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OKOUMÉ (*AUCOUMEA KLAINIANA* PIERRE)

By JEAN COLLARDET, *Ingénieur Agronome*

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Okoumé, an African timber, was first brought to European attention at the exposition in Antwerp in 1885. At that time nothing was known regarding the botanical status of the tree except that it presumably was a member of the family Burseraceae. In 1894, Professor Henri Lecomte and the Rev. Father Klaine collected herbarium specimens which were subsequently examined by the noted botanist Pierre. On the basis of this material he described a new genus, *Aucoumea*, which is closely related to *Boswellia*. The plants of the latter, however, are incense-bearing xerophytic shrubs, while the Okoumé is a large tree of the humid equatorial forest. He named the species *Aucoumea Klaineana*, and only the one species has been described.

THE TREE

The known distribution of the tree is not extensive, being confined to the western portions of French Equatorial Africa (Gaboon and the coastal region of Middle Congo) and the neighboring Spanish colony (Spanish Guinea). It is very common within this range, however, occurring mostly on the borders of the primary forest, in the glades, and the coastal wooded savannahs. It is a light-loving encroaching species of gregarious habit.

Okoumé attains a height of about 120 feet and a diameter of 6 feet. The trunk is usually straight and cylindrical above the narrow buttresses, which frequently extend 9 feet above the ground, and when growing in dense stands, may be clear of branches for over 75 feet. The smoothish reddish-gray bark, often speckled with moss, is about a quarter of an inch thick and does not scale off. It exudes an oily terebenthine-scented resin, which the natives use in torches.

The round-headed crown is widely branched and the twigs are stout and angular. The leaves are alternate and imparipinnate, with 9 to 13 long-pedunculate leaflets, the lateral ones in pairs, usually oblong-lanceolate, 14 to 30 cm. long and 6 to 9 cm. broad, rather firm and lustrous, but somewhat different on young shoots and sprouts. The flower clusters are lax, 10 to 20 cm. long, the branches stout and the flowers pedicellate; the bracts are deciduous. The fruit is a 5-valved capsule, 4 to 5 cm. long and 2 or 3 cm. thick, somewhat the shape of a small fig, but more elongated and pentagonal. It contains 5 seeds, their cotyledons thick and distorted like those of a walnut.

COMMON NAMES

Okoumé, Gaboon, Gaboon "Mahogany" (Trade); Acoumé, Okoumé (M'ponghoué, N'komi, Mitsogho, Baviya); Angouma (Pahouin); Bengouma (Bakalāi); Moukoumi (Bapounou, Eschira, Bakaya); Koumi (Baloumbo); N'koumi (Bavili ba Loango).

PROPERTIES OF THE WOOD

Color of the heartwood salmon pink, usually pale, but sometimes with a reddish tinge; sapwood (1 to 3 inches thick)

lighter, often grayish. Luster high. Dry material without distinctive odor or taste.

Wood light and soft, comparable to Poplar (*Populus*); sp. gr. 0.40 to 0.50; texture very uniform, medium; grain wavy, curly, roey, or sometimes more or less spiral near the periphery of large logs. Shrinkage in drying moderate, hence round and square logs may be imported without liability of serious splitting (a consideration of the utmost importance in the manufacture of veneers); lumber seasons readily without warping or checking and when once seasoned remains comparatively inert to changes in the humidity of the atmosphere and will withstand the salt air of the seacoast; exposed surfaces become harder with age. Is not highly resistant to decay or to the attacks of insects and marine borers, although the gum content affords a measure of protection; in consistently wet or dry situations the heartwood is highly durable.

Mechanical tests demonstrate that Okoumé wood is remarkably tough, strong, and stiff for its weight, and is thus well adapted for light structural work. It has fair shock-resisting capacity and is suited for use where subject to vibration and impact, as in vehicle bodies, airplanes, and packing boxes. It is highly elastic, but splits rather easily.

On account of its fibrous nature, the wood is not easily worked with the usual hand-tools and machines, though this difficulty can be readily overcome by using machines especially adapted for the purpose and having the proper speeds. Saws have been designed with special teeth which give a very clean cut. The best angle of adjustment for the planer knives appears to be about 30°. The wood finishes smoothly and is fairly easy to stain, paint, varnish, or enamel. In natural or oil finish it presents a satiny and polished surface which is very effective. It takes glue very readily.

USES OF THE WOOD

In variety of uses Okoumé is probably not exceeded by any other tropical wood. The large size and uniformity of the logs and their freedom from splits and shakes, together with the homogeneity of the structure of the wood and the ease with which it may be glued, render it especially well-suited

for plywood. The rotary-cut veneers are large and clear and exhibit attractively figured grain.

The most extensive uses are backs, drawer sidings, and partitions of furniture; trunks, caskets, chests, and boxes, especially cigar boxes; doors, panelling, and interior fittings of motor cars and airplanes; and miscellaneous purposes such as stage scenery, incubators, baby carriages, and artificial limbs. It is valuable for the manufacture of boats and canoes and in shipbuilding, replacing mahogany and Spanish cedar; it is also suitable for tight and slack cooperage. When painted, it is sufficiently durable for exterior work, such as summer houses, siding, trim, battens, columns, newels, etc. The lower grades are used extensively for fruit boxes, crates, and similar purposes. It might be used for wood pulp if economic conditions permitted.

COMMERCIAL CONSIDERATIONS

Okoumé has become the most important timber exported from Africa, exceeding African mahogany, which is now becoming scarce. The exports of Okoumé logs from Gaboon, which amounted in 1913 to 134,000 tons, were discontinued during the war, beginning anew in 1920 with 33,000 tons. They have since progressively risen to 305,000 tons during 1927 and to about 400,000 tons in 1928. The timber is exported in round and in square logs, the better grades being reserved for veneers; a small amount of lumber also is shipped to Europe. Although commerce in Okoumé is almost entirely in French hands, Germany remains, as before the war, the principal consumer, taking about half of the production. French industry absorbs about a third. The remainder goes, in the order named, to Holland, Italy, Spain, Belgium, England, and Norway. Shipments to the United States are on the increase, but are still very small.

Although accurate information is not available as to the quantity of standing Okoumé timber, it appears that the actual consumption does not exceed the possibilities of the tropical forest to replace it. The tree makes very rapid growth and reproduces itself satisfactorily. Owing, however, to the scarcity of manual labor in Gaboon there is no immediate prospect of a large increase in the amount of timber cut.

STRUCTURE OF THE WOOD

Gross anatomy: Growth rings fairly distinct, due to alternating lighter and darker zones caused by variations in density. Parenchyma invisible. Pores resemble small pinholes; numerous, evenly distributed, mostly solitary or in groups of two or rarely more. Vessel lines distinct as rather long and wavy scratches, darker than background and containing gummy deposits. Rays fine; visible on cross and tangential sections; very distinct on radial surface, where they are slightly darker than the background. Ripple marks are absent. Gum ducts have not been observed.

Minute anatomy: Pores thin-walled, oval to circular in outline; intervascular pits small, numerous, the apertures elliptic and horizontally elongated to slit-like. Fibers in definite radial rows, sub-circular to polygonal in section, rather thin-walled, often septate; pits small, inconspicuous, simple. Rays about 5 per mm.; 1 to 3 cells wide, but usually biseriate in median portion and with uniseriate margins; mostly 8 to 16 cells high; heterogeneous; deposits of yellow gum abundant; pits into vessels large, often elongated, simple to half-bordered. Parenchyma sparingly developed about pores; cells filled with yellow gum.

Measurements: Pores 0.10 to 0.26 mm. in diameter when solitary. Vessel segments average 0.30 mm. in length; end walls oblique; tips short. Fibers 0.80 to 1.00 mm. long and 0.0018 to 0.002 mm. wide. Rays 0.16 to 0.60 mm. high; breadth, 0.028 mm. (uniseriate) to 0.004 mm. (3-seriate).

IDENTITY OF THE PERUVIAN BALSA

By J. FRANCIS MACBRIDE

Field Museum of Natural History

In 1927, Dr. Ryozo Kanehira, at that time Chief of the Department of Forestry, Government Research Institute, Formosa, collected a species of Balsa which he found growing about the famous Hacienda Pampayacu on the Río Chinchao, Department of Huanuco, Peru. He sent his specimens

to the Gray Herbarium for identification and Dr. I. M. Johnston decided that they represent a new species, *Ochroma peruviana* Johnston, Contrib. Gray Herb. 81: 95. 1928, "most closely related to *O. grandiflora*."

Recently I have had the privilege of examining a portion of this material deposited at the Arnold Arboretum and it seems to me to be identical with my own collections (5250) from La Merced, Peru, which in 1925 (*Field Mus. Publ. Bot.* 4: 91) I referred without question to *O. boliviana* Rowlee, Journ. Wash. Acad. Sci. 9: 166. 1919. Furthermore, re-examination of a specimen of the latter in the Field Museum (*Bang 1501*) discloses no essential difference between the Bolivian and Peruvian trees. No material of *O. grandiflora* Rowlee, l. c. 163, to which Johnston compares his species, has been seen, but that Ecuadorian tree is described as having carinate sepals and flowers 15-18 cm. long. The sepals of the Peruvian tree are plane and the flowers are only 10-12 cm. long. But Johnston apparently relies upon the character of the pubescence to distinguish his species, not only from the Bolivian and Ecuadorian trees, but also from the other very closely related Balsas of Colombia and Central America. The pubescence is excellently described by him as consisting of a close dense stellate tomentum from which tufts of longer hairs project that are themselves stellate, but with erect branches that are tufted, at least in youth. These branches seem to spread in age in greater or less degree and so lose their tufted appearance. Unfortunately this unusual pubescence cannot serve as a distinguishing specific character for it is duplicated exactly on the Bolivian Balsa, especially on the calyx and petioles and less conspicuously on the under side of the leaves. It is very doubtful, therefore, if the Peruvian tree is really a distinct species.

In view of the economic importance of the timber, it would, perhaps, seem most satisfactory to have a Balsa of Peru in competition with one of Colombia (*O. obtusa* Rowlee), one of Ecuador (*O. grandiflora* Rowlee), and one of Bolivia (*O. boliviana* Rowlee) (!), but it seems probable that the number of recognized species will be reduced when the trees are better known. At any rate if the Balsa of Peru cannot have a special

scientific name it at least seems to have a distinct common one, namely Huampo as recorded by Dr. Kanehira. It is also known in Peru, as in Bolivia, as Palo de Balsa.

According to Record (*Timbers of Tropical America*, 426. 1924), woods of all the species are very much alike, although "*O. grandiflora* Rowlee and *O. limonensis* Rowlee (Limón Balsa of Costa Rica and Panama) have brownish instead of reddish or pinkish heartwood" and the wood of *O. velutina* Rowlee (Red Pacific Coast Balsa), according to the author of the species, is harder and heavier than the others. Perhaps research on the woods of the three South American species would disclose differences that would aid in their identification and in a study of their true relationship.

"PAAJ" DERMATITIS PRODUCED BY RED QUEBRACHO

By B. J. RENDLE

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A form of dermatitis produced by *Schinopsis Lorentzii* Engl., the Red Quebracho of South America, is recorded by Di Lullo¹ from Santiago del Estero, Argentina. The malady is commonly known as "paj" (a name of Indian origin), "mal de quebracho," "oure de quebracho," or simply "quebracho." It is said to be induced in sensitive persons by contact with the branches, leaves, or sawdust of the tree or even by close proximity to the foliage. The author goes on to describe the symptoms and medical aspects of the affection. He adds that it was induced in three persons out of four by rubbing the skin with the fresh leaves. It also appeared in a mild form when an alcoholic extract or an aqueous distillate (of the leaves) was applied.

In view of the systematic position of *Schinopsis* in the Anacardiaceae it is not surprising to learn that the tree possesses toxic properties. Several other species of the same

¹O. DI LULLO: Le "paj" dermite provoquée par le quebracho rouge (*Schinopsis Lorentzii*). *Comptes Rendus des Séances de la Société de Biologie et de ses Filiales* 99: 28: 1000. Paris, 1928.

family have been recorded as being poisonous. Of the large genus *Rbus*, the Poison Ivy, *Rbus Toxicodendron* L., and the Poison Sumac, *Rbus vernix* L., are two of the more notorious species. *Metopium Brownei* (Jacq.) Urban and *Comocladia* sp. are known to cause severe inflammation and blistering of the skin. (See *Tropical Woods* 9: 3, March 1927.) *Semecarpus Anacardium* L. is also reported to produce a similar effect.

The family is represented in Malaya and the East Indies by several woody genera which are well known to cause a painful irritation of the skin. Foxworthy,² writing of Rengas, the vernacular name for the most important group of the timber trees of this family, says: "All forms of Rengas contain a poisonous principle which seems to be present in all parts of the plant. The wood contains some of the poison, which is most active when the wood is fresh, but which is capable of causing poisoning many years after the wood is first cut. Sometimes coolies smear themselves with coconut oil before cutting some of the worst forms." The poison seems to be associated with the oily gum which is characteristic of these woods.

A NEW *BROSIMUM* FROM PANAMA, WITH NOTES ON THE GENERIC NAMES *BROSIMUM* AND *FEROLIA*

By PAUL C. STANDLEY

Field Museum of Natural History

The generic name *Brosimum* Swartz, 1788, is applied generally to a small group of trees of the family Moraceae, several of which yield valuable timbers. Closely related to *Brosimum* is Aublet's genus, *Piratinera*, which includes the Letterwood or Snakewood of the Guianas.

Professor Record¹ has discussed in detail the woods of these two genera, concluding that they fall into three groups

² F. W. FOXWORTHY: Commercial timber trees of the Malay Peninsula, *Malayan Forest Records* No. 3, 1927, p. 140.

¹ *Timbers of Tropical America*, New Haven, 1924, pp. 131-141.

which represent either three distinct genera or three groups of a single genus.

Piratinera has been retained as distinct by various recent writers, although formerly it was merged in *Brosimum*. Until ampler herbarium material is available for study, it seems best to recognize *Piratinera* as a valid genus.

There remains, then, the disposition of the species now referred to *Brosimum*. For lack of satisfactory herbarium specimens, it appears necessary, for the present, to refer all these to a single genus, *Brosimum*, but it may be pointed out that from the standpoint of wood structure the species fall into two distinct groups. The first of these, with whitish or yellowish wood, includes such species as *B. alicastrum* Swartz, the Breadnut of the West Indies and Mexico; *B. utile* (H. B. K.) Pittier, the famous Humboldt Cow Tree or Palo de Vaca of Panama and northern South America; and *B. columbianum* Blake, the Guayamero of the Magdalena Valley.

The second group of species, with red wood, includes *B. paraense* Huber, the Muirapiranga of the Amazon region; probably *B. angustifolium* Ducke, of Brazil; the Condurú or Gondurú of Pará, *B. Conduru* F. Allem.; the Páo de Sangue of Amazonas; and the Bloodwood Cacique of Panama, here described.

It may well be that the latter group will prove generically distinct when there is available sufficient herbarium material for its detailed study, for the trees, as the specimens now at hand show, do differ somewhat in general appearance from typical species of *Brosimum*, particularly in their caudate leaves and long narrow divaricate stipules.

The nomenclature of the genus *Brosimum* is complicated by a description published by Aublet. The name *Ferolia guianensis* Aubl. (*Hist. Pl. Guian. Suppl.* 7. *pl.* 372. 1775) evidently is intended to apply to the Bois Satiné or Bois de Féroles of French Guiana, for the generic name is derived from the latter vernacular name. Aublet also gives a description of the wood, which agrees well with that of *Brosimum paraense*.

There is, however, some confusion in Aublet's diagnosis and plate. The branches illustrated, as indicated by the form

of the leaves and the peculiar stipules, are clearly of the genus *Brosimum*, but with them there are associated, and described, fruits which belong to some other family. Any one who has collected in tropical America will guess that these fruits were gathered on the ground beneath a *Brosimum* tree, where they had been carried by the wind, the collector believing that they had fallen from directly overhead.

On the basis of the fruits, the name *Ferolia* has been referred to synonymy under *Parinarium* (Rosaceae); why, it is hard to imagine, for the leaves do not suggest those of that genus, and the drawing of the fruits is very crude. Otto Kuntze even went so far as to transfer to *Ferolia* many of the species of *Parinarium*.

There is no doubt in the writer's mind that the name *Ferolia* should be associated rather with *Brosimum*. It has 13 years' priority over the latter name, and if both names relate to the same genus of plants, the species of *Brosimum*, if strict priority is to be observed in nomenclature, should be transferred to *Ferolia*. It is possible that the name *Ferolia* might be rejected because it is based upon material of two distinct plants, but common sense, all too rarely exercised in the application of nomenclatorial rules, proves that it really refers to the Satiné.

It seems best not to make the suggested transfers, at least at the present time, and thus displace such a well-established name as *Brosimum*. Further study may show that *Ferolia*, as represented by the Satiné and other trees with red wood, is a distinct genus, and that both generic names should be maintained. If not, the case should be placed before the next International Botanical Congress, with a recommendation that *Brosimum* be conserved.

Professor Record, to whom the writer is indebted for most of the data here discussed, is inclined to believe that if *Piratinera* is retained as a distinct genus, *Ferolia* also should be treated as a generic unit. This disposition receives the approval also of Pfeiffer² who proposes definitely that [the

² J. PH. PFEIFFER: De houtsoorten van Suriname. *Med. Kon. Ver. Kol. Inst.* (Amsterdam) 22: 150-151, 1926.

Satiné of the Guianas be known as *Ferolia guianensis* Aubl. (Moraceae).

Study of rather meager herbarium material indicates that the Guiana Satiné and the Brazilian Muirapiranga are identical. The proper name for the species is *Brosimum paraëense* Huber. Of this *Ferolia guianensis* Aubl. is a synonym. The latter should not be transferred to *Brosimum* because there is already a *Brosimum guianense* Huber, based on *Piratinera guianensis* Aubl. Although technically, under the International Rules, *Ferolia guianensis* could still be transferred to *Brosimum*, confusion would follow such a course because of the two identical specific names involved.

The collection of trees made in Panama in 1928 by G. Proctor Cooper includes material of the Bloodwood Cacique, which is closely related to the Satiné, but probably distinct. It is described here as a new species.

Brosimum caloxylon Standl., sp. nov.

Arbor omnino glabra, ramulis gracillimis, ferrugineo-brunneis, interpediis 1-3 cm. longis; stipulae anguste lineares, 1.8-2.5 cm. longae, basi 3 mm. latae, complicatae, tenues, brunneae; petioli graciles, 4-7 mm. longi, supra canaliculati; limbus oblongus vel anguste elliptico-oblongus, 5-10.5 cm. longus, 2-2.3 cm. latus, basi suboblique obtusus, apice abrupte angustatus et caudato-acuminatus, acumine e basi triangulari lineari, 1-2 cm. longo, apice rotundato, subcoriaceus, integer, nervis supra planis, subtus vix elevatis, crassiusculis, lateralibus utroque latere c. 15, angulo fere recto divergentibus, rectis, prope marginem nervum distinctum efformantibus.

PANAMA: Cricamola Valley, alt. 105 m., 1928, G. Proctor Cooper 535 (Herb. Field Mus. No. 579,630, TYPE); Yale No. 12,155. Buena Vista Camp on Chiriquí Trail, alt. 375 m., Cooper 607; Yale No. 12,240.

For a full account of this tree, the Bloodwood Cacique, see *Tropical Woods* 14: 1, June 1, 1928. A fine slab of the handsome wood has recently been placed on exhibition in Stanley Field Hall of Field Museum of Natural History.

Although known at present only from sterile material, it seems advisable to give a name to this important tree, the first of this group of the genus to be reported from North America. *Brosimum caloxylon* is related to *B. paraëense* Huber, which has much shorter leaf acuminations and broader leaves.

A NEW *MICONIA* AND OTHER LARGE
MELASTOMES OF PERU

By J. FRANCIS MACBRIDE

Field Museum of Natural History

Although a vast majority of the Melastomaceae are woody plants, comparatively few are arborescent. In Peru, however, nearly a dozen genera contain one or more species that are known to become trees of considerable size. In the department of Huanuco, I collected an undescribed *Miconia* in 1922 which was about 55 feet high, with a well-developed trunk and large openly branched crown. Its Indian name is Mogo-mogo. As it grew in the foothills of the Andes it may appropriately be called

Miconia incarum sp. nov.

Arbor pulchra circa 17 m. alta satis ramosa; ramis ramulisque obtuse tetragonis, junioribus etiam petiolis primum dense farinoso-furfuraceis demum glabris; pedunculis ramulisque inflorescentiarum sulcatis et valde tetragonis parce granulosis et aliquot farinoso-furfuraceis; petiolis 4-7 cm. longis; foliis rigidis serrulatis late ovato-cordatis, basi profunde cordatis, apice sensim acuminatis vel interdum solum acutis, plerumque 1.5-2 dm. longis et 1-1.4 dm. latis, supra intense viridibus primum obscure bullatis et parce pubescentibus cum pilis infirmis simplicibus demum glabris sed creberrime bullatis, subtus canescentibus, ad nervos nervulosque dense farinoso-furfuraceis caeteris pilis brevis crispulis dense pubescentibus etiam profunde foveolatis, 7-9-nerviis; nervis supra subtusque utrinque mediocriter prominentibus; paniculis anguste thyrsoides, submultifloris, 1.5 dm. longis; floribus 5-meris; pedicellis 3-5 mm. longis; calyce campanulato glabro late breviterque lobato, circa 6 mm. longo; petalis ut videtur rubris, glabris carnosius suborbicularis fere 8 mm. longis; antheris linearibus apice vix, basi haud attenuatis, 4 mm. longis ut videtur 1-porosis, connectivo vix producto, postice conspicue calcarato; filamentis glabris, late oblongis, 2 mm. longis; stylo glabro circa 5 mm. longo; stigmatibus truncatis; ovario libero, valde 10-costato.—PERU: at head of canyon 6 miles south of Mito, Dept. of Huanuco, August 1-5, 1922, *Macbride & Featherstone 1867* (TYPE, *Field Museum*); Cani, pueblo 7 miles northeast of Mito, *Macbride 3547*.

According to Cogniaux' key to the sections of *Miconia* (DC. Monog. 7: 726. 1891) this species belongs in Section *Octomeris* or *Chaenantbera*. It cannot be referred to the former because of the spurred anthers. No single character keeps it out of the latter, but vegetatively it bears no resem-

blance to the members of that group. In its free, strongly ribbed ovary, long and spurred anthers attenuate at neither base nor apex, campanulate calyx, and large flowers it presents a combination of characters that apparently will merit at least sectional designation.

OTHER LARGE MELASTOMES

Recently three Melastomes have been described from the upper Amazon in eastern Peru that were noted by the collector (Tessmann) to attain a height of 80 to 100 feet and a trunk diameter of 20 to 24 inches. These new trees have characters other than their unusual size that make them of interest. One of them, *Tessmaniantbus* Mgf., Notizbl. 9: 1141. 1927, although a member of the suborder Melastomeae (the characteristic group of the family in regard to foliage), is considered by the author to be related to both the Miconieae and the Meranieae. Probably it belongs to the latter.

Another, *Meiandra maior* Mgf., l. c. 1142, which must become *Alloneuron maior* Mgf.,¹ has pinnate-nerved leaves suggesting the suborder Memecyleae, a group which, at least in foliage characters, is aberrant in the family. *Alloneuron*, however, instead of having the few-seeded fruits of the Memecyleae has the numerous-seeded berries of the Melastomeae. From a study of the twigs, kindly furnished by Dr. Markgraf, Professor Record has found that the wood structure is normal, whereas the Memecyleae, so far as known, are characterized by interxylary phloem. It accordingly seems probable that *Alloneuron* is a member of the Melastomeae and is related to *Miconia*.

The third large tree of this group is *Mouriria floribunda* Mgf., l. c. 1147. The presence of large specimens in this genus is less unexpected than in the others, however, since *M. parviflora* Benth. is a fair-sized forest tree in Central America and

¹ *Alloneuron maior* (Mgf.) Mfg., comb. nov. *Meiandra maior* Mgf., Notizbl. 9: 1142. 1927. Professor Record recently asked Dr. Markgraf to verify my conclusion that his genus and *Alloneuron* Pilger, Verhandl. Bot. Ver. Bradenb. 47: 185. 1905, were the same. As he replied affirmatively and indicated the above transfer, I herewith make it for him.—J. F. M.

M. pseudo-geminata Pittier, Bol. Com. & Ind. Venez. 1: 424. 1921, is said by the author to be 60 to 80 feet high and about 26 inches in diameter.² The wood of *Mouriria* is anomalous in that it contains phloëm strands.

BOTANICAL RELATIONSHIPS

The suggestion has been advanced that *Mouriria* and related genera are not properly included in the Melastomaceae. The impressive difference of *Mouriria* has been, of course, its pinnate leaf-nervation, but this character, striking though it may be, is no doubt superficial, as evidenced by the existence of *Alloneuron* and 1-nerved species of *Miconia*. It is not unlikely that other species aberrant in respect to this foliage character could be found if a complete survey of the family were made.

It is known from the researches of Record, Janssonius, Solereder, and others, that the woods of *Mouriria* and *Memecylon* are of anomalous structure, and Krasser (Pflanzenfamilien III. 7. 197) gives this anatomical feature as characteristic of all of the Memecyleae. This would seem to indicate that this group ought to be removed, for it rarely has the typical leaves and always has fruit with only a few, and large, seeds.

The problem, however, is not this simple. Aside from the fact that the characters cited would poorly define a family, it appears that this anomaly of wood structure and concomitant anatomical peculiarities are not unique for the Memecyleae, but also, according to Krasser (*l. c.* 195) characterize *Kibessia* and *Pternandra* of the Kibessieae. Since these two genera have 3-5-nerved leaves and many-seeded berries, the family separation of the suborder Memecyleae would have to be without the support of the wood characters mentioned. It may still be granted, however, that it would be very convenient, as regards aspect alone, to have *Mouriria et al.* in a separate family, and someone may yet be able to show how it logically can be done.

² Another Venezuelan tree, *Conostegia excelsa* Pittier, Journ. Wash. Acad. Sci. 14: 19: 450. 1924, is reported to be 65 to 85 feet tall.

AFRICAN "SANDALEEN" WOOD

By J. BURTT DAVY

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The writer recently received for identification a fragrantly scented wood specimen transmitted by Professor Record, to whom it had been sent by an importer in New York City. The sample came originally from a timber merchant in Portuguese East Africa who states that at least 2,000,000 cubic feet of logs could be procured in lengths of 8 to 16 feet and of an average diameter of 12 inches. The name of the wood is given as Sandaleen.

This so-called Sandaleen Wood has been recognized here as the product of *Spirostachys africana* Sond. (= *Excoecaria africana* Muell. Arg.), of the family Euphorbiaceae. Its known range is as follows: Tanganyika Territory; Portuguese East Africa (frequent but somewhat local, usually on moist flats; common near Delagoa Bay and Umbelusi, also near the Limpopo and lakes in Gazaland, and in certain forests in Magenja da Costa and Nhamacurra); Angola (Bumbo); South West Africa (Amboland and Hereroland); South Africa (more or less gregariously, but seldom in large quantities, on flat frostless river valleys, along with Acacias, in Transvaal Bushveld, Swaziland, Natal, Pondoland, and Transkei). It has not been reported from the Central Plateau region between Tanganyika Territory and Angola, but it is to be expected in Northern and Southern Rhodesia and in Nyasaland.

In Portuguese East Africa, according to Sim (1909), it is a deciduous or semi-deciduous tree, 15 to 30 feet high, with usually a straight clean bole 6 to 16 inches in diameter, and a pyramidal crown having numerous short slender and spreading ultimate twigs. The bark is rough and of a red-brown color. The leaves, which are more or less acute, are 3 to 5 cm. long and 1.5 to 2 cm. wide, those of coppice being somewhat longer and more rounded; they appear very different in youth from what they do at maturity. The seeds are sometimes offered for sale in Africa under the name of "jumping beans." The

fruits are not infrequently infested by larvae which feed on the seed-contents and, when full-fed, cause the shell of the seed, in which they are still housed, to jump about in an extraordinary manner.

Sim states that where this tree is easily accessible in Portuguese East Africa "its export will probably prove remunerative." As regards its future in South Africa he is of the opinion that the wood "ought not to be exported, but used to maintain a South African industry of its own in scented trinkets, small fancy boxes, etc.," since, on account of its beauty and very pleasant and durable scent, it is used to make the rough bead necklaces and charms often worn by native women. It is also placed among stored clothing to keep away the moths. It has been used in South Africa and considered first class for gunstocks, furniture, and wagon-work, though it is much too valuable for the last-named purpose. It has also been tried for ox-yokes, but it has an injurious "burning" effect on the necks of the animals, owing to the presence in the wood of an acrid oily juice. The fresh juice of the living tree is painful to a tender skin and dangerous if it gets into the eyes, cases of loss of sight from this cause having been reported; the late Dr. Medley Wood, of Durban, informed the writer that the application of a few drops of the milky juice of *Sarcostemma viminalis* R. Br. gave almost instant relief. Sawyers complain that the sawdust affects their eyes, and the Swazis refuse to cook over fires made of the wood, saying that it "poisons the food."

COMMON NAMES

Tomboti,¹ umTomboti or umTombotie (Kafir of Natal, and Swazi, *Sim*); Sandalwood (South Africa, *Sim*); Sandalo (Port., *Sim*); Helengomaash or Shelinga-maash (Irongo, Lourenço Marques, *Sim*); Muconite (Echuabo, Quelimane, *Sim*); Nesipolela ? (Echuabo).

¹ According to Sim (1907), the "isi-Tomboti" of East London is *Acalypha glabrata* Thunb.

DESCRIPTION OF THE WOOD

General properties: Heartwood dark brown, beautifully marked with darker streaks, sometimes becoming almost black; a highly ornamental wood; has a waxy appearance and feel. Sapwood much lighter in color. Scent strong and persistent, resembling that of Cedar and Sandal. Taste somewhat acrid.

Very hard and heavy; weight 50 to 62 pounds per cu. ft., oven-dry; of very fine and uniform texture; rather difficult to work because of its hardness, but finishing very smoothly and taking a natural waxy polish; is very durable. According to Scott (1927), the "solution in water is pale green; wood burns well and easily, leaving a pure white ash and exuding a sticky treacle-like substance."

Gross anatomy: Growth rings poorly defined; the darker bands which suggest growth rings are independent of seasonal variations. Pores very small and indistinct, fairly numerous but not crowded, arranged in short radial rows of 2 to 5, mostly filled with dark gummy deposits. Vessel lines very fine, but distinct. Rays minute, barely visible with hand lens on cross and tangential sections, low and inconspicuous on the radial; not storied. Parenchyma not distinguishable.

Minute anatomy: Growth rings defined by slight differences in density. Pores thick-walled, sub-circular or radially flattened, arranged in rows of 2 to several pores each, sometimes appearing sub-divided; vessel perforations simple; pits numerous, fairly large, the apertures elongated; dark red masses of gum abundant. Parenchyma in fairly numerous, uniseriate, irregular and broken tangential lines; dark infiltrates common. Rays 7 to 25 cells deep and 1 or 2 cells wide, mostly uniseriate; somewhat heterogeneous, the larger cells usually marginal; dark infiltrates common; pits into vessels of same appearance as those between vessels. Wood fibers very slender, thick-walled, indistinctly pitted, arranged in definite radial rows. Most of the elements of the wood contain oil globules.

Remarks: The structure of the wood rather closely resembles that of *Gymnanthes lucida* Sw., the so-called Lignum-vitae of British Honduras.

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TREES AND SHRUBS COLLECTED BY
F. C. ENGLISING IN NORTHEASTERN NICARAGUA

Nicaragua ranks first among the Central American countries in the amount and value of its timber exports. The east coast has long been an important source of Mahogany and Cedar and, in some years at least, the exports of these two woods have exceeded those from the rest of Central America and Mexico combined.

In portions of northeastern Nicaragua there are merchantable stands of Pine which are now the basis for modern logging and milling operations. The Bragmans Bluff Lumber Company, Inc., has a sawmill at Puerto Cabezas with a present daily capacity of 125,000 board feet; a planing mill capable of handling 50,000 feet of lumber per day; Moore moist-air dry-kilns; and a timber-treating plant for impregnating lumber and timbers with either creosote or salt solutions. "The present markets for all the production of the company are in the Latin-American nations of Mexico, Central America, South America, Cuba and the West Indies. No attempt to market the products in the United States has been undertaken because the natural markets absorb easily all of the present production."¹

During the past two years this company has been exploring a portion of the higher coastal plain and the foothills of the central cordillera, and has generously coöperated with the Yale School of Forestry in a study of the vegetation of the area. For a year, November 1927 to October 1928, the engineer in charge of the field work, F. C. Englesing, C.E., employed his spare time in collecting botanical and wood specimens and in making notes, drawings, and photographs of both the herbaceous and arborescent plants. This material has been forwarded at intervals to Yale, and the determinations have been supplied by Paul C. Standley, Field Museum of Natural History, who secured the assistance of specialists on certain groups.

¹ A magnificent pine operation in Nicaragua. *The Lumber Trade Journal* (New Orleans), Jan. 15, 1928, pp. 22-23.

Mr. Englesing is an American, educated at the Universities of Mississippi and of Oxford, who has been professionally employed in Brazil, Ecuador, Venezuela, southern China, and Nicaragua, and has recently gone to the Maracaibo region of Venezuela. He has been interested for a number of years in tropical botany, pursuing the subject as a relaxation from his engineering work. It was his intention while in camp in Nicaragua to keep the plants under observation and to continue collecting them as they came into flower and fruit until all available material had been secured. This program, now discontinued, met with many difficulties, as the following instances will indicate.

On April 8, 1928, he wrote: "A box of wood samples was sent down river by canoe on March 6. On the way the Indian crew decided to go inland to visit some friends, so they pulled out at an old house and stored their cargo, which consisted principally of this box of samples. They forgot it, upon re-embarking, and it remained there until their return journey with my monthly supplies, when they brought it back. Upon opening the box I found that termites had been so busily engaged that several of the specimens had to be discarded. The remainder I am now dispatching by pack mule."

The field notes concerning the specimens were always taken on the spot and in the case of No. 223, April 16, we find this memorandum: "Due to an advance of bandit forces in this area, the locality was abandoned before complete notes had been obtained." On June 1 he wrote: "I have lost about a month and a half of the best collecting season through the activities of Sandino in this district, as I was called from the Reserve into active service with the troops here to act as Intelligence Officer and advisor."

In connection with a shipment made on September 5, he said: "I trust these will reach you promptly and in good condition. The great humidity of this unusually wet season has given us a struggle to preserve both botanical material and wood samples. We have experienced several extraordinarily high floods, in two of which my camps were completely

under water for several days at a time. Through these I have nursed the collections personally. At one time we were routed out at 3 o'clock in the morning by a sudden rise of the river and had to carry the whole camp equipment to higher ground, wading waist deep to do so."

Although Mr. Englesing's collections are not complete, they come from a locality scantily represented in herbaria and serve to bridge a serious gap in our knowledge of the Central American flora. The important tree species are shown to be much the same as those growing under similar conditions from British Honduras and Guatemala to Panama.²

"The stand of timber of all species in the district from the railroad of the Bragmans Bluff Lumber Company to the Kukalaya River averages approximately 11,000 feet, B.M., per acre, of which Comenegro comprises about 14 per cent. The other most important species are, in the order named, Santa María, Cedro Macho, Nancito, Guácimo, Leche Amarilla, Burillo, and Cedar. Most of this country has an elevation of from 60 to 150 feet above the sea. There is a marked difference in the species inhabiting the hill country."

The following data have been taken from the copious notes supplied by the collector. Owing to lack of space, it has been necessary to abbreviate them, sometimes almost to the vanishing point. In several instances no notes were received. Only specimens accompanied by wood samples bear the Yale serial number. References to site conditions of growth are included as they provide a clue to the value of the different species as soil indicators. The terms used to denote frequency of occurrence are defined by Mr. Englesing as follows: **ABUNDANT:** Growing gregariously over large areas. **COMMON:** Growing gregariously in groves in mixed forest. **VERY FREQUENT:** More than two trees per acre in mixed forest. **FREQUENT:** About one tree per acre in mixed forest. **INFREQUENT:** Less than one tree per acre in mixed forest. **RARE:** Seldom encountered.

² Persons interested in securing additional information concerning these trees and their woods are referred to various articles in previous issues of *Tropical Woods*.

ANNOTATED LIST OF SPECIES

ACANTHACEAE

Bravaisia integerrima (Spreng.) Standl. MANGLE BLANCO. Small erect tree, 20 feet high, growing unshaded on rich well-drained soil near mouth of Morcielago Creek. Bark mottled gray and dark greenish brown. Branches steeply ascending. Branchlets with prominent nodes showing persistent twig scars. Twigs obscurely quadrilateral, with opposite leaves at the nodes. Flowers white and conspicuous, in axial or terminal clusters of 3 to several flowers each. Wood creamy yellow; odorless; not utilized. No. 147; Yale No. 1241.

ACTINIDIACEAE

Saurauia Englesingii Standl., sp. nov. (in ed.). No. 281; Yale No. 13,273.

AMYGDALACEAE

Hirtella americana L. PELO DE INDIO. Small erect tree growing in shady forest near San Luis.³ Flowers with 5 pink, very easily detached petals and 6 long-exserted purple stamens; in terminal spikes. No. 131; Yale No. 13,262.

ANACARDIACEAE

Anacardium occidentale L. MARAÑÓN. Low short-boled spreading and crooked-branched tree, fairly frequent in old clearings and pastures. No. 122.

Spondias Mombin L. JOBO; JOCOTE MONTERO. Large tree, 125 feet tall, with straight cylindrical trunk 3 feet in diameter, growing in a group of the same species in high open forest on rich well-drained soil near the bank of the Kukalaya River about 1000 yards above the mouth of Grindstone Creek, at altitude of 200 feet. Upper part of trunk with many vertically elongated and layered corky ridges 17 to 31 cm. long and 2 cm. high. Branches ascending and crooked. Twigs coarse, roughened with persistent leaf scars. Leaves pinnate, with 9 to 13 leaflets. Small white flowers borne in large loose terminal panicles. Nos. 231, 232, and 276.

ANONACEAE

Xylopia xylopioides (Dunal) Standl. MANGALARGO. Slender tree, about 80 feet high, with straight bole 10 inches in diameter and buttressed to height of 2 feet, of frequent occurrence in dense forest on well-drained clay

³ San Luis de Ocongwas, an abandoned town on the banks of the Ocongwas River, now completely grown up with native species and a few escapes from cultivation, except for one or two comparatively open pastures. The remainder of the locality is virgin forest covering a broken terrain varying in altitude from 140 feet (by aneroid) at San Luis to 900 feet on certain hilltops. The soil in this vicinity consists of a clayey top soil, 6 to 8 inches deep, underlain with heavy and impervious clay; the surface drainage is generally excellent. Nos. 103 to 133 were obtained in this district Jan. 1 to Feb. 11, 1928, and, unless otherwise stated, were from this class of soil.

soil near Ocongwas River. Bark dark brown or purplish, with long vertical lines of lenticels resembling overgrown fern sporangia. Lowest branches fastigiate, upper ones radiating spoke-like. Leaves alternate, their arrangement along the twigs giving a fern-like appearance. Flowers pure white, curving singly or severally in axils of buds and leaves. Yellowish fruit fleshy, longitudinally dehiscent, containing 2 black seeds. Sapwood white; heartwood blackish brown, with extremely disagreeable fetid odor when freshly cut; not utilized. No. 198; Yale No. 13,295.

ARALIACEAE

Gilibertia Smithiana Johnston. No. 264.

BIGNONIACEAE

Jacaranda Copaia (Aubl.) Don. (Leaves mistaken for those of *Quon*, *Schizolobium*, No. 54.)

Schlegelia nicaraguensis Standl., sp. nov. (Trop. Woods 16: 44). CORALMECA. Woody liana, climbing by twining and looping. Very frequent on red clayey loam in dense shade. No. 99; Yale No. 4268.

Tanaecium Jaroba Sw. CABEZA CULEBRA (?). Liana, growing over tall trees near mouth of Grindstone Creek. No. 233.

Tecoma chrysantha Jacq. AOKA (Mosquito Indian. Pronounced "ow-ka."); CORTÉS. Large deciduous tree, 125 feet high, with straight cylindrical bole 26 inches in diameter above the buttresses (30 inches) and clear of limbs for 70 feet, of infrequent occurrence in open forest on well-drained clay soil along the Ocongwas River. Bark light tan or buff to gray-brown, scaling in small plates between long vertical furrows that give the trunk the appearance of a shallowly fluted column. Leaves digitate and opposite; absent during the blossoming period. Large and showy yellow flowers massed at the ends of the twigs. Sapwood the color of old ivory; heartwood very dark olive-brown, exuding minute drops of an oily substance when freshly cut. It is said that the Sumo Indians cook out this oil and use it as a healing lotion. The strong and durable timber is used for uprights of native houses and for mine timbers, axles, and tool handles. No. 181; Yale No. 13,285.

Tecoma pentaphylla (L.) Juss. Large deciduous tree, 95 feet high, with slender and erect trunk buttressed to a height of 7 feet, growing on gray clay soil in a seasonal marsh. Bark grayish, rough and scaly near the base, smoother and not scaly higher up. Leaves digitate and opposite, clustered near the ends of the stout twigs, rather few during the blossoming period. Flowers showy lavender-purple. Wood the color of old ivory, with distinct growth rings; faint odor suggesting freshly cut watermelon; taste decidedly bitter; said to make excellent axe handles. No. 182; Yale No. 13,286.

BOMBACACEAE

Ochroma limonensis Rowlee. POLOK (Mosquito Indian); GATILLO. Medium-sized tree, with smooth erect bole, of very rapid growth on old clearings. Leaves dark green and smooth above, light gray-green and minutely pubescent below. The down from seed pods used locally for stuffing pillows. Wood white throughout; very soft; odorless; not utilized locally. No. 137; Yale No. 12, 424.

BORRAGINACEAE

Cordia alliodora (R. & P.) Cham. LAUREL NEGRO. Large erect tree, 100 feet high, with unbuttressed straight bole 18 inches in diameter, growing in dense forest on poorly drained heavy clay soil with impervious subsoil along Ocongwas River; said to be frequent in the area bounded by this river and the Bambana. Wood grayish brown; pleasantly and spicily scented; used locally for building purposes, railway ties, flooring, etc. No. 174; Yale No. 13,281.

BURSERACEAE

Protium Copal (S. & C.) Engl. FOSFORITO. Small or medium-sized tree, growing in dense shade on deep well-drained loamy clay soil along the bank of the Kukalaya River; only two specimens observed in this locality. Bark light gray, tinged with pink, and containing a sticky sap. Leaves compound, with 2 or 3 pairs of dark green coarse-textured leaflets. Flowers of a rich cream color and borne in spikes or panicles in bud or leaf axils. Sapwood creamy white; heartwood pinkish brown; used locally for kindling, as it ignites very readily. No. 76; Yale No. 1239.

Protium panamense (Rose) Johnston. No. 67.

Tetragastris Stevensonii Standl., sp. nov. (in ed.). No. 278; Yale No. 13,272; also No. 265, without wood specimen.

CELASTRACEAE

Myginda eucymosa Loes. & Pitt. Shrubby tree in undergrowth of open forest on well-drained red clay soil on low hilltop not far from Ocongwas River; only two specimens observed. Leaves opposite, 2-ranked. Inflorescence axial, of reddish yellow appearance; petals yellow, except inside of corolla tube, which is crimson. Wood reddish yellow; odorless; not utilized. No. 177; Yale No. 13,284.

COMPOSITAE

Eupatorium Vitalbae DC. Small woody climber, abundant in old pastures and clearings near San Antonio. No. 153; Yale No. 12,428.

Melanthera aspera (Jacq.) Rich. BOTÓN BLANCO. Slender shrub, sometimes 8 feet high when supported on a tangle of underbrush, very frequent in the margins of pastures and other open spaces. No. 112.

Mikania micrantha H. B. K. Slender twining vine, abundant on low second-growth near San Luis. No. 107.

Trichostigma polyandrum (Loes.) H. Walt. Woody twining vine, growing in deep shade. No. 93.

Vernonia patens H. B. K. Small erect tree, about 15 feet high, common in old clearings and along sunny river banks, on heavy red clay soil with good surface drainage at elevations of 200 to 300 feet. Leaves alternate, smooth dark yellow-green above and harsh blue-green beneath. Flower buds, which seemed well-developed early in February, showed no signs of opening by middle of March, although a great many plants were examined. Wood creamy yellow; rays conspicuous; odor of fresh material suggests iodoform; pith large. No. 151; Yale No. 12,426.

DILLENIACEAE

Dolioscarpus nicaraguensis Standl.,⁴ sp. nov. (in. ed.). No. 277.

EUPHORBIACEAE

Cleidion nicaraguense Hemsl. Small erect tree or a shrub, sometimes 15 feet high, common under high forest along the banks of Susum Creek where surface drainage is good. Small white flowers borne singly or in clusters in leaf axils and also terminally. No. 14.

Hieronyma alchorneoides Allem. NANCITO. Large tree of the dense forest, over 100 feet high, with cylindrical trunk 3 feet in diameter above the massive buttresses (6 feet) and clear of branches for 40 feet, of frequent occurrence in wet sites and seasonal marshes. Bark pinkish brown, shallowly furrowed and flaky. Branches heavy, steeply ascending and very crooked; break very easily. Inflorescence a many-flowered yellowish catkin. Sapwood pinkish white; heartwood very dark brown, exuding a blackish sap when freshly cut; apparently not utilized. No. 213; Yale No. 13,300.

Pausandra extorris Standl.,⁵ sp. nov. (in ed.). Slender erect tree, 40 feet high, frequent in dense forest on well-drained soil along Waspow Creek. Bark mottled with various shades of greenish gray, yellowish green, dark brown, and ash-gray. Branches and branchlets curving upward. Leaves large, obovate, serrate, alternate, 6-ranked, radiating spoke-like from near ends of the stout twigs. Fruit a globular, 3-lobed, 6-celled, locucially dehiscent, yellowish green capsule, in racemes from axils of last 2 or 3 leaves at tips of twigs. No. 216; Yale No. 13,301.

Tetrorchidium rotundatum Standl. (Trop. Woods 16: 44). Large tree, 100 feet tall and 2 feet in diameter, with trunk buttressed to a height of nearly 6 feet and slightly grooved to an additional height of 12 feet and clear of branches to a total height of 45 feet, growing in dense forest on a small hill along north bank of the Kukalaya River. Bark laticiferous, greenish gray and pitted near the base; smooth, with parts slightly ridged, higher up. Branches ascending. Leaves alternate, at apices of twigs; glabrous, dark green above and several shades lighter beneath. Inflorescence an axial spike. Wood creamy white when fresh; odorless; no local uses known. No. 53; Yale No. 1236.

FLACOURTIACEAE

Carpotroche platyptera Pittier. Small erect tree, about 12 feet high, growing in shady forest in Ocongwas valley. Leaves large, alternate. Flowers pale yellowish, on short pedicels from surface of trunk. Collected by D. R. Terrill, transitman. No. 187; Yale No. 12,436.

Hasseltia floribunda H. B. K. MUÑECA. Small tree, 13 feet high, found in second-growth on old pasture at San Antonio. Leaves 3-nerved and coarsely serrate. Flowers in large terminal panicles. Wood cream-colored, with some-

⁴ "A very distinct new species, belonging to a section of the genus previously unknown from North America."—P. C. S.

⁵ "Genus new to North America."—P. C. S.

what darker lines limiting growth rings; odorless and tasteless; not utilized. No. 152; Yale No. 12,427.

Oncoba laurina Warb. (Included through mistake with *Madroño*, *Calycophyllum*, No. 44.)

GESNERIACEAE

Besleria glabra Hanst. (?). Low shrub, with coral-colored flowers, said to be frequent in some localities. No. 154.

GRAMINEAE

Bambusa aculeata (Rupr.) Hitchc. BARATARA; CARICA. No. 163; Yale No. 13,279.

Lasiacis sp. Arborescent grass, ascending but usually with summits touching or trailing on the ground, common in breña where light is good and drainage poor. No. 194; Yale No. 13,291.

GUTTIFERAE

Rheedia edulis Tr. & Pl. JOCOMICO; MAMEY MONTERO (?). Medium-sized erect tree, growing on well-drained loamy clay soil in open forest along the Ocongwas River. Wounded bark exudes a yellow latex, very attractive to bees. Branches alternate, but radiating like spokes of a wheel. Leaves opposite; the pale green, lax and pendulous new leaves contrasting with the dark-colored old ones. Flowers white, yellow, and green, in clusters at twig and branch nodes and in leaf axils. Wood pale yellow, with fairly distinct growth rings; has odor of fresh grass; used locally for axe handles. No. 191.

Vismia dealbata H. B. K. MATA RANCHA. Small tree, about 15 feet high, frequent in old clearings and thickets where drainage is good and there is plenty of sunlight. Bark, when wounded, exudes a sticky crome-yellow sap. Leaves opposite, 4-ranked, clothing entire length of twig; dark green and smooth on upper surface, buff and minutely puberulent on the lower. Inflorescence terminal and 4-ranked; sepals golden brown; petals soft yellow, with minute reddish lines on back. Sapwood pinkish creamy white; heartwood slightly darker, with distinct growth rings. No. 160; Yale No. 12,429.

LABIATAE

Hyptis obtusiflora Presl. Small shrub, very frequent in second-growth. No. 106.

LAURACEAE

Nectandra Laurel Kl. & Karst. AGUACATILLO. Large tree, with straight and cylindrical bole, of frequent occurrence in high forest near stream banks. Leaves large, glossy yellow-green above (at maturity) and densely pubescent below; young leaves velvety on both sides. Flowers pure white, borne in axillary and terminal panicles. Wood yellowish throughout; odorless; no local uses known. No. 123; Yale No. 12,418; also No. 65, without wood specimens.

Persea americana Mill. AGUACATE. Well-formed fruit tree, abundant on formerly inhabited sites. Specimen 8 years old was 40 feet high, 9 inches in diameter a yard above ground, and 10 feet to the first limb. Sapwood deep creamy yellow; heartwood pinkish; not utilized. No. 162; Yale No. 13,278.

LECYTHIDACEAE

Gustavia integrifolia Standl., sp. nov. (in ed.). PAPALLÓN. Small tree, about 20 feet high, with smooth and erect trunk branching near the summit, collected by a laborer in the dense forest at an altitude of about 200 feet. Leaves very large, 15 to 48 inches long and 3 to 12 inches wide, radially arranged and crowded about the ends of the stout branches. Flowers pale yellow, in clusters on surface of bark of the branches. No. 225; Yale No. 13,303.

LEGUMINOSAE

Acacia sp. CORNIZUELO. One of the Bullhorn Acacias, growing on summit of rocky hill near property line of Yulu village at an altitude of 360 feet. No. 258.

Cassia bacillaris L. No. 294; Yale No. 13,276.

Cassia occidentalis L. PIGUE PAJARO. Erect shrub, 4 feet high, found growing in unshaded pasture at San Luis. It is said that an infusion of the parched and crushed seed is used locally as a substitute for coffee and by some for relieving kidney pains. Flowers frequented by great numbers of small black bees of the forest. No. 126.

Cassia reticulata Willd. SERINCONTIL. Small tree or a shrub, fairly frequent on old clearings at San Luis, with short bole usually forking about a yard above ground, one branch being erect and straight, the other crooked and nearly horizontal. Aerial roots descending from collar near base as in maize. Whole plant always infested with small stinging ants. No. 127.

Cassia sp. TEJO; GUANACASTE BLANCO; GALLINAZO; WILD TAMARIND. Very large tree, 125 feet high, with massive bole over 7 feet in diameter above the buttresses and free of branches for 58 feet, growing in seasonal marsh near bank of Waspow Creek at an elevation of over 200 feet. No. 223; Yale No. 13,302.

Desmodium canum Gmel. MOSOTE. Low erect shrub, growing under shade of second-growth near San Luis. No. 125.

Dialium divaricatum Vahl. SLIM (Mosquito Indian); COMENEGRO; TAMARINDO MONTERO. Large tree, 115 feet tall, with straight and cylindrical trunk 22 inches in diameter above narrow and contorted buttresses (6 feet) and only 1 inch smaller below first branch (44 feet), growing in dense forest on well-drained clay soil near Ocongwas River. The species forms about 15 per cent of total stand in this area. Leaves alternate, 2-ranked, pinnate, with 5 to 9 (generally 7) leaflets, dark green above and yellow-green beneath. Said to bloom during February, but the collector had it under observation for two years without sign of flowers. Fruits small, somewhat pear-shaped, fleshy, indehiscent, with single seed; readily attacked by larvae. Sapwood yellowish white; heartwood blackish brown, very resistant to decay and not attacked by termites; sometimes used for houseposts. No. 197; Yale No. 13,294.

Erythrina sp. ELEQUENE; PALO MACHETE. Small deciduous tree, usually not over 15 feet high, occurring infrequently in hilly country at elevations of 200 to 600 feet. Bark dark reddish brown, with small parallel ridges and few

prominent lenticels; used locally for making blood tonic and purgative. Branches and twigs armed with widely spaced pyramidal thorns. Bright red machete-shaped flowers borne in terminal spikes after leaves have fallen; seeds a seasoning in native cooking, imparting a strong bean flavor. Wood pale yellow when fresh; odorless; not utilized. No. 62.

Gliricidia sepium (Jacq.) Steud. MADRIADO. Small deciduous tree, common in second-growth and old clearings on heavy well-drained clay soil near San Antonio de Susum. Pinkish white pea-like flowers borne in profusion from early January to March when tree is bare of leaves. Sapwood deep creamy yellow; heartwood dark brown and with odor of fresh cucumbers; used for fence posts. No. 134; Yale No. 12,421.

Inga Biolleyana Pittier. Small tree, less than 20 feet high, found in thicket on an old clearing near San Antonio. Wood creamy yellow, with distinct growth rings; faintly scented, suggesting freshly cut watermelon; not utilized. No. 159; Yale No. 13,263.

Inga edulis Mart. GUAVO; GUAJINIQUIL. Rather small spreading tree, 25 feet high, abundant along margins of larger rivers, usually below high-water mark. Leaves pinnate, with winged rachis. Flowers white, axial, usually solitary. Fruit an edible twisted pod. No. 226; Yale No. 13,265.

Inga Englesingii Standl., sp. nov. (in ed.). CAFECITO. Small shrubby tree, discovered growing on clay soil in a seasonal marsh. Bark greenish gray, thin and flaky. Leaves alternate, in pairs from same base, pinnate, with 3 to 5 (usually 5) pairs of glabrous leaflets 18 to 33 cm. long and 38 to 84 mm. wide. Inflorescence in pedicellate clusters from axils of old leaf scars or adventitious on trunk; calyx 5-lobed, greenish pink; corolla gamopetalous, 5-lobed, pink; stamens very numerous, exerted, pinkish white. Wood orange-yellow; not utilized. Species apparently rare. No. 205; Yale No. 13,297.

Inga punctata Willd. GUAVO. Rather small spreading tree, 40 feet high, frequent in partial sunlight in dense forest on rich soil along the Kukalaya River at elevation of 200 feet. Fruit a flattened pod with globose locules, each containing a bean-like seed. Wood yellowish; odorless; not utilized. No. 238.

Mimosa pudica L. SARCA DORMILONA. Low sensitive armed creeper in open grassy pasture at San Luis. No. 119.

Pterocarpus officinalis L. No. 273.

Schizolobium parahybium (Vell.) Blake. QUON (Mosquito Indian name for the curassow, which is said to feed almost exclusively on the fruit when in season); GABILÁN. Tall and slender tree, over 100 feet high, with long clear smooth-barked bole and buttressed base, very frequent on well-drained rust-red loamy clay in an area bounded by the Kukalaya River on the north and the Bambana and Tunky Rivers on the south. The long pinnate leaves are cast before the appearance of great masses of lustrous metallic-yellow flowers, which are borne in lax panicles from early December to early February. Winged bean-like seeds seem not to be attacked by insects or larvae as is usual in so many cases; probably the reason for the frequent occurrence of the species. The soft but tough wood has a white sapwood marked with conspicuous vessel lines, while the heart has a pinkish tinge; has strong disagree-

able odor when fresh. Nos. 54 and 164; Yale Nos. 1237 and 12,431. (For detailed description see *Tropical Woods* 2: 2, June 1925.)

MALVACEAE

Hibiscus Rosa-sinensis L. AVISPA. Small tree or tree-like shrub found on clearings; an escape from cultivation. Flowers large showy crimson. No. 133; Yale No. 13,277.

Malvaviscus grandiflorus H. B. K. MAPOLA. Woody liana, fairly frequent along streams at altitudes of 200 to 300 feet. Does not adhere to trunk of supporting tree, but intertwines through the branches; sometimes a creeper on ground. Infusion of flowers used by Indians as remedy for dysentery. Nos. 75 and 94.

Sida rhombifolia L. No. 129; Yale No. 13,261.

MARCGRAVIACEAE

Souroubea guianensis Aubl. BURITO. Common liana. Specimen measured was 75 feet long and 1.6 inches through at base. No. 57.

MELASTOMACEAE

Bellucia costaricensis Cogn. CAPIROTE. Small upright tree, mostly less than 15 feet high, with noded trunk and slightly constricted internodes. Bark gray or brown mottled with gray, scaling laterally in narrow brittle flakes. Leaves opposite, 4-ranked, smooth, rather dark green above and much lighter below. Flowers borne singly or in clusters of 2 or 3 at the nodes; visited in great numbers by a certain kind of butterfly. Wood a creamy yellow; odor distinct, but indescribable; taste faintly sweetish; not utilized. No. 109; Yale No. 12,417.

Heterotrichyum octonum (H. & B.) DC. Slender erect shrub, 4 feet high, abundant along margins of pastures and old clearings near San Luis. No. 124.

Miconia hondurensis D. Sm. Small erect tree, 20 feet high, growing on well-drained clay soil in open high forest near Ocongwas River at an altitude of over 200 feet. Opposite leaves leathery and 3-nerved; glossy dark green above and pale yellow-green beneath. Wood a creamy yellow; odorless and tasteless; splits easily; not utilized. No. 207; Yale No. 13,299.

Miconia laevigata DC. Small tree or a large shrub, collected in shady forest at altitude of 160 feet near San Luis. No. 130; Yale No. 12,419.

Miconia longifolia DC. Small tree, 15 feet high, occurring under partial shade in very wet clay soil. Bark smooth, greenish gray. Flowers borne in terminal panicles. No. 82; Yale No. 12,413.

Ossæa ciliata Cogn. Erect shrub, 7 feet high, growing in poorly drained very wet clay soil under only partial shade. Leaves opposite, 4-ranked. Flowers borne axially. No. 81.

Tibouchina longifolia (Vahl) Baill. Small erect shrub, 4 feet high, growing along margin of pasture at San Luis. No. 117.

Topobea calycularis Naud. Shrub, 6 feet high, growing in dense thicket in old pasture. Stems somewhat zigzag and partially supported by other shrubs and trees. No. 116.

MELIACEAE

Carapa nicaraguensis C. DC.⁶ CEDRO MACHO. Large tree of the shady forest on low hills, its frequency being about one per acre between the Rawawas and Kukalaya Rivers. Specimen collected was 100 feet high, with straight and cylindrical trunk free of branches for 75 feet, buttressed to a height of 6 feet with three main spurs each subdivided near the ground, and 15 inches in diameter above buttresses. Inner bark rich dark brown, the outer grayish and separating into medium-sized plates which expose the darker layer beneath and give a spotted appearance; contains a decidedly sticky sap. Leaves pinnately compound, usually with four pairs of bright green prominently nerved leaflets. White bell-shaped flowers borne in short panicles near the ends of the twigs; period of blooming, late November to the middle of March. Freshly cut sapwood white near the bark, shading inwardly to pink; heartwood light sepia; is used to some extent locally for building construction. No. 47; Yale No. 1231.

Guarea sp. PRONTOLIVIA. Large and apparently rare tree, 80 feet high, with a straight cylindrical trunk 24 inches in diameter above the low buttresses (3 feet) and clear of branches for 50 feet, found on the bank of a small brook near the Kukalaya River where it was growing on well-drained red clay soil at an altitude of about 200 feet. Bark light greenish gray on the surface, separating into small plates and exposing the brown inner layer in places. Leaves large and compound, dark green above and lighter beneath. Flowers white, in lateral panicles; first appearing in December. Wood white and odorless; no local uses known. No. 56.

MONIMIACEAE

Siparuna nicaraguensis Hemsl. Small tree, growing on heavy clay soil in shady forest near San Luis. Leaves opposite, glabrous, very dark glossy green above and dull light blue-green beneath. Flowers partially coral-colored, in axial clusters. Wood light yellow; odorless. No. 132; Yale No. 12,420.

MORACEAE

Brosimum terrabanum Pittier. MESICA; OJOCHÉ. Large tree, attaining a height of 100 feet or more and a diameter of 3 feet, averaging about two per acre on dark loamy soil in the well-drained rolling or hilly sections between the Kukalaya and Pisbalaya Rivers at altitudes ranging from 165 to 450 feet. Straight and cylindrical trunk free of branches for 50 to 65 feet and buttressed to a height of 5 to 10 feet, the spurs subdivided. Bark gray mottled and beech-like, marked with horizontal lines of lenticels; contains a white latex. Minute white flowers borne in a small tuberculate head. Wood white or cream-colored when fresh; scented rather pleasantly, suggesting "Three-in-one" oil; used locally for axe handles, pack saddles, and fuel. The leaves are a common source of fodder and the fruits are ground and used in making tortillas. No. 51; Yale No. 1234.

⁶ "Probably the first material of this species in any American herbarium."
—P. C. S.

Castilla fallax Cook. TUNA. This Wild Rubber tree, growing on well-drained soil in open forest, was 50 feet high, with a straight and cylindrical trunk 18 inches in diameter at 6 feet above ground, buttressed to a height of 5 feet and free of branches for 30 feet. Branches ascending; branchlets stout, about 20 inches long, not subdivided into twigs, and bearing leaves in two ranks along their entire lateral surface. Inflorescence a peculiar sort of head borne in pairs in the leaf axils. Bark dark greenish gray, smooth except for fine longitudinal furrows; used by the Sumo Indians for making blankets and native cloth through a process of beating and soaking in water. White latex exudes profusely from wounds, but quickly coagulates and turns a dingy gray color upon exposure; used by the Indians for caulking cracks in dugout canoes. Wood pale brownish white, soon becoming golden brown; not utilized. No. 97; Yale No. 12,415.

Cecropia mexicana Hemsl. GUARUMO. Small to medium-sized tree, with cylindrical, often arcuate and inclined, mottled gray bole, found on alluvial flat (vega) of the Kukalaya River. Crown composed of stout, ascending, mostly unbranched limbs which (like the trunk) bear node-like markings; leaves large, green above and greenish white beneath, clustered at the ends of the coarse twigs. Ants inhabit the hollow throughout its entire length. Wood soft; white when fresh; without distinct odor; no known uses. No. 52; Yale No. 1235.

Ficus radula Willd. No. 240; Yale No. 13,268.

MYRISTICACEAE

Virola merendonis Pittier. BANAK (Mosquito Indian); SANGRE (DE) DRAGO. Large tree growing in dense forest on bank of brook flowing into Ocongwas River. No. 190; Yale No. 13,289. (Supposed by collector to be the same as the species following.)

Virola panamensis (Hemsl.) Warb. BANAK (Mosquito Indian); SANGRE (DE) DRAGO. Large tree of frequent occurrence on well-drained soil in mixed forest near the Kukalaya River, sometimes over 130 feet tall, with a straight and well-formed trunk often free of branches for more than 100 feet, 3 to 4 feet in diameter above the buttresses, which are from 6 to 10 feet high. Bark red-brown mottled with gray in young trees, more uniformly dark at maturity; contains a sticky red sap which exudes for weeks from a felled tree and is highly attractive to a kind of small yellow bee. Crown flat, composed of heavy horizontal limbs radiating spoke-like in tiers and bearing rather slender straight branchlets with cylindrical twigs, each with 2 to 20 alternate leaves which are rather glossy above and rusty pubescent below. Yellowish brown flowers borne in axillary panicles. Wood odorless; yellowish throughout when fresh, the heartwood becoming pinkish; not utilized locally. No. 101.

MYRSINACEAE

Ardisia amplifolia Standl. CUIA; UVITA. Shrub, up to 10 feet in height, occurring rather infrequently in groups on rich soil under high forest at altitudes of 200 feet or more. No. 230.

Ardisia nigro-punctata Oerst. Small tree collected in a fairly open bamboo grove on rich well-drained soil. Trunk straight and cylindrical, greatly inclined and branching from upper side only. Bark smooth, mottled gray-green. Flowers borne in terminal panicles suggesting China-berry (*Melia Azedarach* L.). No. 79.

MYRTACEAE

Eugenia jambos L. MANZANA ROSA. Tree of medium size, collected at edge of pasture at San Luis. Escaped from cultivation but propagating readily as shown by numerous seedlings in its vicinity. No. 113.

Psidium Guajava L. GUAYABO. Fruit tree, abundant in old clearings and on sites of former dwellings. Leaves opposite and 4-ranked, yellow-green above and pale dull green beneath. Flowers white, borne singly or in clusters in axils of leaves. Fruit dark yellow-green, with persistent calyx. Wood pinkish white; odorless; not utilized. No. 173; Yale No. 13,280.

NYCTAGINACEAE

Neea psychotrioides D. Sm. Shrub, 9 feet high, collected in a thicket on old clearing at San Antonio. Wood white, with yellowish hue; faintly and pleasantly scented; structure anomalous. No. 169; Yale No. 12,432.

OCHNACEAE

Cespedesia macrophylla Seem.⁷ No. 274.

PALMACEAE

Euterpe sp. (?). SUSULA. Abortive palm, frequent in interior forest at elevations of 200 feet or more, but scarce on coastal plain. "Cabbage" used for food. No. 224; Yale No. 13,264.

Geonoma sp. CAÑA DANTA. Small palm, generally distributed and abundant in well-drained areas and in open high forest. No. 199; Yale No. 13,296.

Geonoma sp. SUITA. Dwarf palm, very common on rich acid soil in open high forest and along the high banks of streams. Used by natives for thatching their houses. No. 260.

Malortia sp. Dwarf palm, abundant on well-drained loamy clay soil in open forest. No. 192; Yale No. 13,290.

PIPERACEAE

Piper auritum H. B. K. SANTA MARÍA. (Name also applied to large forest tree.) Small tree or a shrub, common in old clearings near San Luis, with erect noded stem, the internodes somewhat constricted. Branches horizontal and radiating spoke-like. Leaves have scent of sarsaparilla when bruised; used as a local substitute for tea. No. 128.

Piper sp. CORDONCILLO. Shrub, 1 to 6 feet high, growing on deep rich alluvial soil, sometimes gregariously. Green stem cylindrical and erect, with prominent nodes. No. 91.

Piper sp. Shrub, 5 feet high, growing in dense forest on poorly drained heavy clay soil. No. 186; Yale No. 13,288.

⁷ "Species not previously known north of Panama."—P. C. S.

POLYGONACEAE

Coccoloba acuminata H. B. K. Shrub, 11 feet high, collected in open forest in marshy abandoned stream bed along Ocongwas River. No. 183; Yale No. 12,434.

POLYGALACEAE

Securidaca diversifolia (L.) Blake. Liana, growing to the top of a tree 130 feet high, situated on the bank of the Ocongwas River. No. 196A; Yale No. 13,293.

RUBIACEAE

Cephaelis tomentosa (Aubl.) Vahl. Common shrub, frequently 10 feet high, preferring damp poorly drained clay soil at altitudes below 300 feet. No. 71.

Calycophyllum candidissimum (Vahl) DC. MADROÑO. Rather small tree, usually not over 35 feet high and 10 inches in diameter, occasionally larger, widely distributed throughout the area bounded by the Lacostigne and Ocongwas Rivers, growing in the shade on almost any class of soil from marsh to rocky hills, though making its best growth on the hills. Trunk fairly straight, deeply grooved throughout most of its length. Bark light ruddy brown, shredding into short narrow strips and suggesting *Juniperus virginiana*. No known local uses of the wood. No. 44.

Chomelia Englesingii Standl., sp. nov. (Trop. Woods 16: 45). Small shrubby and sparsely foliated tree abundant in deep shade of the forest on low hills (200 to 600 feet elevation) along the Kukalaya River. Trunk usually crooked and ranging from erect with horizontal branches to almost horizontal with branches ascending from upper side. Bark gray, with patches of pale green. Flowers white. Wood light yellow when fresh; no uses known. No. 49; Yale No. 1233.

Hamelia axillaris Sw. CHILIO DE PERRO. Erect shrub, 4 feet high, collected along old Indian trail from Yulu to Santa Cruz. No. 256.

Hamelia erecta Jacq. CORALILLO. Small shrubby tree, frequent in a thicket on old clearing near San Antonio. Leaves whorled in 4's and 6-ranked. Flowers flame-red, not fragrant. Wood ivory-yellow, deepening inwardly; has odor of fresh cucumbers and a distinctly bitter taste. Parts of the plant are used in native medicine. No. 161; Yale No. 12,430.

Hamelia Rovirosae Wernh. PAPAMIEL; CHUPAMIEL. Shrub, 10 feet high, occurring with scattered frequency along banks of larger streams and wherever any opening in forest permits abundant light. Frequent in second-growth on coastal plain. No. 227; Yale No. 13,266.

Isertia Haenkeana DC. Shrub, very frequent in second-growth near San Luis. Nos. 103 and 282.

Posoqueria latifolia (Rudge) R. & S. JICARILLO. Small tree, occasionally 30 to 45 feet high, usually abundant near water courses and widely distributed from edge of coastal savannah to San Pedro de Pis Pis in the central cordillera. Leaves smooth and leathery, opposite. Inflorescence a terminal corymb of long slender-tubed white flowers. Wood white, with an indescribable unpleasant odor. No. 251; Yale No. 13,270.

Psychotria cuspidata Bredem. Small tree, 20 feet high, growing in the shade of the open forest on well-drained clay soil along the bank of the Ocongwas River. Leaves opposite and 4-ranked, glossy dark yellow-green above and pale gray-green beneath. Flowers creamy white, in terminal panicles. Wood ivory-yellow, with odor suggesting the fresh juice of sugar cane; tasteless; not utilized. No. 175; Yale No. 13,282.

Psychotria horizontalis Sw. Small erect shrub growing on shallow rich acid soil under high forest on steep rocky hillside on Wahawala Divide, at elevation of 360 feet. No. 252.

Psychotria marginata Sw. Shrub, 6 feet high, growing in dense forest on poorly drained heavy clay soil. No. 185; Yale No. 13,287.

Psychotria pubescens Sw. Shrub, 6 feet high, growing on rich soil in completely shaded places on bank of Kukalaya River near mouth of Grindstone Creek. No. 228.

Psychotria suerrensii D. Sm. Shrub, 7 feet high, collected in open forest along stream bank. No. 184; Yale No. 12,435.

Psychotria sp. (probably new). Small shrub, 4 feet high, on well-drained, red loamy clay in heavy shade. Leaves dark green above, lighter green underneath. Fruit in terminal clusters of 2 to 4. No. 77.

RUTACEAE

Ravenia rosea Standl.,⁸ sp. nov. (Trop. Woods 16: 43). Small branchy tree or a shrub, never exceeding 25 feet in height and about 4 inches in diameter, abundant over the whole area between the Rawawas and Ocongwas Rivers, growing in dense shade in the forests of the hills and also of the lower levels. Bark smooth and blackish brown. Flowers, of a deep rose color, usually borne singly or in pairs at the ends of the twigs and rather showy; period of blooming late September to early February. Wood yellowish white when fresh; no known uses. No. 48; Yale No. 1232.

Zanthoxylum microcarpum Gris. LAGARTO. Large tree, 100 feet tall, with straight and cylindrical slightly buttressed trunk 24 inches in diameter and free of branches for 65 feet, growing on well-drained red loamy clay soil on sloping ground leading to bank of the Kukalaya River at an altitude of 230 feet; only one specimen observed, but said to be frequent in the hills. Roots exposed to a distance of about 10 feet from base. Bark green-gray to light gray, somewhat mottled; smooth except for scattered laterally appressed corky knobs on the older parts of trunk. Leaves alternate, usually 4 to 10 at end of each twig, pinnate with 5 to 10 pairs of leaflets. Flowers in axillary panicles. Sapwood canary-yellow; heartwood somewhat darker; odorless; used locally for furniture and firewood. Nos. 61 and 283; Yale Nos. 1238 and 13,274.

SAPINDACEAE

Cupania asperula Standl., sp. nov. (in ed.). BILABILA (Mosquito Indian); COLA (DE) PAVA. Medium-sized tree, 45 feet high, discovered in a thick

⁸ "The genus *Ravenia* has not been known previously from the continent of North America."—P. C. S.

forest on heavy clay soil of a seasonal marsh along the Ocongwas River; single specimen found. Trunk straight and cylindrical, with reddish brown bark having low and narrow confluent ridges. Branches smooth, brownish gray, curved inward and ascending; twigs stout and olive-brown. Leaves pinnate, usually with 4 pairs of leaflets, glabrous and glossy yellow-green above, pubescent and pale yellow-green below. Fruit a triangular, pyramidal dark maroon, 5-celled, 5-seeded capsule dehiscent along sutures; borne axially; endosperm jelly-like and semi-transparent. Wood yellow, with spicy-peppery scent. Young trees used by Indians for making canoe poles. No. 176; Yale No. 13,283.

SAPOTACEAE

Calocarpum viride Pittier. SAPOTE. Large tree, 100 feet high, with straight and cylindrical trunk sometimes 3 feet in diameter above the buttresses (6 feet) and free of branches for 60 feet, of frequent occurrence among the low hills near the Kukalaya River, attaining its best development in rich well-drained soil. Bark near the base scales off and leaves the trunk smooth, while that higher up is shallowly furrowed between confluent ridges; color greenish gray, sparsely mottled with lighter gray patches higher up. Branches heavy and ascending, with numerous branchlets and twigs at upper end which, with their dark green leaves, form a sort of crown for each branch. White sticky latex exudes copiously from wounded bark and leaves. Flowers and fruits both present at time of collection (December 17). Fruit ovoid and fleshy, with a golden brown skin and almost salmon-pink flesh containing one or two seeds; it is highly esteemed for eating. Wood a uniform creamy white when freshly cut, changing quickly to light brown or buff; odorless; not utilized, as the trees are protected for their fruit. No. 85; Yale No. 12,414.

Lucuma sp. (probably new). SILIÓN. An infrequent tree, averaging about one to five acres, collected in the shady forest on low hills along the north side of the Kukalaya River, where the soil is a dark red heavy well-drained loamy clay. Total height 55 feet; bole straight and cylindrical, free of branches for over 30 feet and buttressed to a height of 3 feet; diameter above buttresses, 14 inches; other specimens somewhat larger than the one measured. Bark a rich dark brownish red, exuding a white latex upon incision. Sapwood white; heartwood dark brown, with a pinkish tinge when freshly cut; no local uses known. No. 46; Yale No. 1230.

SOLANACEAE

Lycianthes Maxonii Standl.⁹ Shrub, 6 feet high, collected on rich well-drained acid soil along high bank of Tasinasirpe Creek under complete shade at elevation of 100 feet. No. 253.

Solanum lanceifolium Jacq. UÑA DE GATO. Small shrub, about 6 feet high, very abundant in open places. Relished as forage by saddle mule. No. 111.

Solanum nudum H. B. K. HUELE NOCHE. Large shrub, very frequent in second-growth near San Luis. No. 105.

⁹ "Species known previously only from Panama."—P. C. S.

Solanum torvum Sw. ZOPILOTE. Shrub about 5 feet high, very frequent around edges of old pastures and clearings. Stems sparingly armed with stout laterally flattened thorns. No. 114.

TILIACEAE

Apeiba aspera Aubl. (?). BURILLO; TAPABUTIJA. Large tree, about 100 feet tall, with straight and erect but deeply channeled trunk without buttresses, of very frequent occurrence both in the coastal plain and higher interior country, usually on poorer classes of soil in wet forest or seasonal marshes, occasionally on good sites. Bark grayish and soft, scaling in thin plates. Primary branches heavy, with bark more flaky and darker gray than that of trunk; secondary ones mottled dark gray and white. Inflorescence a showy yellow sparsely flowered cyme. Black and flattened fruit soft-spined, resembling a sea urchin. Nos. 2 and 236.

Belotia reticulata Sprague. CAPULÍN SAVANERO. Medium-sized straight-boled tree, common in second-growth and along the larger streams, requiring sunlight. Leaves pendulous. Flowers white, appearing mostly during February. Wood very light and soft; pure white when fresh; odorless; not utilized. No. 135; Yale No. 12,422.

Heliocarpus appendiculatus Turcz. PESTAÑO MULA; Balsa. Medium-sized tree, frequent in second-growth on old clearings. Flowers small, in rather large axial and terminal panicles. Fruits small and flat, with bristles around the margin. Wood very soft; white when fresh; odorless. Logs used to limited extent for constructing rafts. Bark frequently a local source of fiber for making very strong rope. Nos. 136 and 140; Yale Nos. 12,423 and 12,425.

Luehea Seemannii Tr. & Pl. GUÁCIMO MOLINERO. Large tree, with cylindrical trunk, frequent along Morcielago Creek, and also observed in hills at an elevation of 1000 feet. Bark mottled gray and white. Limbs dichotomously branched, steeply ascending. Leaves smooth dark green above and rough buff beneath. Heavily scented yellowish flowers in axial and terminal panicles. Wood white; odorless; not utilized. No. 146; Yale No. 1240.

ULMACEAE

Trema micrantha (L.) Blume. No. 279.

URTICACEAE

Myriocarpa yzabalensis (D. Sm.) Blake. CHICHICASTE. Small tree, rarely over 15 feet high, growing abundantly in shady places on rocky well-drained soil along brooks among the Malayawas Hills at an altitude of about 500 feet and in sunnier places at lower elevations elsewhere. Minute white flowers, present in December, on long lax spikes pendent from leaf axils. No. 64.

Pourouma aspera Trec. YAHAL (Mosquito Indian); GUARUMO MACHO. Tall slender tree, 85 to 110 feet high, with cylindrical and somewhat arcuate trunk, up to 24 inches in diameter, growing on low hills above 200 feet elevation between the Rawawas and Kukalaya Rivers. Bark smooth and mottled in various shades of brown, mauve, and gray. Stump of a freshly felled tree exudes a quantity of watery sap. Branches few and ascending, forming a

crown which suggests a candelabrum. Leaves alternate and palmate, clustered at the ends of the shoots; they are very rough and are used by the Indians for sandpaper. No uses known for the wood. No. 50; Yale No. 12,412.

VERBENACEAE

Aegiphila martinicensis L. Small erect tree, about 30 feet high, of common occurrence in the shade of the high forest on well-drained soil. Bark whitish gray, scored vertically with very shallow confluent furrows and scaling off in small plates. Branchlets, twigs, and leaves opposite. Fruit yellow, in terminal panicles; contains 4 white seeds. Wood creamy white; slightly aromatic; not utilized. No. 100; Yale No. 12,416.

Clerodendron ligustrinum (Jacq.) R. & S. JAZMÍN. Small shrub, 4 feet high, growing in low second-growth on old clearing. Probably an escape from cultivation. No. 120.

Cornutia grandifolia (S. & C.) Schauer. No. 293; Yale No. 13,275.

VIOLACEAE

Hybanthus guanacastensis Standl. PALO NEGRO. Shrub 6 feet high, growing on well-drained soil in open forest near mouth of Grindstone Creek. Used by natives for making brooms. No. 234.

Rinorea pubipes Blake. Sparsely branched tree, 20 feet high, frequent in high forests above coastal plain. Bark smooth, exfoliating in dry papery sheets. Leaves opposite. Soft yellow flowers small and campanulate, in terminal racemes. Fruit a 3-lobed, 1-celled, 3-seeded capsule, longitudinally dehiscent to the base. No. 206; Yale No. 13,298.

VOCHYSIACEAE

Vochysia ferruginea Mart.¹⁰ YEMERI (Mosquito Indian). Large tree growing near margin of outlet of Wounta Lagoon in thick tangled jungle having little drainage. No. 250; Yale No. 13,269.

CHECK LIST OF THE COMMON NAMES

Aguacate	<i>Persea americana</i> Mill.	Lauraceae
Aguacatillo	<i>Nectandra Laurel</i> Kl. & Karst.	Lauraceae
Aoka	<i>Tecoma chrysantha</i> Jacq.	Bignoniaceae
Avispa	<i>Hibiscus Rosa-sinensis</i> L.	Malvaceae
Balsa	<i>Heliocarpus appendiculatus</i> Turcz.	Tiliaceae
Banak	<i>Virola merendonis</i> Pittier and V. panamensis (Hemsl.) Warb.	Myristicaceae
Baratará	<i>Bambusa aculeata</i> (Rupr.) Hitchc.	Gramineae
Bilabila	<i>Cupania asperula</i> Standl.	Sapindaceae
Botón blanco	<i>Melanthera aspera</i> (Jacq.) Rich.	Compositae
Burillo	<i>Apeiba aspera</i> Aubl. (?)	Tiliaceae
Burito	<i>Souroubea guianensis</i> Aubl.	Marcgraviaceae
Cabeza culebra (?)	<i>Tanaecium Jaroba</i> Sw.	Bignoniaceae
Cafecito	<i>Inga Englesingii</i> Standl.	Leguminosae

¹⁰ "Not previously known north of Panama."—P. C. S.

Caña danta	<i>Geonoma</i> sp.	Palmaceae
Caoba	<i>Swietenia macrophylla</i> King	Meliaceae
Capirote	<i>Bellucia costaricensis</i> Cogn.	Melastomaceae
Capulín savanero	<i>Belotia reticulata</i> Sprague	Tiliaceae
Carica	<i>Bambusa aculeata</i> (Rupr.) Hitchc.	Gramineae
Cedar or Cedro	<i>Cedrela</i> spp.	Meliaceae
Cedro macho	<i>Carapa nicaraguensis</i> C. DC.	Meliaceae
Chichicaste	<i>Myriocarpa yzabalensis</i> (D. Sm.) Blake	Urticaceae
Chilio de perro	<i>Hamelia axillaris</i> Sw.	Rubiaceae
Chupamiel	<i>Hamelia Roviroasae</i> Wernh.	Rubiaceae
Cola (de) pava	<i>Cupania asperula</i> Standl.	Sapindaceae
Comenegro	<i>Dialium divaricatum</i> Vahl	Leguminosae
Coralillo	<i>Hamelia erecta</i> Jacq.	Rubiaceae
Coralmeca	<i>Schlegelia nicaraguensis</i> Standl.	Bignoniaceae
Cordoncillo	<i>Piper</i> sp.	Piperaceae
Cornizuelo	<i>Acacia</i> sp.	Leguminosae
Cortés	<i>Tecoma chrysantha</i> Jacq.	Bignoniaceae
Cujja	<i>Ardisia amplifolia</i> Standl.	Myrsinaceae
Elequene	<i>Erythrina</i> sp.	Leguminosae
Fosforito	<i>Protium Copal</i> (S. & C.) Engl.	Burseraceae
Gabilán	<i>Schizolobium parabybum</i> (Vell.) Blake	Leguminosae
Gallinazo	<i>Cassia</i> sp.	Leguminosae
Gitillo	<i>Ocroma limonensis</i> Rowlee	Bombacaceae
Guácimo	<i>Guazuma ulmifolia</i> Lam.	Sterculiaceae
Guácimo molinero	<i>Luebea Seemannii</i> Tr. & Pl.	Tiliaceae
Guajiniquil	<i>Inga edulis</i> Mart.	Leguminosae
Guanacaste blanco	<i>Cassia</i> sp.	Leguminosae
Guarumo	<i>Cecropia mexicana</i> Hemsl.	Moraceae
Guarumo macho	<i>Pourouma aspera</i> Trec.	Urticaceae
Guavo	<i>Inga edulis</i> Mart. and <i>I. punctata</i> Willd.	Leguminosae
Guayabo	<i>Psidium Guajava</i> L.	Mystaceae
Huelé noche	<i>Solanum nudum</i> H. B. K.	Solanaceae
Jazmín	<i>Clerodendron ligustrinum</i> (Jacq.) R. & S.	Verbenaceae
Jicarillo	<i>Posoqueria latifolia</i> (Rudge) R. & S.	Rubiaceae
Jobo	<i>Spondias Mombin</i> L.	Anacardiaceae
Jocomico	<i>Rheedia edulis</i> Tr. & Pl.	Guttiferae
Jocote montero	<i>Spondias Mombin</i> L.	Anacardiaceae
Lagarto	<i>Zantoxylum microcarpum</i> Gris.	Rutaceae
Laurel negro	<i>Cordia alliodora</i> (R. & P.) Cham.	Borraginaceae
Leche amarilla	<i>Symphonia globulifera</i> L. f.	Guttiferae
Madriado	<i>Gliricidia sepium</i> (Jacq.) Steud.	Leguminosae
Madroño	<i>Calycophyllum candidissimum</i> (Vahl) DC.	Rubiaceae

Mahogany	<i>Swietenia macrophylla</i> King	Meliaceae
Mamey montero (?)	<i>Rbeedia edulis</i> Tr. & Pl.	Guttiferae
Mangalargo	<i>Xylopia xylopioides</i> (Dunal) Standl.	Anonaceae
Mangle blanco	<i>Bravaisia integerrima</i> (Spreng.) Standl.	
Manzana rosa	<i>Eugenia jambos</i> L.	Acanthaceae
Mapola	<i>Mabaviscus grandiflorus</i> H. B. K.	Myrtaceae
Marañón	<i>Anacardium occidentale</i> L.	Malvaceae
Mata rancha	<i>Vismia dealbata</i> H. B. K.	Anacardiaceae
Mesica	<i>Brosimum terrabanum</i> Pittier	Guttiferae
Mosote	<i>Desmodium canum</i> Gmel.	Moraceae
Muñeca	<i>Hasseltia floribunda</i> H. B. K.	Leguminosae
Nancito	<i>Hieronyma alchorneoides</i> Allem.	Flacourtiaceae
Ojoche	<i>Brosimum terrabanum</i> Pittier	Euphorbiaceae
Palo machete	<i>Erythrina</i> sp.	Moraceae
Palo negro	<i>Hybanthus guanacastensis</i> Standl.	Leguminosae
Papallón	<i>Gustavia integrifolia</i> Standl.	Violaceae
Papamiel	<i>Hamelia Rovirosae</i> Wernh.	Lecythidaceae
Pelo de Indio	<i>Hirtella americana</i> L.	Rubiaceae
Pestaño mula	<i>Heliocarpus appendiculatus</i> Turcz.	Amygdalaceae
Pigüe pajaró	<i>Cassia occidentalis</i> L.	Tiliaceae
Pine	<i>Pinus caribaea</i> Mor.	Leguminosae
Polok	<i>Ocroma limonensis</i> Rowlee	Pinaceae
Prontolivia	<i>Guarea</i> sp.	Bombacaceae
Quon	<i>Schizolobium parabybum</i> (Vell.) Blake	Meliaceae
Sangre (de) drago	<i>Viola merendonis</i> Pittier and <i>V. panamensis</i> (Hemsl.) Warb.	Leguminosae
Santa María	<i>Calophyllum antillanum</i> Britt.	Myristicaceae
Santa María	<i>Piper auritum</i> H. B. K.	Guttiferae
Sapote	<i>Calocarpum viride</i> Pittier	Piperaceae
Sarca dormilona	<i>Mimosa pudica</i> L.	Sapotaceae
Serincontil	<i>Cassia reticulata</i> Willd.	Leguminosae
Silión	<i>Lucuma</i> sp.	Leguminosae
Slim	<i>Dialium divaricatum</i> Vahl	Sapotaceae
Suita	<i>Geonoma</i> sp.	Leguminosae
Susula	<i>Euterpe</i> sp. (?)	Palmaceae
Tamarind, Wild	<i>Cassia</i> sp.	Palmaceae
Tamarindo negro	<i>Dialium divaricatum</i> Vahl	Leguminosae
Tapabutija	<i>Apeiba aspera</i> Aubl. (?)	Leguminosae
Tejo	<i>Cassia</i> sp.	Tiliaceae
Tuna	<i>Castilla fallax</i> Cook	Leguminosae
Uña de gato	<i>Solanum lanceifolium</i> Jacq.	Moraceae
Uvita	<i>Ardisia amplifolia</i> Standl.	Solanaceae
Yahal	<i>Pourouma aspera</i> Trec.	Myrsinaceae
Yemeri	<i>Vochysia ferruginea</i> Mart.	Urticaceae
Zopilote	<i>Solanum toroum</i> Sw.	Vochysiaceae
		Solanaceae

CURRENT LITERATURE

A pocket guide to twenty tropical trees cultivated in southern Florida. By NELLIE IRENE STEVENSON, Fayette, Iowa, 1928. Pp. 39; 3½ x 6. Price 50c.

"This little guide book is offered as 'first aid' in the identification of twenty ornamental trees, chosen because of some outstanding character of leaf, fruit, or flower, or generally distinctive appearance, an interesting use, or a close relationship to better known plants. All descriptions are based on notes taken in Florida during the winter 1927-8, supplemented by careful study of the reports of botanists who are familiar with the trees in the lands where they are native."

Flora Salvadoreña. Pub. Ministerio de Instrucción Publica de la Republica de El Salvador, 1926. 2 vols.; pp. 110 and 111, resp.; 11 x 7; 100 plates, each; part in colors.

The pages of these albums are printed on one side only. Upon each page there is an illustration of a Salvadorean plant, reproduced from a photograph, accompanied by its Latin and vernacular names, citation of the locality from which the specimen photographed was obtained, brief descriptive notes, and economic data. Every fifth plate is colored.

The illustrations are from photographs by Mr. Felix Choussy, of the Salvadorean Department of Agriculture. In many cases the specimens photographed were subsequently dried and sent to the writer of the present note for determination. The albums were printed in Switzerland, and it is doubtless on this account that the coloring of some of the plates, made from photographic prints, is not so accurate as could be desired, although many others of the plates are remarkably true to nature.

This is the most elaborate botanical publication ever issued in Central America, and the Salvadorean government deserves great credit for having financed so important a work. Mr. Choussy is to be congratulated upon the excellence of his photographs.

Both native and introduced plants are included in the species treated, and many of them have never been illustrated before. The list of vernacular names is an extensive one, and some of the economic applications noted are of special interest. Among the important trees illustrated are *Castilla gummi-fera*, *Coccoloba caracasana*, *Annona purpurea*, *Andira inermis*, *Karwinskia Calderoni*, several species of *Inga*, *Pithecolobium platypus*, and *Simaruba glauca*.—PAUL C. STANDLEY.

Arboles y arbustos del orden de las Leguminosas. III.

Papilionáceas. By H. PITTIER. Reprinted from *Boletín del Ministerio de Relaciones Exteriores* (Caracas) 4, 5, 6, 7; April–July 1928. Pp. 149–229; 6¼ x 9¼.

This is the third part of *Contribuciones a la dendrología de Venezuela* No. 1. (For references to first two parts see *Tropical Woods* 14: 44; 15: 37.) It contains botanical descriptions, together with keys, lists of vernacular names, and miscellaneous notes on the native species of 31 genera, as follows: *Monopteryx* (2), *Sweetia* (2), *Myrospermum* (1), *Toluijera* (1), *Bowdichia* (1), *Ormosia* (3), *Diploptropis* (2), *Apoplanesia* (1), *Sesbania* (3), *Diphysa* (1), *Gliricidia* (1), *Robinia* (1), *Callistylon* (1), *Dalbergia* (3), *Platypodium* (1), *Machaerium* (16), *Centrolobium* (1), *Drepanocarpus* (3), *Pterocarpus* (4), *Platymiscium* (2), *Hymenolobium* (1), *Piscidia* (1), *Muelleria* (1), *Lonchocarpus* (20), *Derris* (2), *Fissicalyx* (1), *Andira* (2), *Geoffræa* (1), *Coumarouna* (3), *Clitoria* (8), and *Erythrina* (5). The generic key contains all of the genera known to be represented in Venezuela, including many not listed above.

British Guiana woods for paper-making materials. *Bulletin of the Imperial Institute* (London) 26: 1: 4–17.

Part I of this report was published in the *Bulletin* in 1924. The present part deals with samples of 11 timbers, viz. Greenheart, Wallaba, Kakaralli, Mora, Yaruru, Itikibourobali, Trysil, Marishiballi, Kautaballi, Morabukea, and Moraballi.

"The results of the examination of the woods show that most of them furnish good yields of well-digested pulp under similar conditions of treatment and with a comparatively low

consumption of soda. The lowest yields of pulp were obtained from Wallaba and Trysil, viz. 37 and 38 per cent respectively, these yields being rather lower than those usually obtained from the woods generally employed for the manufacture of wood pulp. All the woods gave rather short-fibered pulps, the average length of the fiber being, however, in most cases, greater than that of the fiber of Poplar pulp (1.1 mm.).

"The best paper was obtained from Wallaba, Mora, Trysil, and Morabukea. The pulps from these woods were stronger and bleached more satisfactorily than those obtained from the other woods. The pulps from Wallaba and Mora bleached readily, but a rather large amount of bleaching liquor appears to be needed for the pulps from Trysil and Morabukea.

"The pulp from Moraballi wood was of fairly good quality and the yield was satisfactory, but the ultimate fibers were shorter and coarser than those derived from the four woods mentioned in the preceding paragraph; moreover, the pulp did not felt so well as the pulps from those four woods and the paper was appreciably weaker.

"Greenheart, Kakaralli, Itikibourobali, and Marishiballi furnished satisfactory yields of pulp which could only be bleached with difficulty and furnished papers which were softer than those obtained from the five woods previously referred to, and were of only moderate strength.

"The remaining two samples of wood, Yaruru and Kautaballi, gave good yields of pulp, but in neither case could the pulp be readily bleached and the papers were soft and weak and generally of very poor quality."

Les bois et la Guyane Française. *Le Monde Colonial Illustré* (Paris) 6: 61: 219, Sept. 1928. Illustrated.

Les bois de la Guyane. By ROBERT PREISSIG. *Revue Internationale des Produits Coloniaux* (Paris) 3: 25: 32–33, Jan. 1928.

The forest area of French Guiana is about 17,500,000 acres. The export timber trade has been confined in the past

to cabinet woods, but there are various kinds useful for a wide range of purposes. A brief account is given of some of these timbers and of the effort being made to promote their exploitation.

Importancia comercial del palo de balsa (*Ochroma* spp.).
By E. M. O. [ERNESTO MOLESTINA O.] Bul. No. 10, Subdirección Técnica Agropecuaria del Litoral, Dept. Agr., Guayaquil, Ecuador, June-July 1928, p. 6. Ill.

A full-page picture is shown of a lighter loaded with Balsa planks alongside a steamer in the harbor of Guayaquil. The sizes exported depend upon their destination. Those for the United States are 3 or 4 inches thick, 8 inches wide, and 12 to 16 feet long, while those wanted for the English market are 2" x 8" x 4' or 2½" x 11½" x 12'.

The essential properties of Balsa wood are high resistance to compression and very light weight. The lumber is coming to be used on a large scale for insulating refrigerator ships and cars, for cushioning machinery and motors to prevent the transmission of vibration to the floor, for radio loudspeakers, and for various uses requiring soft and flexible wood, as well as purposes of buoyancy, such as floats, life-preservers, etc. Artificial propagation of the tree is recommended in order to assure a supply of timber for future demands.

Instruções para a cultura dos Eucalyptos. By LUIZ SIMÕES LOPES. Bul. No. 1, Serviço Florestal do Brasil, Rio de Janeiro, 1928. Pp. 45; 7¼ x 10¾; 12 full-page plates; 2 text figs.

There is a general account of the genus *Eucalyptus* and a classification of the species with reference to their suitability for different climates, soils, and sites. The remainder deals with the fruits and seeds, preparation and tending of seed beds, transplanting in the nursery, field planting, care and protection of the plantation. The excellent photographic illustrations depict very clearly the various steps in the work described in the text.

Identification of Corean woods (Gingkoales and Coniferae).
(In Japanese.) By N. YAMABAYASHI. Rept. No. 7, Forest Exp. Station, Govt. of Chosen (Corea), 1928. Pp. 56; 11 plates (1 in color) and 88 figs.

This report deals with the identification of the woods of 27 species of 11 genera of Gymnosperms in Corea. It is divided into two parts, one concerned with the gross anatomy, the other with the microscopical features. In the latter are anatomical descriptions for each species, tables of properties, conclusions, and analytical keys. The photomicrographic illustrations are excellent.—RYOZO KANEHIRA.

Die untersuchung über die grundlage der holzidentifizierungsmethode. I. Die markstrahlen des laubholzes und ihre bauarten. (In Japanese.) By CHUJÔ KANESHI. *Journal of the Society of Forestry* (Tokyo) 10: 3: 7-30, 1928. 1 plate; 1 text fig.

The author proposes a classification of rays of dicotyledonous woods on a basis of their appearance in end view, that is, in tangential sections. He has chosen and illustrated 19 types and several subtypes. A table (pp. 141-148) shows the prevalence of these types in 173 specimens in the laboratory of the Division of Forestry, Tokyo Imperial Institute. In the first column at the left is given the serial number of each sample; in the second the corresponding vernacular name of the wood; in the 26 others plus and minus signs indicate the occurrence of the various types and subtypes, the relative frequency being denoted by the number of plus signs. There is also a review of the classification proposed by other authors and references are made to published drawings and photomicrographs. The editor is informed by Professor Fujioka, who is directing the investigation, that this contribution is preliminary to a report, which will appear in German, on the woods of the Liukiu Islands.

The reviewer recognizes the importance of this work and realizes the need for some such classification as is proposed, but he is not entirely convinced that the types are the best that can be fixed. It is well known that the appearance of the

same ray may undergo decided variations in progressive sections. For example, the cells of a ray passing through a thick layer of wood parenchyma are very noticeably different in size and shape from those in dense fiber layers. Rays often tend to widen out at the termination of a growth ring and to be compressed in contact with large vessels. Type 17 shows a portion of a multiseriate ray penetrated by a wood fiber, but this may be considered an accident. Types 1 to 4, with nine subtypes, might be reduced to one, with two or three subtypes. In fact, the number of typical forms could probably be reduced to five, which would be generally recognized and to which distinctive descriptive names could be given.

The reviewer accordingly suggests that the matter be made the basis of further study and that other investigators be asked to cooperate to the end that eventually there may be universal standards for use in describing woods.

Woods suitable for acid containers. By LUIS J. REYES. *The Makiling Echo* (Laguna, P. I.) 7: 4: 26-28, Oct. 1928.

Tests were made to find Philippine woods suitable for replacing California Redwood for "tanks to be used as containers of a solution of oil, mixture of acid, glycerine, and contact reagent. This solution is met with in the manufacture of glycerine by the Switchell process, which consists roughly in placing the oil in a wooden tank with about a third of its volume of water, depending on the Baumé of the sweet waters desired and the degree of saponification wanted, and then approximately 0.8 per cent of contact and 0.7 per cent sulphuric acid added. The whole mixture is boiled for 36 hours to complete the saponification. The solution, which is acid in nature, attacks wood especially when raised to the boiling point, rendering it very dark and soft, probably as a result of hydrolysis."

"On the strength of these tests, we can now recommend Supa and Yakal as being among the best woods that can be used for acid containers. Both these woods are relatively cheap and are obtainable in almost any size free from defects. Ipil is but little affected by the acid, only it contains too much coloring matter which might discolor the solution."

Utilization of woods and bamboos in Formosa. (In Japanese.)

By K. NAGAYAMA. Rept. No. 5, Dept. of Forestry, Govt. Research Institute, Formosa, 1928. Pp. 630.

This is a report on the utilization of woods and bamboos by the Formosan natives. These people, about 3½ million in number, are Chinese whose ancestors emigrated to the Island about three centuries ago. They differ from the Japanese in customs and mode of living and there is likewise a dissimilarity in the use they make of the forest products, all of which factors are considered in this publication. In the introduction there is a discussion of the important species of timber, the qualities of the wood, and the market. Some of the chapter headings are: House construction; ship-building; rafts; civil engineering works; vehicles; cabinet work; bent-wood; cooperage; various kinds of implements and tools. — RYOZO KANEHIRA.

Les bois d'Indo-Chine. By P. H. *Le Monde Colonial Illustré* (Paris) 6: 61: 216-217, Sept. 1928. Illustrated.

Valeur papetière de bois d'Indo-Chine. Fiches technologiques préliminaires. By F. HEIM DE BALSAC, A. DEFORGES, and H. HEIM DE BALSAC. *Bulletin de l'Agence Générale des Colonies* 21: 485-498, 1928.

Sleeper woods and sleeper supply in India. By R. G. MARIOTT. *Empire Forestry Journal* 7: 1: 76-83, 1928. Ill.

"The present position is that the standard indigenous sleeper woods cannot yield all the sleepers India requires and the railways are consequently using, and for many years have used, large numbers of metal sleepers. But, although the supply of wooden sleepers is inadequate, it is more or less constant, mainly coming as it does from forests that are being managed under some form of working plan."

"It must not be imagined that, as a result of developments in sleeper-treating in India, the use of metal sleepers is likely to be abandoned by Indian railways, or that India will ever become a large exporter of wooden sleepers. On the contrary, such rapid progress is being made with railway construction

that the Indian railways will undoubtedly continue to buy large quantities of metal sleepers as well as all the indigenous wooden sleepers they can get at a reasonable price."

The kapur (camphor) tree of Malaya. By H. N. WHITFORD.
Journal of Forestry 26: 6: 826-827, Oct. 1928.

"It seems that the Kapur tree has a wide distribution throughout Malay, Borneo, and Sumatra. Throughout its range it has the general Malay name of Kapur or Kapoer. While it has a wide range in Malaya, the Kapur type itself is restricted to 350,000 acres, where the stands of this tree reach from 60 to 90 per cent of the total merchantable timber. Kapur is one of the largest trees in Malaya. It is often more than 200 feet in height, with slightly tapering bole up to 100 feet. Generally the crown occupies about one third of the height.

"While the Kapur is found abundantly in the eastern half of the Malay Peninsula, there is a small isolated stand of this type in the western half. It is this stand that has been brought under intensive management. It lies 16 miles north of Kuala Lumpur, the capital of the Federated Malay States. From Kuala Lumpur one passes by auto on an excellent road lined with rubber plantations, until the Kanching forest reserve is reached. The reserve is a small one containing 1180 acres, of which 332 acres contain natural Kapur. In this reserve there are 17 sub-compartments, of which 9 contain Kapur. In 1892 all Kapur trees were reserved from felling. This reservation probably saved the trees from being totally destroyed, but since the boundaries of the reserve, under the land enactment, were not fixed until 1897 and not transferred to the Forest Department until 1914, there was much exploitation prior to that date.

"In 1910 improvement fellings were begun and continued every two or three years until 1919. These were initiated to improve the growth of the valuable trees. Before such fellings were started, regeneration was very poor, seedlings being suppressed chiefly by the Bertam Palm (*Eugeissonia tristis*). In 1916, an even-aged forest of practically pure Camphor saplings, 2500 to 3000 to the acre, was the result. Now

the crop is a pure, uneven-aged stand of Kapur. Practically nothing else grows but Kapur. In 1926 and 1927, the stand was so thick that thinning in the young forest became necessary, and in some sub-compartments the mature trees have been felled and the regeneration is free."

De nuttige planten van Nederlandsch-Indië. I-III. (2nd ed.)
By K. HEYNE. Pub. by Dept. van Landbouw, Nijverheid & Handel in Nederlandsch-Indië, Buitenzorg, 1927. Pp. 1662+ccxli; 7¼ x 10½.

The first edition of Vol. I of this valuable compendium was published in 1913 and it was designed to include not only the better known plants but also those which were treated only casually or not at all in other publications. Three more volumes subsequently appeared, and in 1922 Vol. I was reprinted. The present work is a new edition, revised and enlarged, and it has been rearranged with a view to making it easier to consult. Special attention has been given to the indexes.

About 3000 plants are described. Those which are cultivated only for ornamental purposes have been omitted, since their inclusion would have increased the total by from 800 to 1000 without proportionate increase in the value of the work, and the addition of so many pan-tropical things, such as the orchids, and of a lot of decorative trees from warm climates would have changed the character of the book very materially. The author expresses regret that the question of expense interfered with his plan to illustrate the text with discriminately chosen photographs.

Herbosschingswerk in Bagelen, 1875-1925. By W. G. J. ZWART. No. 17, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1928. Pp. 233; 6½ x 9½; 14 tabular inserts; 6 plates; 1 map.

The formerly independent district of Bagelen was comprised of the present divisions of Poerworedjo, Keboemen, and Wonosobo of the Kedoe district of Midden-Java. Its forests were placed under systematic management in 1875

through the formation of the forest district Kedoe-Bagelen-Banjoemas. In 1893, this was divided in two, and in 1898 the forest of Bagelen was made a separate district and so remained until 1920 when it was merged with Banjoemas and lost its name.

The half-century of forest planting is divisible into four periods, although the transition from one to the next was not abrupt. From 1875 to 1889, the principal concern was the assurance of a future timber supply. From 1890 to 1900, improvement of water conditions was uppermost. During the period 1900-1918, forest planting was at a standstill, the previous plantations were underplanted, and some of them were cut in the interest of fig-culture. Since 1918, the plantations have been managed with a view to securing direct returns in forest produce without sacrificing their protective value to watersheds.

Geslachtellen voor Ned.-Indische boomsoorten naar vegetatieve kenmerken met een beschouwing over de practische en systematische waarde dezer kenmerken. By F. H. ENDERT. No. 20, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1928. Pp. 242; 6½ x 9½.

The purpose of this investigation was to provide a key, based exclusively on vegetative characters, to the identification of the trees indigenous to the Dutch East Indies, exclusive of the eastern part of the Archipelago, particularly the Moluccas and New Guinea. No tree was included unless known to attain a diameter (breast high) of 16 inches, a clear length of 6 feet, and a total height of 35 feet. Owing to the large number of species and the lack of authentic specimens of some of them, the author considers his work preliminary to a fuller investigation which he hopes his present contribution will stimulate.

As a basis for the keys, the author employs various morphological and histological features of the leaves, buds, twigs, bark, wood, pith, thorns, and secretory organs. The practical and systematic value of these features is discussed in the fore part of the book, and portions of it are along the general lines

of Solereder's "Systematic anatomy of the Dicotyledons." Some 2300 herbarium specimens, representing 1200 species of 440 genera, were available for study at the Forest Experiment Station, and about 1300 additional samples, mostly fresh material, were obtained from the Botanical Gardens at Buitenzorg. It is obvious that the task was a large and difficult one.

The keys are dichotomous and lead first to lettered and then to numbered groups. The simplest and most reliable characters were naturally used first and the groups accordingly become progressively more difficult and the distinctions within them less clearly defined. Some families, e.g. Anonaceae, Sapotaceae, Anacardiaceae, and Lauraceae, were not readily separable on a basis of their vegetative characters, partly because of natural resemblances and partly on account of insufficient accurately determined material.

In some cases, e.g. Ebenaceae, Myristicaceae, and Magnoliaceae, the genera could not be distinguished. Some of the particular inseparables are *Intsia* and *Pabudia*; *Canarium* and *Santiria*; *Aglaia* and *Amoora*; *Dysoxylum* and *Apbanamixis*; *Hydnocarpus* and *Taraktogenos*; *Artocarpus*, *Prainea*, and *Parartocarpus*; *Castanea* and *Quercus*; *Macaranga* and *Malotus*; *Laplacea* and *Gordonia*. In the opinion of the reviewer these instances are not so much cases of the classification on vegetative characters falling down, as failures of the classification on reproductive features to stand up under practical tests.

In making the key the genus was chosen as the unit, and effort was made to bring closely related genera and, where possible, whole families together. In 75 per cent of the cases, the genera comprising a family appear in only one group, 17½ per cent in two groups, 5 per cent in three groups, and 2½ per cent in more than three groups. Sometimes a genus will appear more than once within the same group, but this is primarily due to the limitations of a dichotomous key, such as occur also in keys based on flower and fruit characters.

The reader is cautioned regarding the limitations affecting the use of sterile material, especially if it is obtained from young trees, water sprouts, and abnormal sources generally.

The fault is not with the material, but with the present insufficient knowledge of it in relation to systematic classification. The remedy is obvious.

The systematic value of characters, whether reproductive or vegetative, is not the same for different groups of plants. There is often lack of parallelism in the two classes of characters. It appears that related groups exhibit greater harmony in their flowers and (or) fruit than in their vegetative characters, but there are instances, e.g. Anonaceae, Ebenaceae, and Rubiaceae, where the opposite condition prevails. In some instances, of course, the grouping of families and genera, as we know them, has been influenced by similarities in vegetative characters. It is believed that this influence will become progressively greater with increased knowledge of the subject. To be able to identify sterile material is a matter of great practical importance, especially to foresters.

Stamtal en dunning. Een oriënteerend onderzoek naar de beste planwijdte en dunningswijze voor den djati. By H. M. J. HART. No. 21, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1928. Pp. 219; $6\frac{1}{2} \times 9\frac{1}{2}$; 69 figs.

There is a discussion of the principles underlying different methods of thinnings and a consideration of their applicability to plantations of Teak. A method is advocated by which, the ratio of crown breadth to tree height having been determined by measuring dominant trees at different periods, the correct number of stems for a given area can be calculated from their height.

Experimental plantations of Teak designed to show the influence of initial spacing have advanced far enough to warrant the following provisional conclusions: Spacing 2 x 2 meters (2500 trees per hectare) is considered the maximum, even on the best soils, and closer planting is recommended for poor soils and elsewhere also if provision can be made for timely thinnings. The form of bole of Teak is not improved by planting other trees in mixture with it if the spacing is too wide. In certain cases the bad effects of wide spacing can be corrected by artificial pruning. Planting in rows is preferable to triangular, rectangular, or square systems.

The forests of the Fiji Islands. By J. P. MEAD. *Empire Forestry Journal* 7: 1: 47-54, 1928.

"The islands comprising the Crown Colony of Fiji lie between 15 and 22 degrees south latitude and 177 degrees west and 175 degrees east longitude. There are approximately 250 islands in the group, of which about 80 are inhabited. Suva in Vitilevu, the capital, is distant 1740 miles from Sydney and 1140 miles from Auckland.

"The total area of the Colony is 7130 square miles. The principal islands are Vitilevu, 4053; Vanualevu, 2128; Tavuni, 166, and Kandavu, 165 square miles. The country is generally very mountainous and broken, the highest point in the group being Mount Victoria in Vitilevu, 4341 feet."

"The climate of Fiji is cool and healthy for the tropics, malaria fever being quite unknown. The average rainfall in the wet and dry zones, i.e., the windward and lee sides of the islands, is 130 and 80 inches respectively. The greater part of the rainfall occurs during the months of November to April."

"The sea beaches are occupied by a characteristic flora, much of which is pan-tropic. . . . Where estuarine conditions obtain, the beach forests are replaced by mangrove. . . . The southeastern or weather sides of the two main islands are clothed with evergreen rain forest from the sea to the tops of the highest mountains. The composition of this forest is fairly uniform and types cannot be differentiated with any accuracy. Superficially the Fijian forest resembles the equatorial rain forests of Malaya, but the number of species found in the former is very much smaller. . . . Above an elevation of about 3000 feet the forest is stunted and wind-blown, and ascending another 500 feet all trees and shrubs are seen to be clothed with a thick covering of moss.

"The easily accessible portions of the forest have evidently been farmed in the past when the islands were more thickly populated than they are to-day. This has resulted both in extensive areas of secondary growth and also in tracts of open country covered with reeds and isolated stunted trees of species like *Nelitris vitiensis* and *Mussaenda frondosa*.

"On the lee sides of the large islands are found the rolling plains called 'talasinga' (sun-burnt lands) by the Fijians. These plains are of an arid appearance and resemble certain

parts of Australia. Regular forest growth is absent and is replaced by reeds and ferns, with here and there clumps or single trees. . . . It is calculated that the forests cover an area of 51.8 per cent of the total area of the country, and in this calculation the 'talasinga' plains are excluded."

"Although there is no timber in Fiji of outstanding merit which may be compared either to Teak or Mahogany, yet there is a considerable number of useful hardwoods and softwoods." There are descriptions of the most important kinds and notes regarding their uses. Those for which common or vernacular names are given are listed below.

CHECK LIST OF THE COMMON NAMES

Kau solo; K. tambua	<i>Podocarpus cupressina</i> R. Br.	Podocarpaceae
Kauri, Fiji	<i>Agathis vitiensis</i> B. & H. f.	Araucariaceae
Mahogany, Fiji	<i>Calophyllum Burmanni</i> Wight and <i>C. spectabile</i> Willd.	Guttiferae
Mbuambua	<i>Guetarda speciosa</i> L.	Rubiaceae
Ndakua makandre	(Same as Fiji Kauri)	
Ndakua salusalu	(Same as Kau solo)	
"	<i>Podocarpus vitiensis</i> Seem.	Podocarpaceae
"	(Same as Fiji Mahogany)	
Ndamanu	<i>Xylocarpus</i> spp.	Meliaceae
Ndambe	<i>Bruguiera gymnorbiza</i> Lam.	Rhizophoraceae
Ndongo	<i>Vitex vitiensis</i> Seem.	Verbenaceae
Rosawa	<i>Santalum Yasi</i> Seem.	Santalaceae
Sandalwood, Fiji	<i>Seriantbes myriadenia</i> Planch.	Leguminosae
Vaivai	<i>Intsia bijuga</i> O. Ktze.	Leguminosae
Vesi	<i>Nelitris vitiensis</i> A. Gray	Myrtaceae
Vunga	<i>Dacrydium elatum</i> Wall.	Podocarpaceae
Yaka	(Same as Fiji Sandalwood)	
Yasi	<i>Eugenia effusa</i> A. Gray	Myrtaceae
Yasiyasi		

Les sandals d'Australie et leurs essences. By É. PERROT. *Travaux des Laboratoires de Matière Médicale et de Pharmacie Galénique* (Paris) 18: 1-32, 1927. Ill.

Contains botanical descriptions and detailed information concerning the properties of the oils obtained from *Santalum lanceolatum* R. Br. and *Fusanus spicatus* R. Br.

The essential oil from the timber of rosewood (*Dysoxylon Fraseranum*). By A. R. PENFOLD. *Journ. & Proc. Royal Soc. N. S. W.* 61: 337-346, 1928.

Paper pulp from Australian timbers. By L. R. BENJAMIN. *Journal of the Council for Scientific and Industrial Research* (Australia) 1: 65-73, 1927.

Contains results of laboratory experiments with woods and a number of grasses and sedges. Eucalypt woods, treated by the soda process, yield pulp suitable for making book and fine printing papers. Proper use of the sulphite process gave a yield of as much as 60 per cent of an easily bleachable pulp suitable for newsprint. A mixture of 70 per cent of sulphite pulp with 30 per cent of ground wood, both of eucalypts, proved to be stronger than standard newsprint. Tests on a commercial scale are under way.

Forestry and forest resources of Western Australia. A statement prepared for the British Empire Forestry Conference (Australia and New Zealand), 1928. By S. L. KISSEL. Perth, 1928. Pp. 28; 8¼ x 13; 2 large maps.

Les bois d'ébénisterie de la côte ouest de Madagascar. By H. PERRIER DE LA BATHIE. *Revue de Botanique Appliquée et d'Agriculture Coloniale* 8: 83: 469-477, July 1928.

There are various beautiful cabinet woods native to the west coast of Madagascar, but only a few have attained commercial importance. The principal kinds exported before the war were False Camphor and Ebony, but the supply has been almost completely exhausted, and since the war the timber trade has been principally concerned with Rosewood, of which there are several different kinds. Ineffectual regulation of cutting and lack of protection from recurrent fires threaten the destruction of the productive forests of the region. The report emphasizes these dangers, offers suggestions for their amelioration, and recommends the planting of a number of kinds of trees capable of producing valuable cabinet woods. There are notes on the dendrology and silvics of thirteen species.

Kimanga, *Erythrophleum Coumingo* Baill. (Leguminosae). A handsome, dense-foliaged tree, abundant over an area of about a million acres, growing tall and straight, in dense stands, and attaining a diameter of 3 feet or more. The wood

is very hard, the sapwood thin in mature trees, the heartwood dark brown and attractively variegated. It is not exploited because of its evil reputation among the natives. The author affirms from personal experience that no danger attends living or sleeping in its shade, or in felling the trees and sawing or otherwise working the wood. There is a very poisonous sap in the bark, but one must take it internally and in considerable quantity to experience ill effects.

Tsiandalana, *Acacia bellula* Drake and *Dalbergia tricolor* Drake (Leguminosae). The first is a small, sparsely foliated, deciduous tree, common near the sea; usually not over a foot in diameter. The other is comparatively rare and sometimes attains a diameter of 20 inches. The woods are much alike, being hard, of a beautiful rose color striped with black. They are used only locally.

Roibontsika or **Roibokida**, *Acacia morondavensis* Drake. A large, thorny early deciduous tree, widely distributed over the calcareous regions; attains a diameter of nearly 5 feet. The wood is hard, the sapwood thin, the heart resembling Walnut, though more figured. It is not exported, but very attractive furniture is made of it locally.

Fandrianakanga or **Tsitohizanolomalaina**, *Albizia boinensis* R. Vig. (Leguminosae). A handsome tree, with very fine blue-green foliage, fairly common in the coastal region. The wood resembles that of the preceding, but is more attractive and better figured. Used locally for fine cabinet work.

Manary, *Dalbergia Greveana* Baillon (= *D. dikopensis* Jum.). An important tree, sometimes over 3 feet in diameter. Heartwood dark purple and beautifully variegated. The principal source of Rosewood (Palissandre) exported from Majunga and Morondava in recent years; 6265 billets, weighing 1270 tons, shipped in 1926.

Manipika, *Dalbergia trichocarpa* Baker (= *D. Perrieri* Jum.). Occurs in same region as the preceding and the timber is sold in mixture with the other, though the wood is of somewhat lighter color.

Manarizoby, *Dalbergia retusa* Baillon (= *D. toxicaria?* Baillon). A small and usually crooked tree rarely 20 inches in diameter. The wood is very fine-textured, of a violet to nearly

black color with reddish striping. It is the source of a dye similar to logwood.

Arahara, *Phylloxylon Perrieri* Drake. (Leguminosae). A small tree, 25 to 35 feet high and sometimes 20 inches in diameter, though often shrub-like. The wood is very hard, fine-textured; color a beautiful mingling of yellow and dark violet. It is used only locally because of its rarity.

Tourtour, *Gluta Turtur* March. (Anacardiaceae). An evergreen tree, suggesting the Mango, making fairly rapid growth and attaining a diameter of over 3 feet. The heartwood is a dark orange, attractively figured, and highly valued. Small quantities have been exported to France.

Hazomalana or **Faux Camphrier**, *Hernandia Voyroni* H. Jum. (Hernandiaceae). A widely distributed deciduous tree, of sufficiently rapid growth to attain merchantable proportions in 20 to 30 years. The soft, yellowish wood has a pronounced odor of camphor and is very resistant to decay and insects. Large quantities have been exported, particularly to India, as a source of etherial oil. The principal source of supply at present is the Province of Morondava.

Lopingo, **Mapingo**, or **Hazozoby**, *Diospyros Perrieri* H. Jum. (Ebenaceae). A very important evergreen tree, the source of all of the Ebony exported from Majunga and Morondava, and considered superior to that from the east coast. In large old trees the sapwood is thin at the base and the heartwood is sometimes from 3 to 5 feet in diameter. The more accessible timber of merchantable size has been nearly exhausted, but there are many young trees in all the rocky portions of the region.

Mangarahara, *Stereospermum euphorioides* Engler (Bignoniaceae). A large tree, with a long straight bole when forest-grown, sometimes 3 feet in diameter. The heartwood is very hard and difficult to saw; has the appearance of Rosewood, but it is finer-textured and denser.

Fangalitra, *Stereospermum* sp. A tree associated with the preceding, but with a wood so hard that the natives refuse to cut it because it breaks their axes.

Other species recommended for planting, especially along

the borders of streams, are *Kbaya madagascariensis* Jum. & Per. (Haxomena), *Canarium Boivini* Engl. (Ramy), *Eugenia Parkeri* (Routra), and *Cephalanthus spathelliferus* Baker (Sohy). Their woods are chiefly useful for purposes of construction.

Note sur l'*Erica arborea* et sur l'emploi de ses souches dans la fabrication des pipes. By AUG. CHEVALIER. *Revue de Botanique Appliquée et d'Agriculture Coloniale* (Paris) 7: 649-736; 739-752.

Etudes sur les caractères anatomiques des bois d'Algérie. By J. DE SAINT-LAURENT. *Bulletin de la Station de Recherches Forestières du Nord de l'Afrique* (Alger) 1: 7: 241-255, plates xxiv-xxix, Jan. 25, 1926; 1: 9: 351-417, plates xxxi-xliii, May 30, 1928.

The object of these investigations was to prepare a descriptive key to Algerian woods. There are in Algeria about 300 indigenous woody plants, including shrubs and undershrubs. A great many of them are represented in the wood collections of the Forest Research Station. These have been studied microscopically and the descriptions have been supplemented by line drawings and photomicrographs.

Part I deals with the Gnetaceae (*Ephedra*), the Coniferae (*Pinus*, *Cedrus*, *Abies*, *Callitris*, *Cupressus*, *Juniperus*, and *Taxus*), and the Cupuliferae (*Castanea* and *Quercus*). In addition to the keys there are tables showing the comparative sizes of the various elements.

The second part, which follows the same plan as the first, deals with 133 species representing 94 genera and 45 families. It is illustrated with 25 drawings and 52 photomicrographs, the latter showing the cross sections under a uniform magnification of 50x. The tabular synopsis, which occupies 34 pages, gives for each species the diameter of the wood fibers, wood parenchyma cells, and vessels; height, width, and number of cells per ray; number of rays per square mm.; specific gravity; coloration; miscellaneous notes. Coloration refers to the appearance of the extract obtained by boiling 1 gram of heart-wood for about 5 minutes in 8 cc. of pure water.

Le tlaïa, *Tamarix articulata* Vahl. By L. TRABUT. *Bulletin de la Station de Recherches Forestières du Nord de l'Afrique* (Alger) 1: 8: 336-349, Nov. 15, 1926.

This species of Tamarisk is widely distributed throughout northern Africa, Mesopotamia, Persia, Beluchistan, and parts of India. It is particularly important as a source of fuelwood in Egypt and Arabia. It is very useful in the fixation of sand dunes and the protection of water courses and lends itself readily to pollarding. If conditions are at all favorable it makes very rapid growth, being known to attain a diameter of 4 inches in three years in the Sahara region, while specimens 5 years old in southwestern United States were reputed to be 50 feet high and 16 inches in diameter at the base. Fuelwood plantations can be operated on a rotation of four years, the stumps coppicing readily. The trunk, although usually short, often becomes very thick, sometimes over 5 feet through. The wood is very hard and heavy, sp. gr. 0.95; rays large and conspicuous; fibers and wood parenchyma strands storied; color yellowish pink, fading gradually into the sapwood. The young wood shrinks and checks very badly, but mature timber is suitable for carpentry and also for turnery. Both wood and bark are rich in tannin.

The forests of West Africa. *The Times* (West Africa Number), quoted in *The Timber News* (London), Nov. 23, 1928, pp. 8-9.

"The forests of British West Africa cover an area of over 300,000 square miles, representing 14 per cent of the total forests of the Empire, compared with which India has a little more and Australia less than half. These forests are divided among the four countries concerned, approximately in the following proportions:

	<i>Sq. miles</i>
Nigeria (including British Cameroon)	270,000
Gold Coast (including British Togoland)	32,000
Sierra Leone	1,000
Gambia	200

"These woodlands, extending over a widespread area, vary largely from place to place in composition, in character, and

in appearance. Many as these variations are, they can be conveniently classified into four great forest types, each of which merges gradually with those adjoining. This type-variation depends mainly on the distance from the sea. In this way the great West African forest running from the Gambia to Cameroon consists of four distinctive 'belts' lying one behind the other, more or less parallel to the coast of the Gulf of Guinea. These belts of forest are in many places incomplete, but their normal succession from the coast-line inland is:

Mangrove Forests	} Coastal zone of heavy rainfall.
Tropical Evergreen Forests	
Deciduous Forests	} Intermediate zone of moderate rainfall.
Savannah and Orchard Forests	} Inland zone of scanty rainfall.

"Mangrove forests are found occasionally as small scattered areas in the three smaller Colonies—at the mouth of the Gambia River, near Freetown and occasionally elsewhere along the coast of Sierra Leone, and at the mouths of most of the rivers of the Gold Coast. In Nigeria, however, they cover large areas and form an almost continuous belt along the coast line from Dahomey to French Cameroon, varying in width from a few yards to over 50 miles in the deltas of the Niger and other large rivers. These forests are of a low or only moderately high type. Their main characteristics are the aerial prop-roots supporting the stem above the water or mud. These roots with the lower branches form an inextricable network of 'stick-bush' over muddy salt water, or at low tide, when the soil is exposed, over a black, evil-smelling slime.

"The tropical evergreen forests, together with the deciduous forests found in all four Colonies, cover a wide area of land and go to form what has sometimes been referred to as the great forest belt of West Africa. They are the north-westward extension of the vast forests of Cameroon and the Congo. These forests are generally magnificent in appearance, and at the best are unsurpassed in tree growth by any others in the tropics. In virgin forests the huge, straight, cylindrical trees, with smooth bark and comparatively small crowns often knit together by a mass of tangled creepers, cast a shade so dense

that even during the day only subdued twilight obtains. The ground is comparatively clear of undergrowth, and this, together with the dim light and the intense silence which often prevails, gives an impression of great solemnity and awe.

"Further inland the savannah and orchard forests extend over an area greater than all the other types put together, namely, over 200,000 square miles. These forests are of a much more open character than the others, and the tree growth never attains the magnificent dimensions of those of the zones of greater rainfall."

Le problème de la main-d'œuvre pour les exploitations forestières Africaines. *Le Monde Colonial Illustré* (Paris) 6: 61: 206-207, Sept. 1928. Illustrated.

Flora of West Tropical Africa. I. By J. HUTCHINSON and J. M. DALZIEL. Pub. by the Crown Agencies for the Colonies, London. Part 1, March 1927; Part 2, July 1928. Pp. (1) 1-246, (2) 247-523; 6¼ x 10; figs. 177; 1 map. Price 8s. 6d. for each part.

"The chief purpose of this Flora is to render easy the determination in the field of the flowering plants of western Africa. . . . The illustrations have been included mainly for the benefit of the field worker, so that some idea may be gained of each family represented in the area."

"The area covered by this Flora . . . embraces all the region from the Tropic of Cancer in the north to the coast and eastward to the boundary of the French Military Territory in the Lake Chad area (about 15° E.); it also includes the smaller islands off the coast, but not the Cape Verde Islands.

"This area . . . is approximately 2½ million square miles, i.e., about 28 times the size of Great Britain or 1⅔ the area of British India. A considerable proportion of the northern part, however, is desert country and bears only a scanty vegetation. The southern part, except for a coastal strip of grass and savannah, is covered by evergreen forest, which in the Ivory Coast reaches a depth of over 200 miles. Westwards of Liberia this gives place to more open formations, whilst on

each side of the Volta River a wedge of the savannah type of vegetation extends right down to the coast. The greatest development of mangrove swamp is found in the creeks of the Niger Delta, with patches here and there from Gambia to Liberia and at other points where rivers reach the sea by shallow estuaries and lagoons.

"The northern edge of the forest belt, at about 6-8° N., is often fairly sharply defined, and is succeeded by high grass or deciduous forest, open woodland and grass savannah, which extends in the western part to a depth of some 400 miles. Beyond the savannah there is a gradual transition to scrub and desert conditions, which are said to be encroaching on the grass and woodland."

"The flora of the forest region shows considerable affinity with that of the great equatorial forest area of Central Africa, with which it is continuous through the Cameroons, and has also many interesting connections with that of Eastern South America. The savannah and semi-desert flora is very similar in all respects to that of the Eastern Sudan. These relationships will form the subject of a special chapter at the close of the work.

"The number of species recorded is probably about 5000, a comparatively small total as compared with some other tropical areas of equal extent. This is mainly due to the general uniformity of the area, coupled with its comparatively small range of elevation and depression."

"The present work differs in three important respects from all those of the long series of Colonial Floras which previously have emanated from the Royal Botanic Gardens, Kew.

"In the first place it is arranged on a new system of classification; secondly, it is provided with illustrations of the families, as represented by the more important genera, which should considerably enhance its value; and thirdly, the descriptions of the actual plants are reduced to a minimum and the text is mainly in the form of a descriptive 'key,' in order to facilitate easy and rapid determination of the species.

"The system of classification adopted in this Flora is that published by Mr. Hutchinson in his recent book, 'The families of flowering plants.'"

Timbers from the Gold Coast. II. *Bulletin of the Imperial Institute* (London) 26: 3: 275-288, October 1928.

This is the second installment of a report on Gold Coast timbers. The first dealt with seven species, the present with four additional. (See *Tropical Woods* 9: 29, March 1, 1927.) Descriptions of the woods, full mechanical test data, and results of working tests are included.

Achin or Takwadua (*Blighia sapida* Koen.).—Common tree, attaining an average girth of 8 feet. Wood reddish brown to golden brown, hard, heavy (wt. 55 to 64 lbs. per cu. ft.), strong, fine-textured, roe-grained, tends to check, is probably durable, works fairly readily with machine tools but offers some difficulty with most hand tools, can be finished smoothly, does not absorb stains readily; possesses no special features likely to recommend it as a decorative wood. Suggested use, heavy construction work in country of production.

Awieforsemea (Undetermined).—Fairly common, attaining an average girth of 7 feet. Wood orange-brown to reddish brown, soft, moderately light (wt. 30.5 to 42.4 lbs. per cu. ft.), moderately strong, rather coarse-textured, slightly roe-grained, little inclined to warp or check, does not finish very satisfactorily. Suggested use, interior work in the furniture and allied trades; also for local construction where an easy-working material of moderate strength is required.

Kwabohora or Kwatendro (*Entandropbragma* sp.).—Uncommon tree, attaining an average girth of 10 feet. Wood pinkish brown, firm, fairly light (wt. 32 to 39 lbs. per cu. ft.), strong in proportion to its weight, inclined to be brittle, moderately coarse-textured, somewhat roe-grained, little inclined to shrink, warp, or check, works easily and finishes well. Considered a promising timber, which should find a ready market and have many uses if supplies and price are satisfactory. It is being exported to some extent under the name of African Cedar, and is said to be used locally for furniture.

Ananta or Takroa (*Cynometra* sp.).—Very common in places in the evergreen forest, according to Chipp, and attaining an average girth of 8 feet. Wood brown, hard and heavy (wt. 55.4 to 62 lbs. per cu. ft.), very strong, fairly fine-textured, somewhat roe-grained, shrinks considerably in drying, works

with some difficulty with hand tools but more readily with machines, and can be finished smoothly. Not considered promising for export, but might be used to advantage locally in heavy construction.

Die zukünftige rohstoffversorgung der papierindustrie und die hölzer des westafrikanischen urwaldes. By R. LORENZ. *Tropenpflanzer* 31: 83-97, 1928.

A propos des forêts congolaises. By É. DE WILDEMAN. *Bulletin de la Société Royal de Botanique de Belgique* 4: 1: 44-66, 1928.

This is a résumé of a paper presented at a meeting of the Association on February 5, 1928. It is an argument for the conservation of the Congo forests through establishment of reserves and proper utilization and care of the timber. The need for further research is also emphasized.

L'évolution du marché de l'okoumé. By R. VISCONTI. *Revue Internationale des Produits Coloniaux* (Paris) 3: 25: 18-21, Jan. 1928.

Le bossé, *Guarea cedrata* (A. Chev.) Pellegr. By AUBREVILLE A. CHEVALIER, JEAN COLLARDET, FOURMIER, FRON, GILLET, L. HEDIN, PELLEGRIN, and PICOT. Pub. by Assoc. Colonies-Sciences et Comité National des Bois Coloniaux, Paris, 1928. Pp. 30; 6 x 9½; 3 plates, 3 text figs. Price 5 francs.

This is a revision and extension of a previous report on the same subject. (See *Tropical Woods* 15: 51, Sept. 1, 1928.) The matter is presented under the following subdivisions: I. BOTANICAL AND FOREST INVESTIGATIONS: (A) History; (B) Names; (C) Habitat; (D) Morphological characters and botanical description. II. STUDY OF THE WOOD: (A) Esthetic features; (B) Gross anatomy; (C) Minute anatomy; (D) Chemical properties; (E) Physical properties; (F) Mechanical properties; (G) Technical properties; (H) Uses; (I) Commerce. III. SUBSTITUTES FOR BOSSÉ: (1) Genus *Guarea*; (2) Genus *Trichilia*; (3) Genus *Entandrophragma*.

The flower of *Guarea cedrata* is described and illustrated for the first time. It is upon the basis of the floral anatomy that the species has been transferred from *Trichilia* to which Chevalier first referred it.

Côte d'Ivoire. Rapport pour le Congrès International de Sylviculture de Rome. Pub. by Gouvernement Général de l'Afrique Occidentale Française, Paris, 1926. Pp. 20; 6¼ x 9½.

Les bois de la Côte d'Ivoire. By TH. DE PANIAGUA. *Revue Internationale des Produits Coloniaux* (Paris) 3: 26: 61-63, Feb. 1928.

A discussion of the problems attending the development of commerce in timbers other than Mahogany.

Notes sur le sipo de Sassandra (*Entandrophragma* sp.). By AUBREVILLE. *Bulletin Mensuel de l'Agence Economique de l'Afrique Occidentale Française* (Paris) 8: 84: 273-275, Dec. 1927.

Sipo de Sassandra, a member of the Mahogany family (Meliaceae), is one of the principal forest trees of the western part of the Ivory Coast. It is about 130 feet tall, the trunk straight and cylindrical, free of branches for over 65 feet, and having a diameter of 5 or 6 feet above the heavy but rather low buttresses. One of its most distinctive characters is the bark, which is thick and very deeply furrowed, whereas the bark of other species of *Entandrophragma* is smooth (Tiama) or scaly and flaking off in plates (Aboudikro and Sipo du Banco). The leaves usually have 10 or 12 pairs of sub-opposite lanceolate leaflets, 3 to 5 inches in length. The flowers are unknown. The fruits mature in November or December when the leaves are off and are large cigar-shaped or club-shaped 5-valved capsules, the woody valves very thick (about 1 cm.) and covered with rusty warts, the columella 6 to 8 inches long and bearing usually 6 seeds on each of its 5 faces. The sub-triangular, winged seeds, which are about 4 inches long and a little less than one inch wide, are characterized by having a rounded hilum only 2 or 3 mm. in diameter. The seed pods

open while on the tree and allow the seeds to escape; the valves are detached from the summit but remain united at the base, just the reverse of the method of dehiscence in *Tiama*. They are slow to decay after falling to the ground, thus providing another point of distinction, since the fallen fruit hulls of the other species disappear quickly.

The heartwood is moderately hard and of a brownish red color contrasting with the whitish sapwood. The pores are rather large, occurring singly or in groups of 2 or 3. Parenchyma encircles the pores and also occurs in distant concentric bands and in numerous irregular and broken lines. The rays have a decided tendency to storied arrangement.

The timber is cut in the vicinity of Sassandra, Lahou, and Tabou, and in the years 1924 and 1925 about 1200 trees were logged, averaging about 6 tons per tree. In the Sassandra district it is difficult to negotiate the numerous rapids on the river and subsequent exploitation is largely dependent upon transportation by rail. The wood is used in France, but not as yet in America.

Notes sur le dibétou (*Lovoa Klaineana*). By AUBREVILLE. *Bulletin Mensuel de l'Agence Économique de l'Afrique Occidentale Française* (Paris) 9: 87: 91-93, March 1928.

The timber which in the trade is called Noyer d'Afrique or African Walnut, sometimes also Acajou Noir or Black Mahogany, is known in the Ivory Coast by the vernacular name Dibétou, which has been officially adopted. Another vernacular name there is Mutchibanaye. [The tree is not real Walnut (*Juglans*), but is a member of the Mahogany family, Meliaceae.]

The Dibétou seems to be very widely distributed, not only in the Gold Coast but also in Liberia, Nigeria, Gaboon, and elsewhere in tropical West Africa. Usually it is of scattered occurrence, but in a few places it is in clumps or groups and fairly abundant. It is of moderate size, with cylindrical trunk and comparatively low buttresses. It can be distinguished from its associates in the forest by its bark, which is thin, smooth, or somewhat scaly on very old trees, dark brown on the surface and of the color of red meat within, resinous, and

having a strong scent much like that of the Bossé [*Guarea cedrata*]. The leaves are large and compound, with 4 or 5 pairs of sub-opposite leaflets. The tiny flowers are greenish white, their parts in 4's; the blossoming period is during January and February. The fruit is a 4-valved capsule, with a quadrangular columella bearing on each face 4 superposed seeds whose wing tips are attached to the summit of the columella (an arrangement opposite to that in *Entandropbragma*); the valves are thin, and scented like the bark.

The white sapwood is very distinct and its sp. gr. is from 0.50 to 0.65. The heartwood is the color of Walnut [*Juglans regia*], moderately hard, not aromatic. It is as strong in compression and bending as choice Walnut, but has low resistance to tension and is very easy to split. It is a handsome wood for cabinet work, joinery, and moldings. The exports of this timber are small and the amounts listed are smaller still, owing to the fact that the forest officers confuse the logs with Fraké [*Terminalia* sp.], although the two woods are quite dissimilar in structure. The annual production probably does not exceed 400 or 500 tons and is not likely to increase very greatly, owing to the scattered occurrence of the trees. It is only at Tabou that the name Dibétou is used; in commerce it becomes Noyer d'Afrique.

Acajous de la Côte d'Ivoire: Variétés exploitées. By J. MENIAUD. *Revue Internationale des Produits Coloniaux* (Paris) 3: 25: 22, 27-31, Jan. 1928.

The woods of two genera of the Meliaceae are considered, viz. *Kbaya* and *Entandropbragma*. Of the first the best known is *Kbaya ivorensis*, generally known under the name of Grand Bassam, after one of the principal ports of shipment. More than 120,000 cubic meters are exported annually. The timber from the interior is denser and more attractive than that along the coast.

Acajou Blanc, *Kbaya* sp., sometimes known as Ira and also by the native names M'Polé, and M'Pohé, differs from *K. ivorensis* more in the appearance of the tree, particularly of the bark, than in the color and properties of the wood, and it is no longer considered an inferior species. While almost the entire

zone of Grand Bassam Mahogany is already under exploitation, the zone of the other has scarcely been entered and thus provides a great reserve for future development.

There are several poorly known species of *Entandropbragma*, one of which, *E. macrophylla*, supplies a timber known commercially as Tiama or Acajou-tiama. The amount sold is comparatively small and the price is considerably less than for Mahogany; its best market is in Germany. The Sipo and the Mébrou, which may be names of the same species in different localities, are abundant and could supply a very much larger demand than at present. The exports of Sipo and Mébrou amounted to about 3600 tons in 1926. Another kind is called Aboudikro. It is a beautiful wood, reddish brown in color, moderately hard and heavy, and should prove an acceptable substitute for Teak for many purposes. It is as yet little known commercially.

The export of all cabinet woods for the years 1923-26 were as follows: 1923 — 65,090 tons or 92,987 cubic meters; 1924 — 82,201 tons or 117,390 c.m.; 1925 — 73,260 tons or 104,657 c.m.; 1926 — 96,231 tons or 137,474 c.m. About 80 per cent of the total was produced by *Kbaya* spp. The distribution of these exports by countries of destination is shown in the following table (in cubic meters):

Year	France	England	Belgium	Italy	Germany	U. S. A.	Holland	Others	Total
1923	28,021	15,027	1142	1601	2095	44,600	—	501	92,987
1924	39,165	18,013	769	2018	2166	54,959	—	300	117,390
1925	33,438	21,001	825	341	3232	45,767	—	53	104,657
1926	57,582	32,154	1613	1613	274	40,730	147	3240	137,474

Notes sur l'acajou blanc (*Khaya* sp.) de le Côte d'Ivoire.

By AUBREVILLE. *Bulletin Mensuel de l'Agence Economique de l'Afrique Occidental Français* (Paris) 8: 83: 245-248, Nov. 1927.

Acajou Blanc is an undetermined species of *Kbaya* which is abundant in portions of the Ivory Coast and promises to be-

come of great commercial importance as the supply of Grand Bassam Mahogany (*Kbaya ivorensis*) decreases. The Acajou Blanc is smooth-barked and has large leaves, with 2 to 4 (mostly 3) pairs of very large and short-pointed leaflets, while the other species has rough flaky bark, smaller leaves, with at least 5 or 6 pairs of long-pointed leaflets, and smaller seed pods. The woods of the two are very similar, the only noticeable differences being that the ordinary Mahogany is somewhat more deeply colored and lighter in weight than the Acajou Blanc. Dealers who buy by weight and sell by measure cannot well afford to pay the same price for the two kinds of Mahogany. The writer is anxious lest discrimination against Acajou Blanc seriously affect its future commerce.

A propos de l'acajou blanc de la Côte d'Ivoire. By AUG. CHEVALIER. *Revue de Botanique Appliquée et d'Agriculture Coloniale* (Paris) 8: 79: 207-211, March 1928.

The tree of this name described by Aubreville (above) is referred to *Kbaya agboensis* A. Chev. by Chevalier, who attempts to clear up the confusion in the nomenclature of several species of *Kbaya*. A footnote at the end of the article indicates that further investigations and collections will be necessary for a final solution of the problem.

La situation generale du bois en France: Bois coloniaux.

By ROGER SARGOS. *Revue International des Produits Coloniaux* (Paris) 3: 25: 1-5, Jan. 1928.

Le Havre grand marché des bois coloniaux.

By A. CHARLES. *Revue International des Produits Coloniaux* (Paris) 3: 25: 6-10, Jan. 1928.

Bois coloniaux et forêts coloniales. *Revue International des Produits Coloniaux* (Paris) 3: 25: 11-17, Jan. 1928.

An account of three organizations in France which are working together to encourage the importation and consumption of woods from the French colonies and the investigation and management of the colonial forests. These organizations are (1) Association "Colonies-Sciences," (2) Association Nationale et Industrielle du Bois—Comité des Bois Coloniaux and (3) Service Officiel des Bois Coloniaux.

La vulgarisation des bois coloniaux. By JEAN COLLARDET. *Revue Internationale des Produits Coloniaux* (Paris) 3: 26: 55-60, Feb. 1928.

A summary of the forest resources of the French colonies, a consideration of the problems attending the introduction of new kinds of timber, and an outline of the methods of investigating these woods and promoting their commerce. The following table gives a summary of the estimated forest areas, amounting all told to 221,400,000 acres.

<i>Atlantic Colonies</i>	<i>Acreege</i>
North Africa	12,500,000
Ivory Coast	27,500,000
French Guinea	7,500,000
Dahomey	500,000
Gaboon and Middle Congo	50,000,000
Cameroon	20,000,000
French Guiana	17,500,000
Total	135,500,000
<i>Other Colonies</i>	
Indo-China	62,500,000
Madagascar	22,500,000
New Caledonia	500,000
Reunion	250,000
Guadeloupe	150,000
Total	85,900,000

Tanning materials of the British Empire. Part III. *Bulletin of the Imperial Institute* (London) 26: 1: 22-38.

This part deals chiefly with the fruits used for tanning materials, viz. Myrobalans, Divi-divi pods, Algarobilla pods, Teri pods, and *Acacia arabica* pods; reference is also made to Canaigre, the tubers of the Red Dock or Wild Rhubarb.

Tanning materials of the British Empire. Part IV. *Bulletin of the Imperial Institute* (London) 26: 3: 311-322.

"In this, the concluding part of this article, a number of lesser-known tanning materials are dealt with, which are not at present in commerce, but which appear to be worthy of consideration either from the point of view of export or local utilization." There is a list of references; also an index.

Yale University

School of Forestry

TROPICAL WOODS

NUMBER 18

June 1, 1929

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.

ON THE SUITABILITY OF CERTAIN EUPHORBIA-
CEOUS WOODS FOR PAPER PULP

By H. H. JANSONIUS

Handelsmuseum, Koloniaal Instituut, Amsterdam

The paper industry consumes vast quantities of timber, nearly all of which is obtained from the forests of the North. If a substantial portion of the pulpwood supply could be drawn from the tropical hardwood forests it would make possible the utilization of many of the common trees for which no market now exists and thereby greatly stimulate the practice of forestry in the Tropics.

The most important technical properties of a good pulp wood are great length of fiber, minimum content of gum and resin, and ease of pulping and bleaching. These requirements

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CONTENTS

	<i>Page</i>
On the Suitability of Certain Euphorbiaceous Woods for Paper Pulp	1
Note on <i>Pasaniopsis cuspidata</i> Kudo	3
Walnut Woods — True and False	4
Four New Trees from British Honduras	30
The Forests of Venezuela	32
The West African Abachi, Ayous, or Samba (<i>Triplochiton scleroxylon</i>)	43
John Donnell Smith	55
Identity of "Cube," a Peruvian Drug	56
Current Literature	57

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The most important technical properties of a good pulp wood are great length of fiber, minimum content of gum and resin, and ease of pulping and bleaching. These requirements

seem especially well met by a group of woods of the large family Euphorbiaceae, which I have had under investigation for the tenth and eleventh parts of *Mikrographie des Holzes der auf Java vorkommenden Baumarten*.

All of the specimens at my disposal belonging to the tribe Phyllanthae have exceptionally long libriform wood fibers. The range in length for 11 species, representing 10 genera, was found to be from 0.90 mm. to 3.30 mm., average about 2.00 mm. In several of the species the average was 2.5 mm. or more, thus comparing very favorably with the tracheids of the conifers.

These woods can be macerated in from one-sixth to one-fifth, in one instance one-twenty-fifth, of the time usually required by other woods. In this process I employ Schulze's

SIZE OF FIBERS AND RELATIVE TIME REQUIRED FOR MACERATION

Scientific name	Length mm.	Diameter μ	Wall μ	Relative time
<i>Antidesma Bunius</i>	1.5-3.0	25-32 x 28-35	4-5	1/5
<i>Aporosa microcalyx</i>	1.8-2.5	15-28 x 15-25	7-14	1/6
<i>Baccaurea racemosa</i>	2.0-3.3	20-28 x 20-25	9-10	1/6
<i>Bischofia javanica</i>	1.5-2.6	15-45 x 30-45	5-7	1/5
<i>Bridelia minutiflora</i>	1.3-1.7	15-20 x 18-20	3	1/6
<i>Cleistanthus sumatranus</i>	1.4-2.0	10-25 x 15-20	5-7	1/6
<i>Cyclostemon longifolius</i>	2.0-2.7	10-17 x 12-18	6-7	1/10
<i>Glochidion capitatum</i>	1.0-2.0	25-40 x 22-40	3-7	1/25
<i>Glochidion rubrum</i>	1.2-1.7	.....	.....	1/20
<i>Phyllanthus emblica</i>.....	.....	.....	.....	1/4
<i>Phyllanthus indicus</i>	0.9-1.8	8-18 x 12-20	4	1/20
<i>Putranjiva Roxburghii</i>	2.1-3.2	15-20	8-9	1/10

macerating solution, in which strong nitric acid is used in sufficient amount to moisten completely about equal volumes of potassium chlorate and wood. The preliminary warming, customary with other specimens, can be dispensed with in the case of most of these Euphorbiaceous samples, and, once started, the process has to be retarded by cooling. The color, even of the darkest, disappears quickly and completely and

the fiber walls are readily delignified. During maceration, chlorine is evolved, and it is interesting to note that satisfactory experiments have recently been made with chlorine in the manufacture of wood pulp.

The accompanying table contains the results of fiber measurements of the various Javanese species investigated and also the relative time required for maceration with reference to the normal for other woods. In the species of *Antidesma*, *Cyclostemon*, and *Putranjiva* the fibers are often 2.5 mm. or longer; in *Bischofia javanica* they are usually more than 2.2 mm. long and the ends are generally very short. Except in four of the species, namely, *Aporosa microcalyx*, *Baccaurea racemosa*, *Cyclostemon longifolius*, and *Putranjiva Roxburghii*, wood parenchyma is sparingly developed and the libriform fibers are finely septate. The anatomy of many woods of the tribe Phyllanthae corresponds very closely with that of the Violariaceae, Bixineae, and Samydaceae. (See note on page 611 of Vol. III of *Mikrographie des Holzes*.)

The members of the Euphorbiaceae are widely distributed throughout the Tropics of both hemispheres, but few of them are at present of industrial importance as sources of timber. The investigations made indicate that these woods are well adapted to the needs of the paper industry.

Note on *Pasaniopsis cuspidata* Kudo

This name was met with recently in connection with Japanese Oak timber; it was not familiar to me, and I failed to find a reference to the place of publication. Through the courtesy of Professor Seki, Director of the Department of Forestry, Government Research Institute, Formosa, Japan, I have received the following note on its synonymy:

- Pasaniopsis cuspidata* Kudo, Systematic Botany of Japanese Useful Trees. *Quercus cuspidata* Thunb., Fl. Jap. p. 176.
Pasania cuspidata Oersted, in Kjoebenh. Vidensk. Medel. XVIII, p. 76.
Pasania cuspidata Thunbergii Makino, Bot. Mag. Tokyo, XXIII, p. 141.
Synaedrys cuspidata Koidz., Bot. Mag. Tokyo, XXX, p. 186.
Castanopsis cuspidata Schottky, in Bot. Jahrb. XLVII, (1912) p. 625.
Litbocarpus cuspidata Nakai, Bot. Mag. Tokyo, XXIX, p. 55.

—J. BURT DAVY, Imperial Forestry Institute, Oxford.

WALNUT WOODS—TRUE AND FALSE

By SAMUEL J. RECORD

Genuine Walnut woods are exclusively the product of a single genus, *Juglans*, of the Juglandaceae or Walnut family. This is a small family and only one other member of it, the Hickory (*Carya* or *Hicoria*), is commercially important. Walnut and Hickory woods are so distinct in structure, properties, and uses that they are never confused in the trade. There are several kinds of Walnut trees, but the great bulk of the timber is supplied by two species, namely, *Juglans regia* L., the source of the Circassian, French, Italian, and English Walnut, and *Juglans nigra* L., the American Black Walnut of the eastern half of the United States.¹ Another North American species, the Butternut (*Juglans cinerea* L.), ranks a very poor third. The most promising new source of genuine Walnut timber appears to be the lower eastern slope of the Andes in South America.

Walnut is a tree of a temperate climate and its extension into the Tropics is confined to the uplands. Its natural range in the Eastern Hemisphere is limited to the North Temperate Zone and includes Japan(?), portions of China, northern India, the Himalaya region, Persia, the Caucasus Mountains, and countries adjacent to the Mediterranean Sea. The tree has been so long in cultivation for its fruit that the limits of its natural range are in doubt.

It is generally believed, following Pliny, that the early Greeks and Romans introduced it into Europe from Persia, but Professor Augustine Henry, of the College of Science for Ireland, is of a different opinion. In a letter to the writer he says: "*Juglans regia* is a European wild tree as much as it is Caucasian and Persian. It is wild in Serbia, Greece, Bosnia, and Herzegovina. I am convinced of this as I saw it in Jugoslavia truly wild. The nuts and shells are found in Switzerland in Neolithic lake dwellings. Pliny is wrong about it, and it was only a variety that was introduced from Pontus (Persia).

¹ See *Circassian walnut*, Cir. 212, U. S. Forest Service, 1913, and *Utilization of black walnut*, Bull. No. 909, U. S. Dept. Agr., 1921, Washington, D. C.

Theophrastus is clear about it. As the Latin word *nux* means Walnut, it is plain that the Romans would never have applied that simple name to anything but a native tree."

Only in the New World does the natural range of Walnut extend into and beyond the Tropics. It is an important tree throughout most of the hardwood forest region of the eastern half of the United States, and because of the value of its nuts and timber and the ease with which it is propagated, there is assurance of a perpetual supply of Black Walnut lumber, though hardly of the quality produced by the veterans of the virgin forest. There are species of Walnut in southwestern United States, the mountains of Mexico, Guatemala, Honduras, and portions of the West Indies. The distribution in South America is confined to the Cordilleras of Colombia and Venezuela and the eastern slope of the Andes as far south as Santiago del Estero in Argentina. The timber is in the local markets of Colombia and Argentina, but apparently is too rare to export in quantity, although small shipments have been made from Argentina to the United States.

Several Andean species have been described, but little is known of their range and occurrence. In 1927, Mr. Georges H. Barrel, president of Aguna Mahogany and Timber Company, Boston, published a short account of the Walnut in the Peruvian Amazon. (See *Tropical Woods* 10: 51-53, June 1, 1927.) The botanical material he collected was found by Mr. Paul C. Standley to agree best with *Juglans boliviana* Dode, and the wood sample exhibits a striking resemblance to the Black Walnut of the United States. In a letter of February 8, 1929, Mr. Barrel adds: "Walnut has recently been found to be very abundant on both banks of the Río Tambo, which, with the Urubamba, forms the Ucayali River. An affluent of the Tambo, the Río Ene, flows, I am told, through a region very rich in Walnut. The Tambo is navigable at certain seasons of the year by very small launches, but its upper reaches and those of the Ene can only be navigated by canoes. This information was given to me personally by Sr. de Castigliana, a Peruvian gentleman of Italian ancestry, who has lived in that region for over twenty years."

Mr. E. P. Sykes, vice-president of Astoria Importing and

Manufacturing Co., Inc., Long Island City, N. Y., has visited the same locality in Peru, but the only Walnut trees he saw were between the second and third ranges of the Andes. He was told by log merchants in Iquitos that they had been trying for several years to secure a consignment of Walnut, but so far without any success. He is inclined to believe that, owing to the difficulty, if not impossibility, of negotiating the many rapids and falls of the rivers, Walnut logging operations in Peru will not be practicable until such time as a railroad penetrates the country.

Walnut trees growing in the forest are tall and straight, with a long well-formed trunk, which may attain very large size; in the open or in orchards they have a short thick bole and a wide-spreading crown. The twigs are coarse and have chambered pith. The leaves are large, oddly pinnate, the leaflets fairly uniform in size. The two sexes of the flowers are borne separately on the same tree. The fruits consist of a rugose or sculptured nut with large edible kernel and fleshy indehiscent husk.

The woods vary, according to species and conditions of growth, from light and soft, as in Butternut, to moderately hard and heavy, as in Black Walnut; in color from gray to pale brown or even purplish brown, often variegated and richly striped. (See *Tropical Woods* 12: 19.) The fresh wood has a characteristic scent that is pleasant or at least not objectionable. The grain is usually straight, but may be wavy, curly, or otherwise irregular. Highly ornate veneers are obtainable from stumps, crotches, malformed trees, and especially from burls. The rays are fine and inconspicuous, the vessel lines are small but distinct, and the growth rings are plainly marked on tangential surfaces. The material is stiff and strong in proportion to its weight, of medium and uniform texture, contains no ingredient deleterious to tools or finishes, can be dried without checking or warping, finishes easily and smoothly, takes glue well, is naturally durable, and holds its manufactured form exceptionally well under trying conditions.

The uses for which such a wood is fitted are almost unlimited, but because of its comparative scarcity and high cost

Walnut is chiefly employed for furniture, cabinet-work, and gunstocks. Its use for fine furniture dates back to the days of the early Romans, and famous cabinet-makers of different periods have found it a satisfactory medium for the expression of their art. No other wood meets nearly so well the exacting requirements for gunstocks, and the maintenance of an adequate supply of genuine Walnut for this purpose is a matter of military importance. Fortunately the trees are adapted to most of the civilized portions of the earth, are easy to grow, and have the added appeal of their fruit to encourage propagation.

COMMON NAMES

General: Walnut (Eng.); Noyer (Fr.); Nussbaumholz (Germ.); Nogal, Madera de Nogal (Sp.); Nogueira (Port.); Noce (Ital.); Notenhout (Dutch); Valnod (Dan.-Norw.). (Walnut is derived from Anglo-Saxon Walhnutu, *foreign nut*; i.e., foreign to northern Europe.)

Juglans cinerea L.: Butternut, Grey or White Walnut (Eng.); Noyer Cendre (Fr.); Butternussholz, Graues Nussbaumholz (Germ.).

Juglans formosana Hayat.: Taiwan-gurumi (Formosa).

Juglans mandshurica Max.: Manchurian Walnut (Eng.); Manshû-gurumi (Jap.).

Juglans nigra L.: American or Black Walnut (Eng.); Amerikanisches Nussbaumholz, Swarnussholz (Germ.); Noce Nero (Ital.).

Juglans regia L.: Ancona, Auvergne, Black Sea, British, Caucasian, Circassian, English, French, and Spanish Walnut (Eng.); Kaukasisches (etc.) Nussbaumholz (Germ.); Akrot, Jaoz, Charmagz (Pers.); Orzech Wloski (Pol.); Gretski Aryekh (Russ.); Basilikon, Carua, Persicon (Greek); Juglans (Latin); Ko-tiao (Chinese); Birbogh (Chitral); Dun (Kashm.); Than (Pangi); Kam Khol (Kun.); Akhor, Khor (Hind.); Thircha (Burm.).

Juglans Sieboldiana Max.: Japanese Walnut (Eng.); Oni-gurumi (Jap.); Chiu, Hu-tiao (Chinese).

ANATOMY OF THE WOOD

Gross: Growth rings distinct. Pores numerous; visible; diminishing in size toward outer margin of growth ring; often in echelon arrangement; tyloses present. Vessel lines distinct. Rays very fine, inconspicuous. Parenchyma in numerous, fine, closely spaced concentric or tangential lines, independent of pores; not visible without lens. Gum ducts absent.

Minute: Growth rings terminated by thin layer of much flattened fibers and uniseriate row of parenchyma cells on outer margin. Vessel perforations simple; intervascular pits comparatively large, crowded; pit membranes not cribriform. Rays 1 to 3 cells wide and few to 70 cells high; mostly homogeneous, but sometimes more or less heterogeneous; pits into vessels small, rounded, simple to half-bordered. Parenchyma mostly in uniseriate layers;

chambered strands with crystals of calcium oxalate very common. Fibers with small, distinctly bordered pits, the aperture slit-like and extending beyond the border.

WOODS IMPROPERLY CALLED WALNUT

Walnut and Mahogany share foremost rank among cabinet woods. The public esteem in which they are held has prompted unwarranted attempts to extend these names to woods not entitled to them either by natural relationship or historical association. Many more woods have been miscalled Mahogany than Walnut, although Walnut has been more generally used and for a much greater period. Such long familiarity has in itself constituted some measure of protection against substitution, as the woods which most resemble Walnut are of tropical origin and have an exotic appearance. Their resemblance to Walnut is largely confined to color and it is perfectly safe to assume that if they were red instead of brown they would have been called Mahogany. So long as the supply of Walnut was abundant the price remained too low to make the substitution of tropical cabinet woods profitable, but now that this condition has changed, the misuse of the name will tend to become more general.

The nine woods briefly described below represent seven natural families of plants, viz., Anacardiaceae, Borraginaceae, Combretaceae, Hamamelidaceae, Lauraceae (2), Leguminosae (2), and Meliaceae. They are all useful woods, some of exceptional merit, but not one of them is closely related to Walnut or has any legitimate claim to that name. The purpose of this article is to establish their several identities and to provide a basis for distinguishing the woods.

American Red Gum or Gumwood

The timber commonly known in the American lumber trade as Gum or Red Gum, and in the furniture and allied industries as Gumwood, is the product of a single species, *Liquidambar styraciflua* L., of the Hamamelidaceae or Witch-hazel family. Architects sometimes call it Hazelwood. In the European market the heartwood is frequently sold as Satin Walnut and in England the sapwood (Sap Gum of the

U. S. A.) has been inaptly termed "Hazel Pine." The tree is widely known as Sweet Gum, because the resinous exudation from the bark is used locally for chewing gum. It should not be confused with the Black or Sour Gum and Tupelo or Water Gum (*Nyssa* spp.), or with any of the species of *Eucalyptus* that are called Gum.

Red Gum is a very important timber tree. It is widely distributed throughout the southeastern part of the United States, its northern and western boundaries being a line from Connecticut westward through the Ohio Valley to Kansas and southward through Oklahoma into Texas; it reappears on the mountains of southern Mexico and the highlands of Eastern Guatemala and Honduras. It is most abundant and of largest size in river bottoms subject to inundation in the maritime region of the south Atlantic and Gulf States and in the lower Mississippi Valley.

It is often 80 to 100, sometimes 150, feet in height, with a long smooth well-proportioned bole 2 to 5 feet in diameter. The branchlets are provided with corky wings. The bark is light gray on young trees, becoming grayish brown and deeply furrowed on old trunks. The leaves are star-shaped and 3 to 5 inches across. The fruits are spiny-looking heads about an inch in diameter, suspended on slender stalks after the manner of Sycamore or Plane Tree (*Platanus*).

The heartwood is brown or reddish brown, with a satiny surface luster, and often beautifully figured with dark markings suggesting Circassian Walnut. It is odorless and tasteless, of medium density and weight, of very fine and uniform texture, irregularly grained, and requires care in seasoning to prevent warping; quarter-sawed lumber gives the best results. It is comparatively easy to machine, does not dull tools quickly, takes a high glossy finish, is tough and strong, and offers no particular difficulties to gluing, staining, and painting. It is not durable under conditions favorable for decay.

The timber was slow in coming into general use because of early difficulties in drying the lumber. It is now employed in large quantities for a wide range of purposes, such as furniture, interior trim, doors, background of show-windows, planing-mill products, panels, and veneers for plywood, baskets,

wooden dishes, wire-bound boxes, and cooperage. It is a wood of very general utility.

Red Gum is sold under its own name in the American lumber market, but a great deal of the lumber is combined with Walnut in the production of the less expensive classes of furniture. Most manufacturers describe such furniture fully and accurately, but retail dealers and salesmen are tempted to misrepresent it to their customers as being of Walnut construction throughout. In this connection, Mr. George N. Lamb, secretary of the American Walnut Manufacturers' Association, says: "About three years ago I checked up thousands of advertisements and found only 18 per cent of the retailers' advertisements described their wood furniture fully and accurately, and 51 per cent were absolutely misleading, as they offered Gum furniture with Gum solid parts as American Walnut, genuine Walnut, etc. After six months' vigorous effort through advertising and through the National Better Business Bureau and the local Better Business Bureau, the percentage of full and accurate descriptions increased from 18 to 27, and the direct misrepresentations decreased to 43 per cent. Since then there has been considerable further improvement, but literally thousands of people buy so-called Walnut furniture that is made up of Gumwood frame parts and Walnut plywood panels."

COMMON NAMES

Trade: Gum, Gumwood, Red Gum, Hazel (U. S. A.); Red Gum, Satin Walnut (Gr. Brit.); Amberholz, Satin Nussbaumholz (Germ.); Noce Satin, Legno di Noce Satinato (Ital.); Noyer Satiné (Fr.); Satijn Noten (Hol.); Saten (Sp.).

Local: Bilsted, Copalm, Gum, Gum-tree, Red Gum, Sweet Gum, Star-leaved Gum, Liquidambar (U. S. A.); Liquidambar or Liquidamber (Mex. and C. A., general); Estoraque, Maripenda, Naba, Ocotzori, Ozocote, Ozocotl, Yaga-bito, Yaga-bizigni (Mex.); Goma Colorada (Arg., introduced).

ANATOMY OF THE WOOD

Gross: Growth rings indistinct. Pores very numerous, crowded; uniformly distributed; not visible without lens. Vessel lines indistinct. Rays very fine and inconspicuous. Parenchyma invisible with lens. Vertical gum ducts occasionally present in peripheral row.

Minute: Vessel perforations scalariform, with many bars; overlapping tips spiral; intervacular pits often scalariform. Rays 1 or 2 cells wide, few to 30

cells high; heterogeneous; pits into vessels small, simple to half-bordered. Parenchyma sparingly developed; not in lines. Pits in wood fibers small, bordered.

African "Walnut"

The West African timber commonly known in the trade as African Walnut is apparently without question the product of *Lovoa Klaineana* Pierre, of the Meliaceae or Mahogany family. It is the only species of the genus listed by Hutchinson & Dalziel in their *Flora of West Tropical Africa* (Vol. I, pt. 2, p. 493. London, 1928).²

The tree grows scatteringly or in small clumps in the high forest from Sierra Leone to Gaboon. It is medium-sized to large, sometimes 120 feet tall, with a well-formed slender bole occasionally 4 feet or more in diameter above the comparatively low buttresses. The bark is thin, smooth, or somewhat scaly on very old trees, dark brown on the surface and dark red within, resinous, and pungently scented. The leaves are large and pinnately compound, with a slightly winged rachis and 5 or 6 pairs of nearly opposite leaflets, the largest of which are 8 inches long and 2 inches broad. The greenish white flowers are very small, numerous, and borne in large lax clusters. The fruit is a scented 4-valved quadrangular capsule, about the size of one's little finger, the valves very thin and deciduous, each covering 4 superposed long-winged seeds whose wing tips are attached to the summit of the columella.

African "Walnut" was introduced into the British market

² Nine species have been described, namely: *Lovoa trichilioides* Harms (1896), from Congo; *L. Klaineana* Pierre (1906), from Gaboon; *L. budongensis* Sprague (1906), from Budongo Forest, Uganda; *L. brachysipbon* Sprague (1906), from Toro Dist., Uganda; *L. Brownii* Sprague (1906), from Entebbe, Uganda; *L. Pynaertii* De Wild. (1908), from Congo; *L. Swynnertonii* E. G. Baker (1911), from Gazaland; *L. angulata* Harms (1917), from Cameroon; *L. Mildbraedii* Harms (1917), from Cameroon.

The largest tree seems to be *Lovoa Swynnertonii*, known as Brown Mahogany to the settlers in the high country between Eastern Rhodesia and Portuguese territory. According to Swynnerton (*Journ. Linn. Soc. London* 40: 5, 40), a fallen specimen measured 170 feet, "and its smaller twigs, had they been present, would have added at least another 15 feet to its height." The maximum diameter recorded by him was 8 feet.

by Mr. Alexander Howard about 1890. In his well-known book, *Timbers of the World* (London, 1920, pp. 304-305), he says: "This wood is shipped, usually mixed with consignments of Mahogany, from all the ports on the West African coast. The logs are generally of large sizes, 8 to 30 feet long and 18 to 40 inches square, and are at times of even larger dimensions. They are also received in the round, either with or without the bark. The wood only resembles Walnut in its color and by the fact that it shows the same streaks or veins which are prominent in the true Walnut (*Juglans regia*). This is probably the reason why the incorrect term of Walnut has been applied to it in the timber trade. In all other respects, such as formation, grain, weight, texture, and figure, it resembles African Mahogany. The logs vary in character, those from Cape Lopez being almost entirely plain and straight-grained, while from Benin and Lagos the larger portion of the wood is strongly marked with stripes or roe, which, though sometimes straight, is more often broken up into an irregular growth showing black lines which curve and twist into fantastic shapes. These form what is termed 'blister' or 'snail' figure, while other unusual markings also occur. The color is somewhat similar to that of French Walnut, but is more variable; sometimes the wood is of a darker brown, but it nearly always has a golden tinge. By careful selection a yellowish brown golden tint can be obtained which is quite unique. It is easily worked and is not wasteful in conversion, as is most European Walnut. The logs provide long lengths and good widths free from defect, so that without difficulty panels can be obtained up to 2 feet 8 inches and even 3 feet in width. . . . Only a small portion of the logs provide sufficiently handsome timber for decorative work, and it should not be assumed that the name of African Walnut alone will ensure a satisfactory result, that being only obtained by careful selection."

Complete information regarding the consumption of African "Walnut" is not available. Aubreville (see *Tropical Woods* 17: 64-65, March 1, 1929) says that the annual production in Ivory Coast is between 400 and 500 tons; this is equivalent to 20,000 to 25,000 cu. ft. According to Meniaud

& Bretonnet,³ the approximate annual production in Gaboon is 600 cubic meters (= 21,000 cu. ft.), the possible, 8000 cu. m. The imports into Liverpool and London amounted to 27,175 cu. ft. in 1926 and 45,639 cu. ft. in 1927, mostly from Nigeria and Gold Coast. J. F. Müller & Sohn, Hamburg, report imports of 285 tons in 1927 and 450 tons in 1928.

African "Walnut" is well known in the United States, but the amounts used are not great. Mr. Ralph D. Sawyer, vice-president of Palmer & Parker Co., Boston, says: "There is an increasing demand for this wood at present and we are selling the veneer to the makers of the cheaper grades of furniture, who are using it for face veneer, as it has a very good Mahogany-stripe figure and takes a good Walnut or Mahogany stain."

Mr. T. R. Williams, of Ichabod T. Williams & Sons, New York City, says: "My acquaintance with this timber dates back to about 1902. In the year following I personally manufactured between 50,000 and 60,000 feet, which we sold to a furniture manufacturer. We purchased the logs in England as African Walnut, but we sold it under the names of Tigerwood and Congowood. The wood seemed to lose favor about 1906 or 1907 and little was imported until during the last year or so, when the demand materially increased, the buyers specifying African Walnut."

COMMON NAMES

Trade: Alona Wood or Lova Wood (proposed); African Walnut, Tigerwood, Congowood (U. S. A.); African or West African Walnut, Benin Walnut (Gr. Brit.); Noyer d'Afrique, Noyer du Gabon, Acajou Noir (Fr.); Afrikanisches Nussbaumholz or Nussholz (Germ.).

Native: Dibétou, Mutchibanaye (Ivory Coast); Akwantanuro, Dubini Blay, Kwantanuro, Kwantenura, Mpengwa, Pebedum, Pepedom (Gold Coast); Abuwe, Anamomilla, Apobo, Apopo, Ikwahobo, Sida (Nigeria); Alone, Dilobo, Dominguil, Dougonienguéla, Ébey, Ombéga, Ombolowbolo (Gaboon); Mukongoru, Mutunguru (Kenya Colony); Enonee.

ANATOMY OF THE WOOD

Gross: Growth rings absent or very poorly defined. Pores numerous;

³ JEAN MENIAUD and FRÉDÉRIC BRETONNET: *Les bois coloniaux d'Afrique dans l'industrie*. Paris, 1926, p. 74.

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ANATOMY OF THE WOOD

Gross: Growth rings absent or very poorly defined. Pores numerous;

³ JEAN MENIAUD and FRÉDÉRIC BRETONNET: *Les bois coloniaux d'Afrique dans l'industrie*. Paris, 1926, p. 74.

visible; uniform in size and distribution; occurring singly or in radial groups of 2 or 3; tyloses absent. Vessel lines distinct; gum specks visible with lens. Rays very fine, inconspicuous. Parenchyma sparingly developed; scarcely visible with lens; not in concentric lines. Vertical gum ducts sometimes present as result of injury.

Minute: Growth rings usually present, due to differences in thickness of wall and size of fibers. Very small pores often in association with larger ones. Vessels with simple perforations; intervascular pits minute, crowded; gum plugs abundant. Rays 1 to 4, mostly 3, cells wide and up to 30 cells high; homogeneous; pits into vessels minute, resembling the intervascular. Parenchyma sparingly diffuse and paratracheal, occasionally connecting two neighboring pores but not forming long lines; chambered strands with crystals of calcium oxalate common. Fibers with small simple pits; non-septate.

Material: Yale Nos. 4119, 12,474, 12,837, 12,979.

Australian or Oriental "Walnut"

The most recent addition to the American market of so-called Walnut woods is from Queensland, Australia. It appears to have been first introduced in 1927 by Russell Fortune of Indianapolis, Ind., and has since become a serious competitor of American Walnut. It is known to the trade as Oriental Walnut, Oriental Wood, Australian Walnut, Australian Laurel, and Queenswood. According to the best information available, this timber is the product of *Endiandra Palmerstoni* (Bail.) C. T. White (= *Cryptocarya Palmerstoni* F. M. Bailey), of the Lauraceae or Laurel family. It is therefore related to the Imbuia of southern Brazil. It occurs in the rain forests of northern Queensland, especially in the Cairn district. Baker⁴ says it is a tree of large size, attaining a height of over 100 feet; its leaves alternate, 4 to 5 inches long, and about 2 inches broad; the fruit about 2½ inches in diameter, with a hard and brittle pericarp enclosing a round free nut more than an inch thick.

Mr. M. B. Welch, of the Technological Museum, Sydney, states in a letter of November 11, 1928: "The timber is known on the Sydney market as Queensland Walnut; it is also known as Walnut Bean in Queensland. So far it has not gained favor to any great extent in New South Wales, chiefly because it is

⁴RICHARD T. BAKER: *The hardwoods of Australia and their economics*. Sydney, 1919, p. 339. See also E. H. F. SWAIN: *The timbers and forest products of Queensland*. Brisbane, 1928, pp. 238-242.

difficult to mill or saw. The trouble is apparently due to a high silica content which causes the saws and cutters to heat up and become dull readily. Two ash analyses made in Brisbane showed an amount of SiO₂ equal to nearly 1 per cent of the dry weight of the wood. The difficulty in sawing is said to have been overcome by using saws with fewer teeth and keeping them cool with a plentiful supply of water. There is no trouble in slicing veneers. The wood frequently possesses a rather unpleasant leathery smell. It polishes well and, once dry, stands excellently. The whole of the interior fittings in a very large department store just completed in Sydney are of Queensland Walnut and present a very attractive appearance."

The Imperial Institute (*Descriptive list of some Empire timbers*, London, 1928, pp. 11-12) reports as follows: "Queensland Walnut: A moderately heavy timber of a pale chocolate-brown color, somewhat open in the grain and often presenting a fine wavy figure; a streaked figure sometimes occurs. The wood seasons rapidly, works well under the tool, planes to a smooth surface and takes a good finish and polish. Weight, 46 lbs. per cu. ft. An excellent substitute for American Walnut. It is well suited for high-class furniture, cabinet work, joinery, and interior decorative purposes, and is suggested for the manufacture of aircraft propellers. The streaked timber is valued for veneer, which is well suited for shop-window and other panelling. Queensland Walnut would be useful for many purposes where a strong timber of good appearance is required."

In reply to an inquiry, the head of an important firm of timber dealers in England wrote in March 1929: "Up to the present time the demand for this wood in the English market has been negligible, but there seems to be a little more liveliness at present. I consider it a nasty wood with a vile smell, and which, so far as this climate is concerned, will not stand well in the solid; but for all that it may take on presently."

According to a leaflet issued by C. H. Pearson and Son Hardwood Co., Inc., New York City: "The wood arrives at this market in round log form, 36 inches and up in diameter, and from 10 to 14 feet in length. All of the logs contain from 3 to 4 inches of sap. The wood is hard, strong, and durable,

and can be easily worked, although it has a tendency to dull tools. It has a close texture and can be easily polished. The color varies from a grayish to a brownish tone with a pinkish cast. Some logs have beautiful gray stripes in contrast with the pinkish cast. In Australia it is used for construction purposes, boat-building, etc., while in this country its principal use is for veneers, although many thousands of feet have gone into lumber for interior trim, etc."

Mr. T. R. Williams says: "We find that the logs of Oriental Wood or Queenswood run 30 inches or more in diameter. The sapwood, which is 3 to 4 inches thick and of about the color of Maple, is hard on our saws and tools. We have experienced no difficulty, however, in milling the dark-colored portion of the timber."

Mr. Karl Schmiege, recognized authority on cabinet-making and design, says: "Queenswood is a remarkably fine wood, which runs very sound and uniform, keeps straight, takes glue well, and can be readily stained and polished. It has a greenish yellow tinge and dark stripes, suggesting French Walnut more than the others, and is appropriate for use in combination with Ash, Oak, or any kind of Walnut. We have not used it in solid lumber, but have recently made a 'modern' bedroom set to serve as a model for 400 others for a hotel, and all of the surfaces, such as end panels, tops, and drawer fronts, are of Queenswood veneer. I consider the wood suitable for 'modern' interiors of offices, clubs, and hotels. The price at present is very reasonable."

Exact figures regarding the imports of this timber into the United States are not available. Mr. George N. Lamb estimates the amounts as follows: 1927, about 450 logs; 1928, about 1250; total 1700 logs. Assuming an average per log of 600 board feet (Doyle-Scribner measurement), this amounts to a little over one million feet. On a basis of 17 feet of veneer to the board foot, log measure, the total amount of veneer obtainable from these logs would be 17 million feet. Mr. Lamb thinks that the imports for 1929 will be between 5000 and 6000 logs; using the same converting factors, the amount of veneer obtainable from them would be from 50 to 60 million feet.

COMMON NAMES

Trade: Australian Laurel, Queenswood, Australian or Oriental Walnut, Oriental Wood (U. S. A.); Queensland Walnut (Gr. Brit.).

Local: Walnut, Black or Queensland Walnut, Walnut Bean (Australia).

ANATOMY OF THE WOOD

Gross: Growth rings usually indistinct; terminated by fine line or lines of parenchyma; sometimes indicated by differences in color. Pores fairly numerous; visible; uniform in size and distribution; solitary or in radial pairs; tyloses abundant. Vessel lines distinct; gum deposits infrequent. Rays fine; distinct but not conspicuous on radial surface. Parenchyma visible; in concentric lines, sometimes close together, but usually distant and apparently terminating growth rings.

Minute: Vessel perforations simple; intervascular pits comparatively large, crowded. Rays 1 to 4 cells wide and up to 30 cells high; heterogeneous; pits into vessels large, irregular, simple; large oil cells absent. Parenchyma sparingly developed about vessels; mostly in distant concentric lines; oil cells absent; crystals of calcium oxalate uncommon. Fibers with small simple pits; sometimes filled with gum.

Material: Yale Nos. 2619, 3097, 3097A.

Imbuia of Southern Brazil

Imbuia, or Embuia, one of the best known hardwood timbers of southern Brazil, is used in the United States to a limited extent as a substitute for Walnut, and is sometimes sold as Brazilian Walnut. The trees, which attain large dimensions, grow in association with the Paraná Pine (*Araucaria brasiliana*) and are the source of much of the wood used in that region for making fine furniture. According to Mr. Karl Schmiege (*Tropical Woods* 5: 3), Imbuia can be selected for color to match any kind of Walnut, is suitable for reproductions of period furniture made of Walnut, and "is today practically the only wood obtainable in large planks so much needed for heavy carved work, such as table trusses and chair legs." The export trade is not very large, amounting to only a few hundred tons a year, but as the wood becomes better known there is likely to be a considerable demand for it in the United States and Europe.

The exact botanical status of Imbuia has, until very recently, remained undetermined. A study of the wood left no doubt in the writer's mind that it belonged to the Lauraceae

or Laurel family (see *Timbers of Tropical America*, pp. 179-180) and this opinion was confirmed by collections of wood and sterile botanical material in 1918 by Dr. H. N. Whitford, who provisionally identified the specimens as *Nectandra* sp., though they could not be matched at the Gray Herbarium. This was in agreement with the opinions of such Brazilian authorities as Löfgren, Teixeira da Fonseca, and others, although Corrêa (*Flora do Brazil*, p. 38) refers Imbuia to *Bignonia paranaensis* (?) of the family Bignoniaceae.

As repeated attempts by letter to obtain fertile botanical material or definite information as to the identity of the Imbuia proved unavailing, the matter was personally brought to the attention of Mr. Auguste Chevalier last June as he was leaving Paris on a scientific mission to Southern Brazil. In September, under the auspices of the Polytechnic School of São Paulo, he visited the region of Ponta Grossa, Paraná, but the flower buds of the Imbuia had not yet opened. He accordingly marked a tree and some weeks later, through the courtesy of Dr. Paulo da Silva Leitão, obtained herbarium specimens of it in full bloom. He was able to match these in the herbarium of the National Museum at Rio de Janeiro with a specimen collected by Sellow and labeled *Oreodaphne porosa* Nees.

Upon returning to the National Museum of Natural History in Paris, Mr. Chevalier found his material in full agreement with two specimens from São Paulo collected by Gaudichaud in 1832 and labeled by Mez, *Pboebe porosa* Mez. This species, for which Sellow and Gaudichaud's specimens furnished the type, is synonymous with *Oreodaphne porosa*. The correct scientific name for the Imbuia of southern Brazil is thus determined as *Pboebe porosa* (Nees) Mez. The indications are that the different sorts recognized in the trade represent individual variations in color and grain within the single species.

Pboebe porosa, according to Mr. Chevalier, grows in the moist forest of the States of Paraná and Santa Catharina, mostly at altitudes between 2500 and 4000 feet. It is usually in mixture with *Araucaria brasiliiana* and Maté (*Ilex paraguayensis*), and forms about 20 per cent of the stand. It attains at

maturity a height of 115 to 130 feet and a diameter of over 6 feet. Although evergreen, it sheds most of its old leaves at the time of the appearance of the new ones in August and September. The leaves are characterized by having on the under side little 2-lipped pockets (domatia) in the axils of the median and certain secondary nerves; hence the significance of the specific name *porosa*. These domatia are inhabited by minute insect parasites. The inflorescences are groups of cymes, terminal at first, but becoming lateral through the extension of the vegetative shoots. The fruits mature in January and fall to the ground where they provide mast for swine. Many of the fruits are aborted into spherical insect-galls the size of a large pea and persist on the branches until the next flowering season.⁵

The wood of Imbuia varies from yellowish or olive to chocolate-brown, either plain or beautifully variegated and figured; the luster is satiny. It has a spicy resinous odor and taste, not very pronounced in dry material. It is moderately hard and heavy; sp. gr. (air-dry) 0.70 to 0.76, weight 43 to 47 lbs. per cu. ft.; grain variable from straight to wavy or curly; texture rather fine; strong, easy to work, finishes smoothly, takes a high natural polish, holds its place well when manufactured, and is durable. It is said that the fine sawdust is irritating to the skin of some workmen.

The writer is indebted to the Najer Lumber Company, Long Island City, N. Y., for the following information received about four years ago: This firm is distributing approximately 200,000 board feet of Imbuia or Brazilian Walnut annually. The first shipment of importance reached the United States about 1918 and amounted to 100,000 feet, although occasional small lots had come in mixed shipments before that time. In the States of Paraná and Santa Catharina and also in the cities of São Paulo and Santos, Imbuia is the most important wood for high-grade flooring, furniture, interior trim, and fixtures. Exports have been small in the past as the local demand for the lumber has been about equal to the supply. The logs are

⁵ AUG. CHEVALIER: Sur l'origine du bois d'imbuia du Brésil et sur la biologie de l'arbre producteur, le *Pboebe porosa* Mez, de la famille des Lauracées. *Comptes Rendus des Seances de l'Académie des Sciences* (Paris) 187: 1153, Dec. 10, 1928.

shipped to mills in the cities where they are sawed by frame saws of small capacity. Lumber is not carried in stock, being supplied direct from the saw to purchasers who select the logs and have them cut to order. An American band mill at Tres Barras, Santa Catharina, operating in Paraná Pine, accumulates about a million feet of Imbuia a year. This lumber is shipped by rail about 200 miles to San Francisco du Sul, a small open harbor, and lightered to vessels beyond the bank in the open sea. Coffee is the only other commodity exported and sailings are very irregular.

COMMON NAMES

Trade: Imbuia (Brazil); Imbuia, Embuia, Brazilian Walnut (U. S. A.).
Vernacular: Embuia, Embuia Amarella, Embuia Vermelha, Embuya, Imbuia, Canella Imbuia, Canella Imbuia Clara, Canella Imbuia Escura (Brazil).

ANATOMY OF THE WOOD

Gross: Growth rings usually distinct, due to differences in density. Pores small, barely visible; fairly numerous; uniformly distributed; occurring singly or in radial pairs or flattened groups; tyloses absent. Vessel lines fine and not conspicuous. Rays very fine; distinct only on radial surface. Parenchyma not distinct with lens; not in concentric lines.

Minute: Vessels with simple perforations; intervacular pits comparatively large, numerous. Rays mostly biseriate and under 25 cells in height; heterogeneous in part; pits into vessels large, irregular, and simple; oil cells absent. Parenchyma sparingly developed about vessels and diffuse; large, greatly elongated oil cells with yellowish contents common. Fibers with small simple pits.

Material: Yale Nos. 3292, 3294, 3318, 3893-3896, 4884.

Cordia Woods

Cordia is the name of a large genus of tropical and subtropical trees and shrubs belonging to the Borraginaceae. Most of the members of this family are rough-leaved herbaceous plants, among which are such well-known kinds as Heliotrope, Forget-me-not, Hound's-tongue, Gromwell, etc., but there are no common trees in the United States or Europe to which *Cordia* is closely related. The early Egyptians used the wood of the Sebestan Plum, *Cordia Myxa* L., a medium-sized tree native to Egypt, Persia, Arabia, India, and the Malay Peninsula. The writer identified as this species an Egyptian head-rest (Tarkhan, Dynasty IV-V, 2900-2600

B.C.), which for over 45 centuries preserved the characteristic appearance and mealy-gold luster of the wood as known to-day.

Cordia is more abundantly represented in the Tropics of the New World than elsewhere, and the trees occur from southern Florida and Mexico to southern Brazil and northern Argentina. As stated in *Timbers of Tropical America* (p. 516): "The woods exhibit much variation in density and color, but have certain characteristics which make them readily recognizable. The rays are very distinct on tangential surface, the texture varies from moderately to decidedly coarse, the surface of the wood looks mealy and dull or of a golden luster, depending upon the angle of vision. The color varies from grayish yellow or yellowish brown to dark brown variegated with black. The range in density is from light, soft, and spongy to decidedly hard and heavy, the densest being also the darkest."

The timber of the various species is well known locally. The lighter grades serve for carpentry and general construction where resistance to decay is not an important factor, while the dark-colored kinds are used for durable construction and for the same purposes as Walnut. A good example is the Argentine Peterebí, which is used in general construction, vehicle manufacture, door and window frames, and is considered one of the best furniture woods in the country.

The Central American species of *Cordia* are commonly called Laurel (Salmwood in British Honduras) and two principal kinds are recognized, viz., Laurel Blanco and Laurel Negro. The names refer to the color of the heartwood, and as repeated attempts by the writer to get the trees distinguished in the forest have proved unsuccessful he is inclined to believe that the differences in color may be due to the age of the tree or to peculiarities of growth. Laurel Blanco is light-colored throughout, is not scented, and, while fairly resistant to termites, will not stand exposure long. In Laurel Negro the sapwood is nearly white, the heartwood dark brown, with a spicy scent; it is considered preferable in every way. The principal species involved seems to be *Cordia alliodora* (R. & P.) Cham. (See *Tropical Woods* 7: 15; 10: 16; 14: 25.) The harder and heavier type of timber, with more black in the heartwood, such

as the Ziricote of southern Mexico, is produced by other species such as *Cordia dodecandra* DC.

There are several kinds of *Cordia* in Brazil, and in the southern part of the country they are generally known as Louro. In the Amazon region, the principal species is the Frei Jorge or Freijo, *Cordia Goeldiana* Huber, closely related to *C. alliodora*. According to Huber (*Bol. Mus. Goeldi* 6: 90) it is a large tree in the high forest along the right-of-way of the railway between Belem (Pará) and Bragança, and probably elsewhere. He says (*l. c.*, p. 201) that the wood is highly appreciated, particularly for cooperage. In this connection an American consul reported in 1925 that its importation into Portugal for the manufacture of staves had declined owing to the poor quality of timber received and to the fact that it imparts a flavor to wines. (See *Tropical Woods* 4: 11.) Le Cointe (*L'Amazonie Brésilienne*, II, p. 25, Paris, 1922) says that the wood is of good quality, easy to work, much used in Belem (Pará) for carpentry and joinery, and in place of Teak in naval construction.

Freijo has been on the United States market in small quantities for several years. The writer's first acquaintance with it was during the War when a specimen of so-called South American Walnut was submitted for identification by a manufacturer of airplane propellers. Since then he has occasionally encountered it under the names of Brazilian Walnut and Jenny Wood. Mr. Karl Schmieg has used this timber with success. He says (*Tropical Woods* 9: 1): "The *Cordia* Wood or Jenny Wood 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 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."

The exports of Freijo, according to *Commercio exterior do Brasil*, are as follows:

Year	Tons	Value
1924.....	2,214	\$62,395
1925.....	2,414	\$62,421
1926.....	2,836	\$77,398

COMMON NAMES

Trade: Brazilian Walnut, *Cordia* Wood, Jennie or Jenny Wood (U. S. A.); Freijo, Frei Jorge (Brazil). (For list of names of other species see *Timbers of Tropical America*, pp. 517-518, 520.)

ANATOMY OF THE WOOD

Gross: Growth rings distinct to indistinct; sometimes limited by parenchyma, sometimes indicated by differences in density, in color, and in size of pores. Pores rather small, but visible; numerous; fairly uniformly distributed, occurring singly or in small groups; sometimes diagonally or concentrically arranged in outer portions of rings; mostly closed with tyloses. Vessel lines rather coarse, but not conspicuous. Parenchyma about pores and sometimes uniting them laterally or in tangential lines of variable length; fairly distinct on moist cross section. Rays distinct on cross section, conspicuous on radial. Vertical gum ducts sometimes present as result of injury.

Minute: Vessels with simple perforations; intervascular pits very small, crowded. Rays large, up to 7 cells wide and 100 or more high; decidedly heterogeneous, most of the cells square or upright; pits into vessels resemble the intervascular. Fibers with small simple pits.

Material: See *Timbers of Tropical America*, pp. 518, 521.

East Indian "Walnut"

The timber known in England as East Indian Walnut is the product of the Siris Tree, *Albizia Lebbek* Benth., and probably related species also, of the Leguminosae or Bean family. Troup (*Silviculture of Indian Trees*, Oxford, 1921, p. 467) says: "The tree has been so extensively planted in gardens, along roadsides, and in other places, from which it has probably run wild, that its natural habitat is difficult to determine. It is believed to be wild in the sub-Himalayan tract, Bengal, Chota Nagpur, the Indian Peninsula, Burma, and the Andaman and Cocos Islands. . . . It is a tree of the mixed deciduous forests, in both dry and moist types, or of moist semi-evergreen or even evergreen forest, usually occurring scattered and not gregariously."

It is a medium-sized to large deciduous tree, with a long straight trunk in the forest, but short-bodied and spreading when grown in the open. The rough, irregularly cracked bark is dark gray or brownish on the surface and red or crimson within. The leaves are pinnately compound, with numerous leaflets. The masses of yellowish white flowers have a rather heavy fragrance. The fruits are flat, straw-colored, many-seeded pods, 8 to 12 inches long, which may hang on the tree for months and which rustle in the breeze with a characteristic sound that has been likened to the sizzling of frying meat.

Howard (*Timbers of the World*, p. 306) says of the timber: "It is a hard, dense, close-grained wood of a dark brown color, with black and gray streaks. It usually has a curly, wavy grain, often containing the characteristic figure of Mahogany, which is commonly called roe or mottle; it sometimes has a very pronounced and strongly marked fiddle mottle. When planed it has a fine, glossy and rather lustrous surface. It is imported in logs hewn square, in lengths of from 8 to 20 feet and in squares from 16 to 30 inches, with waney edges. . . . A small quantity has been used for decorative furniture work in England, but it is not yet very generally known or appreciated. It has been used very effectively for parquet flooring. . . . In America it has been largely used for decorative work and furniture, especially by the Pullman Car Company in coaches, restaurants, and smoking carriages, where it presents a very handsome appearance. In that country, however, it is known by the name of Koko and Laurel Wood. It is especially adapted for use in veneering, and it is a good wood for turnery. With the growing scarcity of European Walnut it should become much appreciated for decorative work in England, as it possesses high-class qualities similar to that wood. It is not, however, suited to some of the purposes to which European and American Walnut is put; for rifle stocks, for instance, it is too hard, brittle, and heavy. For this purpose the product of *Albizzia procera* is more suitable. In working the timber . . . it has been sometimes found that the dust causes the workmen to sneeze."

The present demand for this wood in the United States is small. It is generally sold under the name of Koko and is used for veneering.

COMMON NAMES

Trade: East Indian Walnut (Gr. Brit.); Koko (U. S. A.); Ostindisches Nussbaumholz (Germ.); Legno di Noce Indiano, Legno di Sirsa (Ital.).

Vernacular: Bage, Chichola, Dirasanam, Harreri, Kal Baghi, Kalsis, Kokko, Koko, Kokoh, Serla, Shirish, Sirai, Sirin, Siris, Sirisha, Sirsa, Sirsul, Tantai, Vagai (India); Cotton-varay (Coromandel); Langil (Phil. Is.); Ki Tokè, Tarisi, Tekik (Java); Acacia Amarilla, Amor Platonico, Thibet Tree, Women's Tongues (Porto Rico); Barba die Jonkeman (D. W. I.); Algarroba de Olor, Aroma Francesa, Cabellos de Angel, Faurestina, Forestina (Cuba); Singer Tree, Whistling Bean, Woman's-tongue Tree (Bahamas); Cha-cha, Tchiatchia, Woman's-tongue (Haiti); Bois Noir (Guad.).

ANATOMY OF THE WOOD

Gross: Growth rings poorly defined; sometimes indicated by small differences in color and density. Pores rather large, very distinct because of parenchyma halos; not very numerous; uniformly distributed; occurring singly or in small radially flattened groups; gum deposits common. Vessel lines coarse and conspicuous. Parenchyma in oblong or diamond-shaped patches about the pores and pore groups, sometimes uniting them into irregular chains; usually very distinct; occasionally partially terminal. Rays minute.

Minute: Vessels with simple perforations; intervacular pits rather large, crowded; pit membranes cribriform. Rays mostly biseriate and less than 15 cells high; homogeneous or nearly so, the cells rather large; pits into vessels resemble the intervacular. Parenchyma coarse-celled. Wood fibers with very small simple pits.

Material: Yale Nos. 890, 1851, 3780, 13,937. (The structure of *Albizzia procera* is similar to the preceding.)

Guanacaste of Middle America

The name Guanacaste is derived from a Nahuatl Indian word meaning "ear-tree," and refers to the characteristic ear-shaped seed pods. The scientific name for the tree is *Enterolobium cyclocarpum* (Jacq.) Gris., and it belongs to the Leguminosae or Bean family and is related to the so-called East Indian Walnut. The timber entered the market of the United States about 1910 and for a while found considerable favor in the cities of the Pacific Coast for paneling and interior trim. It was promoted for a time under the name of Juana Costa Mahogany. It is sold in small quantities in New York under the name of Genizero, Pichwood, Conacaste, and South American, Central American, or Mexican Walnut. There is a closely related species in southern Brazil and Argentina, *Enterolobium Timbouva* Mart., known as Timbó and Tim-

boúva, which supplies some timber for local use, but it is not exported.

The Guanacaste is a large tree, usually with a wide-spreading crown and rather short, forked bole without buttresses. The crotches are the source of figured wood used in matched panels. The heartwood is brown, with various shadings, sometimes with a reddish tinge. It varies in consistency from light, soft, and spongy to rather hard and heavy. The solid dry wood is unscented, but the dust arising in working the material has a disagreeable pungent odor and is said to be poisonous to some workmen. The timber is usually easy to work, finishes smoothly, holds its place well, and is fairly durable. It is a useful wood, but can hardly be classed as a high-grade cabinet wood.

COMMON NAMES

Trade: Conacaste or Guanacaste, Genizero or Jenisero, Juana Costa Mahogany, Pichwood; Central American, Mexican, or South American Walnut (U. S. A.). (For list of vernacular names of this and related species see *Timbers of Tropical America*, p. 206.)

ANATOMY OF THE WOOD

Gross: Growth rings absent or indicated by differences in color and density. Pores rather large; very distinct because of parenchyma about them; uniformly distributed, occurring singly or in compressed radial groups. Vessel lines distinct to conspicuous. Parenchyma about pores and pore groups, sometimes uniting them into irregular patches or diagonal chains; conspicuous. Rays very fine and inconspicuous.

Minute: Vessels with simple perforations; intervascular pits rather small, crowded; pit membranes cribriform. Rays 1 to 3 cells wide and up to 25 cells high, the cells very small; homogeneous; pits resemble the intervascular, though somewhat larger and more elongated. Parenchyma coarse-celled. Wood fibers with small simple pits.

Material: Yale Nos. 1526, 3706, 8917, 10,275, 10,640.

Noyer du Mayombe (Congo Walnut)

Noyer du Mayombe is the name applied in France to the dark-colored heartwood found in certain trees of the Limbo, *Terminalia superba* Engl. & Diels, of the family Combretaceae. According to a French official leaflet,⁷ from which most of the

⁷ *Nos bois coloniaux: Limbo*. Pub. by Association Colonies-Sciences et Comité National des Bois Coloniaux, 44 Rue Blanche, Paris, 1928.

following information is obtained, this species occurs rather scatteringly in Cameroon, but is abundant in the Congo, where it comprises as much as 60 per cent of the stands on alluvial plains and mountain valleys. It is at its best where there is a pronounced dry season. The wood is said to be different from the Fraké, *Terminalia altissima* Chev., of the Ivory Coast and Cameroon.⁷

The Limbo is a very tall tree, frequently from 100 to 140 feet and sometimes 160 feet in height, with a slender cylindrical bole usually 3 to 4, rarely up to 6, feet in diameter above the wing-like buttresses which may reach a height of 15 to 20 feet. The clear trunks are long enough to yield from 4 to 6 16-foot logs, with very little taper. The light gray bark is broken into long plates by vertical and horizontal fissures; the slash is pinkish and there is no latex. The compressed crown is composed of rather short heavy branches and dense foliage, the latter absent during the dry season. The simple entire glossy leaves, with long flexible petioles, are clustered at the ends of the twigs. The numerous small greenish flowers are in simple axillary racemes. The fruit is a samara, about $\frac{3}{4}$ in. long, with a lateral spread of wing of $1\frac{1}{2}$ to 2 in.; these samaras are usually borne in profusion.

The wood of the Limbo is ordinarily light-colored throughout, being yellowish or pale olive. The dark-colored heart is brownish and satiny, variegated with irregular streaks and markings of dark brown or black, suggesting Circassian Walnut. This figured wood is irregularly distributed, being generally associated with injuries or abnormalities of growth; the more gnarly the trunk the greater the proportion of figured wood. The wood has a sp. gr. ranging from 0.45 to 0.65; weight 28 to 40 lbs. per cu. ft. The light-colored material is tough and strong and the best quality, called Chêne Limbo, is suitable for many of the same purposes as Oak. The dark-

⁷ According to Hutchinson & Dalziel (*Flora of West Tropical Africa* Vol. I, pt. 1, p. 226), *Terminalia altissima* Chev. is a synonym for *T. superba* Engl. & Diels, which is credited with a range extending from French Guinea to Angola. Meniaud & Bretonnet (*Les bois coloniaux d'Afrique dans l'industrie*. Paris, 1926, p. 48) say that in the Congo some trees with walnut-brown heartwood are called Limbo, Fraké Limbo, or Noyer Limbo.

colored wood, Noyer du Mayombe, is more brittle and is used as face veneers for furniture and cabinet work and is suitable for foundry patterns. It is said to be a good substitute for American and French Walnut and is consumed in considerable quantities, particularly in Belgium and France. Germany imported 340 tons of it in 1927 and 200 tons in 1928, according to J. F. Müller & Sohn. The timber has been on the market for about 20 years and is exported from the ports of Boma, Chiloango, and Kouilou. According to Meniaud & Bretonnet (*l. c.*, p. 85) the annual production of Noyer du Mayombe in the French colonies is about 200 cu. meters; possible maximum, 5000 cu. meters.

COMMON NAMES

Trade: Noyer du Mayombe, Fraké Limbo, Noyer Limbo (France); Limbo-Nussbaumholz (Germany). Light-colored wood: Limbo or Limba, Chêne Limbo, Limbo Blanc (France); Limba Noir (Belgium).

Native: Limba, N'Limba, Moulimba, N'Dimba, Ngotto (French, Portuguese, and Belgian Congo). Other names for Fraké (Agni) are: Fram (Bondoukou), Pai (Abé), Eeendi (Douala), Yara, Yassa, Akom (Bakoko).

ANATOMY OF THE WOOD

Gross: Growth rings indicated by slight differences in density, but usually not very distinct to unaided eye. Pores rather large, readily visible; fairly numerous; uniformly distributed; occurring singly or in radially flattened groups; open. Vessel lines rather coarse and distinct. Parenchyma extending wing-like from pores, sometimes confluent into irregular chains; not terminal or in fine concentric lines. Rays minute. Gum ducts not observed, but the occurrence of vertical ducts as a result of injury would not be surprising as they have been found in other species of *Terminalia*.

Minute: Vessels with simple perforations; intervacular pits rather large, crowded; pit membranes cribriform. Rays uniseriate and rarely over 15 cells high; homogeneous or nearly so, the cells mostly large but horizontally elongated; pits into vessels resemble the intervacular. Parenchyma coarse-celled. Wood fibers with very small simple pits.

Material: Yale Nos. 11, 127 and 12,790.

Black Poison Wood of British Honduras

Black Poison Wood, until recently commonly called Honduras Walnut, is the product of *Metopium Brownii* (Jacq.) Urban, of the Anacardiaceae or Sumac family. The identity of the tree was first disclosed by means of botanical specimens obtained by the writer while on a visit to British

Honduras early in 1926. (See *Tropical Woods* 7: 3.) The timber is much esteemed locally, but is practically unknown to the export trade.

The species is widely distributed in the Greater Antilles and extends on the continent from Vera Cruz and Yucatán into Guatemala. In British Honduras it is often associated with the Sapodilla or Chicle Tree (*Acbras Zapota* L.) in swamp and intermediate forests, being confined to calcareous soils in the northern portions of the Colony. It is said to be more plentiful than Rosewood (*Dalbergia Stevensonii* Standl.), which is regularly exported from the Toledo District.

Black Poison Wood is a small to moderately large tree, with thin reddish brown bark that contains a very caustic sap. The leaves are compound, with 3 to 7 large, somewhat rounded leaflets, which have long petiolules. The small yellow-green flowers are borne in large, long-stalked, axillary panicles. The fruits are about 1/2 inch long, orange-colored, with a single stone embedded in a resinous pulp.

The heartwood is variegated brown and reddish brown with a greenish tinge and a golden luster. It is a beautiful wood, but does not closely resemble Walnut. It is hard and heavy, of rather fine texture, often wavy-grained, rather difficult to work, finishes very smoothly and takes a lustrous polish. It has no distinctive odor or taste, and, in spite of the name Poison Wood, is quite harmless.

COMMON NAMES

Local: Black Poison Wood, Honduras Walnut (Brit. Hond.); Guao de Costa (Cuba); Cochínillo, Cotinillo (Santo Domingo).

ANATOMY OF THE WOOD

Gross: Growth rings usually limited by parenchyma; fairly distinct. Pores small, barely visible; numerous; well distributed; mostly in radial pairs or flattened groups; tyloses abundant in heartwood. Vessel lines fine. Rays very fine; visible only on radial surface. Parenchyma developed in varying abundance about pores and in lines or bands terminating growth rings; usually inconspicuous. Radial resin ducts visible with lens.

Minute: Vessels with simple perforations; intervacular pits rather large, crowded. Rays mostly biseriate, few to 25 cells high; heterogeneous; pits into vessels large, simple; resin ducts common. Wood fibers with small simple pits and in part septate.

Material: Yale Nos. 7395, 8810, 9044, 9828.

FOUR NEW TREES FROM BRITISH HONDURAS

By PAUL C. STANDLEY

Field Museum of Natural History

The four new trees from British Honduras here described represent as many different families. Two of them were collected by the Forestry Department of that Colony, and were received for study through Professor Record. The other trees, one of which is an interesting addition to the known Sapotaceae of Central America, were collected by Mr. C. L. Lundell in the course of his investigations of the latex-yielding plants of British Honduras.

Pithecolobium Brownii, sp. nov.

Arbor 9-metralis, trunco 50 cm. diam., ramulis ochraceis, dense velutino-hirtellis, spinis crassis, 2.5 mm. longis; folia 4-foliolata, petiolo 0.5-1.5 cm. longo, rhachidibus 4-9 mm. longis, minute pilosulis; foliola sessilia, ovali-oblonga, 2.8-5 cm. longa, 1.5-2.7 cm. lata, coriacea, apice rotundata vel obtusissima, interdum emarginata, basi oblique rotundata, supra minute hirtella, costa et nervis prominulis, subtus paullo pallidior, velutino-pilosula, costa gracili, prominente, nervis lateralibus utroque latere c. 7, gracilibus, prominentibus, rectis, remote a margine conjunctis; flores spicati, spicis axillaribus et solitariis vel ad apices ramulorum subpaniculatis, 2-3 cm. longe pedunculatis, pedunculo dense breviterque hirtella, densis, multifloris, rhachi 1-1.5 cm. longa, bracteolis minutis, triangularibus; calyx 0.6 mm. longus, minute denticulatus; corolla 5 mm. longa, minute sericea, lobis anguste triangularibus, acutis, 1.5 mm. longis; tubus staminalis c. 6 mm. longe exsertus, filamentis liberis 10-12 mm. longis; ovarium sessile.

BRITISH HONDURAS: Hillbank, along lagoons and rivers, July 29, 1928, C. S. Brown 28 (Herb. Field Mus. No. 580,347, TYPE).

A tree with low and spreading crown. Called "Red Fowl." Related to *P. albicaule* Britt. & Rose, of Veracruz, but in that species the leaflets are acute, and the flower spikes are 8-10 cm. long.

Gilibertia concinna, sp. nov.

Frutex vel arbor omnino glabra, ramulis validis, teretibus; petiolus gracilis, 1.5-3.5 cm. longus, supra sulcatus; lamina elliptica vel late elliptica, 4.5-9.5 cm. longa, 2-5 cm. lata, abrupte breviterque acuminata, acumine triangulari, apice rotundato, basi acuta, coriacea, supra lucida, costa prominente, nervis obscuris, subtus paullo pallidior, costa gracili, elevata, nervis

lateralibus utroque latere c. 6, angulo acuto adscendentibus, subarcuatis, gracillimis, prominentibus, prope marginem conjunctis; inflorescentia terminalis, umbellato-racemosa, breviter penduculata, c. 6.5 cm. longa et lata, ramis adscendentibus vel divaricatis, curvis, bracteis minutis, late triangularibus; pedicelli numerosi, graciles, 4-6 mm. longi, nudi; fructus depresso-globosus, 4-5 mm. longus, lucidus.

BRITISH HONDURAS: Honey Camp, Orange Walk, November, 1928, C. L. Lundell 115 (Herb. Field Mus. No. 580,826, TYPE). Freshwater Creek, September 6, 1928, J. B. Kinloch 4.

Vernacular names, "White Gumbolimbo" and "Sacchacah" (Maya).

Bumelia laurifolia, sp. nov.

Arbor, ramulis gracilibus, glabris; petiolus gracilis, 8-13 mm. longus; lamina anguste lanceolato-oblonga, 6.5-9.5 cm. longa, 1.5-3 cm. lata, coriacea, versus apicem acutum breviter angustata, basi obtusa vel abrupte contracta, glabra, supra viridis, nervis prominulis, arcte reticulatis, subtus pallidior, costa gracili, elevata, nervis lateralibus utroque latere c. 12, gracilibus, prominulis, angulo acuto adscendentibus, fere rectis, juxta marginem conjunctis, nervulis prominulis et arctissime reticulatis; flores ad axillas vel ad nodos defoliatos dense fasciculati, pedicellis crassis, 1 mm. longis, sericeis; sepalis 5, suborbicularia vel ovato-rotundata, apice rotundata, imbricata, 1.5 mm. longa, glabra vel sparse sericea; ovarium ferrugineo-sericeum, stylo 1.2 mm. longo; fructus immaturus ovalis vel ovoideus, glaber, 10-12 mm. longus, apice obtusus, glaucescens.

BRITISH HONDURAS: Honey Camp, Orange Walk, September, 1928, C. L. Lundell LP14 (Herb. Field Mus. No. 580,836, TYPE).

The vernacular name is reported as "Silly Young," a name given in the region to various other plants of the same family. This tree is of rather doubtful relationship, no corollas being available for study. At any rate, it represents a species distinct from all the Sapotaceae known previously from the chicle country.

Diospyros bumelioides, sp. nov.

Arbor, ramulis crassis, brevibus, cortice cinereo obtectis, ad apices dense foliatis; folia subsessilia, anguste cuneato-spathulata, coriacea, vulgo 2.5-5 cm. longa, 0.8-1.5 cm. lata, apice rotundata vel emarginata, basin versus longe sensimque attenuata, supra cinereo-viridis, lucida, glabra vel ad costam prominulam obscure puberula, subtus opaca, glabra, costa gracili, prominente, nervis lateralibus utroque latere 3-4, obscuris, angulo acuto adscendentibus, margine revolutis; flores solitarii, pedicellis crassis, 3-5 mm. longis; calyx fructifer extus glabratus, intus puberulus, tubo 4-5 mm. longo, lobis 4, late ovatis vel ellipticis, 5-6 mm. longis, apice obtusis vel late rotundatis,

viridibus, recurvis; fructus globosus, c. 1.5 cm. diam., apice rotundatus, lucidus, sparse sericeus vel glabratus; semina 4, 1 cm. longa.

BRITISH HONDURAS: Honey Camp, Orange Walk, December, 1928, C. L. Lundell 137 (Herb. Field Mus. No. 580, 840, TYPE).

Evidently this is related to *D. tetrasperma* Sw., of Jamaica, but that differs in having broad leaves and smaller fruits and seeds. The British Honduras tree is very different from all the species of *Diospyros* known heretofore from the mainland.

THE FORESTS OF VENEZUELA¹

By LEWIS A. CUMMINGS

The Republic of Venezuela in northern South America is conveniently situated with reference to overseas trade. Although lying wholly within the Tropics, its topography is such that it enjoys a variety of climates. Its area of nearly 400,000 square miles is about equally divided between grassland and forest. The heart of the country is occupied by the savannahs of the great Orinoco Basin, while flanking them are hills and high mountains for the most part covered with forests. The timber resources have been little exploited commercially and most of the lumber consumed in the larger centers of population is imported from the United States. The Venezuelan timber best known on foreign markets is the Zapatero or so-called West Indian Boxwood, and the most valuable forest product exported is Balata gum.

The character of the forests in the different regions is determined largely by the amount and distribution of the rainfall. They may be classified as (1) Dry Forests, (2) Transition Forests, (3) Rain Forests, (4) Temperate Rain Forests, and (5) Savannah Forests.

¹ This paper is condensed from a report prepared by Mr. Cummings (B.S.F., University of Idaho, 1925) in connection with his course in tropical forestry at Yale. It is based, for the most part, upon publications by Dr. H. Pittier and a manuscript report by Mr. Miles Haman. Very little information has been published in English regarding the forests of this important South American Republic.—S. J. R.

DRY FORESTS

This type, comprising about 15 per cent of the total forest area, occurs mostly in the lower zones and hot lands where rainfall is scanty and unevenly distributed throughout the year. The trees are of kinds best suited to endure long periods of drought. Cacti are abundant and lianas are entirely absent. There are two general classes of these forests, namely, Thorn Forests and Chaparral.

Thorn Forests.—These forests, as the name implies, are composed mainly of thorny trees and shrubs. They occur in the Guajira Peninsula between the foothills of the Sierra de Perija and the coast line south of Maracaibo; in a belt about 75 miles wide along the north coast from the eastern shore of Lake Maracaibo to the Gulf of Trieste and thence in a much narrower strip (about 20 miles in width) to Cristóbal Colon; on the lower slopes of the southern border of the Cordillera de Merida; and a portion of the Lower Orinoco to the southwest of the Gulf of Paria.

The forests of the north coast are divisible into three types according to density of stocking and character of undergrowth and ground cover: (1) Open stands on low and level sites, with sparse ground cover consisting mostly of low cacti. (2) Fairly open stands on level to rolling sites, with undergrowth so dense that it is necessary to cut one's way through it. (3) Dense stands on the lower contours of hills, with the ground cushioned with Bromeliads. The trees, which are of comparatively few species, are mostly low, short-bodied, and unsuited for saw timber. Divi-divi pods and Logwood are the principal forest products. In some places there are nearly pure forests of a giant cactus, known as Cardón, which is a source of a yellowish lumber used locally for chairs, small tables and similar purposes. Some of the other trees are Acacias, Ajcito, Amargoso, Amarillo, Atata, Barbasco, Candil de Playa, Gatillo, Guariare, Guayacán, Olivo, Paují, Quigua, Vera, and Zorrocloco.

On the lower slopes of the Cordillera de Merida conditions of soil and moisture are less unfavorable for forest growth and on some sites there are trees large enough to produce lumber. The species are much the same as along the coast, with the

addition of Corozo and Moriche Palms and Chaparro. The latter species also occur in the dry forests of the Lower Orinoco. The general topography of this region is flat and rolling, the soil being light and sandy. Rainfall increases toward the delta. Divi-divi and most of the cacti are absent.

Chaparral.—These forests occur in certain very dry regions of the interior at altitudes generally less than 3000 feet. In some places they merge into the savannah and at others may show a transition to the thorn forests of the coast. Thorny trees, however, are usually in the minority. Some of the characteristic species are Almácigo, Bálsamo, Cabritón, Ciruelo de Hueso, Jobillo, Majomo, Naranjillo Bobo, and Volador.

TRANSITION FORESTS

In summer the transition forests appear somewhat like the dry forests, while in winter they resemble the rain forests. They differ from the former, however, in the abundance of lianas and the absence of cacti and thorny trees, and from the rain forests by the predominance of deciduous species. In some places palms are abundant and very conspicuous.

These forests occupy about 30 per cent of the timbered area and contain from 5000 to 10,000 board feet to the acre. In general, they occur between the dry forests of the low country and temperate forests of the high regions. They cover a large portion of the drainage around Lake Maracaibo south of the dry forests; the southern slopes of the Cordillera de Merida between elevations of 2500 and 8000 feet; the vicinity of Carabobo and Yaracuy; and the immense territory of Guayana in the southern part of Venezuela.

The soils are generally deeper and richer than those in the dry forests, the ground cover of weeds, ferns, etc., is not heavy, and the forest floor is very rich in humus, litter, and duff. Extensive areas have been cut over in the Lake Maracaibo region and around Carabobo and Yaracuy. The lands are well suited for agriculture and are used for growing coffee, cacao, rice, bananas, plantains, and other crops.

In the Maracaibo region, Coruba Palms are often dominant and in some places there are over 50 of them per acre. Other

common trees are Cedro, Ceiba, Clavellina, Corozo Palm, Guácimo, Guayabo, and Orumo. The principal species around Carabobo and Yaracuy, where cutting operations have been carried on for a number of years, are Apamate, Caoba (Mahogany), Carbonero, Ceiba, Chupón Colorado, Chupón Ventoso, Gateado, Habilidad, Jaris, Jobo, Marfil, Pajuí, and Saqui-saqui.

The transition forests attain their best development in the immense Guayana territory. They are interrupted only by small savannahs and remain practically inviolate. Their composition is little known beyond the fact that they contain trees which produce rubber, balata, and chicle.

RAIN FORESTS

The rain forests of Venezuela resemble those of other tropical countries, but the species composing them vary according to locality. Some of the trees reach enormous proportions and their crowns, interlaced with lianas and crowded with epiphytic plants, form a canopy over successive stories of smaller trees. Little sunlight reaches the ground and the forest floor is perennially damp and covered with decaying vegetation.

The rain forests occupy regions of heavy precipitation on the lower slopes of the Andes southward of Lake Maracaibo; in the valley of the Tocuyo; in the Amacuro Delta and the eastern part of the country near the British Guiana border; and the great southern area adjoining Brazil and including the divide between the Orinoco and Amazon drainages. The rain forests comprise nearly half of the entire forested area and their average stand is estimated to be about 10,000 board feet per acre.

Some of the principal trees of the Maracaibo region are Bacú, Cabimo, Cabrahosca, Chupón Ventoso, and Vacahosca. The palms are of the genera *Attalea*, *Bactris*, and *Jessenia*. In the Delta of the Orinoco and in the region adjoining British Guiana are found, among others, Carapa (Crabwood), Ceiba, Cuajo, Mora, Peramán, Viruviru (Greenheart), and various kinds of Fig. The high regions of the Orinoco are particularly rich in species of *Hirtella*, *Licania*, *Macrolobium*, *Ouatea*,

Swartzia, and *Virola*, and various genera of palms such as *Astrocaryum*, *Bactris*, *Lepidocaryum*, and *Mauritia*.

There are three subdivisions of the rain forests in the Delta of the Orinoco. They are clearly defined and the transition from one to another is more abrupt than is the case with the types of the dry forest. They are Mangrove Swamp Type, Moriche Palm Type, and Mixed Hardwoods and Palm Type, and correspond to the lower, the middle, and the upper portions of the Delta.

Mangrove Swamp Type.—This type extends from the coast to the limit of brackish water, a distance of about 35 miles. The rainfall is between 70 and 100 inches annually. There are three principal kinds of Mangrove trees, namely, Mangle Blanco, Mangle Prieto, and Mangle Colorado. Further back the Manicole Palm becomes common and at the inland edge of the type Mora, Mulato, and the Timiche Palm make their appearance. Mangrove swamps also occur along the shore in portions of the Maracaibo region and are the source of considerable timber for local construction, fencing, and fuel.

Moriche Palm Type.—Back of the Mangrove formation is an almost pure stand of Moriche Palms in a belt about 25 miles wide and 100 miles long. The edges of the streams are lined with Mangrove, and in places Timiche and Cucurito Palms are fairly common.

Mixed Hardwood and Palm Type.—This type occupies the inner third of the Orinoco Delta. It varies in width from 15 miles near the Gulf of Paria to about 70 miles at the British Guiana boundary and its total length is about 200 miles. The soils are deep and loamy, and in the southern part, along the Manamo Cano, there are large plantations of cacao. The most common hardwood trees are Cuajo, Mora de Guayana, and Peramán; others are Balata, Carapa, Cedro, Simaruba, and trees known in British Guiana as Aramatta, Kabukalli, Locust, Paddlewood, and Silverballi. (See *Tropical Woods* 15: 11-13.) Among the Palms are the Cucurito, Manicole, Moriche, and Timiche. The stand of timber averages about 10,000 board feet per acre.

TEMPERATE RAIN FORESTS

These are rain forests of the colder regions, the altitudinal limit depending largely upon the amount of rainfall. They are noticeably different from the tropical rain forests in the absence of lianas. They are found at comparatively low altitudes in the Colonia Tovar and at higher elevations in Sierra de Perija and the Cordillera de Merida. They comprise about 5 per cent of the total forest area.

These forests attain their greatest development in the Colonia Tovar. Among the important trees are Caóbano, Cedrillo, Cedro Dulce, Curtidor, Curtidor Montañero, Estoraque, Granadillo (*Podocarpus*), Guacamayo, Jarillo, Lechero, and various species of *Aniba*, *Eugenia*, *Myrica*, *Ocotea*, *Nectandra*, *Persea*, and *Psidium*. There are also many palms, the most characteristic of which are Caña Molinillo, Molinillo, Palma Araque, Palma Bendita, Palma Blanca, Palma de Cacho, Palmiche, Palmiche Morado, and Prapa.

The temperate forests are well developed in the populated districts of the Andes, but their composition is only imperfectly known. It is probable, however, that they contain many of the trees found in the temperate forests nearer the coast. The following genera are known to be represented: *Alnus*, *Caryodendron*, *Cinchona*, *Croton*, *Elutheria*, *Eugenia*, *Nectandra*, *Oreopanax*, *Persea*, *Piptadenia*, *Rhus*, *Styrax*, and *Symplocos*.

SAVANNAH FORESTS

The Orinoco Savannahs or Llanos cover 123 million acres, an area equivalent to four times that of the State of Pennsylvania. The lands, especially the central and northern portions, are flat or gently rolling. The forests are scattered and open, and consist of only a few species. The most common and widely distributed tree is the Chaparro or Curata, which will average five trees to the acre for hundreds of square miles. Another common species is the Sarrapia (Tonka Bean). The Moriche Palm occurs in isolated stands (Morichales), up to 20 acres in extent, along the small winding creeks and in moist sites.

PRINCIPAL TIMBERS OF VENEZUELA

There are between 250 and 300 kinds of timber trees in Venezuela, representing the widest possible range in structure, properties, and utility. Many of them are used locally to some extent, but only a few are exported. Among the latter are Zapatero (West Indian Boxwood), Cedro (Cedar), Caoba (Mahogany), Vera, Guayacán (*Lignum-vitae*), Roble Colorado, Granadillo (Partridge Wood), and Bálsamo.

CLASSIFIED ACCORDING TO HARDNESS

Pittier (*Las plantas usuales de Venezuela*, p. 82) divides the principal timbers into two groups, (1) extremely hard to hard and (2) moderately hard to very soft. Eight gradations are recognized as follows:

Extremely hard: (a) Araguañey, Guayacán, Guayabo, Masarandú, and Purguo. (b) Bacaba, Divi-divi, Granadillo, Nazareno, Palo de Cruz, Vera, and Viruviru.

Very hard: Algarrobo, Mora de Guayana, Palo Machete, and Peonia.

Hard: Almendro, Caoba, Cereipo, and Zapote.

Moderately hard: Carbonero, Laurel Angelino, Laurel Maestro, Laurel Rosado, and Mulato.

Firm: Apamate, Carapa de Montaña, Cedrillo, Pardillo, and Saqui-saqui.

Soft: Bosúa, Carapa de Ciénega, Cedro, Guácimo, Jacifate, Peramán, Pilón, and Sangre Drago.

Very soft: Bucare, Habilidad, Jobo, Lano, Mijao, and Simaruba.

CLASSIFIED ACCORDING TO UTILITY

Packing boxes: Apamate, Bucare, Habilidad, Mijao, and Toco.

General construction: Canalete, Canilla de Venado, Guatacare, Guayabo, Laurel, Mangle, Naranjillo, Quisanda, Tara, and Zapatero.

Beams, girders, rafters, etc.: Amarillo, Angelino, Araguañey, Bálsamo, Canalete, Cartán, Cereipo, Coco de Mono, Gateado, Laurel, Pilón, Roble, and Zapatero.

House posts: Alcornoque, Guatacare, Urape, Vera, and others.

Flooring: Bálsamo, Caoba, Carreto, and Pardillo.

Railroad cross-ties: Angelino, Bálsamo, Cacagüillo, Echa-humo, Guayacán, Guayabo, and Vera.

Naval and submerged construction: Barbasco, Botoncillo, Caracoli, Caro, Cartán, Ceiba, Copaiba, Curarí, Habilidad, Laurel, Mangle Colorado, Mora, and Pacurero.

Vehicle construction: Aguacatillo, Alcornoque, Almendro, Angelino, Bálsamo, Cajobo, Cedrillo, Chicharro, Guayacán, Majomo, and Pardillo.

Cooperage: Carapa, Estoraque, Nispero, Saqui-saqui.

Furniture: Atata, Caoba, Carreto, Cartán, Cedro, Cuspa, Gateado, Nogal, Pardillo, Verraco, and Yaguero.

Dyewoods: Brasil, Brasilete, Cartán, Cuspa, Echa-humo, Mora, and Paraguatá.

CHECK LIST OF THE COMMON NAMES

Acacia	<i>Acacia</i> sp.	Leguminosae
Aguacate	<i>Persea americana</i> Bauhin	Lauraceae
Aguacatillo	<i>Persea caerulea</i> (R. & P.) Mez	Lauraceae
Ajicito	<i>Capparis Pachaca</i> H. B. K.	Capparidaceae
Alcornoque	<i>Bowditchia virgilioides</i> H. B. K.	Leguminosae
Algarrobo	<i>Hymenaea Courbaril</i> L.	Leguminosae
Almácigo	<i>Bursera Simaruba</i> (L.) Sarg.	Burseraceae
Almendro	<i>Prunus sphaerocarpa</i> Sw.	Amygdalaceae
Almendrón	<i>Terminalia Catappa</i> L.	Combretaceae
Amargoso	<i>Aspidosperma</i> sp.	Apocynaceae
Amarillo	<i>Aspidosperma Vargasii</i> A. DC.	Apocynaceae
Amarillo	<i>Terminalia Hilariana</i> Steud.	Combretaceae
Angelino	<i>Nectandra discolor</i> Nees (?)	Lauraceae
Apamate	<i>Tecoma pentaphylla</i> Juss.	Bignoniaceae
Araguañey	<i>Tecoma cbrysantha</i> DC.	Bignoniaceae
Araque	<i>Iriartea fusca</i> (Karst.) Drude	Palmaceae
Atata	<i>Esenbeckia Atata</i> Pitt.	Rutaceae
Bacaba	?	?
Bacú	<i>Cariniana pyriformis</i> Miers	Lecythidaceae
Balata	<i>Mimusops elata</i> Allem.	Sapotaceae
Bálsamo	<i>Toluifera Balsamum</i> L.	Leguminosae
Barbasco	<i>Jacquinia revoluta</i> Jacq.	Theophrastaceae
Barbasco	<i>Piscidia Erythrina</i> L.	Leguminosae
Bosúa	<i>Fagara monophylla</i> Lam.	Rutaceae
Botoncillo	<i>Conocarpus erectus</i> L.	Combretaceae
Brasil	<i>Haematoxylon Campechianum</i> L.	Leguminosae

Brasilete	<i>Haematoxylon Brasileto</i> Karst.
Bucare	<i>Erythrina glauca</i> Willd.
Cabimo	<i>Copaifera Langsdorfi</i> Desf.
Cabrahosca	<i>Zschokkea armata</i> Pitt.
Cabritón	<i>Ruprechtia Hamani</i> Blake
Cacagüillo	<i>Sterculia cartbagenensis</i> Cav.
Cajobo	?
Caña molinillo	<i>Geonoma pinnatifrons</i> Willd.
Canalete	<i>Cordia</i> sp.
Candil de playa	<i>Amyris simplicifolia</i> Karst.
Canilla de venado	<i>Bredemeyera floribunda</i> Willd.
Caoba	<i>Suaetenia Candollei</i> Pitt.
Caóbano	<i>Guarea</i> spp.
Caracoli	<i>Anacardium Rbinocarpus</i> DC.
Carapa	<i>Carapa guianensis</i> Aubl.
Carbonero	<i>Piptadenia Pittieri</i> Harms
Cardón	<i>Cereus</i> spp.
Caro	<i>Enterolobium cyclocarpum</i> Gris.
Carreto	<i>Aspidosperma</i> sp.
Cartán	<i>Centrolobium paraense</i> Tul.
Cedrillo	<i>Trichilia spondioides</i> Jacq.
Cedro amargo	<i>Cedrela Glaziovii</i> C. DC.
Cedro dulce	<i>Cedrela montana</i> Turcz.
Ceiba	<i>Ceiba pentandra</i> Gaertn.
Cereipo	<i>Myrospermum frutescens</i> Jacq.
Chaparro	<i>Curatella americana</i> L.
Chicharro	<i>Terminalia obovata</i> Steud.
Chupón colorado	<i>Sideroxylon amygdallicarpum</i> Pitt.
Chupón ventoso	<i>Gustavia eximia</i> Pitt.
Ciruelo de hueso	<i>Spondias purpurea</i> L.
Clavellina	<i>Calliandra</i> spp.
Coco de mono	<i>Lecythis</i> sp.
Copaiba	<i>Copaifera</i> sp.
Corozo	<i>Acrocomia sclerocarpa</i> Mart.
Coruba	<i>Attalea speciosa</i> Mart.
Cuajo	<i>Pirola venezuelensis</i> Warb.
Cucurito	<i>Maximiliana regia</i> Mart.
Cují yaque	<i>Prosopis juliflora</i> DC.
Curarí	<i>Tecoma serratifolia</i> G. Don
Curata	<i>Curatella americana</i> L.
Curtidor	<i>Weinmannia glabra</i> L.
Curtidor montañero	<i>Eschweilera Fendleriana</i> Miers
Cuspa	<i>Cusparia trifoliata</i> (Willd.) Engl.
Divi-divi	<i>Caesalpinia coriaria</i> Willd.
Echa-humo	<i>Tecoma serratifolia</i> G. Don
Estoraque	<i>Styrax</i> sp.
Gateado	<i>Astronium graveolens</i> Jacq.

Leguminosae
Leguminosae
Leguminosae
Apocynaceae
Polygonaceae
Sterculiaceae
?
Palmaceae
Borraginaceae
Rutaceae
Polygalaceae
Meliaceae
Meliaceae
Anacardiaceae
Meliaceae
Leguminosae
Cactaceae
Leguminosae
Apocynaceae
Leguminosae
Meliaceae
Meliaceae
Meliaceae
Bombacaceae
Leguminosae
Dilleniaceae
Combretaceae
Sapotaceae
Lecythidaceae
Anacardiaceae
Leguminosae
Lecythidaceae
Leguminosae
Palmaceae
Palmaceae
Myristicaceae
Palmaceae
Leguminosae
Bignoniaceae
Dilleniaceae
Cunoniaceae
Lecythidaceae
Rutaceae
Leguminosae
Bignoniaceae
Styracaceae
Anacardiaceae

Gatillo
Granadillo
Granadillo
Guacamayo
Guácimo
Guamacho
Guamo
Guariare
Guatacare
Guayabo
Guayacán
Habillo
Jacifate
Jarillo
Jaris
Jobillo
Jobo
Lano
Laurel angelino
Laurel maestro
Laurel negro
Laurel quina
Laurel rosada
Lechero
Majomo
Mangle blanco
Mangle colorado
Mangle prieto
Manicole palm
Marfil
Masarandú
Mijao
Molinillo
Mora
Mora de Guayana
Moriche palm
Mulato
Naranjillo
Naranjillo
Naranjillo bobo
Nazareno
Níspero
Nogal
Olivo
Orumo
Pacurero
Pajuí

<i>Capparis linearis</i> Jacq.
<i>Caesalpinia Granadillo</i> Pitt.
<i>Podocarpus coriatus</i> Rich.
<i>Protium</i> sp.
<i>Guazuma ulmifolia</i> Lam.
<i>Pereskia Guamacho</i> Weber
<i>Inga</i> spp.
<i>Capparis tenuisiliqua</i> Jacq.
<i>Cbytroma Idatimon</i> (Aubl.) Miers
<i>Eugenia</i> spp. and <i>Psidium</i> spp.
<i>Guaiacum officinale</i> L.
<i>Hura crepitans</i> L.
<i>Protium altissimum</i> March.
<i>Escallonia floribunda</i> H. B. K.
<i>Bombacopsis Jaris</i> Pitt.
<i>Tapiriva guianensis</i> Aubl.
<i>Spondias lutea</i> L.
<i>Ocroma Lagopus</i> Sw.
<i>Nectandra discolor</i> Nees
<i>Nectandra</i> sp.
<i>Ocotea glomerata</i> (Nees) Mez
<i>Nectandra Moritziana</i> Kl.
<i>Nectandra coriacea</i> (Sw.) Gris.
<i>Euphorbia</i> spp. and <i>Sapium</i> spp.
<i>Lonchocarpus Fendleri</i> Benth.
<i>Laguncularia racemosa</i> Gaertn.
<i>Rhizophora Mangle</i> L.
<i>Avicennia officinalis</i> L.
<i>Euterpe edulis</i> Mart.
<i>Homalium Pittieri</i> Benth.
<i>Mimusops</i> sp.
<i>Anacardium Rbinocarpus</i> DC.
<i>Geonoma simplicifrons</i> Willd.
<i>Chlorophora tinctoria</i> (L.) Gaud.
<i>Dimorphandra excelsa</i> (Sch.) Baill.
<i>Mauritia flexuosa</i> L.
<i>Pentaclethra filamentosa</i> Benth.
<i>Eschweilera Moritziana</i> Miers
<i>Eugenia grandiflora</i> Berg.
<i>Bravaisia floribunda</i> DC.
<i>Hymenaea floribunda</i> H. B. K.
<i>Acras Sapota</i> L. (?)
<i>Juglans colombiensis</i> Dode
<i>Capparis odoratissima</i> Jacq.
<i>Myrcia cucullata</i> Berg.
<i>Torrubia Pacurero</i> Standl.
<i>Bumelia buxifolia</i> Willd.

Capparidaceae
Leguminosae
Podocarpaceae
Burseraceae
Sterculiaceae
Cactaceae
Leguminosae
Capparidaceae
Lecythidaceae
Myrtaceae
Zygophyllaceae
Euphorbiaceae
Burseraceae
Cunoniaceae
Bombacaceae
Anacardiaceae
Anacardiaceae
Bombacaceae
Lauraceae
Lauraceae
Lauraceae
Lauraceae
Euphorbiaceae
Leguminosae
Combretaceae
Rhizophoraceae
Verbenaceae
Palmaceae
Flacourtiaceae
Sapotaceae
Anacardiaceae
Palmaceae
Moraceae
Leguminosae
Palmaceae
Leguminosae
Lecythidaceae
Myrtaceae
Acanthaceae
Leguminosae
Sapotaceae
Juglandaceae
Capparidaceae
Myrtaceae
Nyctaginaceae
Sapotaceae

Palma araque	<i>Iriarteia fusca</i> (Karst.) Drude
Palma bendita	<i>Ceroxylon Klopstockia</i> Mart.
Palma blanca	<i>Oenocarpus altissimus</i> Kl.
Palma de cacho	<i>Iriarteia altissima</i> Kl.
Palma de coco	<i>Cocos nucifera</i> L.
Palmiche	<i>Euterpe purpurea</i> Engl.
Palmiche morado	<i>Oenocarpus altissimus</i> Kl.
Palmita	<i>Geonoma undata</i> Kl.
Palo de cruz	<i>Brownea grandiceps</i> Jacq.
Palo machete	<i>Eperua falcata</i> Aubl. (?)
Paraguata	<i>Sickingia erythroxyloides</i> Willd.
Pardillo	<i>Cordia alliodora</i> Cham.
Pauji	<i>Mouriria pseudo-geminata</i> Pitt.
Peonia	<i>Ormosia fastigiata</i> Tul.
Peramán	<i>Symphonia globulifera</i> L. f.
Pilón	<i>Andira inermis</i> H. B. K.
Prapa	<i>Iriarteia praemorsa</i> (Willd.) Kl.
Purgo	<i>Mimusops</i> spp.
Quigua	<i>Amyris balsamifera</i> L.
Quisanda	<i>Coccoloba Pittieri</i> R. Knuth.
Roble colorado	<i>Platymiscium polystachyum</i> Benth.
Sangre (de) drago	<i>Pterocarpus officinalis</i> Jacq.
Saqui-saqui	<i>Bombacopsis sepium</i> Pitt.
Sarrapia	<i>Coumarouna odorata</i> Aubl.
Simaruba	<i>Simaruba amara</i> Aubl.
Supí	<i>Pereskia</i> sp.
Tacamahaco	<i>Protium heptaphyllum</i> (Aubl.) March.
Tara	<i>Oyedea verbesinoides</i> DC.
Timiche palm	<i>Manicaria saccifera</i> Gaertn.
Toco	<i>Crataeva gynandra</i> L.
Urape	<i>Bauhinia multinervis</i> (H. B. K.) DC.
Uvero de playa	<i>Coccoloba uvifera</i> (L.) Jacq.
Vacahosca	<i>Couma sapida</i> Pitt.
Vaco	<i>Brasimum utile</i> (H. B. K.) Pitt.
Vera	<i>Bulnesia arborea</i> (Jacq.) Engl.
Verraco	<i>Tabernaemontana psychotriifolia</i> H. B. K.
Viruviru	<i>Nectandra Rodiaei</i> Schomb.
Volador	<i>Gyrocarpus americanus</i> Jacq.
Yagrumo	<i>Cecropia</i> sp.
Yaguero	<i>Roupala</i> sp.
Zapatero	<i>Casearia praecox</i> Gris.
Zapote	<i>Calocarpum mammosum</i> (L.) Pierre
Zorroloco	<i>Morisonia americana</i> L.

Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Palmaceae
Leguminosae
Leguminosae
Rubiaceae
Borraginaceae
Melastomaceae
Leguminosae
Guttiferae
Leguminosae
Palmaceae
Sapotaceae
Rutaceae
Polygonaceae
Leguminosae
Leguminosae
Bombacaceae
Leguminosae
Simarubaceae
Cactaceae
Bursaceae
Compositae
Palmaceae
Capparidaceae
Leguminosae
Polygonaceae
Apocynaceae
Moraceae
Zygophyllaceae
Apocynaceae
Lauraceae
Combretaceae
Moraceae
Proteaceae
Flacourtiaceae
Sapotaceae
Capparidaceae

THE WEST AFRICAN ABACHI, AYOUS, OR SAMBA (*TRIPLOCHITON SCLEROXYLON*)

By SAMUEL J. RECORD

The timber known in the German market as Abachi and in the French trade as Ayous and Samba is a recent importation from West Africa that is meeting with favor in Europe as a substitute for Poplar and Alder in the manufacture of plywood. On account of the appearance of its leaves and fruits, the tree is commonly known to English-speaking people as African or Bush Maple, but this name is inapplicable to the wood, as it is very light, soft, and coarse-textured. There is an abundant supply of the timber in the forest, but the logs deteriorate so quickly that exceptionally good transportation facilities are essential for successful exploitation.

THE TREE

The tree attains large dimensions, growing to a height of 125 or even 150 feet, and to a diameter of over 6 feet above the buttresses. The bole is usually long and straight, but often somewhat fluted or twisted, and the old specimens are generally hollow. The buttresses, which are typically plank-like and form rather sharp angles with the axis of the tree, exhibit considerable variation in height but are often 10 to 15 feet and occasionally considerably more. In youth the tree in the closed forest is slender, with a dense ovoid head; the bark is smooth and very light gray. Toward maturity the bark becomes scaly and flakes off in patches and the crown spreads out, the steeply ascending upper branches giving it a broom-like appearance which renders the tree readily distinguishable at a distance, even during the short season when it is leafless. The twigs are slender and flexuous.

The maple-like leaves are 3 or 4 inches across, alternate, deciduous, and palmately lobed. The flowers are fragrant and appear in axillary cymes just after or at the time the old leaves are shed. The calyx is very hairy, gamosepalous, and 5-lobed. The corolla is rotate, about an inch across when

open, composed of 5 broadly ovate, appendaged, velvety petals, white on the upper surface and dark purple on the claw; the petals are so loosely attached that they fall in a veritable shower during the blooming period. The stamens (30 or more) are attached at the top of a pubescent green column, have their anthers connate below in pairs, and encircle 5 imbricated petaloid staminodes. The ovary consists of 5 free, but apparently united, pubescent carpels. The fruit is a quadruple samara upward of 2 inches in length.

RANGE AND OCCURRENCE

The tree is widely disseminated in tropical West Africa, being most abundant in the deciduous forest between the savannah of the interior and the monsoon forest nearer the coast. It is known to occur in French Guinea, Liberia, Ivory Coast, Gold Coast, Togo, Dahomey, Nigeria, British and French Cameroons, and Spanish Guinea. It has not been found in Gaboon, according to Chevalier (1917, p. 382).

French Guinea.—Fairly common at the sources of the Niger River and along the Liberian border, according to Hutchinson & Dalziel.

Ivory Coast.—Aubreville says that the Samba is the dominant species of the virgin forest of the north and in transition to savannah; one of the first species to invade abandoned plantations. It is not conspicuous on the Tabou River in the lower Cavally region. It occurs near the mouth of the Sassandra River, but is no longer exploited there, and between Sassandra and Gagnoa it is often dominant and more or less gregarious. It is abundant along the road from Divo to Tiassalé and is often found in nearly pure stands. It is exploited along the Bolo River only a few miles from the coast. It is very plentiful in the vicinity of Kouta on the Boubo, Tiassalé on the Bandama, along the railroad from a few miles south of Agboville to the northern limit of the forest, and up the N'Zi as far as Dimbokro. The species becomes scarce and even disappears on the Mé, the Tozan, the lower course of the Comoé, the Bia, and in the Bassam and Assinie circles.

Gold Coast.—The tree, usually called Wawa, occurs in the monsoon climax forest and is most frequent and conspicuous

in the area of least rainfall in the closed forest where the country is generally sharply hilly from a tableland of over 400 feet elevation. Chipp (1927) calls this the "*Triplochiton-Piptadenia* preclimax" and says (pp. 50-51): "This is the driest of the preclimaxes of the closed forest and for the most part represents the 'deciduous forest' referred to in forestry reports on the country. Its structure shows a marked difference from that of the association, the canopy is not so thickly interlaced, the predominant trees have their crowns more isolated and more fully developed, epiphytes (except *Platyserium*) and herbaceous creepers are generally absent, cauliflory does not occur, whilst woody lianes ascend abruptly to the tree tops instead of trailing their first coils on the ground. Generally this preclimax occupies the comparatively high tableland in south and central Ashanti and stretches fanwise from this apex over the lower slopes of the great divide to the junction with the parkland. It is always liable to interruption when aspect and altitude induce conditions favorable to other units. Its rainfall is the lowest in the closed forest region. The amount and nature of the soil varies considerably, and on steep hill-slopes it is often exceedingly scanty among the protruding rocks. . . . So abundant is *Triplochiton* in this type of forest that its presence in the association and other preclimaxes previously described had not been recognized. The explanation, however, is the emergence into dominance of a species present in other units but only occurring occasionally. In the present case the Meliaceae which have characterized the two former preclimaxes are found only occasionally and in large tracts do not appear at all, whilst in some areas *Triplochiton* represents some 30 per cent of the arboreal constituents.

"This preclimax occupies an area heavily farmed both for domestic and agricultural crops, and occurs towards the comparatively inhospitable parkland. It carries a big population of farmers, who make heavy demands on it for timber for their own use." According to Chipp (1922, p. 24): "Where the original forest has been wholly or partially cleared for farming or fuel supplies and the land subsequently abandoned, a new forest growth is found differing not only in the absence

of a high canopy but in the paucity of species. Timber and rubber trees are generally absent." *Triplochiton* is one of the commonest species of the original trees invading such areas.

Specimens of the leaves and wood (Yale No. 13,610) were collected by Mr. Ralph D. Sawyer, vice-president of Palmer & Parker Co., Boston, on this company's concession at Ongwa, 50 miles from the coast. The tree was about $4\frac{1}{2}$ feet in diameter above the large buttresses, and was free of branches for 75 feet. It was growing in high forest on low land at an elevation of approximately 500 feet above the sea. Mr. Sawyer says the English name is African Whitewood; the Fantee name, Wawa. The natives use it for making dug-out canoes, ornaments, stools, etc. They use various woods for these purposes, but prefer the softer kinds, such as this species and the Cottonwood (*Ceiba*) because they are lighter and easier to work.

Togo.—In the fringing forests, as at Misahöhe, according to Hutchinson & Dalziel; also listed by Unwin (p. 138).

Dahomey.—Collected at Sakété and Adjara, according to Hutchinson & Dalziel.

Nigeria.—According to Unwin (p. 351), the African "Maple" is one of the common trees of the Abeokuta, Ondo, and Benin Provinces, occurring in the mixed deciduous forest zone, more especially in the moister portions. It grows rapidly and natural reproduction seems to be very good. It prefers moist soil of considerable depth, but not necessarily very rich. In exposed localities it is likely to be blown down or broken by the wind.

Cameroon.—Unwin says (p. 436) the Bush "Maple" is "found very plentifully in the Cameroon country"; it is one of the common species of the Bakossi forests (p. 417).

The tree is in commercial quantities in French Cameroon, where it is known as Ayous. There has been some doubt as to the identity of this timber, but Aubreville (p. 50) says that it is *Triplochiton* and, after a study of the wood, the present writer was able to confirm this determination. In a letter of February 7, Mr. Jean Collardet, Secrétaire du Comité National des Bois Coloniaux, says: "We have recently received botanical specimens of the Ayous of Cameroon and it now

seems beyond doubt that it is, as you thought, *Triplochiton scleroxylon* K. Schum." The type of this species was obtained near Yaunde Station, on a northern tributary of the Nyong River.

PROPERTIES OF THE WOOD

Heartwood of a uniform pale brownish yellow color; suggests Satinwood when varnished; has a low natural luster and a dry feel; lacks distinctive odor and taste. Sapwood white; not very sharply demarcated.

Wood light and soft; sp. gr. (4 specimens, thoroughly air-dry) 0.36 to 0.40; weight $22\frac{1}{2}$ to 25 lbs. per cu. ft.; stiff, but not very strong; has firm, cheese-like consistency; breaks with a short fracture; does not split readily. Easy to plane, but shavings are chaffy; saws freely, but the surfaces are rough; chips out in turning; nails can be driven close to the edges and ends of boards without splitting them, but are likely to break out under rough usage; glues up firmly; contains no gums, oils, or resinous materials to interfere with staining and painting.

The heartwood has a low moisture content in the living tree and can be dried readily without checking and splitting; being rather cross-grained, the lumber has some tendency to warp, but once thoroughly dry it retains its shape and position. It is perishable in contact with the ground and is readily attacked by termites and beetles in the Tropics; the sapwood is liable to blue discoloration in the log.

COMMERCIAL CONSIDERATIONS

If the stands of this timber were conveniently situated with reference to the European or American markets the lumber would be very extensively employed for a variety of purposes for which its lightness in weight and color, freedom from odor, and ease of working adapt it. Although the wood has no pronounced natural beauty of color or grain, it can be finished very attractively and the vessel lines and irregularities of grain can be exhibited to advantage by the proper use of stains. Some specimens bear a rather close resemblance to Rakuda (*Hura crepitans* L.).

Apparently the first attempt to introduce the timber into Europe was in 1906, when, according to Unwin (p. 352), sample logs from Nigeria were sold in the Liverpool market as Satinwood, but they did not meet with favor under that name and further shipments were discouraged. "Locally it has been used for boxes and other articles, which have proved quite durable; it has been used as inside planking and other interior work, and so long as it is carefully seasoned it does not warp very badly; it is probable that it is one of those timbers that would yield better results by kiln-drying. In the Central Circle it has been sawn up as planks for a considerable time, but they have been attacked to a great extent by a small weevil. The local people use the bark for making roofs and the wood for doors for their houses."

The Samba of the Ivory Coast is becoming established in the European trade. Aubreville says that 481 trees, yielding about 1200 tons of logs, were cut in 1924; 440 trees, or 1100 tons, in 1925; and 806 trees, or 2000 tons, in 1926. In addition, a number of Samba trees were classed as miscellaneous woods in 1924 and 1925. According to the statistical issue of the *Bulletin Mensuel de l'Agence Économique de l'Afrique Occidentale Française* (1928), the export of Samba from Ivory Coast was 3118 cu. m. in 1926 and 11,335 cu. m. in 1927. The latter amount was considerably exceeded in 1928. The principal localities of production are at Lahou and along the railroad beyond Agboville, and the amounts cut can be increased at both places. The large stands in the interior of the Colony cannot now be exploited economically. The logs deteriorate too rapidly for floating long distances, even where the streams are open. A limited amount could be floated out near the mouth of the Sassandra River. A railroad extending from Sassandra to Daloa or Dimbokro would pass through rich stands of Samba and other timbers and make their exploitation easy and inexpensive. Trees of medium diameter are preferred for cutting, since those of largest size and finest outward appearance are likely to be hollow or punky throughout much of their length. The minimum cutting diameter, 13 feet above the ground, is only 14 inches instead of 32 inches as required in the case of Mahogany and similar kinds. Aubreville believes that the Samba has a promising future.

According to Meniaud & Bretonnet (p. 73) the present annual production of Ayous in Cameroon is about 800 cu. m., and the possible maximum 6000 cu. m., per year. The weight air-dry or half dry is given as 400 or 500 kilos per cu. m., which is the same as for Okoumé. They state (p. 68) that this timber is meeting with favor in Europe for common joinery, moldings, and plywood. The logs generally arrive in good condition, without being stained or seriously damaged by insects. The prospect of extending the consumption of the timber is considered favorable.

The trade in this timber is developing rapidly in Germany where it is known as Abachi. The writer is indebted to J. F. Müller & Sohn, the well-known firm of wood brokers and agents in Hamburg, for the following information: The trade in Abachi began in a very small way before the war, but it was not until 1925 that the imports began to assume importance. The logs are 28 inches and over in diameter, and their average weight is between 2 and 3 tons each. Timber from Nigeria has been preferred by consumers, but makers of rotary-cut veneers sometimes object to the fact that the logs are hewn on one side for hauling out of the forest. The Cameroon Abachi, or Ayous, is of much the same quality as the Nigerian. That from the Ivory Coast, called Samba, is sometimes disliked because the logs are more subject to grub holes in the heartwood. The principal uses for the timber are in the form of veneer and thin lumber as a substitute for American Yellow Poplar [*Liriodendron*], European Poplar [*Populus*], Alder [*Alnus*], and to a less extent Okoumé [*Aucoumea*]. The imports for the last four years are as follows:

Source	1925		1926		1927		1928	
	Logs	Tons	Logs	Tons	Logs	Tons	Logs	Tons
Nigeria	15	50	28	75	2,751	6,900	4,518	10,130
Cameroon	91	250	123	442	993	3,000	1,558	4,050
Ivory Coast	1,115	2,260	47	135	715	1,100	2,562	3,100
Total	1,221	2,560	198	652	4,459	11,000	8,638	17,280

As to the outlook for the future of this timber in Germany, the above-mentioned firm makes the following statement: "We are of the opinion that the import figures will be larger every year, as our veneer industry is growing and demands raw material like Abachi and other tropical woods of light weight to be had at reasonable prices."

The only instance, so far as the writer knows, of this timber being imported into the United States occurred only a few months ago when Palmer & Parker Company, of Boston, included some logs in a shipment of Mahogany from their concession in the Gold Coast. In a letter of February 4, Vice-President Ralph D. Sawyer says: "We recently converted seven of these logs into lumber and veneer and found that every one had been damaged by some kind of a worm and there were scattered worm holes clear into the center. Because of this damage the lumber will all be disposed of for core stock. The veneer will probably be sold, along with that of the average African 'Walnut,' for use in cheap furniture. Were it not for the worm holes the timber would be very satisfactory, as it has a small Mahogany grain or figure and could be employed for many purposes for which Mahogany is now used."

COMMON NAMES

TRADE: Abachi, Ayous, Sam, Samba. CAMEROONS: Ayous; Ejuong (Jaunde); Nkom (Bakossi); Bush Maple. GOLD COAST: Owawa (Ashanti, Wassaw); Wawa (Aowin, Apollonian, Ashanti, Krepi, Twi); African White-wood. IVORY COAST: Cofa, Kofa (Attrie); Hafa, Ofa, Ouofa (Abé); Bamba, Sam, Sama, Samba, Samkamba, Sankamba, Sérama (Bondoukou); Oua-oua, Wana, Wawa (Apollonian). NIGERIA: Arere (Yoruba); Kpa (Efik); Obeche, Obechi (Benin); African Maple, Bush Maple, Soft Satinwood.

GROSS ANATOMY OF THE WOOD

Growth rings fairly distinct, due to slight differences in density and color. Pores resemble small pin holes, visible to unaided eye; rather few and irregularly scattered to numerous and fairly uniformly distributed; mostly solitary, but frequently in radial pairs or sometimes in radially appressed groups; tyloses present, but not abundant. Parenchyma in exceedingly numerous, fine, irregular lines, scarcely visible with lens. Rays faintly visible without lens on cross and tangential sections, distinct but not very conspicuous on radial surface, being of about the same color as the background. Ripple marks present; fairly distinct with lens; 80 to 90 per inch.

MINUTE ANATOMY OF THE WOOD

Cross section: Growth rings defined by larger proportion of fibers and fewer and smaller pores in late wood. Pores circular or oval; diameter 0.11 mm. to 0.26 mm., av. 0.19 mm.; mostly solitary, but occasionally in radial pairs or appressed groups or in little clusters; thick-walled; mostly open, but tyloses frequent. Rays very numerous, curved in contact with pores, the cells short and irregular and not sharply differentiated from ground mass. Parenchyma abundant, in uniseriate tangential laminae alternating with fiber layers, in places making up the bulk of the ground mass, as in early wood and about some of the pores; cells mostly large, thin-walled and angular, or much flattened in contact with pores; pits in end walls very numerous. Wood fibers very small, thick-walled, in irregular tangential laminae one to several cells wide; cells often apparently of two distinct sizes owing to storied arrangement.

Radial section: Vessels with simple perforations; segments short, barrel-like; annular ridge narrow but distinct; tyloses sometimes abundant. Rays decidedly heterogeneous, the cells widely variable in size and shape, mostly square or upright, the procumbent ones interspersed; walls thin, becoming thicker in contact with vessels; abundantly pitted; pits into vessels resemble the intervacular, while those into wood parenchyma are small, irregular, and clustered; small rhombohedral crystals of calcium oxalate very common. Parenchyma abundant; mostly one or two cells per strand, except in contact with vessels where there are several; strands distinctly storied; pits in lateral walls very numerous, small, irregular, clustered; pits in sloping end walls numerous; small crystals common. Fibers slender, much longer than parenchyma strands; pits very small, with circular border and slit-like aperture.

Tangential section: Vessel segments in seriation with parenchyma strands; intervacular pits alternate, very numerous, the borders circular or irregularly hexagonal, the apertures very small and oval. Parenchyma distinctly, but rather irregularly storied; many of the strands one-celled (substitute or intermediate fibers); no secondary seriation; cells resemble those of cambium; pits mostly confined to radial and end walls. Rays variable in appearance and size, particularly in height; the cells are very irregular in size, shape, and arrangement (least so in No. 11,121): In Nos. 11,121 and 13,610 they are 1 to 8 cells wide and few to 50 cells high, being typically plump and occupying 2 or 3 tiers; larger ones 0.09 mm. (av.) wide and 0.60 mm. to 1.00 mm., av. 0.75 mm., high. In No. 12,797 they are thinner, a larger proportion occupy a single tier, and some occupy 6 or 7 tiers; larger ones 0.08 mm. (av.) wide and 0.92 mm. to 1.81 mm., av. 1.32 mm., high. In No. 12,765 they are rather narrow, but most of them occupy 2 or 3 tiers; larger ones are 0.064 mm. (av.) wide and 0.57 mm. to 1.00 mm., av. 0.74 mm., high.

MATERIAL

Yale Nos. 11,121 (Abachi) from J. F. Müller & Sohn; 12,765 (Ayous) from French Cameroon (French "Bois Coloniaux" No. 48 RR); 12,797 (Samba) from Ivory Coast (French "Bois Coloniaux" No. 1513); 13,610 (Wawa) collected with botanical material at Ongwa, Gold Coast, by Mr. R. D. Sawyer.

SYSTEMATIC CONSIDERATIONS

The West African tree in question was described by K. Schumann in 1901 under the name of *Triplochiton scleroxylon* from material collected by Zenker and Staudt (No. 595) near Yaunde Station (about 250 miles inland from Batanger), Cameroon, at an elevation of about 2500 feet above sea; other material, in bud, had been collected by Zenker (No. 298) in 1895. Schumann made it the type of a new genus *Triplochiton* and of a new family, Triplochitonaceae, of the order Malvales. This generic name was proposed by Alefeld in 1863 for species which are at present, but perhaps not permanently, referred to *Hibiscus*. The specific name, *scleroxylon*, gives an entirely erroneous impression of the wood, and one is at a loss to account for Schumann's statement that it is very hard, particularly in view of the fact that Solereder (pp. 843-4) says of Zenker's specimen No. 298 (cited by Schumann) that "the wood is soft."

Only one additional species, *Triplochiton nigericum* Sprague (Kew Bull. 1909: 212), is considered valid by Hutchinson & Dalziel, who include *T. Johnsonii* C. H. Wright (Hook. Ic. Pl. t. 2758) in the synonymy of *T. scleroxylon*. The Nigerian species is closely related to the other and apparently their woods are indistinguishable. The conspicuous difference in the trees is that *T. scleroxylon* has leaves with 5 lobes and 5 to 7 nerves at the base, while those of *T. nigericum* are 7-lobed and 7-nerved. Unwin (p. 352) says that the latter species is a common tree of the mixed deciduous forest in Abeokuta, Ondo, Owerri, and Calabar Provinces, Nigeria. It attains a height, under favorable conditions, of 150 feet, a clear length of 90 feet, and a girth of over 20 feet. The buttresses are often 10 or 12 feet high. The bark is gray or whitish, smooth or, in old age, shallowly fissured. The slash is greenish white and, after a short interval, becomes moistened with a watery sap. The flowers are mottled pink and white. The tree grows rapidly, reproduces readily from seed and coppice, is rather tolerant of shade when young, but requires plenty of light for its later development. The root flanges are used locally for making doors and occasionally a tree is cut for planks.

A Gold Coast tree, the timber of which was said to be exported to Europe as Mahogany, was described by Sprague as *Triplochiton utile* (Kew Bull. 1908: 257), but the name was later changed by him to *Heritiera utilis* (Kew Bull. 1909: 348), and finally to *Tarrietia utilis* (Kew Bull. 1916: 85). Here is an instance where a wood sample would have served to better purpose than the original botanical material, for there should be no occasion to confuse the very soft whitish wood of *Triplochiton* with the comparatively hard, red, and somewhat Mahogany-like wood of *Tarrietia*.

While some botanists accept Schumann's new family, Triplochitonaceae, others do not. Prain has included *Triplochiton* K. Schum., along with *Mansonia* J. R. Drummond (Journ. Linn. Soc. London 37: 260. 1905), in a proposed new tribe, Mansonieae, of the Sterculiaceae.

Through the courtesy of the Royal Botanic Gardens, Kew, the writer has had the opportunity to examine a specimen of the wood of *Mansonia Gagei* J. R. Drummond, from Tenasserim. This agrees with the description given by Gamble (Journ. Linn. Soc. London 37: 262) and bears little outward resemblance to *Triplochiton*, as shown below.

Gross features: Heartwood dark olive-brown, contrasting sharply with the white sapwood; without distinct scent, although it appears to have been confused with Sandalwood (*l. c.*, pp. 250-254). Very hard, heavy, and strong; sp. gr. (thoroughly air-dry), 0.95; wt. nearly 60 lbs. per cu. ft. (70 lbs., according to Gamble); texture very fine and uniform; appears highly durable. Growth rings visible, but poorly defined. Pores minute; not very distinct under lens; numerous. Parenchyma indistinct with lens. Rays minute; very numerous; storied. Ripple marks visible, regular, all elements storied, about 85 per inch. *Minute anatomy:* Pores thick-walled; sub-circular, tending to form radial rows; av. diam. 0.043 mm. Vessels with simple perforations; intervascular pits minute. Parenchyma in numerous, short, irregular, uniseriate lines. Rays mostly biseriate and about 15 cells (0.28 mm.) high; uniform in size; heterogeneous; pits into vessels resemble the intervascular. Wood fibers thick-walled; pits small, inconspicuously bordered. *Material:* Yale No. 14,410.

The wood of *Mansonia altissima* A. Chev. from the Ivory Coast, according to Perrot's description and illustration, resembles the Indian species. He says that it has a yellowish white sapwood and blackish brown heart; is odorless; rather hard and heavy; sp. gr. 0.70; of fine and uniform texture. Growth rings fairly distinct. Pores small, sub-circular; 18 to 20 per sq. mm.; diam. 0.06 mm. to 0.08 mm. or about one-fourth the size of those in *Triplochiton*;

solitary or in rows of 2 to 4. Parenchyma diffuse or tending to form tangential lines; crystals of calcium oxalate abundant. Rays biseriate, 0.20 mm. to 0.25 mm. high. Wood fibers 0.20 mm. to 0.90 mm. long and 0.018 mm. to 0.02 mm. in diameter.

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JOHN DONNELL SMITH

On December 2, 1928, there passed away in Baltimore, Maryland, Captain John Donnell Smith, the oldest living graduate of Yale University, and Nestor of the botanists not only of America but doubtless of the whole world.

Born at Baltimore June 5, 1829, John Donnell Smith received the degree of Bachelor of Arts from Yale in 1847, and was admitted to the bar in 1851. He was a captain of artillery of the Confederate States in 1864 and 1865. Retiring from business in the early eighties, he devoted himself to botanical studies, which already had long attracted his interest. He botanized extensively in most of the Southern States as well as in the North, and finally directed his attention to Central America, then almost unknown botanically. He made large collections of plants in Guatemala, and in Costa Rica, where he still is remembered with affection by the older scientists. He stimulated interest in other collectors in Central America, and subsidized the work of such men as H. von Tuerckheim.

Captain Smith assembled a herbarium of 100,000 specimens, notable for its wealth of Central and South American collections, which, with his library, he presented to the Smithsonian Institution some years ago. He published many papers describing hundreds of new species of woody and herbaceous plants, and did more than any other single person to make known the rich flora of Central America.

Captain Smith was an intimate friend of Sereno Watson, and on visits for study in European herbaria he formed the acquaintance of foreign botanists, many of whom he numbered among his correspondents. He was a fellow of the Linnean Society of London and Associate in Botany of the Smithsonian Institution.

Tall and of commanding appearance, a kindly host, a scholar not only in botanical science but in the languages, John Donnell Smith was the finest type of a Southern gentleman. Until within a year or two he possessed good health, although ten years ago he had abandoned his active botanical work. Fortunate were the botanists who enjoyed his hospital-

ity, for he could recount the most interesting anecdotes of botanists long dead, and of his associations with them. His life span of nearly a century tempts one to speculate upon the changes Captain Smith had seen in his native city of Baltimore and in the botanical world. It is a matter of great regret to his friends that it was not granted him to complete the full hundred years which lacked just six months of their fulfilment.—PAUL C. STANDLEY, *Field Museum of Natural History*.

Identity of "Cube," a Peruvian Drug

Inquiry having been made recently as to the botanical identity of a narcotic plant of Peru known as Cube, the following information regarding it seems worth recording.

In 1923 I purchased a specimen of Cube in the famous Andean market at Huancayo where products from even remote parts of Peru are offered for sale. This material, now in the collections of Field Museum of Natural History, consists of four short cylindrical pieces of wood, about 1.5 cm. thick, two of them evidently portions of a stem, the others, with soft nodose bark, probably parts of a root. The wood is slightly reddish and has numerous conspicuous pores. I was told that macerated it is very effective for extermination of rats, lice, and other vermin and for stupefying fish. Professor Record has determined it as leguminous and evidently from a liana.

Among the few genera in the Leguminosae of the Amazon region known to contain lianas two closely related ones, *Lonicocarpus* and *Derris*, notably *Derris negrensis* Benth, called Timbó (cf. Taubert, *Pflanzenf.* 3. 3: 345. 1891), are used as "fish-poisons" and presumably have the other properties ascribed to Cube. It is quite possible, therefore, that Cube is this particular liana, though the name very probably is applied indiscriminately to a number of species or perchance even to several genera.—J. FRANCIS MACBRIDE, *Field Museum of Natural History*.

CURRENT LITERATURE

Plan de repoblación forestal para Puerto Rico. By WILLIAM P. KRAMER. *Boletín Oficial de la Cámara de Comercio, Industria y Agricultura* (Santo Domingo, R. D.) 2: 30: 5-7, Nov. 1928.

The author, who is the forester for Porto Rico, outlines his plans for the development and improvement of forest conditions on the island. The seven lines of activity are as follows:

1. Administration, protection, and development of the Insular forests.
2. Aquisition of lands for the establishment of additional Insular forests.
3. General extension of reforestation.
4. Investigations of growth, utilization, and silvicultural systems.
5. Educating landowners in the proper handling of their forests.
6. Emphasizing the teaching of forestry in the public schools.
7. Establishment of new forest nurseries.

Untersuchungen über das cocoboloholz und seine inhaltsstoffe in bezug auf ihre hautreizende wirkung. By MARGARETHE RICHTER. (A dissertation.) Hamburg, 1925. Pp. 38; 5½ x 8½; illustrated.

Forestry in British Honduras. A statement prepared for the British Empire Forestry Conference, Australia and New Zealand, 1928. By J. N. OLIPHANT. Belize, 1928. Pp. 21; 8¼ x 13; 1 map.

Les bois de la Guyane: Le teck. By M. DEMOUGEOT. *Revue Internationale des Produits Coloniaux* (Paris) 4: 37: 24-28, Jan. 1929.

The French Guiana timber referred to as Teak is the *Angélique*, *Dicorynia paraënsis* Benth. (Leguminosae), known as Basra Lokus in Surinam. The wood has excellent technical properties and is considered satisfactory for most of the

purposes for which Teak and Oak are employed. The present exports are small, 1500 to 1800 tons annually, but it is believed that they will increase rapidly as soon as the good qualities of the timber come to be appreciated.

Sur l'origine des campos Brésiliens et sur le rôle des *Imperata* dans la substitution des savanes aux forêts tropicales. By AUG. CHEVALIER. *Comptes Rendus des Séances de l'Académie* (Paris) 187: 997, Nov. 26, 1928.

Vast areas of central and southern Brazil were prairies or "campos" before the advent of Europeans. The treeless portions are called "campos limpos" and those with clumps and open groves of stunted tree growth are known as "campos cerrados." The extensions of the original prairies through encroachment on cut-over and abandoned agricultural lands are designated "campos geraes." The most important plant in this advancement is a kind of grass, *Imperata brasiliensis*, 2 to 5 feet high, which makes a very dense growth almost to the exclusion of other vegetation. If fire is kept out, the woody vegetation will slowly come back and shade out the grass, but repeated burning impoverishes and hardens the soil and makes tree growth impossible.

Sur l'origine du bois d'imbuia du Brésil et sur la biologie de l'arbre producteur, le *Phoebe porosa* Mez, de la famille des Lauracées. By AUG. CHEVALIER. *Comptes Rendus des Séances de l'Académie* (Paris) 187: 1153, Dec. 10, 1928.

While on a visit to southern Brazil the author obtained flowering botanical specimens of the well-known timber tree, Imbuia or Embuia, the identity of which had not been previously determined, and found them to agree perfectly with specimens of *Phoebe porosa* Mez (= *Oreodaphne porosa* Mez) in herbariums at Rio de Janeiro and Paris. It is closely related to other South American species such as *Phoebe amoena* (Nees) Mez, of Rio Grande do Sul, southern Brazil, and *P. vesiculosa* (Nees) Mez, of Uruguay. In the organization of the flowers, the anatomy of the wood, and the camphor-like scent of various parts of the plant, it exhibits such a close affinity to

certain species of *Cinnamomum* that the author is of the opinion that the separation of these two genera is artificial and entirely on a geographical basis.

Les bois du Brésil. By E.-V. LETZGUS. *Revue Internationale des Produits Coloniaux* (Paris) 4: 37: 8-13, Jan. 1929. Illustrated.

An interview with Aug. Chevalier, Directeur du Laboratoire d'Agronomie Coloniale au Museum d'Histoire Naturelle, with reference to his recent visit to Brazil.

Un voyage scientifique au Brésil. By AUG. CHEVALIER. *Revue de Botanique Appliquée et d'Agriculture Coloniale* (Paris) 8: 88, 1928.

An account of a visit of about three months to southern Brazil, the primary purpose of which was to advise the professors and students of the Polytechnic School of São Paulo regarding the methods employed in France in the identification of tropical woods. It is a very interesting and instructive article on Brazil, with notes on its history, geography, natural resources, and industries. There are short chapters on the stimulant plants (coffee, maté, cacao, guarana, and tea); textile and industrial products (cotton, silk, sugar cane, and tobacco); root crops, cereals, etc. (manioc, arrow-root, potatoes, corn, rice, wheat, barley, and beans); fruits for export (bananas, citrus fruits, etc.); wines; vegetable oils (olive, peanut, castor-bean, palm, Brazil nut, etc.); farming; forest products (timber, rubber, ivory nuts, drugs, tannin, etc.); mineral resources.

Although there are vast forest areas in Brazil, there is a shortage of timber in the thickly populated regions for fuel and construction. More than 20,000 acres in the State of São Paulo have been planted with *Eucalyptus* to supply the needs of one railway company. There are over 200 kinds of timber trees in southern Brazil, but the demands for construction and furniture are met by a very few, notably Peroba, Pinho, Imbuia, Jequitibá, and Ipé. The total exports of timber in 1927 amounted to 119,611 tons, of which 88,791 tons were of Pinho or Paraná Pine (*Araucaria brasiliana*). Five-sixths of

this timber went to Argentina and the remainder to Uruguay. Only five or six species are exploited in the Amazon country and about 50,000 tons are shipped annually to Rio de Janeiro. Most of the timber exported to the United States and Europe is of the rarer kinds such as Rosewood and Brazil Wood, and there is prospect of an increased foreign demand for the Imbuia of Paraná. The importations of lumber are small and are mostly Pine from the southern United States, known erroneously in Rio as "Pin de Riga."

Mindanao and the Sulu Archipelago: Their natural resources and opportunities for development. By P. J. WESTER. Bul. No. 38 (2d ed., revised), Phil. Bureau of Agriculture, Manila, 1928. Pp. 117; 6 x 9; 29 half-tone plates; 8 maps and charts (separate).

Le bois de banglang. By JEAN COLLARDET. *Revue Internationale des Produits Coloniaux* (Paris) 4: 37: 17-22, Jan. 1919. Illustrated.

Banglang, or Banh-lanh, is a collective name applied by the natives in Cochin China and South Annam to the trees belonging to several different species of *Lagerstroemia* (Lythraceae). Different kinds are distinguished, though not necessarily corresponding to a botanical classification, by such suffixes as "nuoc" (water), "cheo" (oar), "oi" (guava), "cum" (mottled), "tia" (violet), "trang" (white), etc. In North Annam and Tonkin the trees are called Sanglé, and in Cambodia they are known as Sralao and Entranel.

Botanists have described about 27 species of *Lagerstroemia* from Indo-China, but the differences between some of them are said to be no greater than may be exhibited by different specimens from a single tree. With the exception of *L. speciosa* Pers., the various kinds of Banglang are much alike in the appearance of the tree and in the structure, properties, and uses of the timber. They attain large size, sometimes 115 feet tall, with a fluted bole more than 3 feet in diameter above the root-swellings and free of branches for 80 feet. The channeled and inbarked growth of the lower part of the trunk is

very characteristic and results in considerable waste in logging. The bark is thin, light-colored, and scaly. Old leaves are cast in January and February, the new ones appearing in March. The flowers are brightly colored and showy.

The wood resembles French Walnut in appearance, color, and density. The rather thin sapwood is yellowish gray, the heartwood brownish or reddish gray and highly lustrous. Some logs are highly figured and well suited for cabinet work, and Banglang burls, although rather rare, are prized for the same purpose. Logs will usually float and do not deteriorate rapidly; the checks which appear at the ends in drying are ordinarily shallow. The wood combines the mechanical properties of Ash and Walnut, being fairly tough, moderately fissile, strong in compression and bending, highly elastic, and very resilient under violent and repeated impact. It is considered particularly well adapted for bentwork, spokes and felloes of wheels, vehicle frames, tight cooperage, airplane propellers, gunstocks, oars, tool handles, etc. In general, it is suitable for the same purposes as Walnut and Ash, but has an advantage over the former in being less brittle, and over the latter in being less flexible. The timber is abundant, often occurs in nearly pure stands, and is readily exploited. It can be supplied to the European market in large quantity and at a reasonable price.

Bijdrage tot de kennis van *Pinus Merkusii* Jungh. et de Vr., meer in het bijzonder in de Gajo-landen. By C. BRANDTS BUYS, C. JAPING, and D. FERNANDES. No. 19, Med. van het Proefstation voor het Boschwezen, Buitenzorg, Java, 1928. Pp. 139; 6½ x 9½; 50 half-tones, 18 graphs, 7 maps.

Pinus Merkusii is the only species of Pine whose range crosses the equator into the southern hemisphere. It occurs in the Philippine Islands, French Indo-China, Siam, Burma, and Sumatra. The report contains a full account of the tree in northern Sumatra, including botanical description, reproduction, forest growth, natural enemies, and economic importance. The tree gives a good yield of resin and affords a basis for the development of an important turpentine industry in Sumatra.

The trees of New Zealand. By L. COCKAYNE and E. PHILLIPS TURNER. Pub. by N. Z. State Forest Service, Wellington, 1928. Pp. 171; 5 x 8; 120 half-tones. Price 4s (bound copies extra).

This excellent manual, designed primarily to provide delegates to the Third British Empire Forestry Conference with a brief account of New Zealand's indigenous forests, together with descriptions and photographs of the trees composing them, serves a much wider field and will be found of great usefulness to everyone having an interest in the subject.

Chapter I (pp. 5-23) gives a succinct account of the forests. Chapter II (pp. 24-146) is entitled The Trees. Occupying the upper two-thirds of each page is a clear half-tone reproduction of a photograph of fresh botanical specimens, and beneath are the scientific and vernacular names, brief technical descriptions, and a note on distribution; special forms are brought together in the last 16 pages of the chapter. In order that the technical language, employed for the sake of conciseness, may be readily understood, a glossary of terms is included as an appendix. Chapter III, The Timbers (pp. 147-155), contains short descriptions and information on the properties and uses of 27 kinds. The arrangement of the tree descriptions is alphabetical by genera and species; both scientific and popular names are fully indexed.

La mangrove Malgache et ses produits. By A. GUILLAUMIN. *L'Agronomie Coloniale* (Paris) 17: 126: 189-202, June 1928.

A study of the Mangrove formations of Madagascar, including botanical descriptions and a key for identification of the principal species, notes on the bark, and the uses and commercial importance of the products (especially tannin and gum). The scientific and vernacular names of the species described are as follows:

Avicennia officinalis L. Afiafy.

Bruguiera gymnorrhiza Lam. Tsitolona or Tsitolony.

Carapa obovata Bl. Fobo or Foby.

Ceriops Candolleana Arn. Palétuvier femelle; Honkolavy or Honkovavy (?).

Rhizophora mucronata Lam. Palétuvier mâle; Anabovahatra, Honka, Honkolafy (?) or Honkovavy, Voandrano.

Sonneratia alba Lam. Farafata.

Essais de traitement du bois des palétuviers de Madagascar faits à l'École Française de Papeterie. By L. VIDAL and M. ARIBERT. *L'Agronomie Coloniale* (Paris) 17: 126: 203-212, June 1928. Illustrated.

Results of tests on the pulping and paper-making properties of three kinds of Mangrove, namely, *Rhizophora mucronata* (Honkolahy), *Bruguiera gymnorrhiza* (Tsitolona), and *Ceriops Boiviniana* (Honkovavy). The species have the advantage of being abundant, easy to log, and located along the seashore; on the other hand, the woods are not white, soft, and light, but are dense, reddish, and more or less tough. That white paper of good quality can be made from them is demonstrated by the inclusion of two inserts (a text figure and a table) printed on Mangrove paper, but the difficulty of producing it is too great to make the process commercially attractive at present. There are greater possibilities in the manufacture of kraft and manila papers.

Le palissandre de Madagascar. By A. DEMAISON. *Revue Internationale des Produits Coloniaux* (Paris) 1: 2: 58-59, Feb. 1926.

The two principal kinds of Madagascar Rosewood are designated, according to their origin, Tamatave and Majunga. Tamatave Rosewood [*Dalbergia* sp.] is a beautiful tree of large size, occurring as scattered individuals in the high forests surrounding Antongil Bay and extending northward along the cliffs facing the Indian Ocean. Like the Vintanina [*Calophyllum* sp.], it seems to attract lightning. It is a heavy timber and difficult to exploit except within easy reach of waterways or the sea. The logs weigh, on an average, about 150 kilograms per linear meter (100 lbs. per foot). They are exported from Tamatave and Maroansetra, arriving in about 30 days at Havre, whence they go to Paris and are made into veneers for pianos and furniture.

Majunga Rosewood [*Dalbergia Greveana* Baill.] grows in

more open forests in the northwest part of the island, particularly in the valleys of the Loza and the Tsiribina. The conditions of growth are not favorable to the production of well-formed trees. The violet color of the wood, which turns to maroon in the Tamatave Rosewood, changes to the color of the lees of wine in the Majunga. Often the violet is interlaid with rose and sometimes the rose color predominates. Majunga Rosewood is more cross-grained, less elastic, the logs are of poorer form and lighter weight (about 125 kilograms per meter), the market price is considerably lower, and the timber is more abundant than in the case of the Tamatave. The best quality of the timber is made into veneers; some is employed for turned portions of furniture and handles of utensils, but the greater part is used, in place of Ebony, for the handles of cutlery.

Notes sur le samba (*Triplochiton scleroxylon*). By AUBREVILLE. *Bulletin Mensuel de l'Agence Économique de l'Afrique Occidentale Française* (Paris) 9: 86: 50-52, Feb. 1928.

This is one of a series of five articles on the lesser-known but potentially important timbers of the Ivory Coast. Much of Forest Inspector Aubreville's material is incorporated in an article appearing elsewhere in this issue of *Tropical Woods*.

Les bois de l'Afrique Equatoriale Française. By ALPH. BAILLY. *Revue Internationale des Produits Coloniaux* (Paris) 3: 37: 29-34, Jan. 1929.

An account of the timber industry in French Equatorial Africa and a consideration of the various problems attending its future development. The author is vice-president of the Chambre Syndicale des Agents et Commissionnaires en Bois d'Industrie.

Le marché des bois coloniaux Africains en 1928. By A. POUZIN. *Revue Internationale des Produits Coloniaux* (Paris) 4: 37: 1-7, Jan. 1929.

The author, who is Secrétaire Général de la Chambre Syndicale des Producteurs des Bois Coloniaux Africains, discusses the current problems of the African timber trade

and expresses the fear that propaganda in favor of French Colonial woods is being overdone.

Die zukünftige rohstoffversorgung der papierindustrie und die hölzer des Westafrikanischen urwaldes. By RUDOLF LORENZ. *Der Tropenpflanzer* (Berlin) 31: 3: 83-97, March 1928. Illustrated.

Not only the paper industry of Germany, but the whole fiber industry of the world must now with deep concern face the question: What will be done 30 years hence, when the coniferous forests of the earth are exhausted?

The author suggests that the answer may be found in the tropical broadleaf forests. The timbers there can be satisfactorily pulped by the soda, sulphate, and chlorine processes, and the distances of the product to the consumer are not greater than from Scandinavian countries to the United States. The shortness of fiber is now overcome by admixtures of coniferous pulp and it is believed that methods can be devised for making satisfactory paper out of hardwood pulp alone.

Results are given of tests on 32 kinds of wood from Cameroon. There are 16 photomicrographs of pulp samples.

L'okoumé: exploitation, commerce, utilisation. By J. MÉNIAUD. *Revue Internationale des Produits Coloniaux* (Paris) 1: 10: 367-373, Oct. 1926.

Between 1900 and 1908 the production of Okoumé in Gaboon increased gradually from 6000 to 30,000 tons, practically all of the timber being absorbed by the German market for cigar boxes and plywood. From 1909 to 1913 the exports grew rapidly, the amounts (in tons) being as follows:

Year	Total	France	Other countries
1909.....	33,033	4,270	28,763
1910.....	51,411	9,340	42,062
1911.....	91,540	10,046	81,494
1912.....	85,364	15,114	70,250
1913.....	133,538	15,619	117,919

The outbreak of the war in August 1914 suddenly interrupted the business, although by that time more than 80,000

tons of Okoumé had already been exported. The amount exported in 1915 was 18,000 tons and 1916 only 8,000 tons, representing, for the most part, logs which had been cut in 1914. The trade began to revive in 1919, and the amounts consumed in France have very materially increased, as shown below (in tons).

Year	Total	France	Other countries
1919.....	4,125	3,725	400
1920.....	14,276	5,496	8,780
1921.....	48,295	12,039	36,256
1922.....	83,000	33,453	49,547
1923.....	100,391	44,344	56,047
1924.....	181,391	73,378	107,684
1925.....	202,499	41,682	160,817

The amounts (in tons) distributed to countries other than France for the three years 1923 to 1925 are as follows:

Year	Germany	Holland	England	Belgium	Spain	Italy	Misc.
1923.....	29,633	9,546	8,000	1,752	.....	.....	7,116
1924.....	67,841	13,439	6,174	3,762	2,105	13,195	1,168
1925.....	92,217	40,973	12,354	3,427	1,584	8,407	2,215

Much of the timber shipped to Holland is re-exported from Rotterdam to Germany. In addition, between 25,000 and 30,000 tons from Spanish Guinea also go to Germany, thus increasing the total amounts of Okoumé imported into that country to about 42,000 tons in 1923, a little less than 102,000 in 1924, and over 130,000 in 1925.

Notes sur l'aboudikro (*Entandrophragma* sp. aff. *rufa* aff. *utilis*). By AUBREVILLE. *Bulletin Mensuel de l'Agence Économique de l'Afrique Occidentale Française* (Paris) 9: 85: 1-3, Jan. 1928.

Aboudikro is a large, well-formed, deciduous forest tree growing on uplands and slopes, rarely in the wet lowlands, in the northern and western portions of Ivory Coast. It is frequently associated with Tiama [*Entandrophragma macrophylla* A. Chev.] and Acajou Blanc [*Khaya antbotbeca* C. DC.]. The amount of timber being exported is small, but it is on the increase. Some effort has been made to pass it off as Mahog-

any, but the author is strongly opposed to this practice as it tends to depreciate the real Mahogany and does not give Aboudikro the standing it deserves on a basis of its own merits. It is suggested that this tree may be the same as the Sapeli (*Entandrophragma utile* Sprague), which supplies one of the principal export timbers of Nigeria and the Gold Coast.¹

Aboudikro is a tall tree, with a very straight cylindrical trunk, slightly buttressed at the base. The ashy gray bark is rather thin; showing large surface cracks in youth and thin circular scales when mature; the fresh slash has a rose-cream color, and its pleasant cedary fragrance suggests Bossé [*Guarea cedrata*]. The bark of the Tiama, with which it is sometimes confused, is smooth and rather dark-colored, the fresh slash is red, and the odor is very disagreeable. The limbs are heavy and the leaves are clustered at the ends of the twigs. The leaves are 8 to 18 inches in total length, with 7 to 10 (usually 10) pairs of sub-opposite obliquely oblong leaflets, cuneiform or rounded at the base and pointed or slightly acuminate at the tip. The flowers, which appear in November after the leaves fall, are small, yellowish green, and odorless, while those of Tiama are large and fragrant. The fruits are small 5-valved capsules with 3 or 4 seeds per cell.

The heartwood is reddish brown, faintly aromatic; sapwood thin, distinct. Sp. gr. 0.844; the logs will float, but after a time will become water-logged and sink. The wood tends to warp and check badly, if not carefully dried. The pores are rather large, numerous, mostly solitary. Parenchyma is about the pores, more or less wing-like, and tending to form unevenly spaced concentric lines, sometimes 0.5 cm. distant. The rays are visible without lens, more or less storied, in some specimens distinctly so. The wood is considered a substitute for Teak rather than for Mahogany.

¹ From a study of the descriptions given by Hutchinson & Dalziel (*Flora of West Tropical Africa* 1: 2: 494-495), it would appear that *E. utile* Sprague does not grow in Ivory Coast; also it is characterized by very high buttresses. *E. rufa* A. Chev. is placed in the synonymy of *E. cylindricum* Sprague. Recent information indicates that the Aboudikro is *E. cylindricum*.—S. J. R.

World's softwood resources. By FRASER STORY. *The Australian Forestry Journal* 11: 3: 108-111, Sept. 1928.

"I have attempted in the table below to estimate the acreage and volume of the accessible softwood resources, although well aware that the figures may be exceedingly wide of the mark. It should be noted that the areas and volumes have reference only to those conifer forests which there is at least some possibility of operating profitably at prices obtainable in normal times and with the means of extraction and utilization at present available.

ACCESSIBLE CONIFER FOREST (ESTIMATED)

Country	Area Million acres	Present stand Million cubic feet	Annual drain* Million cubic feet
Canada.....	240	100,000	4,000
U. S. A.....	190	390,000	12,000
Europe.....	240	285,000	8,000
Siberia.....	100	100,000	1,000
Others.....	110	110,000	1,500
Total.....	880	985,000	26,500

* Amount cut and destroyed, expressed in terms of standing timber.

"So far as reliance may be placed on rough approximates, the world's annual consumption of softwoods appears to amount to fully 26,000 million cubic feet. The conclusion might, therefore, be drawn that, apart from the question of second-growth, the merchantable conifer forest will not last for more than about 38 years at the present rate of consumption. There are many factors, however, which may come into play to modify results, and in any case, as the readily accessible area is only one-third of the total conifer area, it is not suggested that there is likely to be a timber famine. Nevertheless, the available statistics lead one to believe that the difficulty of obtaining adequate supplies of softwoods 40 years hence will be considerable."

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CONTENTS

	Page
Growing Teak in Trinidad <i>By R. C. MARSHALL</i>	1
<i>Cornus</i> , A Genus New to South America <i>By J. FRANCIS MACBRIDE</i>	4
The "Tango" Tree of Central America <i>By PAUL C. STANDLEY</i>	6
A Contribution to the Natural Classification of the Euphorbiaceae <i>By H. H. JANSSONIUS</i>	8
The Lands of Loba, Colombia <i>By HUGH M. CURRAN</i>	11
A New Species of <i>Sorocea</i> from Colombia <i>By PAUL C. STANDLEY</i>	39
Current Literature	40

Yale University

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TROPICAL WOODS

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

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

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GROWING TEAK IN TRINIDAD¹

By R. C. MARSHALL

Conservator of Forests, Trinidad & Tobago

The introduction of Teak (*Tectona grandis* L. f.) into Trinidad dates back to 1913 when Mr. C. S. Rogers, then Conservator of Forests, imported seed from Burma and established plantations. Judging from the growth the trees have made, the experiment appears to have been a decided success. The oldest plantations have now, at an age of 15 to 16 years, an average height of about 70 feet, and a sample plot has shown a mean annual increment of 126 cubic feet

¹ Several inquiries having been received regarding the possibilities of growing Teak in tropical America, the editor applied for information to Mr. Marshall, who kindly prepared this account of his experience with this tree in Trinidad.

per acre (quarter-girth measurement, under bark, to a 3-inch minimum diameter of stemwood). The early indications are that the timber will be well up to standard. The rotation likely to be adopted will probably be somewhere in the neighborhood of 60 years.

Trinidad is the southernmost island of the West Indies and as it lies only 10 to 11 degrees north of the equator the climate is tropical. In the cool season—December to April—the temperature at sea level varies from a mean minimum of 67° F. to a mean maximum of 88° F.; during the rest of the year corresponding temperatures vary from 71° F. to slightly over 90° F.

The yearly rainfall over most of the island varies from 50 to 100 inches, the east side being the wetter. Relative humidity is high, the mean range falling between 78 and 85 per cent. There is a dry season of varying intensity from January to May and a wet season the rest of the year, with a short "Indian summer" about September.

The maximum elevation is 3000 feet, but most of the island is very much less than 1000 feet. The underlying geological formations vary from cretaceous to alluvial, a considerable area being of tertiary age. The resultant soils include a large range from coarse sands to heavy clays.

Teak needs a well drained soil; this is of paramount importance. A sandy or clayey loam of good depth and drainage is most suitable. Poor shallow soils should be avoided and heavy clays are undesirable as the growth in later life has been reported to fall off in plantations formed on such soils in the East. Teak produces a large, deep root system commencing with a tap root.

The tree is deciduous and, in Trinidad, it flowers in the rains and ripens its fruit the following dry season (February–March). A considerable amount of seed is now available from plantations in Trinidad, as trees bear good fertile seed at an early age. Although in its natural habitat difficulty is often experienced in obtaining rapid germination (the seed often lying dormant to the second year), such difficulty has not been experienced in this Colony. In nursery beds the seeds should be planted at intervals of about 6 inches in drills

approximately 9 inches apart, and covered to a depth of not more than half an inch. The beds need plenty of light and must not be shaded. Germination usually takes place in 3 or 4 weeks, and, as a rule, the percentage is high. Seedling growth is rapid, a height of 3 or 4 feet or even up to 6 feet being obtained in the first rains under favorable conditions.

Although plantations can be formed by direct sowing, cheapest and best results have been obtained by using root and shoot cuttings of 1-year nursery plants. Such plants should have a stem at least the size of a man's little finger. When planting, the stem should be cut back to within an inch or so of the ground and the roots may also be trimmed a little if necessary.

A good burning over of the area before planting has a very stimulating affect on the growth of Teak. Under Trinidad conditions burning should be completed by the end of April, so as to be ready for planting as soon as the rainy season shows signs of setting in. Planting should preferably be finished by the end of July; if done later the results are likely to be unsatisfactory.

A spacing of 6 feet x 6 feet is recommended, this being the distance advised as a result of many experiments conducted in India and Burma, and one which has proved suitable to conditions in Trinidad.

It is essential that the young plants be kept free from suppression by weeds, and proper attention to this, during the first year or two, will be fully repaid.

On good soil, by the third year, Teak should approximate 20 feet in height, with canopy beginning to form.

Teak needs plenty of room for rapid development and in a healthy crop planted 6 feet x 6 feet thinning should take place when the plantation is about 5 years old. In this thinning about 50 per cent of the crop should be removed.

Teak is a very strong light demander and full exposure to light is essential. This is most important. It coppices well and has proved a very hardy species. So far it has been free from any serious diseases; one or two trees have died, but no specific cause therefor has been found and the plantations, on the whole, are singularly healthy.

CORNUS, A GENUS NEW TO SOUTH AMERICA

By J. FRANCIS MACBRIDE

Field Museum of Natural History

The discovery in Peru and Bolivia of two species of Dogwood—both undescribed—is of rather exceptional botanical interest in view of the fact that the genus *Cornus*, typically of north temperate regions, apparently has heretofore been recorded in the western hemisphere only from as far south as Central America. Wangerin, in his comparatively recent monograph (Pflanzenreich 4. 229. 1910) lists only three species for Mexico and Central America out of the 46 recognized. One is known from Africa, just south of the Equator. The family (Cornaceae) is represented in South America by the genus *Greselinia* of Chile and Brazil. The discovery of *Cornus* in Peru was made by the Captain Marshall Field Botanical Expedition of 1923 to that country.

Dogwoods, when in fruit (the condition of our specimens), sometimes simulate Viburnums (of the Caprifoliaceae), which are numerous in the Andes and readily distinguishable in flower by their partially united corollas. At the suggestion of Professor Record, search was made for anatomical characters that would supply irrefutable proof of their identity and such were found positively in the character of the pubescence. According to Solereder (Syst. Anat. Dicot. 1: 435-436), 2-branched, unicellular, nodose, and carbonate of lime-encrusted trichomes, various in shape, are altogether characteristic for the genus *Cornus*. Microscopic examination of the sparse pubescence on the under leaf-surfaces of both the Bolivian and Peruvian specimens disclosed the nature of the individual hairs to be exactly as described and illustrated by the authority cited. The trichomes of the former appeared to be unequally branched or pronged, one of their two "arms" being much longer than the other; the hairs from the Peruvian shrub were found to be equally two-armed and to resemble closely those from the upper side of a leaf of *Cornus Nuttallii*, illustrated by Solereder. In both cases nodular prominences were very obvious and the presence of an incrustation of

carbonate of lime in the hair-walls became clearly apparent upon the addition of a little HCL to the slide. Trichomes conforming in all respects to these are seemingly unknown in *Viburnum*, the pubescence of which characteristically consists of tufted, stellate, or peltate and often glandular hairs.

Professor Record has kindly examined the wood of the twigs and reports that it exhibits no characters not in conformity with those of the genus *Cornus*. Since the perforations in the vessels of the secondary wood are scalariform and the two-armed hairs unicellular and lime-encrusted, the specimens are only referable to *Cornus*, according to Sertorius' key to the genera of the family based on anatomical features (cf. Solereder, l. c. 438). The hard bony-shelled fruits and the general aspect of the specimens are also typical. The Bolivian material was distributed as "*Cornus* sp.," but no published reference to it has been found.

Cornus peruviana, sp. nov.

Fruticosa, 3-4 m. alta; ramis ramulisque ut videtur subcurvatis, glabris; foliis chartaceo-coreaceis ovato-oblongis acuminatis vel subcaudato-acuminatis basi acutis plerumque circa 9 cm. longis et 3-4 cm. latis, supra viridibus minutissime sparseque pubescentibus, subtus pallidioribus et cum pilis bifurcatis gracilibusque obscure adpresse strigillosis, in nervorum angulis saepius densiusculis barbatis; costa nervisque lateralibus primariis supra vix notatis, subtus prominentibus; petiolis circa 1 cm. longis; cymis paucifloris, ebracteatis; fructibus coccineo-purpureis subovoideis vel ellipsoideis fere 1 cm. longis leviter costulatis et minute strigillosis.

PERU: Cani, Department of Huanuco, April 16-26, 1923, Macbride 3439 (TYPE, Field Museum).

In foliage this species resembles *C. excelsa* HBK., but in size and shape of fruit, *C. disciflora* Moç. & Sessé, both species of Mexico and Central America.

Cornus boliviana, sp. nov.

Ut videtur *C. excelsa* affinis; foliis membranaceis ovato-ellipticis subabrupte acuminatis basi acutis plerumque circa 1 dm. longis et 4.5-6 cm. latis, supra lucidis viridibus glabris, subtus paullo pallidioribus plus minusve adpresse strigillosis et costa nervisque cum pilis irregulariter ramosis fulvescentibus mediocriter dense piloso-barbatis praetersim in nervorum angulis; cymis ut videtur densifloris; fructibus glabris vel minutissime parceque strigillosis ovoideis vel subglobosis circa 6 cm. longis.

BOLIVIA: without locality, Bang 1799 (TYPE, Field Museum).

THE "TANGO" TREE OF CENTRAL AMERICA

By PAUL C. STANDLEY

Field Museum of Natural History

In spite of the large botanical collections brought in recent years from Central America, one is reminded forcibly from time to time that the flora of the region is by no means exhausted. The tree here discussed is a striking example of the unexpected genera that are being discovered as exploration of the Atlantic coast is continued. Until last year I had never heard the name Tango applied to a tree, but I found that both the tree and the wood bearing this name were well known about Tela, Honduras. Soon afterward specimens of the same tree, accompanied by the same vernacular name, were collected in southern British Honduras by Forest Ranger M. A. Balderamos and transmitted through the Yale School of Forestry for determination.

The specimens available for study are incomplete, but they seem definitely to represent a member of the genus *Zollernia* of the Leguminosae. When the flowers are collected they may show that the tree represents a distinct generic type but, if so, it must be a close relative of *Zollernia*, a genus known heretofore only from Brazil.

Zollernia tango, sp. nov.

Arbor magna omnino glabra, ramulis gracilibus angulatis, internodiis brevibus; stipulae binae, lineari-oblongae, 2-3 mm. longae, erectae, rigidae, persistentes, obtusae; folia alterna, simplicia, petiolo crassiusculo 2-4 mm. longo supra anguste sulcato; lamina anguste oblonga vel elliptico-oblonga, 5-17 cm. longa, 1.5-6 cm. lata, breviter vel longe acuminata, interdum abrupte longiacuminata, acuminis obtuso vel longe attenuato, basi inaequalis acuta vel subobtusata, subcoriacea, remote serrata, dentibus adpressis vel salientibus, sublucida, fere concolor, nervis supra prominentibus et reticulatis, costa subtus elevata gracili, nervis lateralibus utroque latere c. 8, gracilibus, prominentibus, adscendentibus, arcuatis, prope marginem conjunctis, nervulis prominulis et arcte reticulatis; fructus maturus viridis, globosus, 2-3 cm. diam., glaber, laevis, basi et apice late rotundatus; semen 1, ellipsoideum, 1.5-2 cm. longum.

HONDURAS: In wet forest, Lancetilla Valley near Tela, Dept. Atlántida, altitude about 150 meters, February 3, 1928, *Paul C. Standley 55535* (Herb. Field Mus. No. 581189, TYPE). Lancetilla Valley, *Standley 54631, 54687,*

55433. Hills near Lancetilla, May 1929, *W. D. Hottle 110*. BRITISH HONDURAS: Toledo District, January 25, 1929, *Balderamos 1* (Yale No. 14501).

A large forest tree with deeply fluted trunk, common in the region of Lancetilla; known in both Honduras and British Honduras by the vernacular name Tango. About Tela the wood is used for cabinet work and construction purposes, and for the manufacture of axe handles.

The material at hand is unsatisfactory, all the specimens except one being sterile, and the type material consisting of fallen leaves and fruits. I examined several trees which had been felled recently, but all were sterile.

The simple leaves, the rigid binate stipules, and the toothing of the leaves all point definitely to the genus *Zollernia*, which is related to the better-known group *Swartzia*. I am indebted to Dr. William R. Maxon for the loan from the U. S. National Herbarium of two Brazilian specimens of *Zollernia* for comparison with the Central American material. The leaves of *Z. tango* closely resemble those of *Z. falcata* Nees in shape and venation, but in the latter the leaves are quite entire; in *Z. tango* they are always conspicuously serrate, even on the ultimate branchlets. The leaves of young and sterile seedlings have numerous large and salient serrations.

Origin of the names "Rakuda" and "Bethabara"

Rakuda is the copyrighted name for Possumwood, *Hura crepitans* L., obtained from Dutch Guiana by the Rakuda Wood Products Company, Pittsburgh, Pa. The name was coined by the founder of this company, the late Mr. W. L. Kann. His son, Mr. R. G. Kann, says: "The name 'Rakuda' is a word coined by my father from the names of his three children—Ralph, Ruth, and Eda—with a 'k' substituted for the second 'r' for the sake of euphony."

Similarly Bethabara, a trade name for Surinam Greenheart, *Tecoma leucoxyloides* Mart., was coined by Mr. Malcolm A. Shipley, formerly a manufacturer of fishing rods in Philadelphia, from the names, Elizabeth and Barbara.

A CONTRIBUTION TO THE NATURAL
CLASSIFICATION OF THE EUPHORBIACEAE

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During the investigation of certain woods of the Euphorbiaceae for my *Mikrographie des Holzes der auf Java vorkommenden Baumarten*, I have met with a number of peculiarities which may prove helpful in the natural classification of this composite family. The most interesting of these are presented here, although the work is not quite finished. Additional details will appear in Part 10 of my *Mikrographie*.

The Javanese trees of this family belong to the tribes Phyllanthaceae and Crotonaceae, according to the system of Bentham & Hooker, which I am following. In the first tribe, the wood structure of the genera *Aporosa*, *Baccaurea*, *Cyclostemon*, and *Putranjiva* exhibits a decided homogeneity and indicates a natural group quite distinct from the other Phyllanthaceae, although nothing to substantiate such a classification appears in the taxonomic literature I have consulted. The principal differences noted are as follows:

The four genera

Bulk of the wood consisting of non-septate libriform fibers with very thick walls and minute cavity.

Metatracheal parenchyma abundant, sometimes nearly of same mass as the libriform.

Vessel perforations in part to exclusively scalariform, often varying within the genus.

The other Phyllanthaceae

Bulk of the wood consisting of septate libriform fibers which are not thick-walled.

Metatracheal parenchyma absent.

Vessel perforations exclusively simple.

The wood of *Daphniphyllum*, a genus also referred to the Phyllanthaceae, differs so greatly from that of other Euphorbiaceae as to raise a serious doubt as to its proper inclusion in that family. Its affinities are rather with a large group of families which includes, for example, the Ternstroemiaceae and Hamamelideae. This is in general agreement with the conclusions of J. Müller, Argoviensi (in *De Candolle Prodr. Mus. XVI*, 1, 1869, 1), and Käthe Rosenthal (Dissertation,

Breslau, 1916, and *Das Pflanzenreich*, Pt. 68, IV, 147a, 1919) who approve the setting up of a separate family, Daphniphyllaceae, to include this one genus. A discussion of the natural position of this family and of the opinions of various taxonomists will be found in these references.

The principal anatomical differences between the wood of *Daphniphyllum* and that of the other Euphorbiaceae are as follows:

Daphniphyllum

Bulk of the wood consisting of typical fiber-tracheids.

Vessel perforations scalariform.

Comparatively few pores in groups.

Other Euphorbiaceae

Bulk of the wood consisting of typical libriform fibers.

Vessel perforations predominately simple.

Pores frequently in groups.

The wood structure of the remaining genera of the Phyllanthaceae examined is very similar to that of the Bixineae, Samydeae, and Violarieae (*Alsodeia*).¹ Gamble (*A manual of Indian timbers*, London, 1902, p. 37) says of the Bixineae that "the structure closely resembles that of the red-wooded section of Euphorbiaceae." Den Berger (*Beiträge zur Kenntniss der Anatomie des sekundären Holzes der Niederländisch Indischen Baumarten*, I, Bull. du Jardin Bot. Sér. III, Vol. IX, 1928, p. 231) states: "Nach meinen Beobachtungen sind auch bestimmte Euphorbiaceae (*Bridelia*, *Bischofia*, u. s. w.) den Flacourtiaceae anatomisch sehr nahe verwandt." Hutchinson (*The families of flowering plants*, I, London, 1926, p. 19) characterizes the Euphorbiaceae as "a composite family probably derived from several sources such as the Bixales,² Tiliales, Malvales, Celastrales, and perhaps Sapindales." I have found no other reference in taxonomic literature to this relationship between the Euphorbiaceae and the other families mentioned.

The wood of *Acalypha* exhibits many anatomical deviations from the other Crotonaceae, and agrees in so many particulars

¹ See footnote on p. 611 of Vol. III, *Mikrographie des Holzes*.

² To the Bixales belong the Bixaceae, Flacourtiaceae, Samydeae, and other families. See page 16.

with the Phyllanthaceae as to suggest its proper inclusion in the latter tribe. The nearest approach to a confirmation of this view that I have found is the statement in *Das Pflanzenreich* (Pt. 85, IV, 147, 1924, p. 11) that *Acalypha* constitutes a rather isolated genus.

The principal differences between the woods of the Phyllanthaceae (exclusive of *Aporosa*, *Baccaurea*, *Cyclostemon*, *Putranjiva*, and *Daphniphyllum*) and the Crotonaceae (excepting *Acalypha*) are indicated below:

<i>Phyllanthaceae</i>	<i>Crotonaceae</i>
Libriform fibers septate.	Libriform fibers non-septate.
Metatracheal parenchyma absent; diffuse parenchyma absent or sparingly developed.	Metatracheal and diffuse parenchyma both well developed.

U. S. Department of Agriculture Adopts New Plant Name Standard

Standardized Plant Names, published by the American Joint Committee on Horticultural Nomenclature, has replaced Webster's Dictionary as the standard for the spelling of common names of plants in publications of the Department of Agriculture. One of the principles followed in this work is that "whenever a common name properly belonging to one genus is used as a name for a plant of some other genus (unless rarely where very closely related) it is to be used only as a part of a compound name, written either with a hyphen or solid." While observing this principle in general, the department will deviate from it by retaining the following well-established timber trade names: Western Red Cedar [*Thuja plicata*], Eastern Red Cedar [*Juniperus virginiana*], Southern Red Cedar [*Juniperus lucayana*], Southern White Cedar [*Chamaecyparis thyoides*], Northern White Cedar [*Thuja occidentalis*], Southern Cypress [*Taxodium distichum*], Incense Cedar [*Libocedrus decurrens*], Douglas Fir [*Pseudotsuga taxifolia*], Yellow Poplar [*Liriodendron tulipifera*], and Red Gum [*Liquidambar styraciflua*].—*Forest Worker*, May 1929, p. 18.

THE LANDS OF LOBA, COLOMBIA

By HUGH M. CURRAN¹

The Lands of Loba, situated in the Department of Bolívar, Colombia, South America, are the property of the American-Colombian Corporation, Provo, Utah. The tract is about 60 miles in length north and south and 30 in width east and west, comprising more than a million acres, exclusive of lakes and permanent waterways. It lies between the Magdalena and Cauca Rivers, from the vicinity of Mangangué and Mompos, Lat. 9° 15' N., southward to two small mountain streams, the Norosí and the Culebras, about Lat. 8° 15' N. The lands are easily reached from the Magdalena ports of Mangangué and El Banco.

There are two main topographic divisions: (1) level land along the rivers and their tributaries; (2) a rough mountain section extending from the southern boundary into the level lands. The transition is often very abrupt.

The level lands aggregate about 600,000 acres and are of two types: (a) areas above high water or at most only occasionally flooded for a few days at a time; (b) low lands, periodically inundated, some for only a short period during

¹ Mr. Curran has had many years of experience in tropical forestry and exploration work in the Philippine Islands, Argentina, Colombia, Venezuela, Brazil, and the West Indies. He visited the Lands of Loba in the spring of 1916 and submitted a detailed report to the owners. The originals of the botanical material he collected were deposited in the U. S. National Herbarium, while an incomplete set of duplicates, together with small wood samples, was presented to the Yale School of Forestry and later proved exceedingly helpful in the preparation of *Timbers of Tropical America*. About 25 logs were forwarded to the Forest Products Laboratory for testing, but unfortunately at the time the tests were made many of the logs showed considerable deterioration. The herbarium material has been examined by several botanists, notably Paul C. Standley and S. F. Blake, and at least 18 new species have been described. Because of the dearth of definite information concerning the forests of Colombia, the editor obtained the consent of Mr. Curran and the owners of the property to the publication here of a portion of the original report, together with the most recent information concerning the identities of the trees and the results of tests by the U. S. Forest Service on small clear specimens of 20 of the woods.—S. J. R.

the rainy season, others for most of the time except at the height of the dry season. Portions of the higher levels, probably not more than 20,000 acres, are in cultivation, including improved pastures, banana and other fruit plantations, and the annual clearings made in the forests and second-growth for raising maize, yucca, sugar cane, and rice. The low lands are grass or brush, or both, and are used for pasturage during the season of low water. Cattle-raising is the principal industry, and the men in control of the herds clear areas of higher lands and plant Pará and Guinea grass for the period when the natural pastures are flooded.

The forested area is about 530,000 acres; some of it is in isolated patches, but mostly it is in a compact body in the mountain section. Second-growth, swamp, and river-bottom forests comprise about 220,000 acres, and the first-growth forests about 310,000. The heavily timbered mountain section is, in general, a region of narrow, flat-topped ridges with steep slopes, and varying in height from a few hundred to 2000 feet, mostly between 500 and 1200. In the valleys are shallow rivers with considerable fall near their source; the valley floor varies in width from a few yards to half a mile or more. The outer rim of hills is very rocky and the soil is a loose gravel, but near the southern boundary and along the divide, gravels are less abundant and in many places give way to stiff yellow clay.

Most of the population of the region is of Negro ancestry with a considerable mixture of Indian and white. The present occupations of these people, aside from agriculture and grazing, include fishing, firewood-cutting and logging, canoe-making, and river-transportation of passengers and freight in dug-out canoes; also several minor industries such as making mats, brooms, and earthenware. These products are mostly consumed at home or in the neighboring towns.

There are practically no wheeled vehicles in use anywhere in this region. There is a road about 20 miles long in the vicinity of Mompos and another between Loba and a mine called Amargamiento Rico, but nearly all of the transport is by water. Numerous trails connect the valley pasture lands and the clearings with the towns and villages, but they are usually

too narrow and poor to permit the transportation of cargoes, even on pack animals. Good waterways are numerous and can readily be increased through extension and improvement of the canals now in existence. By linking up the river steamboat service with an auxiliary steam or gasoline service suitable for the smaller streams and canals, practically all of the property could be reached quickly and cheaply.

DESCRIPTION OF THE FORESTS

More than half of the property of the American-Colombian Corporation is covered by some form of tree growth. Except for small clearings and a light culling of certain areas adjacent to the river, the mountain forests in the southern part are apparently in primeval condition. Those of the lower lands, however, have long suffered from cutting and burning over due to the settlements along the river, more especially since the steam navigation of recent years has demanded great quantities of firewood. Near the larger settlements it is difficult to determine what the original forests were like, as this continuous cutting has removed the larger trees of desirable kinds, leaving brush, weeds, vines, and inferior species in possession. Further back, however, there are small areas of the river type which have been little disturbed and accordingly provide the basis for judging the composition of the original forest on similar sites elsewhere. Growth is rapid in such places, seedlings of the commercial species are present, and the periodic cutting has not prevented a gradual restocking sufficient to meet the small local demand for timber.

From a commercial point of view, the forests may be classified into three more or less distinct types, namely (1) river bottoms, (2) dry hills and flats, and (3) moist upper slopes, interior valleys, and high mountain tops. For brevity in description these types will be referred to as River, Hill, and Mountain forests, respectively. The divisions are often arbitrary as transitions from one type to another frequently occur.

River forests.—Practically all of the land now occupied by towns and villages and under cultivation was once covered with this type of forest, which in many ways resembles the

mixed hardwood stands of the Mississippi bottomlands. The number of species is comparatively small, the large trees are rather widely spaced, and there is usually a dense undergrowth of vines, palms, shrubs, and small trees; in many places dense thickets of bamboo exclude all other forms of vegetation. Bordering small lakes and marshlands are thickets of a spiny palm called Lata, or, in restricted localities, almost pure stands of a low-growing, much-branched tree, the Mangle (*Symmeria*).

The principal commercial species of the river forests are Campaño, Ceiba, Coquillo, Garcero, Guayabo León, Guayamero, Jobo, Majagua, Malagano, Oriera, Piñón, and Sanchoaraña. Between 50 and 75 per cent of the total lumber cut will be supplied by Jobo, Guayabo León, and Campaño. The last is less abundant than the other two, but more than compensates for this difference by its larger size. The stand per acre varies from 6000 to 10,000 feet B. M. on the areas examined, though heavier stands may be expected in less accessible places. Assuming an average of 8000 feet per acre, the total stand on the entire area of this type (220,000 acres) is estimated to be 1760 million feet.

About half of this timber would have the general properties of Basswood (*Tilia*), Yellow Poplar (*Liriodendron*), and Cottonwood (*Populus*). A third would be of moderate density and suitable for many of the purposes for which Oak (*Quercus*) Ash (*Fraxinus*), Maple (*Acer*), and Beech (*Fagus*) are commonly employed in the North. The remainder would be dense and strong, and mostly useful for heavy and durable construction and special purposes. About 80 per cent of the total cut would be of a quality best fitted for ordinary manufacturing purposes, box shooks, and rough construction lumber. Not more than 20 per cent, mostly of Campaño and Oriera, would meet the standards for fine furniture, interior trim, and similar uses where natural beauty is essential.

Hill forests.—This type is intermediate between the river and the mountain forest and its boundaries are poorly defined. Usually it occurs on the deep gravel soils of the lower hills or on the flats formed by the wash from these hills. It

attains its optimum development in the dry regions about Norosí and northward to the mouth of the Mejía River.

The trees are rather short-boled and in fairly open stand, in some places consisting almost entirely of a single species called Tolú. Cedro (Spanish Cedar) occurs sparingly and is the most important timber commercially. Other kinds of value are Aceituno, Algarrobo, Cañaguata, Carreto, Gusanero, and Roble; of these, Carreto is the most abundant and is much exploited. The hill forests have been culled for years, as they are fairly accessible from the river. The average stand of timber per acre is about 8000 feet B. M.

Mountain forests.—In these are to be found the principal timber wealth of the property. The forests have suffered but little despoilation from settlers and wood cutters and are free from fire damage. Dense stands of tall, straight-boled trees are common, and on the interior valley floors there are considerable areas that would yield an average of 25,000 feet B. M. of merchantable timber per acre. The size of the trees and the density of stocking decrease with the elevation above the valley and on rocky, exposed slopes the stand will not exceed 10,000 feet per acre. The average for the whole type is estimated to be about 18,000 feet, giving a total for 310,000 acres of 5580 million feet.

The largest and most abundant species is the Albarco; it occurs everywhere except on some of the dry frontal hills and the highest ridges. Its most important associates are Anime, Caimo, Caracolí, Granadillo, Guayamero, Sapán, and Yaya. Next in occurrence is a group consisting of Ají, Algarrobillo, Canime, Guayabo, Maquí-maquí, Papozambo, and Tomasuco. A third group of still less common occurrence includes Caguí, Ceiba, Coco de Mono, Guayacán Jobo, Gusanero, and Tananeo.

The bulk of the timber would be supplied by Albarco, Sapán, and Caracolí. Of the total cut, about 60 per cent would be medium or soft, 30 per cent hard, and 5 per cent very hard wood. About 40 per cent would be suitable for furniture and interior trim, as it would be mostly Albarco, which has already been tried out with success in the United States.

MINOR FOREST PRODUCTS

In addition to the merchantable timber on the tract, which, after allowance for invisible defects, is estimated to amount to over six billion board feet, there are various minor products of present or potential value. Principal among these are the palms.

The leaves of the Palma Barbasco furnish material for brooms. Palma Estera produces nuts that are edible and are also the source of oil; its leaves are used for making mats, and from the midrib are fashioned very stiff and durable brooms. The nuts of Palma Mangue are large, are produced in great quantity, and yield an edible oil; the leaves are used for thatching native dwellings. Palma Coroso fruits prolifically and the nuts yield oil of better quality, greater quantity, and of more general use than is the case with any of the other palms; its leaves are employed for thatching. Palmo Vino yields oil-producing nuts and a form of wine may be obtained from the growing point of the stem.

Other products worthy of investigation are medicinal plants, dyestuffs, and tanning materials; gums and resins; bast fibers for cordage, particularly from the bark of Albarco and Majagua trees; bamboo; and various vines.

FOREST EXPLOITATION

The principal utilization of timber at present is for firewood, which is sold to the steamboat companies for use on the river steamers. Cutting has in the past been without control and as a result the lands along the streams have been stripped bare of timber, forcing longer and longer hauls and ever widening the areas of brushland. Under proper management the productiveness of these lands could be restored. There is also the possibility of combining cordwood-cutting with modern logging operations, thus utilizing the tops and defective portions of large trees and ridding the land of inferior species.

During recent years logging on the property has been carried on in only a very small way. Near the rivers and the villages enough of the larger trees are felled to meet the needs

of the population, mostly for canoes and house timbers. The logs are dragged to water by hand or animals, the distance rarely exceeding a few miles, except in the case of Cedro, which may be hauled as far as 10 miles. Sometimes for convenience in hauling, the logs are cut into 2-inch planks and dragged by animals to the water courses or the towns. It is necessary to go considerable distances from the settlements to find good specimens of Aceituno, Caguí, Cañaguatè, Cedro, Coquillo, Gusanero, Roble, Tolú, and large soft-wooded trees suitable for dug-out canoes.

Clearing for temporary cultivation has been a much greater factor than lumbering in the destruction of the forest. Shifting agriculture is a problem confronting tropical foresters the world over, and some method of control is necessary to prevent great losses of merchantable timber.

The forests of the Lands of Loba are above the average for tropical South America. They are near to large navigable rivers and there are numerous natural channels or canals entering the property which would provide water transport from the edge of the forest to the river ports. Logging could begin within one to three miles of navigable water, and the longest hauls would hardly exceed 20 miles. The bulk of the timber could be reached by tram and dirt roads entering the hills at easy grades along the level valley floor of the mountain streams. The best market for 80 per cent of the lumber would probably be found in the principal river and coast ports of Colombia and also the Panama Canal Zone and Cuba where the dealers and manufacturers are already familiar with tropical woods of the same or similar kinds. About 20 per cent would be suitable for export to the markets of the United States and Europe.

ANNOTATED LIST OF TREES ON THE LANDS OF LOBA

(The numbers 1-378 are the collector's field numbers. Those marked T. S. are trade samples, without botanical material, and constitute a separate series. The Yale serial numbers, usually in parenthesis, refer to wood specimens only. Since many of the trees and woods have been described at length by Professor Record in *Timbers of Tropical America*, frequent reference is made to that work under the abbreviation *T. of T. A.*)

ACANTHACEAE

Aphelandra Deppeana S. & C. HUESO DE ANTA. Small tree, of no commercial importance. Nos. 99 and 111, San Martín de Loba and vicinity.

Bravaisia integerrima (Sprague) Standl. SANCHO-ARAÑA. Medium-sized tree, 60-80 feet high, with peculiar stilt roots 20-30 feet above the ground, bearing at the top a crown of numerous branches some of which are large enough to be utilized for timber. Wood nearly white, odorless and tasteless, moderately soft, easy to work, not readily discolored or attacked by insects when left on the ground after logging. Appears suitable for certain classes of packing boxes and pails for food products. Nos. 308 (Y. 3964) and 317 (Y. 1534), vicinity of Estrella, Caño Papayal; No. 222, along Mompos-Juana Sanchez trail, Island of Mompos. See *T. of T. A.*, pp. 545-546.

Trichanthera gigantea H. & B. Medium-sized tree, the one collected being 50 feet tall and 10 inches in diameter. No. 54, San Martín de Loba and vicinity.

AMYGDALACEAE

Licania arborea Seem. GARCERO; QUITO SOL. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Wood grayish or brownish, hard, heavy, and strong, suitable for many of the purposes of Oak. No. 303 (Y. 1530), vicinity of Estrella, Caño Papayal; also Yale No. 1601.

Licania platypus (Hemsl.) Fritsch. CHUPA. Medium-sized tree, the one collected being 40 feet tall and 12 inches in diameter. Fruit is edible. No. 146, Norosi-Tiquisio trail, alt. 150-600 meters.

Licania sp. CARBONERO. Medium-sized tree, the one collected being 40 feet tall and 20 inches in diameter. Wood similar to *L. arborea*. No. 178 (Y. 1516), San Martín de Loba and vicinity.

Moquilea sp.? PERQUETANO. Wood brown, rather hard and heavy, not very durable. No. 139 (Y. 1545). See *T. of T. A.*, pp. 199-201.

ANACARDIACEAE

Anacardium Rhinocarpus DC. (= *A. excelsum* Skeels). CARACOLÍ. A large tree, frequently 75-100 feet tall and 3-4 feet in diameter, occasionally much larger and attaining a diameter of 8 feet. Wood variegated light brown, pinkish brown, or yellow, darkening upon exposure, rather light and soft but firm, roe-grained, fairly easy to work, takes a high natural finish and appears durable. Is suitable for general carpentry and furniture. Well known in Panama under the name of Espavé. Nos. 274 (Y. 1589) and 351 (Y. 1544 and Y. 3966), vicinity of Estrella, Caño Papayal; also Yale No. 1575. See *T. of T. A.*, pp. 380-381.

Astronium fraxinifolium Schott. GUSANERO. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Sapwood white, heartwood dark reddish brown, beautifully figured with dark bands; hard, fine-textured, highly durable, suitable for heavy construction and fine cabinet work; is practically the same as Gonçalo Alves of Brazil. No. 354 (Y. 3969), vicinity of Estrella, Caño Papayal; also T. S. Nos. 9 and 10 (Y. 1562 and Y. 1563). See *T. of T. A.*, pp. 389-390.

Spondias Mombin L. JOBO; JOBO COLORADO. Medium-sized to large tree, 75-100 feet tall and 2-3 feet in diameter, occasionally 4 feet. One of the commonest trees in the forest. Wood white or grayish, soft, very subject to attack by insects and fungi, so that the logs must be manufactured into lumber promptly and kiln dried. Suitable for packing boxes and light construction. No. 272, along the Caño Chacagua; No. 291 (Y. 1522), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 381-382.

ANNONACEAE

Duguetia sp.? YAYA. Small or medium-sized tree, 50-75 feet high and 18-24 inches in diameter. Sapwood yellowish white, tough and flexible, much used locally for handles of axes and other tools, and suitable for archery bows, serving the same purposes as Hickory (*Carya*). Heartwood of old trees variegated brown with streaks of dark color, sometimes decidedly greenish, and suitable for cabinet work. No. 350 (Y. 1613A and Y. 3965). See *T. of T. A.*, p. 167.

APOCYNACEAE

Aspidosperma sp. CARRETO. Moderately large tree, 75-100 feet tall with a straight bole 2-3 feet in diameter; of common occurrence. Wood dull grayish white or reddish, hard, heavy, and strong, highly durable in contact with the soil, used largely for railway crossties and heavy exterior construction. No. 294 (Y. 1524), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 514-515.

Tabernaemontana grandiflora Jacq. A small tree of no commercial importance. No. 12, San Martín de Loba and vicinity.

Tabernaemontana psychotrifolia H. B. K. Small tree or a shrub of no commercial importance.

BIGNONIACEAE

Crescentia Cujete L. TOTUMA. A small tree, occasionally 50 feet high and 18 inches in diameter, known in the West Indies as Calabash. The moderately hard, tough, and strong wood has much the consistency of Elm (*Ulmus*). No. 184 (Y. 1518). See *T. of T. A.*, p. 544.

Jacaranda filicifolia D. Don. CHINGALÍ. Small or medium-sized tree with fern-like leaves. Wood nearly white, rather fine-textured, fairly straight-grained, easy to work, takes a smooth finish, stiff and strong, but only moderately heavy and not durable in contact with soil. Appears a suitable substitute for Ash (*Fraxinus*). No. 162 (Y. 1606), Norosi-Tiquisio trail.

Tecoma pentaphylla A. Juss. ROBLE. A fair-sized tree, 75-100 feet tall and 18-24 inches in diameter. This species is very widely distributed throughout tropical America. Wood of light brown color, suggesting plain White Oak, and suitable for general construction, interior trim, floors and furniture. No. 332 (Y. 1538), vicinity of Estrella, Caño Papayal; also wood samples Y. 1566 and Y. 1598. See *T. of T. A.*, p. 535; also *Tropical Woods* 8: 8, Dec. 1, 1926.

Tecoma spectabilis Pl. & L. CAÑAGUATE; GUAYACÁN POLVILLO. A large

tree, 100 feet or more in height, with trunk up to 3 feet in diameter and clear of branches for 40-50 feet. Wood dark olive-brown, containing yellowish powder (lapachol compound), very hard and heavy, tough, strong, not easy to work, highly durable in contact with the soil. It is similar to the Lapacho of Argentina, the Ipé of Brazil, and the Pui of Venezuela. Chiefly used for railway cross-ties and heavy outside construction. T. S. No. 15 (Y. 1568). See *T. of T. A.*, pp. 541-543.

BIXACEAE

Bixa Orellana L. ACHIOTE. A small tree, specimen collected being 30 feet high and 6 inches in diameter. Widely distributed in tropical America. No commercial importance. No. 86 (Y. 1577), San Martín de Loba. See *T. of T. A.*, p. 446.

BOMBACACEAE

Bombacopsis sp. TOLÚ. A large tree, 75-100 feet high and 3 or 4, occasionally 5 or 6, feet in diameter, usually with a short bole, buttressed at the base. Wood of a red color, odorless and tasteless, light and soft, easy to work, but tough and strong for its weight. One of the best known and most widely used locally of Colombian woods, being considered a fairly satisfactory substitute for Cedro for general construction and interior finish and cabinet work. The timber is more abundant than Cedro, sells for considerably less, and is one of the most promising woods on the tract. No. 347 (Y. 1616); also Yale Nos. 1557 and 1582. See *T. of T. A.*, pp. 415-417.

Bombax cumanense H. B. K. CEIBA DE AGUA. A medium-sized tree, with rather light and soft, coarse wood of no present commercial importance. Could be used for the manufacture of boxes. No. 341 (Y. 1540), vicinity of Estrella, Caño Papayal.

Bombax sp. MAJAGUA. Medium-sized tree with soft, coarse, and tough wood of no commercial importance. The inner bark is considerably used locally for cordage. The cotton from the seed pods is employed for stuffing pillows and mattresses. No. 251 (Y. 1591), Caño Chacagua; No. 290 (Y. 1521), vicinity of Estrella, Caño Papayal; also Yale No. 1570. See *T. of T. A.*, pp. 414-415.

Ceiba pentandra (L.) Gaertn. CEIBA. A very large tree, 100-125 feet tall, 4-5 feet, rarely up to 8 feet, in diameter above the heavy, wide-spreading buttresses. The wood is nearly white, light and soft but tough, very perishable in contact with the ground and subject to brown stain and insect injury. Kiln-dried lumber would be suitable for packing boxes and light construction. No. 275 (Y. 1547), along the Caño Chacagua. See *T. of T. A.*, pp. 419-420.

Quararibea guianensis Aubl. BOTÓN. Small tree, 40-50 feet high, with a smooth bark suggesting Beech (*Fagus*), the bole 12-20" in diameter and usually covered throughout its length with small limbs which interfere with its use for lumber. The wood is white, suggesting Holly (*Ilex*), odorless and tasteless, rather hard and heavy, straight-grained, easy to work, subject to blue stain and not durable when exposed. No. 352 (Y. 3967), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 422-424.

BORRAGINACEAE

Cordia alliodora (R. & P.) Cham. SOLERA. Medium-sized tree, sometimes 80 feet tall and 25 inches in diameter, with enlarged twigs which harbor ants. Wood grayish brown in young trees, becoming darker brown in old ones, and fragrantly scented; rather light and soft but firm, easy to work, takes a smooth finish and holds its place well when manufactured. Dark-colored wood is highly durable and is suitable for general carpentry, interior trim, and furniture. No. 177 (Y. 1548), Norosí-Tiquisio trail; also Yale Nos. 1556 and 1599. See *T. of T. A.*, pp. 518-521.

Cordia glabra L. CUSÚ. Small tree, the specimen collected being 30 feet high and 6 inches in diameter; of no commercial importance. No. 159, Norosí-Tiquisio trail.

Cordia Sebestena L. CANALETE? Medium-sized tree, with dark-colored brownish heartwood often with irregular black markings, hard and heavy, medium-textured, finishes smoothly and is highly durable; is well suited for fine furniture. No. 219, along the Mompos-Juana Sanchez trail. See *T. of T. A.*, pp. 516-518.

BURSERACEAE

Bursera Simaruba (L.) Sarg. RESBALO MONO. A slender tree, usually with a crooked trunk covered with lustrous copper-colored papery bark. Wood whitish to light brown, odorless and tasteless, rather light and soft but strong, medium-textured, fairly easy to work, holds nails readily and would be suitable for the manufacture of boxes and for general carpentry if the logs were sawn into lumber promptly and kiln-dried to prevent blue stain and insect attack. Nos. 85 and 197, San Martín de Loba; No. 346 (Y. 1542), Estrella, Caño Papayal. See *T. of T. A.*, pp. 337-339.

Protium guianense (Aubl.) March. ANIME BLANCA. A slender tree, 75-100 feet tall and 18-24 inches in diameter. The reddish wood is moderately hard, light, fine-textured, easy to work and suggests Birch (*Betula*) and is suitable for the same purposes. No. 15, San Martín de Loba; No. 138 (Y. 1546), Norosí-Tiquisio trail. See *T. of T. A.*, pp. 334-337.

CAPPARIDACEAE

Crataeva Tapia L. NARANJILLO. A small tree, rarely 50 feet high and 20 inches in diameter, with a white or yellowish wood of moderate hardness, medium density, fairly easy to work, not durable in contact with the soil. Of no commercial importance, but suitable for minor carpentry purposes. No. 186 (Y. 1520), San Martín de Loba; No. 189, Estrella, Caño Papayal; No. 289 (Y. 3961). See *T. of T. A.*, pp. 190-191.

COMBRETACEAE

Terminalia sp. GUAYABO LEÓN. Large tree, 100-125 feet tall and 2-3 feet in diameter above the heavy buttresses. Sapwood yellowish white, heartwood dark brown, often beautifully figured, but hard, rather cross-grained, and difficult to work. It is suitable for interior construction and furniture and takes a lustrous polish. No. 179 (Y. 1590); No. 270, Caño Chacagua; No. 293

(Y. 1610 and 3962), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 477-478.

Terminalia sp. PALO PRIETO. Small tree, the specimen collected being 30 feet high and 12 inches in diameter; Apparently of no commercial value. No. 270, Caño Chicagua.

COMPOSITAE

Tessaria mucronata DC. A shrub or a small tree collected in San Martín de Loba.

ELAEOCARPACEAE

Sloanea sp. GUEBA DEL GATO. A small tree of no known uses. No. 208, San Martín de Loba.

EUPHORBIACEAE

Acalypha macrostachya Jacq. A small tree of no commercial importance, specimen collected being 30 feet high and 10 inches in diameter. No. 50, San Martín de Loba.

Acalypha villosa Jacq. SALVIA DEL MONTE. A small tree of no known uses. Nos. 101 and 109, San Martín de Loba.

Adelia barbinervis S. & C.? A small thorny tree, the specimen collected being 20 feet tall and 6 inches in diameter. No. 82, San Martín de Loba.

Alchornea castaneifolia (Willd.) Juss. SERRÉN SERRÉN. A small tree with sharply serrate leaves suggesting Chestnut (*Castanea*). No. 343, Estrella, Caño Papayal.

Croton fragrans H. B. K. MANTECO. A small tree of no known uses. Nos. 51 and 187, San Martín de Loba.

Hura crepitans L. CEIBA DE LECHE. A shade tree known in British West Indies as Sandbox and the source of lumber from Dutch Guiana sold in the United States market as Rakuda. No. 176, Norosí-Tiquisio trail. See *T. of T. A.*, pp. 374-377.

Phyllanthus acidus (L.) Skeels. ARBOLITO. A small tree, the specimen collected being 15 feet high and 4 inches in diameter; of no known use. San Martín de Loba.

Phyllanthus sp. GABELLÓN. A small tree, the specimen collected being 18 feet high and 6 inches in diameter; no known uses. No. 113, San Martín de Loba.

Sapium aucuparium Jacq. FLORAL. Small tree, the specimen collected being 20 feet high and 10 inches in diameter; no known uses. No. 266, Mompos-Juana Sanchez trail.

FLACOURTIACEAE

Casearia arguta H. B. K. PALO BLANCO. A small tree, the specimen collected being 15 feet high and 4 inches in diameter. No. 9, San Martín de Loba.

Casearia guianensis (Aubl.) Urb. PALO BLANCO. Shrub 10 feet high and 1 inch in diameter. No. 79, San Martín de Loba.

Casearia nitida (L.) Jacq. A small tree, one specimen being 15 feet high and 3 inches in diameter. Nos. 17 and 78, San Martín de Loba; No. 215, Mompos-Juana Sanchez trail.

Casearia sylvestris Sw. MAHAJO. A small tree of no commercial importance. No. 99x, San Martín de Loba.

Homalium columbianum Blake (Contr. U. S. Nat. Herb. 20: 7: 233). TREBO. A small or medium-sized tree, the specimen collected being 40 feet high and 12 inches in diameter; no known uses. No. 21, San Martín de Loba.

Laetia americana L. GUÁCIMO? A small tree of no commercial importance, the one collected being 30 feet high and 8 inches in diameter. No. 216, Mompos-Juana Sanchez trail.

Laetia apetala Jacq. A small tree 15-20 feet high, of no commercial importance. No. 36, San Martín de Loba.

Tetrathylacium Johansenii Standl. A small or medium-sized tree, the specimen collected being 30 feet high and 12 inches in diameter. Wood yellowish, fine-textured, moderately hard and heavy, tough and strong, fairly easy to work, finishes smoothly, is probably not very durable when exposed; local uses unknown. No. 329 (Y. 1537), vicinity of Estrella, Caño Papayal.

GUTTIFERAE

Vismia guianensis (Aubl.) Pers. PUNTA DE LANZA. A small or medium-sized tree with a brownish wood resembling that of Santa María (*Calophyllum* sp.); of little utility because of the small size of the tree. Nos. 183 (Y. 1517) and 193, San Martín de Loba. See *T. of T. A.*, p. 445.

Vismia viridiflora Duch. A small tree, the specimen collected being 15 feet high and 6 inches in diameter; no known uses. No. 67, San Martín de Loba.

HERNANDIACEAE

Gyrocarpus americanus Jacq. PIÑÓN? A small or medium-sized tree, the specimen collected being 40 feet tall and 10 inches in diameter. Wood grayish, light and soft, and subject to blue stain and decay; suitable for box boards if properly handled. No. 235, Mompos-Juana Sanchez trail.

LAURACEAE

Nectandra sp. LAUREL NEGRO. A medium-sized tree, the one collected being 35 feet high and 10 inches in diameter; uses unknown. No. 8, San Martín de Loba.

Ocotea flavescens Rusby. A small or medium-sized tree, the one collected being 20 feet high and 5 inches in diameter. No. 18, San Martín de Loba.

Ocotea veraguensis Mez. LAUREL. Medium-sized tree, the one collected being 30 feet tall and 10 inches in diameter. No. 172, Norosí-Tiquisio trail. See *T. of T. A.*, p. 175.

Undetermined. LAUREL COMINO. Wood yellowish brown, mildly scented, rather hard and heavy, fine-textured, fairly easy to work, takes a lustrous polish, and is probably fairly durable; suitable for carpentry, general construction, and furniture. Yale No. 1600. Another specimen is coarser-textured, curly-grained, soft, and much more highly scented; would make an excellent cabinet wood. No. 311 (Y. 1612A).

LECYTHIDACEAE

Cariniana pyriformis Miers. ALBARCO. One of the largest and tallest trees in the forest, being 125-175 feet high and 3-5, rarely up to 8, feet in diameter, with clear lengths of 50-80 feet. Wood reddish or brownish, moderately hard and heavy, tough and strong, takes a lustrous polish, but is sometimes difficult to saw because of gritty constituent; was formerly exported to the United States under the name of Colombian Mahogany. No. 353 (Y. 3968), vicinity of Estrella, Caño Papayal; also Yale No. 1602. See *T. of T. A.*, p. 468.

Lecythis Curranii Pittier (Contr. U. S. Nat. Herb. 20: 3: 130). COQUILLO. A fair-sized tree, 70-100 feet high and 18-24 inches in diameter. Heartwood blackish brown, distinctly laminated, hard, heavy, and strong, rather harsh-textured, and very durable in the ground; used for exterior construction. No. 242 (Y. 1594), Mompos-Juana Sanchez trail, No. 305 (Y. 1614), vicinity of Estrella, Caño Papayal; type from Norosí-Tiquisio trail.

Lecythis sp. COCO DE MONO; OLLA DE MONO. A very large tree, 100-150 feet tall and 3-4 feet in diameter. Wood reddish, distinctly laminated, very hard and heavy, often cross-grained and tough, durable in contact with the ground; used for exterior construction. Yale Nos. 1572, 1573, and 1619.

LEGUMINOSAE

Andira inermis H. B. K. CONGO. This is the Cabbage Bark tree of the British West Indies, noted for its strong and durable dark-colored wood. Nos. 23 and 71 (Y. 1553), San Martín de Loba. See *T. of T. A.*, p. 300.

Brownea bolivarensis Pittier (Contr. U. S. Nat. Herb. 20: 3: 111). A shrub or small tree, the specimen collected being 15 feet high and 4 inches in diameter; no known uses. No. 142, Norosí-Tiquisio trail.

Caesalpinia coriaria (Jacq.) Willd. DIVI-DIVI. A small tree, usually of very poor timber form and chiefly useful for its pods, which are an important source of tannin. No. 90, San Martín de Loba; No. 221, (Y. 1617?), Mompos-Juana Sanchez trail. See *T. of T. A.*, p. 251.

Calliandra sp. A small tree along a mountain stream in the vicinity of Amargamiento Rico.

Cassia bacillaris F. YEMA DE HUEVO. A small tree, the specimen collected being 15 feet high and 2 inches in diameter. The wood is yellow, rather light and soft, fine-textured, easy to work, finishes very smoothly; no known uses. No. 348 (Y. 1543), vicinity of Estrella, Caño Papayal.

Centrolobium sp. GUAYACÁN JOBO. A fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Sapwood yellowish white, heartwood dark yellow or

brown with beautiful luster and sometimes attractively figured; rather hard and strong, fairly easy to work, takes a beautiful finish and is suitable for interior construction and furniture. Yale No. 1603. See *T. of T. A.*, pp. 291-293.

Copaifera officinalis (L.) Willd. CANIME. A fair-sized tree, 75-100 feet tall and 18-24 inches in diameter. Wood brownish, moderately hard, medium-textured, easy to work, finishes very smoothly, and is fairly durable; used for interior construction. From the heartwood of the living tree an oily liquid exudes, which is the source of a commercial product called Copaiba Balsam. See *T. of T. A.*, pp. 229-231.

Coursetia arborea Gris. A small tree or a shrub, the specimen collected being 15 feet high and 2 inches in diameter. Collected along Mompos-Juana Sanchez trail.

Dialium divaricatum Vahl. GRANADILLO. A fair-sized tree, 75-100 feet tall and 18-24 inches in diameter, with a dark brown wood, very hard, heavy, strong, and durable, suitable for exterior construction and for frames of implements and vehicles. No. 60 (Y. 1576), vicinity of Amargamiento Rico. See *T. of T. A.*, pp. 239-240.

Enterolobium cyclocarpum (Jacq.) Gris. ORIERA. A large timber tree, widely distributed from Mexico into northern South America. Wood walnut-brown of various shades, moderately light and soft, easy to work, takes a smooth finish and is durable; is suitable for furniture and interior trim, and the timber from Mexico is known on the markets of the United States as Pichwood and South American Walnut. No. 296 (Y. 1526), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 204-207; also *Tropical Woods* 18: 25-26, June 1, 1929.

Hymenaea Courbaril L. ALGARROBO. A large tree, 100-125 feet tall and 3-4 feet in diameter. Yields a commercial resin and the fruits are edible. Wood reddish brown, hard, heavy, and strong, fairly durable, used for exterior construction. This tree is widely distributed in tropical America and the English name for it is West Indian Locust.

Inga punctata Willd. GUAMO MACHO. A small spreading tree, the specimen collected being 30 feet high and 15 inches in diameter. Yale No. 1585, San Martín de Loba. See *T. of T. A.*, p. 203.

Inga spectabilis Willd. GUAMO MACHETE. A rather small spreading tree, with very large leaves; fruit edible. Nos. 147 and 173, Norosí-Tiquisio trail.

Inga spuria H. & B.? GUAMO MACHO. A low tree, the specimen collected being 25 feet high and 12 inches in diameter. No. 3, San Martín de Loba.

Inga sp. GUAMO MICO. A small tree, the specimen collected being 30 feet high and 10 inches in diameter. No. 226, along the Mompos-Juana Sanchez trail.

Lonchocarpus violaceus H. B. K.? MOROCOLO; MURUCUTÚ. A small or a medium-sized tree, one specimen collected being 25 feet high and 15 inches in diameter. Wood yellowish, hard, heavy, strong. No. 26, San Martín de Loba; No. 301, vicinity of Estrella, Caño Papayal.

Machaerium sp.? SIETE CASCAS. A small tree, the specimen collected being 35 feet high and 20 inches in diameter; of no commercial importance. No. 220 (Y. 1549?), San Martín de Loba.

Peltogyne sp. TANNANEO. Fair-sized tree, 75-100 feet tall and 20-30 inches in diameter. Wood purplish, deepening upon exposure, very hard, heavy, and strong, takes a lustrous polish, is very durable in contact with the ground; suitable for exterior construction and for frames of implements and vehicles. Wood of closely related species known in United States markets as Purpleheart or Amaranth. No. 344 (Y. 1541), vicinity of Estrella, Caño Papayal; also Yale Nos. 1555 and 1564. See *T. of T. A.*, pp. 233-235.

Piptadenia communis Benth.? ESPINO. A medium-sized tree, the one collected being 50 feet tall and 10 inches in diameter; no known uses. No. 55?, San Martín de Loba; No. 328 (Y. 1536), vicinity of Estrella, Caño Papayal.

Pithecolobium ligustrinum (Jacq.) Kl. PAYANDÍ; UÑA DE TIGRE. A small armed tree of no known uses. No. 225, Mompos-Juana Sanchez trail; also unnumbered specimen from vicinity of Estrella, Caño Papayal.

Pithecolobium pilosulum Pittier (Contr. U. S. Nat. Herb. 20: 12: 466). GUAMO MACHO? A small or medium-sized tree, one specimen collected being 30 feet high and 10 inches in diameter. Nos. 19 and 88, San Martín de Loba.

Pithecolobium spinulosum Pittier (Contr. U. S. Nat. Herb. 20: 12: 459). PAYANDÍ. A small tree, one specimen collected being 25 feet high and 15 inches in diameter. Nos. 48 and 169, San Martín de Loba.

Pithecolobium sp. GUAYACÁN; GUAYACÁN CHAPARRO; GUAYACÁN CIÉN-AGA. A small hard-wooded tree, 30-40 feet high (not a true *Pithecolobium*); no known uses. Nos. 43 (Y. 1551) and 44 (Y. 1552), San Martín de Loba; No. 300 (Y. 1528), vicinity of Estrella, Caño Papayal.

Platylobium sp.? A fair-sized tree, the specimen collected being 80 feet tall and 24 inches in diameter. No. 195, San Martín de Loba.

Samanea Saman (Jacq.) Merr. CAMPAÑO. A very large tree, 100-125 feet tall and 3-4, rarely 6, feet in diameter, usually with a broad trunk and wide-spreading branches. Sapwood thin and white, heartwood dark walnut-brown, often beautifully figured, of medium hardness, usually cross-grained, fairly strong, takes a beautiful finish and is suitable for interior trim and furniture. No. 10, San Martín de Loba; No. 302 (Y. 1529), vicinity of Estrella, Caño Papayal; also Yale Nos. 1595 and 1620. See *T. of T. A.*, p. 204.

Sweetia panamensis Benth. REJO? A medium-sized tree, the specimen collected being 50 feet high. The brownish wood is hard and heavy, rather fine-textured, tough and strong, takes a high polish, and is highly durable. Wood of this species is used in Central America for outside construction, framing timbers, and spokes of log wagons. Collected along Norosí-Tiquisio trail. See *T. of T. A.*, pp. 261-263.

Undetermined. MADURO PLÁTANO. A rather large tree, the specimen collected being 80 feet tall and 24 inches in diameter. Wood hard, heavy, strong; pores very small, parenchyma in numerous wavy bands about one-half the width of the fiber layers; ripple marks present. No. 224 (Y. 1550), along Mompos-Juana Sanchez trail.

Undetermined. SAPÁN. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Wood chocolate-brown showing lighter-colored parenchyma layers distinctly as in Partridge Wood; hard, heavy, strong, not easy to work, takes a lustrous polish, is highly durable; suitable for outside construction and umbrella handles, canes, and miscellaneous articles of turnery.

MALPIGHIACEAE

Bunchosia pilosa H. B. K. A small tree of no known uses. No. 189, San Martín de Loba.

MELASTOMACEAE

Miconia impetolaris (Sw.) Don. PUNTA DE SARVIA. A small tree or a shrub, one specimen collected being 12 feet high and 2 inches in diameter. Nos. 14 and 68, San Martín de Loba.

MELIACEAE

Cedrela sp. CEDRO. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter, rather short-boled. Wood light and soft or moderately so, aromatic, very easy to work, highly resistant to decay and insects, much used locally for carpentry, interior finish, and furniture. This is the timber known on the American market as Spanish Cedar; used chiefly for cigar boxes. Yale Nos. 1565, 1567, and 1622. See *T. of T. A.*, pp. 340-348.

Guarea racemiformis Blake (Contr. U. S. Nat. Herb. 20: 7: 241). A small tree, one specimen collected being 20 feet high and 6 inches in diameter; no known uses. No. 96, San Martín de Loba; No. 265, along the Caño Chacagua.

Guarea trichilioides L. TROMPETO. A small or medium-sized tree, one specimen collected being 30 feet high and 12 inches in diameter. No. 105, San Martín de Loba; No. 181, Norosí-Tiquisio trail. See *T. of T. A.*, pp. 359-361.

Trichilia Curranii Blake (Contr. U. S. Nat. Herb. 20: 7: 242). MAN-GALITO. A small tree, one specimen collected being 20 feet high and 6 inches in diameter. Nos. 107 and 112, San Martín de Loba; No. 288 (Y. 3960), vicinity of Estrella, Caño Papayal.

Trichilia triphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 243). BAGRE. A small tree with a light-colored, moderately hard wood. Nos. 292 (Y. 1523) 299 (Y. 1527), 299A (Y. 1611), and 315, vicinity of Estrella, Caño Papayal.

MORACEAE

Brosimum columbianum Blake (Proc. Biol. Soc. Wash. 35: 179). GUAY-AMERO. A fair-sized tree, 75-100 feet tall, with cylindrical bole 2-3 feet in diameter and free of limbs for 40-50 feet. The bark is thin and smooth, suggesting Beech (*Fagus*) and has very little latex. The wood is light-colored, hard, heavy, strong, not durable in contact with the soil; not used locally but worthy of trial as a substitute for Hickory (*Carya*). No. 304 (Y. 1531), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 137-138.

Machaerium sp.? SIETE CASCAS. A small tree, the specimen collected being 35 feet high and 20 inches in diameter; of no commercial importance. No. 220 (Y. 1549?), San Martín de Loba.

Peltogyne sp. TANNANEO. Fair-sized tree, 75-100 feet tall and 20-30 inches in diameter. Wood purplish, deepening upon exposure, very hard, heavy, and strong, takes a lustrous polish, is very durable in contact with the ground; suitable for exterior construction and for frames of implements and vehicles. Wood of closely related species known in United States markets as Purpleheart or Amaranth. No. 344 (Y. 1541), vicinity of Estrella, Caño Papayal; also Yale Nos. 1555 and 1564. See *T. of T. A.*, pp. 233-235.

Piptadenia communis Benth.? ESPINO. A medium-sized tree, the one collected being 50 feet tall and 10 inches in diameter; no known uses. No. 55?, San Martín de Loba; No. 328 (Y. 1536), vicinity of Estrella, Caño Papayal.

Pithecolobium ligustrinum (Jacq.) Kl. PAYANDÍ; UÑA DE TIGRE. A small armed tree of no known uses. No. 225, Mompos-Juana Sanchez trail; also unnumbered specimen from vicinity of Estrella, Caño Papayal.

Pithecolobium pilosulum Pittier (Contr. U. S. Nat. Herb. 20: 12: 466). GUAMO MACHO? A small or medium-sized tree, one specimen collected being 30 feet high and 10 inches in diameter. Nos. 19 and 88, San Martín de Loba.

Pithecolobium spinulosum Pittier (Contr. U. S. Nat. Herb. 20: 12: 459). PAYANDÍ. A small tree, one specimen collected being 25 feet high and 15 inches in diameter. Nos. 48 and 169, San Martín de Loba.

Pithecolobium sp. GUAYACÁN; GUAYACÁN CHAPARRO; GUAYACÁN CIÉN-AGA. A small hard-wooded tree, 30-40 feet high (not a true *Pithecolobium*); no known uses. Nos. 43 (Y. 1551) and 44 (Y. 1552), San Martín de Loba; No. 300 (Y. 1528), vicinity of Estrella, Caño Papayal.

Platylobium sp.? A fair-sized tree, the specimen collected being 80 feet tall and 24 inches in diameter. No. 195, San Martín de Loba.

Samanea saman (Jacq.) Merr. CAMPAÑO. A very large tree, 100-125 feet tall and 3-4, rarely 6, feet in diameter, usually with a broad trunk and wide-spreading branches. Sapwood thin and white, heartwood dark walnut-brown, often beautifully figured, of medium hardness, usually cross-grained, fairly strong, takes a beautiful finish and is suitable for interior trim and furniture. No. 10, San Martín de Loba; No. 302 (Y. 1529), vicinity of Estrella, Caño Papayal; also Yale Nos. 1595 and 1620. See *T. of T. A.*, p. 204.

Sweetia panamensis Benth. REJO? A medium-sized tree, the specimen collected being 50 feet high. The brownish wood is hard and heavy, rather fine-textured, tough and strong, takes a high polish, and is highly durable. Wood of this species is used in Central America for outside construction, framing timbers, and spokes of log wagons. Collected along Norosí-Tiquisio trail. See *T. of T. A.*, pp. 261-263.

Undetermined. MADURO PLÁTANO. A rather large tree, the specimen collected being 80 feet tall and 24 inches in diameter. Wood hard, heavy, strong; pores very small, parenchyma in numerous wavy bands about one-half the width of the fiber layers; ripple marks present. No. 224 (Y. 1550), along Mompos-Juana Sanchez trail.

Undetermined. SAPÁN. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Wood chocolate-brown showing lighter-colored parenchyma layers distinctly as in Partridge Wood; hard, heavy, strong, not easy to work, takes a lustrous polish, is highly durable; suitable for outside construction and umbrella handles, canes, and miscellaneous articles of turnery.

MALPIGHIACEAE

Bunchosia pilosa H. B. K. A small tree of no known uses. No. 189, San Martín de Loba.

MELASTOMACEAE

Miconia impetolaris (Sw.) Don. PUNTA DE SARVIA. A small tree or a shrub, one specimen collected being 12 feet high and 2 inches in diameter. Nos. 14 and 68, San Martín de Loba.

MELIACEAE

Cedrela sp. CEDRO. Fair-sized tree, 75-100 feet tall and 2-3 feet in diameter, rather short-boled. Wood light and soft or moderately so, aromatic, very easy to work, highly resistant to decay and insects, much used locally for carpentry, interior finish, and furniture. This is the timber known on the American market as Spanish Cedar; used chiefly for cigar boxes. Yale Nos. 1565, 1567, and 1622. See *T. of T. A.*, pp. 340-348.

Guarea racemiformis Blake (Contr. U. S. Nat. Herb. 20: 7: 241). A small tree, one specimen collected being 20 feet high and 6 inches in diameter; no known uses. No. 96, San Martín de Loba; No. 265, along the Caño Chacagua.

Guarea trichilioides L. TROMPETO. A small or medium-sized tree, one specimen collected being 30 feet high and 12 inches in diameter. No. 105, San Martín de Loba; No. 181, Norosí-Tiquisio trail. See *T. of T. A.*, pp. 359-361.

Trichilia curranii Blake (Contr. U. S. Nat. Herb. 20: 7: 242). MANGALITO. A small tree, one specimen collected being 20 feet high and 6 inches in diameter. Nos. 107 and 112, San Martín de Loba; No. 288 (Y. 3960), vicinity of Estrella, Caño Papayal.

Trichilia triphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 243). BAGRE. A small tree with a light-colored, moderately hard wood. Nos. 292 (Y. 1523) 299 (Y. 1527), 299A (Y. 1611), and 315, vicinity of Estrella, Caño Papayal.

MORACEAE

Brosimum columbianum Blake (Proc. Biol. Soc. Wash. 35: 179). GUAYAMERO. A fair-sized tree, 75-100 feet tall, with cylindrical bole 2-3 feet in diameter and free of limbs for 40-50 feet. The bark is thin and smooth, suggesting Beech (*Fagus*) and has very little latex. The wood is light-colored, hard, heavy, strong, not durable in contact with the soil; not used locally but worthy of trial as a substitute for Hickory (*Carya*). No. 304 (Y. 1531), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 137-138.

Cecropia peltata L. GUARUMO. A common, small, ant-infested tree of no commercial importance. No. 65 (Y. 1607), San Martín de Loba. See *T. of T. A.*, pp. 144-147.

Chlorophora tinctoria (L.) Gaud. MORA. A small or medium-sized tree, the specimen collected being 25 feet high and 15 inches in diameter. Well known for its hard, durable, yellow wood which is called Fustic in the dye-wood trade. No. 7, San Martín de Loba. See *T. of T. A.*, pp. 118-122.

Coussapoa villosa P. & E.? SERPE. A large tree; no known uses. Norosí-Tiquisio trail. See *T. of T. A.*, pp. 143-144.

Ficus dendrocidia H. B. K. QUANO. A medium-sized tree, the specimen collected being 30 feet high and 12 inches in diameter; no known uses. No. 22, San Martín de Loba. See *T. of T. A.*, pp. 142-143.

Ficus panamensis Standl.? Collected in San Martín de Loba.

Pourouma hirsuti-petiolata Mildb. (Notizbl. Bot. Gart. & Mus. Berlin-Dahlem, December 1, 1928). No. 116.

Sorocea colombiana Standl. (Trop. Woods 19: 39, September 1929). VARA BLANCA. A shrub or small tree of no known uses. Nos. 102 and 186, San Martín de Loba.

Undetermined. AJÍ. Fair-sized tree, 75-100 feet high and 18-24 inches in diameter. The yellow wood darkens to russet upon exposure and is moderately hard, heavy, and strong, apparently highly durable; used locally for general construction. Closely resembles the Brazilian *Oiticica* (*Clarisia racemosa* R. & P.). T. S. Nos. 7 (Y. 1560) and 8 (Y. 1561). See *T. of T. A.*, pp. 123-124.

MYRSINACEAE

Ardisia turbacensis H. B. K. A small tree of no commercial importance. No. 213, San Martín de Loba.

MYRTACEAE

Eugenia sp. CABEZA DE LORO. A small tree collected along the Norosí-Tiquisio trail.

Eugenia sp. GUAYABO CASCUDO. A small tree, the specimen collected being 20 feet high and 6 inches in diameter. No. 110, San Martín de Loba.

Myrcia splendens (Sw.) DC. PERILEO. A small tree, the larger specimen collected being 20 feet high and 6 inches in diameter. Nos. 16 and 106, San Martín de Loba.

Psidium molle Bertol. GUAYABO SABANERO. A shrub or small tree. No. 121, Norosí-Tiquisio trail.

Undetermined. GUAYABO. Medium-sized tree, 60-80 feet tall and 18-24 inches in diameter. Wood reddish, hard, heavy, tough, and elastic, not very durable, suitable for tool handles and interior construction.

NYCTAGINACEAE

Torrubia sp.? A small tree, the specimen collected being 22 feet high and 4 inches in diameter. No. 154, San Martín de Loba.

POLYGONACEAE

Coccoloba acuminata H. B. K. MAÍZ COCIDO. A shrub or a small tree, of no commercial importance. Nos. 100 and 211, San Martín de Loba.

Coccoloba caracasana Meissn. UVERO. A small tree, the specimen collected being 25 feet high and 8 inches in diameter. The leaves are round and leathery and the fruit is edible, suggesting the common Sea Grape (*C. uvifera* L.). Collected in San Martín de Loba. See *T. of T. A.*, pp. 151-152.

Coccoloba cyclophylla Blake (Contr. U. S. Nat. Herb. 20: 7: 238). A small tree, the specimen collected being 25 feet high and 8 inches in diameter; of no commercial importance. No. 47, San Martín de Loba.

Ruprechtia oxyphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 238). A small tree, the specimen collected being 20 feet high and 10 inches in diameter. No. 263, along the Caño Chacagua.

Symmeria paniculata Benth. MANGLE. A low-growing much-branched tree occurring in almost pure stands at the edge of the forest near fresh-water streams in a restricted portion of the Magdalena Land Company's property; not to be confused with the Mangle found in salt or brackish waters near the mouths of tropical rivers. The wood is reddish, hard, heavy, strong, and used principally for fuel. Nos. 1 and 66 (Y. 1609), San Martín de Loba.

Triplaris euryphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 239). PALO SANTO. A small tree, one specimen collected being 20 feet high and 4 inches in diameter. Nos. 4 and 5, San Martín de Loba.

Triplaris laxa Blake (Contr. U. S. Nat. Herb. 20: 7: 240). PALO SANTO; VARA SANTA OVERA. A small tree, the larger specimen collected being 35 feet high and 8 inches in diameter. The wood is pinkish, rather fine-textured, straight-grained, easy to work, and takes a smooth finish; suggests Birch (*Betula*). No. 20, San Martín de Loba; No. 312 (Y. 1533), vicinity of Estrella Caño Papayal.

RUBIACEAE

Alibertia edulis (L. Rich.) A. Rich. A small tree, the specimen collected being 15 feet high and 3 inches in diameter. No. 168, Norosí-Tiquisio trail.

Alseis Blackiana Hemsl. A small tree or a shrub collected in San Martín de Loba.

Genipa americana L. JAGUA. A medium-sized tree. Wood grayish, hard, heavy, tough and strong, fine-textured, not durable in contact with the ground, and suitable for implements and bent work. No. 306 (Y. 1615). See *T. of T. A.*, pp. 549-550.

Macrocnemum roseum (R. & P.) Wedd.? QUINA. A small tree collected in the vicinity of Amargamiento Rico.

Morinda panamensis Seem. YEMA DE HUEVO. A small tree, the larger specimen collected being 20 feet high and 4 inches in diameter. Wood reddish yellow, fine-textured, moderately hard and heavy; no known uses. Nos. 74 and 185 (Y. 1519), San Martín de Loba.

Palicourea crocea R. & S. A shrub of no known uses. No. 190, San Martín de Loba.

Cecropia peltata L. GUARUMO. A common, small, ant-infested tree of no commercial importance. No. 65 (Y. 1607), San Martín de Loba. See *T. of T. A.*, pp. 144-147.

Chlorophora tinctoria (L.) Gaud. MORA. A small or medium-sized tree, the specimen collected being 25 feet high and 15 inches in diameter. Well known for its hard, durable, yellow wood which is called Fustic in the dye-wood trade. No. 7, San Martín de Loba. See *T. of T. A.*, pp. 118-122.

Coussapoa villosa P. & E.? SERPE. A large tree; no known uses. Norosí-Tiquisio trail. See *T. of T. A.*, pp. 143-144.

Ficus dendroica H. B. K. QUANO. A medium-sized tree, the specimen collected being 30 feet high and 12 inches in diameter; no known uses. No. 22, San Martín de Loba. See *T. of T. A.*, pp. 142-143.

Ficus panamensis Standl.? Collected in San Martín de Loba.

Pourouma hirsuti-petiolata Mildb. (Notizbl. Bot. Gart. & Mus. Berlin-Dahlem, December 1, 1928). No. 116.

Sorocea colombiana Standl. (Trop. Woods 19: 39, September 1929). VARA BLANCA. A shrub or small tree of no known uses. Nos. 102 and 186, San Martín de Loba.

Undetermined. AJÍ. Fair-sized tree, 75-100 feet high and 18-24 inches in diameter. The yellow wood darkens to russet upon exposure and is moderately hard, heavy, and strong, apparently highly durable; used locally for general construction. Closely resembles the Brazilian *Oitigica* (*Clarisia racemosa* R. & P.). T. S. Nos. 7 (Y. 1560) and 8 (Y. 1561). See *T. of T. A.*, pp. 123-124.

MYRSINACEAE

Ardisia turbacensis H. B. K. A small tree of no commercial importance. No. 213, San Martín de Loba.

MYRTACEAE

Eugenia sp. CABAÑA DE LORO. A small tree collected along the Norosí-Tiquisio trail.

Eugenia sp. GUAYABO CASCUDO. A small tree, the specimen collected being 20 feet high and 6 inches in diameter. No. 110, San Martín de Loba.

Myrcia splendens (Sw.) DC. PERILEO. A small tree, the larger specimen collected being 20 feet high and 6 inches in diameter. Nos. 16 and 106, San Martín de Loba.

Psidium molle Bertol. GUAYABO SABANERO. A shrub or small tree. No. 121, Norosí-Tiquisio trail.

Undetermined. GUAYABO. Medium-sized tree, 60-80 feet tall and 18-24 inches in diameter. Wood reddish, hard, heavy, tough, and elastic, not very durable, suitable for tool handles and interior construction.

NYCTAGINACEAE

Torrubia sp.? A small tree, the specimen collected being 22 feet high and 4 inches in diameter. No. 154, San Martín de Loba.

POLYGONACEAE

Coccoloba acuminata H. B. K. MAÍZ COCIDO. A shrub or a small tree, of no commercial importance. Nos. 100 and 211, San Martín de Loba.

Coccoloba caracasana Meisn. UVERO. A small tree, the specimen collected being 25 feet high and 8 inches in diameter. The leaves are round and leathery and the fruit is edible, suggesting the common Sea Grape (*C. uvifera* L.). Collected in San Martín de Loba. See *T. of T. A.*, pp. 151-152.

Coccoloba cyclophylla Blake (Contr. U. S. Nat. Herb. 20: 7: 238). A small tree, the specimen collected being 25 feet high and 8 inches in diameter; of no commercial importance. No. 47, San Martín de Loba.

Ruprechtia oxyphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 238). A small tree, the specimen collected being 20 feet high and 10 inches in diameter. No. 263, along the Caño Chacagua.

Symmeria paniculata Benth. MANGLE. A low-growing much-branched tree occurring in almost pure stands at the edge of the forest near fresh-water streams in a restricted portion of the Magdalena Land Company's property; not to be confused with the Mangle found in salt or brackish waters near the mouths of tropical rivers. The wood is reddish, hard, heavy, strong, and used principally for fuel. Nos. 1 and 66 (Y. 1609), San Martín de Loba.

Triplaris euryphylla Blake (Contr. U. S. Nat. Herb. 20: 7: 239). PALO SANTO. A small tree, one specimen collected being 20 feet high and 4 inches in diameter. Nos. 4 and 5, San Martín de Loba.

Triplaris laxa Blake (Contr. U. S. Nat. Herb. 20: 7: 240). PALO SANTO; VARA SANTA OVERA. A small tree, the larger specimen collected being 35 feet high and 8 inches in diameter. The wood is pinkish, rather fine-textured, straight-grained, easy to work, and takes a smooth finish; suggests Birch (*Betula*). No. 20, San Martín de Loba; No. 312 (Y. 1533), vicinity of Estrella Caño Papayal.

RUBIACEAE

Alibertia edulis (L. Rich.) A. Rich. A small tree, the specimen collected being 15 feet high and 3 inches in diameter. No. 168, Norosí-Tiquisio trail.

Alseis Blackiana Hemsl. A small tree or a shrub collected in San Martín de Loba.

Genipa americana L. JAGUA. A medium-sized tree. Wood grayish, hard, heavy, tough and strong, fine-textured, not durable in contact with the ground, and suitable for implements and bent work. No. 306 (Y. 1615). See *T. of T. A.*, pp. 549-550.

Macrocnemum roseum (R. & P.) Wedd.? QUINA. A small tree collected in the vicinity of Amargamiento Rico.

Morinda panamensis Seem. YEMA DE HUEVO. A small tree, the larger specimen collected being 20 feet high and 4 inches in diameter. Wood reddish yellow, fine-textured, moderately hard and heavy; no known uses. Nos. 74 and 185 (Y. 1519), San Martín de Loba.

Palicourea crocea R. & S. A shrub of no known uses. No. 190, San Martín de Loba.

Pallasia Stanleyana (Schomb.) Kl. A small or medium-sized tree, the specimen collected being 50 feet high and 20 inches in diameter. This genus previously known only from British Guiana. No. 62, vicinity of Amargamiento Rico.

Randia spinosa (Jacq.) Karst. MANANGOLO. A small thorny tree of no commercial importance. No. 98, San Martín de Loba.

Warscewiczia coccinea (Vahl) Kl. A small tree, the specimen collected being 30 feet high and 6 inches in diameter. No. 115, Norosí-Tiquisio trail.

RUTACEAE

Zanthoxylum Fagara (L.) Sarg. A small tree or a shrub collected at San Martín de Loba.

SALICACEAE

Salix chilensis Mol. (= *S. Humboldtiana* Willd.) MIMBRE. A well-known shrub or small tree along water courses. Collected in vicinity of Estrella, Caño Papayal.

SAPINDACEAE

Allophylus Cominia (L.) Sw. SAN PEDRO. A small tree, the specimen collected being 15 feet high and 4 inches in diameter; no known uses. No. 191, San Martín de Loba.

Melicococcus bijugatus Jacq. MAMÓN; MAMONCILLO. A medium-sized tree, one specimen collected being 40 feet high and 15 inches in diameter. The fruit is edible; no known uses for the wood. No. 84, San Martín de Loba; No. 231, Mompos-Juana Sanchez trail.

Sapindus Saponaria L. JABONCILLO. A medium-sized tree, 60-75 feet tall and 20 inches in diameter. Wood yellowish, rather coarse-textured, hard, heavy, strong, and not durable. No. 295 (Y. 1525), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, p. 402.

SAPOTACEAE

Chrysophyllum Cainito L. CAIMITO. A medium-sized tree, 50-75 feet tall and 12-20 inches in diameter. Wood reddish, rather hard, heavy, and strong, fairly durable, suitable for general construction; fruit is edible. No. 234 (Y. 1584?), Mompos-Juana Sanchez trail. See *T. of T. A.*, pp. 496-497.

Lucuma sp.? CAIMO. A medium-sized tree, 50-75 feet high and 12-20 inches in diameter. Wood reddish, moderately hard, fairly durable, not difficult to work; suitable for general construction.

STERCULIACEAE

Guazuma ulmifolia Lam. GUÁCIMO. A small or medium-sized tree, widely distributed throughout tropical America. The wood is pinkish, of rather light weight, but tough and strong, having a consistency suggesting Elm (*Ulmus*); suitable for slack cooperage and interior construction. Nos. 42 and 276 (Y. 1554), San Martín de Loba. See *T. of T. A.*, pp. 428-429.

Sterculia apetala (Jacq.) Karst. PIÑÓN. A fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Wood reddish brown, coarse-textured, of medium hardness, that of young trees being very soft and suitable for interior construction and packing boxes. Large trunks are used locally for making dug-out canoes. No. 41, San Martín de Loba; No. 310 (Y. 1612).

TILIACEAE

Luehea speciosa Willd. MALAGANO. A fair-sized tree, with very irregular trunk, 65-80 feet tall and 20-30 inches in diameter. Wood pinkish brown, of medium hardness, easy to work, not very durable, suitable for interior construction. No. 307 (Y. 1532), vicinity of Estrella, Caño Papayal. See *T. of T. A.*, pp. 407-408.

ULMACEAE

Trema micrantha (L.) Blume. VENACO. A small tree of no commercial importance, the specimen collected being 25 feet high and 6 inches in diameter. No. 182, Norosí-Tiquisio trail. See *T. of T. A.*, p. 114.

VERBENACEAE

Vitex columbiensis Pittier (Contr. U. S. Nat. Herb. 20: 12: 484). ACEITUNO. A fair-sized tree, 75-100 feet tall and 2-3 feet in diameter. Wood grayish white or yellowish, varying in density from moderately hard to rather soft, easy to work, takes a high polish and is suitable for interior construction and, in some instances, for furniture. No. 114, San Martín de Loba; No. 131, Norosí-Tiquisio trail; also Yale Nos. 1559, 1578, 1579, 1581. (These woods appear to represent two different species.) See *T. of T. A.*, pp. 525-527.

VIOLACEAE

Rinorea ulmifolia (H. B. K.) Kuntze. PIE DE VENADO? A small tree of no commercial importance. No. 322 (Y. 1535), vicinity of Estrella, Caño Papayal.

ZYGOPHYLLACEAE

Bulnesia arborea (Jacq.) Engl. GUAYACÁN. A small or medium-sized tree with exceedingly hard and heavy wood similar to *Lignum-vitae* (*Guaiacum*). No. 241 (Y. 1596). See *T. of T. A.*, pp. 312-313.

UNCLASSIFIED

ALGARROBILLO. A fair-sized tree, 75-100 feet tall and 18-24 inches in diameter. Wood dark brown, very hard and heavy, fine-textured, probably durable; appears suitable for exterior construction.

CAGUÍ. A very large tree, 100-125 feet tall and 3-4, rarely up to 8, feet in diameter. Wood light-colored, moderately hard, coarse-grained, easy to work, not durable when exposed; suitable for interior construction.

MAQUÍ-MAQUÍ. A large tree, 100-125 feet tall and 3-4 feet in diameter. Wood reddish brown, moderately hard, and suitable for interior construction.

PAPOZAMBO. A fair-sized tree, 75-100 feet tall and 20-30 inches in diameter. Wood suitable for interior construction.

TOMASUCO. A fair-sized tree, 75-100 feet tall and 20-30 inches in diameter. Wood reddish, hard, suitable for heavy construction.

CHECK LIST OF THE COMMON NAMES

Acéituno	<i>Vitex colombiensis</i> Pitt.	Verbenaceae
Achiote	<i>Bixa Orellana</i> L.	Bixaceae
Ají	?	Moraceae
Albarco	<i>Cariniana pyriformis</i> Miers	Lecythidaceae
Algarrobo	?	?
Algarrobo	<i>Hymenaea Courbaril</i> L.	Leguminosae
Anime blanca	<i>Protium guianense</i> (Aubl.) March.	Burseraceae
Arbolito	<i>Phyllanthus acidus</i> (L.) Skeels	Euphorbiaceae
Bagre	<i>Trichilia triphylla</i> Blake	Meliaceae
Botón	<i>Quararibea guianensis</i> Aubl.	Bombacaceae
Cabeza de loro	<i>Eugenia</i> sp.	Myrtaceae
Cagui	?	Euphorbiaceae?
Caimito	<i>Chrysophyllum Cainito</i> L.	Sapotaceae
Caimo	<i>Lucuma</i> sp.?	Sapotaceae
Campaño	<i>Samanea Saman</i> (Jacq.) Merr.	Leguminosae
Cañaguatú	<i>Tecoma spectabilis</i> Pl. & L.	Bignoniaceae
Canalete?	<i>Cordia Sebestena</i> L.	Borraginaceae
Canime	<i>Copaifera officinalis</i> (L.) Willd.	Leguminosae
Caracoll	<i>Anacardium Rhinocarpus</i> DC.	Anacardiaceae
Carbonero	<i>Licania</i> sp.	Amygdalaceae
Carreto	<i>Aspidosperma</i> sp.	Apocynaceae
Cedro	<i>Cedrela</i> sp.	Meliaceae
Ceiba	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae
Ceiba de agua	<i>Bombax cumanense</i> H. B. K.	Bombacaceae
Ceiba de leche	<i>Hura crepitans</i> L.	Euphorbiaceae
Chingali	<i>Jacaranda filicifolia</i> D. Don	Bignoniaceae
Chupa	<i>Licania platypus</i> (Hemsl.) Fritsch	Amygdalaceae
Coco de mono	<i>Lecythis</i> sp.	Lecythidaceae
Congo	<i>Andira inermis</i> H. B. K.	Leguminosae
Coquillo	<i>Lecythis Curranii</i> Pitt.	Lecythidaceae
Cusú	<i>Cordia glabra</i> L.	Lecythidaceae
Divi-divi	<i>Caesalpinia coriaria</i> (Jacq.) Willd.	Borraginaceae
Espino	<i>Piptadenia communis</i> Benth.?	Leguminosae
Floral	<i>Sapium aucuparium</i> Jacq.	Leguminosae
Gabellón	<i>Phyllanthus</i> sp.	Euphorbiaceae
Garcero	<i>Licania arborea</i> Seem.	Euphorbiaceae
Granadillo	<i>Dialium divaricatum</i> Vahl	Amygdalaceae
Guácimo	<i>Guazuma ulmifolia</i> Lam.	Leguminosae
Guácimo?	<i>Laetia americana</i> L.	Sterculiaceae
Guamo machete	<i>Inga spectabilis</i> Willd.	Flacourtiaceae
		Leguminosae

Guamo macho	<i>Inga</i> spp.	Leguminosae
Guamo macho?	<i>Pithecolobium pilulosum</i> Pitt.	Leguminosae
Guamo mico	<i>Inga</i> sp.	Leguminosae
Guarumo	<i>Cecropia peltata</i> L.	Moraceae
Guayabo	?	Myrtaceae
Guayabo cascudo	<i>Eugenia</i> sp.	Myrtaceae
Guayabo león	<i>Terminalia</i> sp.	Combretaceae
Guayabo sabanero	<i>Psidium molle</i> Bertol.	Myrtaceae
Guayacán	<i>Bulnesia arborea</i> (Jacq.) Engl.	Zygophyllaceae
Guayacán; g. chaparro; g. ciénaga		
Guayacán jobo	<i>Pithecolobium</i> sp.	Leguminosae
Guayacán polvillo	<i>Centrolobium</i> sp.	Leguminosae
Guayamero	<i>Tecoma spectabilis</i> Pl. & L.	Bignoniaceae
Gueba del gato	<i>Brosimum columbianum</i> Blake	Moraceae
Gusanero	<i>Sloanea</i> sp.	Elæocarpaceae
Hueso de anta	<i>Astronium fraxinifolium</i> Schott	Anacardiaceae
Jaboncillo	<i>Aphelandra Deppeana</i> S. & C.	Acanthaceae
Jagua	<i>Sapindus Saponaria</i> L.	Sapindaceae
Jobo; j. colorado	<i>Genipa americana</i> L.	Rubiaceae
Laurel	<i>Spondias Mombin</i> L.	Anacardiaceae
Laurel comino	<i>Ocotea veraguensis</i> Mez	Lauraceae
Laurel negro	?	Lauraceae
Maduro platano	<i>Nectandra</i> sp.	Lauraceae
Mahajo	?	Leguminosae
Mafz cocido	<i>Casearia sylvestris</i> Sw.	Flacourtiaceae
Majagua	<i>Coccoloba acuminata</i> H. B. K.	Polygonaceae
Malagano	<i>Bombax</i> sp.	Bombacaceae
Mamón	<i>Luebea speciosa</i> Willd.	Tiliaceae
Mamoncillo	<i>Melicoccus bijugatus</i> Jacq.	Sapindaceae
Manangolo	<i>Melicoccus bijugatus</i> Jacq.	Sapindaceae
Mangalito	<i>Randia spinosa</i> (Jacq.) Karst.	Rubiaceae
Mangle	<i>Trichilia Curranii</i> Blake	Meliaceae
Manteco	<i>Symmeria paniculata</i> Benth.	Polygonaceae
Maquí-maquí	<i>Croton fragrans</i> H. B. K.	Euphorbiaceae
Mimbre	?	?
Mora	<i>Salix chilensis</i> Mol.	Salicaceae
Morocolo	<i>Chlorophora tinctoria</i> (L.) Gaud.	Moraceae
Murucutú	<i>Lonchocarpus violaceus</i> H. B. K.?	Leguminosae
Naranjillo	<i>Lonchocarpus violaceus</i> H. B. K.?	Leguminosae
Olla de mono	<i>Crataeva Tapia</i> L.	Capparidaceae
Oriera	<i>Lecythis</i> sp.	Lecythidaceae
	<i>Enterolobium cyclocarpum</i> (Jacq.) Gris.	
Palo blanco	<i>Casearia</i> spp.	Leguminosae
Palo prieto	<i>Terminalia</i> sp.	Flacourtiaceae
Palo santo	<i>Triplaris</i> spp.	Combretaceae
Papozambo	?	Polygonaceae
		?

Payandí
Pie de venado?
Piñón
Piñón?
Perileo
Perquetano
Punta de lanza
Punta de sarvia
Quano
Quina

Quito sol
Rejo?
Resbalo mono
Roble
Salvia del monte
Sancho-araña

San Pedro
Sapán
Serpe
Serrén serrén

Siete cascás
Solera
Tannaneo
Tolú
Tomasuco
Totuma
Trompeto
Uña de tigre

Uvero
Vara blanca
Vara santa overa
Venaco
Yaya
Yema de huevo
Yema de huevo

Pithecolobium spp.
Rinorea ulmifolia (H.B.K.) Ktze.
Sterculia apetala (Jacq.) Karst.
Gyrocarpus americanus Jacq.
Myrcia splendens (Sw.) DC.
Moquilea sp.?
Vismia guianensis (Aubl.) Pers.
Miconia impatiolaris (Sw.) Don
Ficus dendroctida H. B. K.
Macrocnemum roseum (R. & P.)
Wedd.?

Licania arborea Seem.
Sweetia panamensis Benth.
Bursera Simaruba (L.) Sarg.
Tecoma pentaphylla A. Juss.
Acalypha villosa Jacq.
Bravaisia integerrima (Spr.)
Standl.

Allophylus Cominia (L.) Sw.
?
Coussapoa villosa P. & E.?
Alchornea castaneifolia (Willd.)
Juss.

Macbaerium sp.?
Cordia alliodora (R. & P.) Cham.
Peltogyne sp.
Bombacopsis sp.
?
Crescentia Cujete L.
Guarea trichilioides L.
Pithecolobium ligustrinum (Jacq.)
Kl.

Coccoloba caracasana Meissn.
Sorocea colombiana Standl.
Triplaris laxa Blake
Trema micrantha (L.) Blume
Duguetia sp.?
Cassia bacillaris L.
Morinda panamensis Seem.

Leguminosae
Violaceae
Sterculiaceae
Hernandiaceae
Myrtaceae
Amygdalaceae
Guttiferae
Melastomaceae
Moraceae

Rubiaceae
Amygdalaceae
Leguminosae
Burseraceae
Bignoniaceae
Euphorbiaceae

Acanthaceae
Sapindaceae
Leguminosae
Moraceae

Euphorbiaceae
Leguminosae
Borraginaceae
Leguminosae
Bombacaceae
?

Bignoniaceae
Meliaceae

Leguminosae
Polygonaceae
Moraceae
Polygonaceae
Ulmaceae
Annonaceae
Leguminosae
Rubiaceae

RESULTS OF TIMBER TESTS

(Tables I-IV contain the results of standard tests on small clear specimens of timber collected on the Lands of Loba. As the greater part of this material was somewhat decayed and the number of tests very limited, the data should be considered only as rough indications of the properties of the species.)

TABLE I. PHYSICAL PROPERTIES OF COLOMBIAN WOODS
By U. S. FOREST SERVICE, Madison, Wisconsin

Name	Condition	Moisture content	Specific gravity				Wt. per cu. ft.	Shrinkage from soaked to oven-dry condition		
			No. of tests	Based on volume when—				In volume	Radial	Tangential
				Air-dry	Soaked	Oven-dry				
		Per cent				Lbs.	Per cent of sizes wet			
Campaño	air-dry soaked	12.5 67	26 21	0.50 0.46	0.54	18 48	8.5	4.2	5.8	
Caracolí	air-dry soaked	10.3 72	5 6	0.46 0.43	0.48	8 46	8.7	4.3	4.4	
Carreto	air-dry soaked	11.8 40	9 6	0.80 0.69	0.84	9 60	15.1	6.9	8.4	
Ceiba	air-dry soaked	14 184	36 18	0.29 0.27	0.30	18 37	9.1	4.5	5.7	
Coquillo	air-dry soaked	14.6 52	2 2	0.66 0.57	0.71	1 54	7.2	8.2		
Garcero	air-dry soaked	11.7 60	10 9	0.61 0.55	0.63	12 55	13.2	5.2	8.8	
Guayaboleón	air-dry soaked	12.4 43	12 7	0.68 0.64	0.70	7 57	10.7	5.4	8.6	
Guayamero	air-dry soaked	12.3 45	13 10	0.73 0.65	0.75	10 59	10.5	5.1	6.8	
Gusanero	air-dry soaked	13.5 29	1 1	0.87 0.82		62 66	5.6	6.7		
Jaboncillo	air-dry soaked	11.3 42	6 5	0.67 0.59	0.69	9 52	12.9	6.2	7.7	
Jagua	air-dry soaked	12 43	5 2	0.68 0.57	0.74	4 51	12.6	7.1	12.5	
Jobo	air-dry soaked	10.9 116	7 10	0.36 0.34	0.38	8 46	7.5	4.0	3.4	
Majagua	air-dry soaked	15.4 ..	3 ..	0.23 ..	0.25	3 ..	6.4	7.4		
Malagano	air-dry soaked	12.3 54	4 4	0.62 0.51	0.64	6 49	10.2	5.6	6.8	
Mangalito	air-dry soaked	12.8 ..	3 ..	0.74 ..	0.88	2 ..	4.7	7.1		
Naranjillo	air-dry soaked	12.2 124	1 1	0.47 0.39	0.50	2 55	4.2	8.8		
Resbalo mono	air-dry soaked	10.6 121	2 1	0.27 0.28	0.29	2 39	2.6	3.1		
Sancho-araña	air-dry soaked	13.5 70	1 1	0.63 0.50	0.68	1 53				
Tolú	air-dry soaked	12.5 100	5 6	0.48 0.39	0.48	7 49	8.4	4.1	4.8	

TABLE II. STATIC BENDING TESTS ON COLOMBIAN WOODS

By U. S. FOREST SERVICE, Madison, Wisconsin
(Test specimens were 2" x 2" x 30')

Name	Condition	No. of tests	Fiber stress at elastic limit	Modulus of rupture	Modulus of elasticity	Work in bending	
						To elastic limit	To maximum limit
Campaño	air-dry soaked	15	8,700	11,800	1,410	3.10	11.1
		10	4,400	6,700	1,080	1.29	6.4
Caracoli	air-dry soaked	4	6,400	9,400	1,310	1.92	6.7
		2	2,100	2,100	520	0.48	0.5
Carreto	air-dry soaked	4	12,300	19,900	2,580	3.29	14.9
		5	11,000	14,700	1,950	3.45	11.1
Ceiba	air-dry soaked	21	3,100	4,200	600	0.93	2.4
		8	2,000	2,800	470	0.50	1.6
Coquillo	air-dry soaked	1	9,000	11,100	1,160	3.91	9.5
		2	4,700	8,600	1,120	1.08	11.3
Garcero	air-dry soaked	4	10,200	16,200	1,860	3.24	13.2
		6	6,800	9,100	1,450	1.81	5.8
Guayabo león	air-dry soaked	7	11,400	15,200	2,110	3.59	8.8
		4	7,600	11,200	1,430	2.32	7.9
Guayamero	air-dry soaked	8	12,300	16,100	1,790	4.88	14.0
		5	7,600	11,700	1,620	1.97	8.8
Gusanero	air-dry soaked	1	12,600	15,200	2,080	4.24	6.5
		1	9,500	12,100	1,440	3.46	5.8
Jaboncillo	air-dry soaked	4	10,500	15,900	2,230	2.79	8.8
		3	4,800	6,800	1,090	1.19	4.8
Jagua	air-dry soaked	3	18,200	23,100	2,460	7.84	21.4
		2	6,200	9,000	1,100	1.93	15.2
Jobo	air-dry soaked	4	4,300	6,200	1,100	0.99	2.9
		5	3,500	4,700	740	0.93	2.5
Majagua	air-dry soaked	2	2,100	3,500	670	0.52	2.4
	
Malagano	air-dry soaked	4	9,700	16,800	2,000	2.86	12.7
		3	5,900	10,500	1,550	1.32	10.9
Mangalito	air-dry soaked	3	12,300	19,000	2,320	3.68	16.8
		1	4,200	7,700	780	1.25	15.6
Naranjillo	air-dry soaked	2	6,300	7,600	1,080	2.06	4.3
		1	3,700	5,500	730	1.03	6.0
Resbalo mono	air-dry soaked	1	1,600	3,200	950	0.15	0.8
	
Sancho-araña	air-dry soaked	1	10,400	11,500	1,530	3.97	7.2
		1	4,200	6,600	1,170	0.84	5.1
Tolú	air-dry soaked	2	7,400	10,600	1,660	1.92	7.1
		3	3,600	5,600	930	0.78	3.8
Vara santa	air-dry soaked	2	8,700	12,500	1,940	2.19	9.3
		1	7,400	10,500	1,830	1.64	10.0

TABLE III. IMPACT BENDING AND COMPRESSION TESTS ON COLOMBIAN WOODS

By U. S. FOREST SERVICE, Madison, Wisconsin

Name	Condition	Impact bending				Compression			
		No. of tests	Fiber stress at elastic limit	Work in bending to elastic limit	Ht. of drop causing complete failure (50 lb. hammer)	Parallel to grain		Perpendicular to grain	
						Maximum crushing strength	Fiber stress at elastic limit	Maximum crushing strength	Fiber stress at elastic limit
Campaño	air-dry soaked	9	Lbs. per sq. in. 12,200	Inch-lbs. per cu. in. 4.6	Inches 31	No. of tests 22	Lbs. per sq. in. 6,200	1,140	No. of tests 8
		10	12,200	5.7	31	21	3,940	600	10
Caracoli	air-dry soaked	1	7,800	2.1	7	6	4,800	730	3
		2	8,200	2.8	6	6	2,490	500	1
Carreto	air-dry soaked	3	15,800	5.2	40	9	9,660	2,090	3
		4	13,000	4.2	54	6	7,520	1,820	5
Ceiba	air-dry soaked	8	6,400	2.7	12	36	2,490	660	5
		10	4,200	1.8	5	18	1,300	290	8
Coquillo	air-dry soaked	..	..	..	..	2	5,420	..	..
		..	..	..	..	..	3,280	850	..
Garcero	air-dry soaked	5	11,200	3.1	23	10	7,180	1,730	5
		7	10,400	3.7	25	10	4,730	1,080	7
Guayabo león	air-dry soaked	5	14,400	4.4	39	12	8,800	1,910	5
		3	9,400	3.2	26	7	6,230	1,060	4
Guayamero	air-dry soaked	..	..	..	..	12	8,810	2,910	6
		5	10,300	4.0	29	10	5,590	1,610	5
Gusanero	air-dry soaked	..	..	..	..	1	9,840	1,810	1
		..	..	..	..	1	7,040	1,590	1
Jaboncillo	air-dry soaked	2	9,500	3.0	13	6	7,180	2,360	4
		5	10,800	4.6	17	5	4,110	1,170	2
Jagua	air-dry soaked	2	12,600	4.3	26	5	8,740	2,210	3
		1	13,700	6.6	..	2	4,140	860	2
Jobo	air-dry soaked	3	7,600	2.1	9	7	4,520	630	4
		4	8,100	3.0	15	10	2,570	400	4
Majagua	air-dry soaked	1	4,800	1.6	6	3	2,060	310	2
	
Malagano	air-dry soaked	1	11,900	4.1	38	4	7,710	2,570	3
		..	..	..	..	4	4,580	1,180	2
Mangalito	air-dry soaked	..	..	..	..	3	8,620	2,800	1
		..	..	..	..	..	..	1,100	1
Resbalo mono	air-dry soaked	..	..	..	..	2	2,650	..	..
		..	..	..	..	1	1,600	350	1
Sancho-araña	air-dry soaked	..	..	..	..	1	8,260	2,020	1
		..	..	..	..	1	3,460	450	1
Tolú	air-dry soaked	2	10,800	3.8	20	5	5,150	800	2
		3	9,500	3.8	23	6	3,080	380	3

TABLE IV. SHEARING, CLEAVAGE, TENSION, AND HARDNESS TESTS ON COLOMBIAN WOODS
By U. S. FOREST SERVICE, Madison, Wisconsin

Name	Condition	Shearing strength along grain		Cleavage strength per in. of width		Tension across grain		Load required to imbed 0.444-in. ball $\frac{1}{2}$ its diam.		
		No. of tests	Lbs. per sq. in.	No. of tests	Pounds	No. of tests	Lbs. per sq. in.	No. of tests	End surface — pounds	Side surface — pounds
Campano	air-dry	..	..	..	..	..	..	6	780	830
	soaked	15	810	12	200	10	230	9	570	600
Caracoli	air-dry	..	..	..	..	..	..	4	880	530
	soaked	7	710	4	220	1	310	3	550	440
Carreto	air-dry	2	3,050	2	410	1	700	3	2,240	2,310
	soaked	4	1,220	3	380	2	460	4	1,750	1,580
Ceiba	air-dry	2	830	..	..	..	..	5	400	240
	soaked	16	480	8	120	15	220	9	340	300
Coquillo	air-dry	..	..	..	..	..	..	..	..	..
	soaked	..	..	..	..	..	..	2	950	860
Garcero	air-dry	1	1,840	3	310	..	..	3	1,500	1,110
	soaked	7	1,040	7	250	7	340	6	940	830
Guayabo león	air-dry	3	2,220	4	430	2	820	5	1,940	1,290
	soaked	6	860	2	300	5	290	5	1,290	1,040
Guayamero	air-dry	10	2,440	9	420	7	820	6	2,230	1,080
	soaked	7	870	6	360	3	390	4	1,570	1,030
Gusanero	air-dry	..	..	..	..	..	..	1	..	1,520
	soaked	..	..	..	..	..	..	1	1,220	1,480
Jaboncillo	air-dry	4	2,420	4	520	..	..	3	1,980	1,410
	soaked	7	1,440	4	330	3	330	3	1,030	920
Jagua	air-dry	1	2,140	..	..	..	..	1	1,680	1,520
	soaked	2	1,240	2	300	1	500	1	1,060	930
Jobo	air-dry	5	1,050	..	..	..	..	4	570	330
	soaked	9	820	2	300	10	300	4	460	410
Majagua	air-dry	..	..	..	..	..	..	2	260	130
	soaked	..	..	..	..	..	..	..	..	..
Malagano	air-dry	..	..	..	..	..	..	..	..	..
	soaked	2	1,240	..	..	..	..	3	1,600	1,270
Mangalito	air-dry	..	..	..	..	..	..	2	1,220	1,020
	soaked	..	..	..	..	..	..	1	2,570	2,120
Naranjillo	air-dry	..	..	..	..	..	..	1	1,030	980
	soaked	..	..	..	..	..	..	1	850	650
Resbalo mono	air-dry	..	..	1	170	1	320	..	..	..
	soaked	..	..	..	..	..	..	1	330	210
Sancho-araña	air-dry	..	..	..	..	..	..	..	..	..
	soaked	..	..	..	..	..	..	1	780	780
Tolú	air-dry	..	..	..	..	..	..	2	570	500
	soaked	4	780	3	100	2	340	3	480	420

A NEW SPECIES OF *SOROCEA* FROM COLOMBIA

By PAUL C. STANDLEY

Field Museum of Natural History

Of the large collection of plants made in northern Colombia by H. M. Curran in 1916 comparatively few numbers have been determined critically, although several new species have been based on scattered specimens by Dr. S. F. Blake and others. In a miscellaneous lot of specimens of the trees collected by Mr. Curran and sent to the writer recently for determination there is represented the *Sorocea* here described, which differs in minor details from all the few species heretofore ascribed to the genus.

Sorocea colombiana, sp. nov.

Frutex vel arbor parva, ramulis gracilibus ferrugineis rimosis, novellis sparse et minute puberulis; stipulae minutae, caducae; folia alterna, petiolo 5-8 mm. longo gracili fere glabro; lamina oblonga, 5-9 cm. longa, 1.4-3 cm. lata, rigide membranacea, abrupte vel subabrupte caudato-acuminata, acumine angusto obtuso, basi obtusa vel subrotundata, irregulariter adpresso-serrata, serraturis numerosis obtusis, glabra, supra fusco-viridis, nervis non elevatis, subtus olivaceo-viridis, costa gracili elevata, nervis lateralibus utroque latere c. 9 prominentibus gracilibus angulo lato adscendentibus subarcuatis remote a margine conjunctis, nervulis prominulis laxe reticulatis; spicae masculae 1.5-2.5 cm. longae, solitariae vel geminae, breviter pedunculatae, 3-4 mm. crassae, rhachi tomentulosa, floribus sessilibus confertis numerosis puberulis c. 1.5 mm. latis; spicae femineae solitariae vel geminae, remote pauciflorae, breves, 2-3-florae vel saepe uniflorae, rhachi dense et minute puberula, floribus sessilibus; fructus globosus, 5-6 mm. diam., dense et minute ferrugineo-puberulus; styli rami graciles, filiformes, 2-3.5 mm. longi.

COLOMBIA: San Martín de Loba and vicinity, Lands of Loba, Dept. of Bolívar, April-May, 1916, H. M. Curran 186 (Herb. Field Mus. No. 589673, TYPE). Same locality, Curran 102 (staminate branch).

Faux Satiné

Among the various woods recently received by the editor for identification is one known as Faux Satiné. This name is applied to figured crotch wood from double stems of Bald Cypress, *Taxodium distichum* Rich., of the southern United States. The material is very attractive and is chiefly used for furniture panels.

CURRENT LITERATURE

Natural resources of southern Florida. By ROLAND M. HARPER. Reprinted from 18th Ann. Rept. Florida State Geol. Survey, Tallahassee, 1927. Pp. 206; 6 x 9; 58 figs.

This highly interesting and valuable report describes "the physical features or natural resources of South Florida, from the northern boundaries of Manatee and Indian River Counties to the south end of the State, an area of about 17,000 square miles, not counting lakes and salt water."

The chapter headings are as follows: Sources of information (including comprehensive bibliography); Geology and mineral resources; Topography; Soils; Climate; Vegetation; Floristics; Fauna; Regional classification. More than half the report is concerned with vegetation, which differs considerably from that of the rest of the United States and also from that of the tropics. The principal types are described as they presumably were before the changes brought about by civilization, and there are many good photographic illustrations.

La repoblación forestal es un negocio. By JOSÉ I. CORRAL. *Boletín Oficial de la Cámara de Comercio, Industria y Agricultura* (Santo Domingo, R. D.) 3: 36: 11-14, May 31, 1929.

An argument for tropical forestry, with particular reference to Cuba and Porto Rico.

Forest trusts. By J. N. OLIPHANT. Papers Third Brit. Emp. For. Conference 1928, pp. 9-11.

An account of the organization and administration of the Forest Trust of British Honduras. "The advantages of the system seem so obvious that it will suffice to enumerate them: Continuity of management; security of tenure for the professional staff; freedom from political influences; the establishment of the forest organization on a quasi-commercial basis, with a powerful incentive to the administrative body to seek every legitimate means of increasing forest revenue in order to extend its operations; elimination of the 'lapsing vote' difficulty inseparable from the ordinary system of Government finance."

An expedition to the Cockscomb Mountains, British Honduras, in March 1928. By J. N. OLIPHANT and DUNCAN STEVENSON. *The Geographical Journal* (London) 73: 2: 123-137, Feb. 1929. Illustrated.

An interesting account of an expedition by the Conservator and Deputy Conservator of Forests "undertaken with the primary object of studying the region in which the Cockscombs are situated, and its possibilities for forest development, agricultural settlement, and as a line of approach to the high-level Mahogany area of the Western Territory. An incidental aim was to clear up doubts regarding the physiography of the range, and to collect as much information as might be possible in the course of a short trip on its vegetation, soil, and rock formation."

Regarding the possibilities of economic development and transportation in the region, the authors are of the opinion that the Cockscombs themselves are not suitable for settlement of any kind. "The range is merely a wall of disintegrating rock, flanked by the debris of this process of disintegration, and held together only by the vegetation which covers it. Disturbance of this vegetation would, in all probability, have serious results in the form of landslides and rockfalls.¹

"There are limited quantities of Mahogany on the lower slopes and ridges of the range which might, in favorable circumstances, be profitable to remove by tractor haul. The South Stann Creek is, however, anything but a good stream for driving Mahogany.

"In the lower part of the valley, say eastwards of a point about 20 miles from the coast, Mahogany cutting has been carried on intensively, within the limitations imposed by cattle haul, for a long time back. A tractor was employed, it is believed for the first time in the valley, last year. It may be assumed that in this section the forests within easy reach of the stream have been over-cut beyond the possibility of repair,

¹ Herbert T. Grant (A second Cockscomb expedition in 1928, *l. c.*, p. 138) does not concur in this statement. "On the contrary, the rocks are very hard and compact and will not fracture under a hammer. . . . It is this very consistency which has enabled these bold residual peaks to endure while the softer rocks have weathered away."

and that such wood as remains is situated on relatively difficult ground on the lower slopes of the flanking hills. . . . There may be certain quantities of exploitable wood farther up the narrow valley of the Cockscomb branch than we had occasion to go. . . . We may be fairly certain, however, that no large bulk of wood, such as would justify a protracted operation or substantial expenditure on transport lines, exists on the northern branch of South Stann Creek.

"The basin of the southern branch, however, . . . extending fanwise to the southwest and south, is characterized by the low, regular and lenticular outlines of its weathered granite hills. . . . The country would seem to be a type offering relatively few obstacles to railway or road construction. To what extent it bears Mahogany and has been penetrated by workings it was impossible to judge.

"Looking out across this large expanse of not too broken country, the idea naturally suggested itself that here might be a conceivable way of tapping the Mahogany resources of the Western Territory. As far as the range of slate hills the difficulties do not look particularly serious, and while the lower part of the South Stann Creek Valley, failing rapid development in the market for secondary woods, promises little in the way of forest production, it is not impossible that the upper part of that valley and the untouched forest of the upper basin of Swasey-Cockscomb, a stream reputedly rich in Mahogany resources, might help to finance a logging railway having as its ultimate objective the Western Plateau. We know that the plateau itself offers no outstanding difficulty; the problem would be to negotiate the ascent of the slate range."

"The lower valley of South Stann Creek . . . is relatively easy of access; the main trunk-pass passing into the valley through Cabbage Haul Gap, 400 feet above sea level, would require little modification to provide a first-class road alignment. . . . The soil is the same type of deep fertile loam of mainly granitic origin which is found in the North Stann Creek Valley. In the aggregate there is probably a much larger area of land suitable for agriculture than has been opened up by the Stann Creek Railway. . . . Altogether it

is an attractive proposition from an agricultural or pastoral point of view."

The cultivation of mahogany in British Honduras. By J. N. OLIPHANT. Papers Third Brit. Emp. For. Conference 1928, pp. 517-524.

"In natural Mahogany forests, other than those located on poor soil, the conditions in the undergrowth are normally unfavorable to the establishment and development of Mahogany regeneration, this effect being largely due to the ingress of palms. Removal, or at least thinning, of the undergrowth is, therefore, necessary to secure successful reproduction.

"The most favorable environmental conditions for Mahogany regeneration are produced by cutting the forest growth and burning it on the ground, the cost of this operation being recoverable by raising an agricultural crop, ordinarily maize, on the cleared area.

"In order to obtain a young forest crop including a suitable mixture of Mahogany and other species, the cleared area should be located, and its size so regulated, as to admit of natural seeding from the adjacent high forest. If necessary the Mahogany can be introduced or supplemented by artificial means.

"Alternatively Mahogany regeneration can be established by opening the canopy where required and freeing the seedlings from the surrounding undergrowth, but this system is more costly and involves greater exposure of the young growth to insect attack. To obtain successful results it is important that the seedling growth should be given ample top light as soon as it reaches the established stage.

"In a less expensive variation of the same method, treatment is limited to seedling growth in the vicinity of the stumps of felled Mahogany, where the canopy has already been opened out to some extent. Some local success has been achieved with this system, but it is not certain whether it will be applicable to all types of forest.

"The technique of tending young Mahogany raised by either of the two methods from the sapling stage onwards has not yet been worked out."

Nos bois coloniaux (Guyane). Angélique (*Dicorynia parensis* Benth.). Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, Paris, 1929. Pp. 4; 5¼ x 7¼; 2 plates; 2 veneer samples.

This is one of the best known timbers of French Guiana and is frequently, but improperly, called Teck de la Guyane; in Dutch Guiana the usual name is Basra Lokus. It is a large, well-formed tree, attaining a maximum height of about 150 feet and a diameter of 5 feet above the buttresses. Two kinds of the timber are recognized, Angélique Franc (sp. gr., air-dry, 0.80 to 0.90) and Angélique Gris (sp. gr., 0.75 to 0.85), but they appear to be supplied by the same species. The amounts exported to Havre vary from about 1800 to 2300 tons of round or squared logs per annum. The wood is used for durable construction, ship building, carriage work, and furniture. It is suitable for railway crossties and tight cooerage.

Botanical notes on, and new descriptions of, new and old species of Venezuelan plants. By H. PITTIER. *Journ. Wash. Acad. Sci.* 19: 9: 175-186, May 4, 1929.

Among the several descriptions is a new one of *Cariniana pyriformis* Miers. The author says: "In his extensive monograph of the Lecythidaceae, Miers described and figured under the name of *Cariniana pyriformis*, fruits deposited in the collections of the Linnean Society of London and in the Kew Museum, the label of which, probably because of indistinct handwriting, was read as: 'Betania, río Sinú, Bolivia.' Hence the attribution of this species, in the Kew Index, to the Republic of Bolivia, a country probably far beyond the southern limits of the family area. Miers, however, had understood the labels to read: 'Betania riviere sinu Plato Bolivia, New Granada,' and so had correctly attributed the species to the last country, though his interpretation of the details was inaccurate. It is very likely that the label reads: Betanci, rivière Sinú, Estado Bolívar, New Granada, thus referring the origin of the fruits to the vicinity of the Betanci Lagoon, near the Sinú River in the State Bolívar of the actual Colombia. Miers' monograph was published in 1874, but in 1898,

Niendenzu in his treatment of the Lecythidaceae in the *Pflanzenfamilien* still attributes *Cariniana pyriformis* to Bolivia.

"About 1910 or 1911, Sudworth and Mell, of the Forest Service of the United States Department of Agriculture, undertook the study of the wood known on the market as 'Colombian Mahogany' which was imported into the United States from the port of Cartagena in Colombia. The identification of the wood was obtained through the study of its structure on one side, and by means of a branchlet with leaves and of a few pyxids that were turned over to me for determination on the other. Two plates with pictures of the leaves, fruits, and seeds were published, both fairly good, except that the serratures of the leaves are too sharp and the fruits too short, but the original descriptions sent by me were so altered that they did not correspond any longer to the facts; several typographic errors were also overlooked. The branchlet in question, which, if I am not mistaken, is deposited in the U. S. National Herbarium, seems to correspond to a shoot, taken perhaps from a stump. The leaves are large as compared with those collected later and the branchlet itself is thin and flexible.

"In 1922, it was my good fortune to find the tree itself in full bloom and growing abundantly in the forests of the Lora River, in the Venezuelan State Zulia where it seemed well known under the vernacular name of Bacú. I collected specimens with leaves and flowers and a good number of fruits with their corresponding seeds. These materials are the base of the description given above."

Le bois de rose des états brésiliens du Pará et de l'Amazonie. By A. DUCKE. *Rev. de Bot. Appl. & d'Agr. Coloniale* (Paris) 8: 88: 845-847, Dec. 1928.

The name Bois de Rose or Páo Rosa is applied in the Brazilian states of Pará and Amazonia to several representatives of the family Lauraceae. The tree whose wood is distilled for the essence of Bois de Rose in Guiana and the Amazon region is recognized as a new species, *Aniba rosæodora* Ducke, with a geographical variety, *amazonica* Ducke. The type, which is known in Dutch Guiana as Echt Rosenhout, is said to be

difficult to distinguish from *A. muca* and *A. panurensis*, thus confirming J. W. Gonggrijp's conclusion to that effect. (See *Timbers of Tropical America*, p. 188.) The variety differs from the type principally in leaf characters; their taste and scent are the same.

The Páo Rosa of Santarem and Faro, often called Louro Rosa, is *Aniba parviflora* (Meissn.) Mez. The bark is highly aromatic, but the greenish yellow wood is almost odorless.

The Páo Rosa of the Amazon estuary is considered a new species, *Aniba terminalis* Ducke. The heartwood is dark brown, aromatic but not bitter, and is highly durable; it is used for construction, but not for distillation.

Ocotea costulata (Nees) Mez, the Louro Camphora of Juruty Velho, is also called Páo Rosa in a portion of its range. It is a rather large tree of the wet lands, with a straight and cylindrical trunk having a reddish brown bark suggesting the true Páo Rosa. The odor of the bark is rather agreeable; that of the wood suggests camphor. The wood resembles that of *A. roseodora* and *Nectandra elaiophora*, but the old trunks contain a small core of brown.

The wood of *Nectandra elaiophora* Barb. Rodr., the Louro Inamuy of Manáos, but also called Páo Rosa, has a pronounced terebenthine odor. Cavities in the trunks of old trees are sometimes filled with a liquid resin which is inflammable. The common Louro da Varzea is *N. amazonum* Mart.

The Philippine lumber industry. By LUIS J. BORJA. *Economic Geography* (Worcester, Mass.) 5: 2: 194-202, Apr. 1929.

"Colonel Carmi A. Thompson, who was sent to the Philippines by President Coolidge to make a survey of the economic conditions there, reported that the islands had vast timber resources from which a large part of the hardwood requirement of the United States may be supplied. Expert foresters, according to Colonel Thompson, say that the Philippine timber is 100 years overripe and is now deteriorating so that it should be cut and marketed in order to provide an opportunity for a new stand.

"To bring more light on this subject, this article has been prepared with the object of bringing together the most important facts concerning the commercial forests of the Philippines and the exploitation and marketing of their products, which are perhaps of interest to the students of economic geography, manufacturers of hardwood products, and prospective promoters of the sawmill industry in the Islands."

Nos bois coloniaux (Indochine). Banlang (*Lagerstroemia* sp.)

Pub. by Assn. Colonies-Sciences & Comité Natl. du Bois Coloniaux, Paris, 1929. Pp. 4; 5¼ x 7¼; 2 plates; 1 veneer sample.

The group of closely related woods known collectively as Banlang or Banglang is believed to offer excellent commercial possibilities. They are somewhat intermediate in their properties between Walnut (*Juglans*) and Ash (*Fraxinus*), and can satisfactorily replace them for many purposes. (See *Tropical Woods* 18: 60-61, June 1, 1929.)

Essais mécaniques de bois d'Indochine effectués au Service Technique des Bois Coloniaux. By JEAN COLLARDET and M. MONNIN. Pub. by Agence Économique de l'Indochine, Paris, 1929. Pp. 39; 9½ x 12½; illustrated.

An excellent report on a comprehensive study of the physical and mechanical properties of the woods of French Indo-China and the employment of the data in classifying the timbers according to the uses for which they appear best fitted. The work complements that of Bertin (*Notes sur les bois de l'Indochine*, 1924), Lecomte (*Les bois de l'Indochine*, 1926), and Guibier (*Caractères généraux de la forêt indochinoise*, in appendix to preceding).

Notes on wood preservation research at Dehra Dun. By J. W. WARR. Papers Third Brit. Emp. For. Conference 1928, pp. 296-300.

"India has, of course, a fair supply of naturally durable timbers, such as Teak, Sal, Pyinkado, and Deodar, but it is by no means adequate to deal with the total demands of all

the Indian railways, with the result that an economic balance between metal and naturally durable timber has been reached. The use of imported timber, either naturally durable or artificially preserved, has affected this balance to a certain extent, but as a whole, the issue has remained between domestic supplies of wood and imported supplies of metal.

"With the increase in demand for sleepers on account of new railroad construction, if prices are to be kept down, either imported supplies of timber must increase, or means must be found to utilize other indigenous species which abound in the Indian forests.

"The present work at the Institute concerns itself chiefly with the practical question of sorting out those species which are amenable to treatment, and, therefore, worth trying on a large scale. Since, however, amenability to treatment is only one factor in the problem, the work is carefully correlated with that of the timber-testing and seasoning sections, both of which have been for some years busily employed in determining the strength and seasoning properties of as many species as possible."

Forest products in Burma. By W. A. ROBERTSON. Papers Third Brit. Emp. For. Conference 1928, pp. 273-278.

"Whatever estimates are made of the tonnage of timber which India may be able to give to other parts of the Empire, there are certain very definite conditions to be borne in mind. India's forests are chiefly tropical mixed hardwood forests, that is, forests in which the annual yield contains relatively little of any one species. It just happens that the present chief export timber, Teak, is also practically the most widely distributed species; none of the rest, with the possible exception of Laurel Wood (*Terminalia tomentosa*), can compare with it in distribution. At the best one can only hope for an output of a few thousand tons of any one species.

"A certain amount of improvement can be made by grouping together species of the same genus as, for example, the various species of *Dipterocarpus*, of *Cedrela*, *Hopea*, *Shorea* and others, but such grouping depends on careful preliminary testing and practical trial and demonstration.

Successful grouping will very much increase the amount of useful timber put at the disposal of trade.

"It is probable that in the future India's part in the timber supply of the Empire will be, first, the continued supply of Teak of which it now holds, and will continue to hold, pre-eminent position in the world, and, secondly, to supply the rest of the Empire with luxury woods and timbers for specialized industries."

"India will probably never rank as one of the great timber-exporting countries of the Empire, but it will be able to play a useful part in the mutual exchange of supplies, sending luxury and special timbers in exchange for generalized wood manufacturers which it cannot produce itself."

Timber seasoning research in India. By S. FITZGERALD. Papers Third Brit. Emp. For. Conference 1928, pp. 291-294.

"There are a number of well-known Indian hardwoods that season quite easily—that is to say, they lose their sap moisture slowly and evenly, and without the timber splitting or warping. Such are Teak (*Tectona grandis*), Rosewood (*Dalbergia latifolia*), Sissoo (*Dalbergia Sissoo*), and Toon (*Cedrela Toona*). The far larger number of species, however, lack this advantage, and are consequently not so much in favor.

"The work of the seasoning section of the Forest Research Institute is to find out how to season the refractory timbers so that they may, under more favorable circumstances, compete with Teak and other docile woods. Both open-air seasoning and kiln seasoning tests are being carried out."

Lumbering in the Andaman Islands. By J. KENNETH PEARCE. *The Timberman* 30: 8: 37, June 1929.

Indian hardwoods. By C. C. WILSON. Papers Third Brit. Emp. For. Conference 1928, pp. 67-82.

"For many years past Teak has been one of the best known of all the products of India, and it has been a big factor in the world supplies of hardwoods. Very much the larger part of these supplies come from Burma, and in the future the quantity available from this country will steadily decrease

for some ten or twenty years. After this period, it will rise again, but it is not expected that it will ever reach the high point to which it has attained during the last decade. Very roughly, the supplies of Teak have recently amounted to between 500,000 and 600,000 tons annually (a ton equals 50 cubic feet); but even now there is a considerable falling off from this figure, and the shortage will become more marked annually during the next ten years or so, until the total output will amount to not much more than, say, 300,000 tons per annum. Then, as the numerous plantations that have been, and are being, made all over India and Burma come to maturity, the supplies of Teak will again rise gradually to, perhaps, some 450,000 tons per annum at which figure they will remain, provided proper forest management continues.

"It would thus seem that what we have first to aim at with our hardwoods is to help out the shortage in world supplies of Teak before we can anticipate doing very much to mitigate the expected famine in softwoods, or, more accurately, conifers. Some of our better class timbers are as strong and durable as, and more beautiful than, Teak, and again others, though not indeed of such unsurpassed quality as Teak, are yet every bit as good as is necessary for the purpose in view.

"There is not an inexhaustible supply of miscellaneous hardwoods for export, though the statistics compiled for India, in accordance with the scheme approved by the Standing Committee of the Empire Forestry Conference, might give that impression; but there should be a fair surplus for export, after India's needs have been fully met. This will be more especially the case from such forests as are within easy access of the sea, such as those of the West Coast of Madras and Bombay, and the Andaman Islands.

"Appended to this paper is a list of some 44 timbers, supplies of which are considerable, and export of which should be possible at reasonable rates. Certain details as to approximate quantities, suitability for various purposes, locality whence obtainable, and very approximate prices are also given."

Engineering for forest rangers in tropical countries, with special reference to Burma. By A. H. LLOYD. Oxford, 1929. Pp. 228; 6½ x 9½; 32 half-tone plates; 85 text figs. and diagrams.

"A forest ranger has frequently to undertake engineering work in the forests which under other circumstances would be entrusted only to a trained engineer. This book is an attempt to supply to some extent the urgent demand for a manual dealing with this kind of forest work in tropical countries in a simple way which can be understood by untrained men. It is primarily designed to serve as a manual in forest engineering for students at the Burma Forest School, and deals chiefly with materials and methods actually used in Burma. It is hoped, however, that the book may also be of use to newly joined forest assistants and others who, with no previous experience, may have to carry out work in countries where conditions are similar to those in Burma and in places where expert advice and help are not available."

The subject is treated under 12 chapter headings, as follows: (1) Materials used in forest engineering; (2) Carpentry joints and fastenings; (3) Forest buildings; (4) Forest road alignment; (5) The preparation of a forest road estimate; (6) Forest road construction; (7) Road drainage and metalling; (8) Simple wooden bridges; (9) Construction of bridges and culverts; (10) Transport of timber; (11) Water supply; (12) Miscellaneous.

Summary report, resolutions and reports of committees, Third British Empire Forestry Conference, Australia and New Zealand, 1928. Canberra, 1929. Pp. 67; 6 x 9½.

Australia. Commonwealth handbook. By C. E. LANE-POOLE. Canberra, 1928. Pp. 42; 6 x 9½; illustrated.

A very serviceable report prepared for the Third British Empire Forestry Conference, Australia and New Zealand, 1928. The subject matter is conveniently arranged under the following headings: General description; Vegetation and forest types; Potential forest area of Australia; History of

forestry in Australia; Australian Forestry School; Timber tariff; Forestry statistics. There are three maps, one of them showing in color the different types of vegetation.

Pulp and paper in Australia. By L. R. BENJAMIN. Papers Third Brit. Emp. For. Conference 1928, pp. 430-435.

"To summarize the results of investigations carried out in the past ten years, it can be confidently stated that the methods developed for pulping the Eucalypts, and the economic feasibility of growing Pine for pulpwood on a short rotation, leave little room for doubt as to the feasibility of Australia becoming entirely self-supporting in regard to its newsprint requirements within the next 10 years, and for most other grades of paper inside 20 years."

Hardwoods and their markets (Australia). By C. E. LANE-POOLE. Papers Third Brit. Emp. For. Conference 1928, pp. 97-140.

"The hardwoods of Australia, while possessing very high qualities which make them serviceable for innumerable purposes, have a more restricted use than softwoods. The area of forest is comparatively small (19,500,000 acres) and has been heavily and wastefully cut into in the past. Best quality hardwoods of a non-durable nature find a ready market, but second quality cannot be easily sold, and immature timber poles and piles are unsaleable. Durable hardwoods find a ready market here and overseas both as sawn timber and in the round. The silviculture of the latter is accordingly simplified through the possibility of selling thinnings. The development of overseas markets for hardwoods of a quality saleable in Australia is not practicable, save possibly in the case of turnery and small articles. Over-production and the devastated condition of the 'cut-over,' but not 'cut-out' forests, is responsible for the hardwood situation in Australia. Any development leading to the conservation of timber resources is to be welcomed, and the reduction of cut rather than the opening of overseas markets is the solution. Durable hardwood forests will pay to regenerate; non-durable devastated hardwood forests will probably not prove profit-

able and their conversion to conifers seems indicated. The Commonwealth Forest Products Laboratory can lend assistance to the hardwood saw-millers by bettering their technique in seasoning and impregnation and finding uses for waste, and by-products in the shape of tans, essential oils and resins, and kinos, which will bring into use second grade qualities, and create markets within and possibly without Australia for by-products of the forests in process of exploitation. Paper pulp may absorb a volume of hardwood unsaleable for any other purpose and make that most pressing silvicultural need—thinning—of non-durable hardwoods, practicable."

Softwood timber supply and consumption of Australia. By V. GRENNING. Papers Third Brit. Emp. For. Conference 1928, pp. 59-66.

"The native softwood resources of Australia are very limited in extent, and are totally inadequate to supply the local requirements. Of the coniferous genera producing timber in appreciable quantity *Araucaria*, *Callitris*, and *Agathis* are of major importance, and *Atrotaxis*, *Dacrydium*, *Phyllocladus*, and *Podocarpus* of lesser value."

"Generally, the remaining softwood stand in Australia probably does not exceed 500,000,000 cubic feet. The rate of utilization is in the neighborhood of 20,000,000 cubic feet. Loss by fire and from other causes no doubt exceeds increment, so increasing the rate of removal of the remaining stand. Regulation of the cut on a sustained yield basis is impracticable in the case of the *Araucaria* and *Agathis* stands. This may be possible in the Cypress areas because of the extent of immature stands, but the present cut would then be greatly reduced and of no great consequence. Should the present rate of cutting continue, the whole of the mature stand will be removed in 25 to 30 years' time; when, unless capital is further cut by a reduction of the minimum girth limit, the annual cut on a sustained yield basis will be only a small percentage of the present cut.

"Queensland, once a softwood-exporting state, now imports softwood to make up the deficiency, and must continue to do so until requirements are supplied from local plantations."

The forest conditions of Queensland. By E. H. F. SWAIN. Pub. by Queensland State Forest Service, Brisbane, 1928. Pp. 70; 6 x 9½; 8 half-tones; 1 large map in color.

A very useful report prepared for the Third British Empire Forestry Conference. It is conveniently arranged for reference and is well illustrated. The principal headings are: Geological history; The rain processes; Climato-phytogeographical considerations; The trees of Queensland; Regional forest conditions; Discussion.

Timbers and forest products of Queensland. By E. H. F. SWAIN. Pub. by Queensland Forest Service, Brisbane, Sept. 1928. Pp. 500; 6 x 9½; illustrated.

"In this governmental publication, the work of Mr. E. H. F. Swain, Chairman of the Provisional Forestry Board, there are descriptively presented the accumulated data of the Queensland Forest Service with reference to the forest resources of this state.

"The information, both favorable and unfavorable, which has been garnered and collated departmentally with respect to Queensland woods, is here made available for general knowledge. The objects are to assist all concerned in maintaining the industrial operation and the timber industry to the fullest extent, and to offset the acute deficiency in building-softwoods as much as possible by developing the use of native timbers for every likely purpose in woodwork.

"The publication reveals an almost embarrassing range of 200 wood types—from the softest, lightest, coarsest, and whitest, to the hardest, heaviest, finest-grained, and deepest-hued—capable of industrial application in 53 major directions.

"To give the book a general usefulness and interest to those who are concerned for forests and trees and their produce, means of identification of both wood and trees have been included, and notes have been added with respect to distribution, availability, and acclimatization range. In the last chapters, the field of forest products has been surveyed, and the native tannages, the charcoal resource, wood pulp, the honey flora, grass-tree gums, vegetable oils and nuts, etc., have been discussed.

"The Queensland Government trusts that the publication will serve the state by providing dependable and helpful information for that section of the community which is engaged in the growing, logging, milling, and marketing of timber for every known use."—Foreword by THOS. DUNSTAN, *Minister for Lands*.

Forestry handbook for New South Wales. Sydney, 1928. Pp. 48; 6 x 9¾; 7 half-tones; 1 large map.

A comprehensive report prepared for the Third British Empire Forestry Congress, Australia and New Zealand, 1928. It contains (pp. 7-12) a "Summary of the geology of New South Wales," by S. M. Tout, Secretary of the Forest Commission, and (pp. 13-48) "Forestry in New South Wales," by N. W. Jolly, Forestry Commissioner. The principal topics considered by the latter are: Distribution of the forests; General review; State forest area and value; Disposal of Crown timber; Industries; The forestry act and administration; Revenue and expenditure; Forest management; Forestry statistics.

Notes on some Australian timbers of the Monimiaceae. By M. B. WELCH, Reprint, *Journ. & Proc. Royal Soc. N. S. W.* 62: 350-365, Feb. 1929. Seven photomicrographs.

Seven woods, representing five of the eight Australian genera, are described in detail and a key is given for their identification. Those of the genera *Atherosperma*, *Daphnandra*, and *Doryphora* of the Atherospermae are fine-textured and conifer-like, while *Hedycarya*, *Kibara*, and *Mollinedia* of the Monimieae have large and conspicuous rays. The woods are normally pale in color, but very dark streaks are common. Vessel perforations are much elongated and scalariform; the intervacular pits are typically scalariform. Wood fibers are thick-walled, with more or less distinctly bordered pits. Wood parenchyma is sparingly developed and there are intermediate cells. Rays are heterogeneous, the marginal cells usually much elongated vertically; maximum height, in *Mollinedia*, 15 mm.; width 100 to 300μ. The general properties and uses of the seven woods may be summarized as follows:

Doryphora Sassafras Endl. SASSAFRAS; GREY OR BLACK SASSAFRAS. Medium-sized tree in brush forests and gullies throughout N. S. W. and extending into southern Queensland. Wood pale yellowish, darkening upon exposure, occasionally streaked or nearly black, but without distinctive figure; fresh wood with pleasant safrol-like scent; weight 30-40 lbs. per cu. ft.; average lateral hardness (load required to imbed 0.444-in. ball to half its depth), 975 lbs.; works easily, is not fissile, inclined to be woolly; very resistant to borers and termites, moderately so to decay.

Available in fairly large quantities and used chiefly for broom handles brush stocks, stained for cheap furniture, toys, flooring, lining, and case material; well-suited for automatic turnery; has also been used for clothes pins and tallow cask staves.

Atherosperma moschatum Labill. TASMANIAN SASSAFRAS. Large tree, up to 100 feet tall, in moist gullies throughout Tasmania and also in southern and eastern Victoria and southeastern N. S. W. Wood white to light brown, often with dark streaks, usually without pronounced figure; odorless, although the bark is highly aromatic; wt. 37-41 lbs.; av. lat. hardness, 1035 lbs.; fine-textured, tough, not fissile, works easily and cleanly, is not durable when exposed and is liable to attack by the furniture beetle.

A very useful timber, especially for small handles and clothes pins. Other uses are interior fittings, furniture, brush stocks, wooden screws, cask and pail staves, finishing lasts, and carving.

Daphnandra micrantha Benth. YELLOW-WOOD; SATINWOOD; YELLOW OR GREY SASSAFRAS; YELLOW BOX; SOCKET-WOOD; BUTTER-WOOD. Moderate-sized tree in coastal brushes of northern N. S. W. and extending into Queensland. Wood grayish yellow to yellow, becoming brown upon exposure; slightly aromatic; wt. 28-45 lbs.; av. lat. hardness, 1045 lbs.; is tough, non-fissile, works cleanly.

Used for turned articles, such as small tool handles, door knobs, and broom handles; also for brush stocks, interior fittings, linings, flooring, and case material.

Daphnandra repandula F. v. M. SASSAFRAS; GREY SASSAFRAS. Moderate-sized tree in brush forests of northern Queensland. In appearance, properties, and uses closely resembles the preceding species. Wt. 40 lbs.; av. lat. hardness, 1075 lbs.

Daphnandra aromatica Bailey. SASSAFRAS; GREY SASSAFRAS. Moderate-sized tree in brush forests of northern Queensland. In appearance, properties, and uses closely resembles the two preceding species, except that available specimens are softer. Wt. 30-35 lbs.; av. lat. hardness, 560 lbs.

Mollinedia Huegeliana Tul. Small tree, occurring sparingly in the brushes of eastern N. S. W. and Queensland. Wood yellow-brown, often with irregular brown streaks; quarter-sawed material silver-grained; wt. 45 lbs.; av. lat. hardness, 1330 lbs.; fine-textured, tough, non-fissile.

Rarely on the market except in mixed brushwoods. Suitable for ornamental turnery and small cabinet work.

Hedycarya angustifolia A. Cunn. WILD MULBERRY. Small or medium-sized tree in creek beds and gullies in Victoria and eastern N. S. W. Wood yellowish to grayish brown; quarter-sawed material silver-grained; wt. 22-30

lbs.; av. lat. hardness, 495 lbs.; fine-textured, soft, easily worked, the lightest specimens inclined to be spongy.

Rarely on the market, but suitable for small cabinet work.

Some destructive agencies in building timbers. By M. B. WELCH. Sydney, N. S. W., 1928. Pp. 8; 8½ x 11; illustrated.

"Of the borers which attack seasoned timber, the most serious are the powder-post beetle, *Lyctus brunneus*, and the furniture beetle, *Anobium striatum*. . . . The powder-post beetle appears to be cosmopolitan. . . . These borers ordinarily confine their attention to the sapwood of the majority of timbers, both hardwoods and cabinet timbers, but do not attack coniferous woods. . . . Unfortunately, in some of our brush timbers the line of demarcation between heartwood and sapwood is not very clearly defined, if at all; e.g., a very large part of the wood may be destroyed in woods such as Crab Apple (*Schizomeria ovata*), Maiden's Blush (*Echinocarpus australis*), and Yellow Carabeen (*Sloanea Woollsii*). One of the commonest building timbers is Spotted Gum (*Eucalyptus maculata*), and it is an unhappy coincidence that this wood possesses a very wide sapwood, and one further that is particularly subject to attacks by this borer. When one has definite evidence that saplings of Spotted Gum measuring not more than 6 inches in diameter and consisting almost entirely of sapwood, have been milled to be made up into furniture, etc., and in turn to be destroyed by borers, there is little wonder that Australian hardwood is not so popular in some quarters as it could be."

"Whilst the powder-post beetle reveals its presence at the completion of its life cycle by the heaps of powder which are thrown out from the flight holes, the furniture borer is a much more insidious worker. Frequently the first evidence of attack is the total collapse of the infested wood; flight holes are made, but unless searched for can easily be overlooked, and the dust is not prominently ejected. The frass is considerably coarser than that made by the powder-post borer, and largely remains in the tunnels. This borer does not attack hardwood, though it does attack moderately hard cabinet

woods, having been found in Tasmanian Blackwood (*Acacia melanoxylon*) and Japanese Oak (*Quercus* sp.). The statement has been made that this borer does not attack Australian timbers; it is indeed a great pity that this is not quite correct. Many of the brush timbers are liable to attack, and experience will probably show others to be also subject to attack. The principal damage is done, however, to coniferous woods, e.g., the various species of Kauri (*Agathis* spp.), Hoop Pine (*Araucaria Cunninghamii*), but more especially Baltic Pine (*Picea excelsa*) and New Zealand White Pine (*Podocarpus dacrydioides*). The latter wood is undoubtedly the greatest source of trouble. It has been, and is being, used extensively for building and in furniture, especially for backing, and is above all other woods most liable to infestation. Its use for any building purpose should be absolutely prohibited. In short, New Zealand White Pine is a serious menace, since the spread of the furniture borer can largely be attributed to its widespread use. In New Zealand it is not now used in building construction, and there is no justification for its use here. Cypress Pine (*Callitris glauca*) or Redwood (*Sequoia sempervirens*) are not attacked, and Oregon is very rarely affected, and these woods or hardwood should be used to replace badly infested timber."

"Turning now to the second group of insect pests, the termite or white ant, we have also a worker which frequently does not betray its presence till the structure has collapsed. . . . Moisture is essential, and white ants have been known to perforate lead flashing and even lead water pipes to obtain it. Altogether about 50 species occur in Australia, but the commonest in the vicinity of Sydney is *Coptotermes lacteus*, which, according to Froggatt, is the principal cause of damage to buildings.

"Practically any timber can be destroyed by the white ant if it so desires, although woods like Cypress Pine (*Callitris*) or Redwood (*Sequoia*) are not commonly attacked. Among the hardwoods, Red Mahogany (*Eucalyptus resinifera*), and Turpentine (*Syncarpia laurifolia*), are usually fairly resistant. Hill records an instance where white ants passed through a stump cap, a 3-in. x 4-in. Cypress Pine joist, and a 1-in.

Cypress flooring board in order to get at a bag of sugar. The destructive action appears to be due to a corrosive acidic secretion produced by the termite, and by this means it is even able to eat through metal caps placed over wooden or concrete piers; it is also able to destroy lime mortar. Oshima has shown that the food of the termite is evidently the cellulose of which wood partly consists, the lignin being undigested."

The paper includes descriptions of these insects and discusses methods of control. There is also a discussion of decay, its causes and prevention.

Forest survey of Tasmania. By G. J. RODGER. Papers Third Brit. Emp. For. Conference 1928, pp. 809-902.

"The Development and Migration Commission having undertaken a complete survey of the economic position of Tasmania, called on the Forestry Bureau for a report on the forest resources of that state. The work was entrusted to Mr. G. J. Rodger, B.Sc., Chief Forester of the Federal Capital Territory, from which service he was for the time being seconded. Tasmania was known to possess the best forest climate in the Commonwealth, and was credited with the possession of very large areas of high forest. Mr. Rodger's report shows that the area of native forest capable of being profitably treated silviculturally is 334,000 acres, while the area of land suitable for afforestation with conifers amounts to 100,000 acres. The discovery that Tasmania's forest resources are less than was generally anticipated does not come as a surprise to the foresters of Australia, for the exaggeration of forest area has been the rule in all states, and it is only when a technical forester has investigated the resources that the true position in this regard has been revealed. The shrinkage in Tasmania is from 1,500,000 to under 500,000 acres, and is not so great as in other states. Western Australia was credited with the possession of 20,000,000 acres, and the forest assessment showed 3,000,000 acres. New South Wales was thought to possess 8,000,000 acres; Mr. Jolly's report for the year 1927 shows that half that area is all he can possibly get. Before 1917, Australia possessed (statistically) 90,000,000 acres of forest; by 1920 the figure had shrunk to 24,500,000,

and today it stands at 19,500,000, and it may be expected to continue shrinking as forest assessments are completed till the true position is reached, which competent authorities estimate at between 12,000,000 and 15,000,000 acres. Looked at from this angle, Tasmania's forest estate of around 500,000 acres is actually a fair proportion of the whole forest area of the Commonwealth.

"Mr. Rodger's report covers the whole field, and in it will be found full descriptions of the country, and also the preliminary plans for the establishment of forestry practice in the native forests and the establishment of plantations of exotic conifers of the best type. Outside the highlands of Victoria and New South Wales it is doubtful whether Australia possesses any region whose climate is so propitious for the growth of the better kinds of conifers as Tasmania. With the threatened famine of softwoods, all regions with a coniferous climate are of first importance."—From preface by C. E. LANE-POOLE.

New Zealand. Commercial forestation. A statement of operations for the year ending 31st March, 1928. Leaflet No. 7/28, N. Z. State Forest Service, Dec. 1928. Pp. 7; 6 x 9³/₄.

"Prior to 1923 forestation operations were carried on in the Dominion by the State Forest Service, the Prisons Department, a number of local authorities, and to a limited extent by farmers and others. Apart from the operations of the State Forest Service and the Prisons Department, the amount of forestation carried on, judged by the areas planted annually, was practically negligible. The rising timber prices recorded in the last decade, the certainty in the future of further decreases in the available supply, together with a reasonable prospect of a constant and increasing demand, have in recent years focused attention on the growing of timber for profit. The formation of softwood forests as a profit-making proposition was seriously undertaken by private enterprise in 1923, since when great strides in this direction have been made."

"Two kinds of organizations have been formed to carry

out the various ventures. The first is the joint-stock company, where the property in the forests is vested in the company, each shareholder receiving a share of the profits according to the amount of capital contributed; the second is a private company registered with a comparatively small capital, but in which the investing public do not become shareholders. The company contracts with each investor that, in consideration of his paying the prescribed amount of cash, it will convey to him at the end of a given term a certain area of land duly planted according to a prescribed agreement. The interests of the investing public are watched over by trustees appointed by investors, and the lands concerned are conveyed by way of mortgage to the trustees until the time for conveyance to the investor arrives."

"The recorded planting program for 1927-28 (1927 planting season) showed 75,628 acres of new areas planted, against 78,380 acres for the previous season. A feature of the commercial forestation is that the planting operations follow closely behind the sale of bonds; as these sales reached their peak (so far) soon after the scheme was initiated some three or four years ago, it is not surprising that the areas planted decreased substantially from 49,824 acres in 1926-27 to 39,222 acres in 1927-28. Plantings by the State Forest Service totalled 19,924 acres in 1926-27, against 49,824 acres by forestation companies in the same year, but for the year under review State Forest plantings had amounted to 35,106 acres, while the figure for forestation companies showed 39,222 acres."

New Zealand. Firewood on the farm. Leaflet No. 11, N. Z. State Forest Service, 1929. Pp. 8; 6 x 9³/₄.

"Since the heating-value of 1 lb. of thoroughly dry wood substance is approximately constant, irrespective of the species, it follows that the greater the density or weight per cubic foot of a wood the greater its heating-value per cubic foot or per cord. As a great deal of firewood is commonly measured and sold on a cord basis, it is convenient to classify the various woods on a density basis and to compare their heating-values.

"Group 1.—This, the most valuable group, averages about 50 lbs. of dry wood substance per cubic foot, and includes the heavy native hardwoods as follows:

Northern rata (<i>Metrosideros robusta</i>)	Puriri (<i>Vitex lucens</i>)
Southern rata (<i>Metrosideros lucida</i>)	Pohutukawa (<i>Metrosideros tomentosa</i>)
Black maire (<i>Olea Cunninghamhamii</i>)	Manuka (<i>Leptospermum</i> spp.)

"Group 2.—This next group averages about 38 lbs. per cubic foot, and includes the Beeches (*Notofagus* spp.), with the exception of the Silver-beech (*N. Menziesii*).

"Group 3.—The third group comprises the lighter native hardwoods, the heavier native softwoods, and some of the heavier introduced Eucalypts (hardwoods), the average density oven-dry being about 32 lbs. per cubic foot, and the principal species being as follows:

Native Hardwoods	Peppermint-gum, etc. (<i>Eucalyptus amygdalina</i>)
Tawa (<i>Beilschmiedia Tawa</i>)	
Taraire (<i>Beilschmiedia Taraire</i>)	Native Softwoods
Kamahii (<i>Weinmannia racemosa</i>)	Matai (<i>Podocarpus spicatus</i>)
	Miro (<i>Podocarpus ferrugineus</i>)
Introduced Hardwoods	Rimu (<i>Dacrydium cupressinum</i>)
Blue-gum (<i>Eucalyptus globulus</i>)	Kauri (<i>Agathis australis</i>)

"Group 4.—In the fourth group fall the light native hardwoods and softwoods, the heavier introduced softwoods, and the lighter Eucalypts, their average density oven-dry being about 26 lbs. per cubic foot, and including the following species:

Native Hardwoods	Introduced Softwoods
Silver-beech (<i>Notofagus Menziesii</i>)	Macrocarpa (<i>Cupressus macrocarpa</i>)
Introduced Hardwoods	Insignis pine (<i>Pinus radiata</i>)
Tasmanian stringybark (<i>Eucalyptus obliqua</i>)	Corsican pine (<i>Pinus Laricio</i>)
	Austrian pine (<i>Pinus austriaca</i>)
Native Softwoods	Douglas fir (<i>Pseudotsuga Douglasii</i>)
Kahikatea (<i>Podocarpus dacrydioides</i>)	European larch (<i>Larix europaea</i>)

"The choice of wood for fuel does not, however, depend upon its heating value alone. There are other factors of importance, such as freedom from smoke, ease and completeness of combustion, rapidity of burning, sparking, etc.

Kauri, for instance, tends to smoke badly, and such woods as Hinau (*Eleocarpus dentatus*), Pukatea (*Laurelia novae-zelandiae*), and Rewarewa or Honeysuckle (*Knightsia excelsa*) are so difficult to burn, even when seasoned, that they are seldom used by themselves for firewood. Tawa and Taraire burn very rapidly, but are useful in that they will burn when quite green, while Totara (*Podocarpus Totara*), Silver-pine (*Dacrydium Colensoi*), and Macrocarpa tend to spark."

Coniferae of South Africa, Australia, and New Zealand. By F. W. FOSTER. Papers Third Brit. Emp. For. Conference 1928, pp. 48-58.

"The typical conifers of South Africa, Australia, and New Zealand, belong mainly to the family Taxaceae (the 'Taxads'), and to a less extent to the Araucarineae tribe of the family Pinaceae. None of the Abietineae—true Pines, Spruces, Firs, etc.—occur there, but the remaining tribes of the Pinaceae are represented."

"In South Africa the main conifers are the Yellow-woods, genus *Podocarpus*. They have been largely exploited.

"In Australia the Taxads, mostly in Tasmania, include the Huon Pine, Celery-top Pine, and Brown Pine. In the other group are Hoop and Bunya Pines and two Kauris in Queensland. Species of Cypress Pines occur in all the States.

"New Zealand's most valuable timber tree, the Kauri, has been largely exploited. The Taxads are mainly Rimu, Totara, Kahikatea, Matai, and Miro."

"Taxad forests are essentially dense, evergreen rain-forests. They may be either tropical or sub-tropical (or perhaps more correctly, extra-tropical). In Chile and Patagonia, New Zealand, Fiji, New South Wales, Tasmania, and South Africa, they are characterized by giant coniferous timber trees growing over a dense under-forest of broad-leaved trees. From the forester's point of view the weak points of these forests, at least as they occur in New Zealand, are: (a) a great number of species, some of no value; and (b) a weak-natured regeneration. The good points are: (a) the trees are shade-bearers; (b) low fire hazard except in very dry seasons."

"Group 1.—This, the most valuable group, averages about 50 lbs. of dry wood substance per cubic foot, and includes the heavy native hardwoods as follows:

Northern rata (<i>Metrosideros robusta</i>)	Puriri (<i>Vitex lucens</i>)
Southern rata (<i>Metrosideros lucida</i>)	Pohutukawa (<i>Metrosideros tomentosa</i>)
Black maire (<i>Olea Cunninghamei</i>)	Manuka (<i>Leptospermum</i> spp.)

"Group 2.—This next group averages about 38 lbs. per cubic foot, and includes the Beeches (*Notofagus* spp.), with the exception of the Silver-beech (*N. Menziesii*).

"Group 3.—The third group comprises the lighter native hardwoods, the heavier native softwoods, and some of the heavier introduced Eucalypts (hardwoods), the average density oven-dry being about 32 lbs. per cubic foot, and the principal species being as follows:

Native Hardwoods	Peppermint-gum, etc. (<i>Eucalyptus amygdalina</i>)
Tawa (<i>Beilschmiedia Tawa</i>)	
Taraire (<i>Beilschmiedia Taraire</i>)	Native Softwoods
Kamahī (<i>Weinmannia racemosa</i>)	Matai (<i>Podocarpus spicatus</i>)
	Miro (<i>Podocarpus ferrugineus</i>)
Introduced Hardwoods	Rimu (<i>Dacrydium cupressinum</i>)
Blue-gum (<i>Eucalyptus globulus</i>)	Kauri (<i>Agathis australis</i>)

"Group 4.—In the fourth group fall the light native hardwoods and softwoods, the heavier introduced softwoods, and the lighter Eucalypts, their average density oven-dry being about 26 lbs. per cubic foot, and including the following species:

Native Hardwoods	Introduced Softwoods
Silver-beech (<i>Notofagus Menziesii</i>)	Macrocarpa (<i>Cupressus macrocarpa</i>)
Introduced Hardwoods	Insignis pine (<i>Pinus radiata</i>)
Tasmanian stringybark (<i>Eucalyptus obliqua</i>)	Corsican pine (<i>Pinus Laricio</i>)
	Austrian pine (<i>Pinus austriaca</i>)
Native Softwoods	Douglas fir (<i>Pseudotsuga Douglasii</i>)
Kahikatea (<i>Podocarpus dacrydioides</i>)	European larch (<i>Larix europaea</i>)

"The choice of wood for fuel does not, however, depend upon its heating value alone. There are other factors of importance, such as freedom from smoke, ease and completeness of combustion, rapidity of burning, sparking, etc.

Kauri, for instance, tends to smoke badly, and such woods as Hinau (*Elæocarpus dentatus*), Pukatea (*Laurelia novae-zelandiae*), and Rewarewa or Honeysuckle (*Knightsia excelsa*) are so difficult to burn, even when seasoned, that they are seldom used by themselves for firewood. Tawa and Taraire burn very rapidly, but are useful in that they will burn when quite green, while Totara (*Podocarpus Totara*), Silver-pine (*Dacrydium Colensoi*), and Macrocarpa tend to spark."

Coniferae of South Africa, Australia, and New Zealand. By F. W. FOSTER. Papers Third Brit. Emp. For. Conference 1928, pp. 48-58.

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"The Taxads as a whole provide timbers suitable for all but a few special purposes. Some of the woods are very durable, even in the ground, and those that are not durable are straight-grained, easily worked, and offer a wide range of color, and many are strong. Logs from the typically over-mature trees are often defective, but the timbers can be said to be suitable for all the purposes to which the softwoods of the Northern Hemisphere are applied.

"Unlike the Taxads, the pinaceous conifers of South Africa, Australia, and New Zealand resemble, rather than differ from, the conifers of the Northern Hemisphere. Most of them have a long merchantable bole, they occur in pure stands, their natural regeneration is abundant, their growth-rate is fairly rapid, they are light-demanders, and in general they present fewer difficulties to the silviculturist. Their distribution is generally local."

A study of sulphur as a wood preservative. By E. F. ENGLISH. *Journ. So. Afr. Inst. Engineers* (Johannesburg) 27: 7: 127-137, Feb. 1929.

Plantations of Gums, Pines, and Wattles cover approximately 600,000 acres in South Africa, and it is said to be not unusual, under the best conditions, for trees to attain a height of 100 feet in 10 years. The average growth of Gums and Pines per acre is between 100 and 300 cubic feet per annum. In order to find a market for the increasing quantities of thinnings, it is highly important to discover the best methods of treating the poles to protect them against decay and insects and, if possible, to improve their technical properties.

The work described in this paper was carried out to determine: (1) What absorptions of sulphur could be obtained in South African hardwoods and softwoods by open-tank treatments of normal severity. (2) The extent of the hardening effect of sulphur treatments. (3) The effect of sulphur treatments on the rate of absorption of water and water vapor.

SUMMARY OF RESULTS

"1. Round sticks of *Pinus Pinaster*, *Eucalyptus saligna* and *Acacia mollissima* were treated in molten sulphur by the

open-tank method. The highest absorptions were about 23, 17, and 8 lbs. of sulphur per cubic foot respectively. Complete penetration of the sapwood was obtained in all cases. (The *Pinus Pinaster* contained no heartwood.)

"2. Hardness tests on oven-dry heartwood of *Euc. saligna* treated in sulphur and untreated were made. It was found that practically no change in hardness was caused by the sulphur treatment. The absorption and penetration of the sulphur in these test pieces was low.

"3. Hardness tests on *Cryptomeria japonica* treated in sulphur and at a moisture content of about 3.5 per cent and on untreated oven-dry wood of the same species showed an average increase in side hardness of about 17 per cent, and in end hardness of about 57 per cent. In both cases the increase in hardness varied directly with the absorption of sulphur.

"The side hardness of the sulphur-treated wood decreases with increasing moisture content.

"4. Hardness and compression tests on air-dry blocks of *Pinus Pinaster* treated in sulphur and untreated showed a hardness of about 14 per cent greater, but a compressive strength of about 14 per cent less for the former.

"5. Tests on the absorption of water vapor by sulphur-treated and untreated wood of *Pinus Pinaster* initially oven-dried showed that the rate of absorption is decreased by sulphur treatment and the equilibrium moisture content of sulphur-treated wood is slightly lower than that of untreated wood.

"6. Tests on the absorption of water by sulphur-treated and untreated wood of *Pinus Pinaster* and *Euc. grandis* showed that sulphur impregnated into wood exerts practically no water-proofing action."

Le genre Faurea (Protéacées) en Afrique et la distribution géographique de ses espèces. By É. DE WILDEMAN. Reprinted from *Mémoires Acad. Roy. de Belgique*, 2d ser., vol. 10, 1929, pp. 37.

L'exploitation des bois à Madagascar. By A. CHARLES. *Revue Internationale des Produits Coloniaux* (Paris) 4: 40: 154-156, Apr. 1929.

Notes on the forest flora of Northern Rhodesia. By J. BURTT DAVY. *Empire Forestry Journal* (London) 7: 2: 255-261.

Curtisia faginea Ait. ("Assegaai"): An ecological note. By JOHN F. V. PHILLIPS. *Transactions of the Royal Society of South Africa* 17: 1: 29-41, 1928.

Silvicultural experiments at Sapoba, Nigeria. By R. ST. BARBE BAKER. *Empire Forestry Journal* (London) 7: 2: 203-208, 1928. Illustrated.

Contribution a l'étude de la flore du Katanga. Supplement II. By É. DE WILDEMAN. Pub. by Comité Spécial du Katanga. Brussels, Jan. 1929. Pp. 109; 7 x 10.

Matériaux pour la flore forestière du Congo Belge. By É. DE WILDEMAN. *Ann. Soc. Sci. Bruxelles* 48 (ser. B): 1: 131-138, Oct. 1928.

Contains botanical descriptions of four new varieties of *Brachystegia ferruginea* De Wild.

Les richesses forestières du Congo Belge. By R. BORGERHOFF. *Revue Internationale des Produits Coloniaux* (Paris) 4: 38: 49-54, Feb. 1929.

An account of the forests of the Belgian Congo with particular reference to the problems involved in their exploitation.

Des bois du Congo; de leur utilisation et de leur exportation. By JASSOGNE. *Congo* (Brussels) 1: 3: 382, 1928.

Attention is called to the forest wealth of the Congo, particularly of the territory of Mayumbe, and the possibilities of supplying a greater portion of the Belgian timber imports, which amount to about 1,400,000 cu. m. annually.

Note sur le *Mimusops congolensis* (De Wild.) W. Russell et Hédin (syn.: *Austranella congolensis* [De Wild.] A. Chev.). By L. HÉDIN. *Bull. Soc. Bot. de France*, 1929, pp. 67-72.

This is a very tall tree of the Moyen-Congo and Cameroon. Its bark is rough and fissured, and, upon incision, a white sticky latex exudes. The wood is sold, along with that of *Baillonella toxisperma*, under the name of Moabi; the natives use the trunks for making canoes.

The author completes De Wildeman's original botanical description with an illustrated account of the flowers, and includes a number of other observations, particularly with reference to the seeds.

L'exploitation du palétuvier dans la baie de Manoka (Cameroun). By M. L. HÉDIN. *Rev. Bot. Appl. & d'Agr. Coloniale* (Paris) 8: 85: 623-626, Sept. 1928.

An account of the exploitation of Mangrove on Manoka Bay by a French company which obtained a concession for the extraction of timber and tanbark in 1919. The wood is used chiefly for railway cross-ties.

Timber resources of British West Africa. By J. R. AINSLIE. Papers Third Brit. Emp. For. Conference 1928, pp. 83-96.

"The whole situation may be summed up by saying: "That, provided shifting cultivation can be controlled, which may not unreasonably be anticipated, and provided the forests are managed on sound scientific and economical principles in the future, then an immense supply of timber will be available for all time for outside purchasers. The amount may, by judicious treatment, be increased at any rate to an annual supply of double that estimated earlier in this paper, and accordingly may give a yield of 1,600,000,000 cubic feet of hardwoods, and 800,000,000 feet of soft-hardwoods or softwood substitutes;

"That within the next two decades the prices of timbers of all kinds will have risen to such an extent and the demands for timber will be so great that at least half of this material

will be in large demand, and will accordingly be economically marketable abroad; and

"That British West Africa, owing to its geographical situation, will probably be one of the first countries to supply tropical timbers, both hardwoods and soft-hardwoods on a large commercial scale as substitutes for temperate timbers to the chief timber-consuming markets of the world."

Nos bois coloniaux (Côte d'Ivoire et Cameroun). Samba-Ayous (*Triplochiton scleroxylon* K. Schum.) Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, Paris, 1929. Pp. 4; $5\frac{1}{4} \times 7\frac{1}{4}$; 2 plates; 2 veneer samples.

A concise account of this species from both the scientific and commercial aspects. (For an extended report see *Tropical Woods* 18: 43-54, June 1, 1929.) The editor is informed that Professor Chevalier believes that there is only one species, *Triplochiton scleroxylon*, since the characters which have been relied on to distinguish *T. nigericum* Sprague, notably the 7-lobed and 7-nerved leaves, are not constant and both kinds of leaves may appear on the same tree.

Nos bois coloniaux (Côte d'Ivoire, Cameroun, Gabon et Moyen Congo). Badi-Bilinga (*Sarcocephalus* sp.). Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, Paris, 1929. Pp. 4; $5\frac{1}{4} \times 7\frac{1}{4}$; 2 plates; 2 veneer samples.

The principal species involved are *Sarcocephalus Trillesii* Pierre (= *S. Diderrichii* DeWild. & Dur.) and *S. Pobeguini* Pob. The vernacular names for the trees are as follows: **IVORY COAST:** Badi (Attié); Bedo (Abé); Ekusamba (Appolonien); Zerongo (Bambara); Boisima or Boissima (Agni). **CAMEROON:** Mukonia mamoundi (Douala); Eké, Ekeng, Edjin (Bakoko); Akondoc (Yaoundé and Boulou); Bie, Toumbo (Mabéa). **GABOON & CONGO:** Bilinga (Gabonais, M'Pongoué, N'Komi); N'Toma, Aloma, Issoula (Pahouin); N'Gulu (Vili and Yaka); Gulu (Lumbo).

The trees are large, 115 to 140 feet tall, with a cylindrical bole often free of branches for upward of 100 feet and attaining a maximum diameter of about 5 feet. The fresh wood is of a golden yellow color and is sometimes called Bois d'Or, but,

upon exposure, it darkens to orange or orange-brown. It varies in density from 0.70 to 0.90 (thoroughly air-dry), depending largely upon conditions of growth. While not an easy wood to work, it is tough and strong and often exhibits a very attractive grain. It is finding considerable use in France for decorative portions of furniture and interior fittings. Owing to its durability and strength it is suitable for railway cross-ties, and 50,000 were used on French lines in 1927. Exports are mostly from Gaboon (7000 tons) and Cameroon (2000 tons).

Note sur l'exploitation de la forêt du Gabon. By LÉON GÉRAUD. *Actes & Comptes Rendus de l'Assn. Colonies-Sciences* (Paris) 5: 48: 125-131, June 1929. 1 map.

Le *Baillonella toxisperma* Pierre (1890) au Cameroun. By L. HÉDIN. *Rev. Bot. Appl. & d'Agr. Coloniale* (Paris) 8: 88: 853-855, Dec. 1928.

An account of this tree with particular reference to the use of the seeds as a source of vegetable fat. The species occurs both in Cameroon and Gaboon, often abundantly, and is one of the giants of the forest.

Sur la sous-famille des Érisimées. By AUG. CHEVALIER and W. RUSSELL. *Comptes Rendus des Séances de l'Académie des Sciences* (Paris) 188: 565-567, Feb. 1929.

The family Vochysiaceae, established in 1820 by A. de Saint-Hilaire, originally consisted of the three genera *Salvertia*, *Vochysia*, and *Qualea*. Other genera were subsequently added and in 1874 M. H. Baillon divided the family into three tribes, namely the Salvertiaceae (or Vochysiaceae proper), the Erisimeae (with a single genus *Erisma*), and the Trigoniaceae (now generally classed as a distinct family, the Trigoniaceae). According to A. Engler and P. van Tieghem, the first two tribes form a homogeneous group, the Vochysiaceae, comprising five American genera.

In 1913, Mildbraed described an African genus, *Erismadelphus*, represented by a single Cameroun species which he

named *E. exul*. Recently Baudon discovered in the Haut-Ogooué (Moyen-Congo) a second species, *E. Baudoni* A. Chev. It is a tree about 50 feet high, common between Franceville and Brazzaville, occurring in groves in the sandy regions and also in the high forest; the vernacular name is Kensagui (Batéké). A study of the morphology and anatomy of this plant and of Amazon species of *Erismia* permits the separation of *Erismia* and *Erismadelphus* into a sub-family, *Erismeeae*. One of the most important characters, which these two have in common in contrast with the others of the family, is the presence of strands of interxylary phloem.

In the fruit of *Erismadelphus*, which is an achene, the calyx lobes are accrescent, the anterior and two posterior ones elongating into oblong, dry, stiff wings, resembling the *Dipterocarpaceae*.

Le thuya du Maroc. By PASCAL PROVASOLI. *Le Monde Colonial Illustré* (Paris) 7: 69: 114, May 1929.

Thuja (*Callitris quadrivalvis*), the Citron of the Romans and Arar of the Arabs, grows abundantly in southern Morocco. The resinous wood is highly durable, fine-textured, fragrantly scented, rather brittle; the burls are much sought after for cabinet work and fancy articles. These burls result from injuries to the trunk and branches from fire and browsing animals, which occasion the development of innumerable buds whose subsequent growth produces a very gnarly and intricately woven structure. Large-sized burls are now rare, but there is still a good supply of the smaller ones employed in marquetry. Logs and lumber are used locally and also exported. *Thuja* resin is also an article of commerce and is known on the French and English markets as "gomme sandaraque."

L'industrie du papier et nos colonies. By MAURICE MARTELLI. *Actes & Comptes-Rendus de l'Assn. Colonies-Sciences* (Paris) 4: 42: 233-245, Dec. 1928.

Les acajous. By MARCEL MONNIN. *Actes & Comptes-Rendus de l'Assn. Colonies-Sciences* (Paris) 4: 41: 209-215, Nov. 1928.

Projet de résolution limitant la dénomination d'acajou.

Actes & Comptes Rendus de l'Assn. Colonies-Sciences (Paris) 5: 44: 43-44, Feb. 1929.

The Sub-committee on Colonial Woods of Colonies-Sciences took the following action at its meeting on Dec. 21, 1928:

Whereas there is need for regulating the commercial name Mahogany (Acajou) by restricting it exclusively to woods which have all the properties of the true Mahogany (*Swietenia Mahagoni*) and which, therefore, should be able to replace it in all of its uses;

Whereas the most important properties of Mahogany are due to its anatomical structure, and these structural features occur to a greater or less extent in other woods belonging to the same family or to the family *Meliaceae*;

Whereas the characters used for the classification and identification of commercial woods, such as grain, texture, odor, density, etc., are likewise of botanical origin and are found in different degrees in other species of the same family;

Whereas the French law regulates the naming of agricultural products and the American law limits the name Mahogany exclusively to the woods of the *Meliaceae*; but realizing that not all of the woods of trees, shrubs, and bushes of the family *Meliaceae* can be considered Mahogany and that it is necessary, therefore, to couple the botanical definition with a physical one;

Resolved that the name Mahogany, accompanied by the indication of the kind, can be given to all of the red, reddish, or rose-colored woods which are produced by trees belonging to the family *Meliaceae* and which possess the following physical characters: Having a total shrinkage, from green or soaked condition to a dry state, of not more than 11 per cent of the dry volume; and exhibiting a variation in volume of less than 0.46 per cent per unit of its moisture content (in the neighborhood of 15 per cent). The name can be extended, with indication of color, to others of the *Meliaceae* meeting these [physical] conditions but not having the Mahogany color.

Resolved, further, to enumerate the species of the *Melia-*

ceae having a right to the name Mahogany as fast as they can be shown to comply fully with the foregoing requirements.

The National Committee on Colonial Woods is commissioned to carry out these decisions and to have them observed, if need be before the magistrates.

Coniferae: Keys to the genera and species, with economic notes. By H. M. FITZPATRICK. *Sci. Proc. Royal Dublin Society* 19 (n.s.): 19: 189-260, Apr. 17, 1929. Plates 9-15.

"The family Coniferae is an extensive one comprising 47 genera and 490 living species. . . . The present work was undertaken with the object of compiling a comprehensive series of descriptions of the species of the Coniferae, based on the morphology of the foliage, arranged in the form of an artificial key. In the recognition of plants, in the living or in the fossil state, the characters of the flowers or fruit are often of no help, as these may not be available. Living trees must be identified by means of peculiarities of the foliage alone in youth, and later in life also if they are not bearing cones. Workers in paleobotany recognize fossil remains of plants in many cases by the impressions of leaves and twigs, and for such work keys are essential. Obvious characters, which can be made out with the naked eye or by the use of a pocket lens, are as far as possible relied upon in the descriptions. The main divisions of the key rest upon the arrangement of the leaves of normal sterile branches, occurring in the lower part of the crown of adult trees, and on their shape and their mode of attachment to the twigs. In the Abietineae the twigs become woody in the second year of growth, and this distinguishes this important timber-producing tribe from all other Conifers except *Taxodium*.

"Certain genera may be recognized at a glance by some prominent character. *Pinus* has long needle-like leaves in clusters of from two to five. *Sciadopitys*, with its long, grooved cladodes arranged in regular whorls, is unmistakable. *Larix* and *Pseudolarix* have light green leaves on clusters and spurs, and are, with *Taxodium* and *Glyptostrobus*, the only genera which are deciduous, the latter two being distinct by their annual branchlets falling with the leaves in autumn."

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TROPICAL WOODS

NUMBER 20

DECEMBER 1, 1929

CONTENTS

	<i>Page</i>
Trade Practice Conference of the Walnut Woods Industry	1
Walnut Bean (<i>Endiandra Palmerstoni</i>)	4
Bossé (<i>Guarea cedrata</i>)	10
<i>Panda oleosa</i> Pierre	14
Identification of Some Timber Trees of the Gold Coast	17
Two New Trees from Honduras and British Honduras	20
Notes on Brazilian Woods	22
<i>Machrideina</i> , a New Genus of Trees of the Family Rubiaceae	24
The Wood of <i>Caryodendron angustifolium</i> Standley	26
<i>Pseudocopaiva</i> Britton & Wilson, gen. nov.	28
A New Peruvian <i>Capparis</i>	30
Note on <i>Garcinia kola</i> Heckel	32
Current Literature	33

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TROPICAL WOODS

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December 1, 1929

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

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

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TRADE PRACTICE CONFERENCE OF THE WALNUT WOODS INDUSTRY

A trade practice conference of the Walnut Woods Industry was held at Chicago, Illinois, October 10, 1929. It was called by Mr. M. Markham Flannery, Director of Trade Practice Conferences for the Federal Trade Commission, and was presided over by Commissioner C. W. Hunt.

The purpose, as stated in the official notice, was "to give all concerned an opportunity to participate in deliberations which are expected to result in efficiently eliminating from the industry all practices which may be considered unfair, wasteful, or otherwise bad for the industry and the public." The only practice proposed for discussion concerned the nomenclature of woods, particularly the application of such terms as "Oriental," "Australian," "African," "Brazilian," etc., to the name Walnut.

At this conference the following resolutions were adopted, those in the first group being mandatory, those in the second group advisory only:

GROUP I

Whereas, certain domestic and imported woods are being advertised and sold in the markets of the United States of America as and for Walnut Wood, which in truth and in fact are not Walnut Wood, and

Whereas, said woods are sold and advertised under names or terms such as: African Walnut, Brazilian Walnut, South American Walnut, East Indian Walnut, Oriental Walnut, Australian Walnut, Queensland Walnut, and other names and terms to which various prefixes appear before the word Walnut, and

Whereas, generations of American people have universally known and applied the name Walnut to wood from the genus *Juglans*, and said domestic and imported woods are not of the genus *Juglans*, now, therefore, be it

RESOLVED, that the use of the term Walnut, either alone or in conjunction with other words, as applied to wood other than the wood of the genus *Juglans*, deceives the public and is an unfair method of competition.

GROUP II

We recommend that the article, "Walnut Woods—True and False," by Professor Samuel J. Record,¹ pages 4 to 29 inclusive, of *Tropical Woods*, No. 18, published by the School of Forestry, Yale University, on June 1, 1929, be accepted and made a part of the record of this meeting.

In accordance with the information contained in the above publication, for the clarification of trade names and the protection of the public from misrepresentation, the following resolutions were adopted:

Whereas, it is the tendency of modern business to seek descriptive terms that avoid confusion and are the least capable of being used to mislead the public, and

¹ Chairman of the Advisory Committee on Nomenclature of Lumber appointed in 1926 by the Director of Trade Practice Conferences by authorization of the Federal Trade Commission.

Whereas, it is the desire of the lumber, veneer, and cabinet-making industries to promote the use of distinctive names that separate rather than confuse various woods, be it

RESOLVED, that the present commercially used species of Walnut be designated with a qualifying adjective indicating the species, variety, or place of origin; and be it further

RESOLVED, that the following names be designated as the accepted trade names for use in the United States:

Juglans nigra: American Walnut or Black Walnut.

Juglans cinerea: White Walnut or Butternut.

Juglans regia: Royal Walnut or Persian Walnut (general); English Walnut (if from England); French Walnut (if from France); Italian Walnut (if from Italy); Turkish Walnut (if from Turkey); Russian Walnut, Caucasian Walnut, or Circassian Walnut (if from Russia); Spanish Walnut (if from Spain).

Juglans Sieboldiana: Japanese Walnut.

Juglans boliviana: Bolivian Walnut.

AND BE IT FURTHER RESOLVED, that we recommend that the following woods that have been sold as or called Walnut be designated as follows:

Lovoa Klaineana: Tigerwood. (Known in a limited way as African Walnut; a member of the Mahogany family.)

Endiandra Palmerstoni: Oriental Wood. (Recently introduced in quantity into the United States from Australia as Oriental Walnut; also called Australian Walnut, Queensland Walnut, and Walnut Bean. This tree is a member of the Laurel family. . . .)

Albizzia Lebbek: Koko. (Sometimes called East Indian Walnut.)

Phoebe porosa: Imbuya. (Sometimes called Brazilian Walnut.)

NOTE: The names Tigerwood and Oriental Wood were chosen by majority votes of the conference on the ground that they were already fairly well known to the trade. It was disclosed that the term "oriental" was applied by the original importer to conceal the origin and identity of the Queensland timber.

WALNUT BEAN (*ENDIANDRA PALMERSTONI*)

By M. B. WELCH, *Economic Botanist, Technological Museum, Sydney*

Walnut Bean,¹ also known as Black Walnut, Medang Walnut, Queensland Walnut, and Black Mahogany, was first described, from incomplete botanical material, by Bailey² who named it provisionally *Cryptocarya Palmerstoni*. More recently flowers were obtained and an examination of these by White³ resulted in the genus being established as *Endiandra*. This genus includes several others of the so-called brush (rain-forest) trees, but these are not very important commercially. Actually the wood belongs to the family Lauraceae and has no connection with the Juglandaceae or Walnut family of the Northern Hemisphere.

According to Swain,⁴ "Walnut Bean is a tree of continuous and heavy rainfalls and warm temperatures. The average annual rainfall of its habitat amounts to 50-80 inches; the average for the driest month seldom drops below 1½ inches. The mean temperature of the coldest month is from 59° to 65° F. In these climatic circumstances it prefers the drier sites upon the hill and ridge crests in red, brown, and gray clay loams. It occurs singly, in clumps, and in numbers as a dominant tree of closed and stratified jungle formations with Silky Oaks and other members of the Proteaceae and with Maple Silkwood and other Flindersias."

The species is confined to the coastal district of Queensland in the neighborhood of Atherton and Innisfail, where it is one of the largest trees, reaching a height of over 100 feet and a

¹ Walnut Bean is the name adopted by the Queensland Forest Service, but Queensland Walnut is the name universally used on the Sydney market. (American importers have adopted the name Oriental Wood for this timber.—S. J. R.)

² F. M. BAILEY: *Queensland Dept. Agr. Bot. Bull.* 2: 16, 1891.

³ C. T. WHITE: *Queensland Dept. Agr. Bot. Bull.* 22: 36, 1920.

⁴ E. H. F. SWAIN: *The timbers and forest products of Queensland*, Brisbane, 1928, p. 239.

girth of 6 to 16 feet. The trunk is somewhat buttressed at the base.

Estimated cut.—According to the Queensland Forest Service, the amount of Walnut Bean timber cut from Crown and private lands is approximately 3,000,000 super. ft.⁵ per annum, and the total amount of logs and sawn timber exported is about 2,500,000 super. ft. per annum. Sydney exporters believe that the annual cut is nearer 5,000,000 ft., but the Forest Service should be in the best position to make an estimate. According to certain authorities there is in sight only about 5 years' supply of timber at the present rate of cutting. There is difference of opinion on this point, however, some estimates of supply being much lower and others considerably higher.

Prices.—The following prices are supplied by the Queensland Forest Service:

Logs 8 ft. and over in girth, f.o.b. Cairns, 20/- to 30/- per 100 super. ft.

Logs 8 ft. and over in girth, f.o.b. Cairns mills, 14/- to 20/- per 100 super. ft.

Export sawn fitches, f.o.b. Cairns, about 55/- per 100 super. ft.⁶

Sawing, etc.—Considerable difficulty has been experienced in sawing the wood, due to the saw teeth rapidly becoming blunt. A case is on record where six circular saws were required to cut 10 feet of a fitch. This is apparently due to the very high silica content, the silica content of the ash varying from 82.5-94 per cent, or nearly 1 per cent of the total wood, according to analyses made by the Government Analyst, Brisbane. Swage-set band saws, with plenty of water to cool the saw, give the best results, but even then after three or four deep cuts the saw dulls and must be changed at once. It is necessary to keep the saw moving forward through the wood steadily. Using reduced speed on the saw and taking out

⁵ A superficial foot is the measure of a board 12 inches square and 1 inch thick.

⁶ The price for sawn fitches is too low for present conditions. I have just received (September 3) from a large exporting firm of timber merchants a quotation of 95/- per 100 super. ft., f.o.b. Cairns.

alternate teeth have also been tried. There appears to be very considerable variation in the apparent hardness of the wood, and methods of working and tools which are condemned in some quarters appear to have given satisfaction in others. Whilst some yards have experienced the greatest difficulty in moulding the wood, others using specially hardened cutters have had comparatively little difficulty. Hand tools are not affected.

There is often a considerable loss in conversion due to the presence of a large brittle heart, whilst the sapwood amounts at times to as much as five inches in thickness.

Seasoning.—Like most timbers, quarter-sawn boards season most easily; those cut tangentially or "backed off" near the sapwood often twist badly, though again, like most timbers, the warping and twisting are largely dependent on the way the wood is treated and on the density and the maturity of the timber. End checking is usually not serious when the ends of the boards are painted with some moisture-proof material. The shrinkage in seasoning is small. Kiln-drying has given excellent results and it is claimed that the wood so treated is much easier to use in cabinet work than when air-dried.

Uses.—The principal local uses are: furniture, mantels, counters, tables, show cases, and general shop fittings; it is particularly suited for this class of work since its hardness enables it to stand up to hard wear. Other uses include doors, skirtings, mouldings of all kinds, interior panelling (especially in veneer, for which purpose it is largely used), small turned articles, gramophone cabinets, etc. In one large department store recently completed in Sydney the shop fittings, costing over £200,000, were all done in Queensland Walnut and are giving excellent service, there being far less subsequent shrinkage and swelling than has been experienced with other timbers. Before the timber for this job was selected, samples of American Walnut framing and panelling were obtained from U. S. A. in order to compare it with the local material and, the consensus of opinion being that Queensland Walnut was of equally good appearance, it was decided to use the Australian wood.

The wood possesses a rather objectionable sour smell, like badly tanned leather, but a careful examination of shop fittings in which articles had been stored for some time showed these had not acquired any appreciable smell, and when the show cases were frequently opened the odor was scarcely perceptible. Veneer apparently soon becomes odorless.

The wood requires little filler and finishing material and polishes well, but the greater hardness and difficulty in working make it about 50 per cent more expensive to use in the cabinet trade than Queensland "Maple" (Silkwood), *Flindersia Brayleyana*, and, therefore, the wood is not at present popular. Trouble has sometimes been experienced in glueing.

When made up, the wood has generally been found to resist changes in atmospheric humidity and to "move" very little, a rather important consideration in cabinet and joinery timber.⁷ It is durable in the weather, and has been used satisfactorily in outside veranda flooring and in ladder rungs for outside work. It possesses a high resistance to the passage of electrical currents and is recommended for the woodwork of electrical apparatus.

DESCRIPTION OF THE WOOD

General features: Color pinkish to reddish brown, occasionally very dark brown or almost black; sometimes uniform, but often with irregularly spaced dark streaks and bands which do not always coincide with growth rings, and produce a "flower" figure on tangential surface.

Grain usually straight, but sometimes wavy and producing fiddle-back mottle on tangential surface, or interlocked and giving rise to ribbon-grain figure on quartered material. Wood

⁷ A few years ago furniture made of Walnut Bean in Melbourne and sent to Canberra gave trouble in warping, but this might possibly have been due to the use of air-seasoned timber with a higher moisture content than would be normal in the drier atmosphere of Canberra. My experience with cabinet-makers is that they rarely check the moisture content of the woods they use, with the result that subsequent shrinkage and warping sometimes arise from the use of imperfectly seasoned material. Kiln-dried timber used in Sydney has given practically no trouble after making up.

is ordinarily fissile, works cleanly, and is moderately hard. Weight (thoroughly air-dry), 41-49 lbs. per cu. ft. Sp. gr., 66-78.

Gross anatomy: Pores medium in size and easily visible with naked eye; distributed fairly uniformly, but are more crowded in lighter-colored portions of growth rings; often appear to be in discontinuous oblique rows. Soft tissue (parenchyma) easily seen on end section as fine lines irregularly spaced, from one line per inch to as many as seven lines in an eighth of an inch. Rays not prominent, but easily visible on end section without lens, appearing lighter in color than ground tissue. Growth rings not sharply defined, but indicated by reduction in number of pores and darker color of ground tissue.

Minute anatomy: Pores single or in short radial rows of 2-4, or rarely in small groups of 3-4; av. no. per sq. mm., 16; single pores elliptical; radial diameter 60-250 μ , mean 180 μ ; tangential diameter 60-220 μ , mean 135 μ ; length of vessel segments 300-600 μ ; walls 5-17 μ in thickness; end perforation simple, transverse to oblique; end projection small or wanting; lateral inter-vessel pits crowded, rounded, the borders about 12 μ in diameter; those in contact with wood parenchyma and ray cells large semi-bordered and irregularly oval or slit-like or small circular; tyloses very prevalent. Wood fibers thick-walled; average diameter, 26 μ ; length, 750-1650 μ ; walls 5-8 μ thick; pits small, apparently simple, apertures slit-like; septate fibers not observed; gradations occur to shorter and broader irregularly shaped tracheidal cells with small indistinctly bordered pits. Wood parenchyma thick-walled, diffuse, vasicentric or in metatracheal bands from 1 to 14 cells in width, often terminal; occasionally present as septate prosenchymatous units. Comparatively large thin-walled cells occur, frequently, but not always, in contact with rays; approximately elliptical in section and about 60 μ x 40 μ in diameter x 500 μ in length and appear to be enlarged continuations of normal parenchymatous cells; these are apparently of the nature of secretory cells, but only in very few instances were they found to contain oily material, being usually without contents. Rays diffuse, heterogeneous; cells thick-walled, outer cells rarely considerably elongated; sometimes uniseriate but usually multiseriate, usually up to 3 cells in width, rarely 4; up to 600 μ in height and 75 μ in width; number of rays per mm. of transverse section, 5-10. Growth rings indicated by more or less sharply defined thicker-walled fibers of late wood.

Alkannin shows the presence of a few small oily globules in the parenchyma and fiber cells, with occasionally a fringing residue in the enlarged "secretory cells."

MECHANICAL PROPERTIES OF WALNUT BEAN

Kind of test	Maximum	Minimum	Mean
	<i>Pounds per square inch</i>		
Static bending:			
Modulus of rupture	14,820	11,800	13,320
Modulus of elasticity	1,840,000	1,680,000	1,750,000
Compression parallel to grain:			
Comp. stress at prop. limit	6,750	5,000	6,210
Ultimate crushing strength	9,960	6,750	9,145
Modulus of elasticity	2,810,000	2,220,000	2,590,000
Compression perpendicular to grain:			
Comp. stress at prop. limit	2,250	1,775	2,015
Tension perpendicular to grain	850	300	505
Shearing strength par. to grain	2,445	1,815	2,192
	<i>Pounds per inch of width</i>		
Cleavage strength	525	220	338
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Hardness (load required to imbed 0.444-in. ball $\frac{1}{2}$ its diam.):			
Radial surface	1,800	1,070	1,480
Tangential surface	1,640	1,160	1,350
End surface	1,940	1,520	1,740

NOTE: In tests for static bending the mean wt. per cu. ft. was 44.4 lbs.; moisture content, max. 13.2 per cent, min. 12.8 per cent, mean 13.1 per cent. In the other tests the mean moisture content was 11.7 per cent.

Queensland "Maple" a Misnomer

"Queensland Maple . . . has risen to fame under this unsuitable trade appellation. It is not a Maple and does not resemble Maple . . . It is a Silkwood . . ."—E. H. T. SWAIN.

BOSSÉ (*GUAREA CEDRATA*)

By JEAN COLLARDET, *Ingénieur Agronome,*
Secrétaire du Comité National des Bois Coloniaux, Paris

The West African tree producing the timber known commercially as Bossé was studied for the first time by Prof. Aug. Chevalier who found it in 1907 along the railway (Kilometer 87, Bouroukou) in Ivory Coast. Two years later he described it in his book, *Les Bois de la Côte d'Ivoire*, as *Trichilia cedrata* A. Chev., of the Meliaceae or Mahogany Family. At that time, however, the flowers were unknown and the generic status of the plant was not definitely determinable. The missing botanical material was not secured until March 1928, when Forest Inspector Aubréville forwarded the flowers. On the basis of these, Pellegrin transferred the species to *Guarea*.

THE TREE

Bossé is not known to occur outside of Ivory Coast, but further investigation may reveal it elsewhere, particularly in Gold Coast where H. N. Thompson and A. Harold Unwin found a tree of the same vernacular name which they referred to *Guarea*.¹ In the French Colony it is distributed throughout the forests of the coastal region,—common in places, but usually scattered; it becomes scarce to the northward. It is at its best in the humid primary forest where the stems are shaded in youth.

Bossé is a tall and slender tree, 80 to 115 feet high, with a straight, cylindrical bole 26 to 40 inches in diameter above the low buttresses and clear of limbs for 50 feet or more. The bark, cinder-gray on the surface, in scaling exposes the inner brown layer in peculiar designs or even elliptical pouches the size of an egg which are highly characteristic and permit ready

¹ In the Yale collections is a specimen (No. 15342) collected in Gold Coast by Asst. Conservator Vigne (his No. 955) and labelled by him as follows: "*Guarea Thompsonii* Hutch. & Dalz.; BOSSI (A), TENININI (W). Medium tree; good, scented timber; 'cedar.'" The wood is in many ways similar to Bossé of Ivory Coast (Yale Nos. 12471 and 12783), but is considerably denser, and the parenchyma bands show more clearly, especially on tangential surface.—S. J. R.

identification of the species in the forest. It is rather thick and fibrous and is pleasantly scented like Cedar.

The stout, round-headed crown of Bossé differs in appearance from that of the other Meliaceae. The pinnately compound leaves are not borne in starlike clusters as is the rule with *Entandropbragma*, neither do they remind one of the light foliage of *Kbaya ivorensis*. They are often very large, with 3 to 6 pairs of pendulous leaflets which are glabrous, oval-lanceolate, insensibly acuminate, 10 to 30 cm. long and 4 to 6 cm. broad, very unequal at the base; the terminal leaflet (if any) is usually much larger than the others; often it is lacking.

The flowers are yellow and fragrant and are borne in axillary panicles; the bracts are deciduous. The calyx is hairy outwards, gamosepalous, and 4-lobed. The corolla is composed of 4 (exceptionally 5) oblong-lanceolate petals, glabrous inside, velvety outwards. The stamens are united into an 8- or 9-lobed tube, their anthers inclosed. The ovary, which is sub-globular and very hairy, consists of 4 (exceptionally 3 or 5) united, 1-ovulated carpels. The fruit is a 3- to 5-valved, velvety, spherical capsule 3 or 4 cm. in diameter, each valve covering a red, triangular, unwinged seed which is without albumen. The fact that monkeys and toucans are very fond of the seed accounts in no small part for the scarcity of the tree.

COMMON NAMES

Bossé, Bossé Mahogany, Acajou Rosé or Pink Mahogany, Cèdre d'Afrique or African Cedar, Pink African Cedar, Santal d'Afrique or African Sandalwood (Trade); M'Bossé (Agni); M'Bossa (Appolonian); Anokué (M'Bomoi); M'Ganaké, Hagué, Krassé (Abé); Ibotou (Bereby region); Donoza (Attié).

PROPERTIES OF THE WOOD

Sapwood, which is about 4 inches thick in commercial logs, is pinkish creamy white when fresh. Heartwood, only slightly darker than the sapwood at first, turns light reddish brown upon exposure. Natural luster rather low. No distinctive taste; characteristic cedar odor tends to disappear in time.

Sp. gr. (fresh) 0.90; (15 per cent moisture) 0.55 to 0.70, av. about 0.60. Weight 35 to 40 lbs. per cu. ft. Texture medium and uniform. Grain inclined to be curly and roey. Bossé wood is stiff, tough, strong, has a fair shock-resisting capacity, is easy to plane, saws freely, and does not chip out in turning. The fine dust arising in working with machines is an irritant to the throat, but does not seem noxious. The wood glues up firmly, but boards are likely to split when nails are driven close to the edges and ends. The oily content of the heartwood affords a measure of protection against decay, termites, and beetles; when abundant, it sometimes exudes in minute drops on the surface of lumber and veneers, but usually does not interfere with staining and varnishing. Fresh heartwood has an average moisture content of 30 per cent and can be dried readily without checking, splitting, or warping.

USES OF THE WOOD

Bossé, owing to its attractive color and often handsome grain, its moderate shrinkage, and its ease of working, is especially well suited for furniture, cabinet work, piano cases, interior trim, and, in general, for the same purposes as Mahogany. It is valuable for the manufacture of boats and canoes and in shipbuilding. On account of its agreeable scent it is also used to some extent for making cigar boxes.

COMMERCIAL CONSIDERATIONS

Bossé was introduced into the European market at the beginning of the present century. The first shipments were made from Bassam and consisted of only a few logs, usually mixed with consignments of Mahogany (*Kbaya*) and sold as such or sometimes advertised as Cèdre d'Afrique (African Cedar) or Santal d'Afrique (African Sandalwood). It was not until 1924 that the imports began to assume any importance.

According to the official statistics of Ivory Coast, the amounts of Bossé timber cut during the past five years are as follows:

	1924	1925	1926	1927	1928
No. of trees	375	453	520	796	986
Tons of logs	2800	3400	3900	5900	7400

The logs are generally of large size, being 13 to 20 feet long (sometimes more) and 23 to 40 inches in diameter or 20 to 35 inches square. The cost is approximately the same as for African Mahogany (*Kbaya ivorensis*). The principal consumers are (in the order named) France, United States, England, and Germany.

Although the consumption of the timber is increasing, it is limited by the fact that the trees are of scattered occurrence. The future is not very promising, as natural reproduction is unsatisfactory. The Forest Service of Ivory Coast is conducting regeneration experiments with a view to remedying this condition, if possible.

STRUCTURE OF THE WOOD

Gross anatomy: Growth rings poorly defined, sometimes suggested by darker layers which seem independent of seasonal variations. Pores scarcely visible to unaided eye; numerous, but not crowded; appear fairly uniformly distributed, occurring singly, or in radial pairs or, less commonly, in 3's (rarely more) with the middle pore (or pores) much flattened. Vessel lines fine, but usually distinct, being darker than the background; gum deposits very common. Parenchyma in numerous, wavy, ulmiform, tangential lines or bands, closely and rather evenly spaced; sometimes fairly distinct on moist cross section without lens and producing a faint tracery on longitudinal surfaces, particularly the tangential; most of the pores are in association with the parenchyma laminae, but there is no noticeable widening to include them. Rays minute, not visible without lens on cross and tangential sections; low, but distinct, on radial surfaces; not storied. No gum ducts observed.

Minute anatomy: Growth rings not determinable. Pores thin-walled; mostly open. Vessel segments with more or less oblique end walls; perforations simple; annular ridge distinct; gum plugs at ends of segments common and interior masses very numerous; tyloses absent; pits minute, crowded, the apertures ovoid. Wood parenchyma in irregular and broken tangential bands, about 3 per mm. of radius, and usually 3 or 4 (in some specimens more) cells wide; also slightly paratracheal; crystals few. Rays numerous, 5 or 6 per mm.; curved in contact with the pores; usually biseriate (in some specimens wider); more or less heterogeneous. The cells sometimes widely variable in size and shape, the largest ones usually marginal; yellow gum deposits abundant in

heartwood; cell walls rather thick, abundantly pitted; pits into vessels half-bordered and of the same general size and appearance as the intervacular, except that one ray pit may cover a row of 2 to 4 in the vessel. Fibers in fairly definite radial rows; septate; pits minute, simple or indistinctly bordered.

Measurements: Pores usually 0.10 mm. to 0.19 mm. in diam. when solitary; in some specimens larger, up to 0.25 mm. Fibers 0.90 mm. to 1.00 mm. long and 0.02 mm. wide; walls 2.5 μ thick. Parenchyma cells 0.04 mm. to 0.05 mm. long. Rays 0.20 mm. to 0.40 mm. high.

PANDA OLEOSA PIERRE

By C. VIGNE, *Asst. Conservator of Forests, Gold Coast,*
and SAMUEL J. RECORD

This is a small or medium-sized tree whose range, according to Hutchinson and Dalziel (*Fl. West Trop. Afr.* 1: 447), extends from the Ivory Coast to Portuguese Congo. *Panda*, with its single species, was first described in 1894 by Pierre (*Bull. Soc. Linn. Paris* 2: 1255), who made it the type of a new family, the Pandaceae,¹ which has been recognized by subsequent authors.

The same tree was described again by Engler in 1899 (*Bot. Jahrb.* 26: 367) under the name *Porphyranthus Zenkeri*, and referred to the family Burseraceae, near *Boswellia* and *Aucoumea*; at least the latter name is referred to synonymy under *Panda* by Hutchinson and Dalziel (*loc. cit.*). Engler's description, however, exhibits certain discrepancies which are difficult to reconcile with the characters of *Panda*. The chief difference is that the leaves of *Porphyranthus* are described as pinnate rather than simple.

The *Panda* tree is widely distributed, though never common, in Gold Coast, and is confined to the under story of very mixed forests. It prefers wet situations and, apparently, heavy soil. It does not occur in the savannah (open) forest and has not been noted in the transition zone between the savannah and the closed forest. Specimens have been measured which were 50 feet tall and 7 feet in girth, but the usual

¹ The Pandaceae should not be confused with the Pandanaceae, or Screw Pines, as has been done in the *Index Kewensis*

sizes are considerably smaller. There are no true buttresses, although old trees develop root spurs to some extent. The bole, ordinarily less than 20 feet and inclined to be crooked, supports a shady crown of large, frequently drooping, branches. The bark is about half an inch thick, fairly smooth, with faint horizontal ridges, the outer layer thin and green, the cortex purplish pink with distinctive black fibers contrasting with the light-colored cambial layer. There is no latex.

The leaves are alternate, serrate, and glabrous. They are simple, but their arrangement on short stems gives them the appearance of being pinnate. The flowers are red, the two sexes borne on different trees, the male flowers in long, clustered racemes. As seems to be the case with many of the dominated trees, the blossoming seasons are not very definite, and flowers have been collected in March, April, June, August, and September.

The most curious part of the tree is its fruit, which is globose, hard, and green, and not at all pointed at the apex as some of the illustrations would indicate. The pericarp is pink and hard. The large, pitted stone is 3- or 4-celled, each cell containing a single seed, which is shield-shaped, curved lengthwise, and concave. The seeds are oily and edible, but useless as food because of the difficulty of their extraction. The fruits, in various stages of decay, may be found on the ground at all times of the year. In germination the radicle emerges, the cotyledons swell and split off a valve, and the stem elongates, draws out the cotyledons, and straightens.

The natives apply various names to the tree and its fruit, but make no use of either.

DESCRIPTION OF THE WOOD

Color dull yellowish or greenish yellow throughout. (Specimen studied is somewhat stained and streaked.) Dry material apparently without distinctive odor and taste.

Hard, tough, strong, moderately heavy; sp. gr. (thoroughly air-dry) 0.67; weight about 42 lbs. per cu. ft.; grain somewhat irregular; texture fine, but harsh, planed surfaces having a "wiry" feel against the grain.

Growth rings indistinct. Pores small, near limit of vision, open, very numerous, fairly uniformly distributed, except that they show a radial arrangement under lens. Vessel lines fine, with silvery luster. Rays barely visible to unaided eye on cross section, invisible on tangential, low but distinct on radial. Parenchyma (visible only with lens) in very numerous, fine, closely spaced lines forming network with the rays. Ripple marks absent. Gum ducts not observed.

MINUTE ANATOMY

Cross section: Growth rings indistinct or absent. Pores occasionally solitary, but mostly in radial rows of 2 to several pores each, the interior ones squarish in section; tang. diam., max. 0.15 mm., min. 0.05 mm., av. 0.11 mm. Rays numerous; appear widely variable in size; section through marginal cells and uniseriate rays suggests radial lines of wood parenchyma; crystals abundant. Parenchyma in numerous, irregular, uniseriate rows; cells appear much larger than fibers, due to thinner walls and much larger cavities. Wood fibers with laminated, gelatinous walls and very small lumen; arranged in fairly definite radial rows.

Radial section: Vessel perforations mostly simple, but sometimes scalariform with few to several slender bars; annular ridge rather wide. Rays usually decidedly heterogeneous, the procumbent portions composed mostly of narrow cells, the marginal cells square or upright, often for considerable heights; rows of square cells also interspersed; crystals of calcium oxalate abundant, occurring singly in the square cells and generally in vertical pairs in the upright ones; cell walls rather thick and abundantly pitted; pits into vessels half-bordered to simple, variable in size and shape from the type of the intervacular (the usual form in the procumbent cells) to large and gash-like or scalariform (commonly in the square and upright cells); some marginal cells conjugate. Parenchyma cells and strands long; crystals uncommon; pits into vessels irregular, sometimes scalariform. Fibers rather sparsely pitted, mostly on radial walls, the apertures slit-like, the borders sub-circular and inconspicuous.

Tangential section: Plane of junction of vessel segments inclined; overlapping tips usually pronounced; intervacular pits numerous but not crowded together; borders subcircular, the lenticular apertures inclined and crossing. Rays of two types: (1) uniseriate, with all cells square or upright resembling parenchyma strands; (2) multiseriate, mostly 3-5 cells wide in large median portion (0.06 mm. x 0.63 mm.) and frequently (but not always) with uniseriate portions of indefinite width above and below resembling the first type; procumbent cells mostly very small and subcircular in cross section; larger cells often interspersed.

Macerated material: Length of vessel segments (total) 0.77 mm. to 1.59 mm., av. 1.16 mm.; (excluding tips) 0.58 mm. to 1.16 mm., av. 0.87 mm. Length of fibers 1.32 mm. to 2.84 mm., av. 1.95 mm.

Material: Yale No. 15348, collected with botanical material by C. Vigne (No. 1357) at altitude of 400 ft., Amentia, Ashanti, Gold Coast, Sept. 1928.

NATURAL RELATIONSHIPS

The anatomy of the wood indicates relationship to certain of the Icacinaceae and Olacaceae, particularly the latter. According to Hutchinson (*Families of flowering plants*), Pandaceae belongs to the order Celastrales (which includes also the Icacinaceae). He characterizes the Olacales as "more or less as in Celastrales." There is nothing in the wood to indicate close relationship to the Burseraceae, the family to which Engler referred *Panda* under the name of *Porphyranthus*.

IDENTIFICATION OF SOME TIMBER TREES OF THE GOLD COAST

By J. BURTT DAVY

Imperial Forestry Institute, Oxford

The staff of the Forestry Department of the Gold Coast, West Tropical Africa, under the direction of Mr. King-Church, has done admirable work in the last few years in the collection of specimens representing the forest flora. The material has been identified at the Imperial Forestry Institute, Oxford. The native names referred to in the following notes, based on these collections, are additions to those included in Dr. Chipp's list.

ANNONACEAE

Anonidium Mannii Engl. & Diels. ASUMPA (Ash.). A tree up to 70 ft. high and 6 ft. girth, with very large fleshy fruits hanging down by their weight, on thin leafless branches. Gold Coast; Ashanti: Abofaw, elev. 1000 ft., in closed forest, fruiting June 1928; C. Vigne F. H. 1191.

CAESALPINIACEAE

Copaifera Salikounda Heck. ENTÉDUA (Ash.). A big tree, up to 100 ft. high and 7 ft. girth. The pods are one-seeded, 1½-1¾ ins. long, 1-1¼ ins. broad and ¼ in. thick, "purplish-green" when ripe, but drying black, dehiscent when dry along both edges, towards the peduncle; the inner layer often separates and curls up. The seed is small, black, flat, oval, ¼ in. long, on a fairly long funicle, covered with a flat, orange-pink, firm aril. When this aril dries completely it sometimes forms a membranous wing round the seed,

which would appear thus to have two chances of distribution, *i.e.*, by birds (attracted by the colored aril) and by the wind. Gold Coast; Ashanti: Amenia, elev. 450 ft.; *C. Vigne* F. H. 1491.

The trunk exudes a very aromatic gum "of probable economic value."

MIMOSACEAE

Albizia ferruginea Bth. AWIEM-FOSEMENA. A large tree up to 120 ft. high and 8 ft. girth, with rusty-tomentose leaf- and flower-stalks. Gold Coast; Ashanti: Kumasi, elev. 900 ft., flowering Mch. 1929; *C. Vigne* F. H. 1661.

Described as having a hard brown wood. Mr. Vigne's specimen is a good match with the type.

PAPILIONACEAE

Milletia Stapfiana Dunn. FRAFRAH (Ash.). A small tree producing purple flowers in Aug. to Oct. (1926), and flat pods 6 ins. long. Gold Coast; Western Province: Dunkwa, elev. 400 ft., appearing in cut-over areas; *C. Vigne* F. H. 188.

Ostryoderris impressa Dunn. HAHUMA, MFINTIMA (S). A liane with pinnate leaves, the under surface of the leaves and the inflorescence clothed with a silky brown indumentum. Gold Coast; Bibiani, elev. 700 ft., flowering Aug. 1928; *C. Vigne* F. H. 1328.

Ostryoderris leucobotrya Dunn. ANSU-DUA; ANSO-HUMA (Ash.). A very straggling small tree with unusually pinnate leaves, and conspicuously bracted inflorescences of white flowers. Gold Coast; Axim District: Abiabo, in closed wet forest, flowering Nov. 1928; *C. Vigne* F. H. 1426.

SAPOTACEAE

Chrysophyllum albidum G. Don. AKASA (Ash.). A big tree, 140 ft. high, 7 ft. girth, with small buttresses and white gummy latex; flowers small, sessile. Gold Coast; Ashanti: Abofaw, elev. 1000 ft.; *C. Vigne* F. H. 1180.

Fruit reported edible. Timber split into beams for building huts.

Chrysophyllum sp. AJAR (Sefwi). A tree with bright, rusty, dense tomentum and conspicuous lateral nerves on the under surface, and dense clusters of sessile rusty-tomentose buds in the leaf-axils. Gold Coast; Western Province: Ntakem, elev. 400 ft., in deciduous high forest, often in groups, Mch. 1927 (in bud); *C. Vigne* F. H. 234.

This species, probably new, will be described by Mr. Hutchinson and Dr. Dalziel in the *Flora of West Tropical Africa*.

Mimusops sp. nov. (= *Dumoria Heckelii* A. Chev.). ABAKU, ABAKU BAKU (Ash.). A huge tree, not buttressed, with a grand bole often 12 ft. in girth and 100 ft. up to the branches. Produces a fine red timber sometimes shipped as Mahogany, and used locally. Soap is made from the seeds and other oil-seeds mixed. Gold Coast; Ashanti: South Fomang Su Reserve, near Bombata, elev. 700 ft., dominant in closed forest, widespread but not common; *C. Vigne* F. H. 1213.

Mr. Vigne observes that this tree can be reproduced easily from fresh seed, but grows slowly at first. The determination was most kindly made for us by Mr. Hutchinson and Dr. Dalziel, while working over material of the Sapotaceae for the *Flora of West Tropical Africa*, in which it will be described and named.

SIMARUBACEAE

Hannoa undulata Planch. GLANTORI (Krachi). A small tree 20 ft. high, with yellow flowers and fruits, black when ripe. Gold Coast; Ashanti: Kete-Krachi, common in parts of the Savannah-forest, flowering Jan. 1929; *C. Vigne* F. H. 1532.

STERCULIACEAE

Cola caricifolia K. Schum. DODOWA. A small tree with palmately-lobed leaves on long petioles. Gold Coast; Ashanti: Kumasi, elev. 900 ft., in closed forest, flowering Dec. 1928; *C. Vigne* F. H. 1460.

Cola chlamydantha K. Schum. KANDABA-ESSERI (Ash.). A small tree 25 ft. high, with large digitate leathery leaves, red flowers borne on the stem, and large sessile fruits. Gold Coast; Axim District: Awaibo, elev. 100 ft., in closed forest, flowering Nov. 1928; *C. Vigne* F. H. 1434.

CHECK LIST OF THE COMMON NAMES

Abaku; a. baku	<i>Mimusops</i> sp.	Sapotaceae
Ajar	<i>Chrysophyllum</i> sp.	Sapotaceae
Akasa	<i>Chrysophyllum albidum</i> G. Don	Sapotaceae
Anso-huma	<i>Ostryoderris leucobotrya</i> Dunn	Papilionaceae
Ansu-dua	<i>Ostryoderris leucobotrya</i> Dunn	Papilionaceae
Asumpa	<i>Anonidium Mannii</i> Engl. & Diels	Annonaceae
Awiem-fosemena	<i>Albizia ferruginea</i> Bth.	Mimosaceae
Dodowa	<i>Cola caricifolia</i> K. Schum.	Sterculiaceae
Entédua	<i>Copaifera Salikounda</i> Heck.	Caesalpiniaceae
Frafrah	<i>Milletia Stapfiana</i> Dunn	Papilionaceae
Glantori	<i>Hannoa undulata</i> Planch.	Simarubaceae
Hahuma	<i>Ostryoderris impressa</i> Dunn	Papilionaceae
Kandaba-esseri	<i>Cola chlamydantha</i> K. Schum.	Sterculiaceae
Mfintima	<i>Ostryoderris impressa</i> Dunn	Papilionaceae

Fresh Wood of *Triplochiton* is Malodorous—A Correction

In his article entitled, "The West African Abachi, Ayous, or Samba (*Triplochiton scleroxylon*)," published in *Tropical Woods* 18: 43-54 (June 1929), the editor said (p. 47) that the wood lacks distinctive odor. This statement was based upon his limited personal experience with small, thoroughly dry specimens, and recent information shows that it does not apply to fresh wood. "On the contrary," kindly writes Mr. Jean Collardet, "the wood when fresh or moist has an extremely disagreeable fetid odor, well known to plywood manufacturers. This scent is rather persistent and we are informed that in Germany Abachi is therefore sometimes submitted to a deodorizing process."

TWO NEW TREES FROM HONDURAS AND BRITISH HONDURAS

By PAUL C. STANDLEY

Field Museum of Natural History

For several years it has been desired to establish the identity of the Bullhoof trees of British Honduras, of which only sterile and therefore doubtful material had been obtained. Recent fertile specimens received from Honduras and British Honduras make it possible to name these trees, both of which represent undescribed species. It is possible, also, upon the basis of complete specimens lately collected, to identify the "Cherry" of British Honduras, which seems to represent two distinct but closely related species, rather than a single one, as had been presumed.

Celtis Hottlei, sp. nov.

Arbor 18-metralis, trunco c. 50 cm. diam., ramulis gracilibus teretibus, novellis minute griseo-puberulis et interdum glaucescentibus, internodiis brevibus elongatis; folia breviter petiolata, petiolo 7-12 mm. longo valido puberulo vel glabro; lamina coriacea, oblonga vel elliptico-oblonga, 7.5-16 cm. longa, 3-7.5 cm. lata, fere concolor, sublucida, abrupte acuminata, acumine angusto attenuato, basi subacuta vel fere rotundata et saepe paullo inaequalis, glabra, basi triplinervia, costa nervisque supra prominulis subtus prominentibus, nervis lateralibus utroque latere vulgo 3, angulo acuto adscendentibus, arcuatis, prope marginem conjunctis, margine integra, nervulis vix prominulis; flores ad axillas sessiles et dense congesti, vel saepius cymosi, cymis breviter pedunculatis paucifloris petiolo vix longioribus dense puberulis et interdum glaucescentibus; drupa ovali-globosa, 13 mm. longa, densissime scaberulo-puberula, apice styli ramis 2 puberulis crassiusculis 3 mm. longis onusta.

HONDURAS: Near Progreso, Dept. Yoro, April 4, 1929, *W. D. Hottle 32* (Herb. Field Mus. No. 589282, TYPE; Yale No. 15610). Farm 43 near Progreso, April 11, 1929, *Hottle 108* (Yale No. 15669).—BRITISH HONDURAS: Hillbank, July 1928, *C. S. Brown XVII* (Yale No. 13035).

Called Manteca in Honduras, and Bullhoof (female) in British Honduras. The tree has no very close relatives in Central America, or elsewhere, so far as I can learn.

Drypetes Brownii, sp. nov.

Arbor, ramulis crassiusculis, teretibus vel in sicco sulcatis, glabris, internodiis elongatis; folia alterna breviter petiolata, petiolo valido 3-6 mm. longo; lamina coriacea, lucida, oblonga, lanceolato-oblonga vel elliptico-oblonga,

15-20 cm. longa, 5-8 cm. lata, abrupte acuta vel breviter acuminata, acumine obtuso vel acutiusculo, basi contracta et cuneatim decurrens, glabra, costa nervisque utrinque prominentibus, nervis lateralibus utroque latere c. 10, angulo acuto adscendentibus, irregularibus, remote a margine conjunctis, nervulis subtus prominulis et arcte reticulatis; flores in axillis fasciculati, pedicellis 3-4 mm. longis dense sericeo-pilosulis; sepala 3-3.5 mm. longa, late ovalia, apice rotundata, dense minuteque sericea; antherae breviter exsertae; drupa obovoideo-globosa 2-2.5 cm. longa; semen ovale fere 1.5 cm. longum ochraceum.

BRITISH HONDURAS: Hillbank, March 1929, *C. S. Brown 38* (Herb. Field Mus. No. 589157, TYPE; Yale No. 15354) and 39; July 1928, *Brown XVI* (Yale No. 13034).

The vernacular name is Bullhoof (male) or Bullhoof Macho. The tree is related to *D. glauca* Vahl, of the West Indies, but in that both the flowers and fruits are much smaller. From Central America only one other species of *Drypetes* is known, *D. lateriflora* (Sw.) Krug & Urb., in which the leaves are much smaller and rounded at the base, and the flowers smaller and almost glabrous.

Pseudolmedia oxyphyllaria Donn. Smith.

This species has been known heretofore from Veracruz and Guatemala, and it may now be reported from British Honduras: Watrous Road, Columbia, April 1, 1929, *N. S. Stevenson 119* (Yale No. 14901). The vernacular name is Cherry. This name is applied to two closely related trees in British Honduras, the other being:

Pseudolmedia spuria (Sw.) Griseb.

BRITISH HONDURAS: Honey Camp, Orange Walk, September 1928, *C. L. Lundell LP8*. Hillbank, September 1928, *C. S. Brown 34* (Yale No. 13685); March 1929, *Brown 35* (Yale No. 15351). The fruit is reported to be edible, and the tree is one of the numerous sources of chicle gum. *P. spuria* is a West Indian species which has been reported with some doubt from Panama, but has not been found elsewhere in Central America.

Note on the Wood of *Celtis Hottlei*

This wood is of particular interest because of the abundant normal deposits of calcium carbonate in the vessels in the

heartwood and, to a less extent, in the sapwood. As stated in *Tropical Woods* 12: 26 (Dec. 5, 1927), such deposits "in the sapwood and normal heartwood are rare and may have important diagnostic value, for example in certain of the Ulmaceae." The unidentified specimen (No. 63; Yale No. 8894) collected by Henry Kuylen in eastern Guatemala, referred to in the same article (*loc. cit.*, p. 23), has since been determined as *Celtis*, presumably *C. Hottlei*. Failure to ascribe it to this genus in the first place was due to the fact that its parenchyma is sparingly developed, whereas in most species it is in prominent concentric lines or bands.—S. J. R.

NOTES ON BRAZILIAN WOODS

By SAMUEL J. RECORD

New Use for Paran  Pine

Paran  Pine (*Araucaria brasiliana*) from southern Brazil has lately come into use in the United States for blocking for electrotypes. For this purpose it is highly important that the lumber be properly kiln-dried, otherwise it is likely to warp. One trade name for this timber is Araca Wood, coined from the generic name *Araucaria*. It should not be confused with the Brazilian Ara a.

"Afamo"

In looking up some statistics of the timber trade in England, I came across references to imports of 2889 cubic feet in 1923 and 4198 cubic feet in 1924 of a Brazilian wood called Afamo. Through inquiry it was learned that Mr. E. H. S. Boulton, of the School of Forestry at the University of Cambridge, had obtained a specimen of the 1924 cargo and identified it as *Carapa* sp., better known as Andiroba.

If the amusing story told to Mr. Boulton can be credited, the word Afamo owes its origin to the slang expression, "alf a mo" (half a moment), this being the temporizing reply of an assistant to whom the broker, wishing to christen the timber, had appealed for suggestions!

No Oil Cells in Wood of *Physocalymma*

I have finally convinced myself that the Bolivian wood specimen which seemed so well authenticated as *Physocalymma scaberrimum* Pohl (Lythraceae) is in reality one of the Lauraceae, probably *Ocotea* sp. The most striking feature of the wood is the presence of numerous very large and thin-walled secretory cells in the rays and parenchyma strands. Since such cells have not been reported in other woods of the Lythraceae, the list of families in which these structures are known to occur is accordingly reduced to four, namely, Magnoliaceae, Annonaceae, Canellaceae, and Lauraceae. (See *Tropical Woods* 1: 9-12, March 1929.)

Identity of the Brazilian Tulipwood

Through the courtesy of Mr. C. H. Pearson, President of C. H. Pearson & Son Hardwood Co., 29 Broadway, New York, I have received a wood specimen of Brazilian Tulipwood accompanied by leafy twigs taken from the same tree.¹ The herbarium material has been examined by Paul C. Standley who says that it is one of the Leguminosae and probably a species of *Dalbergia*. Further attempt is being made by Mr. Pearson to secure flowers and fruits of this interesting tree so that its identity can be definitely established. The leaves alone, however, provide ample proof of my repeated assertion that this well-known timber is the product of a leguminous tree and not of *Physocalymma* (Lythraceae) to

¹ This is latest in a series of instances in which Mr. Pearson has rendered valuable assistance to the scientific classification of commercial woods. It was through his co-operation, for example, that the Cocobolo of Nicaragua and Costa Rica was proved to be genuine and not a substitute; that the Cer n of Mexico was identified as *Phyllostylon brasiliensis* (the same as the Santo Domingo Boxwood), thus providing the first published record of the occurrence of this tree in Mexico; that material of the African "Sandaleen" Wood was obtained which led to the interesting article on the subject by Dr. Burt Davy (*Tropical Woods* 17:15); and that much of the confusion regarding Lignum-vitae, Boxwoods, and other commercial timbers was straightened out. His son, Herbert B. Pearson, who has charge of the Brooklyn yards of this firm, kindly sends me samples of new woods as they enter the market, together with data regarding their sources, properties, and utilization.

which it is so commonly ascribed by other writers. The wood differs in some respects from that of any authentic specimens of *Dalbergia* with which I am familiar and seems to be intermediate between that genus and *Tipuana*. It is in this position I placed it in *Timbers of Tropical America* (1924).

MACBRIDEINA, A NEW GENUS OF TREES OF THE FAMILY RUBIACEAE

By PAUL C. STANDLEY

Field Museum of Natural History

Among the Rubiaceae studied recently while preparing an account of this family as represented in Peru there were found specimens of the handsome tree described below as a new generic type. Although represented by ample and complete material, classification proved difficult, and detailed study has convinced the writer that the tree can not be referred to any of the recognized South American genera of the family. It is remarkable that so striking a tree should have remained so long unnamed.

That it was not unknown is proved by the discovery of a specimen obtained by Ruiz and Pavón, the first botanists who visited Peru. This specimen was included in a recent sending of miscellaneous undetermined Rubiaceae received on loan from the Royal Botanic Gardens, Kew, through the courtesy of Captain Arthur W. Hill. The Ruiz and Pavón specimen, collected about 140 years ago, has remained without a name probably because it consists of flowering branches only, and the tribal position of the plant was on that account uncertain.

Macbrideina, gen. nov.

Arbores sparse pilosae; folia opposita, breviter petiolata, crasse membranacea, integra; stipulae intrapetiolares, liberae, magnae, caducae; inflorescentia terminalis, cymoso-corymbosa, pauciflora, floribus magnis; hypanthium glabrum, clavatum; calyx brevis, profunde 5-lobus, lobis deciduis triangularibus acuminatis; corolla infundibuliformis, tubo crasso intus glabro superne valde ampliato, lobis 5 aequalibus adscendentibus rotundato-ovatis contortis; stamina 5, fauce corollae inserta, aequalia, filamentis brevissimis, antheris oblongo-linearibus rectis vel subrecurvis basifixis exsertis; discus

pulvinaris; ovarium 2-loculare, stylo gracili, ramis 2 oblongo-ovatis, ovulis in loculis numerosis; capsula lignosa, obovoidea, subcompressa, bisulcata, apice late areolata, 2-locularis, loculicide bivalvis, polysperma, endocarpio post dehiscenciam e valvis soluto; semina numerosissima, minuta, horizontalia, compressa, anguste alata, ala integra.

Macbrideina peruviana, sp. nov.

Arbor 9-12-metralis, ramulis crassis, novellis breviter pilosis mox glabratibus, vetustioribus subteretibus ochraceis vel brunnescentibus, internodiis brevibus; stipulae ovali-oblongae, 2 cm. longae, 9 mm. latae, apice rotundatae, tenues, prope basin hispidulae; petiolus crassus 1-2 cm. longus, supra sulcatus, puberulus vel glabratus; lamina obovato-oblonga vel anguste obovata, 13-40 cm. longa, 6-17 cm. lata, obtusa et breviter protracta, basin versus longe cuneatimque angustata, supra viridis, glabra, nervis prominulis, subtus paullo pallidior, statu juvenili dense hispidulo-pilosa, cito glabrata, ad axillas barbata, costa gracili elevata, nervis lateralibus utroque latere c. 17, gracilibus, prominentibus, angulo fere recto divergentibus, fere rectis, juxta marginem conjunctis, nervulis prominulis, subparallelis; inflorescentia pauciflora, sessilis, basi trichotoma, ramis erectis fastigiatis glabris, pedicellis plerumque 3-6.5 cm. longis; bractae c. 1 mm. longae; hypanthium c. 1.5 cm. longum, apice 3 mm. latum; calyx 5-6 mm. longus, glaber, lobis angustis attenuatis sinu lato separatis; corolla viridis, omnino glabra, fere 5 cm. longa, tubo superne sensim ampliato basi 6-7 mm. lato, fauce 1.8 cm. lato, lobis 2 cm. longis tubo paullo brevioribus; filamenta 2 mm. longa, antheris 7 mm. longis, 1.2 mm. latis; stylus 2.8 cm. longus, ramis 4 mm. longis, 2.2 mm. latis; capsula c. 3 cm. longa et 1.5 cm. lata, fusco-brunnescens; semina c. 1 mm. longa, pallida.

PERU: La Merced, alt. 600 m., August 10-24, 1923, J. Francis Macbride 5573 (Herb. Field Museum Nos. 536613-614, TYPE; duplicate in U. S. Nat. Herb.). Chanchamayo Valley, Dept. Junín, alt. 1200 m., Schunke 432. Chinchao, Ruiz & Pavón (Kew Herb.).

According to Wernham's treatment of the American Rubiaceae (Journ. Bot. 54; 322, 1916), this plant would fall in the tribe Rondeletieae. In his key to the genera it would run at once to *Schenckia* Schum., a Brazilian genus not at all closely related to the Peruvian tree. The genus *Macbrideina* seems to me to be related in many respects to *Ferdinandusa* Pohl, of the tribe Cinchoneae. In that, however, the filaments are elongate and inserted at the middle of the corolla tube, the anthers are dorsifixed, and the seeds are peltately imbricate.

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This Peruvian genus is justly named for Mr. J. Francis Macbride, the first collector who obtained complete material

of it. His extensive collections of Peruvian plants, obtained in the course of the two Captain Marshall Field Expeditions, are by far the largest existing in American herbaria, and they have added some hundreds of species to the known flora of Peru.

THE WOOD OF *CARYODENDRON ANGUSTIFOLIUM*
STANDLEY

By LLEWELYN WILLIAMS

Field Museum of Natural History

Among the many interesting wood specimens collected in July 1927 by G. Proctor Cooper and George M. Slater on the lands of the United Fruit Company in Chiriquí, Panama, is one of a new species of Euphorbiaceae described by Paul C. Standley under the name of *Caryodendron angustifolium*. The author says: "The genus *Caryodendron* has not been reported previously from North America. Two other species are known: *C. grandiflorum* (Muell.) Pax, of Brazil, and *C. orinocense* Karst., of Colombia. The Panama tree is related to *C. grandiflorum*, but in that the leaves are proportionately broader, the spikes more slender, and the flower clusters smaller."

The tree is small, the specimen collected being 18 feet high and 3 inches in diameter. The smooth and entire leaves are simple, alternate, and elongated-oblong, often over a foot in length and 3 inches at the widest portion, with wedge-shaped base and rather blunt tip. The flowers are very small, sessile, and scattered along rather stiff spikes, which are up to 8 inches long. The bark is thin and smooth and the twigs are cylindrical. The tree is presumably rare and no vernacular name for it is known.

DESCRIPTION OF THE WOOD

General properties: Color yellowish throughout. (The specimen shows considerable blue stain due to fungous attack.) Luster rather dull. Odor and taste absent or not distinctive. Grain fairly straight, texture fine and uniform, easy to cut, finishes very smoothly, is not durable. Sp. gr. (oven-dry), 0.56; weight, about 35 lbs. per cu. ft.

Gross anatomy: Growth rings fairly distinct under lens, due to slight differences in density and in arrangement of elements. Parenchyma in very fine, very numerous, continuous, uniformly spaced, concentric lines, the intervening spaces being about twice that between rays. Pores minute, not very numerous, occurring singly or somewhat more often in radially appressed groups of few to several pores each. Vessel lines fine and indistinct. Rays minute, not visible without lens on cross section, invisible on tangential, fairly distinct on radial.

Minute anatomy: Pores subcircular (when solitary), rather thin-walled, mostly open; tyloses frequently present. Vessel segments with oblique to horizontal end walls and exclusively simple perforations; intervacular pits rather large, alternate, crowded, screw-head type. Rays up to 14 per mm.; irregularly disposed; uniseriate, occasionally biseriate in median portion, 1 to 28, mostly 10 to 20, cells high; decidedly heterogeneous, the square or upright cells often predominating; walls fairly thick, abundantly pitted, especially at ends; marginal cells often apparently conjugate; pits into wood parenchyma numerous, irregular in shape and arrangement; pits into fibers distinctly half-bordered; pits into vessels half-bordered, similar in size and shape to the intervacular; gummy contents common; crystals not observed. Parenchyma abundant, in concentric lines or bands 1 or 2, occasionally more, cells wide and spaced 3 to 5 rows of fibers apart; individual cells appear about twice the size of the fibers in section; strands mostly 8-celled, less commonly 4-celled; chambered strands with large rhombohedral crystals of calcium oxalate common. Wood fibers square, angular, or flattened and arranged in fairly definite radial rows; walls moderately thick, the lumen rather large; pits numerous on radial walls, very small, distinctly bordered, the slit-like aperture extending beyond the circular border. *Measurements:* Pores (tang. diam.), 0.053 mm. to 0.098 mm., av. 0.072 mm. Length of vessel segments (including tips), 0.22 mm. to 0.82 mm., av. 0.46 mm.; length of tips, 0.08 mm. to 0.18 mm., av. 0.13 mm. Height of rays, 0.07 mm. to 0.89 mm., av. 0.49 mm. Fiber length, 0.81 mm. to 1.59 mm., av. 1.16 mm.; diameter, 0.015 mm. to 0.029 mm., av. 0.023 mm.

Material: Cooper & Slater No. 192; Yale No. 10545.

Expedition to the Peruvian Amazon

Mr. Williams, author of the foregoing paper, is making a study of the forest flora of the Peruvian Amazon region for Field Museum of Natural History. He has obtained a large collection of woods, with accompanying herbarium material, which will give the first definite information regarding the composition of these interesting and valuable forests.

PSEUDOCOPAIVA BRITTON & WILSON,¹ GEN. NOV.

Trees, with glabrous foliage, the petioled, apparently stipulate leaves of one pair of oblique, coriaceous leaflets. Flowers small, in short axillary racemes; bractlets none. Calyx-tube very short, with 4 oblong valvate segments. Petals none. Stamens 10, distinct; filaments filiform, glabrous; ovary stipitate; style long, slender; stigma minute. Legume short, flat, dehiscent. Seed 1, oblong, black, shining, the aril short, borne at one basal edge of the seed.

Type species, *Copaifera hymenaefolia* Moric.

Pseudocopaiva hymenaefolia (Moric.) Britton & Wilson

Copaifera hymenaefolia Moric. Mem. Soc. Phys. Genève, 6: 529. 1833.²

Copaiba hymenaefolia Kuntze, Rev. Gen. Pl. 172. 1891.

A slender tree, 10 m. high, or higher. Leaflets obliquely ovate or lanceolate, 4-7 cm. long, acuminate, reticulate-veined, shining; racemes shorter than the leaves; sepals glabrous and black-punctate without, densely white-tomentose within; stamens about twice as long as the sepals; ovary a little longer than the stamens, flattened, tapering into the style; stipe of legume 5-6 mm. long, slender; legume strongly flattened, short-oblong to orbicular, 2-2.5 cm. long; seed short-oblong, oblique at base, 1-1.5 cm. long, rounded.

TYPE LOCALITY: Cuba.

DISTRIBUTION: Cuba and Isle of Pines.

ILLUSTRATION: Moric., *loc. cit.*, pl. 1.

Note on the Wood of *Pseudocopaiva*

Pseudocopaiva hymenaefolia (Moric.) Britt. & Wils. is a small or medium-sized tree, well known throughout Cuba for the flinty hardness and great natural durability of its purplish red heartwood. Its usual name in the eastern part of the island is Caguairán, in the western portion, Quiebrahacha (axe-

¹ Dr. N. L. Britton and Mr. Percy Wilson, New York Botanical Garden.

² *Copaifera lapsus calami*.

breaker). The density of two thoroughly air-dry all-heart specimens, as determined in the Yale laboratory, was 1.33 for the western and 1.34 for the eastern; weight per cubic foot, between 83 and 84 lbs. This is in marked contrast with the American species of *Copaifera*¹ examined, the density of their woods being moderate, usually about half of that indicated for *Pseudocopaiva*.

The wood of *Pseudocopaiva* exhibits marked anatomical differences from *Copaifera*. In the latter the parenchyma is in distinct, rather widely spaced, concentric bands which appear to terminate seasonal growth rings, and also about pores but not wing-like; few to many vertical gum ducts are normally present in parenchyma layers; and the elements are not storied. In *Pseudocopaiva*, gum ducts are absent; all elements are storied, the number of ripple marks per inch varying in different specimens from 80 to 105. The abundance and arrangement of parenchyma is so variable that one might readily suppose that there were two or more species were it not for the fact that transitional forms can be found in the same specimen; at one extreme is the *Copaifera* type (described above) and at the other the *Peltogyne* type, with numerous wing-like extensions from about the pores, becoming more or less confluent into closely spaced, irregular lines or bands. This affinity with *Peltogyne* is also indicated in the purplish color of the wood.—S. J. R.

"Cativo" for Boxes in Colombia

The source of the principal wood now being used in parts of Colombia for the manufacture of boxes is the Cativo, *Prioria Copaifera* Gris., a leguminous tree of large size and said to be abundant along portions of the Magdalena River. The logs usually have a very thick sapwood, which is preferred for boxes. The heartwood is dark brown and streaks of it are frequently found in the sapwood. In drying the lumber the

¹ For detailed description see *Timbers of Tropical America*, pp. 229-231. Attention is there called to the seeming inappropriateness of referring the Cuban Quiebrahacha to the genus *Copaifera*.

heart portions and streaks are subject to collapse, thus occasioning much waste in re-sawing. It is believed this trouble can be overcome through proper methods of kiln-drying, and experiments to that end are under way. Gummy exudations detract from the appearance of the lumber, but appear not to be otherwise objectionable. (For an account of this timber in Panama, see *Tropical Woods* 14: 6, June 1, 1928.)

A NEW PERUVIAN *CAPPARIS*

By OSCAR HAUGHT¹

Northern Peru and adjacent Ecuador, especially near the coast, are rich fields for the genus *Capparis*, which is one of the most important groups of the comparatively few woody plants in that desert and semi-desert region. Several species become small trees and, in such a land, they assume a value, at least potential, that they would not have in timbered areas. But apart from this, it is of botanical interest to add another species to the long list already described from the region. I have chosen the specific name not only because of the striking resemblance of the leaves to those of *Eucalyptus* in shape, but also because of the similar manner in which they are borne.

Capparis eucalyptifolia is a member of the section *Cynophylla*. In aspect it resembles *C. mollis* H. B. K., with which, apparently, it sometimes grows, for there is a specimen of the latter in the herbarium at Berlin-Dahlem,² collected by Dr. Weberbauer, which is, in very small part, my new species.

¹ This paper has been communicated by J. Francis Macbride, Field Museum of Natural History, who has edited the introductory paragraphs on the basis of the author's field notes and letters. Mr. Haught is an engineer by profession, but his interest in plants has led him to make an important collection of the flora of the Department of Piura, Peru, where he is stationed.—S. J. R.

² The kindness of Dr. Diels, Director, Botanical Museum, Berlin-Dahlem, in granting permission to study the type (or cotype) of *C. mollis* H. B. K., is acknowledged with appreciation.—J. F. M.

It may be distinguished at once by the complete lack of the fine soft puberulence which clothes the leaves and inflorescence branches of *C. mollis*, even in age, and by the very much larger flowers and longer stamens (nearly twice as long), if one may judge from herbarium material. Apparently there is also a difference in the position of the glands, which in *C. mollis* and also in the related species, *C. flexuosa*, seem always to be strictly axillary. Of course, *C. flexuosa* is a notoriously variable species of wide distribution, but no race of it, even narrow-leaved, has the thin and lanceolate leaves which characterize both *C. mollis* and *C. eucalyptifolia*.

Capparis eucalyptifolia Haught, sp. nov.

A shrub or small tree, usually less than 3.5 m. high, of upright growth, with light gray, rather smooth bark; leaves alternate, entire, lanceolate, obtuse, about 2 x 7 cm., the upper surface smooth and shining, the lower dull, the leaves borne on petioles about 1.5 cm. long, usually hanging with blades vertical or nearly so, and the upper surface turned outward; inflorescence terminal, paniced; flowers on pedicels 1-1.5 cm. long; sepals 4, united below, imbricate, rounded above, about 5 mm. long; petals 4, white, spreading, rounded distally like the sepals, about 1.5 cm. long; stamens numerous, the filaments white, showy, 4-5 cm. long; anthers attached near (but not at) one end; gynophore 5-7 cm. long; stigma sessile; fruit 1-18-seeded, 3-15 cm. long, constricted between the seeds, dehiscent for the entire length of one side only.³

PERU: Amotape Hills, east of Talara, Dept. Piura, Dec. 23, 1928, and near La Brea, March 1929 (fruit), *Oscar Haught F96* (TYPE, Field Museum).

³ *Capparis eucalyptifolia* Haught, sp. nov., fruticosa, circa 3.5 m. alta, glaberrima; ramulis flexuosis; petiolis 5-7 mm. longis; foliis submembranaceis supra nitidis, viridibus, subtus opacis, pallidioribus, ovato-lanceolatis, basi subrotundatis, apice gradatim attenuatis, subobtusis, vix vel obscure mucronulatis, plerumque 7 cm. longis, 2 cm. latis, nervis tenuibus utrinque solum mediocriter prominulis, glandulis saepius extra-axillaribus; paniculis axillaribus terminalibusque 5-7-floris; pedicellis circa 8 mm. longis, supra incrassatis; sepalis valde imbricatis, subrotundatis, circa 4 mm. longis et latis, margine scarosis; petalis late obovatis, circa 1.5 cm. longis; staminibus circa 4 cm. longis; bacca lineari-cylindracea nodoso-torulosa, carpophorum duplo pluriesve superante.

NOTE ON *GARCINIA KOLA* HECKEL

By C. VIGNE, *Asst. Conservator of Forests, Gold Coast*

This tree, known to the natives as Tweappia, owes its special interest to the fact that it is the source of "chew-stick." This is the term applied to small pieces of wood, roughly the size of a fountain pen, which the natives chew, mainly to whiten their teeth, although the chewing is said to serve also as a matutinal tonic. There is no doubt but that the constant use of a chew-stick does keep the teeth beautifully white, but this is possibly due to the mechanical effect, since the frayed end of the stick is often rubbed on the teeth like a brush. It is curious, however, that the natives insist on obtaining the wood of this particular tree, and billets of it are a regular commodity in the Kumasi market. Only small trees are cut for this purpose and, as the local supply has long been exhausted, it is necessary to bring the wood a distance of 50 miles or more. A piece weighing about a pound fetches 3 d.

The tree is widely distributed, but never occurs in pure stands and is rather uncommon in the mixed forest, although some parts of the country are much richer in the species than others. It is restricted to the closed forest and appears to favor hills, although I have noted it in river valleys. It attains a height of 100 feet and a girth of 7 feet. It is not buttressed, and the clear bole, covered with a dark and smoothish bark, supports a dense, compact crown. The fruit is apricot-colored, about 3 inches in diameter, and contains 4 to 6 seeds, which germinate very slowly. Attempts are being made to reproduce the tree artificially in Kumasi.

Yale-Firestone Forest Survey of Liberia

The field work in Liberia, West Africa, conducted by the Yale School of Forestry in coöperation with the Firestone Plantations Company, Akron, Ohio, was concluded in August, and G. Proctor Cooper, Field Assistant in Tropical Forestry, returned to New Haven where he is now engaged in studying and testing the woods and preparing his report for publication. Identifications of the herbarium specimens were made at the Royal Botanic Gardens, Kew, by Messrs. Hutchinson and Dalziel.

CURRENT LITERATURE

Diccionario botánico de nombres vulgares Cubanos (Segunda y tercera partes). By JUAN TOMAS ROIG Y MESA. Boletín No. 54, Estación Experimental Agronomica, Santiago de las Vegas, Cuba, (dated) Feb. 1928. Pt. II, pp. 249-598; Pt. III, pp. 599-897; 6 x 9; illustrated; indexed.

The first part of this valuable dictionary appeared in February 1928; the last two during the current year. Pp. 3-735 are devoted to descriptions of plants in alphabetical arrangement of their vernacular names; there are numerous cross references. On pp. 737-765 are lists of plants classified according to their uses and properties. The index to the scientific names occupies pp. 767-882. This is followed by additions and corrections (pp. 883-897) and a list of publications of the Experiment Station. There are many half-tone illustrations. As a ready reference to authoritative knowledge of Cuban plants and plant names this work is worthy of high recommendation.

The year book of the Bermudas, the Bahamas, British Guiana, British Honduras, and the British West Indies, 1929. Pub. by "Canadian Gazette," Ltd. (London) and Associated Canadian Industries, Inc. (Montreal), 1929. Pp. 463; 8 x 9½; with illustrations, index, and colored map. Price (Gr. Br.) 7/6; Canada \$2; U. S. A. \$2.50.

La muerte de los pinos. *Guatemala Agricola* (Guatemala City) 2: 27-28: 333, May 15-31, 1929.

"Los pinos se mueren; se mueren sin remisión. Hace algún tiempo se nos dió la voz de alarma. Fuimos expresamente por las regiones de Los Altos y vimos cómo los pinares eran invadidos de una rara enfermedad. Pudimos apreciar el proceso destructivo. Primero, los pinos sanos presentan una suave coloración achocolatada en los extremos de las hojas; después invade el color toda la parte verde y da una sensación de quema; por último, el árbol se destruye en definitiva."

The death of the pine trees in Guatemala has been attributed to the ravages of bark-beetles, and to determine this point, specimens of bark and insects were sent to the editor of *Tropical Woods* by the Guatemalan Minister of Agriculture, through the courtesy of the United Fruit Company. The editor, in turn, forwarded the material to Mr. F. C. Craighead, in charge of forest insect investigations, U. S. Bureau of Entomology, who wrote on September 5 as follows:

"This is the second report that has come to our attention describing widespread destruction of pines in Guatemala. Mr. Carl Heinrich, one of the Bureau representatives, spent April and May in Guatemala and brought back specimens from, and a first-hand description of, these dying pines. Although the material which you transmitted represents a great number of insects, we believe that the chief offenders are two bark-beetles—*Ips cribricollis* Eich. and *Dendroctonus mexicanus* Hopk. In this country neither of these insects is considered as a primary pest. They usually attack trees which have been weakened from some other cause, such as fire, defoliation, or prolonged drought. Mr. Heinrich reported that the dry season was unduly prolonged this year and we assumed that this may have been the underlying cause of the insects' aggressiveness. A few years ago a long drought in Texas and Louisiana caused the destruction of millions of feet of yellow pine by similar insects. As soon as normal precipitation occurred the outbreaks died out completely. Whether or not conditions are similar in Guatemala is, of course, purely an assumption. We have had practically no experience with the forest insects of the countries south of the States.

"In view of the uncertainty of the cause of the death of these trees, I should hesitate to recommend control methods. If, however, these insects are the chief offenders, felling and barking the trees would undoubtedly have some beneficial effect. Burning the bark for the control of these species would not be necessary. It would probably be more economical to burn the tops and branches than to attempt to peel them. We should appreciate your calling to our attention any

further information you may obtain on the situation, particularly if the destruction continues through the wet season."

Botanical exploration in Honduras. By PAUL C. STANDLEY. *Explorations and Field Work of the Smithsonian Institution in 1928*, Washington, D. C., 1929, pp. 115-122; figs. 100-107.

"In comparison with other Central American countries, the flora of Honduras and Nicaragua is virtually unknown. As a step toward remedying this condition the writer spent the period from December 1927 to March 1928, inclusive, in botanical exploration in northern and central Honduras, the work having been undertaken by the National Museum in coöperation with the Arnold Arboretum, the United Fruit Company, and the Lancetilla Experiment Station of the Tela Railroad Company.

"Headquarters for the work was established at Lancetilla Station, three miles south of the port of Tela, the most important shipping point for bananas from the Honduran coast. The station, under the direction of Wilson Popenoe, is devoted to experimental work with bananas and to the testing of new plants of possible economic value in Central America. . . .

"Lancetilla is an ideal headquarters for field work because of the excellent living conditions which it affords, and also because of its proximity to interesting collecting grounds. After a walk of 10 minutes from the office one reaches virgin forest, composed of a great variety of important timber trees. The number of palm species in the undergrowth is surprisingly large, the most abundant and conspicuous being the familiar Cohune or Corozo (*Attalea cobune*), with which are associated *Chamaedoreas*, a *Malortia*, *Geonomas*, and many others. From one of the common palms, formidably armed with long, stout, flattened spines, and known locally as *Lancetilla*, the valley and station derive their name.

"The hills which confine the valley rise to a height of 2000 feet, thus affording a variety of plant life seldom found so near the coast. The large trees on the very humid hilltops, above the Corozo forests, are loaded with a luxuriant growth

of epiphytic plants, among which ferns, orchids, bromeliads, aroids, and mosses predominate."

"Extensive collections were made about Siguatepeque, in central Honduras. This is a comparatively dry, mountainous region of pine forests, lying at an elevation of 3500 to 6000 feet. The general aspect of the country recalls the Rocky Mountains of southern Colorado and northern New Mexico. Not only are the Honduran pines strongly suggestive of the common Yellow Pine of the Rockies, but the appearance of the rather sparse undergrowth likewise is very similar. Curiously enough, there occur here in the higher mountains a Hop Hornbeam (*Ostrya*), the Sweet Gum (*Liquidambar styraciflua*), the royal and cinnamon ferns, and bracken, all of which are common plants of the eastern United States. The vegetation of central Honduras seems to be closely related to that of some parts of non-tropical southern Mexico. This fact is emphasized by the abundance of *Parosela* species, and by the large number of handsome red- and blue-flowered *Salvias*."

British Guiana. Report on the Forestry Department for the year 1928. By B. R. WOOD. Georgetown, 1929. Pp. 7; 8¼ x 13¼.

"The principal field work for the year was the completion of the valuation of the accessible forests of the Barima, Barama, and Waini Rivers in the North West District, and the commencement of operations in the Essequibo-Cuyuni area. . . . The area now valued and surveyed in the North West District totals 435.5 square miles. The total volume, on this area, of timber consisting of sound trees, merchantable bole, of diameter 16 ins. and above over bark at breast height or above buttresses, is shown below in millions of cubic feet under bark in the round, true measure:

Silverballi	0.6	Crabwood	7.1
Wallaba	2.5	Misc., heavy	48.4
Kakeralli	14.8	Misc., light	66.6
Mora	76.8	Greenheart	0.2
Purpleheart	1.0	Morabukea	0.9
Total 218.9			

"There is, therefore, in round figures a total of 219,000,000 cubic feet of timber on this area, of which 76,800,000 is Mora. The average volume of timber per acre over the whole area is 813 cubic feet. It was found that the best forests were situated on the river banks between St. Bedes Mission and Towakaima Falls on the Barama River. This area carries a total volume per acre of 962 cubic feet, of which 562 cubic feet is Mora, and the latter species on such area comprises 59.4 per cent of the total stand. With the exception of this type of forest, which occurs near the rivers, the forests of the North West District appear to be of a miscellaneous type with a high proportion of light miscellaneous species and are not of high value."

Notiz über das vorkommen von euxanthon im kernholze von *Platonia insignis* Mart. ("geelhart" oder "pakoeli"). By D. B. SPOELSTRA and M. J. VAN ROYEN. *Recueil des Travaux Chimiques des Pays-Bas* (Amsterdam) 48: 3: 370-371, March 15, 1929.

Upon extraction with benzene, the heartwood of *Platonia insignis* Mart. of Surinam gave a residue of 1.5 per cent which appears to be euxanthone, m. p. 239° C. The substance was identified by comparison with an authentic specimen of euxanthone prepared from "Indian yellow," the magnesium salt of euxanthin acid, which is obtained in Bengal from the urine of cows that are fed mainly with the leaves of the Mango-tree, *Mangifera indica* L. So far as known, euxanthone has never before been found in a free state in the vegetable kingdom.—M. J. VAN ROYEN.

Primera contribución al conocimiento de los árboles cultivados en la Argentina. By ENRIQUE C. CLOS. *Boletín del Ministerio de Agricultura de la Nación* (Buenos Aires) 28: 1: 29-63, Jan.-March 1929.

This is the first of a series of contributions to the knowledge of the trees cultivated for ornament and shade in Argentina. The following ten species are described:

- (1) *Cocos Romanzoffiana* Cham.
- (2) *Enterolobium contortisiliquum* (Vell.) Morong (= *E. Timboüva* Mart.)
- (3) *Erythrina crista-galli* L.
- (4) *Peltoporum dubium* (Spreng.) Taub. (= *P. Vogeliana* Benth.)
- (5) *Piptadenia macrocarpa* Benth. (= *P. cebil* Gris.)
- (6) *Tipuana tipu* (Benth.) Kuntze (= *T. speciosa* Benth.)
- (7) *Sebinus molle* L.
- (8) *Cborisia insignis* H. B. K.
- (9) *Cborisia speciosa* St. Hil.
- (10) *Jacaranda acutifolia* H. & B. (= *J. mimosifolia* D. Don).

The choice of species was governed by the opportunity to secure fresh botanical material for study and illustration. There are also original photographs of the trees. Much valuable information is given concerning the appearance and habits of the trees, together with notes on their natural range, the properties and uses of the wood, bark, etc., their insect enemies and diseases, and also numerous references.

CHECK LIST OF THE COMMON NAMES

Aguaribay	<i>Sebinus molle</i> L.	Anacardiaceae
Algodón	<i>Cborisia speciosa</i> St. Hil.	Bombacaceae
Árbol de la pimienta;		
Bálsamo	<i>Sebinus molle</i> L.	Anacardiaceae
Caña fistula	<i>Peltoporum dubium</i> (Spr.) Taub.	Leguminosae
Cebil blanco;		
c. colorado	<i>Piptadenia macrocarpa</i> Benth.	Leguminosae
Ceibo	<i>Erythrina crista-galli</i> L.	Leguminosae
Coco	<i>Cocos Romanzoffiana</i> Cham.	Palmaceae
Curanguay	<i>Sebinus molle</i> L.	Anacardiaceae
Curupay	<i>Piptadenia macrocarpa</i> Benth.	Leguminosae
Gualeguay	<i>Sebinus molle</i> L.	Anacardiaceae
Horco cebil	<i>Piptadenia macrocarpa</i> Benth.	Leguminosae
Ibirá-puitá	<i>Peltoporum dubium</i> (Spr.) Taub.	Leguminosae
Jacarandá	<i>Jacaranda acutifolia</i> H. & B.	Bignoniaceae
Oreja de negro;		
Pacará	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Leguminosae
Palo borracho	<i>Cborisia</i> spp.	Bombacaceae
Pimienta del diablo;		
Pimiento	<i>Sebinus molle</i> L.	Anacardiaceae

Pindó	<i>Cocos Romanzoffiana</i> Cham.	Palmaceae
Samohú	<i>Cborisia</i> spp.	Bombacaceae
Seibo	<i>Erythrina crista-galli</i> L.	Leguminosae
Tarco	<i>Jacaranda acutifolia</i> H. & B.	Bignoniaceae
Terebinto	<i>Sebinus molle</i> L.	Anacardiaceae
Timbó	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Leguminosae
Tipa; t. blanca	<i>Tipuana tipu</i> (Benth.) Kuntze	Leguminosae
Yuchán	<i>Cborisia insignis</i> H. B. K.	Bombacaceae

Arborização urbana. Prática da arborização. By OCTAVIO SILVEIRA MELLO. Bol. No. 2, Serviço Florestal do Brasil, Rio de Janeiro, 1929. Pp. 87; 7¼ x 10¾; illustrated.

A carefully prepared and well illustrated manual for the growing, planting, and care of street and park trees, particularly applicable to conditions in southern Brazil. The most desirable species are listed and described in the chapter entitled "Árvores indicadas para arborização," pp. 63-87.

Contribuição para o conhecimento de nomes vulgares novos.

By J. GERALDO KUHLMANN. *Revista Florestal* (Rio de Janeiro, Brazil) 1: 3: 7-9.

A check list of the common and scientific names of 76 Brazilian trees whose identities are frequently confused in popular nomenclature.

Resistability of Indian timbers to white ant attack. By H. TROTTER. *The Indian Forester* 55: 7: 376-382, July 1929.

This is the latest semiannual inspection report on an experiment started at the Forest Research Institute, Dehra Dun, in 1926, with the object of testing the comparative resistability of untreated Indian woods to white ants and fungus attack under ground. For the experiment, 6 billets, 2" x 2" x 24", of each of 132 species were placed vertically in the open ground to a depth of a foot. Only 12 kinds have been in place for the full period of 3 yrs. and 2 mos., the others having been added at intervals, the most recent being in place only 4 months. Out of 36 species which have been in over 2 years, only 6 are reported as "heartwood not attacked by white ants or fungus, or only slightly attacked by either or

both of them." In only one of these instances (*Bursera serrata*) had the specimens been in place the full period, although another (*Terminalia tomentosa*), not included in the 6 just mentioned, has a perfect record except that one of the specimens could not be found.

Australia. Second annual report of the Council for Scientific and Industrial Research for the period from the 1st July, 1927, to 30th June, 1928. Melbourne, 1929. Pp. 38; 8¼ x 13.

The field of investigation is very extensive. Of special interest to the forester is the account of the research in forest products, including the following items:

Paper pulp investigations.—The semi-large scale tests of the pulping of *Pinus insignis*, mentioned in the previous report, were concluded in November 1927, and the results showed that a highly satisfactory wrapping paper could be made from that timber. At the present time, it is considered that there is hardly sufficient pulpwood available at any one place to render the production of pulp particularly attractive, as the operations would necessarily be on rather too small a scale to make the proposition economically sound. However, the results have shown the way to the utilization of the thinnings of large *Pinus insignis* plantations at some future date, when these are available in sufficient quantity to keep a 60-ton per day mill supplied. . . .

Artificial silk.—A small sample of a few pounds weight of high-grade bleached sulphite pulp was sent to the Imperial Institute, London, for report as to its suitability as a raw material in the manufacture of artificial silk. The sample was prepared from upland-grown Tasmanian Stringy Bark (*Eucalyptus obliqua*). The Imperial Institute has reported, after analysis and submission to one or two commercial artificial-silk manufacturing firms, that the material appears to be quite suitable from the technical point of view. It has requested that a much larger sample, approximating a ton in weight, be sent for further tests. Judging from the prices being paid for this material, there appear to be quite good chances of establishing an export trade from Australia in this product.

Tannin investigations.—The coöperative arrangement between the Western Australian Forests Department, the University of Western Australia, and the Council was outlined in detail in the last annual report. The semi-commercial scale plant then mentioned has since been erected and practical operations commenced. A description of the plant was given in the fifth number of the Council's quarterly *Journal*. The investigation is nearing completion in so far as Karri bark is concerned. Later it is proposed to carry out investigations on Marri kino, on the bark of Ridge Gum (*Eucalyptus alba*), and on the barks of various Wattles and Mangroves. The whole object of the work is the development of a satisfactory tannin extract prepared from Australian raw materials. It is well known that Australia is annually importing large quantities of such substances, notwithstanding the fact that the barks of many indigenous timbers are high in tannin content, notably varieties of Wattles (*Acacias*). One of the present difficulties in the way of preventing the use of many Australian barks and tanning materials, kinos, &c., is the fact that undesirable color effects are often produced. It is hoped to overcome these troubles by suitable blending."

Forest products research. By I. H. BOAS. *Journal of the Council for Scientific and Industrial Research* (Melbourne) 2: 2: 68-74, May 1929.

The author, who is chief of the Council's Division of Forest Products Research, gives a concise account of the work being done at the Forest Products Laboratories at Madison, Wisconsin, and Princes Risborough, England, as suggestive of the possibilities for a similar undertaking in Australia.

"In countries like Australia, thinly populated as it is, some waste of timber is unpreventable, but there can be no doubt that much of that which exists at present can and should be prevented. It is only as complete a knowledge as possible of all the properties of our timbers that can form the base of economic utilization. A striking example of waste through ignorance is that of the Huon Pine in Tasmania. This valuable timber has been exploited till it is very nearly exhausted.

It is remarkably durable and resists attack of borers, teredo, and fungi. This property was well recognized and led to the rapid exploitation of the timber. No one, however, was sufficiently anxious to find out why the timber was so resistant to attack until comparatively recently. Chemical investigation yielded an oil which has remarkable powers as a disinfectant and is a potential source of valuable compounds. The heaps of waste are now being exploited to obtain this oil; but it is sad to think of the huge quantities burned on the fire-shoot before this discovery was made. Many examples of similar waste could be cited. They are not by any means the worst, for much of the waste has not been due so much to ignorance as to carelessness and a lack of any desire to do more than to exploit the forests for immediate gain, with no care for the future. Such an attitude has led, much sooner than otherwise would have occurred, to the present unsatisfactory forest position.

"There is evident, all over the Empire, a realization that wasteful methods must cease and a recognition of the fact that this can only be brought about by a thorough knowledge of all the properties of the timbers and forest products. Hence the establishment of the various research laboratories, whose aim is the collection of the necessary data and the working out of practical methods for the economic utilization of these properties."

"The programme of work to be begun in Australia is now under consideration and it is hoped that very shortly some work will be begun, apart from that of the planning, erection, and equipment of the permanent laboratories."

Queensland rain forest trees: the pigeon-berry ash or southern maple. By W. D. FRANCIS. *Queensland Agr. Journ.* 31: 4: 292-293, Apr. 1, 1929.

Queensland rain forest trees: the scrub box. By W. D. FRANCIS. *Queensland Agr. Journ.* 31: 5: 354-356, May 1, 1929.

Sur quelques essences forestières exploitées au Cameroun.

By L. HÉDIN. *Rev. Bot. Appl. & d'Agr. Tropicale* (Paris) 9: 89: 39-51, Jan. 1929.

ANACARDIACEAE

Antrocaryon Klaineianum Pierre. ENGONGUI (Yaoundé and Boulou), NGANGA (Bakoko d'Eséka), NDOOSON (Mabéa), ONZABILI (trade). Common in the forest, sometimes very large. Wood reddish white; sp. gr. 0.70 to 0.80; exported under the name of WHITE MAHOGANY.

Lannea Welwitschii Engl. EKOE (Yaoundé). Occurs scatteringly; occasionally abundant. The smooth bark is marked with depressions as large as one's hand. Wood pinkish when fresh, grayish when dry; readily attacked by insects and decay; sometimes exploited under the name of ACAJOU MAGONA.

ANNONACEAE

Enantia chlorantha Oliv. MFO (Yaoundé and Boulou), MPOULEY (Mabéa), NJIE (Douala), MOAMBE JAUNE (trade). Generally distributed, in some places fairly common; often too small for commercial purposes. It is suitable for the same purposes as the Linden (*Tilia*), but the logs do not appear large enough to make veneers. It has been used for cabinet-making in Germany, but the color is not lasting.

Pachypodanthium confine (Pierre) Engl. & Diels. NTOM (Yaoundé and Boulou), NTOUMA (Mabéa), BOHINGO (Batanga). Of general occurrence, in groups near the marigots, as scattered individuals on the slopes. Wood brownish yellow, uniform, dense, long-fibered, and straight-grained; barked logs season readily without decaying and checking; timbers up to 65 feet long are obtainable. It has been sold under the incorrect name of OLON. (The Olon of Gaboon is *Fagara* sp.)

APOCYNACEAE

Alstonia congensis Engl. EKOUK (Yaoundé and Boulou), KOKOMATT (Bakoko), PFOUEY (Mabéa), BOKOUKA-BAMBALE (Douala), EMIEN (trade). Common in the second-growth forests. Wood nearly white throughout, soft, not strong, subject to insect attack and decay; suitable for paper pulp.

BURSERACEAE

Canarium Schweinfurthii Engl. (= *C. occidentale* A. Chev.). ABEL (Yaoundé), HÉHÉ (Bakoko), SAOEYIDI (Douala), TOUAMBO (Mabéa), AIÉLÉ (trade). Generally distributed. The fruit is edible and is sold on the markets. Sapwood white, heartwood pink; sp. gr. 0.70 to 0.80; subject to insect damage.

COMBRETACEAE

Terminalia superba Engl. & Diels. AKOM (Yaoundé and Boulou), END (Bakoko), LANDI (Mabéa), MUKONIA WEISS (Douala), KOM (Malimba),

FRAKÉ (trade). A tree of the second growth, abundant near some of the villages. Wood light yellow, somewhat grayish; sp. gr. 0.75; requires a long time to season; logs should be cut at the most favorable times to prevent loss from worms and rot.

GUTTIFERAE

Mammea Klaineana Pierre. ABOT-ZOC (Boulou and Yaoundé). This tree is known in Gaboon as Oboto.

LEGUMINOSAE

Albizzia Brownei Oliv. ONGOAYEM (Yaoundé), ESSAC (Boulou), BOBAÏ (Douala), BOBAÏ (trade). A medium-sized tree, generally distributed, but more common near the coast and around savannas. Sapwood yellowish, heartwood reddish; hard and very compact; formerly exploited by the Germans. There are two other species in Cameroon, namely, *A. angolensis* Welw. and *A. Welwitschii* Oliv.; the natives confuse the three kinds and call them all by the same names.

Cynometra aff. *Lujai* De Wild. ALLEN (Douala), AMOUK (Yaoundé and Boulou), ZINGANA (trade). Sapwood very thick, pinkish; heartwood brownish rose, well figured; some specimens have the veins less deeply colored and more widely spaced than others of the same species.

Didelotia africana (Bn.) Pierre. ESSINGANG, NOMÉLÉ, OVOGN (Yaoundé and Boulou), IAN (Mabéa), OMEBABA (Douala), OGBONÉLÉ (Pahouin du Campo), SIMINGAN (Bakoko), BUBINGA (trade). Generally distributed, especially near the marigots and portions of the forest above high water; a tree of large diameter, but of medium height. Sapwood yellowish white, heartwood purplish rose with irregular striping of dark violet. Exported in square pieces 8 or 9 feet long or in logs 16 feet or more in length. In July 1928, 32 logs, weighing 71 tons, were exported from Cameroon.

Distemonanthus Benthamianus Bn. EYEN (Yaoundé and Boulou), SEBAKO (Bakoko), TABAKO (Batanga and Douala), SELLA (Mabéa), MOVINGUI (trade). Common near the shore. Sapwood white, heartwood citron-yellow; different specimens exhibit considerable variation; figured logs are required for the European market.

Macrolobium sp. ESSABEM.

Piptadenia africana Hook. f. ATUI (Yaoundé). This tree is called Dabema in Ivory Coast.

Pterocarpus Soyauxii Taub. MBE (Yaoundé and Boulou), MBIÉ, EPION (Bakoko d'Eséka), MOHINGUÉ (Douala), MBILI (à Doumé), PADOUK (trade). Grows throughout the Cameroon forest. Sapwood yellowish brown, heartwood vivid red, becoming darker upon drying. The timber is used by the natives for making dugout canoes. Two varieties are recognized, depending on where the trees grow: (a) that from near the water, MBE MIKI (Yaoundé) or MOUENGUE MOSSOUMBÉ (Douala), is usually hollow; (b) that from the non-inundated parts of the forest, MOUENGUE BOSSICO (Douala), is more solid and much denser than water.

MELIACEAE

Entandrophragma Leplæi Verm. TIMBA (Douala), ACAJOU BLANC (trade). Much less abundant in the forest than the following.

Entandrophragma utile Sprague. ASSIÉ (Yaoundé), KOUKINJOK (Bakoko), ACAJOU ASSIÉ (trade). Rather common throughout the forest. Wood attractively figured when quarter-sawed. Exported in square logs; minimum size 24 x 24 inches (when over 18 feet long); minimum length, 14 feet (for large logs). This species is known as Sipo in Ivory Coast.

Entandrophragma sp. EDOUSSIÉ (Yaoundé), KOUNI KONG (Bakoko), EDOUCIÉ (trade). Heartwood slightly reddish, with darker stripes; difficult to work. It is not sold as Mahogany but as a substitute for Iroko.

Entandrophragma sp. SAPELI (trade). This species is distinguished by its ribbon grain. Being used mostly for veneers, it is sold in square timber 30 x 30 inches or more; large sizes only are desired, as small logs have a very thick sapwood.

Khaya aff. *anthotheca* C. DC. MANGONA (Douala), ACAJOU MANGONA (trade). Wood light rose-colored, fine-textured, with numerous groups of pores; supplies an important part of the Mahogany of Cameroon.

Khaya ivorensis A. Chev. (= *K. Klainei* Pierre). NGOLO and ZOÉLÉ (Yaoundé), HOUNGO (Bakoko), RED MAHOGANY (trade). The timber the Yaoundés call Ngolo appears more frequently in the log yards than the Zoélé, and the wood is a little lighter in color.

Lovoa Klaineana Pierre. ALOP (Yaoundé), BIBOLO, NOYER DU GABON (trade). This is the timber commonly known on the English and American markets as African Walnut. The name Alop is also applied by certain Yaoundés to a leguminous tree of an undescribed species of *Gossweilerodendron*.

Trichilia sp. EBANGBEMVA (Yaoundé), DISSOKO (Bakoko).

MORACEAE

Chlorophora excelsa B. & H. ABANG (Yaoundé and Boulou), BANG (Bakoko and Douala), IROKO (trade). A timber well known on European markets as a substitute for Oak and Teak. There is much variation in the color of different specimens; some logs yield figured wood. The timbers exported are usually 30 x 30 inches square and 15 to 25 feet long. German brokers recommend shipping in the round with the bark on.

MYRISTICACEAE

Pycnanthus Kombo Warb. ETENG (Yaoundé), TENG (Bakoko d'Eséka), KIANG (Mabéa), BAKONDO (Douala), ILOMBA (trade). A tree of the second growth, in some places abundant. Heartwood and sapwood not distinguishable, light-colored when first cut, but turning pink upon exposure to the air; not resistant to decay; shrinks badly in drying.

Staudtia gabonensis Warb. M'BOUNDÉ (Yaoundé), OYOS (Boulou), HIKOB (Bakoko d'Eséka), BOPÉ BAMBALÉ (Douala), NIOVÉ (trade). Generally dis-

tributed; maximum diameter about 36 inches. Wood dark red, fine-textured, of medium density. Used by the natives for making paddles. It is rather frequently exported.

OCHNACEAE

Lophira procera A. Chev. OKOKA (Yaoundé), OKOA (Boulou), LIHOS (Bakoko d'Eséka and d'Edéa), KOA (Mabéa), BOKOKA (Batanga), BONGOSI (Douala), AZOBÉ (trade). Generally distributed, in some places abundant. Sapwood yellowish brown, thin; heartwood reddish brown, with yellowish white pores; very hard, will sink when green but floats when dry; is easy to cut and logs will season fully in 3 or 4 months. Usually sold in squared timbers 30 x 30 inches and 18 to 25 feet long.

RUBIACEAE

Mitragyne macrophylla Hiern. ELILOM (Yaoundé), AFOP ZAM (Boulou), MOUKONIA MALAMBA (Douala), OHOMBÉ (Bakoko), LOUAMBO (Mabéa), BAHIA (trade). Occurs throughout the forests in inundated places; maximum diameter about 36 inches. Wood pinkish, or somewhat grayish, throughout; fine-textured; inclined to check in seasoning; is not highly resistant to insects and decay.

Sarcocephalus Trillesii Pierre. AKONDOK (Yaoundé and Boulou), MOUKONIA MAMOUNDI (Douala), EKENG (Bakoko), BIE (Mabéa), BILINGA (trade). Generally distributed throughout the forest. Wood light yellow throughout; sp. gr. 1.00. Used locally for the construction of public works. Fifteen logs (32 tons) were exported from Douala in July 1928.

Sarcocephalus sp. ANDINDING (Douala).

SAPOTACEAE

Baillonella toxisperma Pierre. ADJAP (Yaoundé and Boulou), NJABI (Douala), MOABI (trade). Generally distributed, in places abundant. Wood light reddish brown throughout; growth rings not very distinct; some specimens figured; subject to heart rot; good for construction and for cabinet work.

Mimusops congolensis De Wild. ELANG (Yaoundé), AJA ZOC (Boulou), BONJABI (Douala), GUIOZOC (Mabéa), MOABI (trade).

SIMARUBACEAE

Irvingia gabonensis (A. Lec.) Bn. ANDOC (Yaoundé and Boulou), NDOKA (Bakoko d'Eséka), WIPA (Bakoko), GUIBA (Douala), NDOA (Mabéa), MANGUIER SAUVAGE (colonists). Generally distributed in the forest, abundant near settlements as it is protected on account of its edible fruit. Wood varies in color from yellowish white to light brown; very hard and compact. Used for piling in railroad construction.

Irvingia oblonga A. Chev. OMAN (Yaoundé), MAN (Bakoko), ALEP (Boulou), LIAN (Mabéa).

Klainedoxa gabonensis Pierre. ODUI (Boumbo), NGON (Yaoundé), OBI (Bakoko d'Eséka), NGONDI (Douala), NGION (Mabéa).

STERCULIACEAE

Triplochiton scleroxylon K. Schum. AYOUS (Yaoundé), LOMANGENÉ (Bakoko), OUESSE (Lala), AYOUS (trade). A common tree of the second growth, in places abundant. Timber much in demand at present. Minimum size for round logs is 24 inches in diameter and about 14 feet long. Malformed logs and those over 4 feet through are squared. In July 1928, 424 logs (845 tons) were exported from Douala.

CHECK LIST OF THE COMMON NAMES

Abang	<i>Chlorophora excelsa</i> B. & H.	Moraceae
Abel	<i>Canarium Schweinfurthii</i> Engl.	Burseraceae
Abot-zoc	<i>Mammea Klaineana</i> Pierre	Guttiferae
Acajou assié	<i>Entandropbragma utile</i> Sprague	Meliaceae
Acajou blanc	<i>Entandropbragma Leplaei</i> Verm.	Meliaceae
Acajou magona	<i>Lannea Welwitschii</i> Engl.	Anacardiaceae
Acajou mangona	<i>Khaya</i> aff. <i>antbotheca</i> C. DC.	Meliaceae
Adjap	<i>Baillonella toxisperma</i> Pierre	Sapotaceae
Afop zam	<i>Mitragyne macrophylla</i> Hiern.	Rubiaceae
Aiélé	<i>Canarium Schweinfurthii</i> Engl.	Burseraceae
Aja zoc	<i>Mimusops congolensis</i> De Wild.	Sapotaceae
Akom	<i>Terminalia superba</i> Engl. & Diels	Combretaceae
Akondoc	<i>Sarcocephalus Trillesii</i> Pierre	Rubiaceae
Alep	<i>Irvingia oblonga</i> A. Chev.	Simarubaceae
Allen	<i>Cynometra</i> aff. <i>Lujai</i> De Wild.	Leguminosae
Alop	<i>Lovoa Klaineana</i> Pierre	Meliaceae
Amouk	<i>Cynometra</i> aff. <i>Lujai</i> De Wild.	Leguminosae
Andinding	<i>Sarcocephalus</i> sp.	Rubiaceae
Andoc	<i>Irvingia gabonensis</i> (A. Lec.) Bn.	Simarubaceae
Assié	<i>Entandropbragma utile</i> Sprague	Meliaceae
Atui	<i>Piptadenia africana</i> Hook. f.	Leguminosae
Ayous	<i>Triplochiton scleroxylon</i> K. Schum.	Sterculiaceae
Azobé	<i>Lophira procera</i> A. Chev.	Ochnaceae
Bahia	<i>Mitragyne macrophylla</i> Hiern.	Rubiaceae
Bakondo	<i>Pycnanthus Kombo</i> Warb.	Myristicaceae
Bang	<i>Chlorophora excelsa</i> B. & H.	Moraceae
Bibolo	<i>Lovoa Klaineana</i> Pierre	Meliaceae
Bié	<i>Sarcocephalus Trillesii</i> Pierre	Rubiaceae
Bilinga	<i>Sarcocephalus Trillesii</i> Pierre	Rubiaceae
Bobai	<i>Albizia Brownei</i> Oliv.	Leguminosae
Bohingo	<i>Pachypodium confine</i> (Pierre) Engl. & Diels	Annonaceae
Bokoka	<i>Lophira procera</i> A. Chev.	Ochnaceae
Bokouka-bambale	<i>Alstonia congolensis</i> Engl.	Apocynaceae
Bongossi	<i>Lophira procera</i> A. Chev.	Ochnaceae
Bonjabi	<i>Mimusops congolensis</i> De Wild.	Sapotaceae
Bopé bambale	<i>Staudtia gabonensis</i> Warb.	Myristicaceae
Bubinga	<i>Didelotia africana</i> (Bn.) Pierre	Leguminosae

Dissoko	<i>Tricbilia</i> sp.
Ebangbemva	<i>Tricbilia</i> sp.
Edoucié	<i>Entandropbragma</i> sp.
Edoussié	<i>Entandropbragma</i> sp.
Ekeng	<i>Sarcocephalus Trillesii</i> Pierre
Ekoe	<i>Lannea Welwitschii</i> Engl.
Ekouk	<i>Alstonia congensis</i> Engl.
Elang	<i>Mimusops congolensis</i> De Wild.
Elilom	<i>Mitragyne macrophylla</i> Hiern.
Emien	<i>Alstonia congensis</i> Engl.
End	<i>Terminalia superba</i> Engl. & Diels
Engongui	<i>Antrocaryon Klaineum</i> Pierre
Epion	<i>Pterocarpus Soyauxii</i> Taub.
Essabem	<i>Macrolobium</i> sp.
Essac	<i>Albizia Brownei</i> Oliv.
Essingang	<i>Didelotia africana</i> (Bn.) Pierre
Eteng	<i>Pycnanthus Kombo</i> Warb.
Eyen	<i>Distemonanthus Benthamianus</i> Bn.
Fraké	<i>Terminalia superba</i> Engl. & Diels
Guiba	<i>Irvingia gabonensis</i> (A. Lec.) Bn.
Guiozoc	<i>Mimusops congolensis</i> De Wild.
Héhé	<i>Canarium Schweinfurthii</i> Engl.
Hikob	<i>Staudtia gabonensis</i> Warb.
Houngou	<i>Kbaya ivorensis</i> A. Chev.
Ian	<i>Didelotia africana</i> (Bn.) Pierre
Iomba	<i>Pycnanthus Kombo</i> Warb.
Iroko	<i>Chlorophora excelsa</i> B. & H.
Kiang	<i>Pycnanthus Kombo</i> Warb.
Koa	<i>Lopbira procera</i> A. Chev.
Kokomatt	<i>Alstonia congensis</i> Engl.
Kom	<i>Terminalia superba</i> Engl. & Diels
Koukinjok	<i>Entandropbragma utile</i> Sprague
Kouni kong	<i>Entandropbragma</i> sp.
Landi	<i>Terminalia superba</i> Engl. & Diels
Lian	<i>Irvingia oblonga</i> A. Chev.
Lihos	<i>Lopbira procera</i> A. Chev.
Lomangené	<i>Triplochiton scleroxylon</i> K. Schum.
Louambo	<i>Mitragyne macrophylla</i> Hiern.
Mahogany, Red	<i>Kbaya ivorensis</i> A. Chev.
Mahogany, White	<i>Antrocaryon Klaineum</i> Pierre
Man	<i>Irvingia oblonga</i> A. Chev.
Mangona	<i>Kbaya aff. antboteca</i> C. DC.
Manguier sauvage	<i>Irvingia gabonensis</i> (A. Lec.) Bn.
Mbe; m. miki	<i>Pterocarpus Soyauxii</i> Taub.
Mbié	<i>Pterocarpus Soyauxii</i> Taub.
Mbili	<i>Pterocarpus Soyauxii</i> Taub.
M'boundé	<i>Staudtia gabonensis</i> Warb.
Mfo	<i>Enantia chlorantha</i> Oliv.

Meliaceae
Meliaceae
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Rubiaceae
Anacardiaceae
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Sterculiaceae
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Anacardiaceae
Simarubaceae
Meliaceae
Simarubaceae
Leguminosae
Leguminosae
Leguminosae
Leguminosae
Myristicaceae
Myristicaceae
Annonaceae

Moabi	<i>Baillonella toxisperma</i> Pierre	Sapotaceae
Moabi	<i>Mimusops congolensis</i> De Wild.	Sapotaceae
Moambe jaune	<i>Enantia chlorantha</i> Oliv.	Annonaceae
Mohingué	<i>Pterocarpus Soyauxii</i> Taub.	Leguminosae
Mouengue bossico;		
m. moussoubé	<i>Pterocarpus Soyauxii</i> Taub.	Leguminosae
Moukonja malamba	<i>Mitragyne macrophylla</i> Hiern.	Rubiaceae
Moukonja		
mamoundi	<i>Sarcocephalus Trillesii</i> Pierre	Rubiaceae
Movingui	<i>Distemonanthus Benthamianus</i> Bn.	Leguminosae
Mpouley	<i>Enantia chlorantha</i> Oliv.	Annonaceae
Mukonia weiss	<i>Terminalia superba</i> Engl. & Diels	Combretaceae
Ndoa	<i>Irvingia gabonensis</i> (A. Lec.) Bn.	Simarubaceae
Ndoka	<i>Irvingia gabonensis</i> (A. Lec.) Bn.	Simarubaceae
Ndooson	<i>Antrocaryon Klaineum</i> Pierre	Anacardiaceae
Nganga	<i>Antrocaryon Klaineum</i> Pierre	Anacardiaceae
Ngion	<i>Klainedoxa gabonensis</i> Pierre	Simarubaceae
Ngolo	<i>Kbaya ivorensis</i> A. Chev.	Meliaceae
Ngon	<i>Klainedoxa gabonensis</i> Pierre	Simarubaceae
Ngondi	<i>Klainedoxa gabonensis</i> Pierre	Simarubaceae
Niové	<i>Staudtia gabonensis</i> Warb.	Myristicaceae
Njabi	<i>Baillonella toxisperma</i> Pierre	Sapotaceae
Njie	<i>Enantia chlorantha</i> Oliv.	Annonaceae
Nomélé	<i>Didelotia africana</i> (Bn.) Pierre	Leguminosae
Noyer du Gabon	<i>Lovoa Klaineana</i> Pierre	Meliaceae
Ntom	<i>Pachypodanthium confine</i> (Pierre)	Annonaceae
	Engl. & Diels	
Ntrouma	<i>Pachypodanthium confine</i> (Pierre)	Annonaceae
	Engl. & Diels	
Obi	<i>Klainedoxa gabonensis</i> Pierre	Simarubaceae
Odui	<i>Klainedoxa gabonensis</i> Pierre	Simarubaceae
Ogbonélé	<i>Didelotia africana</i> (Bn.) Pierre	Leguminosae
Ohombé	<i>Mitragyne macrophylla</i> Hiern.	Rubiaceae
Okoa	<i>Lopbira procera</i> A. Chev.	Ochnaceae
Okoka	<i>Lopbira procera</i> A. Chev.	Ochnaceae
Olon	<i>Pachypodanthium confine</i> (Pierre)	
	Engl. & Diels	
Oman	<i>Irvingia oblonga</i> A. Chev.	Annonaceae
Omebaba	<i>Didelotia africana</i> (Bn.) Pierre	Simarubaceae
Ongoayem	<i>Albizia Brownei</i> Oliv.	Leguminosae
Onzabili	<i>Antrocaryon Klaineum</i> Pierre	Anacardiaceae
Ouesse	<i>Triplochiton scleroxylon</i> K. Schum.	Sterculiaceae
Ovogn	<i>Didelotia africana</i> (Bn.) Pierre	Leguminosae
Ovos	<i>Staudtia gabonensis</i> Warb.	Myristicaceae
Padouk	<i>Pterocarpus Soyauxii</i> Taub.	Leguminosae
Pfouey	<i>Alstonia congensis</i> Engl.	Apocynaceae
Saoyéidi	<i>Canarium Schweinfurthii</i> Engl.	Burseraceae
Sapeli	<i>Entandropbragma</i> sp.	Meliaceae

Sebako	<i>Distemonanthus Benthamianus</i> Bn.	Leguminosae
Sella	<i>Distemonanthus Benthamianus</i> Bn.	Leguminosae
Simingan	<i>Didelotia africana</i> (Bn.) Pierre	Leguminosae
Tabako	<i>Distemonanthus Benthamianus</i> Bn.	Leguminosae
Teng	<i>Pycnanthus Kombo</i> Warb.	Myristicaceae
Timba	<i>Entandropbragma Leplaei</i> Verm.	Meliaceae
Touambo	<i>Canarium Schweinfurtii</i> Engl.	Burseraceae
Wipa	<i>Iringia gabonensis</i> (A. Lec.) Bn.	Simarubaceae
Zingana	<i>Cynometra</i> aff. <i>Lujai</i> De Wild.	Leguminosae
Zoélé	<i>Kbaya ivorensis</i> A. Chev.	Meliaceae

Sur un *Dalbergia* de Madagascar. By H. LECOMTE. *Bulletin du Muséum* (Paris) 1 (2d ser.): 2: 159, 1929.

The name of one kind of Madagascar Rosewood, known locally as Manarizoby, is changed from *Dalbergia retusa* H. Baillon (1884) to *Dalbergia obtusa* Lecomte, as the former name had been given by Hemsley in 1878 to a tree of Panama, one of the principal sources of the commercial timber, Cocobolo, so well known in the cutlery trade.

The wattle bark industry. *Bulletin of the Imperial Institute* (London) 27: 2: 169-183, July 1929.

"Although wattle bark has now an established position among tanning materials and is used by tanners not only in this country, but also on the Continent and in the United States, the profitable production of the bark depends to a large extent on the market which can be found for by-products of the industry, especially the wood which remains after the bark has been removed from the trunks. It has been thought desirable therefore to give in the present article an account of the attempts which have been made to utilize these by-products and to discuss the bearing of the question on the future of the wattle-bark industry in countries of the Empire. Reference is also made to the efforts now being undertaken in South Africa to improve the industry in that country from the cultural standpoint."

Among the actual and suggested uses of the by-products, the peeled stems and the branches, are the following: pit props, paper-pulp, millboard, artificial silk, wood distillates, charcoal, and ash-fertilizer.