely tomentose on the inner surface; petals obovate-orbicular, 5 mm. long, glabrous; stamens 8, 3 of them perfect, with stout glabrous curved filaments 2 cm. long, the other 5 sterile and 2.5 mm. long or shorter; style slender, long-pilose; ovary densely pilose.

Type in the U. S. National Herbarium, No. 576,748, collected at Livingston, Guatemala, near sea level, February, 1905, by H. von Tuerckheim (No. II. 1141; *J. D. Smith* 8680).

To this species is referable, perhaps, sterile material of "pigeon plum," collected in British Honduras in 1927 by H. M. Heyder (No. 17).

The type collection of *H. guatemalensis* was distributed as *H. mollicoma* H. B. K. It is related to that species, but differs in the long pubescence, large bracts, few-flowered inflorescence, and large sepals.

#### *Anneslia belizensis* Britton & Rose, sp. nov.

A tree 10 m. high, with very hard yellowish wood, the twigs long-hairy. Petiole and rachis hairy; petiole 1 cm. long or shorter; pinnae 2 pairs; leaflets about 20 pairs, thick, shining above, paler beneath, glabrous on both sides, ciliate, linear-oblong, 8-12 mm. long, acute; flowers in large sessile heads, often clustered at the ends of branches; bractlets lanceolate, persistent, the outer ones hairy on the back, the inner ones long-ciliate; calyx 5-6 mm. long, the tube glabrous, striate, the teeth hairy; corolla 1 cm. long, glabrous except its hairy lobes; stamens numerous, 3-4 cm. long, the sheath included; legume



spatulate, 9-10 cm. long, 9 mm. broad above, densely white-lanate with long hairs, the tip acutish.

Collected by H. W. Winzerling at Hillbank, Orange Walk District, British Honduras, in 1927 (No. VII. 4). Type in the U. S. National Herbarium, No. 1,269,799.

*Trichilia minutiflora* Standl., sp. nov.

Tree, the branchlets slender, very leafy, appressed-pilose with short pale hairs; leaves petiolate, the petiole and rachis together 6-10.5 cm. long, very slender, sparsely and minutely pilose with spreading hairs; leaflets 7-11, short-petiolulate, chiefly alternate, the blades lance-oblong or elliptic-oblong, 2.5-6.5 cm. long, 1-2 cm. wide, gradually or abruptly acute to long-acuminate, with broad or narrow, obtuse tip, at base usually oblique, cuneate-acute to rounded, membranaceous, deep green on the upper surface, glabrous except along the puberulent costa, beneath slightly paler, at first copiously hirsute along the costa, in age glabrate, the costa slender, prominent, the lateral nerves very slender, divergent at a wide angle, straight; panicles axillary, shorter than the leaves, branched from the base, laxly many-flowered, the branches very slender, green, sparsely and minutely pilose; calyx 0.7 mm. long, 1.3 mm. broad, minutely hirtellous, 5-dentate, the teeth short, usually obtuse, sometimes acute, irregular; petals 5, glabrous, 1.6 mm. long, oblong-ovate, acutish; stamen tube over half as long as the petals, glabrous, remotely and minutely 5-dentate; anthers 5, subglobose; ovary ovoid-globose, sessile, sericeous, the style very short.

Type in the U. S. National Herbarium, No. 1,315,891, collected in the Orange Walk District, British Honduras, April, 1927, by H. W. Winzerling (No. VIII. 1; Yale No. 9870). The Maya name is given as "xpukuskil."

Related, perhaps, to the little-known *T. oligantha* C. DC., of Mexico, which has large leaflets and villous branches.

*Eugenia Winzerlingii* Standl., sp. nov.

Branches stout, terete, ochraceous, slightly rugose and rimose, the internodes 1.2-3 cm. long; petioles very stout and thick, 2-4 mm. long, glabrous, rounded on the lower side, shallowly sulcate on the inner surface; leaf blades rounded-obovate to obovate-oval or obovate-oblong, 3-7 cm. long, 1.5-4 cm. wide, broadly rounded at apex, gradually narrowed to the obtuse base, thick-coriaceous, glabrous, pellucid-dotted with numerous large distant glands, lustrous on the upper surface, beneath dull and paler, the venation prominent and conspicuous on both surfaces, especially above, the costa stout, the lateral nerves about 8 on each side, ascending at an angle of about 60 degrees, nearly straight, anastomosing remote from the margin to form a distinct, nearly regular, collective nerve, the margin pale, conspicuously cartilaginous-thickened; flowers axillary and also borne on old defoliate branches, fasciculate, usually 2-4 in each fascicle; pedicels stout, straight, 8-12 mm. long, glabrous; bractlets 2, oval, rounded at apex, less than 1 mm. long; fruit globose or oval, 5-7 mm. in diameter, rounded at base and apex,

glabrous; calyx persistent upon the fruit, the 4 lobes erect, suborbicular or ovate-orbicular, rounded at apex, united at base, glabrous; seed 1, brown, lustrous, filling the interior of the fruit; embryo green, the cotyledons large, fleshy, green, conferruminate, densely gland-dotted.

Type in the U. S. National Herbarium, No. 1,315,892, collected in the Orange Walk District, British Honduras, April, 1927, by H. W. Winzerling (No. VIII. 7). Collected also in British Honduras in 1926 by Winzerling (No. I. 7).

I have tried in vain to identify this *Eugenia* with one of the many species known from the West Indies. From all the described Central American species it is distinguished by the thick-coriaceous leaves, of characteristic shape and venation.

*Dipholis Stevensonii* Standl., sp. nov.

Large tree, the branchlets densely leafy, very densely and closely ferruginous-tomentose; petioles stout, 2.5-4.3 cm. long, flat on the upper surface, densely ferruginous-tomentose; leaf blades broadly oblong or oblong-obovate, 15-25 cm. long, 7-11 cm. wide, broadly rounded to obtuse at apex, slightly narrowed to the rounded or broadly obtuse base, abruptly and very shortly decurrent, coriaceous, deep green and glabrate above, the venation not elevated, beneath paler, bright green, when young covered with a dense close tomentum of matted, bright ferruginous hairs, in age glabrate except on the nerves, the costa stout, salient, the lateral nerves slender, prominent, about 14 on each side, divergent at an angle of about 45 degrees, arcuate toward the margin, distinct nearly or quite to the margin, this cartilaginous-thickened; fruits clustered at the defoliate nodes of old branches, the pedicels stout, 1.5-2 cm. long, ferruginous-tomentose or glabrate; sepals (imperfect) 6 (or perhaps more), suborbicular or broadly ovate, 3-3.5 mm. long, rounded at apex, sparsely and minutely sericeous on the inner surface, the outer sepals minutely ferruginous-tomentose on the outer surface, the inner ones minutely sericeous; fruit broadly oval, 2 cm. long and 1.5 cm. broad, broadly rounded at base, the apex subtruncate, depressed, caplike, sharply differentiated from the body of the fruit; fruit densely ferruginous-tomentose when young, glabrate in age; seed 1, oval, 1.5 cm. long and 1 cm. thick, narrowed to the obtuse ends, dark brown, slightly lustrous, smooth, the hilum oblique, pale, oval, 5 mm. long and 3 mm. wide.

Type in the U. S. National Herbarium, No. 1,315,540, collected in British Honduras in 1927 by Duncan Stevenson.

The collector furnishes the following notes: "*Zapote faisán*. Common to the Mopán zone. General appearance that of *Calocarpum mammosum*. Latex used in chicle; called *chicle faisán*."

It is evident that this is an important tree because it is one of the numerous sources of commercial chicle. It is un-

fortunate that flowers are not available so that the true generic disposition of the tree might be determined. I am not certain that it belongs properly to *Dipholis*, but have referred it there because of the close resemblance of the fruit to that of the Costa Rican *Dipholis minutiflora* Pittier.

*Dipholis Stevensonii*, whatever its final generic disposition may be, is evidently distinct from any of the Sapotaceae now known from Central America, and may be recognized at once by the rustlike tomentum of the leaves. The tree is quite unlike *Lucuma amygdalina* Standl. (Trop. Woods 4: 5, 1925), which also is said to be called "zapote faisán."

*Lucuma Heyderi* Standl., sp. nov.

Branchlets terete, grayish, rimose, densely leafy, when young densely and minutely brownish-sericeous, in age glabrate; petioles slender, 1-1.8 cm. long, minutely sericeous or glabrate; leaf blades oblong to obovate-oblong, 7-14.5 cm. long, 3-5.5 cm. wide, rounded to obtuse at apex, acute and decurrent at base, often slightly asymmetric, thick-membranaceous, glabrous in age or nearly so but with traces of an earlier minute sericeous pubescence, deep green and lustrous on the upper surface, the venation evident but not elevated, beneath scarcely paler, dull, the costa slender, prominent, the lateral nerves very slender, 12-16 on each side, straight or nearly so, divergent at an angle of 45-50 degrees, distinct nearly to the margin; flowers supra-axillary, solitary or clustered, the stout pedicels 5-8 mm. long, minutely grayish-sericeous or glabrate; sepals 5, 3 mm. long, suborbicular, sometimes broader than long, broadly rounded at apex, strongly concave, minutely grayish-sericeous or glabrate, coriaceous; ovary globose, 2.5 mm. long, sericeous, the style thick and stout, 1.5 mm. long.

Type in the U. S. National Herbarium, No. 1,315,539, collected in British Honduras in 1927 by H. M. Heyder (No. 25). Vernacular name, "mamee ciruela."

In its foliage this *Lucuma* suggests *L. hypoglauca* Standl. (Trop. Woods 4: 4, 1925), but in that species the flowers are nearly sessile.

THE WOOD OF *TETRAPODENIA GLANDIFERA*  
GLEASON

*Tetrapodenia*, a genus of the Malpighiaceae, is described in *Bulletin of the Torrey Botanical Club* 53: 289, June 3, 1926, by Dr. H. A. Gleason, Curator, New York Botanical Garden. It is "closely related to *Glandonia* and *Burdachia*, two genera

of the northern Amazonian forests which are still poorly known and have probably not been collected in recent years."

The type of *Tetrapodenia glandifera* Gleason was a small tree collected at Amakura, Northwest District, British Guiana; other specimens have been obtained by the same collector (La Cruz) from the upper Mazaruni River. The wood specimen described below is part of a collection made in British Guiana in 1924 by the late A. C. Persaud for the Field Museum of Natural History, Chicago; determination of botanical material by Dr. Gleason.

DESCRIPTION OF THE WOOD

*General properties:* Heartwood reddish brown, fading gradually into the lighter colored sapwood.

Odor and taste absent or not distinctive in dry material.

Hard and heavy, of rather irregular grain, fine-textured, difficult to cut, splits with a splintery fracture, takes a high polish; durability doubtful.

*Growth rings:* Poorly defined.

*Parenchyma:* Faintly visible without lens, occurring in fine, irregularly spaced, concentric lines, which in some instances appear to terminate growth rings; also sparingly about the pores, and diffuse.

*Pores:* Very small, not distinct without lens; numerous, but not crowded; irregularly distributed, occurring singly or more often in radial groups of two or three, occasionally more.

*Vessel lines:* Fine and inconspicuous.

*Rays:* Very fine and scarcely distinct without lens on any section.

*Ripple marks:* Absent.

*Gum ducts:* None observed.

*Minute anatomy:* Pore walls thick; lumen open. Vessel perforations simple, the opening subcircular, with narrow annular ridge; intervascular pits very small, with narrow lenticular orifice which may extend beyond the border; pit membranes cribriform. Rays decidedly heterogeneous; biseriate in procumbent-cell portion, but mostly uniseriate; cells in uniseriate rays and portions square or more often upright, the marginal ones tapering and often conjugate; cells mostly

with thick, abundantly pitted walls and filled with dark gummy substance; pits into vessels simple to half-bordered, widely variable in size and shape, often large and elongated or more or less scalariform, the smaller ones showing distinctly cribriform membranes. Wood fibers very small in cross section, with thick gelatinous layer and minute lumen; pits minute, simple.

Measurements by D. A. Kribs: Pores 0.05 to 0.10 mm., av. 0.075 mm., in tang. diam. Length of vessel segments, 0.46 mm. to 0.60 mm., av. 0.51 mm. Rays 1 to 25 cells high, measuring 0.033 mm. to 1.06 mm., av. 0.58 mm. Fiber length, 1.195 mm. to 1.79 mm., av. 1.39 mm.; diameter, 0.014 mm. to 0.022 mm., av. 0.18 mm.

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

---

#### MIMOSA SCHOMBURGKII DISCOVERED IN HONDURAS

On February 15, while en route from Corocito to Black River, the editor and Mr. Henry Kuylen observed near Fallarones a number of strange leguminous trees which were growing along the right of way of the Truxillo Railroad Company, not far from the seashore. They were graceful trees, with a peculiar rusty brown color throughout, and occurred singly or in clumps at the edge of open woodlands for a distance of a mile or more. The largest specimen was probably not more than 25 feet tall and 8 inches in diameter; nearly all of them were in bloom.

The location of these trees was noted and two days later a section of one of the stems was obtained (No. 73; Yale No. 10,019), together with leaves and flowers. (See *Tropical Woods* 10: 26, June 1, 1927.) Fruiting specimens were subsequently secured through the courtesy of Messrs. Walter E. Brown and C. H. McClellan, of the Truxillo Railroad Company. These botanical specimens have been identified by Dr. J. N. Rose, of the U. S. National Museum, as *Mimosa Schomburgkii* Benth.

"This species was first found in British Guiana," says Dr. Rose, "but we have only two records of its appearance there. A type specimen of it, collected by Schomburgk in 1839, is preserved in the National Herbarium at Washington. The discovery of the tree in Honduras adds another species to our North American flora. It may be described as follows:

"A small tree, the twigs densely lepidote pubescent. Leaves large, often 2 dm. long, the petiole, rachis, and young leaflets densely lepidote pubescent; pinnae 7-15 pairs; leaflets 15-20 pairs, oblong, 4-6 mm. long, becoming glabrate in age, the midvein subcentral, prominent beneath; inflorescence a terminal panicle; spikes 3-8 cm. long; peduncle, calyx, and corolla lepidote-pubescent; stamens 10; pod oblong, 5-7.5 cm. long, short-stipitate, lepidote."

---

#### TWO NEW TREES OF THE FAMILY RUBIACEAE FROM PANAMA

By PAUL C. STANDLEY, *U. S. National Museum*<sup>1</sup>

A recent collection of trees made in the Changuinola Valley of Panama by George P. Cooper and George M. Slater contains the two interesting Rubiaceae trees here described. The collection includes also one or two additional new species in other groups, whose publication is delayed with the hope that more complete material of them may be obtained to supplement that now available for study.

#### *Ixora rauwolfioides* Standl., sp. nov.

Small tree, the branches slender, terete, with short or elongate internodes, when young obscurely pruinose-puberulent; stipules linear-subulate, with long slender apex, persistent, 4-7 mm. long, pruinose-puberulent; leaves opposite, the petioles 3-6 mm. long, slender, glabrous; leaf blades lance-oblong to elliptic-oblong, 6.5-12.5 cm. long, 2-4.5 cm. wide, rather abruptly acuminate or long-acuminate, with acute tip, at base gradually or abruptly acute to attenuate, rarely obtuse, decurrent, membranaceous, glabrous,

---

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

slightly paler beneath, the costa very slender, salient beneath, the lateral nerves very slender, about 13 on each side, divergent at an angle of 60 degrees, slightly arcuate, irregularly anastomosing remote from the margin; inflorescences terminal, cymose-paniculate, sessile, 3.5 cm. long, the branches slender, puberulent, the primary branches about 1.3 cm. long; flowers numerous, some of them sessile, the others on pedicels 1 mm. long or shorter; bracts triangular-lanceolate, 1 mm. long or shorter, acute, spreading, persistent; calyx and hypanthium together 1-1.5 mm. long, puberulent, campanulate, the calyx limb truncate or obscurely dentate; corolla glabrous, the tube slender, 2.5-3 mm. long, the 4 lobes oblong, 2 mm. long, obtuse, spreading; anthers linear, 1.5 mm. long, exserted; style slender, glabrous, equaling the corolla lobes, the 2 stigma lobes linear, 1 mm. long.

Type in the U. S. National Herbarium, No. 1,315,888, collected in a catival in the Changuinola Valley, Panama, in 1927 by George P. Cooper and George M. Slater (No. 93; Yale No. 10,274). A sterile specimen obtained by the same collectors (No. 95; Yale No. 10,276) in the same region is conspecific.

This is the first native species of *Ixora* to be reported from Panama. It is related to *I. nicaraguensis* Wernham, which has much larger flowers and broader stipules.

***Chimarrhis parviflora* Standl., sp. nov.**

Branches subterete or, when dry at least, more or less compressed, ochraceous, minutely puberulent or sericeous, the internodes elongate; stipules linear-lanceolate, 1.3-2.5 cm. long, deciduous, densely grayish-sericeous; petioles stout, 8-20 mm. long, semiterete, minutely sericeous or glabrate; leaf blades oblong-obovate, 7.5-15 cm. long, 2.5-6 cm. wide, acute or abruptly acute at apex, acute to abruptly attenuate at base and decurrent, thick-membranaceous, deep green and glabrous above, beneath slightly paler, when young densely sericeous but in age only sparsely sericeous, the costa stout, prominent beneath, the lateral nerves 9 or 10 on each side, ascending at a wide angle, arcuate, irregularly anastomosing close to the margin; cymes axillary, 2-7 cm. broad, 1.5-4 cm. high, very dense, many-flowered, the peduncles stout, compressed, 2.5-4 cm. long, the branches of the cymes densely puberulent; flowers sessile or on very short, stout pedicels; calyx and hypanthium together 1 mm. long, campanulate, glabrous or nearly so, the calyx limb obscurely denticulate; corolla 2 mm. long, glabrous outside, the tube nearly obsolete, the lobes oblong, obtuse, the throat densely white-villous; anthers oval, 0.6 mm. long, the slender filaments exceeding the corolla lobes.

Type in the U. S. National Herbarium, No. 1,315,890, collected in the Changuinola Valley, Panama, in 1927, by George P. Cooper and George M. Slater (No. 120; Yale No. 10,300).

Closely related to *C. cymosa* Jacq., of the Antilles, in which the broader leaves are glabrous or nearly so and barbate beneath, the stipules glabrous, and the flowers twice as large. The flowers of *C. parviflora* are said to be fragrant.

CURRENT LITERATURE

**Ueber die verwendung des aschenbildes für die bestimmung technisch-verwendeter hölzer.** By KAMETARO OHARA. *Denkschriften der mathem.-naturw. Klasse* (Wien) 100: 301-320, 1926. Illustrated.

A study of the ash of 108 woods, representing 70 genera and 38 families, with a view to determining the diagnostic value of the mineral deposits, notably calcium oxalate, calcium carbonate, and silicates.

In some woods the ash was found to be without special structure and crystals were absent, but in many others very characteristic features were noted. A more or less pronounced silicated condition of the vessels, ray cells, substitute fibers, and wood parenchyma cells was observed in *Magnolia hypoleuca* S. & Z., *Quassia amara* L., *Tectona grandis* L., *Cinnamomum Camphora* (L.) H. & E., and *Machilus Thunbergii* S. & Z., and in the case of the last two it extended to include the wood fibers. Phosphate of lime was identified in the tyloses and ray cells of *Tectona grandis*, thus confirming the disputed findings of earlier investigators.

**Die dampfmethode, ein neues verfahren zum schneiden härtester pflanzlicher objekte.** By J. KISSER. *Zeitschrift für wissenschaftliche Mikroskopie und für mikroskopische Technik* 43: 346-354, 1926. Illustrated.

Description of a method of sectioning hard woods, seeds, etc., for microscopic study. The material is softened by the action of live steam directed upon the block while in place in the microtome. It is claimed that quebracho wood (*Schinopsis*), lignum-vitae (*Guaiacum*), bamboo stems, coconut shell, and like objects can be sectioned by this method. The apparatus is very simple in construction and operation.

**Las regiones botánico-geográficas del estado de Oaxaca.**

By C. CONZATTI. Oaxaca, Mexico, 1926. Pp. 23; 8 x 10; 1 map.

This paper, which was presented by Professor Conzatti at

the Fourth International Botanical Congress (Ithaca, N. Y., 1926), summarizes the results of field investigations by himself and others in the State of Oaxaca, Mexico. With the aid of a map, one is afforded a remarkably clear picture of the vegetal zones.

There are three general divisions: the hot region (sea level to 1200-1500 meters elevation), temperate region (1200-1500 to 2000-3000 meters), cold region (2000-3000 to 3400 meters).

The hot region is subdivided as follows: (1) The littoral, a narrow zone which attains a maximum elevation of 300 meters and is semi-humid. Characteristic trees are *Rbizophora Mangle* L., *Hibiscus tiliaceus* L., and various representatives of the Anonaceae and Cactaceae. (2) The hot coastal forest zone extending back of the littoral formation for distances of 10 to 35 miles. It is dry from October to May and wet from June to September. There are many kinds of trees, which, in the ravines, attain large size and are valuable for their woods, among them being *Hymenæa Courbaril* L., *Toluifera Pereirae* (Klotzsch) Baill., *Haematoxylon Brasileto* Karst., *Astronium Conzattii* Blake, *Guarea Makrinii* Blake, *Hippomane Mancinella* L., *Diospyros Conzattii* Standl., and *Attalea Cobune* Morris. Cotton, coffee, and indigo are cultivated. Some places are covered with thorn forests, largely leguminous species. In this subregion is included also the large canyon between Cuicatlán and Teotitlán on the Gulf side of the Divide, mainly because the country is hot and dry. More than 40 families of Phanerogams are represented there and Cactaceae are abundant. The principal cultivated crops are sugar cane and rice. (3) The rain forest on the Gulf side of the Divide, being an extension of the forests of Veracruz and Chiapas, is dense, difficult of access, and little explored. There are at least 50 families of the Dicotyledons represented there and an abundance of palms. The principal crops are cacao, Castilloa rubber, sugar cane, tobacco, plantains, and coffee.

Two divisions of the temperate region are recognized: (1) The lower (1200 to 2000 meters), occupying the larger part of the river valleys in the central portion of the State and extending down to the coastal forest. It is dry from November

to April and wet from May to October. There are at least 70 plant families represented there. Cultivation is largely confined to cane, wheat, and corn (maize). (2) The upper portion (1500 to 2000 meters), situated in large part beyond the Divide. In some places it is wet, in others dry. There are about 30 families of plants. Cane and coffee are the principal crops in some localities in the eastern portion, and wheat in the western, while corn is grown in both.

There are two subdivisions of the cold region: (1) The mountain ridges (2000 to 3000 meters), occurring irregularly through the State. The climate is semi-humid and there are many different kinds of trees, including *Drimys Winteri* Forst, various oaks, *Abies religiosa* (H. B. K.) Schl. & Cham., *Pinus oöcarpa* Schiede, and *Juniperus flaccida* Schl. (2) The mountain peaks (3000 to 3400 meters), limited in extent and scattered. The climate is semi-humid and the vegetation is low.

In general, the portion of Oaxaca draining to the Gulf of Mexico possesses a much more humid climate and consequently has more luxurious forest growth than is the case on the Pacific slope, although the composition of the vegetation does not differ essentially on the two sides of the Divide.

**Trees and shrubs of Mexico.** By PAUL C. STANDLEY. *Contributions from the United States National Herbarium* 23: 1-5. Washington, D. C., 1920-1926. Pp. 1721+cxliii; 6 x 9½.

The following account of this monumental work is taken from a review by the late Mr. George B. Sudworth, Dendrologist, U. S. Forest Service, which appeared in the January issue of the *Forest Worker*:

"The completed volume represents the careful study of an enormous number of herbarium specimens, begun in 1918 and concluded in 1925. . . . [It contains descriptions] of all the known woody plants of Mexico, of which it is estimated there are some 5700 different species and varieties.

"The material studied comprises thousands of dried specimens now preserved in the National Herbarium. A large part of this material was obtained by collectors sent into Mexico

by the National Museum and the United States Department of Agriculture. To these specimens have been added collections made by some 52 other botanists who traveled and collected plants in Mexico. . . .

"The plan of Mr. Standley's work includes a survey of the growth of interest in Mexican plant life and of those who were instrumental in promoting a knowledge of it, especially of the plants of economic importance. Brief descriptions are given of the family and generic groups, together with keys enabling the student to classify unknown trees and shrubs. The technical and vernacular names of the different species and varieties and brief descriptions of their distinguishing characteristics are given. So far as it is known the range is briefly noted, and mention is made of the locality from which the type specimen of a species was first obtained. Careful attention is also given to recording the economic uses of the different plants, particularly the uses made of the wood and other products of trees and shrubs.

"Having to depend very largely upon the collectors' labels and scanty field notes accompanying dried specimens to determine what species are trees and what are shrubs, the author had much difficulty in clearing up this point. It is a notable fact that collectors, even now, too often neglect to note the size of plants from which specimens are taken. . . .

"The great interest Mr. Standley's splendid work has for foresters is that it presents for the first time a comprehensive means of becoming acquainted with Mexican trees likely to be of commercial value in the United States. Heretofore the great forest resources of Mexico have, as a whole, remained very imperfectly known, except to a few students of special plant groups such as conifers, oaks, mahogany, etc. Mexico has also been explored from time to time by lumber and naval stores interests to find what supplies are available, but little has been done to bring together and publish the information so collected. Even if it had been brought together and given to the public, it must necessarily have lacked full usefulness because the writers would have had to depend on local vernacular names in discussing Mexican trees, and these would have been most confusing. In all such accounts there

would have been wanting the definite work of the trained botanist, now presented in this volume."

**Possibilities for Para rubber production in northern tropical America.** By JOHN C. TREADWELL, C. REED HILL, and H. H. BENNETT. Trade Promotion Series No. 40, U. S. Dept. of Commerce, Washington, D. C., 1926. Pp. 375; 6 x 9; 63 figs. (maps, half-tones, and graphs). Price 65c.

The sixth of a series of publications made under instructions from Congress "to investigate and report on the possibilities of developing the plantation rubber industry in the Philippines and Latin America." It deals with 21 countries, all of which, with the exception of parts of Colombia and Ecuador, lie north of the equator.

"As was the case with surveys in other parts of the world where the plantation rubber industry is not now important, the investigations in northern tropical America were made and this report was prepared with the single object of furnishing to persons contemplating investment in rubber plantations the basic information which would determine the specific regions most worthy of exhaustive examination. A general treatment of the important points affecting successful rubber culture has been undertaken in the present report, with the understanding that prospective planters will supplement it with detailed studies of the areas appearing attractive to them."

"The advantages and disadvantages of northern tropical America from the standpoint of rubber planting are definite. In addition to having in many sections physical conditions unquestionably favorable to the growth and yield of *Hevea* rubber trees, its strategic position in relation to consuming markets is unequalled. In the matter of a present labor supply, it is perhaps less fortunately situated than any other region climatically suited for rubber.

"Judged by climatic records and by existing vegetation, there are many extensive areas in northern tropical America where climatic and soil conditions are favorable to rubber culture. These areas contain some parts, such as swamps and

steep hills, which are topographically unsuited for planting; with such parts eliminated, these regions would offer six million or more acres of land as suitable for rubber culture as are the lands now used for that purpose in the Middle East."

**Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii for the biennial period ended December 31, 1926.** Honolulu, 1927. Pp. 66; 6 x 9.

"During the past two years 75,993 acres have been added to the forest reserves, bringing the total area up to 916,977 acres. The Territory owns or controls 65 per cent of this acreage. The bulk of forest extension work on Oahu has now been completed. Contemplated additions to be made during the coming year to reserves on the other three main islands will bring the grand total up to at least 978,500 acres, an area of protected forest none too large to guarantee a sufficient and assured water supply." (Page 6.)

"The division planted a total of 204,689 trees in the forest reserves during the two years, an increase of 88,932 trees over the previous biennium. This means that, with an average spacing used of 9 by 9 feet, 380 acres of open land in forest reserves were reforested. This is only a pittance compared to the vast areas that should and could be reforested had we the necessary appropriation; but tree planting takes money and we are using, as often as possible, trees which are self-reproducing so that nature will help us in this work." (Page 22.)

A very serious problem, neglected for the past twenty years, but requiring early solution if the native forests are to be put into the best condition for conserving and increasing the water supply, is "the very undesirable encroachment of the staghorn fern or 'uluhi' on the indigenous native forest. While this thick mat of aggressive, vegetative cover may be of some service in holding back excessive run-off, it prevents the natural reproduction of the 'lehua' and other native Hawaiian trees and during dry weather seasons it forms a serious fire menace. A forest which cannot reproduce itself is doomed. Therefore, the staghorn fern must be eliminated. The method as to just how this may be accomplished most

economically must be solved by scientific research quite apart from routine administrative work." (Page 25.)

Arrangements have been made to have a forester from India make a study of tree requirements in Hawaii with a view to introducing Indian trees adapted to the various wet forest sites. It is also planned to use redwood seedlings from California to afforest the moist slopes of the mountains above the present timber line. (Page 26.)

**Some useful matters contained in forest trees in Japan.**

By IHACHIRO MIURA. Reprint, *Journal of the College of Agriculture* (Tokyo) 9: 2: 85-100, March 1927.

Deals with the following subjects: (1) Fatty oil contents of the seeds of 44 Japanese forest trees; (2) Contents and properties of four kinds of tung oil; (3) Tannin content of the bark or leaves of 81 Japanese trees; (4) Content of methoxyl group in the principal Japanese forest trees and its utilization by dry distillation; (5) Growth of cinchona in Formosa and alkaloid content of the bark; (6) Needle oils of 26 Japanese conifers.

**Annual report of the Director of Forestry of the Philippine Islands for the fiscal year ending December 31, 1925.**

By ARTHUR W. FISCHER. Manila, 1926. Pp. 227; 6 x 9.

"Marked activity in local markets was noted during the year. General prices for local lumber were higher than the previous year, especially of construction materials of the first group timber such as ipil and yacal. This is due to the home-building boom. The local market absorbed a total of 152,800,000 board feet of lumber and timber, including the 4,309,536 board feet of imported woods, as compared with 141,357,289 board feet, including 4,670,884 board feet of imported woods, in 1924. . . .

"Heavy demands of export lumber for foreign and local markets were noted during the year with prices higher than the previous year. This is particularly true for red lauan and tangle of the grades of firsts and seconds and veneer flitches for the American market. Active buying for future deliveries was likewise noted. During the year the export of lumber and

timber had an increase of 1,469,872 board feet over that of the same period of 1924 so that the total export amounted to 52,216,872 board feet as compared with 50,747,000 during 1924. . . .

"The United States continues to lead in the importation of the so-called Philippine mahogany (red and white lauan, tangile, and apitong) while Australia, where the same is marketed under the trade name of Pacific maple, jumped from the fifth place in 1924 to the second place in 1925. The export to the United States increased slightly over the previous year while that of Australia was doubled, the latter being over 9,000,000 board feet as compared with a little over 4,000,000 board feet in 1924. The prospect for a much larger trade with Australia is bright. Export to Japan for 1925 had dropped about 50 per cent, that country importing about 7,000,000 board feet as compared with 12,000,000 board feet in 1924. Indication, however, is that this drop is only temporary. Buyers for Japan were active during the latter part of the year. Philippine lumber in the Chinese market held its own in spite of the Civil War, registering a slight increase over that of the previous year.

"The decrease of exports to Japan and other smaller European countries was counteracted by the increase of exports to the United States and Australia, and by the opening of new markets. As a whole, the lumber industry maintained its increasing healthy growth, and it is anticipated that the volume in 1926 will be much more than the previous year."

**Les bois de l'Indochine.** By HENRI LECOMTE. Pub. No. XIII, Agence Économique de l'Indochine, 20, Rue de la Boétie, Paris, 1926. Pp. 311; 10 x 12½; 16 full-page plates; 30 text figs.; 1 map. **Atlas** (printed separately), with 68 plates of 4 photomicrographs each.

This impressive work is a notable contribution to the knowledge of tropical forests. Systematic botanists, foresters, wood technologists, and those interested in the utilization of tropical timbers will find it invaluable for reference and study. It is well printed and beautifully illustrated.

The contents are as follows: Introduction. Chap. I, General

character of the forest, and the physical properties of the woods (pp. 1-4). Chap. II, Features used in the study of the woods [vessels, fibers, wood-parenchyma, rays, resin ducts, etc.] (pp. 5-12). Chap. III, The natural families of the trees [key] (pp. 13-18). Chap. IV, Gymnosperms [including key to genera, and descriptions of species] (pp. 19-24). Chap. V, Monocotyledons (pp. 25-28). Chaps. VI-XII, Dicotyledons (pp. 29-218). Chap. XIII, Means of identifying the woods of Indo-China [keys and classifications] (pp. 219-234). Chap. XIV, Properties and possible uses of the woods of Indo-China, based on their structure (pp. 235-247). The atlas contains photomicrographs of the cross and tangential sections of the wood of 136 different species, with a uniform magnification of 30x, the work of Messrs. Conrad and Cintract.

There is also an appendix containing "Caractères généraux de la forêt Indochinoise" by M. H. Guibier, Inspecteur des Eaux et Forêts, Chef du Service forestier de l'Indochine. It deals with utilization of the woods, composition of the stands, and forest types; considers individually Cochin-China, Cambodge, Annam, Tonkin, and Laos; gives results of forest administration, forest improvements, and plantations.

There is an extensive bibliography; also indexes to the scientific and vernacular names.

**Forests and forest research in India.** By E. P. STEBBING and RALPH S. PEARSON. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 694-705. Inst. Int. d'Agr., Rome, 1926.

Gives an account of the progress of forest administration in the Colony; the inauguration, growth, and present organization of the Imperial Forest Research Institute and College at Dehra Dun; and discusses some of the problems arising from forest research, such as choice of site for institute, organization and staff, standardization in technique, and the practical application of the results of scientific investigations.

**Progress report of forest research work in India for the year 1925-26.** Calcutta, 1927. Pp. 143; 6¼ x 9½; 3 half-tone plates. Price 5s.



A full account of the activities in the various branches, including the administration report of the Forest Research Institute, Dehra Dun. It is printed on paper made in the Institute's experimental factory from bamboo, *Melocanna bambusoides*. The chapter headings are (1) General; (2) Silviculture and working plans; (3) Forest botany; (4) Forest economy; (5) Forest entomology; (6) Forest chemistry; (7) Forest publications. Appendix V gives a list of all of the forest publications of the Institute.

The section of timber testing reports that the following Indian species have been found satisfactory as substitutes for hickory (*Carya*) in the manufacture of airplane tail-skids: *Anogeissus acuminata* Wall., *A. latifolia* Wall., *Terminalia tomentosa* W. & A., *Dalbergia Sissoo* Roxb., *Grewia tiliifolia* Vahl, *Acacia arabica* Willd. (P. 79.)

"Salai" (*Boswellia serrata* Roxb.), a timber proposed for the manufacture of matches, but frequently spoilt by rapid fungous discoloration, has been seasoned successfully and without any discoloration in veneers and half-inch and inch planks. *Cullenia* wood, which formerly was useless because of decay during air seasoning, is being kiln-dried satisfactorily at Olavakot and supplies excellent box shooks which find ready sale. (P. 85.)

The workshops in Burma report an increase in revenue. "The increase, which is mainly due to an increased demand from the public for furniture in woods other than teak, is a sufficient indication that the timbers once known merely as 'jungle' woods are awakening the interest they merit." (P. 92.)

"Kanazo" (*Heritiera Fomes* Buch.) having proved satisfactory as a substitute for hickory for sucker rods in oil wells, tests are being made with another timber, "yon" (*Anogeissus acuminata* Wall.), which may replace entirely the imported hickory rods. These two woods and also "lein" (*Terminalia pyrifolia* Kurz) and "thitsein" (*T. belerica* Roxb.) are being tried out for handles of axes, hammers, hatchets, and peaveys. "Yon" handles can be sold at least 35 per cent below the price of hickory and this fact is counted upon in overcoming the prejudice against the color of the wood. In the search for

timber for bending, trial is being made of "thitsein," "tawpasa" (*Morus laevigata* Wall.), "sagawa" (*Michelia Champaca* L.), and "tawthayet" (*Nepbelium Longana* Camb.) (Pp. 93-4.)

At the sawmill, logs of some species treated the highly tempered saw teeth "as if they had been made of soft iron." In the case of "thakutpo" (*Stereospermum* sp.), "thanthat" (*Albizia lucida* Benth.), and "thane" (*Stereospermum* sp.) "four small cuts of 8 in. to 10 in. face were sufficient to wear the saw teeth so badly that they could not be re-sharpened." "Chay" (*Gluta tavoyana* Wall.) also proved difficult to saw, being both resinous and fibrous. When cutting "thitni" (*Amoora Robituka* W. & A.) "the entire sawmill staff complained of acute irritation of the nose and throat." (Pp. 96-7.)

"As regards the possibility of developing trade in impregnated sleepers from Burma, it appears that there is little likelihood of its ever being an economic proposition. As regards internal consumption, the cost of extraction of suitable species is so close to that of 'pyingado' [*Xylia dolabriformis* Benth.] that so long as the latter is available there will be no market for impregnated sleepers." (P. 100.)

**Distillation of agar oil.** By R. N. DE. *The Indian Forester* 53: 3: 158-9, March 1927.

Agar oil is obtained by crude methods of distillation of agar, a peculiar formation of the wood tissue found inside the *Aquilaria Agallocha* tree. This is a soft-wooded species growing in the evergreen forests of Assam, and, as the trees show no outward indication as to whether or not they contain agar, considerable loss results from felling specimens which have not yet developed the product sought.

There are two classes of agar wood—real and "dhum." The real agar is hard and brown and is so highly prized by the Parsees and Arabs for incense that it is rarely distilled. Dhum agar, the principal source of the oil, is soft and nearly colorless. Chips of it are steeped in water in an earthen pot for about two days, after which they are cut into smaller bits and pulverized. The powder is mixed with water and distilled, the oil being recovered by decantation. "One can suggest a num-

ber of improvements on the existing method, but the prejudice of the people against doing anything their forefathers have not done stands in the way."

**Administration report of the Forest Department of the Madras Presidency for the year ending 31st March 1926.**

Madras, 1927. Vol. I, pp. 159; 6 x 9 $\frac{3}{4}$ ; 7 plates; price 12 annas. Vol. II, pp. 172; 6 x 9 $\frac{3}{4}$ ; price 8 annas.

From out the great wealth of material in this report the editor gleans the following paragraph because of the lesson it teaches. In connection with the work of the sawmill at Olavakot, it is stated (Vol. I, p. 3):

"The demand for the hitherto unknown evergreen timbers is still rising. It is interesting to note that *Acrocarpus fraxinifolius* and *Polyalthia fragrans*, both unsalable until quite recently, have become so popular that the demand for *Acrocarpus* absorbs the entire outturn and in the case of *Polyalthia* actually exceeds the supply. The former is used for cart shafts and the latter for tea boxes and to a small extent for billiard cues. Another species, *Elaeocarpus tuberculatus*, suitable for tea boxes is equally popular, the demand for it exceeding the supply."

**Report on the Forest Administration in Burma for the year ending the 31st March 1926.** Rangoon, 1927. Pp. 217; 6 $\frac{1}{4}$  x 9 $\frac{3}{4}$ ; 13 plates, 1 graph. Price 9s.

"All research posts have justified themselves and probably that of the silviculturist most of all. The value of the silviculturist in collecting and coördinating the views of the individual observers is hard to estimate. The branch is now on a sound basis and may be trusted to guide the silviculture of the future on sound lines." (Page 16.)

The work of the botanist "is at present mainly concerned with establishing a representative collection of Burma timber species, including timber specimens." The necessity for a zoologist is becoming more and more obvious as a result of the increase in insect damage to plantations.

"The research branch of the Utilization Circle . . . con-

tinued its useful work of exploring the possibilities of timbers other than teak. . . . The object before the manufacturing section is not only to bring home to people the beauty of the Burmese timbers but also to make them realize that these timbers can replace imported supplies, particularly for some of the larger industries. The year has shown a marked increase in the interest taken by the general public in these timbers."

"The results of the sales of hardwoods in Europe have shown that the time is not ripe for the development of a big export industry so that our chief efforts in timber research must be devoted to improving the internal demand for hardwoods as substitutes for imported timbers." (Page 17.)

"The experiments to find the degree of resistance to teredo attack were reorganized. As it is now fairly certain that no timber is teredo proof the experiment is laid out to discover the relative rapidity of attack, the period when the attack is strongest, and the extent to which situation in respect to high water, silt deposit, current, and water pollution affects the attack." (Page 18.)

**Onderzoek naar bruikbare kenmerken ter identificatie van boomen naar hun bast.** By A. THORENAAR. No. 16, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1926. Pp. 207; 7 $\frac{1}{4}$  x 11. Platenatlas (printed separately), with 60 half-tones.

This valuable contribution to the knowledge of the barks of Javanese trees was first published as a dissertation and was referred to, in part incorrectly, in *Tropical Woods* 9: 25. The author is a member of the section of botanical and wood technical exploration of forests at the forest research institution in the Dutch Indies.

**Forest research in the Dutch Indies.** By the GOVERNMENT OF DUTCH INDIES. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 719-729. Inst. Int. d'Agr., Rome, 1926.

An instructive account of the organization and development of forest research and the various phases of the work undertaken. There are five sections as follows: (1) Botanical and

wood technical exploration of forests. Collecting authentic botanical and wood specimens of principal trees, together with data on distribution and utilization, and devising means for the ready identification of species in the forest. (2) Wood technology. Structure, properties, and classification of woods, inspection of timbers, distribution of specimens, study of minor products, etc. (3) Regeneration of species other than teak. (4) Regeneration of teak and forest protection. (5) Thinnings and yield capacity.

**The export of teakwood from the Netherlands Indies, British India, and Siam.** By the GOVERNMENT OF DUTCH INDIES. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 730-743. Inst. Int. d'Agr., Rome, 1926.

**Identifizierung des holzes für die praxis.** By L. G. DEN BERGER. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 749-761. Inst. Int. d'Agr., Rome, 1926.

Discusses the problem of identification of woods and outlines a classification based on macroscopic characters. The various features of importance are listed and arbitrary standards are proposed with a view to greater precision in the use of descriptive terms.

**Queensland. Report of the Provisional Forestry Board for the year ended 30th June, 1926.** Brisbane, 1926. Pp. 131; 8¼ x 13; 17 full-page plates.

This report is of special interest to wood technologists because of the large amount of detailed information given concerning native woods that may be used to replace imported lumber for specified uses.

"Australia has an abundance of hardwoods, timbers which are the envy of the outer world because of their great strength and durability. Countries overseas lacking hardwood would absorb our surplus, did not our high production costs limit the possibility of export at prices which the world is ready to pay. So the native timber trade on the one hand is unable to export to any great extent because of the local cost level, and on the

other hand is faced with objections of local trade that its products are more difficult to work than imported Oregon."

The report urges the revision of the tariff schedules to stimulate the utilization of indigenous timbers and, in proof that suitable material is available, lists and describes the various woods and suggests the different uses to which they are adapted.

**Western Australia. Report of the Forests Department for the year ending 30th June, 1926.** By S. L. KESSELL. Perth, 1926. Pp. 50; 8 x 13; 1 map.

The wood technology investigations include experiments in air-seasoning, kiln-drying, and methods of preservation. "One of the objections made in connection with jarrah flooring is that often, although the timber has been described as thoroughly seasoned, very serious shrinkage takes place after the floor has been laid. The probable reason for this has been shown by the test. It is not usual to provide rainproof coverings for seasoning stacks, so that, during the winter months, the top layers are wetted by the rain, and the water drips through the stacks to the lower layers of timber. As a result, the moisture content of the timber rises considerably during the winter months. Tests have shown that the boards in stacks reasonably dry at the end of summer absorb moisture rapidly during the winter months, a maximum moisture content of 25 per cent to 30 per cent being the average for a stack. Jarrah at 30 per cent moisture content will shrink nearly half as much in drying as green timber, so that boards unstacked during the winter months cannot be expected to give satisfaction. Dry jarrah boards stacked under cover absorb comparatively little during the winter months, and it would therefore appear that, by the provision of coverings for seasoning stacks, a very great improvement in the seasoning of jarrah flooring boards can be effected."

As a result of a comprehensive investigation into the conditions of powellized "karri" timber throughout the State, "it was found that, in localities of moderate and high rainfall, powellized karri was being attacked by a rot-producing fungus, which generally tended to cause failure after a period

varying from 8 to 14 years. In drier localities this rotting was not encountered, and here the timber was giving excellent service, a notable example being the Trans-Australian Railway, where the behavior of powellized karri was excellent. In other words, the powellizing process was effective in preventing the ravages of white ants, but failed to combat the attack of rot-producing fungi. It was, therefore, decided that a process was required which would provide protection against both white ants and rot." An open-tank treatment of green karri was devised, "using a solution containing selected fungicides to replace the molasses of the powellizing process, the proven insecticide, arsenic, being retained." The process is being patented and the State sawmills have adopted it for commercial treatments.

In order to stimulate the export trade in jarrah it is suggested that the identity of the wood be concealed. "To secure a footing among cabinet timbers it may ultimately prove necessary to adopt some other trade name, such as 'Western Australian mahogany.' The success of a similar action in connection with 'stringy bark' and its use in the manufacture of 'Australian oak' furniture is sufficiently recent to be generally known."

**Contributo alla conoscenza delle materie tanniche della Somalia.** By ANTONIO FERRARA. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 657-662. Inst. Int. d'Agr., Rome, 1926.

Results of an investigation of such of the indigenous flora of Italian Somaliland (East Africa) as appear likely to be commercial sources of vegetable tannins. Includes analyses of the barks of the mangroves (*Rhizophora*, *Bruguiera*, *Ceriops*, and *Xylocarpus*) and of the mainland species in the following check list.

Agag	<i>Commiphora africana</i> Engl.	Burseraceae
Bassèc	<i>Terminalia Ruspolii</i> Eng. & Diels	Combretaceae
Dàmmal	<i>Acacia stenocarpa</i> Hochst.	Leguminosae
Dur	<i>Tamarix aphylla</i> Lanza	Tamaricaceae
Fullài	<i>Acacia Seyal</i> Del. var. <i>fistula</i> (Schw.) Oliv.	Leguminosae

Gik	Ditto	
Golol	<i>Acacia Bussei</i> Har.	Leguminosae
Guva	<i>Cassine aquifolium</i> Fiori	Celastraceae
Guva	<i>Cassine Schweinfurtiana</i> Loes.	Celastraceae
Hàrar	<i>Terminalia polycarpa</i> Eng. & Diels	Combretaceae
Herèri	<i>Terminalia somalilensis</i> Eng. & Diels	Combretaceae
Kansak	<i>Acacia Stefanini</i> Chiov.	Leguminosae
Messère gèvis	<i>Terminalia parvula</i> Pamp.	Combretaceae
Rabai	<i>Cassia abbreviata</i> Oliv.	Leguminosae
Sarman	<i>Acacia Bussei</i> Har.	Leguminosae
Tiggèc	<i>Terminalia Brownii</i> Fres.	Combretaceae
Tugher	<i>Acacia Adansonii</i> Guill. & Per.	Leguminosae
Urmè	<i>Cassia abbreviata</i> Oliv.	Leguminosae

**A descriptive catalogue of some of the common trees and woody plants of Kenya Colony.** By E. BATTISCOMBE. London, 1926. Pp. 142; 7 x 9; 39 full-page plates. Price 10s.

This is the first descriptive list published of the woody plants of Kenya Colony, situated in equatorial West Africa. The author, formerly Conservator of Forests there, has compiled this valuable report from material collected by past and present members of the Kenya Forest Department. Nearly all of the species mentioned have been determined at Kew from herbarium specimens forwarded from time to time to the Royal Botanic Gardens. The families (98 in number) are arranged in accordance with the system proposed by Hutchinson (*The families of flowering plants*, 1926). As many as possible of the native names for the plants have been included. The descriptive notes refer to the size and site of the plants, appearance of the leaves, flowers, and fruits, and, in the case of the better known kinds, the properties and uses of the wood and minor products. The work is well illustrated with views of individual trees and of stands, and there are separate indexes for the botanical and the vernacular names.

**Les bois coloniaux d'Afrique dans l'industrie.** By JEAN MENIAUD and FRÉDÉRIC BRETONNET. Melun, 1926. Pp. 124; 6 x 9½; 2 plates, 2 graphs.

This publication deals with the woods of the French colonies

in West Africa, namely Côte d'Ivoire, Gabon, Cameroun, and Moyen-Congo. It is divided into two parts, of which the first is concerned with a classification for industrial purposes of the better known timbers, the other with the lesser known kinds. They are grouped with reference to their ability to replace, for some purposes at least, such timbers as poplar, pine, oak, beech, elm, etc. Tables give the common and scientific names, the source, weight, color, and present and possible production. These are followed by more detailed descriptions of each species. The appendix includes some results of tests on the durability of colonial timbers and a key for the identification of the principal woods of the Ivory Coast.

**Les forêts Congolaises et leurs principales essences économiques.** By É. DE WILDEMAN. Brussels, 1926. Pp. 214; 6 x 9; 1 large map.

Part I of this book deals with general considerations of the tropical African forests and matters pertaining to their exploitation. It discusses the present and potential value of these forests and emphasizes the need for their protection and conservation. Part II is concerned with the forests of the Belgian Congo and various tree species. The introductory portion (pp. 81-116) is followed by an alphabetical enumeration of about 400 species (representing nearly 50 families and 100 genera) capable of supplying useful timber. Information is given as to the size of the trees and the properties and uses of the woods and minor products. The location of the tropical forest in the central portion of the Belgian Congo is shown in color on a large map.

**Notes sur les produits forestiers de la Guinée Française.**

By A. RAVISE. *Actes du Premier Congrès International de Sylviculture*. Vol. V, pp. 663-672 (with map). Inst. Int. d'Agr., Rome, 1926.

French Guinea, situated just north of Sierra Leone and Liberia in West Africa, has a total area of about 95,000 square miles, of which about one third is covered with rather dense forests, another third with brushland or scrubby growth, and

the remainder barren or in cultivation. The vegetation exhibits a wide range of variation according to altitude, character of the soil, and proximity to the sea. Seven zones are distinguishable, although in some places the characteristic appearance has been greatly modified by human activity. There is much damage from fires, nomadic agriculture, and improvident exploitation of the natural resources. Although forestry regulations have nominally been in effect since 1901, they have been largely nullified through the inadequacy of funds for their enforcement.

#### FOREST ZONES

1. **Halophile zone.** The estuaries of the numerous small streams from the central plateau form a veritable network of canals which are bordered by dense mangrove thickets as far back as the effect of sea water is noticeable. The soil is wet, marshy in places, and covered with palms, particularly *Elais*. Some areas have been cleared for rice cultivation.

2. **Forest zone.** This is an irregular strip extending back 20 to 50 miles to highlands. There are thickets of oil palms (*Elais*), *Raphia*, etc., and high forests with underbrush and lianas. *Copaifera* is the dominant tree along the streams. The arable soil is deep and fertile, and great areas are in rice.

3. **Intermediate zone.** This is formed by the first elevations of the central plateau—sandy, stratified hills, often barren of soil. The vegetation is low and stunted, except in some depressions covered with palms and wild cane.

4. **High plateaus.** A very rough region of rather high mountains, deep valleys, and great tablelands with sandy clay soil that no doubt formerly supported forests and could be made fertile through proper methods of cultivation; also areas which are barren. There are strips of dense forest in the more remote valleys and gorges. Palms are scarce and small, bamboos occur in places, and oranges are grown in the villages.

5. **Brush forests.** Grassland and scrubby growth, with occasional well-formed trees, and strips of high forest along the streams; also cultivated fields.

6. **Broken forest.** Tree growth 25 to 50 feet high, with

numerous old clearings covered with brushwood stands resembling those of zone 5, the result of temporary cultivation by the natives. Rubber-producing lianas (*Landolphia* spp.) are common. There are great plains adjoining waterways, along which are many tall trees.

7. True forest. A mountainous region, with fertile valleys and plains, supporting a forest of splendid trees. In some places the flora is similar to that of Liberia and the Ivory Coast.

## FOREST PRODUCTS

There are several species producing oils and fats. The oil palm (*Elæis guineensis* L.) is abundant in zones 1, 2, 3, 7 and supplies large quantities of oil, mostly for local consumption; extensive stands are unexploited. In 1924 there were exported 720 tons of palm oils and 10,620 tons of palm nuts. The seeds of *Butyrospermum Parkii* and *Pentadesma butyracea* are sources of fat used as an article of diet by the natives or in cooking. Oils for soap-making are obtained from the seeds of *Lophira alata*, *Carapa Touloucouna*, and *Parkia biglobosa*. The yield of oil is as high as 45 per cent in the *Parkia* and the product can also be used for culinary purposes.

The fiber about the seeds of *Bombax buonopozense* is fine, white, fairly strong, and nearly as good as that of *Ceiba pentandra* (L.) Gaertn. of Venezuela. The brownish silk floss supplied by *Eriodendron anfractuosum* is of considerably less value than that of the preceding. For the manufacture of baskets, hats, matting, rope, twine, etc., the natives use the leaves, leaf stalks, and bast of various trees and shrubs, mostly of the following genera: *Bambusa*, *Borassus*, *Phoenix*, *Draacaena*, *Pandanus*, *Calamus*, *Baubinia*, and *Sterculia*.

An excellent quality of rubber is obtained from the latex of two shrubs or lianas, *Landolphia Heudelotii* A. DC. and *L. owariensis* P. Beauv. The former is abundant in zones 4, 5, 6, 7, the latter common in zones 3, 4, 7. The amount of crude rubber exported in 1924 was 1038 tons.

Among the miscellaneous products may be mentioned gum copal from *Copaifera copallina*; kola nuts from *Sterculia acuminata*; the leaves of *Anogeissus leiocarpus* yield a yellow dyestuff, and those of a liana, *Lonchocarpus cyanescens* Benth.,

a blue dye similar to indigo. Tanbark is obtained from *Kbaya*, *Erythrophloeum*, *Avicennia*, and *Rhizophora*.

There are many timber trees and in places the stands are sufficiently dense and accessible as to permit of exploitation on a large scale. In portions of the mountainous country, however, the existing means of transport and communication are so poorly developed that extraction of timber is very difficult. The article enumerates the important species and gives information regarding their distribution and size, and the appearance and uses of the woods. Following is a list of the vernacular and scientific names of the trees mentioned.

## CHECK LIST OF COMMON NAMES

Bembé	<i>Odina</i> sp.	Anacardiaceae
Boumou	<i>Bombax buonopozense</i> Beauv.	Bombacaceae
Boussana	<i>Eriodendron anfractuosum</i> DC.	Bombacaceae
Diala	<i>Kbaya senegalensis</i> Juss.	Meliaceae
Dialfélkété	<i>Hannoa undulata</i> Planch.	Simarubaceae
Diou	<i>Mitragyne africana</i> Korth	Rubiaceae
Karité	<i>Butyrospermum Parkii</i> (G. Don) Kotschy	Sapotaceae
Kobadi	<i>Sarcocephalus Pobeguini</i> Pob.	Rubiaceae
Kobi	<i>Carapa Touloucouna</i> G. & P.	Meliaceae
Ko-fina	<i>Dialium guineense</i> Willd.	Leguminosae
Kola	<i>Sterculia acuminata</i> Beauv.	Sterculiaceae
Koudou	<i>Vitex</i> sp.	Verbenaceae
Koura	<i>Parinarium excelsum</i> Sab.	Amygdalaceae
Koussé	<i>Palaquium</i> sp.	Sapotaceae
Kré-kré	<i>Anogeissus leiocarpus</i> G. & P.	Combretaceae
Lami	<i>Pentadesma butyracea</i> Sab.	Guttiferae
Lingué	<i>Azalia africana</i> Sm.	Leguminosae
Méné	<i>Lophira alata</i> Banks	Ochnaceae
M'Gouin	<i>Pterocarpus erinaceus</i> Poir.	Leguminosae
Missa Amandan	<i>Milletia</i> sp.	Leguminosae
Néré	<i>Parkia biglobosa</i> Benth.	Leguminosae
Ouoro	<i>Terminalia macroptera</i> G. & P.	Combretaceae
Palétuvier commun	<i>Rhizophora racemosa</i> G. F. W.	Rhizophoraceae
Palétuvier rouge	<i>Avicennia africana</i> Beauv.	Verbenaceae
Sandan	<i>Daniella thurifera</i> J. J. Benn.	Leguminosae
Sindia	<i>Cassia Sieberiana</i> DC.	Leguminosae
Sô	<i>Berlinia</i> and <i>Macrolobium</i> sp.	Leguminosae
Sounsoun	<i>Diospyros</i> sp.	Ebenaceae
Tali	<i>Erythrophloeum guineense</i> Don	Leguminosae
Tamba	<i>Detarium</i> sp.	Leguminosae
Tomé	<i>Tamarindus indica</i> L.	Leguminosae

**Production of gutta-percha, balata, chicle, and allied gums.**

By JOSEPH W. VANDER LAAN. Trade Promotion Series No. 41, U. S. Dept. of Commerce, Washington, D. C., 1927. Pp. 72; 6 x 9. Price 15c.

"This is the seventh of the series of publications on crude rubber issued under authority of the Sixty-seventh Congress, which appropriated funds for the investigation of raw materials wholly or largely under foreign control. The report contains available data concerning the native habitat of the plants producing the rubber-like gums named, summarizes the history of their production in various countries, and reviews official statistics of the exports from producing countries and the imports into chief consuming countries so far as such information is published.

"The United States imported these gums to the value of \$8,833,000 in 1925, apportioned as follows: Gutta-percha and inferior guttas, \$629,000; balata, \$575,000; jelutong, \$1,643,000; chicle, \$5,986,000.

"Efforts thus far made to produce these gums on plantations have been limited to the gutta-percha of Netherlands, India and Malaya; the production of others is entirely from wild sources, usually by methods injurious to the trees. The eventual depletion of existing wild supplies may force the development of more scientific exploitation, possibly resulting in plantation organization for the production of the most important of these gums.

"Gutta-percha, inferior guttas, and jelutong are produced mainly in the British and Dutch East Indies and in British Malaya. True gutta-percha is consumed chiefly in the United Kingdom, Germany, and Italy; jelutong and the inferior guttas, in the United States. Balata comes principally from South America and lower Central America and is marketed in the United Kingdom, Germany, the United States, Czechoslovakia, Norway, and Belgium. Chicle also is a product of tropical America; it finds its largest market in the United States."—From Director Klein's letter of submittal.

Yale University

School of Forestry

**TROPICAL WOODS**

NUMBER 12

December 5, 1927

*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.*

**THE HONDURAS ROSEWOOD**

By NEIL S. STEVENSON

*Assistant Conservator of Forests, British Honduras*

The Honduras rosewood tree, *Dalbergia Stevensonii* Standl., grows in damp Broken Ridge of the riverain type from the Sarstoon River northward to Monkey River in the Toledo District of British Honduras. Between Deep River and the Temash it appears in fairly large patches, concentrated for the most part along the rivers though occurring also in the inter-riverain and drier areas.

It attains a height of 50 to 100 feet, and the trunk, which often is fluted, commonly forks about 20 or 25 feet from the ground. The papery, disordered bark is about one-fourth inch thick, the scaly outer portion varying in color from a pale

brownish gray to a dingy yellow-brownish gray. When freshly cut the bark (and sapwood as well) has a distinctive odor, suggesting stored apples, and the taste is slightly bitter. The dried bark separates readily into a thin and solid outer layer and a curiously matted inner portion.

The leaves are compound, with three to five alternate leaflets that are dark glossy green on the upper side and lighter beneath. The "close, dark leaf-mosaic" has been noted as a distinctive feature of the tree and is a remarkably apt description. The leaves are said to drop sparingly during February or March.

The flowers appear during the first fortnight of July and their yellow color suggests that of ripe maize. At the end of August the unripe fruits hang in thick clusters on the outer branches and give the appearance of new leaves. They probably ripen and fall at the close of September or in October.

Although seedlings of all sizes have been found, the method of germination has not been determined. The seedling leaves resemble the adult, and the smallest leaflets, which are about 1 inch long and  $\frac{3}{4}$  inch wide, are more nearly round and have a sharper apex than the larger ones; the under surface is glabrescent and the short, dense, light-brown pubescence, which occurs also (though more scatteringly) on the petiolules and petioles, almost disappears in the older leaves. The absence of extensive regeneration may be due to the attack of a small caterpillar in the young fruit, since examination of a large number of unripe fruits revealed in every instance either the caterpillar or pupa.

The stumps of rosewood trees sprout freely, regardless of size. Shoots were seen not only on the cut surface but also down the stump and elongated spur and seemed to have arisen wherever the bark had been cut or otherwise injured. With careful attention and selective thinning valuable timber should be obtainable in a fairly short time as one shoot less than 4 inches through had about an inch of heartwood.

Only one sucker shoot originating from a root was found

close to a coppicing stump. In the Temash area, on a tree uprooted by the wind, no shoots have developed from the upturned roots, but they are growing from the side of the trunk, which is propped up a foot or two above the ground, and are forming root systems at the same time. The shoot forms a kind of T piece (placed sideways), the tail of the T joining the shoot to the trunk from which most of the sapwood has now decayed. This peculiar growth requires further investigation.

Honduras rosewood<sup>1</sup> is one of the best known timbers of the Colony. It is very hard and heavy, weighing from 58 to 68 lbs. per cu. ft. when thoroughly air-dry. The heartwood is of a pinkish-brown or purplish color, with alternating light and dark zones which are independent of the true growth rings; the sapwood, which is 1 to 2 inches thick, is white with yellow vessel lines when first cut, but quickly turns yellow. The heartwood is highly durable, but the sapwood soon decays when in contact with the ground. The heart portion of a house post in use in Punta Gorda for 37 years was found to be as sound as when it was put in, but the sapwood, of course, had entirely disappeared.

Honduras rosewood is often well figured and, though used to a limited extent for cabinet work, is chiefly employed for the bars of marimbas<sup>2</sup> and xylophones manufactured in the United States. The requirements for the musical instrument trade are light-colored, straight-grained wood, in logs as nearly round as possible, hewn free of sap, mostly 4 to 6 feet in length and not less than 10 or 12 inches in diameter, although in times of shortage diameters as low as 5 inches may be taken. The exports of the timber, all to the United States, were 248 tons (valued at \$5,362) in 1925, and 76 tons (valued at \$2,315) in 1926.

<sup>1</sup> For more detailed description of the wood see RECORD & MELL'S *Timbers of Tropical America*, New Haven, 1924, pp. 285-6.

<sup>2</sup> The wood used for marimbas in Guatemala is not the same as this, but is supplied by one or more species of *Platymiscium*.—EDITOR.



TWO NEW SPECIES OF *DALBERGIA* FROM  
BRITISH HONDURAS

By PAUL C. STANDLEY<sup>1</sup>

Among the most important of all the Central American trees are the species of *Dalbergia*. Their handsome, strong, and fine-grained wood, known in commerce as rosewood or cocobolo, is exported in substantial quantities to the United States, where it is used for a wide variety of purposes.

About 12 species of *Dalbergia* are known from Central America, but two of them are coastal shrubs of little or no economic importance. Most of the others are little known botanically, and they appear to have narrowly restricted ranges. It is probable that several more will be found in the region when the forests are more thoroughly explored. The two new species here described from British Honduras, although closely related, appear to be sufficiently different to be recognized as distinct species.

*Dalbergia Stevensonii* Standl., sp. nov.

A tree, the branchlets slender, terete, brownish, bearing numerous small, pale, elevated lenticels, glabrate; leaf rachis and petiole together 6-8 cm. long, slender, glabrous or nearly so; leaflets 5-7, the petiolules 4-5 mm. long, sparsely puberulent with minute subappressed hairs; blades of the leaflets mostly elliptic, sometimes oblong-elliptic or oval-elliptic, 3.5-5.5 cm. long, 2.5-3 cm. wide, broadest at the middle, obtuse or rounded at apex, rarely emarginate, acutish to rounded-obtuse at base, firm, deep green above, lustrous, glabrous, the costa impressed, the other venation prominulous-reticulate, beneath paler, fulvous, rather densely but minutely sericeous with fulvous hairs; panicles slender-pedunculate, shorter than the leaves, lax, much branched, the branches slender, very sparsely puberulent or glabrate; fruits oblong, flat and thin, 4-4.5 cm. long, 12-14 mm. wide, rounded at apex and minutely apiculate, acute at base, 1-seeded (seed central), thinly fulvous-sericeous, the very slender stipe 5-6 mm. long, sericeous.

Type in the U. S. National Herbarium, No. 1,316,905, collected along the San Antonio Road near Westmoreland, Punta Gorda, Toledo District, British Honduras, August 27, 1927, by Neil S. Stevenson; Yale No. 10,696. Leaf specimens of this species were collected also at Punta Gorda in May, 1923, by W. N. Bourne.

<sup>1</sup> Published by permission of the Acting Secretary of the Smithsonian Institution.

The type material consists of leafy fruiting branches from which the leaflets have become detached in drying. There have been forwarded also detached flowers, taken from another tree which is believed to represent the same species. They may be described as follows:

Flowers 5 mm. long; calyx campanulate, narrowed at base, sparsely pilose with minute yellowish subappressed hairs; upper calyx lobes short, rounded at apex, the lower lobe lanceolate-attenuate; petals glabrous, the standard twice as long as the calyx, its blade narrowed to the claw.

*Dalbergia Stevensonii* is related to *D. tucurensis* Donn. Smith, of Alta Verapaz, Guatemala. It differs in that the leaflets are larger and more numerous and the pubescence much more copious. Since the Guatemalan tree is known only in flower, comparison of the other characters is impossible. Its flowers are very similar to those supposed to belong to *D. Stevensonii*.

*Dalbergia laevigata* Standl., sp. nov.

Branchlets terete, pale brownish, rimose, the young twigs sparsely curved-puberulent with whitish hairs; rachis and petiole of the leaf together 8-10.5 cm. long, slender, shallowly channeled above, sparsely curved-puberulent; leaflets 9-11, the petiolules stout, 3-4 mm. long, sparsely puberulent; blades of the leaflets oblong-lanceolate or oblong, 3.5-7.5 cm. long, 1.3-2.8 cm. wide, narrowed to the broad emarginate apex, broadest near the obtuse or rounded base, thick and firm, deep green above, lustrous, sparsely puberulent along the impressed costa, elsewhere glabrous, the other venation prominulous, beneath brownish, dull, glabrous, at least in age, the costa slender, elevated, the venation closely reticulate; panicles long-pedunculate, equalling or longer than the leaves, once or twice branched, the branches sparsely and minutely pilose or puberulent, the flowers pedicellate; fruit 1 or 2-seeded, oblong, thin, flat, 5.5-8 cm. long, 1.5-1.8 cm. wide, narrowed to the acute or obtuse apex, apiculate, gradually attenuate to the acute base, the stipe stout, 5-7 mm. long, glabrous, the valves glabrous, their venation prominent and densely reticulate.

Type in the U. S. National Herbarium, No. 1,266,471, collected on the lower Belize River, British Honduras, February, 1926, by Samuel J. Record.

Although evidently related to both *D. tucurensis* and *D. Stevensonii*, this differs from both in the glabrous leaflets. From *D. Stevensonii* it is amply distinct in the form of the leaflets and in the differently shaped, larger, glabrous fruit.

## PANAMA "OREY" WOOD AND RELATED SPECIES

By SAMUEL J. RECORD

The writer's attention was first attracted to "orey" or "ori" wood in 1923 when two specimens obtained by Dr. Alvin G. Cox in the Province of Bocas del Toro were added to the Yale collections. The anatomy, particularly the presence of ducts in the rays, indicated relationship with the softwooded members of the Anacardiaceae, but for lack of material for comparison the genus could not be determined. During the past summer a sample of the same kind of wood, labeled "hoary wood from Panama," was received for determination from the International Paper Company who had been testing the material for pulp. This revival of interest in the subject came at a time, fortunately, when Messrs. G. Proctor Cooper and George M. Slater, of the United Fruit Company, were collecting in the Bocas del Toro region and they were successful in locating orey trees in flower and fruit. The wood proved to be identical with that in question and the botanical specimens were identified by Paul C. Standley as *Camptosperma panamensis* Standl. (Anacardiaceae).

In his original description of the species, Standley<sup>1</sup> says: "Collections of plants obtained in Panama in recent years have revealed the occurrence in that region of many genera of plants, especially of trees, which previously were believed to be confined to the forests of Brazil and the adjoining countries. It is now evident that the Panamanian flora is much more closely allied with that of Brazil than has been believed heretofore. Another striking example of this relationship is afforded by the new species of *Camptosperma* here described. This genus, which is a member of the Anacardiaceae, has been known in America from a single species, *Camptosperma gum-mifera* (Benth.) L. March., a native of the Amazon region of Brazil. The other members of the group are natives of the East Indies. . . . Type in the herbarium of the Arnold Arboretum, collected 'at the Chiriquicito Lagoon on the south

<sup>1</sup> STANDLEY, PAUL C.: A new species of *Camptosperma* from Panama. *Journal of the Arnold Arboretum* 2: 2: 111, Oct. 1920.

side of Panama where it covers an area of about six square miles' and received from A. D. Little, Inc., of Cambridge, Massachusetts, in August, 1920."

The following information is supplied by Mr. Cooper: "I first saw the orey tree while I was on a trip from Almirante to Bocas by launch. There is a long neck of low swampy mainland off the western part of Columbus Island, on which the town of Bocas del Toro is situated, and viewed from a distance one sees an even, unbroken line of timber that contrasts noticeably with the appearance of the usual type of shore forest. This is due to the predominance of the orey trees which comprise upward of 50 per cent of the whole stand and form 'groves' here and there that are almost pure in so far as the larger trees are concerned. In this gregarious habit the orey resembles the 'cativo' (*Prioria Copaifera* Gris.) and the silica palm. I was told by Mr. William Ponton, the British vice consul at Bocas, that orey occurred in places all along the Caribbean coast from San Blas, Panama, to Puerto Limón, Costa Rica, and, according to reports by natives, was to be found also along the east coast of Nicaragua.

"To the best of my knowledge the tree does not occur on the south side of Panama as the label on the type specimen in the Arnold Arboretum would indicate. The locality, 'Chiriquicito Lagoon,' very probably refers to a portion of Chiriqui Lagoon. This is on the north coast and is the largest semi-enclosed body of salt water in Panama, forming one of the best deep-sea harbors in Central America. The men on the launches which make the circle of the entire lagoon every week to collect fruit say that orey is found all along the shore line.

"The specimen in our collection (No. 154; Yale No. 10,500) was obtained on Columbus Island, near Bocas. It is from one of a group of trees growing just behind the fringe of mangroves and almost at sea level where the ground is wet and during heavy rains is under water, site conditions said to be typical for the species. The trees are 12 to 18 and occasionally 24 inches in diameter breast high, with low and stout buttresses, and a rather short bole covered with a thick, greenish-gray bark that is rough, though not deeply furrowed. The crowns, which are large, forked, and spreading, have heavy

branches and coarse, brittle, and blunt twigs which bear clusters of leaves at the ends and are marked with prominent leaf scars. From the tips of some of the twigs, beyond the leaves, extended spikes of small, yellow, faintly-scented flowers. The new fruits, some of which were nearly mature before the tree was through blooming, were about half an inch in diameter and had a stony pit covered with a green fleshy exocarp from which, when cut into, a dirty gray juice exuded that stained the knife blade a bluish purple. A similar juice was found in cutting the bark of the trunk, but it was not very abundant.

"The wood is light and soft and is not 'sappy.' It has a rather distinctive, though not pronounced, odor when fresh, but there is nothing unpleasant about it. The color varies from white to grayish buff, without marked contrast between heartwood and sapwood. The dingy pink color that eventually covered the surface of the specimen was not in evidence at the time of cutting, and did not penetrate deeply except along cracks. Some blue stain due to a fungus appeared in the sapwood while the sample was being seasoned. I did not observe any local uses for the timber."

Following are the results of a study of dry ore wood in the laboratory. The old surfaces are dull red and there are numerous tiny oil spots on the tangential faces, but upon cutting into the material a pinkish gray color is revealed that remains bright and clean. The luster is rather silvery in proper light, but in general the appearance of the wood is decidedly commonplace. There is no odor or distinctive taste.

Specific gravity (air-dry) 0.44 to 0.48; weight 27 to 30 lbs. per cu. ft., or about the same as for yellow poplar (*Liriodendron*). The wood is firm, rather fine-textured, fairly straight-grained, easy to cut, strong and tough for its weight, holds nails firmly, is perishable in contact with the ground. It resembles the "duka" (*Tapirira guianensis* Aubl.) of British Guiana, though the oily exudations are not so pronounced.

Growth rings are apparently absent. Parenchyma not visible. Pores very numerous, crowded, well distributed, indistinct without lens. Rays very fine, distinct only on radial surface where they resemble those of birch (*Betula lenta* L.).

Ripple marks are absent. Radial gum ducts fairly common, sometimes two per ray, visible with lens and sometimes without it.

As to the minute anatomy: the vessel perforations are either simple or scalariform with many bars; rays heterogeneous, the marginal cells with large simple pits in scalariform arrangement, the pits of the interior cells smaller and half-bordered; wood fibers with simple or indistinctly bordered pits. *Material*: Yale Nos. 6770, 6924 (Cox); 10,500 (Cooper & Slater).

The timber is not used locally, but various attempts have been made from time to time to get manufacturers of paper pulp interested in it. Tests made by the International Paper Company indicate that it is not very satisfactory for sulphite, kraft, or ground-wood because of the difficulty in removing the pinkish gray color of the unbleached pulp. It can be used, however, for soda pulp. The results of one test are as follows:

## SULPHITE PULP

Liquor, 6° Be.	
Total SO <sub>2</sub> .....	4.44%
Free SO <sub>2</sub> .....	3.70%
Combined SO <sub>2</sub> .....	0.74%
Cooking time.....	9½ hrs.
Maximum pressure.....	.75 lbs.
Maximum temperature.....	310° F.
Yield, air-dry, unscreened pulp.....	42.5%
Consumption of 35% bleach.....	62.8%
Fiber: short, soft, and of poor color.	

## BRAZILIAN AND EAST INDIAN SPECIES

Little information, other than the botanical description, is available concerning the Brazilian species. Ducke<sup>2</sup> says that it is a tree about 20 meters high, very common in the marshy forests along Cauhy creek (in the country to the east of Faro). No vernacular name is given.

Comparison of the ore wood with specimens of the East

<sup>2</sup> DUCKE, ADOLPHO: Plantes nouvelles ou peu connues de la région Amazonienne. *Archivos do Jardim Botânico do Rio de Janeiro* 3: 204, 1922.

Indian species reveals such a similarity in appearance and properties that there is little doubt that the woods are suitable for the same purposes, and in this connection the following information should be helpful.

Gamble<sup>3</sup> states that "aridda," *Campnosperma zeylanicum* Thw., is "an endemic Ceylon tree, sometimes gregarious, found in the low moist country, and having the 'wood white, smooth, rather light and soft, coarse-grained, of little use except for tea boxes, for which it is said to be very good.' (Trimen.)"

Regarding the same species Lewis<sup>4</sup> says: "A rather large tree with gray bark and long-spreading surface roots; very abundant in the Ratnapura District, where in places it is found growing gregariously, as for instance in Bambarabotuwa. . . . An ideal tea box wood. Fairly hard, white, easily worked, free from tainted smells, and moderately durable. Weight, about 34 lbs. per cu. ft."

Ridley<sup>5</sup> lists three species as occurring in the Malay Peninsula. *Campnosperma Griffithii* March. (= *C. macrophylla* Hook. f.), called "poko kelinting," is a rather large, spreading tree, about 80 feet tall, common in damp forests. *C. auriculata* Hook. f. is of about the same height and grows in damp, swampy, lowland forests; its range extends to Borneo. The variety *Wallichii* (= *C. Wallichii* King) is known locally as "terentang." *C. oxyrachis* Engl., called "mulumut," is a small, straight, little-branched tree in low, open country.

According to Foxworthy,<sup>6</sup> "terentang," *Campnosperma* spp., is widely distributed in the lowland forests. Trees 3 feet in diameter and with 40 feet clear length are frequently found. The wood is soft, light, rather light silvery gray or whitish,

<sup>3</sup> GAMBLE, J. S.: *A manual of Indian timbers*. London, 1922, pp. 222-3.

<sup>4</sup> LEWIS, F.: *A descriptive catalogue of the more useful trees and flowering plants of the Western and Sabaragamuwa Provinces of Ceylon*. Colombo, 1902, p. 66.

<sup>5</sup> RIDLEY, HENRY N.: *The flora of the Malay Peninsula. I*. London, 1922, pp. 533-5.

<sup>6</sup> FOXWORTHY, F. W.: Commercial woods of the Malay Peninsula. *Malay Science Bulletin* 1: 130-1, Apr. 1921.

fine-grained, with no sharp distinction between sapwood and heartwood; not durable, being subject to insect attack and decay. Weight (air-dry) 23-24 lbs., (oven-dry) 20-21 lbs. per cu. ft. Sp. gr. (oven-dry) 0.32-0.33. Used for planks for light or temporary construction.

There are two well-known species in Sumatra. Endert<sup>7</sup> says that one of the most striking trees met with in his journey was the "medang rimoeëng," *C. auriculata* Hook. f., a forest giant with smooth, yellowish-white bark, and a thin crown with extraordinarily large leaves (more than 50 cm. long) clustered at the ends of the branches. On the Island of Morsala the species is known as "tarantang" and near Loemet as "toemboes." In the latter locality the wood, which is fine and light, is used for canoes. South of Langsa *C. macrophylla* Hook. f. occurs in swamps or bogs in association with species of *Terminalia* and *Alstonia*.

The woods of these two species of *Campnosperma* have been described in considerable detail by Den Berger.<sup>8</sup> He says they are of a light roseate-gray color, odorless and tasteless, very light to light in weight (sp. gr. 0.30 to 0.50), fine-textured, straight-grained, of soft feel, easy to cut, of medium strength, and low in durability. They find considerable use in Sumatra and Borneo for the manufacture of boxes.

Full information regarding the anatomy of the bark of *C. auriculata* has been made available through the researches of Thorenaar.<sup>9</sup>

#### CONCLUSIONS

From all of the foregoing considerations it would appear that the orey wood of Panama is not well suited for pulp, or

<sup>7</sup> ENDERT, F. H.: Boschbouwkundige aantekeningen over een reis in Atjeh, Sumatra's oostkust, Tapanoeli en Sumatra's westkust. *Korte Med. van bet Proefstation voor bet Boschwezen*, No. 9, 1924.

<sup>8</sup> DEN BERGER, L. G.: Houtsoorten der cultuurgebieden van Java en van Sumatra's oostkust. *Med. van bet Proefstation voor bet Boschwezen*, No. 13, pp. 88-9, 1926.

<sup>9</sup> THORENAAR, A.: Onderzoek naar bruikbare kenmerken ter identificatie van boomen naar hun bast. *Med. van bet Proefstation voor bet Boschwezen*, No. 16, pp. 76-8, 1926.

for construction where exposed to decay or insect attack, or for purposes requiring great strength or attractiveness of figure or grain. It seems best adapted for boxes and food containers, as it is easy to work, finishes smoothly, holds nails well, and is free from objectionable odor and taste. It is also worthy of trial for plywood as it is somewhat like "okoume," a West African timber extensively used in Europe for this purpose.

### THE AMERICAN SPECIES OF *ENGELHARDTIA*

By PAUL C. STANDLEY<sup>1</sup>

One of the most interesting and least known of Central American trees is one described in 1856 by the Danish botanist, Oersted, who was the first to study the fascinating flora of Costa Rica. The genus was named in honor of an eminent Costa Rican, Francisco María Oreomunna, who had assisted Oersted in his work of exploration, which covered three years spent in Costa Rica and Nicaragua.

In the wet forest of the Atlantic slope of Costa Rica, between Naranjo and Tucurrique, Oersted found the curious fruits of this tree upon the ground, but he was unable to obtain any supplementary material. After his return to Copenhagen he published the new genus *Oreomunnea*, based upon these fruits alone. His material was studied later by Casimir De Candolle, the monographer of the Juglandaceae, or Walnut Family. De Candolle concluded that the proposed genus could not be maintained, and included it in *Engelhardtia* as a separate section, *Oreomunnea*.

The tree was not rediscovered until many years later, when Pittier found a fruit of the tree at La Gloria, near Juan Viñas. A fruit collected at Cachí in 1910 by C. H. Lankester is in the National Herbarium. In 1914 that indefatigable collector, Adolfo Tonduz, obtained at Hacienda La Gloria a large

<sup>1</sup> Published by permission of the Acting Secretary of the Smithsonian Institution.

quantity of specimens, showing leaves, inflorescences, and fruits. These specimens were sent to the U. S. National Herbarium and have been distributed to many herbaria of America and Europe.

The tree is still little known except to the people familiar with the limited region in which it grows, on the Atlantic coast of Costa Rica, at altitudes of 700 to 1,500 meters. It is known locally as "gavilán." The tree attains a height of 40 to 48 meters (according to Tonduz) and a trunk diameter of 50 to 70 cm. The wood is of good quality and is used for various purposes. There is a large log of it on exhibition in the National Museum in San José.

The existence of the genus *Engelhardtia* elsewhere in Middle America had not been suspected, at least by the writer, but recently my attention was called by Mr. W. E. Manning to the fact that there was a Mexican specimen in the herbarium of the Phila. Academy of Natural Sciences. This specimen has been lent for study by the Academy through Dr. F. W. Pennell. The most casual inspection shows that it represents a species quite distinct from the Costa Rican one. The Mexican material was collected in 1891 by J. N. Rovirosa, an engineer who made a large collection of plants in the states of Tabasco and Chiapas, regions which have received almost no attention from other collectors. Although the National Herbarium possesses a good series of the Rovirosa collections, this tree is not represented among them, hence it was not included in the writer's enumeration of the Mexican trees. The species concerned is one of the most interesting and remarkable additions made in recent years to the known flora of Mexico.

*Engelhardtia*, as here recognized, is a genus quite unusual in distribution. About fifteen Old World species are known, occurring in Malaysia and southeastern Asia. They all belong to the section *Pterilema*. The two American species constitute a distinct group, *Oreomunnea*.

In the Old World species the fruit has two dissepiments, the bracts are hispid at the base, the leaves are alternate, and the leaflets are membranaceous. In the two American species the fruit has four dissepiments, the bracts are not at all hairy, and

the leaflets are coriaceous. The fact that the leaves are opposite in *E. pterocarpa* (also in the new species here described) has been pointed out to me by Mr. Manning, but was overlooked in discussing the relationships of the Costa Rican genus *Alfaroa*, recently published.<sup>2</sup>

Another peculiarity of the American species—one of no systematic importance, but interesting, nevertheless—is the fact that in both these species the basal portion of the leaflet is involute on each side. In *E. mexicana* there are distinct auricles which are pressed closely against the lower face of the leaflet and form cuplike structures. In *E. pterocarpa* there are no auricles, but the margin is strongly involute. The involu- tion in the latter species would have been assumed to be merely the result of drying if attention had not been directed to it by the well-developed auricles of *E. mexicana*.

The chief difference between the two sections of *Engelhardtia* lies, of course, in the arrangement of the partitions of the nut. Those who feel that geographic isolation is sufficient to supply the lack of distinguishing structural differences may feel justified in recognizing *Oreomunnea* as a genus, but, in consideration of the close resemblance in general appearance between the American and Old World species, the writer prefers to consider them congeneric, at least for the present. The staminate inflorescences of the American trees are not available for study, and it is possible that they may exhibit supplementary characters of such a nature as to justify the maintenance of generic rank for the American group.

#### ENGELHARDTIA Leschen

##### KEY TO AMERICAN SPECIES

- Fruiting bracts mostly 8–15 cm. long; nut 10–12 mm. in diameter; leaflets not auriculate, but the margins strongly involute at base. . . . . *E. pterocarpa*.  
 Fruiting bracts 4–4.8 cm. long; nut 6–7 mm. in diameter; leaflets with small inflexed auricles at base. . . . . *E. mexicana*.

<sup>2</sup> *Journ. Wash. Acad. Sci.* 17: 77–79, Feb. 19, 1927.

#### Engelhardtia pterocarpa (Oerst.) Standl.

*Oreomunnea pterocarpa* Oerst. Nat. For. Kjobenhavn Vid. Medd. 33: 1856.  
*Engelhardtia Oreomunnea* C. DC. Ann. Sci. Nat. IV. Bot. 18: 36. 1862.

Known only from the wet forests of the Reventazón Valley, Atlantic slope of Costa Rica.

#### Engelhardtia mexicana Standl., sp. nov.

Tree 16–18 m. high, the branchlets slender, subterete, with short internodes, at first densely lepidote with small, punctiform, yellow or grayish scales, later glabrate; leaves opposite, even-pinnate, the petiole 1.5–2 cm. long, the rachis 2–6 cm. long, slender, subterete, sparsely lepidote; leaflets 3 or 4 pairs, on slender petiolules 2–3 mm. long, the blades linear-lanceolate, 5–8.5 cm. long, 1–1.7 cm. wide, long-attenuate to the narrow obtuse apex, at base slightly or strongly oblique, on the outer side rounded or broadly rounded, on the inner acute and decurrent, most of the leaflets bearing on each side at the base a small, rounded or obtusely deltoid auricle, this incurved against the lower surface of the blade; leaflets coriaceous, entire or undulate, or many of them with several large salient serrations near the apex, deep green and lustrous above, obscurely punctate, the costa elevated, the lateral nerves very slender, numerous, obscure, nearly straight, irregularly anastomosing near the margin, the leaflets paler beneath, densely yellow-punctate, the costa slender, prominent, the lateral nerves obscure; fruiting racemes about equaling the leaves, simple, very densely many-flowered, the rachis slender, yellow-lepidote; pedicels stout, 1–2.5 mm. long; fruiting bracts 4–4.8 cm. long, sparsely and minutely yellow-lepidote, coarsely reticulate-veined, the outer division deeply 3-lobate, the lobes oblong or linear-oblong, 6–9 mm. wide, obtuse or rounded at apex, the lateral (basal) lobes divaricate or ascending, 1.2–1.8 cm. long; inner division of the bract about 1 cm. long, broadly rounded at apex, the two divisions of the bract compressed above the nut and concealing it; nut broadly obovoid, 6–7 mm. long, slightly compressed, broadly rounded at apex, densely yellow-lepidote, with 4 dissepiments, 4-celled, each of the cells again divided by a nearly complete partition, this again extended on each side as a partial partition, the three perianth lobes persistent on the apex of the nut, erect, spatulate, 1.5 mm. long.

Type in the herbarium of the Philadelphia Academy of Natural Sciences, collected in a moist place in the temperate region of the mountains of Chiapas, Mexico, altitude 900 to 1,000 meters, July 24, 1891, by J. N. Rovirosa (No. 1006).

The characters mentioned in the key indicate the principal differences between this and *E. pterocarpa*. The leaflets of *E. mexicana* are much smaller and proportionately narrower than those of the Costa Rican tree, and in the latter, also, the leaflets are entire, so far as the specimens show.

## COMPARATIVE ANATOMY OF THE WOODS OF THE JUGLANDACEAE

By DAVID A. KRIBS<sup>1</sup>

The members of the Juglandaceae or Walnut Family are widely distributed over the north temperate zone and in certain mountainous portions of the tropics of both hemispheres. The three best known genera are *Juglans*, *Carya* (*Hicoria*), and *Engelhardtia*, the first two being of great commercial importance for timber and edible nuts. *Platycarya* and *Pterocarya* are found only in western Asia. *Oreomunnea*, limited in its distribution to Central America, is considered by some botanists to be worthy of generic rank while others include it with *Engelhardtia*. *Alfaroa* is a new genus recently established for another Central American species.

Although the woods of the Juglandaceae exhibit a great range of variation in density, color, and mechanical properties, they have certain anatomical features in common, such as the presence of fine concentric lines of parenchyma; narrow and inconspicuous rays; comparatively few pores; wood fibers with small bordered pits; and crystal-bearing wood parenchyma and ray cells. There are two general divisions—the hickory (*Carya*) type and the walnut (*Juglans*) type. The first of these is characteristically ring-porous, but in some instances this is not pronounced. The others are diffuse-porous, but in some cases, especially *Juglans*, there may be a very noticeable diminution in size of the pores outward through the growth ring; also the pores (and pore groups) usually show a diagonal arrangement, or more or less in echelon. The rays, which are never exclusively uniseriate, vary from nearly homogeneous to decidedly heterogeneous, and there may be considerable difference in this respect within a genus. The pits between parenchyma cells and vessels provide a valuable diagnostic feature. In most cases the vessel perforations are exclusively simple, but in *Engelhardtia* and *Alfaroa* scalariform perforations occur also. Spiral vessels and vascular tracheids are found only in *Platycarya*.

<sup>1</sup> Graduate student at Yale University; formerly Instructor in Forestry at the University of Minnesota. This investigation was carried on under the direction of Professor Samuel J. Record.

ations are exclusively simple, but in *Engelhardtia* and *Alfaroa* scalariform perforations occur also. Spiral vessels and vascular tracheids are found only in *Platycarya*.

## KEY TO THE GENERA

- Ring-porous, i. e., with largest pores in a distinct zone.  
 Small vessels spiral, thin-walled, numerous. Rays heterogeneous, with large crystals. . . . . *Platycarya*.  
 Small vessels not spiral, very thick-walled, few. Rays mostly homogeneous, without large crystals. . . . . *Carya*.  
 Diffuse-porous, i. e., without definite zonate arrangement of the pores.  
 Vessel perforations exclusively simple. (Pith chambered.)  
 Multiseriate rays exclusively biseriate. . . . . *Pterocarya*.  
 Multiseriate rays 3 or 4 cells wide. . . . . *Juglans*.  
 Vessel perforations scalariform in part. (Pith solid.)  
 Scalariform perforations few, nearly always with a single bar. . . . .  
     *Engelhardtia* (Division *Pterilema*).  
 Scalariform perforations common, with several bars.  
 Crystals common in wood parenchyma, but rare in rays. Perforations with 3 to 5 bars. . . . . *Engelhardtia* (Division *Oreomunnea*).  
 Crystals common in rays, but rare in wood parenchyma. Perforations with 4 to 12 bars. . . . . *Alfaroa*.

*Platycarya* Sieb. & Zucc.

This genus, with a single species, *Platycarya strobilacea* Sieb. & Zucc., is indigenous to China and Japan. The tree has alternate, oddly pinnate, deciduous leaves. The twigs have solid pith. The fruit is a winged nutlet borne in the axils of the scales of an upright cone.

The heartwood is yellowish brown; sapwood yellowish white. Rather hard and heavy; sp. gr. 0.72. Ring-porous, the largest pores in a band of 1 to 3 rows; pores and vascular tracheids in late wood numerous and forming diagonal or zigzag markings which appear whitish under lens; vessel perforations exclusively simple; small vessels and vascular tracheids spiral. Parenchyma in concentric lines 2 to 4 cells wide in late wood. Rays 1 to 7 cells wide and 1 to 30 cells high; slightly heterogeneous; frequently containing very large rhombohedral crystals of calcium oxalate; pits into vessels small, elliptical, simple to half-bordered. Fibers with fairly distinctly bordered pits, the slit-like apertures extending beyond the border.

The wood is of the general type of *Carya*, from which it is distinguished by the arrangement of the pores in the late wood, the presence of spirals in the vascular tracheids and small vessels, and the large crystals in the rays. Some of the rays are wider than in any other genus.

*Material*: Yale No. 10,795, from M. Fujioka, Japan.

**Carya Nuttall (=Hicoria Rafinesque)**

The range of this genus is confined to the eastern half of the United States, northern Mexico, and China. The trees are of present commercial importance only in the United States and supply timber unequalled for strength, toughness, and shock-absorbing ability. Some species and forms are highly valued for their nuts and are grown in plantations, particularly in southern United States.

The trees have alternate, unequally pinnate, deciduous leaves. The twigs have solid pith, except at the nodes. The fruit is a nut inclosed in a 4-valved thickened involucre. Two groups are distinguishable: I. APOCARYA. Bud scales valvate. Catkins of staminate flowers usually from buds formed in the axils of leaves of the previous year. Fruit more or less broadly winged at the sutures; wall thin and brittle; lacunae usually large and sometimes containing cavities filled with dark astringent powder. Examples: *Carya Pecan* Asch. & Gr., *C. texana* Schn., *C. cordiformis* K. Koch., *C. aquatica* Nutt., and *C. myristicaeformis* Nutt. II. EUCARYA. Bud scales imbricated. Catkins of staminate flowers pedunculate on branches of the year. Fruit without sutural ridges (in one species slightly ridged); walls of the nut thick and bony; lacunae minute, without astringent powder. Examples: *Carya ovata* K. Koch., *C. laciniata* Schn., *C. alba* K. Koch., *C. pallida* Ashe, *C. glabra* Sweet, *C. ovalis* Sarg., *C. floridana* Sarg., *C. Buckleyi* Durand.

The woods of *Carya* have a brown or reddish-brown heart and thick white sapwood, often with dark rusty streaks. They are usually distinctly ring-porous, the largest pores being localized in a band 1 to 3 rows wide; pores in late wood few, very thick-walled; vessel perforations exclusively simple. Parenchyma in fine concentric lines in late wood. Rays fine, 1 to 3 cells wide, mostly homogeneous, with tendency to heterogeneous; pits into vessels small, rounded, simple to half-bordered. Fibers with very small, indistinctly bordered pits. The woods of the two sections, so far as studied, indicate that those of *Apocarya* have thinner-walled vessels and fibers and are of lower density and strength than those of *Eucarya*. In commerce the woods of the first or so-called pecan group are considered inferior in technical properties to the others.

No woods of the Asiatic species are available for study and it may be that their structure differs from that of the American hickories. In Lecomte's photomicrograph<sup>2</sup> of the cross section of the late wood of *Carya tonkinensis* H. Lec., the pores appear thin-walled and are more numerous than in the American species. Large crystals are present in the parenchyma strands.

*Material:* Species mentioned in text in Yale collection of American woods.

**Pterocarya Kunth**

The several species of this genus are limited mostly to China and Japan. The leaves are alternate, oddly pinnate, and deciduous. The winter buds are scaly or naked, usually stalked. The twigs have laminated pith. The fruit is a winged nut attached to a long pendulous axis; nuts usually 2-winged, with

<sup>2</sup> LECOMTE, HENRI: *Les bois de l'Indochine*. Paris, 1926, Plate IX of Atlas.

thin pericarp and hard endocarp, usually 4-celled at the base; 1-seeded; cotyledons 4-lobed, carried above ground in germination.

The wood of *Pterocarya rhoifolia* S. & Z., the only one available for study, is yellowish white, lustrous, light and soft; sp. gr. 0.40. Diffuse-porous, the pores more or less in echelon arrangement; vessels with exclusively simple perforations. Parenchyma in fine concentric or broken tangential lines. Rays 1 or 2 cells wide; homogeneous; pits into rays small, elliptical, simple to half-bordered. Fibers very thin-walled, with numerous, large, bordered pits which have slit-like apertures extending beyond the circular border.

The wood bears a close resemblance to that of the soft-wooded species of *Juglans*. The principal distinction, so far as known, is in the rays, none of which are more than 2 cells wide, while in *Juglans* some of the rays are 3 or 4 cells in width. The light color and low specific gravity serve to distinguish it from all of the harder species of *Juglans*.

*Material:* Yale No. 9284 from Japan (Fujioka's No. 2677).

**Juglans L.**

This genus, with its numerous species, has a wide distribution, being indigenous to China, Japan, India, Persia, United States, Mexico, Central America, West Indies, and the Andean region of South America from Colombia and Venezuela to Argentina. The natural ranges of certain species and forms have been greatly extended through planting, particularly for the production of nuts. Two species, *J. nigra* L. and *J. regia* L., are of high commercial importance for their timber, which is unsurpassed for cabinet work and gunstocks.

The trees are characterized by having alternate, unequally pinnate, resinous and aromatic, deciduous leaves; twigs with distinctly septate or chambered pith; and fruits which consist of a nut having a roughened and sometimes deeply sculptured shell and a fleshy, indehiscent husk. The genus is separable into two groups on the basis of the structure of the nut, as follows: I. Nut 4-ribbed at the sutures, without smaller intermediate ribs; 2-celled at the base. Examples: *J. cinerea* L. and *J. mandsburica* Max. II. Without intermediate ribs; 4-celled at the base. Examples: *J. nigra* L., *J. ruprestis* Engl., *J. californica* S. Wats., *J. regia* L., and *J. major* Hell.

The woods of *Juglans* are structurally alike in being diffuse-porous, though the pores tend to diminish in size toward the outer portion of the growth ring; echelon arrangement of pores usually distinct; vessel perforations exclusively simple. Parenchyma in numerous fine concentric or broken tangential lines; crystals common. Rays fine, 1 to 3 cells wide and up to 70 in height, mostly homogeneous, but with a tendency to heterogeneous that is sometimes pronounced; pits into vessels small, rounded, simple to half-bordered. Fibers with distinctly bordered pits, the aperture slit-like and extending beyond the border. Growth rings are terminated by a thin layer of flattened fibers and a uniseriate row of parenchyma cells on outer margin.

Two main groups are recognizable, as follows: I. Color of heartwood light—chestnut, pinkish, or reddish. Sapwood thin. Woods light and soft; sp. gr. 0.35 to 0.50. Vessels and fibers thin-walled. Examples: *J. cinerea*, *J. mand-*



*sburica*, *J. Sieboldiana* Max., and *J. formosana* Hay. II. Color of heartwood dark chocolate brown to purplish, often variegated. Sapwood thick. Woods moderately heavy and hard; sp. gr. 0.60 to 0.70. Vessels and fibers thick-walled. Examples: *J. nigra*, *J. regia*, *J. rupestris*, *J. californica*, *J. pyriformis* Liebm., *J. australis* Gris., and *J. boliviana* Dode.

*Material:* *J. australis*, Yale Nos. 1137 and 4396 from Argentina; *J. regia*, Yale No. 3829 from India (F. R. Inst. No. 1155); *J. pyriformis*, Yale No. 7505 from S. Calderón, Salvador; *J. boliviana*, Yale No. 10,168, collected by G. Barrel in Peruvian Andes; *J. Sieboldiana*, Yale No. 6578 from Antung, China, Yale No. 10,217 from Japan (Kanehira's No. 11), and Kanehira's No. A-548 from Japan; *J. formosana*, Yale No. 9385 (Kanehira's No. 17) and Kanehira's No. A-497, both from Formosa; *J. mandsburica*, Yale No. 9336 from Korea (M. Fujioka's No. 3261); American species in Yale collections and collected by author.

### Engelhardtia Lesch.

This genus, in the broad sense, consists of several species mostly confined to the Far East. The trees have pinnate, deciduous leaves. The twigs have solid pith. The fruit is a globose nutlet at the base of an unequally 3-lobed bract. Two groups are recognized, namely, *Pterilema*, including all of the Old World species, and *Oreomunnea*, sometimes given generic rank, including the two species of Central America. (See Standley's paper on pp. 12-15 of this issue of *Tropical Woods*.)

The heartwood is brownish, more or less variegated, lustrous; sapwood lighter, rather sharply defined. Diffuse-porous, the pores more or less in echelon arrangement; vessel perforations both simple and scalariform. Parenchyma in concentric or broken tangential lines. Rays decidedly heterogeneous, 1 to 3 cells wide and 1 to 30 cells high. Pits into vessels in part small, oval, and simple to half-bordered, and in part large, gash-like, and simple. Fibers with small bordered pits, the slit-like apertures extending beyond the border.

The only wood specimen of the *Oreomunnea* group available for study is *Engelbardtia pterocarpa* (Oerst.) Standl. It differs from the *Pterilema* group chiefly in having numerous scalariform perforations with 3 to 5 bars each, while in the other the scalariform perforations are few and usually have only a single bar, rarely two.

*Material:* *E. spicata* Bl., Yale No. 6495 (Kanehira's No. 94); *E. formosana* Hay., Yale No. 9384 (Kanehira's No. 16) and Kanehira's No. A-466; *E. pterocarpa*, Yale No. 10,796 from P. C. Standley.

### Alfaroa Standl.

The only species known of this new genus is *Alfaroa costaricensis* Standl., a small or medium-sized tree common in the wet mountains of southern Costa Rica. The leaves are mostly opposite, pinnate, without true terminal leaflet. The staminate flowers are borne singly at the base of the erect pistillate spike or upon two short lateral branches. The fruits, which are borne in long spikes,

are small, oval or obovoid, the pericarp thin and nearly dry, the nut thin-walled, smooth, falsely 4-celled.

The wood is pale brown and fairly light and soft. Diffuse-porous, the pores in echelon arrangement, small, fairly uniform in size, not very numerous; vessel perforations in part simple, in part scalariform, with 4 to 12 bars. Parenchyma in fairly numerous concentric lines. Rays 1 to 50 cells high; uniseriate or with biseriate middle portion; decidedly heterogeneous; small crystals common; pits into vessels vary from rather small, rounded, simple or half-bordered to extremely elongated, gash-like, and simple, with tendency to scalariform arrangement. Fibers arranged in definite radial rows; pits numerous, rather large, the slit-like apertures extending beyond the circular border.

Standley<sup>3</sup> says that before seeing the fruits he had supposed the tree was a species of *Oreomunnea*, but "the fruits proved to be a great surprise, for they were not at all like those of *Oreomunnea* but rather miniature walnuts. Aside from the superficial aspect of the fruit, the tree did not resemble very closely a walnut tree." This lack of resemblance to *Juglans* is emphasized in the wood, which is very much like that of the *Oreomunnea* group of *Engelbardtia*. Furthermore, the twigs have solid pith.

*Material:* Yale No. 9837 from P. C. Standley.

### CONCLUSIONS

The results of this investigation indicate that the members of the Juglandaceae comprise a "natural" family.

They also indicate that there are only four distinct genera, namely, *Carya*, *Platycarya*, *Juglans*, and *Engelbardtia*. *Pterocarya* belongs with the division of *Juglans* of which *J. cinerea* may be considered the type, and *Alfaroa* belongs with the *Oreomunnea* section of *Engelbardtia*.

### Gum Canals in *Elæagnus*

Professor Mitsunaga Fujioka, Tokyo Imperial University, has forwarded two specimens of *Elæagnus* in which vertical gum canals, gummosis type, were discovered by Mr. Chûzô Kaneshi. One is "aki-gumi," *Elæagnus pungens* Thunb., the other *E. umbellata* Thun.; both are common throughout Japan. The ducts are in tangential rows and are clearly of traumatic origin. The woods are ring-porous and have rather coarse rays.

<sup>3</sup> STANDLEY, PAUL C.: *Alfaroa*, a new genus of trees of the family Juglandaceae. *Journ. Wash. Acad. Sci.* 17: 4: 77, Feb. 19, 1927.

## OCCURRENCE OF CALCIUM CARBONATE DEPOSITS IN WOODS

By SAMUEL J. RECORD

Deposits of calcium carbonate are known to occur (1) in normal heartwood, (2) in dark-colored streaks in otherwise normal heartwood, (3) in heartwood induced by injury, (4) in black knots, (5) in dark-colored callus about knots and wounds, (6) in the pith and surrounding wood, (7) on the surface along star shake near pith, (8) rarely in normal or sound sapwood, and (9) in special structures (cystoliths) in the rays of the woods of a single family (Opiliaceae).

The deposits are mostly in the vessels, often completely filling them for considerable length and leaving casts in the ash which faithfully preserve the form not only of the cavity, but also of the pits, of the segments. When the wood is of a dark color, as is so commonly the case where such deposits are found, the lime shows very distinctly as white dots on the cross section or long lines on the longitudinal. Not infrequently the deposits are found in other cells of the wood, but because of their small size they are not conspicuous.

The first important investigation of this subject was by Dr. Hans Molisch<sup>1</sup> whose attention was attracted to it by the finding of deposits of calcium carbonate in the vessels of both the sapwood and the heartwood of *Anona laevigata* Mart. Various other woods were subsequently investigated, but in none other did he find the deposits in normal sapwood, although he did find them in the so-called "reifholz" (immature heartwood) of *Bulnesia arborea* Engl. (= *Zygophyllum arboreum* Jacq.). The four principal situations discussed are (1) heartwood, (2) colored wound wood, (3) pith, and (4) colored knots.

His explanation of the occurrence of the deposits in such places is briefly as follows: The calcium carbonate, dissolved in water containing CO<sub>2</sub>, penetrates very slowly the dead and

<sup>1</sup> Ueber die Ablagerung von Kohlensäurem Kalk in stamme dicotyler Holzgewächse. *Sitzungsberichte d. math.-naturw. Classe d. k. Akad. d. Wissenschaften* (Wien) 84: 1: 7-27, 1881.

discolored portions of the wood. During this time opportunity may be afforded for the CO<sub>2</sub> to escape, particularly as a result of fluctuations in temperature of the wood, and with the loss of its solvent the calcium carbonate would be deposited. The deposits in normal sapwood, however, are considered of physiological origin, or excretions by living cells.

Molisch's brief list of woods has been extended by the present writer to include representatives of 28 different families. Further investigation would undoubtedly add many more, since localized deposits may be expected in any wood having the requisite conditions of unsoundness or abnormality. Little or no diagnostic value can be ascribed to features of so sporadic a character.<sup>2</sup> On the other hand, deposits which are of regular occurrence in normal wood, whose origin may be considered physiological rather than purely physical or physico-chemical, have a distinct diagnostic value.

Instances of the latter sort are apparently very rare. The most notable case in the writer's experience is supplied by *Phyllostylon brasiliensis* Capanema (Ulmaceae), a tree known to occur in the West Indies, southern Mexico, Nicaragua, Venezuela, Brazil, and Argentina. Calcium carbonate occurs so abundantly and consistently in the vessels of this wood that this feature alone is sufficient to separate it from all others with which it is likely to be confused, namely the boxwoods of commerce.<sup>3</sup> The extent to which similar deposits in the woods of *Holoptelea integrifolia* Planch. (Ulmaceae) and *Anona laevigata* Mart. (Anonaceae) have systematic value remains to be determined.

Another wood with abundant deposits of calcium carbonate is of an unidentified tree discovered in eastern Guatemala by Mr. Henry Kuylen, of the United Fruit Company (No. 63; Yale No. 8894). Beginning with the outermost ring of sapwood with isolated vessels the number rapidly increases inwardly until approximately half of them show white against

<sup>2</sup> This fact should be taken into consideration by those who attempt to construct keys for the determination of woods through the structure of their ash.

<sup>3</sup> See RECORD & GARRATT's *Boxwoods*. Bul. No. 14, Yale School of Forestry, 1925.

the yellowish background of the fibers. Study of the wood and leaves, the only material so far available, has failed to indicate even the family to which the tree is referable.

Following is a list by families, arranged alphabetically, of the various species of woods in which deposits of calcium carbonate have been found. Except as otherwise specified, the deposits have been noted by the writer in specimens in the collections of the Yale School of Forestry, of which only those in the tropical collections are individually numbered.

#### THE FAMILIES AND SPECIES

**Aceraceae.**—In callus and knots of *Acer macrophyllum* Pursh, *A. rubrum* L., and *A. Negundo* L.; in dark streaks in heartwood of *A. circinatum* Pursh; in pith and surrounding wood, also in bird's-eye, of *Acer saccharum* Marsh. Reported by Molisch in pith, knots, and heartwood of various species of *Acer*.

**Anonaceae.**—Reported by Molisch in the vessels of the heartwood and also in the sapwood, including the last ring, of *Anona laevigata* Mart.

**Aquifoliaceae.**—In callus of *Ilex opaca* Ait.

**Betulaceae.**—In callus of *Betula lenta* L., *B. lutea* Michx., *B. nigra* L., *B. papyrifera* Marsh., and *B. populifolia* Marsh. Reported by Molisch in pathological heartwood of *B. alba* L.

In callus of *Alnus incana* (L.) Willd., *Carpinus caroliniana* Walt., and *Ostrya virginiana* (Mill.) Koch.

**Bombacaceae.**—In callus of *Quararibea funebris* (Llave) Standl. (Yale No. 10,012) and *Q. venezuelensis* Pittier (Yale No. 9729); in dark streaks in *Q. pterocalyx* Hemsl. (Yale No. 7343), *Q. stenophylla* Pittier (Yale No. 10,027), and *Quararibea* sp. (Yale No. 4707). In the last instance particularly the vessels show conspicuously as white lines against a black background.

Also in dark streaks in *Matisia dolichosiphon* Schum.

**Combretaceae.**—In callus of *Combretum* sp. (Yale No. 3012).

**Cornaceae.**—In callus of *Cornus florida* L. and *C. Nuttallii* Aud.; in pith of *C. stolonifera* Michx. Reported by Molisch in the heartwood of *C. sanguinea* L., *C. mas* L., and also in the pith of the latter.

**Fagaceae.**—In callus of *Quercus velutina* Lam., *Q. agrifolia* Née, *Q. cbrysolepis* Liebm., *Castanopsis cbrysophylla* (Hook.) A. DC., and *Fagus grandifolia* Ehrh. Reported by Molisch in wound wood and in dark-colored knots of *Fagus sylvatica* L.

**Flacourtiaceae.**—In old knots, pith, and along star shake of *Casearia praecox* Gris. (Yale No. 4424); also along surface of star shake of another specimen (Yale No. 6339).

**Hamamelidaceae.**—In dark streaks in heartwood of *Liquidambar styraciflua* L.

**Hippocastanaceae.**—In old knots of *Aesculus* sp. from Tennessee.

**Juglandaceae.**—In dark streaks, often plainly visible, and sometimes in tangential lines in heartwood of *Carya olivaeformis* Nutt., *C. myristicaeformis*

Nutt., *C. aquatica* Nutt., *C. alba* Koch, *C. sulcata* Nutt., *C. ovata* Koch, *C. porcina* Nutt., and *C. microcarpa* Nutt.; also in callus of *Juglans nigra* L. **Lauraceae.**—In callus of *Umbellularia californica* (H. & A.) Nutt.; in dark streak in heartwood of *Phoebe effusa* Meissn. (Yale No. 2972).

**Leguminosae.**—In callus of *Pentaclethra filamentosa* Benth. (Yale No. 10,306) and *Pongamia mitis* Merr. (Yale No. 2348); in dark streak in heartwood of *Pterocarpus* sp. (Yale No. 3954) from Brazil.

**Magnoliaceae.**—In dark streaks in heartwood of *Magnolia acuminata* L., and *M. glauca* L.; also in *Talauma sambuensis* Pittier (Yale No. 2974; from type tree).

**Meliaceae.**—In callus of *Aglaiia odorata* Lour. (Yale No. 2372).

**Moraceae.**—In callus of *Ficus padifolia* H. B. K. (Yale No. 10,044) and in dark streaks in heartwood of *Morus rubra* L.

**Nyssaceae.**—In callus and old knots of *Nyssa sylvatica* Marsh.

**Opiliaceae.**—As cystoliths in the rays of the seven genera comprising this family, namely, *Agonandra*, *Cansjera*, *Cbampereia*, *Lepionurus*, *Melientba*, *Opilia*, and *Rbopalopilia*. Observed by writer in *Champereia manillana* Merr. (Yale Nos. 5623, 9394, 9895). See *Tropical Woods* 3: 10-12, Sept. 1925.

**Rosaceae.**—Reported by Molisch in heartwood of *Pyrus microcarpus* Wendl. and *Sorbus terminalis* Ehrh.

**Salicaceae.**—In dark streaks in heartwood of *Salix nigra* Marsh. and in old knots of *Populus trichocarpa* Hook.

**Sapotaceae.**—Reported in the heartwood of *Cbrysophyllum Grisebachii* Mez. See SOLEREDER's *Systematic anatomy of the Dicotyledons*, Oxford, 1908, pp. 511 and 979.

**Sterculiaceae.**—In old knot of *Fremontia californica* Torrey.

**Styracaceae.**—In old knot of *Halesia carolina* L.

**Tiliaceae.**—In callus of *Tilia americana* L.

**Ulmaceae.**—In dark streaks, often plainly visible as white lines, in heartwood of *Ulmus alata* Michx., *U. americana* L., *U. fulva* Michx., and *U. racemosa* Thom.; in concentric lines and scattered vessels of *U. laciniata* Mayer (Yale No. 9358) and *U. japonica* Sarg. (Yale No. 9339); about knots of *U. campestris* Sm. (Yale No. 6566); about pith of *U. mexicana* Planch. (Yale No. 3006). Reported by Molisch in the heartwood of *U. campestris* and *U. montana* Sm.

Of eight specimens of *Celtis occidentalis* L. calcium carbonate was found in dark streaks in 4, in callus in 4, and at edge of pith in 2. In dark streaks and edge of pith of *C. Tala* Gill. (Yale No. 1030) and *C. Sellowiana* Miq. (Yale No. 1002); in dark streaks only in *C. luxonica* Warb. (Yale No. 5620) and *C. philippinensis* Blanco (Yale No. 5621); in callus of *C. australis* L. (Yale No. 10,177) and *Celtis* spp. (Yale No. 1031, Argentina; No. 1637, P. 1.; No. 3416, Brazil). Reported by Molisch in *C. orientalis* [= *C. australis* L. ?].

In normal heartwood of *Holoptelea integrifolia* Planch. (Yale No. 3882). According to Gamble (*A manual of Indian timbers*, London, 1922, p. 628) the pores of this wood are "frequently filled with a white substance, marked on a vertical section."

Abundant in *Phyllostylon brasiliensis* Cap., sometimes extending almost

if not entirely to the bark. Observed in numerous specimens representing the entire known range of the species.

Vitaceae.—In callus of *Ampelopsis quinquefolia* Michx.

Zygophyllaceae.—Reported by Molisch in heartwood and intermediate wood (reifholz) of *Bulnesia arborea* Engl.

#### CONCLUSIONS

1. Deposits of calcium carbonate are of very common occurrence in the vessels, and sometimes in other cells, in and about discolored knots and wounds and in dark streaks in woods representing a wide range of families. Such deposits have little or no diagnostic value.

2. Similar deposits in the sapwood and normal heartwood are rare and may have important diagnostic value, for example in certain of the Ulmaceae.

3. Cystoliths of calcium carbonate characterize the woods of the Opiliaceae and are not known to occur in any other woods. They are confined to the rays.

#### FIFTH INTERNATIONAL BOTANICAL CONGRESS

At the International Congress of Plant Sciences (Fourth International Botanical Congress) held at Ithaca, New York, U. S. A., in August, 1926, an invitation was conveyed from British botanists for the Fifth International Botanical Congress to be held in England in 1930. The invitation was accepted by the botanists assembled at Ithaca, and arrangements are now being made for the Congress to be held at Cambridge about the middle of August, 1930.

It has been decided to organize the Congress in the following seven sections: Morphology (including Anatomy), Paleobotany, Plant Geography and Ecology, Taxonomy and Nomenclature, Genetics and Cytology, Physiology, and Mycology and Plant Pathology.

Mr. F. T. Brooks, the Botany School, University of Cambridge, England, and Dr. T. F. Chipp, Royal Botanic Gardens, Kew, England, have been appointed Honorary Secretaries of the Congress, and any communications with regard to the Congress should be addressed to one of them.

#### CURRENT LITERATURE

##### Report on the Agricultural Department of St. Lucia, 1924.

By E. A. WALTERS. Imp. Dept. of Agr. for the West Indies, Castries, St. Lucia, 1926. Pp. 30; 8 x 13.

"The total area of St. Lucia is 152,320 acres, of which one-ninth is under cultivation. Land under proprietary rights amounts to over 77,400 acres. The residue, roughly 74,800 acres, comprises the undeveloped assets of the Colony; of this one-third is suitable for agricultural production. The remainder includes precipitous hillsides and impassable ravines; this area is at present mainly under forest, the best forest trees have, however, been removed, no system of planting having replaced the felled timber, and secondary forest growth now largely substitutes original forest. This area also forms the central watershed, and rainfall and humidity are largely encouraged and conserved by the existence of the forest-clothing at considerable elevations.

"An increase in the forest products exported is shown by the following figures:

Exported	Forest Timbers and Firewood Cu. ft.	Shingles Number	Charcoal Lbs.
1914	175,484	7,000,000	.....
1922	319,522	22,500	378,560
1924	243,037	2,900	1,157,370

"No addition is made here for local consumption. This shows that the forest reserves are being largely drawn upon and are not replaced by afforestation and rarely by cultivated land.

"It will be necessary to check this deforestation until collection and replanting of selected forest trees replaces the total loss due to indiscriminate felling. A workable method would be the imposition of a tax on all trees felled for timber, charcoal, etc., the proceeds of this tax to finance systematic care and conservation of the forest.

"Attention is also drawn to the necessity for retaining crowns of trees on ridges throughout all cultivated areas, to encourage rainfall and prevent erosion; where such belts are

absent arid conditions invariably obtain. Factories requiring large amounts of fuel usually obtain it by clearing wooded land near the cultivation, and this can be continued by making a five year rotation of cleared blocks so that the land is never entirely denuded. In general trees and bushes should not be cut lower than about three feet above ground, as the stumps then bud out and form ratoon growth."

**British Honduras. Annual Report of the Forest Trust for the year ended 31st March 1927.** By DUNCAN STEVENSON. Belize, 1927. Pp. 22; 7½ x 13.

During the five years the Forest Trust has been in existence it has made remarkable progress, and no one can read the present interestingly written report without a feeling of optimism for the future of forestry in British Honduras. The Colony has given concrete evidence of its confidence in the Forestry Department by increasing its duties and adjusting various legislative matters to strengthen its authority.

The silvicultural work done during the year in the Silk Grass Forest Reserve "was most satisfactory. Gangs, composed chiefly of laborers of the previous year, were proficient from the start and work was reduced to a routine average basis of 3388 mahogany seedlings, seven mahogany trees, and five other trees per week. An increase in the daily task resulted in a decrease in actual improvement cost of 0.3 cent per seedling and, including the overhead, of 3.1 cents. . . . A total area of 4755 acres was improved, the mahogany trees of 6 feet girth and over numbering 1296, or 0.27 per acre, while the total number of mahogany trees was 3088, or 0.65 per acre. Of this total area some 3780 acres were improved for mahogany seedlings, the stock at the end of 1926 being 189,448, or approximately 50 per acre." It is considered probable that without improvement over 75 per cent of the seedlings would have died out within the first three years. "An examination of the unit expenditure during 1926 indicates that the cost of improvement per tree is 9.75 cents and per seedling 3.25 cents, the figures including not only the labor cost, but also the distributed cost of the local overhead." Similar work was done in other localities.

"From experience gained in the improvement of mahogany seedlings in 'huamil' areas, that is, in the secondary growth on sites of abandoned cultivation, a new method of improvement has been formulated for the high bush, the object being to induce a 'huamil condition' beneath an open canopy of high bush species wherever there are sufficient seed-bearers, as this condition appears to be most favorable to the germination of seed and development of mahogany seedlings in their first stages."

Insect damage to mahogany seedlings is confined to those not protected by overhead cover. Caterpillars were collected and bred out and later identified at the United States Bureau of Entomology. "The shoot borer which causes most damage is *Hypsipyla grandella* Zeller and is of the same genus as the shoot borer of mahogany in Java. The seedlings killed as a result of attack are few and, apart from the production of numerous secondary leaders, there is no malformation of the seedlings. A defoliator causing relatively little damage is *Egchiretes nominus* Dyar."

The value of exports of forest produce of domestic origin during 1926 was \$1,593,179, or 84.3 per cent of the total. Mahogany accounted for \$1,403,732 of this amount. The exports of other woods were: Cedar, 281,940 S. ft., \$25,136; Logwood, 667 tons, \$16,531; Banak, 355,256 S. ft., \$12,434; Santa Maria, 159,103 S. ft., \$5,569; Yemeri, 3,451 S. ft., \$121; Rosewood, 76 tons, \$2,315; Pine lumber, 194,844 S. ft., \$13,725. Imports of dressed lumber amounted to 1,099,262 S. ft., valued at \$51,863; rough lumber, 345,528 S. ft., \$17,296; furniture and other wood manufacturers, \$38,012; total value, \$107,171.

During 1926-27 the Forest Trust received 50 per cent, or \$70,704.84, of the general forest revenue. The total expenditures were \$79,546.27, of which \$31,286.15 was for salaries and \$26,601.08 for improvements of forest reserves, fire protection, and exploration of Crown forests.

The report includes accounts of the forestry operations of the Belize Estate & Produce Company, Ltd., and the Chicle Development Company, and of the work at the Botanic Station. "Arrangements have been made by the Chicle

Development Company for intensive research to be carried out on their sapodilla estates in connection with latex production and economic tapping methods. This important work in conjunction with the reforestation of sapodilla, the investigations on the increment of *Abras Sapota*, and the examination of the possible utilization of inferior grades of chicle gums from allied species, will have far reaching effects on the reconstitution of an industry which has suffered in its domestic production for many years on account of the wanton destruction of sapotaceous trees by excessive tapping."

**The flora of Barro Colorado Island, Panama.** By PAUL C. STANDLEY. *Smithsonian Miscellaneous Collections* 78: 8, Washington, D. C., May 20, 1927. Pp. 32; 6 x 9½.

"On April 17, 1923, Barro Colorado Island, in Gatún Lake, was set aside by the Governor of the Canal Zone as a permanent reservation to preserve in a primitive state the animal and plant life of the region. . . . [It] covers approximately six square miles, being about three miles in greatest length and width. It is of artificial origin, and before the water was turned into the lake formed merely a part of the hills along the Chagres River. . . . The island consists of a mass of hills, steep in places, broken by ravines through which run a few small clear streams. . . . The present plant covering has every aspect of the typical virgin forest occupying the humid lowlands of Central America and is so rank and dense that in order to penetrate it a way must be cut with a machete. Many of the trees tower to a vast height and have massive trunks swathed in a mantle of epiphytic vegetation that is still to be studied. Ropelike vines or lianas dangle from the crowns of the tallest trees, whose branches are loaded with aroids, bromeliads, orchids, and other epiphytes.

"Palms are unusually abundant, and many of the 22 genera known from the Canal Zone exist here. Ferns, particularly handsome tree ferns of the genus *Hemitelia*, are plentiful, although in Central America most species of ferns must be sought at much higher elevations. Species of *Piper* are numerous, also Araceae, Rubiaceae, and Bignoniaceae, and most of the important groups of lowland Central Ameri-

can plants are represented. Thus far the cryptogamic plants have been little studied, but there must be a wealth of fungi. The lichens, hepatics, and mosses of the tropics are not highly diversified at so low an altitude.

"The present list of the plants known from Barro Colorado Island is based chiefly upon personal collections and notes. . . . This list is little more than an enumeration of the names of the species of plants now known to occur on Barro Colorado Island. I hope that at some time it may be practicable to prepare a descriptive flora of the island, but it is better to leave such work until the list is more nearly complete. In the near future there will be published, as volume 27 of the Contributions from the National Herbarium, an account of the plants of the Canal Zone with keys for their determination, and it is felt that to publish here keys to the species would be an unnecessary repetition."

"The Spanish vernacular names given for the species here listed are those used in Panama, and many of them were verified upon the island. Well established English names have been cited when available.

"In the present paper there are listed for Barro Colorado Island 611 species of plants. Of these at least 38 species are introduced."

**The genus *Hampea*.** By PAUL C. STANDLEY. *Journ. Wash. Acad. Sci.* 17: 15: 394-8, Sept. 19, 1927.

"The genus *Hampea* consists of a small group of American trees and shrubs which has been referred by most authors to the family Bombacaceae, although others have believed its more natural position to be in the Malvaceae. The genus was based by Schlechtendal upon a single species, *H. integerrima*, described from Veracruz. In 1862 Triana and Planchon described a second species, *H. thespesioides*, from Colombia, and in 1886 Sereno Watson a third from Guatemala. A variety of *H. integerrima* was described from Costa Rica in 1899 by Captain John Donnell Smith, and in 1923 I transferred to the genus a Mexican plant described as a *Thespesia* by Presl, and published a new species from the Yucatán Peninsula.

"Practically all the scanty herbarium material of the genus

has been referred without question to the original *H. integririma*. Our representation of the genus has increased rapidly in recent years and, when an attempt was made recently to name two Central American specimens, it became evident that the group was badly in need of revision.

"In the present treatment nine species are recognized, one indigenous in Colombia, the others ranging from Panama to southern Mexico."

Three new species are described, namely, *Hampea panamensis*, *H. Rovirosae*, and *H. platanifolia*. The first of these was collected for the Yale School of Forestry by G. Proctor Cooper and George M. Slater, of the United Fruit Company, in the Almirante region of Panama.

**British Guiana. Report on the Forestry Department for the year 1926.** By B. R. WOOD. Georgetown, 1927. Pp. 10: 8 x 13 $\frac{1}{4}$ .

"This was the first complete year during which the Department has functioned and much of the work done was of a preliminary nature. This is particularly the case as it cannot be too strongly emphasized that at the outset the first need is to find out what the forests consist of and what quantities of timber and other forest products are available and where. Until we have this information we cannot hope to develop a timber industry, nor can we offer samples of our woods for test or trial as no timber merchant will endeavor to put a new wood on the market until he knows in what quantity it can be supplied, knowledge which was non-existent until the Department commenced its work of inspection and valuation of the forests."

"The sequel to the first expedition which disclosed the quantities and kinds of timber over a considerable area is the investigation of the suitability of the species found for various purposes, and particularly those species which occur in quantity mixed with species known to be valuable or which themselves form considerable and fairly dense stands. As the natural outlet for the forests is a point within tender loading distance of where ocean-going ships can come and also close to falls capable of developing very considerable hydroelectric

power, specimens of the eleven commonest species were obtained and sent to the Imperial Institute for tests for paper pulp, the results of which are awaited with interest. At the same time the Imperial Institute was asked to test these woods for the extraction of commercial alcohol as well."

"The total values of timber and lumber exported (\$275,845) and lumber imported (\$224,002) show the difference in favor of the exports to be only \$51,843. When it is considered that greenheart is a timber almost unsurpassed for house construction work, both as regards strength and durability, whilst for flooring where greenheart is less popular crabwood is excellent, it seems unfortunate that so large a quantity of inferior deals should be imported from abroad, when a much better article at a lower price should be able to be produced in the Colony. The crux of the matter is that the local wood is unseasoned while, because the greenheart is harder to work, it is unpopular with carpenters."

"During the drought attention was drawn to the destruction of greenheart logs lying in the forest, awaiting haulage to water, by a species of shot hole borer. There are two kinds and these have been identified as *Platypus mulsanti* and *P. alternans*. The destruction frequently necessitated the re-squaring of the logs on the flat before shipment, which caused expense to the cutters. Several firms had tried various insecticides with a view to preventing the logs being attacked by this weevil. In response to an enquiry from a firm of greenheart exporters it was suggested that the painting of the logs with the cheapest form of crude fuel oil be resorted to. This was done and complete success was reported, and the trade was informed accordingly."

**De houtsoorten van Suriname. II.** By J. PH. PFEIFFER. Med. No. 22, Koninklijke Vereeniging Koloniaal Instituut, Amsterdam, 1927. Pp. 244; 6 $\frac{1}{4}$  x 9; 43 text figures. Price f7.50. Atlas (printed separately): 18 plates, with 105 half-tones.

A comprehensive report on the technical properties of 28 of the more important Dutch Guiana woods described in the first volume. (See *Tropical Woods* 9: 22-23, March 1, 1927.)

The subject matter is treated under the following heads:

Chapter I. Investigation of the chemical and physical properties. (1) General; (2) ash analyses; (3) extracts; (4) imbibition; (5) shrinkage and swelling; (6) specific gravity; (7) permeability.

Chapter II. Biological investigations. (1) Durability in general; (2) resistance to insects and marine borers; (3 and 4) laboratory tests on resistance to fungi and value of results as indicative of durability; (5 and 6) fermentation tests and the relation of the volume of gas generated to the durability of the wood.

Chapter III. Mechanical tests. (1) General considerations; (2) compression parallel to the grain; (3) compression across the grain; (4) static bending; (5) impact bending; (6) shear; (7) splitting; (8) tension at right angles to the grain; (9) resistance to indentation; (10) resistance to wear.

Chapter IV. Correlation of the results of the tests on the woods and the technical qualities of practical importance. (1) General observations; (2) rôle of the mechanical properties in utilizing timber; (3) relation of mechanical properties to specific gravity; (4) technical importance of specific strength values in determining particular properties of woods; (5) relation between strength and moisture content; (6) workability; (7) shrinkage, checking, warping, etc.; (8) durability.

Chapter V. Probable suitability of the woods for certain important uses. (1) General considerations; (2) interior trim, furniture, and special uses; (3) house construction; (4) shipbuilding; (5) wagon construction and railway crossties; (6) bridge-flooring and paving; (7) hydraulic works.

**Oleos vegetaes Brasileiros. Nogueira de Iguape.** By EURICO TEIXEIRA. Ministerio de Agr., Ind. e Com., Rio de Janeiro, 1927. Pp. 8; 6 x 9.

The name "nogueira" (walnut) is applied to various nut-producing trees. *Juglans regia* L., which is cultivated in Brazil, is known as "nogueira real." "Nogueira de Iguape" refers to species of *Aleurites* (Euphorbiaceae) which have been planted in Minas Geraes, Rio de Janeiro, Paraná, and São Paulo. The paper contains an account of these trees, method of

collecting the nuts, and of the preparation, analyses, and uses of the oil.

**The natural resources of the Hawaiian forest regions and their conservation. Factors deleterious to the Hawaiian forest. Bamboo against staghorn fern.** By C. S. JUDD. *The Hawaiian Forester and Agriculturalist* 24: 2: 40-55, April-June 1927.

**Some determinations of Philippine forest types.** By R. F. WENDOVER. *Journal of Forestry* 25: 7: 802-817, November 1927.

Practically the entire land surface of all the principal islands was at one time forested, but the present condition of the land is about as follows:

Virgin forests	40,000 sq. mi.	33 $\frac{1}{3}$ per cent
Brush land	20,000 " "	16 " "
Grass land	48,000 " "	40 " "
Cultivated	12,000 " "	10 " "

The virgin forests are divisible into six more or less well-defined types as follows:

Dipterocarp (5 subtypes)	75 per cent
Molave	10 " "
Mangrove } Beach }	2 " "
Mossy forest	8 " "
Pine	5 " "

The report contains descriptions of these types and outlines investigations necessary for their accurate delimitation.

**Federated Malay States. Report on forest administration for the year 1926.** By F. W. FOXWORTHY. Supplement to the *F. M. S. Government Gazette*, August 5, 1927. Pp. 65; 8 x 13.

"The objection of the public and of government departments to use timbers which have not stood the test of service in this country, though believed or even known by foresters to be sufficiently serviceable, is readily understandable.



It is not the business of building contractors and officers of the Railway or the Public Works Department to run risks; they know 'chengal' [*Balanocarpus Heimii* Gaertn.] is good, and they naturally ask for it. Moreover, as the second best timber is often just as difficult as, or even more difficult than, the best to cut, it is not possible, working with hand labor paid by results, to make much difference in price; so the best is bought. Two things result from this: the price of timber is raised because the output per unit of area is low, and what is left is wasted. It has not proved enough to say that timbers such as are neglected here are in regular use in other tropical countries and are even exported to Europe and America; therefore it is incumbent on the Forest Department to prove that they, or at any rate 'keruing' [*Dipterocarpus* spp.], which is by far the commonest of the second grade timbers and is therefore the key to the situation, are really serviceable, or can be made so. The serviceability of timber can be proved by actual service; but this takes time, and may involve risk. Timber can most easily be proved or made serviceable by proper seasoning, by antiseptic treatment, and by subjecting it to mechanical tests in machines specially designed for the purpose."

**Jelutong (with special reference to *Dyera Lowii*).** By THOMAS CORSON. *Empire Forestry Journal* 6: 1: 47-55, 1927.

"'Jelutong' is the Malay name for trees of the genus *Dyera*. It is these trees that produce the *wild rubber* of commerce which goes by the same name, and which has long been a very considerable source of profit to the people of Sarawak.

"The tree is widely distributed throughout Malaya and Borneo, and is very plentiful in Sarawak, where three species are recorded—*Dyera Lowii* Hook. f., *D. borneensis* Baill., and *D. costulata* Hook. f. While in the Malay Peninsula Jelutong appears to be uncommon except on the lower hill lands, in Sarawak it is most common on the swamp lands of the lower river basins. In fact, so characteristic is it of such areas that they are commonly referred to as 'Jelutong swamps.'"

"As to general conditions, Jelutong demands a temperature

around 90° F., humid conditions of atmosphere, and plenty of soil moisture. Without these germination is poor and growth slow.

"The genus *Dyera* consists of large trees, commonly 150 feet in height and around 10 feet in girth. Specimens up to double this girth are occasionally met with. The tree is light-demanding, and as a result always forms the upper story."

"The wood, which is white, fine-grained, and soft, may be used for models or patterns, and makes excellent drawing boards, but there is no trade in this timber in Sarawak, as felling is illegal."

"It is for its latex that Jelutong is valued in this country. Latex is very plentiful and flows freely when the tree is wounded. It contains a high percentage of water, but will congeal on the stem if left. This congealed rubber is greyish-white and pleasant to the taste."

"Considerable quantities are used in the manufacture of chewing-gum, the use that is probably best known, but much is also used either alone or in mixture with better rubbers in the production of the cheaper qualities of rubber goods. It has been known to be used as an adulterant of gutta percha.

"Annual quantities exported vary, price being the controlling factor and production rising with it. The figures for 1925 show that in that year over 3,000 tons of raw Jelutong and nearly 2,000 tons of refined were exported, equivalent to a total production of about 7,000 tons of raw Jelutong. There is no doubt that, if collection were properly organized, a high and steady output could be maintained. At present, unfortunately, most of the produce is worked rather casually for the Chinese merchants.

"That the collection of Jelutong is profitable is easily shown. A tapper can collect 4 gallons or more of latex in a day. This, when coagulated, will give about 25 cattie (1 catty equals 1.33 lbs.) of rubber, with a value which is rarely as low as one dollar (2s. 4d.) and is frequently much higher. This has to be compared with coolie wages, which are generally around 70 cents. The work, of course, is fairly hard, but it is well suited to the Dyaks and other jungle tribes of this country, as is indicated by the large numbers engaged in it."

**Unterscheidungsmerkmale von rezenten und fossilen Dipterocarpaceengattungen.** By L. G. DEN BERGER. *Bulletin du Jardin Botanique de Buitenzorg* (ser. 3) 8: 4: 495-8, June 1927.

A brief synopsis of the anatomical characters of the woods of living Dipterocarpaceae to show that certain Tertiary fossil woods found in the Dutch East Indies have been improperly named. The following classification is made:

- I. Resin ducts all or in large part solitary, or in short tangential rows of 2 to 5, or occasionally also in tangential series of many ducts.
  - Ia. Radial diameter of pores not exceeding 0.15 mm. and in most species not over 0.1 mm. Vessels nearly all solitary, though also in groups in some species. Parenchyma typically diffuse, occasionally also in metatracheal bands which contain the tangential rows of resin ducts.—*Vatica* (including *Pachynocarpus*), *Cotylelobium*, and at least one unknown genus. (Also three specimens of *Vateria* from Ceylon.)
  - Ib. Radial diameter of pores greater than 0.15 mm. Parenchyma widely variable, even within the same genus, and only in part diffuse.—*Dipterocarpus* and *Anisoptera*.
- II. Resin ducts almost exclusively in long to very long tangential rows; solitary ducts entirely absent or occurring sparingly here and there.
  - IIa. Vessels all solitary.—*Dryobalanops*.
  - IIb. Vessel groups present; number of solitary vessels less than 20 times as many as the groups.—*Balanocarpus*, *Hopea*, *Isoptera*, *Parashorea*, *Shorea*, and *Pentacme*.

The above classification on the basis of the anatomy of the secondary woods corresponds very closely to that of Engler and Prantl (*Pflanzenfamilien* III, 6, pp. 254-5). Group Ia includes the Vateaceae, and the investigated specimens of *Vateria* of the Vaterieae, Group Ib coincides with the Dipterocarpeae, Group IIa with the Dryobalanopseae, and Group IIb with the Shoreae.

**Report on forest administration in the Andamans for the year 1925-26.** By L. MASON. Calcutta, 1927. Pp. 76; 6¼ x 9½.

In order to find markets for some of the lesser known species provision was made for tests at the Forest Research Institute at Dehra Dun. Ten tons each of "black chuglam," *Terminalia Manii* King, "badam," *T. procera* Roxb., and "gurjan," *Dipterocarpus* spp. were sent to be tested as to their suitability for the construction of railway carriages. Ten sleepers each of "white chuglam," *T. bialata* Wall., and "badam" were sent for creosoting tests. Ten logs of "chooi," *Sageræa elliptica* Hook. f. & Th., were chosen for trial for golf shafts, fishing rods, hammer handles, etc.

Samples of the following species were sent to match factories at Rangoon, Calcutta, and Bombay to determine their suitability for match boxes and splints: "Papita," *Sterculia campanulata* Wall., and "shawbya," *S. alata* Roxb.; "didu," *Bombax insigne* Wall.; "thitpok," *Tetrameles nudiflora* R. Br.; "white dhup," *Canarium euphyllum* Kurz; and "white chuglam" and "badam."

**The Kanjikod match factory.** By R. P. GUPTA. *The Indian Forester* 53: 9: 540-2, Sept. 1927.

"*Bombax malabaricum* is the principal wood used in this factory and it is found there in great abundance and does not have a ready sale in the market. Logs are transported from the forest with their bark on in order to prevent quick drying. The bark is peeled off before use and the log is cut into lengths of one foot for making box veneers, the girth of the log being 18 inches, which is found to be most convenient. From practical experience, trees from 10 to 15 years are well suited for match boxes and those from 15 to 20 years for splints. If the wood is very soft the surfaces of the veneers are not smooth and hence the inner soft portions of the billets are rejected."

It is stated in a footnote that the above-mentioned species and *Bombax insigne* were found eminently suitable for both boxes and splints; *Spondias mangifera* very suitable for splints; and *Melia composita* and *Ailanthus excelsa* fairly good for

splints but not for boxes. *Alstonia scholaris*, *Odina Wodier*, and *Garuga pinnata* were tried, but found to be less satisfactory than the species of *Bombax*.

**Annual return of statistics relating to forest administration in British India for the year 1924-25.** Calcutta, 1926. Pp. 31; 8½ x 13; 1 diagram. Price 5s.

Contains the following tabular statements: (1) Area of forests under the control of the Forest Department. (2) Progress of forest settlements. (3) Demarcation and maintenance of boundaries. (4) Forest areas surveyed and under survey. (5) Progress in working plans. (6) Expenditure on communications and buildings. (7) Breaches of forest rules. (8) Area protected from fire. (9) Causes of forest fires. (10) Area closed and opened to grazing. (11) Protection from cattle. (12) Progress on reproduction and afforestation. (13) Outturn of forest produce. (14) Forest produce removed by different agencies. (15) Exports of forest produce. (16) Value of forest produce given away free or at reduced rates. (17) Details of revenue and expenditure. (18) Summary of revenue and expenditure. (19) Revenue, expenditure, and surplus during the 26 years from 1899-1900 to 1924-1925. Appendix: Diagram showing annual forest revenue, expenditure, and surplus for the years 1915-16 to 1924-25.

**Forest Commission of Victoria. Seventh annual report, 1925-26.** Melbourne, 1927. Pp. 22; 8 x 13; 1 large map.

"From a forestry point of view the past year has been an eventful one for Victoria. Coupled with an extraordinarily dry seeding period, we had a visitation of fires and abnormal cyclonic winds of exceptional severity, occasioning lamentable loss of life and destruction of valuable forests, especially in the mountainous regions.

"The result of these fires was reflected in a reduction of the output of forest produce, especially in sawmilling timber. This, together with the prevailing trade depression in the hardwood milling industry, had its effect on the anticipated forest revenue.

"The demand, however, for the more durable species of hardwood used in contact with earth and water, viz., red gum, grey box, and the ironbarks, considerably increased, thus compensating in a great measure for the reduced output of the sawmilling timbers.

"As a means of alleviating the depression in the milling trade, for which various causes have been attributed, the Commission has had despatched to London trial shipments of *Eucalyptus regnans*, locally known as mountain ash, but which, on account of its close resemblance to oak, is better known to the overseas trade as Australian oak. This timber, of fair average sample, was thoroughly kiln-seasoned at the Commission's Seasoning Works at Newport. It is intended to test the hardwood timber market in Great Britain, and thereby endeavor to assist in opening the way for private competition and trade, especially in timbers for cabinet work, interior fittings for buildings, etc. In taking this action the Commission has a dual economic purpose in view: (1) From the trading viewpoint of its forest licensees and consequent reflection on the forest revenue. (2) From the silvicultural aspect. *Eucalyptus regnans* is the quickest growing of our native species, and is the most prolific of our sawmilling trees confined to the mountainous regions. It reaches maturity in 55-65 years, but also commences to deteriorate in comparatively rapid time after maturity, thereby becoming the prey in its weakening state of fungi and insect pests. The mature trees must of necessity be taken out at the correct period for cropping to make way for the young growth. Therefore, in the interests of forestry the regulated output should be assured, and the utilization of the wood to the greatest economic advantage is of vital concern to the State."

**New Zealand. Annual report of the Director of Forestry for the year ended 31st March, 1927.** By L. MACINTOSH ELLIS, Wellington, 1927. Pp. 44; 8½ x 13.

"Altogether over thirty major investigations are in progress. These include: Sawmills and wood-waste survey; introduction of shop grades into New Zealand grading rules; wood requirements of wood-using secondary industries; statistical

survey of sawmilling industry; woods for butter-boxes; uses for short lengths of timber; standardization of sizes, grades, and nomenclature for yard timber; utilization of little-used species; study of floating properties of New Zealand woods; physical properties of wood; air-seasoning of wood; basic mechanical properties of woods grown in New Zealand; grading rules and working-stresses for structural timbers; cross-arm tests; routine strength tests of plywood; test of box-bindings; study of nail-holding power of New Zealand woods; treatment of wood by non-pressure process; treatment of wood by pressure process; service-test records; routine examinations of wood-preserved; the pulping of thinnings from Rotorua plantations; suitability of New Zealand woods for pulp; microscopic structure of woods; kauri-bleeding; relation between durability and the chemical composition of woods; destructive distillation of native and exotic woods; prevention of sap-stains and moulds on timber; relative resistance of untreated woods to borer-attack; relative resistance of untreated woods to decay; introduction of forest and timber insects and fungi in imported forest products."

**An examination of defective New Zealand kauri (*Agathis australis*).** By M. B. WELCH. Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 60: 345-358, March 1927. Three plates.

"During 1925 a large consignment of New Zealand kauri (*Agathis australis*) was received in Sydney, intended for vat building. After making up several large vats and filling them with water, it was found that some of the staves were broken across, as though they had been hit from inside. The wood had ruptured with a brash-like fracture across the direction of the grain, thus showing that it was devoid of strength. The sizes used were three inches or over in thickness, so that the failure was not due to local 'cross grain' effects. In the floor of one vat a piece of wood fourteen feet in length and three inches thick arched up to the extent of ten inches and showed cracks, not on the convex side which would be expected if the wood were in tension, but on the concave side, showing that the shrinkage there was abnormal. . . .

"In appearance the wood was quite normal, varying somewhat in color from pale straw to light brown. There was no external evidence of sap stain or other fungal attack. The density was normal, but the luster on a planed surface was rather less than usual, and according to the coopers the wood was 'dead' and in nature resembled Powellised kauri. The whole consignment, amounting to about 100,000 super feet, was condemned as useless for the purpose for which it was intended."

"*Summary:* New Zealand kauri milled from logs obtained from the swamps is liable to become worthless due to seasoning defects which not only cause the wood to check across the grain and to warp, but also produce excessive brittleness.

"The weakness is evidently caused by a lowering of the strength of the cell walls with the result that they become cracked spirally when internal stresses are produced by shrinkage."

**Les forêts du Sahara.** By L. LAVAUDEN. Reprint, *Revue des Eaux et Forêts*, June-July 1927. Pp. 26; 5 half-tone plates.

The Sahara region is divisible into three main portions: (1) the northern part, in which elements of the Mediterranean flora are dominant; (2) the southern part, which is largely tropical; and (3) a central part, where there is a mingling of the two extremes. Within these main areas there are various sites with particular formations; the zones in which vegetation is absent constitute only a small portion of the whole. The tree growth and shrubby thickets are relics of former times and a study of them reveals the extent and condition of the original forests.

The paper is divided into five parts: (1) Phytogeographic boundaries and general appearance of the Sahara; (2) general characteristics of the vegetation and forest types; (3) descriptions of the trees and shrubs; (4) the climatic problem; (5) bibliography. The author brings together the results of former investigations and considers them in the light of his own experience. About 30 different kinds of trees and shrubs are described. Those for which common and vernacular names are given are listed on next page.