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Yale University — School of Forestry

TROPICAL WOODS

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Yale University School of Forestry

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NUMBER 25 March 1, 1931

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

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

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USE OF AMARANTH FOR INTERIOR TRIM AND FLOORING

By H. S. CLARK

Casper Ranger Lumber Company, Holyoke, Mass.

Amaranth or Purpleheart [1] from British Guiana was recently employed by our firm with good effect for all of the exposed woodwork of the library in the home of Mr. H. Halstead Lindsley in Lenox, Massachusetts. So far as we know it is the first time that this timber has been used for such purposes in this country and an account of our experience with it may prove of interest.

Mr. Lindsley chose Amaranth because of his earlier ac-

[1] *Peltogyne pubescens* Benth. Other species occur from southern Mexico to Brazil. For further information see *Timbers of Tropical America*, pp. 233–6. (The footnotes to this article are by the editor.)

quaintance with it in the lands of its growth. In the Guianas the tree is said to be fairly common on the low hills just back of the coastal plain. It attains a height of 125 feet, with a smooth-barked trunk free of branches for 50 feet and usually 2 to 3 feet in diameter. The dingy white sapwood is from 3 to 4 inches thick. The heartwood is of a dull brownish color when freshly cut, but soon turns to purple upon exposure to light and air.

We obtained our lumber from a Boston firm that imported the logs and sawed them to our order. The logs were about two years old when received and the fresh lumber weighed about 8 pounds per board foot. We bought the lumber, log run, and kiln-dried it carefully for four weeks, thereby reducing the weight to about 4½ pounds per board foot.

The four walls of the room were panelled with Amaranth, backed with Whitewood.[2] The floor boards are 3-ply, ¾" thick, and with a 10"-finish face. The surface layer is Amaranth, the others Chestnut,[3] with the grain of the middle ply at right angles to the other two. A strong, *hot* glue was used, as it was found that it held the Amaranth better than a waterproof glue.

Machining and hand work removes the dark purple color from the surface and exposes the much lighter wood beneath. Within 24 hours, however, the rich color commences to return and continues to deepen. On this account it was considered advantageous to allow the room to stand for three or four weeks before the application of any painter's finish. The finishing in this instance was simply the use of wax, as nothing further was needed to bring out the rich natural color.

Amaranth is a hard, heavy, fine-textured wood requiring considerable labor and skill for producing fine cabinet work. It has to be run slowly through the machines and all cutter tools must be of high-speed steel. It is about as expensive a wood as any with which we have had experience. The price of the air-dry lumber, 1" to 2" thick, log run, is from $450 to $500 per thousand board feet. The cost of kiln-drying is about $25 per thousand feet additional. The waste in cutting to get

[2] *Liriodendron tulipifera* L.

[3] *Castanea dentata* L.

proper materials for the cabinet work of this room was between 40 and 50 per cent.

The wood stays in place remarkably well when properly treated. There is enough feather-striping of the grain and sufficient variation in shade and luster to prevent monotony of color, and the general effect is as pleasant and attractive as it is unusual.

SOME FURTHER NOTES ON *TRIPLOCHITON SCLEROXYLON*

By E. H. B. Boulton *and* T. J. Price

Department of Forestry, Cambridge University

The timber of *Triplochiton scleroxylon* K. Schum. (=*T. Johnsonii* C. H. Wright) is sold on the English market under the trade names of Obechi and Arere. The demand for it has been increasing during the past few years. Imports are of round logs, 15 to 22 ft. (av. 19½ ft.) long and having an average girth of 12 ft. The sapwood is 4 to 5 inches thick, sometimes stained and usually showing abundant pin-worm holes. The latter are not very frequent in the heartwood; occasional grub holes are present. Shakes are of about the same order as in African Mahogany.

Uses.—The principal uses of the timber in England are for motor-body work, blackboards, wooden parts of food machinery, furriers' nailing boards, mouldings, shelving, and furniture. It has been employed successfully by the Department of Forestry, Cambridge University, for shelving and other fittings. The wood, when filled, stains and polishes well. It marks rather easily and is of too soft a texture for furniture. It should not be used without having been kiln-dried.

Shrinkage.—The accompanying table gives the results of shrinkage tests on 10 boards, each from a different log, half of them tangentially sawn and half radially or quarter-sawn. They varied in width from 7.81 to 21.44 inches and in initial moisture content from 55 to 76 per cent. In drying to about 10 per cent, the average radial shrinkage (on a basis of dry

width) was 1.69 per cent; tangential, 2.21 per cent; general average, 1.95 per cent.

RESULTS OF SHRINKAGE TESTS ON OBECHI WOOD

No.	Section	Initial		Intermediate			Final		
		Moisture content	Width	Moisture content	Width	Shrinkage	Moisture content	Width	Total shrinkage
		Per cent	*Inches*	*Per cent*	*Inches*	*Per cent*	*Per cent*	*Inches*	*Per cent*
1	Tang.	76	21.44	20	21.25	0.89	10	20.94	2.40
2	Rad.	76	14.37	23	14.19	1.28	11	14.12	1.74
3	Tang.	75	12.07	30	12.00	0.59	10	11.87	1.64
4	Tang.	73	16.06	27	16.00	0.40	10	15.69	2.40
5	Rad.	76	15.50	21	15.37	0.82	10	15.25	1.64
6	Rad.	55	13.00	..	....	....	9	12.80	1.56
7	Tang.	55	7.81	..	....	....	10	7.60	2.71
8	Tang.	69	10.84	..	....	....	11	10.63	1.92
9	Rad.	57	10.28	..	....	....	11	10.12	1.58
10	Rad.	70	11.81	..	....	....	10	11.70	0.94

Anatomy.—The wood of *Triplochiton* affords an unusually good example of so-called intermediate fibers, *i.e.*, single vertical parenchyma cells having the normal length of a parenchyma strand. Furthermore, they are all storied.

An interesting feature of the ray structure is the irregularity in the size and shape of the cells, visible on all three sections. Large, upright cells, which in most woods with heterogeneous rays have a fairly definite arrangement, are here irregularly interspersed and may not be present along the edges, particularly as seen on tangential view. (For further details see the editor's article in *Tropical Woods* 18: 43–54, June 1, 1929.)

Change in Determination of a Colombian Specimen

In the annotated list of the trees, shrubs, and lianas collected by Record and Kuylen in the Santa Marta region of Colombia, No. 51 (Yale No. 16450) is briefly described as *Acacia* sp. (see *Tropical Woods* 23: 16, Sept. 1, 1930).

A duplicate of the specimen in question has since been determined by Dr. N. L. Britton, New York Botanical Garden, as *Harvardia platyloba* (Spreng.) Britt. & Rose (=*Pithecolobium sericiflorum* Benth.).

THE FORESTS OF NORTHEASTERN PERU

By L. WILLIAMS [1]
Field Museum of Natural History

The Republic of Peru, third largest of South American countries, has a total area, including the new territory of Tacna and part of Arica, of approximately 533,000 square miles. Its coast line extends almost the entire distance between the Equator and the Tropic of Capricorn. The population is estimated to be between five and six millions.

The Republic has the three major physiographic zones, characteristic of the western countries of South America within the tropics, namely, (1) a narrow, arid, coastal plain with tributary mountain valleys; (2) a massive cordillera varying in width between 200 and 250 miles, and (3) a montaña or eastern region of dense, wet forest beginning at the tree line upon the eastern slopes of the Andes and extending towards the interior. These three regions offer entirely different conditions of climate and products, which in turn give rise to ethnological differences in the inhabitants who dwell in the respective territories.

The montaña constitutes more than half the area of the Republic and reaches from the frontier separating Peru from Ecuador and Colombia on the north to that of Bolivia in the south, and from the forests of Brazil on the east to the limit of forest vegetation, the slopes of the Peruvian Andes. It is approximately 1000 miles in length and has a varying width of 300 to 700 miles. Only a small fraction of it is under cultivation, the remote parts having scarcely been penetrated. Based on topographical and vegetative characters, three distinct types of montaña can be distinguished: (a) a series of ranges, foothills, and rolling ground heavily timbered with deciduous trees; (b) open plains covered with grasses and shrubs; (c) an expanse of dense, low-lying forest remarkable for the magnificent size of the trees and the great variety of their species, an extension of the Amazonian Hylaea.

[1] In charge of the Peruvian division of the Marshall Field Botanical Expedition to the Amazon, 1929–1930.

All the rivers which penetrate this forest are affluents of the Amazon within Peruvian territory. One series of tributaries, principal of which are the Marañón, Huallaga, and Ucayali, have their sources in the Andean highlands and flow in a northeasterly direction. Along the series of table-lands feeding these tributaries, the rainy season commences about September and the highest waters reach the Amazon towards the end of February or beginning of March. Another group of affluents, of which the chief are the Moróna, Pastaza, Tigre, Nanay, and Napo, have a general southeasterly course. The wet season in the northern cordilleras begins in February and these rivers carry down the floods, attaining their greatest rise in June, by which time the southern tributaries have fallen. In this manner only one set of affluents is acting at a time. At Iquitos the Amazon River rises between 30 and 40 feet above its lowest level and inundates the valley for several miles on either side.

The wood specimens mentioned in this account were collected for the study series of Field Museum of Natural History from two main regions, differing in climate and altitude, namely, (a) the low-lying forest extending from the foot of the ranges, between the rivers Huallaga and Marañón, to the Javarý, which forms a natural boundary between Peru and Brazil; (b) the upland region of the Departments of San Martín and Amazonas.

The Lowland

The greater portion of the montaña lies within the Department of Loreto, constituting about 260,000 square miles of territory, only a small fraction of which is privately owned or inhabited. The capital, Iquitos, situated on the left bank of the Amazon about 200 miles within Peruvian territory, is the most important commercial center on the eastern side of the Andes. Its central location in the heart of the tropical forest, 2300 miles up the Amazon, and the great mileage of interior navigation tributary to it, emphasize the possibilities of the town for development. A great transcontinental route across South America would be created by the construction of a railroad uniting a seaport on the Pacific Coast with

the navigable waters of the upper Amazon. The principal commodities of export are ivory nuts, cotton, coffee, Mahogany, Spanish Cedar, rubber, balata, and resins.

In this region the climate is divided into two seasons—the wet period extending from November until the end of April, and the dry season from May to October. The rainfall in places is heavy, varying according to the locality, between 70 and 90 inches, and the climate is neither excessively warm nor insalubrious. At Iquitos the mean temperature is 70° F. The open nature of the Amazon valley allows the equatorial east winds to sweep its entire length, and these mitigate the heat and render comparatively temperate the broad river channels that feel their influence. Intermittent fevers are infrequent, except in remote regions of the rivers Javarý, Marañón, and Ucayali. The wide tract of periodically inundated forest along the banks is interrupted by bluffs that rise above the high-water mark, as if purposely to provide sites for villas and towns. The areas subject to flood receive a rich deposit of silt and are admirably adapted for the cultivation of bananas. Rice is grown on a small scale in the upper reaches of the Napo, and sugarcane is cultivated to some extent on high ground along the banks of the Amazon, Ucayali, and Huallaga. Small plantations of coffee have been gradually developing during the past few years.

For many years rubber was the controlling factor in the Peruvian Amazon region, but its importance has declined during the last two decades because of the cheapness with which plantation rubber is being produced in the Far East. During the period 1900 to 1910 the annual production of rubber in the upper Amazon was valued in millions of dollars, while in 1928 the exports did not exceed $50,000. Exports of balata, however, have increased from 3000 lbs. in 1919 to well over 1,000,000 lbs. in 1929, and, together with the recently begun exploitation of Mahogany and Spanish Cedar, have compensated to some extent for the declining rubber shipments.

The lumbering industry of the Department of Loreto, of which Iquitos forms the center, differs from that of some other tropical countries in the great distances which have to be

traversed before encountering timber suitable for the market and in the necessity for floating the logs several hundred miles to the shipping point. The local wood-working industries have for many years been depleting the forests along the banks of the Amazon and its tributaries, so that it becomes necessary to go increasing distances for supplies. From the commercial standpoint, Mahogany is undoubtedly the most valuable tree encountered in the forests of Peru. It occurs in a belt paralleling the Andes from the Ecuadorean border southward toward the headwaters of the river Ucayali and its affluents. Its occurrence in unexpected areas in this region appears to be the proportion of one tree to about an acre and a quarter (two trees per hectare). The exportation of logs of this important timber has shown a steady increase during the past few years. The principal sources of supply at present are forests along the Ucayali, Samiria, and Huallaga.

One is impressed by the sameness of this extensive forest. Although it contains a large number of species, the composition in one locality is remarkably like that of another, the variations corresponding to local differences in soil and climate. Some trees seem ubiquitous, as for example, the Capirona (*Calycophyllum Spruceanum*), one of the handsomest of the region. Often it attains a height of 120 feet and is easily recognized by its tall cylindrical trunk, with smooth, deciduous bark of grayish green color when fresh, deepening to reddish brown with age, and, in the spring, by its profusion of white flowers. Capirona is the common firewood of the territory, being consumed in enormous quantities by launches plying on the Amazon and its affluents.

Of all the families encountered the Leguminosae is probably the most abundant in both species and individuals, and some of them furnish valuable timber. Representatives of the Rubiaceae are of common occurrence and include such trees as the Puca-quiro (*Sickingia*), Uchpa-caspi (*Faramea candelabrum*), *Bothriospora corymbosa*, Quinilla (*Warscewiczia coccinea*), Guacamayo-caspi (*Coutarea hexandra*), and Pamparemo-caspi (*Duroia longifolia*). The family Melastomaceae is also well represented. Most common of the Moraceae is the Setico (*Cecropia*), which grows in abundance along the river banks and attains a height of 60 feet.

Other trees of the forest are Tahuarí, prominent because of its large, yellow, fragrant flowers; Remo-caspi (*Tocoyena*), the buttresses of which are used extensively by the natives for canoe paddles; Tangarana (*Triplaris*), usually along the edge of the forest or in the vicinity of streams; Ojé (*Ficus*), its bark the source of a latex used by the natives for medicinal purposes; Rifari (*Terminalia oblonga*); Huacapú; Palo de aceite, of rare occurrence; Estoraque; Pashaco; *Palicourea pachycalyx;* Gutta-percha (*Sapium*); Jeve (*Hevea*); Leche-caspi (*Couma*); and numerous others less distinct or whose vernacular names are unknown. There are many shrubs of the genera *Miconia, Clidemia, Piper, Aegiphila,* etc.

In the open, along the border of the forest, and in cultivated or abandoned land the most prevalent are: Pichirina (*Vismia*), a small tree secreting a deep brown, insipid resin from the bark; several species of Shimbillo (*Inga*); Guayaba (*Psidium Guayava*); Achiote (*Bixa Orellana*); Pan del Arbol; Marañón or Cashew (*Anacardium occidentale*); Limón (*Citrus aurantifolia*), the introduced lime; and various others.

The Uplands of San Martín and Amazonas

The town of Tarapoto is situated at an altitude of 2600 feet in a large plain having the appearance of a vast natural amphitheatre completely encircled by high spurs which represent ramifications of the eastern arm of the Andes. The climate of this region of the Department of San Martín, influenced by the peculiar location, is drier than that of the equatorial forest of Loreto. Heavy rains are frequent on the hills, however, and the deficiency of precipitation in the plain is compensated by hovering mists prevalent in the mornings.

The forest about Tarapoto has been cleared, except along the banks of the streams, and the soil of loose sand is covered with coarse grasses, shrubs, or small scattered trees of secondary growth. Most of the land in the immediate vicinity is under cultivation for cotton, tobacco, sugarcane, and coffee, which form the principal crops for export, as well as for plantains, yuca, and esculents for purely local consumption. For that reason one has to travel to the neighboring highlands in the north and east or to the forest flanking the rivers Huallaga and Mayo before reaching good botanizing ground.

The general character of the vegetation is intermediate between that of the Amazon lowland and of the Andean highland. There is an abundance of rainfall in the eastern foothills of the Andes. Very frequently, however, the evaporation under the intense heat of the afternoon sun is so rapid in the valleys facing the north and northwest, that the soil cannot retain sufficient moisture for tree growth and only the shady ravines and slopes are forest clad.

The principal trees growing in the plain are: Renaco (*Ficus*); Ángel Sisa or Flor del Ángel (*Caesalpinia pulcherrima*); Shapallejo (*Zanthoxylum*); Icoje; Chichara-caspi (*Lippia virgata*); Pashaco (*Entada*); Yana Pichirina (*Vismia*); Rifari (*Anisomeris paniculata*); Lluicho Vainilla (*Guazuma ulmifolia*); Bolaina; Ingaina (*Roupala*); Quina-quina; Quillo Bordón; Atadijo (*Trema micrantha*); Algarrobo; Alcanfor Sacha (*Zanthoxylum*); and numerous others. Among the shrubs are those belonging to the genera *Byrsonima*, *Machaerium*, *Phyllanthus*, *Acalypha*, *Hamelia*, and *Solanum*.

Along the range known as Guayapurima, to the northeast of Tarapoto, the forest is dense but mostly low. To the east is Cerro Pelado whose summit is devoid of trees, whence the name meaning "the bald hill." Among the specimens collected there and along the Huallaga River are Tahuampa-caspi (*Cordia*); Racta-panga (*Curatella americana*); Maqui Sapa Ñac-cha (*Apeiba*); Cascarilla or Quinina; Ucsha-quiro; Indano (*Byrsonima*); Topa (*Ochroma*); Pinshi-caspi (*Aspidosperma*); Cedro Pashaco; Águano or Mahogany (*Swietenia Tessmannii*); Cedro Colorado or Spanish Cedar (*Cedrela*); Quinilla; Camesito (*Rapanea*); Palo Blanco; and many others of lesser importance.

About 17 miles to the west is the village of Lamas, situated a few hundred feet below the summit of a volcanic hill. The heavy loamy soil there is extremely fertile and yields abundant crops of yuca, bananas, and "poroto" (a legume). Throughout the eastern slopes of the cordillera all loads must be carried on Indians' backs, as the paths seldom admit of any other method. This arduous work is performed mainly by the natives of Lamas. That these natives, exponents of dynamic strength, are rebellious, may well be attributed to the effect of these incessant long and difficult journeys.

One of the most profitable excursions made in the uplands was that to San Roque, about 40 miles west of Tarapoto. A short distance away extending into the valley is a spur of the Campana. This hill is round, has an altitude of 6000 feet, and is almost devoid of trees, being clad with natural meadow. In the forest extending towards the upper reaches of the Huallaga, many different kinds of trees were encountered, including: Palo de Cruz; Asar-quiro (*Hedyosmum*); Borracho-sisa; Huito-quiro; Trueno Mullaca; Sangre de Dragón (*Croton*); Cedro Sisa; Parinari or Supai Ocote; Rufindi (*Inga punctata*); Mahogany; and Cedar.

Two days' journey on foot to the west from San Roque is Moyobamba, the capital of the Department of San Martín. Although this town, located in the midst of a fertile plain, has the possibilities of a great center, its population has diminished considerably in the last generation, principally because of lack of suitable highways of commerce. The natives are occupied in cultivating the soil for corn, yuca, sugarcane, and plantains. A day's walk to the south-west is Rioja, situated on a sandstone plateau. The majority of its 3000 inhabitants are engaged in hat-making, an industry for which the village is famed.

Approximately 40 miles west of Moyobamba is Bagazán, an uninhabited spot at an elevation of about 10,000 feet, where the montaña terminates, the line of demarcation being very noticeable. Above this is Pishgo Guayuna, a high mountain reaching up to 12,000 feet, whose slopes are covered with ichu grass, tree ferns, and low thorny shrubs which struggle against the low temperature.

Continuing westward for two days the expedition reached Chachapoyas, the capital of the Department of Amazonas. This town is located at an altitude of 7000 feet in a fertile and salubrious region at the foot of a lofty range. The principal crops cultivated are potatoes and wheat, mainly along the slopes of the sierra. The barren aspect of the plain is relieved by straggling aloes, cacti, and low shrubs. Such exotic trees as Eucalyptus and Olive thrive. A species of Walnut, probably *Juglans boliviana*, rarely more than 60 feet in height, occurs scattered in the vicinity. The shrub Coca (*Erythroxylon Coca*), from which the alkaloid cocaine is ex-

tracted, is one of the chief products of the middle slopes of the montaña, while in certain regions the "cocales" (Coca plantations) form the most profitable industry. Only a small amount is exported, as the bulk of the product is consumed by the natives. The dried leaves form one of the principal articles of commerce, and often take the place of currency.

THREE NEW SPECIES OF *AEGIPHILA* FROM CENTRAL AMERICA

By HAROLD N. MOLDENKE

During the past two years I have been especially interested in the verbenaceous genus *Aegiphila* Jacq., a genus of at present about 120 species from the West Indies, Mexico, Central America, and South America south to Paraguay and the Argentine Republic. A monograph of this genus is at present in preparation and will be published shortly. In this monograph some fifty new species will be described and published and our conceptions of a number of old species considerably altered and amplified. In the work of studying and annotating some two thousand herbarium sheets from all the largest and most important herbaria of this country and abroad, a number of specimens were found which had been collected by Yale School of Forestry collectors in Central America. Several of these specimens were found to represent new species and three of these new species are herein described. More complete and detailed discussions of these species as well as of the 45 or more additional new species which this monographic work has revealed, will be found in my forthcoming monograph of the genus.

Aegiphila monstrosa Moldenke, sp. nov.

Frutex robustissimus; ramis validis teretibus glabris; hornotinis obtuse tetragonis glabris vel minute puberulentibus; foliis oppositis; petiolis elongatis glabris; laminis oblongis vel ellipticis saepe amplissimis leviter acuminatis integris ad basin late acutis vel leviter acuminatis chartaceis leviter puberulentibus vel glabratis; inflorescentiis axillaribus sessilibus; cymis densis multifloris glomeratis vel fasciculatis; floribus pedicellatis odoratissimis; pedicellis tenuibus brevibus puberulentibus; calyce campanulato patente glabrato vel leviter puberulente, mergine subtruncato vel tenue repando; corolla infundibulariforme alba, tubo elongato, lobis 4 late ovatis; staminibus 4 longe exsertis; pistillo incluso; stylo breve; stigmate bifido; ovario minuto 4-loculare; calyce fructifero cupuliforme valde dilatato et incrassato verrucoso; fructibus drupaceis subglobosis vel oblongis viridibus umbilicatis usque ad semi-inclusis.

Shrub, 3–7 m. tall, very robust; "stems jointed like bamboo"; wood soft, white, brittle; branches exceedingly stout and robust, terete, to 1.5 cm. in diameter, hollow in the center, light gray, glabrous; branchlets obtusely tetragonal, deeply canaliculate toward the apex, grayish-brown, glabrous or minutely puberulent, somewhat ampliate at the nodes, stout; buds minute; internodes very variable, 2–7.5 cm. long; leaves decussate-opposite, petiolate; petioles slender or stoutish, elongate, 3–10 cm. long, glabrous; blades oblong to elliptic, often extremely large, 16–35 cm. long, 9–23 cm. wide, chartaceous, rather dark green and nitid on both surfaces, slightly acuminate at apex, broadly acute or slightly acuminate at base, entire, very minutely puberulent on both surfaces, becoming glabrous; midrib stout, prominent beneath; secondaries about 10 pairs, ascending, very prominent beneath; veinlets slender, rather few; inflorescence axillary, sessile; cymes dense, glomerate or fasciculate, numerous at the nodes of the branches of 1 or 2 years back, many-flowered; flowers pedicellate, very odorous; pedicels very short, slender, 1–2 mm. long, puberulent; bractlets small, linear, puberulent, inconspicuous; calyx campanulate, herbaceous, about 3.5 mm. long and wide, glabrate or minutely pubescent, lax around the corolla-tube, its rim membranous, subtruncate or shallowly repand, scarious; corolla infundibular, white, its tube slender, cylindric, about 10.5 mm. long, somewhat ampliate above, glabrous or minutely puberulent, its limb 4-parted, its lobes broadly ovate, about 3.7 mm. long and 3.8 mm. wide at base, abruptly rounded at apex; stamens 4, inserted about 3.7 mm. below the mouth of the corolla-tube, long-exserted (in male); filaments filiform, 10–11 mm. long (in male), glabrous; anthers ovate, about 1.3 mm. long and 0.8 mm. wide; pistil included (in male); style about 6 mm. long (in male), capillary, glabrous; stigma bifid, its branches slender and papillose, about 3.7 mm. long; ovary minute, subglobose, flattened and umbilicate above, about 0.8 mm. long and wide, glabrous, dark, 4-celled; fruiting-calyx cupuliform, greatly enlarged and indurated, verrucose; fruit drupaceous, subglobose or oblong, 6–7 mm. long and wide, green, flattened and umbilicate at both ends, up to semi-included by the mature calyx, glabrous.

The type specimen of this very distinctive species was collected by M. A. Carleton (No. 422) at Cuyamel, Cortés, Honduras, December 22, 1922, and is No. 1,169,015 in the U. S. National Herbarium. It has hitherto been confused with *A. fasciculata* Donn. Sm. and all of the 22 sheets examined

had been erroneously distributed under that name. The latter is apparently closely related, but differs pronouncedly by its more slender and ochraceous-velutinous branches and branchlets, its smaller and densely ochraceous-velutinous leaf-blades, its shorter and ochraceous-velutinous petioles, its smaller cymes situated only at this year's nodes, its densely ochraceous-velutinous and mucronulate calyx, and its shorter corolla-tube.

This species has been collected in Guatemala by Cook & Griggs (No. 521), Johnson (No. 520), and Standley (Nos. 23,757 and 25,114); in Honduras by Record & Kuylen (Nos. H. 19 and H.19a) and Standley (Nos. 52,717; 53,176; 53,938; and 55,268); and in British Honduras by Lundell (No. 146) and Winzerling (No. 105). The native name as recorded by Standley is "Vara blanca."

Aegiphila panamensis Moldenke, sp. nov.

Frutex vel arbuscula; hornotinis crassiusculis obtuse tetragonis dense puberulentibus fuscis; foliis oppositis; petiolis debilibus puberulentibus vel glabratis; laminis chartaceis vel membranaceis oblongo-lanceolatis vel oblongis plerumque in siccitate undatis acutis vel acuminatis integris ad basin acutis vel acuminatis dense scabro-puberulentibus; inflorescentiis axillaribus terminalibusque; cymis pedunculatis oppositis bracteolatis multifloris; paniculis plerumque amplis thyrsoideo-pyramidatis foliosis, sympodiis saepe elongatis crassis dense puberulentibus plerumque insigniter complanatis sulcatisque; floribus pedicellatis; pedunculis puberulentibus; pedicellis gracilibus puberulentibus; bracteis foliaceis; bracteolis elongato-linearibus; calyce obconico-campanulato puberulente, margine subtruncato vel leviter 4-apiculato; corolla hypocrateriforme luteola, tubo anguste cylindrico intus pubescente, lobis 4 oblongis obtusis; staminibus 4 longe exsertis vel inclusis; filamentis pilosulis; pistillo incluso vel longe exserto; stylo glabrato; stigmate bifido; ovario oblongo glabro 4-lobato 4-loculare; calyce fructifero indurato cupuliforme venoso puberulente patente, margine prave tenueque lobato.

Shrub or small tree; branchlets rather stout, obtusely tetragonal, usually conspicuously flattened and sulcate toward the apex, brownish, densely puberulent; internodes 3.5–5.5 cm. long; leaves decussate-opposite, petiolate; petioles slender or stoutish, weak, 5–13 mm. long, puberulent or glabrate, ampliate at base; blades membranous or chartaceous, dark green above, light beneath, varying from oblong-lanceolate or oblong to obovate, 9–17 cm. long, 3–8 cm. wide, usually very undate in drying, varying from abruptly acute to acuminate at apex, entire, acute or acuminate at base, densely roughened-puberulent on both surfaces; midrib prominent beneath, slightly so above;

secondaries slender, 8–10 pairs, irregular, arcuate-ascending; veinlets very slender and delicate; inflorescence axillary and terminal; cymes axillary, pedunculate, to 10 cm. long and 6.5 cm. wide, often dense-flowered, bracteolate, half as long as the subtending leaf or less, solitary, opposite; panicle terminal, usually large and thyrsoid, to 30 cm. long and 21 cm. wide at base, pyramidal, bracteate, its sympodia variable in length, often elongated, stout, 2–5 cm. long, usually conspicuously flattened and sulcate, densely puberulent, its branches opposite or approximate, very numerous; flowers pedicellate; peduncles 1–6 cm. long, puberulent; pedicels slender, 1–2 mm. long, puberulent, incrassate in fruit; bracts large and foliaceous, similar to the leaves in all respects, but smaller; bractlets elongate-linear or narrow-lanceolate, to 15 mm. long and 7 mm. wide; prophylla linear, 1-5 mm. long; calyx obconic-campanulate, about 2.8 mm. long and 2.3 mm. wide, puberulent, its rim truncate or minutely 4-apiculate; corolla hypocrateriform, pale yellow, its tube narrow-cylindric, 5.2–7.5 mm. long, ampliate above, glabrous without, pubescent within, its limb 4-parted, its lobes oblong, about 4.1 mm. long and 2.3 mm. wide, obtuse; stamens 4, inserted about 2.8 mm. below the mouth of the corolla-tube, long-exserted in male, included in female; filaments flattened, 0.7–10.4 mm. long, somewhat pilose; anthers oblong, about 0.5 mm. long and 0.4 mm. wide; pistil included or equaling the tube in male, long-exserted in female; style capillary, 5.2–12 mm. long, glabrate; stigma bifid, its branches 0.5–2.6 mm. long; ovary very dark, oblong, about 1 mm. long and 0.5 mm. wide, flattened and umbilicate at apex, glabrous, 4-lobed, 4-celled; fruiting-calyx large and indurated, cupuliform, about 5 mm. long and 10 mm. wide, veiny, puberulent, lax, its rim irregularly and shallowly lobed; fruit not seen.

The type specimen of this apparently endemic species was collected by Henri Pittier (No. 6815) on the Agricultural Experiment Station at Matías Hernandez, Dept. Panamá, Panama, October 28, 1914, and is deposited in the herbarium of the N. Y. Botanical Garden, with a co-type in the U. S. National Herbarium (No. 679,248). It is apparently closely related to *A. martinicensis* Jacq., which is very widely distributed throughout the West Indies and also occurs sparingly in parts of Central America and northern South America. The latter, however, differs in its more slender and usually more glabrate branches and branchlets, its glabrous or glabrate leaf-blades which are not undate and are usually much more firm, its much more slender peduncles and sympodia, its shorter corolla-tubes, and its more deeply lobed fruiting-calyx.

This species has also been collected in Panama by Cooper

& Slater (Nos. 40 and 117); Dunlap (Nos. 481/2 and 438); Killip (No. 12,171); Piper (No. 5616); Pittier (No. 4149); and Standley (Nos. 25,808; 26,465; 26,684; and 30,496). Many of the 21 sheets examined were characterized by very numerous bracts of varying sizes and dimensions, usually quite large, in the terminal thyrsi.

Aegiphila paniculata Moldenke, sp. nov.

Arbuscula; hornotinis obtuse tetragonis vel subteretibus elongatis plerumque glabris in siccitate badiis; foliis oppositis; petiolis tenuis debilibus glabratis; laminis chartaceis lanceolatis vel oblongis longe acuminatis integris ad basin leviter acuminatis vel anguste attenuatis minute puberulentibus subtus dense glanduloso-punctatis et secus venam mediam discis glandulosis numerosis ornatis; inflorescentiis terminalibus; paniculis densis longe angustis foliosis, ramis brevibus multifloris oppositis bracteatis plerumque trifurcatis; pedunculis teretibus badiis canaliculatis glabris vel puberulentibus; pedicellis fructiferis incrassatis acute tetragonis brevibus vel obsoletis puberulentibus; bracteis foliaceis lanceolatis acuminatis quam foliis densius puberulentibus et pluribus discis ornatis; calyce fructifero cupuliforme distinctissime tetragono puberulente basi truncato, margine truncato, basin fructus arcte amplectente; fructibus oblongis tetragonis flavis glabris nitidis insigniter umbilicatis 4-locularis ad mediam gibbosis.

Small tree, to 9.8 m. tall; trunk straight, erect, cylindrical; bark grayish-white, "minutely scored vertically with very shallow confluent furrows and scaling off in small plates between furrows; branches ascending and irregularly opposite, almost white; wood creamy-white, with a somewhat aromatic odor"; branchlets rather slender, elongate, glabrous or puberulent, becoming furrowed in drying, gray-green or brownish, obtusely tetragonal or subterete, flattened and ampliate at the nodes; internodes 4.5–5 cm. long; leaves decussate-opposite, petiolate, "8–20 per. twig"; petioles slender, 6–10 mm. long, weak, spreading, glabrate, canaliculate above; blades chartaceous, dark green above, paler beneath, lanceolate or oblong, 11–18 cm. long, 3.5–6 cm. wide, long-acuminate at apex, slightly acuminate or narrowly attenuate into the petiole at base, entire, very minutely puberulent on both surfaces, especially along the midrib and secondaries, probably becoming glabrate, densely and minutely glandular-punctate beneath, with numerous glandular disks of varying size scattered along the lamina on both sides of the midrib beneath, disappearing as the apex is approached; midrib prominent beneath; secondaries 9–12 pairs, rather prominent on both surfaces; veinlets delicate, but conspicuous beneath; inflorescence terminal, paniculate; panicles dense, long and narrow, about 14 cm. long and 5.5 cm. wide, its branches about 5 pairs, many-flowered, short, opposite, usually trifurcate, 2–3 cm. long, bracteate, foliose, its sympodia terete, brownish, furrowed in drying, rather

abbreviated, glabrous; flowers pedicellate or subsessile; peduncles about 4 cm. long, brownish, terete, furrowed in drying, glabrous; pedicels greatly thickened in fruit, acutely tetragonal, the lateral ones 1–2 mm. long, the central ones shorter or obsolete, widening to about 1.2 mm. above, puberulent; bracts large and foliaceous, lanceolate, 6–10 cm. long, 1–2 cm. wide, acuminate at both ends, similar to the leaves but more densely puberulent on both surfaces and with more glandular disks along the midrib; bractlets and prophylla apparently obsolete (in fruiting specimens); flowers not seen; fruiting-calyx very distinctly tetragonal, flat and truncate at base, cupuliform, about 2 mm. long and 7 mm. wide, very much indurated, puberulent without, glabrous and shiny within, its rim very regular and truncate, fitting closely over the base of the mature fruit like the cup of an acorn or subincluding the very immature fruit; fruit drupaceous, oblong, 9–10 mm. long, about 7 mm. wide, tetragonal, yellow, flattened and conspicuously umbilicate above, smooth and shiny even when dry, but turning brown, gibbous at the middle, subincluded by the calyx when very immature, invested very closely for less than 1/4 its length when mature, 4-seeded; seeds white.

The type specimen of this very distinctive species was collected by Killip & Smith (No. 14,729) in a thicket along a stream at Puerto Wilches and its vicinity, Dept. Santander, Colombia, at an altitude of 100 m., November 28, 1926, and is deposited in the herbarium of the N. Y. Botanical Garden, with a co-type in the Gray Herbarium. It is a very remarkable species because of the very striking regularity of the entire-margined and close-fitting calyx, the long and narrow dense terminal panicles, the smooth and shiny fruit (even in drying!), and because of the leaves with conspicuous glandular disks along the midrib beneath (numbering to about 125 on large and mature leaves!). It is probably related to *A. martinicensis* Jacq., to which the size, shape, and texture of the leaves bear a striking similarity. The latter, however, differs very pronouncedly in having its fruit-bearing pedicels very slender, much longer, and hardly at all thickened or tetragonal; its leaf-blades without glandular disks beneath; and especially in having its mature calyx very lax and shallow (often almost saucer-shaped), spreading and splitting to almost the base.

It has also been collected in Nicaragua by Englesing (No. 100) and in Panama by Standley (Nos. 28,871; 29,232; and 30,246). All of the seven sheets examined were in fruit. Flowering specimens, apparently, have not yet been collected.

QUEENSLAND "MAPLE" (*FLINDERSIA* SPP.)

By M. B. WELCH

Technological Museum, Sydney, Australia

The wood now universally known on the Sydney market as Queensland Maple and in Queensland originally as Red Beech has no botanical affinity to the Maple (*Acer*) or the Beech (*Fagus*) of Europe and North America, but is produced by two closely related species of *Flindersia*, namely, *F. Brayleyana* F. v. M. and *F. Pimenteliana* F. v. M. Swain's proposal to call this timber Maple Silkwood appears unlikely of commercial adoption, certainly not in New South Wales. Curiously enough, however, the name Silkwood is commonly used by timber merchants in speaking among themselves of *F. Pimenteliana*, though to the consumer and in price lists only Queensland Maple is mentioned.

BOTANICAL CLASSIFICATION

Botanists are not yet in agreement regarding the correct position of the genus *Flindersia* in the systematic classification of plants. Bentham & Hooker (*Genera Plantarum* I, p. 340. 1862–1867) included it provisionally in the family Meliaceae, though pointing out that it is closely connected with the Rutaceae, differing notably from the other meliaceous genera in having pellucid-dotted leaves. Engler & Gilg (*Syllabus der Pflanzenfamilien*, p. 248. 1924) placed it in a sub-family of the Rutaceae. (See also *Pflanzenfamilien* III, 4, p. 170. 1895.) Hutchinson (*Families of Flowering Plants*, p. 251. 1926) still retains it in the Meliaceae. (See note below.)

NOTE BY THE EDITOR: A study of the woods of several species of *Flindersia* not only having convinced me that the genus was out of place in the Meliaceae, but also having suggested that the differences noted might be of generic rank, I solicited the opinion of Mr. C. T. White, Government Botanist at Brisbane, who replied on January 17, 1930, as follows: "The members of the genus *Flindersia* seem to me to constitute a very natural group and I do not think they can be divided into separate genera. On floral characters, I should say the genus is better placed in the Rutaceae than in the Meliaceae, but would favor the formation of a separate family, 'Flindersiaceae,' to receive them."—S. J. R.

Flindersia is largely an Australian genus, only a few of its 18 species occurring outside the continent. Nearly all of the trees yield valuable timber, but Queensland Maple is the most highly prized. The chief botanical distinction between the two species furnishing the wood of that name is to be found in the fruits, those of *F. Pimenteliana* being echinate while those of *F. Brayleyana* are marked with mussel-shaped scars. Two additional species have been described (*Queensland Flora*, pp. 240–241. 1899), but White (*Proc. Linnean Soc., N. S. W.*, 46, pp. 325–326. 1921) considers that one of them, *F. Chatawaiana*, is not distinct from *F. Brayleyana*, and that the other, *F. Mazlini* is inseparable from *F. Pimenteliana*.

THE TREES AND TIMBER

According to Swain (*Timbers and forest products of Queensland*, p. 147. 1928), "Maple Silkwood (*Flindersia Brayleyana*) is a massive-trunked noble tree of compact umbrageous crown," attaining a height of 100 feet and a basal girth of 150 inches or more. The bark is ¾" to 1" thick, the outer part corky, the inner portion only moderately fibrous. The surface of the sapwood is marked with shallow longitudinal furrows.

The second species (*F. Pimenteliana*), sometimes known as Rose Silkwood, is a smaller tree with a less cylindrical trunk. The bark on logs received in Sydney is usually less than half an inch thick, comparatively smooth, though with small corky pustules and short transverse and longitudinal cracks; the outer part is less corky and the inner portion more fibrous than is the case with the first species. The surface of the sapwood ordinarily is not furrowed.

The two species are confined to the Atherton-Ravenshoe Tablelands in Northeastern Queensland, occurring in brush or rain forests. Swain says (*loc. cit.*, 148) that "a rough estimate of the quantity still available is 50,000,000 sup. ft." (A "superficial foot" is the measure of a board 12 inches square and 1 inch thick.)

Estimated cut.—The figures of annual cut supplied by the Provisional Forestry Board, Queensland, for three years are as follows (in super. feet): Crown lands: 1926–27, 1,770,980; 1927–28, 1,451,525; 1928–29, 2,309,062. The amount mar-

keted from private land is estimated to be between 800,000 and 1,000,000 ft.

Prices.—The timber market in Australia is so unsettled at present that too much reliance should not be placed in the following prices, which are recent Sidney quotations per 100 super. feet for logs, f.o.b. Cairns: 5′ to 5′ 11″ (girth), 19/–; 6′ to 6′ 11″, 28/–; 7′ to 7′ 11″, 38/–; 8′ to 8′ 11″, 48/–; 9′ to 9′ 11″, 49/–; 10′ to 10′ 11″, 50/–; 11′ to 11′ 11″, 51/–. At certain periods of the year, logs often are seriously damaged by shot-hole (ambrosia) beetles and the value of such timber may be reduced to as low as 4d. per super. ft.

The prevailing Sydney trade prices for boards are (per super. ft.): 4″ to 11″ wide, 1/2; 12″ wide and over, 1/2½ to 1/4.

Sawing, etc.—No special difficulty is experienced in sawing. Local sawyers state that Silkwood (*F. Pimenteliana*) is harder to cut than Maple (*F. Brayleyana*), being more "gritty." A shrinkage allowance of ⅜″ to ½″ is made in cutting 12″ boards.

Seasoning, either kiln or air, is not regarded as presenting any trouble; the bulk of the material used in Sydney is air-dried. Furniture made in Sydney from air-dried timber (moisture content about 13 per cent) is likely to show considerable shrinkage when sent to drier areas, and even in Sydney considerable damage sometimes results in summer from exposure of partially manufactured stock to a sudden severe drop in atmospheric humidity. The wood is moderately soft, and one large cabinet-manufacturing firm reports that the damage due to surface bruising in workshop handling and transport amounts to about 25 per cent, in contrast with about 1 per cent for Japanese Oak (*Quercus*).

Whereas straight-grained wood is easily finished with a plane, the more highly figured material requires scraping. It glues well, requires little filler, and polishes readily. The wood is commonly fumed to kill the pink tint, and it can be easily stained to match almost any wood, or bleached with oxalic acid.

Uses.—The wood is employed locally chiefly for cabinet work; also for interior joinery of all kinds including doors, window sashes, mouldings, skirtings, etc., office fittings, counters and show cases. In railway carriages it is used for inside work, such as longitudinal partition framing, panel and general framing, doors, and general finishing; in tramcars, for pillars and bent roof-sticks. It is also used for making athletic and sporting goods, rifle stocks, racing skiffs, and aeroplane propellers. It proved unsatisfactory for sheathing sea-plane floats, due to its excessive swelling when immersed in sea-water. It is very extensively employed for face veneers, mostly rotary or semi-rotary cut, though highly figured butt logs and roots are sliced. It is very satisfactory for carving and steam bending. Many former uses are no longer practicable since the increase in price has made it one of the most expensive timbers on the Sydney market.

Description of the Wood

Heartwood lustrous pink to reddish brown, gradually losing the pinkish tint upon exposure to light. Sapwood paler, ½″ to 2½″ thick; appears to be immune from attacks of powder-post borer (*Lyctus brunneus*), an especially desirable feature in the use of the wood for cabinet work and joinery. Without distinctive odor or taste.

Rather light and soft to moderately hard and heavy; sp. gr. (air-dry) 0.55 to 0.74; weight 35 to 46 lbs. per cu. ft. Wood may be straight-grained and plain, though always lustrous, or beautifully figured and exhibiting ribbon or roe grain, fiddle-back mottle, and various combinations. Occasional abnormal development of parenchyma gives rise to a well-marked flower figure on tangential or flat-sawn boards. Luster, figure, and ease of working combine to make it one of the finest cabinet woods in Australia.

Gross Anatomy

Growth rings not sharply defined, though indicated by variations in the number of pores and in color. Pores medium-sized; readily visible, being larger and more prominent in *Flindersia Brayleyana* than in *F. Pimenteliana;* usually uniformly distributed, but sometimes in concentric zones. Parenchyma often apparently absent, but sometimes in

distinct reddish brown, irregularly spaced, tangential bands which may be crowded and conspicuous, especially as seen on tangential surface. Rays fine, but visible on end and radial surfaces, appearing somewhat lighter than ground tissue. Vertical gum ducts of traumatic origin sometimes present in arcs or concentric lines.

MINUTE ANATOMY

Cross section: Growth rings usually indicated by fewer pores and thicker cell walls. Pores rather evenly distributed, occurring singly or in radially appressed groups of 2 to 6, or occasionally in short radial or oblique rows; no. per sq. mm.: (*F.B.*) 3 to 10, (*F.P.*) 5 to 18; solitary pores oval, variable in size; radial diam.: (*F.B.*) 60 to 330μ (av. 225μ), (*F.P.*) 60 to 230μ (av. 170μ); tang. diam.: (*F.B.*) 60 to 270μ (av. 165μ), (*F.P.*) 45 to 200μ; thickness of walls, 2 to 9μ. Tyloses not observed; insoluble, yellow to brown, amorphous deposits partially or completely occluding pores.

Wood fibers rather irregular in shape; av. diam. 20μ; walls moderately thick, up to 5μ, though often not exceeding 2μ; pits not prominent. Rays usually multiseriate; no. per mm. on cross section: (*F.B.*) 3 to 5, (*F.P.*) 5 to 7; cell contents brownish.

Wood parenchyma vasicentric or diffuse; occasionally present in pronounced metatracheal bands varying in width from several to 40 cells, and in extreme cases comprising half the cross-sectional area of the wood for a distance of a few centimeters, then almost completely disappearing; intercellular canals, gummosis type, may occur in these abnormal parenchymatous zones, usually originating schizo-lysigenously in the parenchyma, or occasionally lysigenously in the vessels and later in adjoining parenchyma; contents of canals generally clear, amorphous, yellow to orange, insoluble in all ordinary solvents and resembling "wound gum." Parenchyma cells commonly with brownish contents.

Radial section: Vessel segments usually with transverse end walls; end projections absent or occasionally prominent and up to 220μ long; perforations simple; pits between vessels numerous, with rather slit-like apertures and not very prominent borders; vessel-parenchyma pits small, crowded, oval, similar in appearance to other vascular pits except that their apertures are usually less elongated.

Wood fibers 750 to 1600μ long, with inconspicuous slit-like pits, without distinct borders; occasional fibers not fusiform, but irregular and tracheidal in shape, though without heavy pitting. Fibers often appear septate because of irregularly spaced fringes or plates of gum which vary considerably in thickness.

Rays almost homogeneous, although outer cells are somewhat shorter and wider; cell walls comparatively thin, without prominent pitting; contents granular or amorphous fringing material. Oil globules few, generally distributed. Wood parenchyma thin-walled, the cells in contact with vessels frequently very irregular and sometimes conjugate; chambered crystalliferous strands common.

Tangential section: Rays not storied, occasionally uniseriate, but mostly 3 to 6 cells wide, fusiform; max. height, 750μ; max. width, 75μ.

Material: The above descriptions are based on specimens in the Technological Museum collections.

RESULTS OF STATIC BENDING TESTS

Kind of test	*F. Brayleyana* Mean of results	*F. Pimenteliana* Mean of results
Fiber stress at prop. limit	8,610 lbs. per sq. in.	8,925 lbs. per sq. in.
Modulus of rupture.....	13,335 " " " "	13,280 " " " "
Modulus of elasticity....	1,649,000 " " " "	1,720,000 " " " "
Weight per cubic foot....	37 lbs.	39.3 lbs.
Moisture content.....	14 per cent	14.1 per cent

Local Names of the Woody Plants of British Honduras—Corrections and Additions

The publication in *Tropical Woods* No. 24 of a check list of the names of the woody plants of British Honduras has already served the useful purpose of bringing to light a few corrections and numerous additions.

Cabbage-bark (p. 17) is incorrect for the Soapseed Tree, *Sapindus Saponaria* L., and should be deleted.

Ceiba (p. 18), which is also called Cotton-tree, was inadvertently referred to *Gossypium mexicanum* instead of to *Ceiba pentandra* (L.) Gaertn.

Fiddlewood (p. 20) for *Dracaena americana* D. Sm. was a misnomer attributable to a mistake on the part of the collector. Mr. Neil S. Stevenson says the correct name is Candlewood.

Palo Sangre (p. 24) should, according to the same authority, be Sangre Palo.

The following list of Mayan names (Mopan dialect) is supplied by Mr. J. Eric Thompson, Department of Anthropology, Field Museum of Natural History. With the three exceptions marked "El Cayo," they are from southern British Honduras. One Ketchi name, from El Cayo, is also included.

MAYAN PLANT NAMES

Common name	*Botanical name*	*Family*
Baluch (Ketchi)	*Lonchocarpus* sp.	Leguminosae
Chi	*Byrsonima crassifolia* (L.) DC.	Malpighiaceae
Chiculte	*Swietenia macrophylla* King	Meliaceae
Chucchemuch	*Calderonia salvadorensis* Standl.	Rubiaceae
Chucul has	*Calocarpum mammosum* (L.) Pierre	Sapotaceae
Cucu	*Theobroma cacao* L.	Sterculiaceae
Dzalmuy	*Annona squamosa* L.	Annonaceae
Kushub	*Bixa orellana* L.	Bixaceae
Luch	*Crescentia cujete* L.	Bignoniaceae
Manash	*Pseudolmedia* sp.	Moraceae
On	*Persea americana* Mill.	Lauraceae
Oop	*Annona purpurea* M. & S.	Annonaceae
Osh	*Brosimum alicastrum* Swartz	Moraceae
Pichi (El Cayo)	*Psidium Guajava* L.	Myrtaceae
Pom	*Protium* sp.	Burseraceae
Posh (El Cayo)	*Annona cherimola* Mill.	Annonaceae
Put	*Carica papaya* L.	Caricaceae
Putah	*Psidium Guajava* L.	Myrtaceae
Shan	*Sabal mexicana* Mart.	Palmaceae
Tucib	*Annona cherimola* Mill.	Annonaceae
Tutz	*Attalea cohune* Morris	Palmaceae
Ya	*Achras Sapota* L.	Sapotaceae
Yasche	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Was (El Cayo)	*Crescentia cujete* L.	Bignoniaceae

Mr. Thompson has also supplied a short list of plants used medicinally. The vernacular names, with one exception, are Mayan (Mopan dialect). The botanical names are based on determinations by Mr. Paul C. Standley.

NAMES OF MEDICINAL PLANTS

Common name	*Botanical name*	*Family*
Caño Cristi (Spanish)	*Costus* sp.	Zingiberaceae
Cashlam pom	*Piper* sp.	Piperaceae
Edic	*Adiantum* sp.	Polypodiaceae
Eskis	*Peperomia* sp.	Piperaceae
Ishcoban	*Mikania* sp.	Compositae
Luch maash (monkey gourd, literally)	*Strychnos panamensis* Seem.	Loganiaceae
Uispon	*Piper* sp.	Piperaceae
Ukuch	*Solanum* sp.	Solanaceae
Wanche	*Stachytarpheta cayennensis* L. Rich.	Verbenaceae

THE YALE WOOD COLLECTIONS

Nearly 3500 wood samples were added to the collections of the Yale School of Forestry during the year 1930, bringing the total to more than 19,500, representing at least 1825 genera of 192 families. The largest single contribution ever received was from Field Museum of Natural History and consists of about 2100 specimens collected with herbarium material by Mr. L. Williams, who was in charge of the Peruvian division of the Marshall Field Expedition to the Amazon, as described elsewhere in this issue of *Tropical Woods*.

Other valuable additions, mostly of authentic specimens, include the following: AFRICA, EAST: Conservator of Forests, Kenya Colony. AFRICA, SOUTH: Mr. Nils Eckbo; Arnold Arboretum. AFRICA, WEST: Mr. C. Vigne (Gold Coast); Bot. Museum und Garten, Berlin (Togo); Forest Service, Ivory Coast; Mr. Jean Collardet (Misc.). ARGENTINA: Mr. Marcelo Noverraz. AUSTRALIA: Provisional Forestry Board, Queensland; Mr. R. K. Barratt, Adelaide; Arnold Arboretum. BRAZIL: Prof. A. J. de Sampaio; Field Museum of Natural History. CENTRAL AMERICA: Forest Department, British Honduras; Mr. F. H. Fischer (Panama). CEYLON: Mr. C. P. Jayawardana. COLOMBIA: Prof. Record and Mr. Henry Kuylen; Mr. Wm. R. Barbour. CUBA: Mr. G. C. Bucher, Santiago; Rev. Bro. León, Havana; Arnold Arboretum. ECUADOR: Dr. A. Rimbach, Riobamba. ENGLAND: Dr. L. Chalk. GERMANY: Institut für angewandte Botanik, Hamburg. INDIA: Div. Forest Officer, Kashmir; Arnold Arboretum. JAVA: Mr. C. Van de Koppel, Buitenzorg. MEXICO: Prof. C. Conzatti, Oaxaca. VENEZUELA: Dr. H. Pittier, Caracas; Tropical Plant Research Foundation, Washington, D. C. There were also important single specimens and trade samples too numerous to list here.

Owing to the rapid rate of accession and also to the fact that a great many determinations of herbarium specimens are pending it is considered advisable to delay the issuance of the proposed supplement to the mimeograph catalog distributed in December 1929. The distribution of classified material continues, and the following can be reported to supplement

the information contained in *Tropical Woods* 22: 2, June 1, 1930:

Anomalous Woods. Study of the anomaly of interxylary phloëm has been undertaken by Dr. L. Chalk, Imperial Forestry Institute, Oxford, England. The material so far forwarded to him represents at least 40 genera of 17 families.

Aceraceae. Available specimens of *Acer* were sent last November to Dr. Hans Meyer, Institut für angewandte Botanik, Hamburg.

Anacardiaceae. Dr. R. Kanehira, Kyushu Imperial University, Fukuoka, Japan, reported on December 19 that the study of the woods of this family was nearly finished.

Coniferae. Representative material of 11 genera of the families Cupressaceae, Pinaceae, Podocarpaceae, and Taxodiaceae were forwarded on November 21 to Prof. I. W. Bailey, Harvard University.

Mr. E. H. B. Boulton, Cambridge University, reports substantial progress in the study of coniferous woods, especially of the genus *Pinus*. Additional specimens of this genus have been forwarded to him.

Cunoniaceae. Fifty-five wood samples, representing 11 genera and at least 26 species, were sent last October to Mr. George Woronoff, Jardin Principal de Leningrad, U. S. S. R.

Euphorbiaceae. Dr. R. Kanehira reports progress in the study of this family, but states that it will require several months more to complete the project.

Malvaceae. Sixty-four samples, representing 16 genera and at least 29 species have been sent for systematic study to Dr. Irma E. Webber, 2083 Life Science Bldg., University of California, Berkeley, Calif.

Meliaceae. See "Current Literature" section of this issue, p. 47.

The editor is confident that these investigators would welcome additional specimens, publications, references, and suggestions pertaining to their problems.

Further contributions to the Yale collections are cordially solicited. Authentic samples of the woods of the less common trees, shrubs, and lianas from any locality are especially desired in connection with the systematic studies.

CONGRÈS INTERNATIONAL DU BOIS ET DE LA SYLVICULTURE

PARIS, JULY 1–5, 1931

This International Congress, which will be held under the auspices of the Exposition Internationale Coloniale, is being organized by the Touring Club of France in coöperation with the Direction Générale des Eaux et Forêts, the Direction Générale de l'Enseignement Technique, the Institut des Recherches Agronomiques, the Comité National des Bois Coloniaux, and the Groupe du Bois (XXVI) de la Confédération Générale de la Production Française. Its objects are:

To bring together all persons interested in forest protection, as well as in the world-wide production and consumption of wood;

To consider the economic, technical, industrial, and commercial questions involved, with a view to international agreements and to standardization;

To consider the legislative and administrative measures best adapted to the conservation and improvement of forests, the restoration of denuded areas, and the utilization of idle lands; and

To discover better ways of handling woods and of utilizing forest products.

The Congress will comprise four main groups: (1) Tropical and subtropical woods; (2) Silviculture, forest management, forest economics, and legislation; (3) The timber industry and international commerce; (4) Technical problems of the artisan in wood and the rôle of forests in art. The first group, which is under the direction of the Comité National des Bois Coloniaux, is divided into five sections, as follows:

I. Silviculture and Wood Technology
   - Forest management and administration.
   - Anatomy and identification of woods.
   - Timber testing.

II. Production.
   - Administration of timber concessions.
   - Logging methods and general woods operations.

III. Transport.
   - Technical and economic problems involved.

IV. Timber Trade.
- Trade names.
- World markets.
- Contracts and terms of sale.
- Stocks on hand.

V. Utilization.
- Sawing and milling.
- Veneers and plywood manufacture.
- Flooring and interior trim.
- Furniture and cabinet work.
- General construction, railway ties, etc.
- Special uses—cooperage, matches, etc.
- Chemical utilization—extracts, distillates, paper pulp, etc.
- Utilization of sawdust and other waste.

International Association of Wood Anatomists

The Congrès International du Bois et de la Sylviculture will be made the occasion for the second conference on wood anatomy provided for at the Cambridge meeting last August. (See *Tropical Woods* 24: 1–5.) The Organizing Committee invites all scientists and scientific institutions interested in the subject to participate in this conference.

Woods used for manicure sticks

During the past few months I have had occasion to identify the woods used in the manufacture of manicure sticks. In one lot of 17 specimens, representing 11 different brands, I found four kinds of woods, although each stick was branded "Genuine Orange Wood" or "Real Orange Wood." Eight of the sticks were of Orangewood (*Citrus*), five of Venezuelan "Boxwood" (*Casearia praecox*), three of *Euonymus*, and one of Black Gum (*Nyssa sylvatica*). This is the first time I have encountered *Euonymus* in manufactured articles. It is readily recognized by its spiral fiber-tracheids, in association with narrow rays and simple vessel perforations, the last two features serving to separate it from *Ilex*.—S. J. R.

CURRENT LITERATURE

Arboles y arbustos cultivados en la Argentina. III. (Leguminosae-Caesalpinioideae). By Enrique C. Clos and Raul Lahitte. *Boletin del Ministerio de Agricultura de la Nación* (Buenos Aires) 29: 3: 239–266, July–Sept. 1930. Illustrated with 7 plates and 36 text figs.

Contains well illustrated descriptions of 13 species of the following genera: *Pterogyne*, *Cercis*, *Bauhinia*, *Ceratonia*, *Cassia*, *Gleditschia*, *Parkinsonia*, *Caesalpinia*, *Peltophorum*, and *Holocalyx*. (For reference to previous contributions in this series see *Tropical Woods* 23: 24.)

The chemical composition of wood of *Trochodendron aralioides*. By Jean Wiertelak. *Journal of Forestry* (Washington, D. C.) 29: 1: 64–67, Jan. 1931.

Although *Trochodendron* is an Angiosperm, its wood simulates in several respects that of the Gymnosperms, notably in the absence of vessels and in "the form, structure, and arrangement of the tracheids."

"The purpose of the work reported here was to determine by a typical chemical analysis and by Mäule's reaction whether *Trochodendron aralioides* should be classed, at least from the chemical point of view, as a hardwood or as a softwood."

"Chemical analysis of wood of *Trochodendron aralioides* L. & Z., as well as the Mäule test, show that it corresponds fully with the hardwood type. The acetic acid content was found to be 7.42 per cent on the basis of the oven-dry wood, which, as far as the author is aware, is the highest ever obtained from a hardwood species."

Les Isles Philippines: L'exploitation des forêts. By Arthur F. Fischer. *Revue Internationale des Produits Coloniaux* (Paris) 5: 59: 450–452, Nov. 1930.

The Philippine Islands contain approximately 39,285,220 acres of exploitable and 7,198,300 acres of nonexploitable forests, the total comprising about 63.5 per cent of the entire

superficial area. The average stand of timber is estimated to be 10,000 cubic feet per acre, giving a total of 800 million cubic meters valued at 400 million dollars (U. S. currency). Three-fourths of the volume of the commercial timber in the virgin forests is of a single family, Dipterocarpaceae, and 75 per cent of this is of the following kinds: Red Lauan, 21 per cent; Apitong, 20; White Lauan (including Almon and Bagtican), 17; Tangile, 7; Guijo, 5; Yakal, 3; Mangasinoro and Palosapis, 1 per cent each.

The amount of timber cut annually on government lands has increased from 136,485,000 cu. ft. in 1919 to 535,723,000 cu. ft. in 1928, while the exports have risen in the same period from 6,813,256 cu. ft. to 85,897,736 cu. ft. The total consumption of native timber is estimated to be 610 million cu. ft., constituting only about 5 per cent of the increment. The government's forest revenue since the creation of the Bureau of Forestry April 14, 1900, to the close of 1928 has amounted to $9,442,116, while the expenditures have averaged half that amount.

Characteristic figure in Philippine woods. By Luis J. Reyes. *The Timberman* (Portland, Oregon) 31: 12: 99–100, Oct. 1930. Illustrated.

"In describing the grain of wood we employ the adjectives straight, wavy, and crossed to describe this character of alignment of the tissue in reference to the long axis of the tree. It should not be confused with the texture of wood, which refers to the size of the elements or group of elements and the width of growth rings. Fine-textured woods are those possessing small pores, and coarse-textured ones, those with large pores distinctly visible to the naked eye. On the other hand, straight, interlocked, and wavy grained woods are those where the fibers are arranged as indicated by the names.

"The characteristic grain or variations from normal wood in the native species may be grouped into four main types, namely, (1) those caused by an abnormal alignment of elements with reference to the longitudinal axis of the tree, such as crossed, or interlocked, and wavy; (2) those caused by the concentric arrangement of pores, parenchyma, and layers of

wood of varying density; (3) by the presence of conspicuously large rays such as those in Oaks, Katmons, Ardisias, and others; (4) those caused by knots or knot-like structures (bird's-eye); (5) and by the differently colored concentric bands of wood such as those in Dao (*Dracontomelum dao*), Kamagon (*Diospyros* spp.), and Sangilo (*Pistacia chinensis*).

"In the tropics, crossed or interlocked grained woods are more common than in the temperate zones. Certain woods have growth rings, which for a number of years run a bit inclined a few degrees to the left and for a similar length of time change the direction of growth to the right.[1] These alternating spiral growths vary in pitch from a few degrees up to 12.5 degrees in reference to the longitudinal axis of the tree, so that we find some woods with an angle of divergence of woody tissues as high as 25 degrees. In most Lauans the angle of divergence ranges from 6 to 16 degrees."

"Wavy grain is common . . . in Amugis (*Koordersiodendron pinnatum*), Bansalagin (*Mimusops* spp.), and Molave (*Vitex parviflora*). When viewed on the tangential side, the grain is wavy, but not conspicuous, as the fibers are cut through on the same plane, but on the radial side it shows a conspicuous corrugated appearance, as the fibers are cut at different planes. . . . Wavy grain in woods is of different types, not only in the size of corrugations, but also in their regularity. For instance, in curly Bansalagin (*Mimusops parvifolia*) the corrugations average 2.3 per cm., while the width varies from 1.5 to 5 mm. In Teak the corrugations are close, but they are less regular; on the other hand, among the Lauans, Apitong, and Palosapis, whenever present, the 'waves' are generally from one to seven centimeters apart. As may be expected, the more the fibers depart from the longitudinal axis the more beautiful the grain. The corruga-

[1] In all the cases I have investigated, interlocked grain arises from the arrangement of the elements in vertical *waves* rather than in true *spirals*. These waves are visible on the surface of peeled logs, and their length varies, as does also the width of the successive layers. The local effect is practically the same as that which would be brought about by alternate right and left spiral growths, but a difference is noticeable in long boards.—Editor.

tions are seldom, if ever, horizontal, but are almost always slightly diagonal.

"The following woods often have a wavy grain: Molave (*Vitex parviflora*), Amugis (*Koordersiodendron pinnatum*), Bansalagin (*Mimusops parvifolia*), Gisihan (*Aglaia laevigata*), Batitinan (*Lagerstroemia piriformis*), Narra (*Pterocarpus* spp.), Banuyo (*Wallaceodendron celebicum*), Tukang-kalau (*Aglaia Clarkii*), Lanete (*Wrightia* spp.), Nato (*Palaquium* spp.), Kalamansanai (*Neonauclea* spp.)."

"Narra (*Pterocarpus*), Kalantas (*Toona calantas*), Teak (*Tectona grandis*), Banaba (*Lagerstroemia speciosa*), and Batitinan (*Lagerstroemia piriformis*) all possess ring-porous woods."

"The common furniture and cabinet timbers with distinct concentric parenchyma bands are Supa (*Sindora supa*), Batete (*Kingiodendron alternifolium*), Palomaria (*Calophyllum inophyllum*), Piago (*Xylocarpus moluccensis*), Tabigi (*Xylocarpus granatum*), and Maranggo (*Azadirachta integrifoliola*).

"Certain woods like Tindalo (*Pahudia rhomboidea*), Ipil (*Intsia* spp.), Bahai (*Ormosia calavensis*), Kamatog (*Erythrophlœum densiflorum*), the various species of *Terminalia*, etc., show fluctuation of growth intensity. When such woods are plain sawn the boards exhibit a florid figure similar to ring-porous woods. The beauty of this grain is greatly augmented when accompanied by concentric parenchyma such as we find in Ipil and Tindalo."

"The mere mention of 'bird's-eye' grain at once suggests Maple, because the bird's-eye grain in this wood is impressive and is unlike any normal wood. Certain species found in the Philippines also possess similar grain at times. Among the most common of these are Arrangen (*Ganophyllum falcatum*), Maranggo (*Azadirachta integrifoliola*), Amugis (*Koordersiodendron pinnatum*), Malapaho (*Mangifera monandra*), and several others. The 'eyes' are best observed in the tangential section. They appear as knots, rounded or spindle-shaped, varying in diameter from one-sixteenth to one-half inch. On the cross section they are not conspicuous, as they appear like compound wood rays which increase in size from the pith

outward. On the radial face they form broad homogeneous lines running across the board somewhat similar to quartered Oak. The greater the number of knots and the closer they are set, the more conspicuous the bird's-eye grain. It is not known exactly what causes such abnormal features, but we know that the center of the knot is composed of thin-walled parenchyma cells very similar to the pith or medulla and is surrounded by wood fibers distorted in various ways."[2]

"In certain species like Kamagon and Dao we often observe bands of dark-colored wood running along the grain. These bands, which are differently colored from the rest of the woody tissue, are heavily loaded with infiltration matters such as tannins, resins, gum, etc., which make them appear distinct. These color bandings, when viewed on the transverse section of logs, appear in a general way to follow the growth rings and are therefore concentric in their arrangement. These should not be confused with similar markings caused by rot (fungi), which are very irregular in their course and do not as a general rule follow the growth rings. Such markings are to be found in perishable species such as in the various species of *Ficus*, *Sideroxylon*, *Myristica*, *Knema*, etc. Figures caused by concentric bands are characteristic of the various species of Kamagon (*Diospyros discolor*), Bolong-eta (*Diospyros pilosanthera*), *D. Poncei*, etc., and Ebony (*Maba buxifolia*), Dao (*Dracontomelum dao*), and Pahutan (*Mangifera altissima*), in which the alternating bands are dark reddish brown and black. In Narek (*Balanocarpus cagayanensis*) and Sangilo (*Pistacia chinesis*) the bands are greenish or dark green with a background of light yellow wood; while in Malambingan (*Allœanthus glaber*) the alternating bands are variously colored, consisting of shades of gray, brown, and pink. In some species like Lanete, Palosapis, etc., pink bands are occasionally present, but these fade out or become indistinct when the wood becomes dry."

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[2] This is the bud type of "bird's-eye" one finds in burls, and the surface of a burl is spiny. In true Bird's-eye Maple, however, the "eyes" have no center of pith and the surface of the log is pitted, with corresponding spiny projections on the inner bark. The cause is unknown.—EDITOR.

Commercial volume tables for sal (*Shorea robusta*) in the wet mixed forests of the Bengal Duars. By PARMA NAND SURI. *Indian Forest Records* (silv. ser.) 13: 3, Calcutta, 1928; illustrated. Price 8d.

Volume tables for sundri (*Heritiera Fomes* Buch., syn. *Heritiera minor* Roxb.) in the Sundarbans, Bengal. By PARMA NAND SURI. *Indian Forest Records* (silv. ser.) 13: 4, Calcutta, 1928; illustrated. Price 1s.

Slash in chir pine (*Pinus longifolia*) forests: Causes of formation, its influence and treatment. By J. E. C. TURNER. *Indian Forest Records* (silv. ser.) 13: 7, Calcutta, 1928; illustrated. Price 5s. 9d.

"Comprehensively defined, Chir slash includes all *débris* resulting from operations involving the felling and utilization of Chir trees, and also from the destruction of trees of this species by such agencies as wind, snow, fire, lightning, floods, landslips, insects, and fungi."

"The treatment of slash, whatever may be the cause of formation, occupies a place of the utmost practical importance in the silviculture of Chir Pine forests. . . . The object ever to be borne in mind is everywhere to reduce the inflammability of the forests, and so automatically to reduce to the very minimum the danger to reproduction and stands of all ages."

Commercial timber (katha) and heartwood volume tables for khair (*Acacia catechu* Willd.) in North India. By H. G. CHAMPION, ISHWAR DAS MAHENDRU, and PARMA NAND SURI. *Indian Forest Records* 13: 9, Calcutta, 1929; illustrated. Price 1s. 6d.

Federated Malay States. Report on forest administration for the year 1929. By J. P. MEAD. **Forest department, timber branch, annual report, 1929.** By F. W. FOXWORTHY.

Mr. G. E. S. Cubitt retired on December 13th after 33 years' service in the East. "The recognition by the Government of the importance of forest research was one of Mr.

Cubitt's greatest achievements. Sanction for the building of a forest research institute was first given in 1927; work was commenced in April 1928, and the main building was completed in September 1929. The institute is situated about nine miles from Kuala Lumpur near the village of Kepong in an area of about 1000 acres of land suitable for plantations and other experimental work. The cost of the institute and of the staff quarters was $389,022.

"The Research Branch removed to Kepong in September. The work of the branch is being organized under the following sections: General, botanical; silvicultural, including working plans; economic; chemical; zoological; school."

Durability of Malayan timbers. I. Untreated timbers. By F. W. FOXWORTHY. **II. Treated timbers.** By F. W. FOXWORTHY and H. W. WOOLLEY. **III. A note on termites.** By H. M. PENDLEBURY. *Malayan Forest Records* No. 8, 1930. Pp. 60; 7¼ x 10½; illustrated. Price 2s. 6d.

"The tests [on untreated timbers] started on September 7, 1918, with 127 pieces representing 21 kinds of wood, and were continued for ten years, a total of more than 5600 pieces of wood being examined.

"Trenches were dug to a depth of 15 or 18 inches. The pieces of wood to be tested were two feet long and two inches square. Sound and seasoned wood was chosen whenever it was available, but it was often necessary to use wood which was only partially seasoned. The pieces were placed in the trenches with a slight uphill slope, and projecting from 3 to 6 inches above the surface of the ground. The trenches were then filled in to the former ground level and loose brush and leaves were piled over the top. The brush was used to attract insects, because it was not known whether the place had many insects, although several termite nests had been found in the vicinity, two or three of them in the area occupied by the trenches. The first examination showed that termites were present in such great numbers that loose brush was not needed to attract them and it was not used after the first six months.

"The closed trenches were left undisturbed for a half year and were then reopened, each piece being carefully examined

and its condition recorded. The pieces that had not been destroyed were returned to the trenches and these were closed again. This process was repeated at intervals of about half a year; and at the time of each examination, such new material as was available was added. . . .

"More than 100 kinds of local woods have been included in our tests, and well-known woods from other countries have been added, for comparison, as there was opportunity."

SUMMARIES AND CONCLUSIONS

"1. Under the conditions of our test, fungus attack is of relatively minor importance, and pieces are usually destroyed mainly by insect attack.

"2. No wood that has been tested is immune to the attacks of termites.

"3. Any wood that lasts for as much as five years under the conditions of these tests, may be considered durable. Woods that have had no pieces destroyed in five years are—Bebras [Burseraceae]; Betis [mostly *Madhuca utilis*]; Belian [*Eusideroxylon Zwageri*]; Chengal [*Balanocarpus Heimii*]; Damar Laut Daun Kechil [*Shorea utilis*]; Giam [*Hopea nutans*]; Greenheart [*Nectandra Rodioei*]; Ingyin [*Pentacme siamensis*]; Jahar [*Cassia siamea*]; Kumus [*Shorea ciliata*]; Pyinkado [*Xylia dolobriformis*]; Sama Rupa [*Shorea* sp.]; Surian Batu [Meliaceae].

"4. Pieces containing sapwood were destroyed more quickly than those that were all heartwood.

"5. Hardness does not prevent insect attack. Kempas, a very hard wood, is very quickly attacked and is sometimes destroyed within six months."

De djativerjonging in de houtvesterij Goendih. By F. KRAMER. No. 18, *Korte Mededeelingen van het Boschbouwproefstation*, Buitenzorg, Java, 1930. Pp. 66; 6¼ x 9½; illustrated.

The Goendih forest district is situated on a chain of hills in the center of Java and the conditions of soil and site are very unfavorable to the development of Teak forests. This report describes the different methods of regeneration attempted and suggests the lines along which further experiments should be conducted.

Onderzoekingen over eenige physische eigenschappen van het hout van den djati, *Tectona grandis* L.f., en van de beide mahoniesoorten, *Swietenia macrophylla* King en *Swietenia Mahagoni* Jacq. Compiled by CH. COSTER from experiments by D. H. IMMINK. **De invloed van het ringen op de eigenschappen van het djatihout (*Tectona grandis* L.f.), voornamelijk op het scheuren daarvan.** By CH. COSTER. No. 18, *Mededeelingen van het Boschbouwproefstation*, Buitenzorg, Java, 1930. Pp. 276; 6¼ x 9½; illustrated.

The Teakwood specimens used in these experiments were obtained in various parts of Java and consisted of 6 logs from living trees and 12 logs from trees which had been girdled for from two to three years. One fresh Mahogany log of each species was obtained from local plantations.

The results of the tests on the physical properties of Teak and Mahogany, as given in the first paper, are very interesting and suggestive, but frequently are too contradictory to be conclusive.

The influence of girdling on the properties of Teak, with particular reference to the checking of the wood, is summarized as follows: Girdling Teak two to three years before felling has no influence on the subsequent checking of the wood or upon its physical properties. Girdling appears not to affect the durability and commercial value of the timber in any way, and is useless as a means for seasoning Teak.

Australia. Sound practice in the air seasoning of boards. Trade Circ. No. 1, pub. by Div. of For. Products, Council for Sci. & Ind. Research, Melbourne, 1930. Pp. 11; 6 x 9½; 1 text fig.

"The series of circulars to the timber trade, of which this is the first to be issued, is intended to cover varied aspects of the treatment of timber . . . in language suitable to the practical timber miller."

Australia. The testing of timber for moisture content. Trade Circ. No. 2, Div. of For. Products, Council for Sci. & Ind. Research, Melbourne, 1930. Pp. 8; 6 x 9½; 1 text fig.

"So many inquiries are received by this Division as to how to proceed to determine moisture content in timber that it has been decided to issue this circular. There seems to be some idea that the necessary instruments are very costly and the process difficult. This is not so, and every timber-miller should possess the proper apparatus, which need cost only a few pounds."

Some aspects of wood preservation in Australia. By J. E. CUMMINS, H. E. DADSWELL, and G. F. HILL. Reprint, *Journ. of the Council for Sci. & Ind. Research*, Melbourne, Aug. 1930, pp. 14.

Consists of three papers by the three authors, respectively. The subjects are: (1) Economics and problems of preservative treatment; (2) Chemical aspects of wood preservation; (3) Termites (white ants).

Man and the forest in Northern Nyasaland. By P. TOPHAM. *Empire Forestry Journal* 9: 2: 213–220, 1930.

"The area here described lies to the west of Lake Nyasa, bounded on the south by Portuguese East Africa (Tete Province), on the west by North Eastern Rhodesia, on the north approximately by the latitude eleven degrees south, and on the east by the shore of Nyasa. This excludes the most northerly district of the Protectorate, also the southern part of the country which contains the larger and older European settlements. The area under review is some two hundred and forty miles in length and from forty to a hundred miles in width.

"The configuration of the country is very briefly as follows: going from east to west, first of all there is the Great Rift Valley, in which lies Nyasa and a bordering plain. After a few miles this plain gives way to a region of foothills and ridges, outliers of the west sides of the Rift Valley itself. This

west side, which rises, sometimes as one escarpment but usually as a series of ever-enlarging ridges, culminates in a chain of hills and mountains between five thousand and eight thousand feet high. To the west again, as far as Rhodesia, there extends a monotonous plateau, broken by kopjes of granite, and generally between three and four thousand feet above sea level.

"In a country with so varied a section there is much variety in climate. Also there are many different types of vegetation. The main vegetational types can broadly be divided into classes: firstly, the deciduous, which is nearly leafless for some months each year, and secondly, the evergreen or nearly evergreen, in which the period without leaves is very short, the young leaves immediately replacing the old. Both these types are composed of forest, woodland, or savannah, or sometimes a very green savannah usually much cleared for cultivation. A third type is the climatic grassland. The first type includes much savannah of small trees of *Combretum* and *Acacia*. The second includes woodland characterized by many trees of the genus *Brachystegia*, especially round the hills. It also includes forests of many types where local conditions of soil moisture are favorable to luxuriant growth. These are to be found on the tops of high hills, very small areas of a truly evergreen type of mountain forest, containing such trees as *Chrysophyllum*, *Apodytes*, *Olea*, some Rubiaceae and Meliaceae. These evergreen areas depend apparently on mists to relieve the seven months' dry season, common to most of the country. The grassland forms a belt between this mountain forest and the *Brachystegia* type, but is generally of small extent except in the north."

"Away from alluvial soil, farming methods are, and have been for a long time, of the type known as 'shifting cultivation.' The general outlines of the system of shifting cultivation are well known. Originally it was the continual clearance of virgin forest in order to grow a crop for two or three years. With slightly denser population it entails a return to land which formerly was cleared, but upon which the forest has grown again, causing the soil to regain its fertility; in this way

trees become a fallow crop. It is possible with a rotation of this kind for a state of equilibrium to be attained in some kinds of forest. Trouble arises, however, when the rotation becomes too short to allow the soil to regain its fertility to the full. Other factors also lead to the impoverishment of the ground, such as the continuance of cultivation for so long a period as to exhaust the soil exceptionally, the annual burning of the grass, which often prevents natural regeneration of the forest from being effective, and, above all, soil erosion. These troubles follow essentially in the wake of overcrowding."

"One point stands out clearly—that forest on fallow land is the only proved agricultural method that gives success. Apart from its use in supplying timber, poles and fuel, as a means of conserving water supplies, and as a check on soil erosion, it remains a prime necessity for refertilizing the soil for agriculture. If this remains unrecognized, there is every possibility that Nature may restore its balance by its age-old methods of famine and disease."

Rhodesia. Utilization of wood. By T. L. WILKINSON. Bul. No. 763, Minister of Agr. & Lands, Salisbury, Nov. 1929. Pp. 21; 6 x 9¾; 4 half-tones.

"Limited research, which has been possible in the past, has indicated that many Rhodesian timbers considered useless have, if correctly handled, a considerable economic value. In order that a more complete utilization of the large timber resources of Rhodesia may be effected and the extremely high imports may be considerably reduced, an outline of the best methods of handling native and locally grown timber will be given in a series of articles." This article deals with the seasoning of wood.

The utilization of wood in Southern Rhodesia. Conversion and disposal of timber. By T. L. WILKINSON. Bul. No. 778, Minister of Agr. & Lands, Salisbury, Apr. 1930. Pp. 15; 6 x 9¾; illustrated.

Describes briefly "how timber may be prepared for market or, alternatively, converted on the farm."

Forestry in Southern Rhodesia. The utilization of wood. By T. L. WILKINSON. Bul. No. 769, Minister Agr. & Lands, Salisbury, Jan. 1930. Pp. 16; 6 x 9½; illustrated.

A concise, practical guide to the preservative treatment of timber by farmers.

Forests and forestry in Southern Rhodesia. By J. S. HENKEL. Bul. No. 1, Minister of Agriculture & Lands, Salisbury, June 1930. Pp. 16; 6 x 9¾.

"The Colony is comparatively well-wooded, being covered more or less with trees and shrubs, over about 60 per cent of the entire area. The great age of the Rhodesian plateau, together with its geographical position, physical features and summer rainfall, has resulted in many striking features in the vegetative covering. Until careful botanical surveys have been made it is difficult to distinguish and classify types in what appears, at first sight, an extraordinary mixture of trees, shrubs, grasses and herbaceous plants. In a general way, however, the vegetation consists of woodland and grassland. The woodland may have its trees large or small, widely spaced or closely spaced. This woodland is found in two groups or types: —First, the *close type* or *high forest*, and, second, the *savannah forest* or *tree-veld*. In the former the trees are always crowded, usually evergreen, produce dense shade and have no grass undergrowth or such a small quantity as not to form a feature. By the latter is understood a mixture of trees and grass—grass is always associated with the type. In many places there is no clear or distinct line separating woodland from grassland. The woodlands sometimes end abruptly; in other instances they thin out gradually with clumps, often on termite mounds, closely or widely spaced or as single trees here and there, and when these disappear open grassland dominates.

"With the exception of a small portion on the mountain range which forms part of the eastern border, where high or close type of evergreen forests occur, and along stream banks throughout the Colony, the woodland is of the tree-veld type with a park-like general appearance. In some parts the tree-veld is comparatively open, with a few shrubs and abundant

grass. In others the trees and associated shrubs are close together and grasses are less conspicuous. Where moisture and soil conditions are especially favorable, the tree-veld approximates to the close type forest in character. Most of the tree-veld trees are deciduous, though the leafless stage may only last a few days or many months, depending upon the season. An evergreen character is given by irregular flushing into leaf and by the presence of some evergreen trees. In some cases these evergreen trees are the dominant species.

"As would be expected, the close type or high forest contains trees of large dimensions and tall growth. In the stream-bank forests which fringe many of the streams and rivers intersecting the country, tall trees of large girth are met with as well. For the rest of the woodland type, namely, the tree-veld, the trees as a rule have short boles, with large spreading crowns, and, according to locality and soil conditions, vary in height from ten to sixty feet and up to three or more feet in diameter. In specially favorable localities the trees approximate the close type forest, and the stems in these cases are longer and the crowns smaller. The smaller dimensions usually occur in areas of shallow soil, dry or very wet situations, or where certain species are on the margins of their natural limits.

"The primeval conditions existing before the advent of Europeans have been considerably altered, and man's interference is rapidly bringing about changes. Yet notwithstanding man's interference it is surprising to note the vigor displayed by many species. Cut-over areas are soon restocked by coppice or sucker growth or by seedlings. In certain areas the accidental or wilful burning of the vegetation by hunters to secure early green grass or facilitate the pursuit of game has resulted in the destruction of tree growth over hundreds of square miles. The annual or periodic fires which sweep through the tree-veld of the country from end to end, while not doing excessive injury to the virgin woodland, yet cause persistent killing back of young growth. One of the astonishing sights is to note the density of the coppice or root-sucker growth which appears after a fire has swept through the tree-veld."

The utilization of wood in Southern Rhodesia. Fencing. By T. L. WILKINSON. Bul. No. 791, Minister Agr. & Lands, Salisbury, Aug. 1930. Pp. 15; 6 x 9¾; illustrated.

"This is the first of a series of articles in which an endeavor will be made to demonstrate how a more complete utilization of local timbers may be obtained."

Empattements, contreforts, racines-échasses. By É. DE WILDEMAN. *Bulletins de la Classe des Sciences* (5th ser.) 16: 8: 989–995, Brussels, 1930. Illustrated with 5 half-tone plates.

This paper is supplementary to the author's previous discussion of the formation and significance of buttresses and root spurs on certain tropical trees. (See *Le forêts congolaises et leurs principales essences économiques*, Brussels, 1926, pp. 87–98.) Its purpose is to show that aerial and stilt roots are simply modifications of buttresses and serve the same purpose, namely, to compensate for the lack of a taproot, (1) by supplying greater mechanical support and (2) by making available a wider nutritional area. The phenomena represent adaptations to special conditions of site, and the inherent tendencies to such formations are not always sufficiently established to constitute specificity. The paper is illustrated with five excellent photographs by Mr. Corbisier-Baland, showing the stilt roots of different species of *Uapaca* in the Belgian Congo.

Les bois du Gabon. By A. BERTIN. Vol. II (2nd edition), Mission d'Études Forestières envoyée dans les Colonies Françaises, Paris, 1929. Pp. 304; 6½ x 10; illustrated.

This second edition contains revisions and corrections by Col. A. Bertin, Conservateur H. C. des Eaux et Forêts and Conseiller technique du Ministère des Colonies. The first edition was published in 1918 and is one of a series which includes: I. Les bois de la Côte d'Ivoire; II. Les bois du Gabon; III. La question forestière coloniale (2 vols.); IV. Les bois du Cameroun; V. Les bois de la Guyane française et du Brésil.

La production de l'okoumé au Gabon. By ANDRÉ POUZIN. *Revue Internationale des Produits Coloniaux* (Paris) 5: 58: 381–385, October 1930.

The European consumption of Okoumé is about 300,000 tons annually, while the production in 1930 was expected to exceed this requirement by about 100,000 tons. The author recommends that the annual cut be limited to 300,000 tons, that the diameter limit be increased, and that the quality of the logs for export be improved.

Sample plot surveys in the Cameroons rain forest. By J. MILDBRAED. Translated from the German by H. M. HEYDER. *Empire Forestry Journal* 9: 2: 242–266, 1930.

This makes available in English the complete text of this valuable report first published in *Notizblatt des Bot. Gart. u. Mus. Berlin-Dahlem* 10: 99: 951–976, March 1930. (See *Tropical Woods* 23: 38, Sept. 1930.)

Taungya method of regeneration in Nigeria. By JAMES D. KENNEDY. *Empire Forestry Journal* 9: 2: 221–225, 1930.

"The forests of this [Sapoba] district are of the rain type and the Sapoba Forest Reserve is one of the richest areas of Meliaceous forest on the West African coast.

"At Sapoba, the trees attain a great height and many of the species have enormous, wide-spreading, sharp buttresses, which extend up the bole to a height of 20 feet or so. The dominant species are *Gossweilerodendron balsamiferum*, Pink Mahogany; *Cylicodiscus gabunensis*, African Greenheart, and *Entandrophragma cylindricum*, Sapelewood, all of which frequently exceed 200 feet in height and have a girth up to 45 feet.

"Trees of such large girths are frequently left untouched by the timber concessionaires on account of extraction difficulties. In accessible areas these forests have been extensively worked under a form of the selection system combined with a minimum girth limit and now there are considerable areas of worked-out forest. The question of regenerating these areas and the forests destroyed by the axe and fire of the shifting

cultivator is occupying the attention of the Forestry Department.

"The sub-dominant species are *Entandrophragma Candollei*, Stinking Mahogany; *Entandrophragma septentrionale*, Brown Mahogany; *Khaya ivorensis*, Benin Wood or Lagos Mahogany; *Guarea Thompsonii* and *Guarea Kennedyi*, Sapelewoods; *Lovoa Klaineana*, African Walnut; *Chlorophora excelsa*, Iroko; *Piptadenia africana; Canarium Schweinfurthii; Distemonanthus Benthamianus; Triplochiton scleroxylon*, African White Wood or Obeche; *Afzelia bipindensis*, similar to Rhodesian Mahogany; *Petersia africana*, *Pycnanthus kombo*, the African Nutmeg, and *Antiaris africana*, the Upas Tree."

"With the aid of taungya, and a well-considered sequence of areas, extensive plantations could be cheaply formed, which in time would produce a compact block and provide a cheap and constant fuel supply, while at the same time the fertility of the soil would be improved instead of being impoverished or rendered infertile as at present by the wasteful system of shifting cultivation and general abuse by the native population."

"In view of the fact that some of the best forests of Meliaceae in Nigeria are found at Sapoba, species belonging to that family are of primary importance, but it should be borne in mind that the planting of pure crops of Mahogany over extensive areas is not recommended on account of the prevalence of the shoot and other borers. Up to date the main crops have consisted of *Sarcocephalus esculentus* with lines of various Meliaceae, and fillings have been done with similar species. The practice has been to concentrate on a few indigenous species, and preferably species of rapid growth which were found previously on the actual area to be regenerated."

Plants of the Gold Coast. By F. R. IRVINE. Oxford Univ. Press, 1930. Pp. 521 lxxix; 5 x 7¾; ill. with 36 half-tone plates and 34 text figs.

The work represents the first attempt to revise and augment Dr. T. F. Chipp's lists of *Trees, Shrubs, and Climbers of the Gold Coast*, and *Herbs and Undershrubs of the Gold Coast*,

and it contains about 1200 species of flowering plants out of an estimated total of 2000 or more for the Colony. The contents of the book include: Introduction; List of economic plants (arranged according to uses); Botanical index (genera arranged by families); Alphabetical list of plants (arranged by genera, with vernacular names, descriptive notes, medicinal and other uses, etc.); Indexes to vernacular names.

"In the only list of Gold Coast names published to date by Dr. T. F. Chipp, their spelling is standardized according to the system suggested by the Royal Geographical Society. While this is useful from the European traveller's point of view it is not being adopted here as this book is regarded primarily as being a Gold Coast book for the use of Gold Coast people. An attempt has therefore been made to put the 3000 odd names given here in the new script as recommended by Dr. Westermann and the International Institute of African Languages and Cultures. . . . For the benefit of Africans and Europeans not familiar with the new script characters, a brief explanation of the sounds that they represent is given."

Le déboisement du Sénégal. By AUGUSTE CHEVALIER. *Actes & Comptes Rendus de l'Association Colonies-Sciences* (Paris) 6: 65: 225–230, Nov. 1930.

Professor Chevalier calls attention to the rapid destruction of the forests in certain parts of Senegal, largely as a result of the great extension of peanut culture. The effect on the climate and water supply threatens to become serious unless adequate remedial measures are at once undertaken.

Les acajous. Les *Khaya* sont-ils des Acajous? By JEAN COLLARDET. *Actes & Comptes Rendus de l'Association Colonies-Sciences* (Paris) 6: 64: 197–209, Oct. 1930.

Presents the results of comparative tests on the woods of *Khaya* and *Swietenia*, with a convincing argument that *Khaya*, no matter from what point of view considered, is fully entitled to the generic name of Mahogany (Acajou). It is shown that every quality of *Swietenia* wood finds its counterpart in *Khaya*. Weight for weight, the strength values of the African timber are equal to or even in excess of those of the

American; in fact the Service Technique de l'Aéronautique Française has long considered *S. Mahogani* unsatisfactory because it is too heavy in proportion to its resistance to compression. A table is included, giving the results of laboratory tests on the physical and mechanical properties of six species of *Swietenia* and two of *Khaya*, the work of Mr. J. Fulconis. The whole constitutes a highly valuable contribution to our knowledge of these important timbers.

Comparative anatomy of the woods of the Meliaceae. By DAVID A. KRIBS. *American Journal of Botany* 17: 8: 724–738, Oct. 1930.

A summary of the results of an investigation carried on at the Yale School of Forestry while the author was the holder of a Sterling Fellowship in Botany, "in an endeavor to throw light on the classification of the Meliaceae by a study of the comparative anatomy of the wood of its species, supplementing data from this source by facts from gross morphology." The specimens examined represented 36 genera and 112 species out of a total for the family of about 40 genera and 1217 species.

The paper contains: (1) Characteristics of the Meliaceae on the basis of wood structure (short descriptions of the gross and minute anatomy); (2) A natural key to the genera on the basis of morphological characters (compiled from the gross morphological descriptions given by 16 authors); (3) A natural key to the genera on the basis of wood structure; (4) An artificial key to the genera on the basis of wood structure; (5) Conclusions; (6) Literature cited.

CONCLUSIONS

"The three important systems of classification concerning the Meliaceae are those of Harms, DeCandolle, and Bentham & Hooker. Harms has divided the family into three subfamilies as follows: (1) Cedreloideae, with two tribes: Cedreleae and Ptaeroxyleae; (2) Swietenioideae; (3) Melioideae, with six tribes: Carapeae, Turræeae, Vavæeae, Melieae, Azadirachteae, and Trichilieae. The systems of DeCandolle and Bentham & Hooker are somewhat similar, the family in

each case being divided into four tribes: Melieae, Trichilieae, Swietenieae, and Cedreleae. DeCandolle, however, is the only one who includes *Carapa* with the Swietenieae.

"Although the writer has followed somewhat all three classifications, he has tried to construct a key on the basis of gross morphological characters which will conform more closely to the key derived from the structure of the wood. Such conformity obtains in the keys presented, at least with respect to the larger groups, *i.e.*, the sub-families Swietenioideae, Melioideae, and Lovoinoideae.

"The genera *Cedrela*, *Carapa*, and *Xylocarpus* have been transferred to the sub-family Swietenioideae, using as primary morphological characters the number of ovules in each cell of the ovary, and also on the basis of wood structure.

"The genus *Lovoa* has been set aside by itself in the sub-family Lovoinoideae on the basis of gross morphological and anatomical characters.

"The genera *Chloroxylon*, *Flindersia*, and *Ptaeroxylon* have caused botanists considerable trouble. Bentham & Hooker and DeCandolle have placed *Chloroxylon* and *Flindersia* with the Meliaceae and *Ptaeroxylon* with the Sapindaceae. Engler & Prantl have included *Chloroxylon* and *Flindersia* with the Rutaceae and *Ptaeroxylon* with the Meliaceae.

"According to Solereder, the Rutaceae are characterized in a definite manner by the presence of schizogenous secretory cavities in the ground-tissue of the branches and of the leaf, giving rise to transparent dots on the leaf surface. The Meliaceae are characterized by the occurrence of secretory cells in the leaf-tissue and in the pith and cortex of the axes. The secretory cells are absent from the leaf in the genera *Chloroxylon* and *Flindersia*, but are present in the cortical tissue of the axes. Moreover, these two genera are further characterized by the occurrence of secretory cavities in the tissue of the leaf and cortex, and for this reason Engler transferred them to the Rutaceae. Capsular fruits, winged seeds, and ovaries with from 4–8 ovules in each cell must have been deciding factors for placing the two genera with the Meliaceae. The presence of secretory cells in the leaves of *Ptaeroxylon* caused Radlkofer to transfer this genus to the Meliaceae.

The writer, after examining the woods of the three genera in question, decided that they resemble more closely those of the Rutaceae and therefore has not included them in the Meliaceae.

"The results of the present investigation show, as the family now stands, great variation in both physical and anatomical characters. In fact they vary to such an extent that the writer has been unable to find a set of characters which will distinguish Meliaceae, as a whole, from other dicotyledonous families. There is also great variation in gross morphological characters.

"The Swietenioideae is the only sub-family in which the genera form a distinct homogeneous group in respect to anatomical and morphological characters and it is the writer's opinion that it should be raised to the rank of a family, to be known as the Swieteniaceae.

"When terminal parenchyma is found in *Khaya*, the woods of *Swietenia*, *Khaya*, and *Pseudocedrela* are indistinguishable, with the exception that the woods of *Khaya* and *Pseudocedrela* have broader rays and *Pseudocedrela* is aromatic when fresh.

"The sub-family Melioideae has been divided into three sections, *A*, *B*, and *C*, on the basis of morphological characters. Although these groups conform more closely than any others to the groupings derived from anatomical characters, the writer has found it impossible to get perfect anatomical and morphological correlation between certain genera within the various sections. If the groups are perfectly homogeneous in regard to wood structure, the morphological characters are not, and *vice versa*.

"In the Melioideae, section *B*, sub-section *I*, the genera *Trichilia*, *Heynea*, *Aphanamixis*, *Amoora*, *Synoum*, *Guarea*, *Chisocheton*, *Dysoxylum*, and *Cabralea* are characterized by simple pinnate or trifoliolate leaves, coriaceous capsules, ovary more than one-celled; and *Turreanthus* by a fleshy capsule and ovary one-celled. The chief anatomical characters are: heterogeneous rays (homogeneous in *Guarea*); fibers with bordered pits; wood parenchyma with numerous crystals in long chains (crystals absent in *Aphanamixis* and *Cabralea*). With the exception of *Amoora* and *Turreanthus* the wood parenchyma

occurs metatracheal in continuous to broken tangential lines 3 to 9 per mm. In *Amoora* and *Turreanthus* the parenchyma is diffuse and scarce.

"In the Melioideae, section *B*, sub-section *II*, the genera *Cipadessa*, *Walsura*, *Lansium*, *Sandoricum*, *Aglaia*, *Ekebergia*, *Owenia*, and *Azadirachta* are characterized by simple pinnate or trifoliolate leaves, fruit berry-like (seed-like in *Azadirachta* and drupaceous in *Owenia*). The anatomical characters of the wood are: heterogeneous rays (homogeneous in *Ekebergia* and *Walsura*); fibers with bordered pits; wood parenchyma with crystals in long chains. *Cipadessa*, *Sandoricum*, *Ekebergia*, *Owenia*, and *Azadirachta* are characterized by terminal parenchyma in concentric lines 2 to 10 mm. apart; *Walsura*, *Lansium*, and *Aglaia* by metatracheal wood parenchyma in closely spaced tangential lines 3 to 9 per mm.

"The genera *Reinwardtiodendron*, *Turræa*, *Vavæa*, and *Quivisia* are the only members of the family with exclusively simple leaves. The last three genera form a homogeneous group in respect to wood structure and are the most primitive. The wood parenchyma is very scarce and diffuse; the rays are decidedly heterogeneous, *Turræa* and *Quivisia* contain uniseriate tips several times the length of the multiseriate portion; the vessels are minute and the end walls of the segments are strongly oblique. *Reinwardtiodendron*, however, with the exception of simple leaves, is very close to *Lansium* from a morphological and anatomical standpoint.

"There is some doubt in the minds of botanists as to whether *Toona* is a distinct genus. Most of the English botanists have included *Toona* with *Cedrela*. Harms retains *Toona* as a separate genus and makes the following distinction.

1. Seeds winged only at the bottom. Disk longer than ovary. Distribution: America ..... *Cedrela*
2. Seeds winged above or winged above and below. Disk shorter or as long as the ovary. Distribution: Asia, Australia, and the Philippines ..... *Toona*

Since the structure of the wood of *Toona* is identical with that of *Cedrela*, the writer has included *Toona* with *Cedrela*.

"There are several genera within the Melioideae which are rather confusing as to their true identity. Two species of *Aphanamixis*, i.e., *A. grandiflora* Blume and *A. Rohituka* Pierre, have been placed in the synonomy of *Amoora*. It is interesting to note that these species, together with *Aphanamixis Cumingiana* Harms, are easily separable from those of *Amoora* from the standpoint of wood structure. The principal anatomical differences are:

Aphanamixis	*Amoora*
Wood parenchyma numerous in continuous tangential lines 4–6 per mm.	Wood parenchyma scarce, not visible with lens; occurs diffuse as scattered cells.
Rays 1 or 2 cells wide, mostly uniseriate.	Rays 1-3 cells wide, mostly 2 or 3 cells.

Amoora cucullata Roxb. seems to be more of an *Aphanamixis* than an *Amoora*. The wood parenchyma occurs in short tangential lines between the pores, but never forms continuous tangential lines. The rays are also 1 or 2 cells wide, mostly uniseriate.

"With the exception of *Azadirachta integrifolia* Merr., the species of *Azadirachta* are synonyms of *Melia*. The anatomical differences between the two genera are:

Azadirachta	*Melia*
Woods diffuse-porous.	Woods ring-porous.
Minute pores do not form wavy tangential bands.	Minute pores form wavy tangential bands.
Gum ducts not observed.	Gum ducts present or absent.
Rays 1–3 cells wide.	Rays 1–8 cells wide.

"Many botanists have united *Xylocarpus* with *Carapa*. Harms makes the following distinction:

1. Upland trees. Leaves with many leaflets. Panicles large with many flowers. Fruit with woody husk. Distribution: trop. America, trop. Africa ..... *Carapa*
2. Lowland trees. Leaves with few leaflets. Panicles small, with few flowers. Fruit with cork-like husk. Distribution: Asia, Philippines ..... *Xylocarpus*

Although the woods resemble each other very much in structure, there are, however, the following differences:

Carapa	*Xylocarpus*
Color usually light reddish brown.	Color usually dark red.
Pores distinct as small to large pinholes.	Pores barely visible without lens.
Rays distinct on all sections.	Rays barely visible on the cross-section; inconspicuous on the radial.
Ripple marks absent.	Ripple marks always distinct.

The slight differences between the two woods in question are probably due to environmental conditions."

Royal Botanic Gardens, Kew. Official guide to the museums of economic botany. No. 1, Dicotyledons. Fourth ed., revised and augmented, 1930. Pp. 249; 4¾ x 7¼. Price 2s. 2d. postpaid.

A compendium of interesting and useful information classified by families and fully indexed.

From nature's treasure chest. By G. BERGSTROM, of the Cincinnati Branch, Penrod, Jurden & Clark Co. A monthly publication, 1929–. Pp. 8; 8½ x 11; illustrated.

Such is the title of a series of booklets issued monthly by Penrod, Jurden & Clark Company, Cincinnati, Ohio, and dedicated "to those who are interested in the use of fancy veneer." Each issue contains well written and attractively printed and illustrated descriptions of from three to five cabinet woods. Contents of the first eleven numbers are: I. Black, Circassian, English, French, and Italian Walnut. II. Orientalwood, Lovoa, Bubinga, and Zebrano. III. East Indian Satinwood, Prima Vera, Avodiré, and Kambala. IV. English Harewood, Greywood, Pearwood, and Ayous. V. English and Russian Oak, Silky Oak, and Black Bean. VI. Brazilian, East Indian, and Madagascar Rosewood. VII. Cocobolo, Kingwood, and Tulipwood. VIII. Macassar Ebony, Teak, and Tamo or Japanese Ash. IX. Indian Laurel and Andaman and African Padauk. X. Burma Padauk, Gonçalo Alves, and Bullet Wood. XI. Purpleheart, Satiné Rubanné, and Koa. According to a letter from Mr. Bergstrom, distribution of these booklets is limited to the trade and to educational institutions.

Price 35 cents

Yale University School of Forestry

TROPICAL WOODS

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

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WEST AFRICAN AVODIRÉ
(*TURRÆANTHUS AFRICANA*)

By SAMUEL J. RECORD

Avodiré is a West African timber which has become of considerable commercial importance in Europe during the past few years and is beginning to find a definite place on the American market. It comes of a noted family, the Meliaceae, though its pale yellowish color suggests a closer relationship to Satinwood than to Mahogany. The wood has a satiny luster and the grain is often very attractively figured. The timber is of uniform texture, works easily with all tools, seasons readily, finishes very smoothly, and holds its place well when manufactured. The principal handicaps to its extensive employment are its comparatively small size and limited occurrence, the poor shape of the logs, and the tendency of the freshly cut timber to stain if not carefully handled.

Common Names

Trade: Avodiré or Avodire. Ivory Coast: Agboui (Abé, Ébrié); Hagué (Agni); Hakue (Attié); Avodiré (Appolonian).

Botanical Classification

The botanical name of Avodiré is *Turræanthus africana* (Welw.) Pellegrin (=*Guarea africana* Welw.=*Bingera africana* A. Chev.). The limits of its distribution have not been determined, but it is known to occur in Angola, Gold Coast, and Ivory Coast. Six other species have been described and their combined range extends from Liberia to the Belgian Congo. Little is definitely known about some of the woods of these species, but it is probable that Avodiré is typical of the genus.

Turræanthus was first described by Baillon in 1874 (*Adansonia* 11: 261). He determined its natural position to be very near *Chisocheton*, and this was confirmed by Harms (*Pflanzenfamilien* 3: 4: 294) who places the two genera in a separate sub-tribe (Trichilieae-Chisochetoninae) of the sub-family Melioideae (fam. Meliaceae). *Chisocheton* is a genus with numerous species in the East Indian region and some of the trees are said to attain large size. The timbers are typically light-colored and are not commercially important. The anatomy of the wood is in many ways similar to that of *Turræanthus*, but there is stronger development of parenchyma.

The Tree

Avodiré is a tree of medium size in comparison with the giants of the West African forest, but under favorable conditions it attains a height of 90 feet or more and a diameter of 40, or even up to 60, inches above the swollen base. The trunk often is irregular and crooked, resulting in considerable waste in logging. It is rather low-branched, and the utilizable portion of the bole is usually between 24 and 48 feet, though exceptionally over 60 feet. The bark is grayish and peels off in thin strips; the inner portion is creamy yellow and has a very characteristic aromatic odor.

The pinnate leaves are large, sometimes 2 feet or more in length, composed of 4 to 12 (mostly about 9) pairs of alternate, smooth and shiny, leathery, oblong leaflets, each 4 to 6 inches long and about 1½ inches wide, rounded at the apex; the midrib is very prominent on the upper surface, with many fine lateral nerves. The leaf buds, young petioles, and flower stalks are covered with a fine rusty pubescence. The trees bloom in March-April, the fragrant yellow flowers appearing in axillary panicles. The fruits mature in autumn and are yellow, fleshy capsules commonly with 4 one-seeded valves, the seeds rough on one side and imbedded in a whitish pulp. The seeds germinate readily and young seedlings are plentiful, although few survive in the dense shade of the virgin forest; they quickly fill up any openings in the stand and they are easily transplanted.

Range and Occurrence

Ivory Coast.—Avodiré occurs as an understory tree in a strip of coastal forest having a maximum width of 25 miles, extending along the Soumié River, a tributary of the Bia, on the west to the Agnéby on the east. Throughout this limited zone it is fairly abundant, occurring commonly in groups or small and nearly pure stands; it prefers moist soils. Efforts are being made to protect the young trees and increase their proportion in the second growth.

Gold Coast.—The following information is supplied by Mr. C. Vigne, Assistant Conservator of Forests, now on leave as Commonwealth Fellow at Yale University: "Of the four species of *Turræanthus* listed in *The Flora of West Tropical Africa* (1928), only *T. africana* and *T. Vignei* have been recorded from Gold Coast. The former has been recorded twice, once from the Tano River, near Ivory Coast, and once from the southern part of Central Province; there is little doubt but that it occurs throughout the lower portion of Western Province. It seems to be restricted to the evergreen forest type and to have a less extensive range than *T. Vignei*.

"The type of *T. Vignei* Hutch. & Dalz. was collected in 1924 in the south of Central Province and the species has since been found in Western Province, Eastern Province, and Ashanti. At one station in Central Province both species were found on the same area, but owing to the differences in

appearance, particularly of the bark, the natives had no difficulty in distinguishing them. *T. Vignei* is somewhat larger than the other and much more numerous, often appearing in groups as an understory. Its bark is scented, gray on the surface, and marked with prominent vertical lines of lenticels; it is said to be used in mixture with the leaves (?) of *Spondianthus Preusii* Engl. to make fish poison. The yellow, scented flowers are borne in profusion in April-May. The fleshy, yellow, 4-valved, usually 4-seeded capsules ripen in August-September. The cotyledons are arranged with the dividing line across the short axis of the seed. The timber is sometimes split into small beams for use in buildings. A trial shipment of a few logs of this species was made by a timber firm in 1929, but it was reported on as inferior Avodiré and the price offered did not justify further consignments.

"The vernacular names for *T. Vignei* are reported as follows: Wansenwa, Wojo, and Odomo (Ashanti); Suinguisu (Sefwi); Appayio and Kwajuma (Wassaw). The last name is also given to *Guarea Thompsonii* Sprague & Hutch."

Liberia.—Turræanthus occurs in Liberia, but the exact species has not been determined. Mr. G. Proctor Cooper collected it during the Yale-Firestone coöperative study of the Liberian forest, but the botanical specimens were unfortunately lost in transit. The wood is much like that from Ivory Coast, though somewhat denser and finer-textured. Mr. Cooper has supplied the following memorandum: "*Turræanthus* sp. occurs scatteringly in the evergreen forests. It is usually 50 to 60 feet tall with a narrow crown extending halfway to the ground. The trunk is 12 to 18 inches in diameter, usually forked about 25 feet up; buttresses are either low or absent. The bark is blotched with green and gray patches, smoothish on young trees, but becoming rough with age; it exudes an aromatic resinous sap when cut. The leaves vary in length up to 18 inches and the smooth, dark green leaflets are 4 to 6 inches long. The natives speak of the fruit as 'sticky,' probably referring to the fleshy nature of the immature capsules.

"The Bassa natives often confuse this tree with species of

Sorindeia and *Trichoscypha* of the Anacardiaceae, calling all of them Blimah, but adding the suffix 'pu' (meaning 'white') to the *Turræanthus*, no doubt because of the contrast of its creamy white wood with the darker colors of the others. Similarities in the general appearance of the bark and leaves of the various trees and the presence of a resinous sap readily account for the confusion in name."

Cameroon.—According to Hédin, the species found in French-mandated Cameroon is *Turræanthus Zenkeri* Harms. The vernacular name is given questionably as Engan (Younde and Boulou). The tree is scattered here and there in the forest, being nowhere common. It is usually from 50 to 70 feet tall, with a trunk 14 to 20 inches, exceptionally 24 to 28 inches, in diameter. The wood is very much like that of Avodiré of the Ivory Coast. It is said to have a Cedar-like odor when fresh. The specific gravity is given as 0.53.

Commercial Considerations

Exports of Avodiré appear to be confined at present to Ivory Coast. The timber there is conveniently situated for transportation to the seaports so that exploitation is comparatively easy. During the years 1927 and 1928 the total shipments amounted to about 5000 tons. Owing to the rather small size and poor shape of the trees and the restricted occurrence of the species the outlook for expansion of the trade is not very encouraging.

Most of the timber is shipped to Havre and Bordeaux, but small quantities are also sent direct to Germany, England, and the United States. The first imports into Germany were in 1923. The annual reports of J. F. Müller & Son, Hamburg, show the following receipts for the six years 1925 to 1930:

	1925	*1926*	*1927*	*1928*	*1929*	*1930*
Logs.....	25	392	818	146	225	146
Tons.....	70	702	980	200	200	200

The first American imports of Avodiré appear to have been in 1928, though occasional trial lots may have come in before. Mr. G. Bergstrom, of Penrod, Jurden & Clark Co., says:

"The prices of Avodiré veneer range from 6 to 15 cents per square foot [as opposed to 10 to 40 cents for East Indian Satinwood, 4½ to 8 cents for Prima Vera, and 2½ to 4 cents for *Chlorophora excelsa*]. Although the wood has only recently been introduced in the market, its low price and beautiful figure, together with its easy working qualities, have created a considerable demand. The veneer is used in the furniture trade especially for lighter types of design and for general fixtures in places where a light-colored wood of moderate price is desired."

Description of the Wood

Color nearly white to pale yellow, uniform throughout and with no distinction between heartwood and sapwood. Luster satiny. Odor and taste absent or not distinctive.

Texture medium; very uniform. Grain sometimes straight, but often beautifully mottled and full of "life," the effect of wavy grain on the luster. Logs season readily, but are likely to surface check if died too rapidly; subject to fungous stains and insect attacks if left too long in the forest. Wood easy to manufacture, produces smooth and hard-surfaced veneers, takes glue and stains well, is free from objectionable oily or resinous contents or exudations, and is low in responsiveness to changes in humidity.

Specific gravity, 0.50 to 0.60 (at 15 per cent moisture); weight, 31 to 37 lbs. per cu. ft.; being about the same as for African Mahogany (*Khaya ivorensis*). It is tough, strong, and elastic for its weight, and is fairly resistant to indentation.

Dr. Hans Meyer reports the following results of tests at the Institut für angewandte Botanik, Hamburg, on the composition of dry wood:

Ash	4.56 per cent
Fats and waxes	0.80 " "
Cellulose	62.15 " "
Lignin	32.49 " "

On a practical basis, the yield of cellulose by dry wood is placed at 57 per cent.

Gross Anatomy

Growth rings absent or poorly defined. Pores small, visible but not very distinct without lens; numerous and well distributed, but not crowded; in some specimens mostly solitary, in others radially paired or in radially flattened rows of three to several pores each; mostly open, though yellowish gum plugs are often visible with lens. Vessel lines fine, numerous, distinct, but not conspicuous. Rays fine, near limit of vision on cross and tangential sections; distinct, but low and inconspicuous on radial surface, being of the same color as the background. Parenchyma in narrow circles about pores and pore groups, tending to make them more distinct. Ripple marks absent. No gum ducts observed.

Minute Anatomy

Cross section: Growth rings poorly defined, but sometimes indicated by flattening of the fibers in the late wood. Pores rather thick-walled, the solitary ones oval or nearly round. Parenchyma sparingly developed about pores. Wood fibers in definite radial rows in part; often radially flattened; walls rather thin; pits indistinct.

Radial section: Vessels with simple perforations, the perforations usually plugged with thin pads of yellow gum; tyloses absent. Rays heterogeneous, although the marginal cells are not distinctly upright; cells decidedly variable in shape, frequently tapering; end walls heavily pitted, frequently curved; yellow gum deposits common; pits into vessels half-bordered and unilaterally compound, though apparently of the same size and shape as the intervascular. Wood parenchyma found only in contact with the vessels; chambered strands with integumented crystals of calcium oxalate very common. Wood fibers non-septate; pits few, minute, simple, lenticular to slit-like.

Tangential section: Vessels with minute, densely crowded intervascular pits, the exserted apertures tending to coalesce into spiral striations; end walls of segments inclined, sometimes steeply; segment tips short to long. Rays mostly biseriate (occasionally 3 cells wide at the middle), 6 to 25, generally

12 to 15, cells high; the low rays, rarely over 6 cells high, are uniseriate.

Measurements: The following measurements are taken from Dr. Meyer's article:

Isolated pores: tangential diam. 80 to 204μ (av. 153μ); radial diam. 104 to 248μ (av. 198μ).

Wood fibers: length 1 to 2 mm. (av. 1.5 mm.); diam. 12 to 26μ (av. 19μ).

Ray cells: interior cells 108 to 360μ (av. 237μ) long and 24 to 36 μ (av. 28μ) high; marginal cells 56 to 140μ (av. 84μ) long and 40 to 52μ (av. 44μ) high.

Material: Yale Nos. 562 (trade sample); 12,342 (Inst. f. ang. Botanik, Hamburg); 12,477 (A. Chevalier 16,298); 12,780 (Service Bois Coloniaux 7 G); 16,819 (collected with botanical material by I. T. Williams & Sons); misc. trade samples.

NOTES ON OTHER SPECIES

The wood of *Turræanthus Vignei* (Yale No. 17,102; Vigne's No. 1942) shows some of the growth rings rather clearly defined as a result of slight differences in density; tendency to the formation of terminal parenchyma also noted. Rays narrower than in other species. Wood softer and tending to tear out in surfacing.

The Liberian specimen (Yale No. 15,853; Cooper's No. 121) has much the consistency of Red Maple (*Acer rubrum* L.), being somewhat harder and finer-textured than the other species. It finishes smoothly without tearing or "pulling" the grain. Following are the results of some tests made by Mr. Cooper in the Yale laboratory:

Specific gravity (oven-dry weight and volume)	0.60
Static bending (moisture content of wood corrected to 12 per cent)—	
Modulus of elasticity..	1,325,000 lbs. per sq. in.
Modulus of rupture...	9,900 " " " "
Fiber stress at elastic limit.....	5,230 " " " "

Hardness (load required to imbed 0.444-in. ball half its diam.; moisture content of wood 12 per cent)—

Radial surface.....	1,205 pounds
Tangential surface.....	1,350 "
End surface.....	1,575 "

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THE USE OF IMBUYA VENEERS IN EUROPE

By PAUL HERGERT

Importer, Berlin-Steglitz, Germany

Among the many beautiful timbers of Brazil none, perhaps, surpasses and few equal Imbuya (*Phoebe porosa* Nees) as a furniture wood, considering its practicability as well as its beauty. Owing to the great expense involved in importing the heavy logs, which not infrequently have a diameter of 1.5 to 2 meters, its use has heretofore been restricted in Europe to special orders where cost was not a problem.

Impressed with its beauty and its splendid adaptability for furniture and interior work of the finer quality, I secured the coöperation of a friend in the experimental manufacture of Imbuya veneers, in which endeavor we found we must pioneer. To our satisfaction we discovered that the timber was especially fitted to this treatment with the result that a modern factory has been established in Curityba, the principal city of Paraná, where the finest supply of Imbuya is obtainable. The most desirable veneer is 0.6 to 1 mm. thick and we have been able to export it in this form at a price that competes favorably with the finest woods.

Of especial interest is the variety in grain and color in which the veneers are obtainable, depending, of course, upon the section from which cut and upon the quality of the particular tree. We have found it practical to market three grades for which the English, German, and Portuguese terms are, respectively, as follows: (1) Light, *bell*, or *clara*—a yellowish brown in various tones with shadings and stripes; (2) Dark, *dunkel*, or *escura*—the background brown, the markings reddish black; (3) Extra or *optima*—the finest quality in brown and red-brown tones with wave and cloud effects. This grade is unexcelled by Caucasian Walnut either in beauty or in working.

The possibilities of Imbuya veneer in manufacture was demonstrated in the recent international fairs in Sevilla, Barcelona, and Brussels, where the exhibit of furniture, interior trim, radio sets, etc., made of it attracted wide attention. This beautiful wood is now rapidly taking the place it merits among the finer tropical woods used in Europe, where only two or three years ago it was practically unknown because of its prohibitive cost.

NOTE ON *ESCALLONIA TORTUOSA* H.B.K.

By H. PITTIER

Museo Comercial de Venezuela

The type of *Escallonia tortuosa* H.B.K. (*Nov. Gen. & Spec.* 3: 295, 1818) is from the Ecuadorian Andes ("Crescit locis montanis, asperrimis Andium Quitensium, alt. 1700 hex. Floret Martio.") but the description corresponds quite fairly to that of our plant. This is a tree, reaching up to 12 m., with a basal diameter of 30 cm. and a storied ramification. Kunth says with doubt that it is a very much ramified shrub ("Frutex (?) ramosissimus"). The trunk is seldom straight, except when it grows in the proximity of houses; it has a grayish, rimose, moderately thick bark, constantly shedding in shreds; the wood is rather light with a whitish, easily worm-eaten sapwood and red-brown or pink-brown, fine-grained but soft heartwood. The ultimate branchlets are covered with the tuberculate scars of the fallen leaves. The description of the leaves as given by Kunth applies exactly to our specimens. The flowers are not known. According to Gehriger (in notes) the calyx is greenish and 5-lobed, while the petals are white, but his collection bears no flowers and mine was only in fruits, these with pedicels varying in length from 3 to 7 mm.

The common name of this plant in the high valley of Mucuchíes is "Quitasol" (*i.e.*, Sun-robber), and in the bare country around San Rafael, at altitudes between 3000 and 3500 m., it is, with the exception of *Alnus jorullensis* H.B.K., about the only real tree to be seen. Our collections (Pittier 12,905, Febr. 6, 1928; Gehriger 46, April 7, 1930) were both made in the neighborhood of the last-named locality.

Weddell (in *Chloris Andina* 2: 208) considers this species as doubtful, but does not explain the reason why. In fact, it cannot be confused with *E. myrtilloides*, which has much smaller, eglandulous leaves and a distinct habit, neither with

E. resinosa, the flowers of which are said to be paniculate. On the other hand, as suggested by Kunth himself, *E. berberifolia* is probably nothing but a variety of *E. tortuosa* (and has not even a correct name). The remaining species reported from the northern part of South America are all relatively large-leaved, with paniculate or racemose flowers. It seems then that the species is a legitimate one.

The Wood of *Escallonia tortuosa*

By S. J. R.

The following description of the wood is based upon two specimens supplied by Mr. Pittier, namely Nos. 16,941 (Gehriger 46) and 19,781 (Pittier 12,905). The two are in full agreement, except that the former is of a young stem or more likely a branch, is all sapwood, and has smaller vessels. An unusual feature is that both vessels and wood fibers (fiber-tracheids) are characterized by distinct spiral thickenings. In two Patagonian species, namely, *E. Fonki* Phil. (Yale No. 1754) and *E. rubra* Pers. (Yale No. 1756), spirals are poorly developed in the vessels and apparently absent from the fiber-tracheids.

General Properties

Color of heartwood uniform reddish brown, fading gradually into the poorly defined sapwood. Luster dull. Odor and taste of dry wood absent or not distinctive.

Wood moderately hard and heavy and of fine and uniform texture, being of about the consistency of Red Gum (*Liquidambar*); short-fibered; easy to cut, tough to split, finishes smoothly, but does not take a highly lustrous polish; appears fairly durable.

Gross Anatomy

Growth rings absent or indistinct, sometimes indicated by slight differences in color.

Pores not distinct without lens; numerous, not crowded, uniformly distributed. *Vessel lines* fine and indistinct.

Parenchyma not visible even with lens.

Rays fine, scarcely distinct even with lens on cross and tangential sections as they tend to merge into ground mass; visible, but inconspicuous on radial surface, being somewhat darker than background.

Minute Anatomy

Pores rounded, fairly uniform in size, nearly all solitary; numerous and well distributed, without pattern.

Vessels with spirals; segments slender, the elongated tips with distinct spirals; end walls steeply inclined; perforations scalariform, with few to 15 bars, the spaces about twice the width of the bars; perforations sometimes also reticulate in part; pits with round, oval, or much elongated borders and included, narrow, oblique and crossed apertures; tyloses absent.

Parenchyma abundant, diffuse or in short, irregular, uniseriate lines; cells filled with reddish gum deposits.

Rays of two sizes: (1) uniseriate, 1 to 20 cells high, the cells coarse, and mostly square or upright; (2) multiseriate, with the median portion composed of procumbent cells, 2 to 4 cells wide and few to 15 cells high, with or without uniseriate, coarse-celled margins; cells filled with reddish gum; ray-vessel pits half-bordered and of the same size and appearance as the vascular pits.

Wood fibers rather thick-walled, but with large lumina; all have distinct spirals; pits very numerous on both radial and tangential walls, the prominent borders round or oval, the apertures narrow, included, oblique and crossed.

La défense du marché des acajous africains et bois similaires. *Actes & Comptes Rendus de l'Assn. Colonies-Sciences* (Paris) 7: 69: 71–72, March 1931.

In order to protect the market for African Mahogany and its allies, most of the operators in Ivory Coast and Cameroons have decided to discontinue the cutting of Mahogany, Cipo, Tiama, Makoré, Bossé, Sapeli, etc., for the remainder of the year 1931. This decision has received official sanction.

TALISIA FLORESII, A NEW FRUIT TREE FROM YUCATAN

By PAUL C. STANDLEY

Field Museum of Natural History

Shortly after the publication of the *Flora of Yucatan* (Field Mus. Pub. Bot., vol. 3, no. 3, 1930), there was received from Dr. Román S. Flores, of Progreso, Yucatan, a request for information regarding a tree known in the Peninsula, especially in Campeche, by the Maya name Coloc. At first it was presumed that the tree was *Talisia oliviformis*, which is well known for its edible fruit, but Dr. Flores was already acquainted with that, and stated that the Coloc was a different tree.

He forwarded to Field Museum excellent photographs and a detailed description of it, but in the difficult family Sapindaceae these were not sufficient for satisfactory determination, and it was not until recently, when herbarium specimens were supplied by Dr. Flores, that it was possible to make a positive identification of the plant involved. It is, as Dr. Flores insisted, quite distinct from *Talisia oliviformis*, although apparently a member of the same genus. The tree is of particular interest because it is an addition to the already long list of native Mexican trees bearing edible fruits.

In the *Flora of Yucatan* the name Coloc was reported as in use in Campeche for the common Guava (*Psidium Guajava*), but the report probably is an error.

Talisia Floresii, sp. nov.

Arbor 5–6-metralis, trunco fusco-cinereo 45–50 cm. diam., ramulis crassis ochraceis rimosis, novellis dense fulvo-tomentulosis glabrescentibus; folia alterna paripinnata breviter petiolata, rhachi gracili puberula cum petiolo c. 4 cm. longa, petiolo basi incrassato; foliola 2–3-juga coriacea crasse 3–4 mm. longe petiolata oblonga vel oblongo-lanceolata 7–8 cm. longa 2–3 cm. lata versus apicem obtusum vel anguste rotundatum et subemarginatum paullo angustata, basi subobliqua acuta, glabra vel glabrata, supra in sicco lucida viridescentia, venis venulisque prominulis pallidis arctissime reticulatis, subtus pallidiora brunnescentia, ad venas sparse adpresso-pilosula, costa crassiuscula elevata, nervis lateralibus utroque latere 5–6 prominentibus angulo latiusculo adscendentibus arcuatis prope marginem conjunctis,

nervulis prominulis pallidis arctissime reticulatis; inflorescentia racemoso-paniculata terminalis subpyramidalis fere sessilis c. 18 cm. longa densiuscule multiflora, ramis obtuse angulatis dense fulvo-tomentulosis, bracteis vix 1.5 mm. longis deciduis anguste triangularibus extus tomentulosis, floribus albis congestis brevissime pedicellatis vel fere sessilibus; sepala 5 late ovata obtusa c. 3 mm. longa subcucullata extus dense tomentulosa; petala 5 parva margine dense villosa; stamina 10; fructus magnus indehiscens sublignosus subglobosus fere 5 cm. diam. plus minusve obliquus minute tomentulosus vel glabratus monospermus.—MEXICO: Cultivated at Progreso, Yucatan, March 1931, *Dr. Román S. Flores* (Herb. Field Mus. No. 633,290, type).

From Mexico there are known only two other species of *Talisia*, *T. oliviformis* (H.B.K.) Radlk. and *T. diphylla* Standl., both of which grow in Yucatan. Neither of those species, however, resembles at all closely the present plant.

Dr. Flores supplies the following notes concerning the Coloc:

Leaves brittle, ashy green on the upper surface and lead-colored beneath, with salient venation. Flowers about 1 cm. broad, white. Fruit rounded, tobacco-colored, similar to that of the Chicozapote (*Achras Zapota*) in external appearance; it measures 14–15 cm. in circumference, and is a woody berry containing a single white seed surrounded by a fleshy aril, which is cream-colored, very aromatic, edible, and with a sweet and altogether agreeable flavor; epidermis cork-like and about 5 mm. thick. Flowering in May and fruiting in November and December.

Native boys have from time immemorial employed the woody part of the fruit in the construction of a small toy, a kind of whirligig. After making a hole about 1 cm. in diameter in each end of the seed and another at the side, they gouge out all of the kernel with a bit of wire. A round stick 20–25 cm. long is thrust through the end holes to half its length and fitted so that it will rotate freely. A cord 50–60 cm. long is attached at one end to the middle of the spindle, the other end extending out through the lateral hole in the shell. To the top of the spindle is fastened a disk, 10–12 cm. in diameter, which is usually made from a gourd (*Lagenaria*). Then, the shell being held in the fingers of one hand, the cord (previously wound up) is successively pulled and released, thus causing the disk to rotate back and forth rapidly and with a whirring noise.

GENERA ADDED TO YALE WOOD COLLECTIONS DECEMBER 1, 1929, TO APRIL 30, 1931

A mimeograph family-and-genera catalog of the Yale wood collections was distributed in December 1929. Since then more than 2500 additional samples have been accessioned, bringing the total to 19,800, representing 1866 genera of 194 families. Many determinations of herbarium specimens remain to be made and new material is being received continually. Every scientist working on a particular group is supplied with new samples as they become available. It is sincerely hoped that every one who can will contribute to these collections so that the systematic investigations now under way can be made more nearly complete. (For list of projects see *Tropical Woods* 22: 2, June 1, 1930, and 25: 25, March 1, 1931.)

ANGIOSPERMAE

ANACARDIACEAE
- Haematostaphis
- Lannea

ANNONACEAE
- Cleistopholis
- Isolona
- Popowia
- Stenanthera

APOCYNACEAE
- Funtumia
- Landolphia
- Rhabdadenia

ARACEAE
- Caladium
- Monstera
- Rhaphidophora

BIGNONIACEAE
- Cotema
- Markhamia
- Newboldia
- Pithecoctenium

CACTACEAE
- Dendrocereus
- Harrisia
- Leptocereus

CAMPANULACEAE
- Siphocampylus

CAPPARIDACEAE
- Cleome
- Forchhammeria

CAPRIFOLIACEAE
- Lonicera

CELASTRACEAE
- Pterocelastrus

COLUMELLIACEAE
- Columellia

COMBRETACEAE
- Pteleopsis

COMMELINACEAE
- Dichorisandra

COMPOSITAE
- Barnadesia
- Mikania
- Oliganthes
- Tagetes

CONNARACEAE
- Connarus

CONVOLVULACEAE
- Bonamia

CUNONIACEAE
- Ackama

DIPTEROCARPACEAE
- Doona

EBENACEAE
- Royena

ELÆAGNACEAE
- Shepherdia

ERICACEAE
- Xolisma

EUPHORBIACEAE
- Aparisthmium
- Chascotheca
- Cubincola
- Ditta
- Lasiocroton
- Mareya
- Neoboutonia
- Omphalea
- Rottlera

FLACOURTIACEAE
- Gossypiospermum
- Scottellia

GESNERIACEAE
- Gesneria

GRAMINEAE
- Homolepis

HAMAMELIDACEAE
- Parrotia

ICACINACEAE
- Leptaulus

LAURACEAE
- Tylostemon

LEGUMINOSAE
- Adipera
- Ateleia
- Burkea
- Bussea
- Cailliea
- Cordyla
- Corynella
- Desmodium
- Harpalyce
- Havardia
- Hymenostegia
- Loesenera
- Ostryocarpus
- Peiranisia

LINACEAE
- Hugonia

LOASACEAE
- Mentzelia

LOGANIACEAE
- Potalia

LYTHRACEAE
- Adenaria
- Punica

MAGNOLIACEAE
- Kadsura
- Illicium
- Schizandra
- Tetracentron

MALPIGHIACEAE
- Stigmatophyllon
- Tetrapteris

MALVACEAE
- Adansonia
- Neobuchia
- Wercklea

MELASTOMACEAE
- Aciotis
- Brachyotum
- Calyptrella
- Clidemia
- Graffenrieda
- Tibouchina

MELIACEAE
- Pterorhachis

MELIANTHACEAE
- Bersama

MENTHACEAE
- Salvia
- Sphacele

MORACEAE
- Olmedia
- Treculia

MYRISTICACEAE
- Coelocaryon

MYRTACEAE
- Myrtekmania
- Phellodendron

NYCTAGINACEAE
- Colignonia
- Mirabilis

OPILIACEAE
- Opilia

OXALIDACEAE
- Oxalis

PALMACEAE
- Borassus
- Coccothrinax
- Drymophloeus
- Thrinax

PASSIFLORACEAE
- Tacsonia

POLYGALACEAE
- Badiera
- Monnina

RHAMNACEAE
- Lasiodiscus
- Maesopsis

ROSACEAE
- Hesperomeles
- Polylepis

RUBIACEAE
- Alibertia
- Anisomeris
- Bothriospora
- Buena
- Capirona
- Casasia
- Crossopteryx
- Duroia
- Elaegia
- Gonzalagunia
- Hippotis
- Hodgkinsonia
- Ladenbergia
- Macrocnemum
- Picardæa
- Remijia
- Sommera
- Sphinctanthus
- Tocoyena
- Uncaria
- Vangueriopsis

RUTACEAE
- Zieria

SAPINDACEAE
- Chytranthus (?)
- Laccodiscus (?)

SAPOTACEAE
- Butryospermum
- Pachystelia

SCROPHULARIACEAE
- Capraria
- Dermatocalyx
- Scoparia

SIMARUBACEAE
- Dictyoloma

SOLANACEAE
- Brugmansia
- Physalis
- Solandra
- Solanum

STERCULIACEAE
- Dombeya
- Firmiana
- Leptonychia

THEACEAE
- Freziera

TILIACEAE
Duboscia
Pityranthe
Vallea

ULMACEAE
Ampelocera

UMBELLIFERAE
Peucedanum

VERBENACEAE
Espadaea

VITACEAE
Leea

GYMNOSPERMAE

CYCADACEAE
Dioon

PINACEAE
Callitris

WELWITSCHIACEAE
Welwitschia

"Pe-Mou," an Essential Oil from French Indo-China

"This oil is obtained by distillation of the rootwood and stumps (or rootstocks) of *Fokenia Hodginsii* Henry & Thomas (*Cupressus Hodginsii* Dunn), a conifer found in the mountainous parts of Annam and Tongking, in Indo-China, and in Fukien. The tree grows to a height of 45 to 50 feet, with a girth of 3 feet. . . . The production of oil of Pe-Mou was first undertaken at Tongking in 1926 for use in soap manufactory at Haiphong, and from 1926 to 1928 . . . exploited in the region of Chapa. . . . The odor resembles that of Cedar Wood oil distilled from the wood of Pencil Cedar (*Juniperus virginiana* L.), which is used here for perfuming soaps. . . . The probability is that all the exports of the material for distillation from Indo-China go to France."—J. H. H. in *Kew Bull. Misc. Inf.* 2: 108, 1931.

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

The Congrès International du Bois et de la Sylviculture (Paris, July 1–5, 1931) will be made the occasion for the second conference on wood anatomy provided for at the Cambridge meeting last August.

The Organizing Committee invites all scientists and scientific institutions interested in this subject to participate in this conference either personally or in writing. The address of the secretary is 205 Prospect Street, New Haven, Conn.

The Paris representative of the Committee is Mr. Jean Collardet, Association Colonies-Sciences, 60 Rue Taitbout, Paris (IX^{e}), France.

CURRENT LITERATURE

A new undertaking in tropical forestry. By J. C. KIRCHER. *Forest Worker* (Washington, D. C.) 7:1: 11, Jan. 1931.

"A report on forest conditions in the Virgin Islands prepared by W. P. Kramer, supervisor of the Luquillo National Forest, Porto Rico, in connection with a study of the islands by a commission, the chairman of which was Herbert Brown, Chief of the Bureau of Efficiency, has led to a request that the Forest Service undertake some needed forestry work there. Funds for the purpose have been transferred to the Forest Service by the Navy Department. William R. Barbour is returning to the service to take charge of the project under Mr. Kramer's general direction. Since leaving national forest acquisition work in 1918, Mr. Barbour has had tropical forestry experience in Haiti, Santo Domingo, Cuba, Venezuela, British Honduras, and elsewhere. Most recently he has been connected with the Tropical Plant Research Foundation, engaging in explorations of tropical hardwoods.

"This spring a more thorough survey will be made of forestry problems of the islands and some planting will be done. Planting stock will be obtained from the insular forest nursery at Rio Piedras, P. R.

"The hardwood stands which originally covered the Virgin Islands have largely been cut, and much of the forest land is now denuded. The island of St. John still has some second-growth timber and a number of slightly culled areas, but on the other islands of the group a large proportion of the forest area has been taken by brush. St. John is the center of the bay-rum industry, and some bay forests are being grown for this purpose, but the industry has been on the decrease in recent years. The only publicly owned forest land on the islands at present is municipal property totaling about 1400 acres, which is not under forestry management. According to Mr. Kramer's estimate approximately half the area of the islands, or about 40,000 acres, is suitable only for the production of forest crops. About 20,000 acres of this forest land, he believes, can be brought back to forest growth by protecting it

against fire and grazing, but the remainder will need to be planted.

"The rapid growth of tropical hardwoods makes it seem practicable to reforest the islands. Such valuable species as Mahogany and Spanish Cedar would undoubtedly do well on many of the mountain areas. Planted forests would become valuable not only for a much-needed timber supply but also to protect the steeper mountain slopes from erosion and to conserve water supplies.

"The Virgin Islands lie about 40 miles east of Porto Rico. Most of the one hundred-odd members of the group are small and uninhabited. The three of greatest importance are St. Croix, with an area of 53,000 acres; St. Thomas, with 16,000 acres; and St. John, with 12,000 acres. The topography of the islands is rolling to rough; their highest peaks rise to 1500 feet elevation. Temperature is rather even, ranging between 70° and 90° throughout the year. The population, which has been steadily decreasing, is now about 20,000.

"Because of their size, the islands do not present an attractive field for national forest extension."

Registro actual de nuestras especies forestales. By GUILLERMO GÁNDARA. *Mexico Forestal* 9: 2: 33–43, Feb. 1931.

A useful annotated list of the principal forest trees of Mexico divided into two groups, namely, those occurring at elevations of 1700 meters and more above sea level and those at elevations up to 1700 meters. The information includes the vernacular and scientific names together with short notes on the occurrence and characteristics of the trees and on the quality and uses of the woods.

Flora of the Lancetilla Valley, Honduras. By PAUL C. STANDLEY. Pub. 283, Field Museum of Natural History (Chicago); Botanical series, Vol. X, Jan. 15, 1931. Pp. 418; 6¼ x 9½; 53 plates.

A splendid volume containing a wealth of information about Central American plants and many excellent illustrations. The introduction is so delightfully written that only its

length (44 pages) prevents our reproducing it here in its entirety.

"The present enumeration of lowland Honduran plants includes a vast majority of the species found in any region along the Central American coast, and even far inland. On the other hand, no farther away than Puerto Barrios, Guatemala, or Puerto Castilla, Honduras, there are found at least a few conspicuous trees and herbs, frequently very characteristic ones, that are not known to grow about Lancetilla. The *Flora of the Lancetilla Valley* will, nevertheless, be found nearly as useful for study purposes anywhere in the lowlands of Central America as in Honduras. For that matter, it will be found to contain some mention of a large proportion of the commoner plants that inhabit southern Mexico, the West Indies, and even northern South America.

"The scope of this flora is a limited one. It is intended to cover primarily the Lancetilla Valley, which runs inland along the Tela River for five miles from the port of Tela, Honduras. At Lancetilla is located the Experiment Station of the Tela Railroad Company, under the direction of Wilson Popenoe. Stimulated by the enthusiasm of the director of this station, and encouraged by the friendly and helpful attitude toward scientific investigation always manifested by the United Fruit Company, and especially by its present president, Victor M. Cutter, this station has become a headquarters for natural history investigations. Because of exceptionally favorable conditions existing here for such work, there is good reason to expect that Lancetilla Station will become increasingly important as headquarters for research work, and we may hope to obtain, through the coöperation of interested specialists, a detailed account of the botany and zoölogy of this little-known part of Central America. In botany, at least, no better center for field work could be chosen, since heretofore nothing at all has been known of the Honduran flora. The collections made by the writer on the coast and in the interior are the first of any extent to have been procured anywhere in the whole Republic of Honduras. Inasmuch as they represent exploration in very limited areas, it is evident that at present

we know but little of Honduran vegetation. Practically all the interior, a highly diversified mountain area, and even most of the coast still await exploration, and there is no doubt that they will yield a profitable return for the effort expended in exploring them."

Annual report of the Canal Zone Plant Introduction Gardens for the fiscal year 1929. By J. Edgar Higgins. Summit, Canal Zone, 1930. Pp. 31; 6 x 9¼; 10 plates.

Since the writing of this report announcement has been made of the change in name to Canal Zone Experiment Gardens. Most of the present report is concerned with fruits and food plants, but there is a short account of town and roadside plantings and of drought-resistant trees.

"The severe and prolonged dry weather of the past season has called attention to the remarkable resistance to drought exhibited by some species of trees. Among those that have gone through the dry season without any irrigation and have maintained themselves in healthy appearance may be mentioned the Ohia, Mountain-apple, or Malay-apple, *Eugenia malaccensis*. This tree with its thick, glossy, dark-green foliage has not even drooped or appeared in a distressed condition at any time through the dry weather. The fruit at this season was dry and pithy and new growth was not being made, but the trees remained handsome. With the coming of the rains, the Ohia bursts into new growth, presenting beautiful reddish-brown foliage over the exterior of the tree which changes to a light green and finally to the dark-green color of the fully mature leaf. . . .

"The Sapodilla, Nispero, or Naseberry, *Achras Zapota*, is another tree that appeared well able to adapt itself to dry conditions. It had no appearance of suffering from lack of water. Had it been in fruit, doubtless water would have been necessary to mature the crop. This tree, a source of chicle for the manufacture of chewing gum, is possibly native in this region, but does not appear to have received here the full recognition of the value of its fruits. . . . Another of the outstanding drought-resistant trees, judged by its performance in several different parts of the Gardens during the past season, is the *Acacia auriculaeformis*. . . . It is said to be a small tree, native of Australia. The trees were received at Summit in 1925, and were planted out in August of 1926. Thus, with less than three years in their permanent position, they have attained a height of 12 to 15 feet. During the last season, without the application of any water, these trees showed no evidence of injury, remaining green and unwilted. Among other trees in the Gardens which seem to endure well the dry weather are the Mango, the Beefwood or 'Australian Oak,' *Casuarina equisetifolia*, and the African Tulip Tree, *Spathodea campanulata*."

Recent investigations of paper-making materials. I. Soft wallaba wood (*Eperua falcata*) from British Guiana. *Bulletin of the Imperial Institute* (London) 28: 4: 411–418, Jan. 1931.

"The results have shown that the present sample of Soft Wallaba Wood contained an appreciably greater amount of cellulose, and consequently furnished a higher yield of pulp, than the previous sample examined at the Imperial Institute in 1927. This variation in the yield of cellulose may be attributable to a difference in the age of the wood, as the log previously examined was only 6½ in. in diameter, whereas the present log had a diameter of 10½ in. Further, although the present wood furnished a higher yield of pulp than the earlier sample, the pulp did not bleach readily, whereas in the case of the pulp previously obtained bleaching was easily effected. The paper obtained from both samples was similar in strength and character."

"From the results of the present investigation it will be seen that when treated by the soda process this sample of Soft Wallaba Wood gave a good yield of pulp which was of good quality but not easily bleached. It furnished paper of satisfactory strength and character, suitable for use as book or writing papers. The wood, however, cannot be recommended for the manufacture of kraft paper, as the product obtainable is lacking in strength for this class of paper and the cost of beating in the mill would be unusually high.

"Owing to the presence of a considerable quantity of resinous material in the wood it could not be satisfactorily employed for the production of pulp by the sulphite process."

Supplement aux notes sur le genre *Hevea* Aubl. By A. Ducke. *Revue de Botanique Appliquée et d'Agriculture Tropicale* (Paris) 10: 111: 27–30, 1930.

Contains some revisions of the original *Notes* and includes accounts of nine species of *Hevea* inhabiting various parts of the Amazon region.

Les arbres producteurs de "balata." By A. Ducke. *Revue de Botanique Appliquée et d'Agriculture Tropicale* (Paris) 10: 111: 849–851, Nov. 1930.

The balata or gutta-percha industry, which until recently has been confined to Venezuela and the Guianas, is becoming important in the Brazilian Amazon. The trees producing balata in Brazil are of several species, all belonging to the Sapotaceae.

The highest quality is supplied by *Mimusops bidentata* A. DC., a large forest tree occurring in the States of Amazonas and Pará, as well as in the Guianas and Venezuela. According to Paul Le Cointe, director of the Commercial Museum of Pará, the product of this species contains about 45 per cent gutta.

The tree of greatest importance, however, is *Ecclinusa balata* Ducke, known locally as Balata, Coquirana or Ucuquirana, and rarely as Abiurana. It is related to *E. sanguinolenta* Pierre (=*Ragala sanguinolenta* Pierre), which occurs in French Guiana where it is called Balata Rouge on account of its reddish latex. The latex of the Brazilian species is white and very abundant. The trees are of medium to rather large size and occur on the moist, but non-inundated, lands in the western portions of Pará and Amazonas. Although the product is of lower quality, containing only about 30 per cent gutta, it supplies most of the Brazilian crop and large quantities of it are exported from Manáos. Unfortunately, the method of harvesting involves the destruction of the trees.

Sideroxylon cyrtobotryum Miq. and *S. resiniferum* Ducke contribute small quantities of balata. They are called Balata Rosada. At present they are of only slight commercial importance.

An excellent quality of balata is secured from the upper Uaupés, a tributary of the Rio Negro. The identity of the tree has not been discovered, but it is believed to be different from *Mimusops bidentata*. There are also some other undetermined members of the Sapotaceae, known locally as Guttapercha, Balatinha, and Abiurana, which supply good balata in small amounts.

The botanical name of "tara." By T. A. Sprague. *Kew Bull. Misc. Information* 2: 91–96, 1931.

"Tara is one of three American species of *Caesalpinia* the pods of which are used in tanning, the other two being Divi-divi, *C. coriaria* (Jacq.) Willd., and Algarobilla, *C. brevifolia* (Clos) Baill. It is a shrub or small tree [20–30 feet high] rather widely distributed in tropical America, and has been re-described several times under different names, the ones most commonly employed in recent literature being *Caesalpinia tinctoria* (H. B. K.) Taub. and *Caesalpinia pectinata* Cav. Under International Rules, however, the correct name for the species is *Caesalpinia spinosa* (Mol.) Kuntze."

"The species has been recorded from Chile, Peru, Bolivia, Ecuador, Colombia, Venezuela, and Cuba, but in Chile it does not appear to be native. . . . No information is available as to whether the species is actually a native of Cuba or is merely cultivated or naturalized there. In Peru, Bolivia, Ecuador, Colombia, and Venezuela, it appears to be indigenous, although it is also cultivated in those countries."

"According to O. F. Cook, Tara pods are a regular article of trade in the market of Lima, and are said to be used for dyeing, tanning leather, and making ink. He also states that Tara is often planted for hedges in Peru, especially in the district round the town of Urubamba, a well-grown hedge of it keeping out cattle, pigs, or goats, as well as human intruders."

The vernacular names are: Tara (Chile, Peru, and Bolivia); Guaranga (Ecuador); Guarango (Colombia: Antioquia); Divi-divi (Colombia: Cauca, Cundinamarca, and Santander); Divi-divi de los Andes (Venezuela).

Forestry in Hawaii for water conservation. By C. S. JUDD. *Journal of Forestry* (Washington, D. C.) 29: 3: 363–367, March 1931.

"The first forest reserve in Hawaii was set aside by proclamation of the Governor on November 10, 1904. . . . During the 26 years since then the work of examination, survey, report, and dedication has progressed until today on the five largest islands there are 63 forest reserves varying in size from 10 to 122,782 acres with a total area of 1,021,314 acres of which 65 per cent is owned by the territorial government. This amounts to almost exactly 25 per cent of the total land area of the territory and is considered none too large to assure the growing population of a continuous and sufficient water supply. . . . Of the 35 per cent in private ownership, 21,288 acres have, under the law, been turned over to the care and control of the territory for varying periods of time.

"There is probably no part of the United States where in as small an area there is as great a diversity in the quantity of water and its availability. The heaviest average rainfall in the world is claimed to be on the summit of the island of Kauai at 5075 feet above sea level. This averages 476 inches annually while less than 15 miles to leeward of this a station near the coast records only 22 inches annually. On the windward or rainy side of the island of Hawaii the rainfall on the cane fields is great enough to raise sugar without irrigation and here the surplus water is used for fluming the cane to the mills. On other parts of Hawaii and on the other islands the sugar cane fields are irrigated and the development of water supplies for this purpose is a matter of great importance. All sources of water have been utilized and these include streams, springs, reservoirs to store flood waters, tunnels into the mountainsides to intercept ground waters, tunnels, ditches and pipes to conduct water from the rainy windward side of the islands to the sunny leeward side, flowing wells and pumped wells. To conserve the water, once it has been developed, ditches are often lined with stone or concrete to prevent seepage. Over nineteen million dollars have been invested in irrigation works alone and one water tunnel through the mountains on Oahu cost $2,500,000. Some of the irrigated

plantations use up to 120 million gallons of water per day, which is more than twice the water consumption of a city like San Francisco. Nearly $175,000,000 is invested in the sugar business of Hawaii in which 49,000 people, or about one-sixth of the entire population of the territory, are directly employed. The 1930 crop of sugar amounted to 924,463 tons and was produced from sugar cane harvested from about 130,000 acres. The raising of sugar cane is done here on a large and efficient scale and since over half of the sugar is raised on irrigated areas it is needless to emphasize the favorable public opinion on all matters pertaining to a permanent water supply.

"Since the water comes mainly from forest areas and its quantity and time of occurrence are vitally affected by the character of the forest, the primary reason for practicing forestry in Hawaii is not for the production of wood supplies but for this valuable liquid commodity. Building materials are obtained from the Pacific Coast of the United States in the form of Douglas Fir and Redwood lumber which is shipped down in schooners and sold at reasonable prices. Small quantities of the native wood *Acacia koa* are taken from lands which are being cleared for pasture and are used for the manufacture of furniture and musical instruments and an occasional shipment of Koa logs is made to Indiana for veneer stock for radio cabinets and furniture. The curly-grained Koa wood is especially prized. The Ohia wood is also converted into an excellent and durable flooring in small quantities. Other native trees are merely of botanical interest and exist in small sizes too scattered and too rare to be of commercial value. Some of them are dying out and will soon be lost forever to the botanical world. Plantations of Eucalyptus have been established in many parts of the islands and are cut occasionally for posts, poles, car stakes, and fuel. The chief supply of fuel comes from the Algaroba or Mesquite tree which now grows wild in the arid regions and has covered over 100,000 acres since its introduction 102 years ago.

"The chief value of the Hawaiian forests lies in the water which they conserve and forestry is practiced here for the purpose, as specified in the law, of 'protecting and developing the springs, streams and sources of water supply, so as to increase and make such water supply available for use.' . . .

"The practical work of forestry, therefore, consists in clothing the watersheds with the best possible association of trees, plants, and other vegetative cover for the holding back of excessive run-off. This is being accomplished by the demarcation of mountainous areas to be devoted to this purpose as forest reserves, by getting rid of the wild stock still at large in the forests, by fencing forest reserve boundaries which are exposed to inroads of tame cattle, and by planting up the areas which are in need of reforestation. . . . In addition to the Territorial Forester there are four trained assistant foresters, one for each of the four main islands, 18 forest rangers who are local men trained to the work, 29 workers in the four tree nurseries and 35 tree planters, a total working force of 87 men. The total appropriation for the present biennium is $261,790."

"It is estimated that approximately 45,000 acres remain to be planted up although some of this will be covered in by natural reproduction from wind-borne and bird-scattered seeds. During the past 14 years, 1,281,562 trees have been planted out in forest reserves. This does not appear to be an extraordinarily large amount, but it should be borne in mind that every one of these trees was set out with a ball of earth around the roots. The bare root system method is not practicable in Hawaii because of the scorching sun and drying winds. The ball planting method, moreover, insures almost 100 per cent success. The 35 tree planters are now setting out trees at the average rate of 33,000 trees per month on 15 different planting sites located on four different islands. The areas in need of reforestation vary greatly in many respects—in elevation, from sea level to 8000 feet; in rainfall, from 20 inches to 300 inches per year; in soil, from stiff clays to rich loam. For these reasons, it is necessary to use a great many different species for the various planting sites. In addition to this, we are trying out many species in the attempt to determine those which are best suited to the particular sites. It is not remarkable, therefore, that among the 298,651 trees planted in forest reserves during the calendar year 1929, as many as 145 different species of trees were employed. These

come from all parts of the tropical world and those from Australia and India are found to be particularly adaptable to our climate. Very few of the indigenous trees are used, mainly because they are too slow of growth and preference is given to introduced trees which reproduce readily either by their seeds being carried on the wind or spread by birds. The following species headed the list in last year's planting in the numerical order given: White Ash (*Fraxinus americana*), Paperbark (*Melaleuca leucadendron*), Silk Oak (*Grevillea robusta*), Swamp Oak (*Casuarina glauca*), Redwood (*Sequoia sempervirens*), the native Koa (*Acacia koa*), Cypress (*Taxodium mucronatum*), Jalna (*Terminalia myriocarpa*), Highland Ironwood (*Casuarina quadrivalvis*), and Logwood (*Haematoxylon campechianum*)."

"Special attention has been given lately to reclaiming earth scars formed by excessive erosion in our red volcanic soils by planting the Swamp Oak (*Casuarina glauca*), a root-suckering tree which in Australia usually grows in the river swamps. We have been particularly successful in getting this tree to grow in this sterile, mineral soil under almost drought conditions, especially where the holes are first dynamited.

"Through helpful coöperation with the U. S. Army, seed has been sown from airplanes over recent burns and on denuded areas and subsequent examinations of rough areas thus seeded from the air have proved that this method of reforestation is successful.

"One serious problem confronts the successful practice of forestry in the indigenous forests and this must sooner or later be solved by serious research. This is presented by the so-called staghorn fern or uluhi (*Gleichenia linearis*), which is an aggressive, scandent fern which grows to a height of eight feet and forms a dense mat on the ground. It not only constitutes a serious fire menace in dry seasons with its mass of dead leaves and stems but prevents the natural reproduction of the native trees. Experiments conducted thus far in the attempt to get rid of it have led to no definite results of benefit. The solution seems to lie in the securing of a natural enemy which will wipe it out."

Chaulmoogra trees bearing fruit in Hawaii. By C. S. JUDD. *Journal of Forestry* (Washington, D. C.) 29: 3: 432, March 1931.

"The largest plantation of Chaulmoogra Oil Trees in the world is located in the Waiahole Forest Reserve on the Island of Oahu in the Territory of Hawaii. It consists of 2000 trees of *Hydnocarpus anthelmintica* planted in 1921 and 250 trees of *Taraktogenos Kurzii* planted in 1924. The former began to bear fruit in 1927 and the latter in 1930.

"The trees are spaced 14 by 14 feet apart and are given special cultivation by harrowing in order to stimulate growth. The seeds for starting this plantation were secured by the plant explorer, J. F. Rock, from Siam and Burma, respectively.

"The fruit is the size of an orange and has a thick brown velvety shell which encloses about 30 closely-packed seeds, the size of peanuts. It is from these seeds that is expressed the chaulmoogra oil which, upon refinement, is used to alleviate leprosy.

"As yet the crops of fruit in the Waiahole plantation have not been very heavy, but it is expected that within a few years enough will be produced not only to supply local needs, but to export to other places where the oil is needed."

The mesquite circles the globe. By C. S. JUDD. *Journal of Forestry* (Washington, D. C.) 29: 3: 423–424, March 1931.

"Seeds of the Algaroba or Mesquite (*Prosopis juliflora*) which were sent about a year ago by the writer, at the instance of Rev. A. S. Baker, from Honolulu to Bahrein, have not only germinated but the young trees resulting from the importation have survived the long, hot summer of 1930, and in a little less than a year after planting are six feet high.

"Bahrein is an interesting but barren island, about 26 by 8.5 miles in size, off the east coast of Arabia and is the center of the Persian Gulf pearl-fishing industry, which supplies some three-fourths of the world's real pearls. . . . With the exception of date palms, the barren island is practically devoid of tree growth and was sadly in need of a tree that would supply shade against the scorching sun, feed for animals, and

firewood. The island has to import great quantities of firewood from Persia.

"The Mesquite . . . is not only now growing on Bahrein, but a part of the seed from Honolulu was taken by a member of the American Dutch Reform Mission to an oasis in the interior of Arabia where still greater hopes are felt for its successful growth."

"Although a native of tropical America, the Algaroba was first introduced to Hawaii in the form of a seed which came from the Royal Gardens in Paris. Quantities of Mesquite seed have been sent from Hawaii to Australia, the Fiji Islands, and to South Africa. Now that it has been sent with Hawaii's greetings to a parched and barren island in the Persian Gulf, it has practically completed its romantic circuit of the globe, distributing its blessings wherever it has taken root."

The fat and oil of *Sapium sebiferum* seeds. *Bulletin of the Imperial Institute* (London) 28: 4: 429–431, Jan. 1931.

"*Sapium sebiferum* Roxb. (=*Excoecaria sebifera* Muell., *Stillingia sebifera* Michaux) is a small tree, from 24 to 30 ft. high, belonging to the natural order Euphorbiaceae and indigenous to Southern China and Japan. It is widely cultivated in parts of the former country for its seeds, which are the source of Chinese vegetable tallow and of stillingia oil. The tree has been introduced into many of the warmer parts of the world and has become almost wild in some regions of Northern India. . . .

"Chinese vegetable tallow is obtained from the outer covering of the seeds and is prepared in China by steaming the whole seeds in perforated vessels whereby the tallow is melted and subsequently drains away. Large quantities of this tallow are imported into this country for use in the manufacture of soap and candles, while small amounts are occasionally used as a means of stiffening softer edible fats. The tallow is also extensively used for edible purposes in China.

"Stillingia oil occurs in the kernels and is prepared by crushing and pressing the residue left from the rendering of the tallow. This oil possesses marked drying properties and would doubtless be suitable for use in the manufacture of

paints and varnishes. Consignments of this oil appear only very rarely on the market in the United Kingdom.

"Sometimes the whole seeds are crushed, whereby an oil is obtained which consists of a mixture of vegetable tallow and stillingia oil.

"The residual oil-cake has a relatively low manurial value and owing to the presence in it of a saponin it cannot be used as a feeding-stuff for livestock. In China the cake is employed as fuel."

On the distribution of *Pseudolarix Fortunei*, the golden larch. By W. R. PRICE. *Kew Bull. Misc. Information* 2: 67–68, 1931.

"We have at present for this tree's distribution area . . . a narrow wedge-shaped area based upon the coast of Chekiang, extending westwards for some 700 miles with its apex in the middle of Hunan, and including parts of the provinces of Anhwei, Kiangsu, Kiangsi, and Hunan, and the whole of Chekiang. As this tree seems to grow exclusively in upland and hilly districts, it is more than probable that it will eventually be found to occur over a wider area in the mountainous parts of the southern Chinese provinces."

Note sur *Gmelina arborea* Roxb., essence de repeuplement pour la forêt tropical asiatique. By D. NORMAND. *Revue de Botanique Appliquée & d'Agriculture Tropicale* (Paris) 11: 115: 168–174. Ill.

An account of this verbenaceous tree with special reference to forest planting in tropical Asia. It includes the vernacular names; natural distribution; description of the tree; the anatomy, properties, and uses of the wood; and notes on existing plantations. Illustrated with two photomicrographs of the wood.

Mikrographie des Holzes der auf Java vorkommenden Baumarten. By H. H. JANSSONIUS. Leiden: E. J. Brill, 1930. Pp. 293–580; 5½ x 9; text figs. 310–322.

This is the second part of Volume V of this well-known

work. The families treated are Laurineae (conclusion), Proteaceae, Thymelæaceae, and Euphorbiaceae. Wood anatomists will ever be deeply indebted to Dr. Janssonius and Professor Moll for this exhaustive investigation of a large and diversified group of woods.

An unusual seasonal growth ring in *Eucalyptus*. By WALTER W. TUPPER. *Papers of the Michigan Academy of Science, Arts & Letters* 13: 217–219, 1913. Illustrated.

"While the writer was working at the Yale Forestry School, his attention was called by Professor Samuel J. Record, of that school, to an unusual seasonal growth ring in the mature stem wood of *Eucalyptus*. This unusual wood came from the so-called Alpine or Mountain 'Ash,' *Eucalyptus delegatensis* R. T. Baker, which grows in snow country, high up on the southern table-lands in the Australasian region. . . . Mr. M. B. Welch found that this species was the nearest approach to a ring-porous timber in the Eucalypts, and that the pores were occasionally entirely absent in the late wood. . . . In the specimen of wood which the writer found to be so unusual and interesting, the vessels are almost entirely absent in the early or spring wood, while large and conspicuous vessels are clustered together in the late or fall wood.

"The end of the late wood has a much sharper and more even line than does the transition from the early wood to the later-formed part. This fact, which is quite evident from the photomicrograph, together with the curvature of the annual rings and the number of rays, shows that the large and numerous vessels are in the late or fall wood in the unusual specimen, instead of in the early or spring growth, as has been supposed."

"The unusual structure of this *Eucalyptus* wood seems to be due to the retardation in the normal formation of new leaves and shoots for a considerable time after the activity of the cambium started for that season. This retardation may have been caused by extreme cold, drought, wind, or by some other external condition which might easily be operative in the high altitudes at which this species grows."

Collapse of timber. A major cause of waste in the Australian timber industry. By C. SIBLEY ELLIOT. Reprinted from *Journal of the Council for Scientific & Industrial Research*, Nov. 1930. Pp. 8: 6 x 9½; 2 plates.

"Certain timbers, in drying, are prone to suffer a severe flattening or sinking-in of the cells, such as can be induced by crushing a piece of timber in a vise. This results in an excessive and frequently irregular form of shrinkage, for which the name of collapse has been adopted."

"Collapse is not confined to Australian timbers, but it is probably a more serious factor in Australia than in any other country, some of our most important commercial timbers commonly being affected seriously by it. Outstanding amongst these are certain members of the 'Ash' group of Eucalypts, *e.g.*, Mountain Ash (*Eucalyptus regnans*) and Red Ash (*E. gigantea*). In these, at least, the evidence is that young timber collapses more severely than old, and material from top logs more severely than that from lower in the tree. . . . The additional size allowance which many millers find it necessary to make in sawing timber which is prone to collapse, commonly amounts to more than 20 per cent over and above the allowance necessary to cover ordinary shrinkage and machining. . . . There is an additional factor, dependent on the greater severity of collapse of top logs of the 'Ash' group. So severe is this at times that it is common practice to relegate to a lower grade timber cut from high in the tree, even from logs below the first limbs. For example, there are cases where such timber will not be accepted for flooring, lining, and weatherboards, solely on account of the severity of collapse which occurs. Thus, collapse is responsible for the lowering in grade, and therefore in value, of a considerable proportion of the timber in trees of these species."

"In considering the treatment of timber to overcome collapse, it must be understood that collapse differs distinctly from normal shrinkage, and whereas the former can be overcome the latter cannot by any known means, though it can be slightly reduced. The essential differences between the two are:

"(1) Ordinary shrinkage is unaccompanied by any marked

distortion of the cells, whereas such distortion, detectable by microscopic examination, is the feature from which collapse takes its name.

"(2) Ordinary shrinkage does not commence in any particular zone in a piece of timber until all the free moisture has been removed from the cavities of the cells in that zone; collapse, on the other hand, becomes evident long before all the free moisture has been removed from the cell cavities.

"(3) Ordinary shrinkage cannot be eliminated, though it can be reduced slightly, and timber will continue to shrink and swell with changing atmospheric conditions; collapse can be overcome simply, and once removed under the correct conditions will not reappear, though it can be induced by artificial conditions."

"Explanation of the stresses necessary to cause collapse of the cell walls has been a more difficult problem, but the theory first put forward by H. D. Tiemann (Dry Kiln Expert, Forest Products Laboratory, Madison, Wisconsin, U. S. A.) seems to fit the facts and is the only one to date to which credence can be given. It is based on the proved experimental fact that if from a system of fine tubes filled with water the water be removed without air being allowed to enter, there will be set up not only the small external pressure due to the creation of a vacuum, but a very great tensile stress due to the cohesive tendency of the film of water lining the tubes. Tiemann's theory assumes these conditions to exist in the drying of a piece of timber with an initially high moisture content, the cells being the fine tubes. In the case of timber, the essential factors, variation from any one of which would account for a particular timber not collapsing, are very high initial moisture content, cell structure of such a nature as to preclude the entry of air as the timber dries, and a fiber strength insufficient to withstand the stresses set up, other conditions being suitable for their development.

"To Mr. Grant, Senior (now of East Warburton, Victoria), and to his son, Mr. George Grant (now of Alexandra, Victoria) belongs the credit of having discovered and developed a method of obtaining permanent recovery in size of collapsed timber. The treatment developed by them—for which the

term 'reconditioning' has been generally adopted—consists of steaming the timber, after it has been dried to a moisture content of 10 to 12 per cent or lower, for a period dependent on the severity of the collapse and on the thickness of the stock."

"The simplicity of the Grant method of reconditioning collapsed timber makes it of easy commercial application, and, in Victoria alone, it has been adopted by plants with an aggregate annual output of approximately 10,000,000 super. feet. . . . Air-dried stock, provided it is sufficiently dry, can be treated as effectively as kiln-dried stock, but in either case the moisture content must be at least as low as 25 to 30 per cent before the treatment is given.

"The only requirements for carrying out the treatment on a commercial scale are a steaming chamber and a sufficient steam supply. . . . The treatment consists simply of running the timber into the chamber, closing the door, and steaming for the required period. The length of the steaming period is dependent on the severity of the collapse, and for this reason badly collapsed stock should, where practicable, be sorted from less severely collapsed stock and treated separately. Determination of the time required is simply a matter of observing the degree of recovery in size obtained."

La forêt de Madagascar. By JEAN BIGORGNE. *Actes & Comptes Rendus de l'Assn. Colonies-Sciences* (Paris) 6: 66: 249–255, Dec. 1930; 7: 67: 7–12, Jan. 1931.

The forests of Madagascar are conveniently subdivided into four principal classes: (1) The evergreen forests of the east; (2) the deciduous forests of the west; (3) the dry forests of the south; and (4) the mangrove swamps. Descriptions of these regions are followed by accounts of the principal timbers and other forest products.

Réunion. Les forêts et les bois. By MARCEL RIGOTARD. *Revue Internationale des Products Coloniaux* (Paris) 6: 61: 35–42, Jan. 1931.

The Island of Reunion was uninhabited at the time of its discovery by Portuguese navigators in the first quarter of the

16th century and luxuriant forests extended from the high mountains to the coast. The first settlers were French and natives of Madagascar who, under the pretext of clearing for agriculture, completely destroyed the timber back to an elevation of 500 meters or even more in some places. There are now less than 250,000 acres which can be classed as forest and woodland.

Enough of the original vegetation remains at altitudes between 1200 and 1600 meters to indicate what the virgin forest was like. Three stories are readily distinguished. The dominant trees at the higher elevations are the Grand Natte, Petit Natte, Bois de Fer, Bois Puant, Tan Rouge, Takamaca, Bois de Bassin, and Bois de Cannelle Blanc; at lower elevations, the Benjoin, Bois Rouge, Bois Jaune, etc.

The principal trees of medium size composing the second story are the Bois Noir des Hauts or Bois d'Ébène, Bois de Coeur Bleu, Bois Maigre, Bois d'Olive, Bois de Pomme, Bois de Gaulette, Mahot or Bois de Senteur, Bois de Judas, and Mapou.

The underwood of shrubs and small trees is almost impenetrable in many places. Among the component species are the Bois d'Oiseau, Bois de Rempant, Bois de Merle, Bois d'Ortie, Lingue, Bois de Quivi, Bois Cassant, and Bois de Chenille or Bois de Tabac, together with tree ferns, screw pines, wild canes, and small palms.

The mountains which occupy the central portion of the Island of Reunion rise to heights of 2000 to 3000 meters, culminating in the Piton des Neiges, 3069 meters above the sea. The finest timbers are found in a zone extending upward from the foot of the mountains to about 500 meters elevation. The soil is volcanic and rich, but often is too shallow to permit the growth of very tall trees. There are countless deep ravines which are constantly eating into the soil where the ground cover is not dense enough to hold it in place. Under natural conditions the forest would maintain itself, but is prevented doing so by indiscriminate clearing and burning for the growth of crops of maize, peas, and sweet potatoes.

The serious consequences of forest destruction soon became all too evident as the heavy tropical rains were likely to be

followed by disastrous landslides. Control measures were instituted in 1853, but proved insufficient. More elaborate regulations were put into force in 1874 and the Service des Eaux and Forêts instituted. This Service has had its periods of low activity, but on the whole has progressed in importance and efficiency. Forest management is attended by many difficulties peculiar to the locality, but these are now being methodically studied. Considerable areas have been planted to species of *Casuarina* and others to Maritime Pine.

The forests of Reunion contain a great many different kinds of trees, though the important timbers are comparatively few in number and may be classified, according to their uses, as follows:

Construction timbers, first class.—Petit Natte, Grand Natte, Takamaca, Bois de Bassin, Bois de Pomme, Bois Puant, Bois Rouge, Bois de Fer, Filao, Benjoin, and Bois de Tan.

Construction timbers, second class.—Bois Maigre, Bois de Gaulette, Change Écorce, Bois d'Ébène, Bois de Rempart, Bois de Senteur Galet, Bois Jaune, Bois de Nèfle, Goyavier Marron, Bois de Judas, Bois de Pêche, Bois de Jamlongue, Jamrosa, Bois de Perroquet, Bois Blanc, and Bois de Mapou.

Woods for joinery and cabinet working.—Grand Natte, Bois Noir, Bois d'Olive, Jacquier, Tamarin des Hauts, Bois d'Ébène, Benjoin, and Petit Natte.

Timbers for maritime structures.—Tamarin des Hauts, Takamaca, Bois Rouge, and Tan Rouge.

Woods for cartwright work.—Hubs: Bois Noir, Takamaca, Tan Rouge, and Bois de Coeur Bleu. *Felloes:* Bois Noir, Benjoin, Takamaca, and Tan Rouge. *Spokes:* Petit Natte. *Shafts:* Takamaca and Bois de Coeur Bleu. *Poles.* Takamaca. *Racks:* Petit Natte. *Yokes:* Tan Rouge.

Medicinal woods and plants.—Ambaville, Faham, Bois Cassant, Bois Jaune, Salsepareille, Bois d'Andrèze, Ayapana, and Quinquina (Int.).

CHECK LIST OF THE COMMON NAMES

Common Name	*Botanical Name*	*Family*
Ambaville	*Senecio ambavilla* Pers.	Compositae
Andrèze	*Celtis madagascariensis* Boj.	Ulmaceae

Ayapana	*Eupatorium ayapana* Vent.	Compositae
Benjoin	*Terminalia mauritiana* Lam.	Combretaceae
Bois blanc	*Hernandia ovigera* L.	Hernandiaceae
Bois cassant	*Psathura borbonica* J. F. Gmel.	Rubiaceae
Bois de Bassin	*Blackwellia paniculata* Lam.	Flacourtiaceae
Bois de chenille	*Psiadia* sp.	Compositae
Bois d'ébène	*Diospyros melanida* Poir.	Ebenaceae
Bois de fer	*Sideroxylon borbonicum* A. DC.	Sapotaceae
Bois de gaulette	*Cupania alternifolia* Pers.	Sapindaceae
Bois de Judas	*Cossinia borbonica* DC.	Sapindaceae
Bois de mapou	*Andromeda pyrifolia* Thou.	Ericaceae
Bois de merle	*Schmidelia* sp.	Sapindaceae
Bois de nèfle	*Jossinia mespiloides* DC.	Myrtaceae
Bois d'oiseau	*Claoxylon* sp.	Euphorbiaceae
Bois d'olive	*Olea lancea* Lam.	Oleaceae
Bois d'ortie	*Obetia* sp.	Urticaceae
Bois de pêche	*Syzygium paniculatum* Gaertn.	Myrtaceae
Bois de perroquet	*Fissilia psittacorum* Vahl	Olacaceae
Bois de pomme	*Syzygium glomeratum* DC.	Myrtaceae
Bois de Quivi	*Quivisia* sp.	Meliaceae
Bois de rempart	*Agauria* spp.	Ericaceae
Bois de rempart	*Monimia myrtifolia*	Monimiaceae
Bois de senteur galet	*Olea cernua* Vahl	Oleaceae
Bois de tabac	*Psiadia* sp.	Compositae
Bois de tan	*Weinmannia macrostachya* DC.	Cunoniaceae
Bois jaune	*Ochrosia borbonica* J. F. Gmel.	Apocynaceae
Bois maigre	*Nuxia verticillata* Lam.	Loganiaceae
Bois puant	*Foetidia borbonica* J. F. Gmel.	Lecythidaceae
Bois rouge	*Elæodendron orientale* Jacq.	Celastraceae
Cannes marronnes	*Cordyline* spp.	Liliaceae
Change écorce	*Prockia theaeformis* Willd.	Flacourtiaceae
Faham	*Angrecum fragrans* Thou.	Orchidaceae
Filao	*Casuarina* spp.	Casuarinaceae
Fougères arborescentes	*Cyathea* spp.	Cyatheaceae
Goyavier marron	*Ludia sessiliflora* Lam.	Flacourtiaceae
Grand natte	*Imbricaria maxima* Poir.	Sapotaceae
Jamrosa	*Jambosa vulgaris* DC.	Myrtaceae
Lilas	*Melia azedarach* L.	Meliaceae
Lingue	*Mussaenda* sp.	Rubiaceae
Palmistes des bois	*Acanthophoenix* spp.	Palmaceae
Petit natte	*Imbricaria petiolaris* A. DC.	Sapotaceae
Pin maritime	*Pinus Pinaster* Sol.	Pinaceae
Salsepareille	*Smilax anceps* Willd.	Liliaceae
Takamaca	*Calophyllum spurium* Boj.	Guttiferae
Tamarin des hauts	*Acacia heterophylla* Willd.	Leguminosae
Tan rouge	*Weinmannia macrostachya* DC.	Cunoniaceae
Vacoas marrons	*Pandanus* spp.	Pandanaceae

Études sur les caractères anatomiques du liber secondaire dans les essences forestières d'Algérie. By J. DE SAINT-LAURENT. *Bulletin de la Station de Recherches Forestières du Nord de l'Afrique* (Alger) 1: 10: 421–516, Nov. 1930. Ill. with 49 text figs. and 76 photomicrographs.

This comprehensive study of the indigenous trees and shrubs of northern Africa is in continuation of anatomical investigations upon which the same author published in parts 7 and 9 of the same volume of the *Bulletin*. The present report is concerned with the barks, the previous ones with the woods. (See *Tropical Woods* 17: 56, March 1, 1929.) The information is presented in the form of a descriptive key and also in tables. Every species is fully illustrated.

Étude sur la forêt et les bois du Cameroun sous mandat français. By LOUIS HÉDIN. Paris, 1930. Pp. 230; 6½ x 10; 1 map; 14 full-page half-tones.

In this important book the author, Chargé de Mission par le Haut-Commissaire de la République au Cameroun, has brought together the results of his personal investigations and those of numerous explorers, botanists, foresters, and wood technologists.

Chapter I (pp. 18–32) contains a concise account of the Cameroon forest as a whole—its extent and principal divisions, and the soil, topography, and climate of the region. Chapter II (pp. 33–40) summarizes the situation with reference to forest exploitation and the timber industry. The foregoing are introductory to Chapter III (pp. 41–200) which is an annotated list of the trees, arranged by families. The descriptions of the more important species (117 species, representing 88 genera of 37 families) include the scientific and vernacular names; the size, appearance, and occurrence of the trees; the anatomy, density, and uses of the woods. Chapter IV considers the problems attending the successful exploitation of the timber resources. The book is concluded with a bibliography and indexes to the scientific and vernacular names of the trees.

L'apport des colonies et des possessions françaises en matières tannantes. By MAURICE MARTELLI. *Actes & Comptes Rendus de l'Assn. Colonies-Sciences* (Paris) 7: 67: 1–6, Jan. 1931; 7: 68: 34–40, Feb. 1931; 7: 69: 59–71, March 1931.

Nos bois coloniaux. By JEAN MÉNIAUD. Paris, 1931. Pp. 386: 6½ x 10; ill. with 7 maps, 3 graphs, 50 half-tones.

This large, well written, profusely illustrated publication has been compiled at the request of the Commission de Synthése de l'Exposition Coloniale Internationale. It is designed to cover the whole field of production, importation, and utilization of French colonial woods. It contains accounts of the different forest regions; problems of exploitation; regulations governing logging operations; descriptions of the commercial timbers; market conditions for tropical woods; addresses of firms able to procure the timbers; present utilization and suggestions for improvements and extensions, etc. It is in fact a veritable encyclopedia of French colonial timbers from the forest to the consumer.

Étude physique et méchanique des bois coloniaux. By JEAN COLLARDET. Paris, 1930. Pp. 132; 6½ x 10. Ill.

This report contains the results of tests of the mechanical, physical, and certain other properties of 310 different timber samples representing 170 species obtained in the French Colonies, mostly West Africa and Indo-China. The tests were conducted at the Laboratoire des Bois du Service des Recherches d'Aéronautique by Marcel Monnin and his collaborator, the late Mr. Tiédrez, and at the Laboratoire de la Station d'Essais des Bois Coloniaux de l'Agence Générale des Colonies by Jean Collardet and Jean Fulconis. The determinations of the herbarium specimens were made at the Muséum National d'Histoire Naturelle.

The preface (pp. 5–10) explains the purpose of the investigations and gives the sources of the materials used. Chapter I (pp. 11–75) first explains the Monnin method of testing and shows illustrations of the machines employed. This is followed by tables (pp. 33–75) summarizing the results of tests. The

dicotyledonous woods are divided into five classes: V. Very soft and light (sp. gr. less than 0.50); IV. Soft and light (sp. gr. 0.50–0.65); III. Moderately soft and light (sp. gr. 0.65–0.80); II. Hard and heavy (sp. gr. 0.80–0.95); I. Very hard and heavy (sp. gr. over 0.95). The few conifers tested are of three classes: IV. Soft and light (sp. gr. 0.40–0.50); III. Moderately hard and heavy (sp. gr. 0.50–0.60); II. Hard and heavy (sp. gr. 0.60–0.70). The tables include common and scientific names; hardness; specific gravity at 15 per cent, with correction factor; saturation point and shrinkage; cleavability; shear; compression; static bending; impact. The results are so arranged that, with a knowledge of the requirements for a particular use, the woods most nearly meeting these requirements are readily selected. At the back of the book are similar tables for various of the better known timbers of commerce, thus providing a basis for comparison and selection.

Chapter II (pp. 77–82) outlines a method for comparing woods and determining their suitability for specific purposes. The demands of the principal wood-using industries with reference to the different properties of wood are presented in tabular form.

Chapter III (pp. 83–123) deals with 15 different major uses of wood and lists the species in the several French colonies which are best adapted to each purpose.

The whole is a work of exceptional interest and value as it presents in convenient form a large amount of new information, the results of hundreds of careful tests on authentic specimens. It is one of a series of notable contributions to the knowledge of the timber resources of the French colonies, which will have a far-reaching effect in promoting the use of tropical woods and thereby stimulate tropical forestry.

Specialization in secondary xylem of Dicotyledons. I. Origin of vessel. II. Evolution of end wall of vessel segment. III. Specialization of lateral wall of vessel segment. By Frederick H. Frost. *Botanical Gazette* (Chicago) 89: 1: 67–94, March 1930; 90: 2: 198–212, Oct. 1930; 91: 1: 88–96, March 1931. Ill.

"The writer plans to trace the major lines of specialization in the secondary xylem and to publish his results in a series of related papers. . . . The fourth will deal with the form and distribution of vessel segments, etc. A list of new diagnostic characters and a discussion of their use in identification will be given in the final paper of the series."

Summary of First Paper

"1. Tracheids are characterized by great average length, small cross-sectional diameter, angularity of outline, evenly thickened walls, thin walls, and the absence of a distinct end wall.

"2. Vessel segments which retain these primitive characteristics nearly always have scalariform perforations; the scalariform perforation is therefore primitive.

"3. There is a high correlation between the diffuse arrangement of vessels and the scalariform condition of the end wall.

"4. Vessel segments with scalariform perforations are characterized by scalariform lateral pitting; therefore scalariform lateral pitting is primitive, and this leads to the natural inference that the tracheid type from which the vessel was derived was also scalariform.

"5. A high correlation was found between the scalariform condition of the lateral walls of vessel segments and the presence of bordered pits in the fibrous elements.

"6. There was some evidence to indicate that a sequence from the protoxylem to the secondary xylem would reflect the origin of the vessel.

"7. Many primitive woods show, in this positional sequence, all transitions from scalariform tracheids to scalariform vessel segments.

"8. The evidence would indicate that vessel segments with scalariform pitting on both the end and side walls are more primitive than vessel segments with scalariform pitting on the end walls and opposite to alternate pitting on the side walls.

"9. The wood of the vessel-less Angiosperms *Trochodendron*, *Tetracentron*, and *Drimys* is unquestionably very primitive. The primitive tracheids of these genera resemble, to a

considerable degree, the scalariform tracheids characteristic of the primary wood of primitive Angiosperms."

Summary of Second Paper

"1. Scalariform intervascular pitting is primitive in the organization of the vessel segments of the dicotyledons.

"2. Specialization of the scalariform pit produces transitional and opposite pitting. The rearrangement of opposite pits gives rise to the highly specialized alternate arrangement of intervascular pits.

"3. Vessel-parenchyma pitting may be scalariform, transitional, opposite, or alternate. The evolutionary development is the same as in the development of intervascular pitting.

"4. Vessel-parenchyma pits may be fully bordered, half-bordered, or non-bordered. The fully bordered pit appears to be primitive and to give rise during specialization to the half-bordered and the non-bordered type.

"5. The introduction of tertiary spirals in secondary vessel segments is an evidence of specialization. Spirals do not occur in the most primitive dicotyledonous woods."

Summary of Third Paper

"1. The scalariform perforation is primitive and the porous perforation is specialized. The phylogenetic order of development is: scalariform, scalariform-porous, oblique porous with vestiges of the scalariform condition, and transverse porous.

"2. The primitive fully bordered aperture of a scalariform perforation gradually loses its order as the perforation becomes specialized.

"3. The primitive scalariform perforation has many bars, which are generally lost in slow stages in correlation with the evolutionary development of the perforation.

"4. Specialization of the scalariform perforation frequently results in a widening of the apertures of the perforation.

"5. The inclination of the end wall changes from the highly inclined position to the transverse position as the scalariform perforation develops into the porous perforation.

"6. The lateral pitting specializes more rapidly than the specialization of the perforation."

Price 35 cents

Yale University School of Forestry

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

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

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PHILIPPINE DAO (*DRACONTOMELUM DAO*)

By GEORGE A. GARRATT

Associate Professor of Forest Products, Yale University

Dao is one of the most recent contributions of the Philippine forest to the timber trade of the United States. Some of the dealers call it by its native name, but others prefer the wholly inappropriate designation of "New Zealand Wood." In general appearance and anatomy it rather closely resembles the lighter-colored kinds of the so-called Orientalwood, of Queensland, and is being used for the same purposes. Although the present demand for Dao is small, there is no obvious reason why it should not substantially increase.

COMMON NAMES

TRADE: Dao, New Zealand Wood. PHILIPPINES: Batúan (Bisayan language); Daó (Bataan, Rizal, Laguna, Tayabas,

Camarines, Albay, Sorsogon, Masbate, Samar, Negros, Leyte, Palawan, Mindoro, Cotabato, Zamboanga); Habás (Agusan); Hamárak or Kamárak (N. Luzon); Kiakía (Leyte Is.); Lupigí (Cagayan); Makadáeg (Ilocos Norte); Mamákau (Agusan, Davao); Mákau (Agusan, Cotabato); Malaiyau (Tayabas). CELEBES: Boewah Raoe (Menado); Koïli (Minahassa); Ngamè (Ternate).

The name Dao is also recorded for *Artocarpus lakoocha* Roxb. (Moraceae), of India. A similar name, Dau (pronounced yao), has been applied to several species of *Dipterocarpus* native to Indo-China; it is also used, in combination with some other word, to designate a number of other Indo-China woods belonging to various families.

BOTANICAL CLASSIFICATION

Daó is a name in the Tagalog language for *Dracontomelum dao* (Blanco) Merrill & Rolfe. This is one of about 14 species having a combined range extending from the Andamans and the Philippines through the East Indian Archipelago to Fiji. The genus is one of several comprising the tribe Spondieae (of which the tropical American Hog Plum, *Spondias*, is the type) of the large family Anacardiaceae. The only well-known representatives of this family in the United States are the Sumacs (*Rhus*), and about the only woods of more than local importance are Quebracho Colorado (*Schinopsis* spp.), of southern South America, and Gonçalo Alves (*Astronium fraxinifolium* Schott), of Brazil. The woods of the family as a whole exhibit a very wide range in density, color, and technical properties, though several of them are highly attractive.

The tree was first described by Blanco, in 1837, under the name of *Paliurus dao* (fam. Rhamnaceae). Later F.-Villar recognized it as a species of *Dracontomelum* and believed it to be identical with *D. mangiferum* Blume. According to Merrill & Rolfe (1908), however, "the Philippine material, on comparison with authentic specimens of Blume's species, was found to differ constantly from *D. mangiferum* in its much smaller leaflets. Blanco's specific name is here retained for the Philippine form, for although his description is short and

rather imperfect it manifestly applies to the specimens here cited. *Dracontomelum celebicum* Koorders, from Celebes, is apparently identical with the form here considered, so far as can be determined from the fragmentary co-type in Kew Herbarium."

THE TREE

The tree grows to fairly large dimensions, attaining a height of 115 to 130 feet and a diameter of 3 feet or more above the buttresses. The bole, which attains a length of 65 feet, is usually straight in forest-grown trees, although it is often fluted near the attachment of the buttresses and of the larger branches. The buttresses are thin, but strongly developed, sometimes reaching a height of 20 to 26 feet. The crown is wide-spreading and open. The bark, which is light steel gray and nearly smooth at maturity, scales off in scroll-shaped pieces of varying size, exposing the light brown color beneath. There is a thin red layer just inside the cork. The inner bark is stringy.

The leaves, which are bunched at the ends of the stout twigs, are alternate and pinnate, usually with 5 to 7 pairs of smooth, glossy, light green leaflets. The latter are 2–6 inches long and 1–1¾ inches wide, pointed at the apex and inequilateral at the base.

The small, white, odorless flowers are borne on compound inflorescences. The fruits are yellow, rounded, about ¾ inch in diameter, and have an edible pulp around the seed.

RANGE AND OCCURRENCE

Although nowhere abundant, Dao is widely distributed in the Philippines. Schneider lists twelve provinces and five islands from which it has been reported. Whitford says that it probably occurs in every province and is "usually associated with Amuguis [*Koordersiodendron pinnatum*], occupying a position in flats and along streams, though found on moist slopes. It thrives best in damp soils and is intolerant of shade." Heyne records the occurrence of the tree in North Celebes and Ternate.

Uses of the Wood

In the Philippines the wood is reported as being used for a variety of purposes. When treated with preservatives, it is considered to be suitable for posts, mine timbers and paving blocks. It has been used in house construction for beams, joists, and rafters; sheathing and ceiling; flooring; door panels; and interior finish. It is also employed in the manufacture of furniture and in cabinetwork. The buttresses have been used in making solid cartwheels, wash bowls, and round and rectangular table tops.

In the United States the wood is cut into veneer and used exclusively in the manufacture of furniture. Part of the veneer is cut on the half-round and part is rotary cut, but the bulk of it is sliced. Some of the furniture-makers stain the wood to resemble Walnut, others Mahogany.

Commercial Considerations

Dao apparently first entered the American market about fifteen years ago, being introduced in an experimental way, but did not become established at that time. No further attempts were made to introduce the wood until about a year ago, when one of the American importers of tropical woods began to market it under the name of New Zealand Wood. During the past spring, Ichabod T. Williams & Sons, New York, the firm that imported the original shipment of Dao, brought in another experimental lot of about 10,000 board feet.

Mr. T. R. Williams, president of that firm, considers Dao a useful timber for anyone desiring a material of the general type of American Black Walnut. He finds that it differs from Walnut in having a more greenish gray color and in exhibiting more stripe and "cross-fire" figure when quarter-sawed; also the logs are of much larger size. The texture is somewhat harder and a little less leathery in consistency than that of Walnut. He adds: "It resembles very closely the timber imported from the high tablelands of Queensland, Australia, and known in this country as Orientalwood; we believe it can be used for the same purposes."

Mechanical Properties of the Wood

The results of the first series of tests made on Dao were published in the appendix to Bulletin No. 14 of the Philippine Bureau of Forestry. While not definitely stated, it is implied that the methods used in testing this wood were the same as those outlined in Bulletin No. 4. According to the latter reference, the beams used in the static bending tests were either 3½ x 3½ or 4 x 4 inches in cross section, with a span of 60 inches; the specimens tested in compression parallel to the grain were either 3½ x 3½ inches or 4 x 4 inches in cross section and 8 inches long. In the case of Dao, the moisture content of the test specimens was definitely above the fiber-saturation point. The derived strength values which follow apply, therefore, to unseasoned material.

Kind of test	Moisture content	Strength values		
		Maximum	Minimum	Mean
	Per cent	*Pounds per square inch*		
Static bending:	31 to 34			
Modulus of rupture		9,440	7,660	8,550
Modulus of elasticity		....	....	1,740,000
Fiber stress at elastic limit		8,150	6,320	7,230
Compression parallel to grain:	35 to 63			
Maximum crushing strength		5,710	3,770	5,070

More recently a series of static bending tests were made by Espinosa on unseasoned Dao timbers in structural sizes. The beams used in these tests varied from 2 x 4 inches in cross section and 6 feet in length to 8 x 8 inches in cross section and 12 feet in length. The following values were obtained:

Number of tests	4
Moisture content	42 per cent
Specific gravity (at test)	0.84
Specific gravity (oven dry, based on volume at test)	0.59
Fiber stress at elastic limit	5,330 lbs. per sq. in.
Modulus of rupture	8,880 lbs. per sq. in.
Modulus of elasticity	1,680,000 lbs. per sq. in.
Longitudinal shear	320 lbs. per sq. in.
Work to elastic limit	0.92 in.-lbs. per cu. in.
Work to maximum load	7.18 in.-lbs. per cu. in.

Based on the results of tests of unseasoned beams, such as the above, Espinosa also compiled a series of "adaptability numbers" for the several properties of beams. These express the strength of the various woods tested in terms of the strength of Red Lauan (*Shorea negrosensis* Foxw.). Following are the adaptability numbers for unseasoned Dao and White Ash[1] (*Fraxinus americana*), the latter being included for comparative purposes:

Property	Adaptability number	
	Dao	White Ash
	Red Lauan = 100	
Strength as a beam	145	165
Stiffness as a beam	120	115
Toughness as a beam	95	130

Description of the Wood

Heartwood variable from greenish gray to medium brown; irregularly marked with distinct chocolate brown or black streaks; somewhat resembling Walnut in general appearance. Sapwood thick and sharply demarked from heart; light brown, often with a pinkish tinge; without black markings. Odor of wood slightly sour but not objectionable, suggesting Oak; taste not distinctive.

Wood rather hard and heavy; sp. gr. (3 commercial specimens) 0.79 to 0.84 at 8 per cent moisture content; weight 50 to 52.5 lbs. per cu. ft.;[1] grain decidedly interlocked;[2] texture medium and uniform.

[1] Values used in computing the adaptability numbers for White Ash are taken from U. S. Dept. Agr. Bul. No. 556.

Gross Anatomy

Pores of moderate size, distinct to unaided eye; fairly numerous and rather uniformly distributed throughout ground mass, sometimes exhibiting a tendency to be disposed in short oblique rows; mostly solitary, but frequently in groups of 2 to 3 (rarely more); generally filled with tyloses. Vessel lines distinct; both lighter and darker than background, depending on appearance of somewhat lustrous tyloses. Parenchyma visible under lens as narrow to fairly wide bands surrounding pores; at times with short winglike extensions; in specimen No. 19717 occasionally extending from pore to pore for considerable distance and frequently distinct to unaided eye. Rays faintly visible without hand lens on cross and tangential sections; distinct, but not conspicuous, on radial surface, being somewhat darker than background, especially in heartwood. Growth rings absent, or scarce and poorly defined; a few apparent growth rings formed by difference in density of fibers.

Minute Anatomy

Vessels: Rather uniformly disposed throughout ground mass on transverse section; mostly solitary, but frequently in radially (sometimes tangentially) flattened groups of 2 or 3, or seldom up to 5. Solitary pores mostly oval in outline; radial diameter from 0.09 to 0.45 mm. (average 0.25 mm.) and tangential from 0.06 to 0.36 mm. (average 0.21 mm.). Irregular, thin-walled tyloses abundantly developed. Vessel segments mostly barrel-shaped, occasionally with short, narrow, projecting tips; 0.14 to 0.65 mm. (average 0.37 mm.) long; end walls variable from transverse to slightly oblique. Perforations exclusively simple; rim narrow but distinct. Intervascular pits large and distinct, about 0.012 to 0.015 mm. wide; alternate, numerous and crowded; borders irregularly rounded to polygonal in outline; apertures oval to narrow lenticular, horizontally inclined, normally included, but sometimes exserted and coalescent. Vessel-parenchyma pits variable in size and outline, but mostly large and tending to oval; simple and half-bordered (both in whole or

[1] The air-dry or shipping-dry weight is given by Schneider as 3847 to 4034 pounds per thousand board feet.

[2] Schneider reports the wood as straight-grained, but all of the available specimens in the Yale collections have pronounced interlocked grain.

in part); sometimes much elongated and tending to scalariform arrangements in wood parenchyma.

Wood fibers: Libriform fibers make up bulk of ground mass of wood. On transverse section, they are small, moderately thick-walled and irregular in shape, although disposed in fairly definite radial rows. In specimen No. 2193, occasional apparent growth rings indistinctly formed by slight flattening of 1 to 3 rows of fibers. As seen on longitudinal sections and in macerated material, they are fairly regular in outline and mostly without distinct shoulders, tapering gradually to long sharp ends from the enlarged median portions; 0.41 to 1.85 mm. (average 1.22 mm.) long. Distinctly septate, with numerous cross walls; prominence due to often pronounced depositions of dark brown resin or gum.[1] Simple pits small but distinct, slit-like; scattered and largely confined to radial walls.

Wood parenchyma: Distinctly paratracheal, surrounding pores in more or less complete bands, 1 to 7 cells wide; most abundantly developed on radial sides of pores, at times forming short to rather long aliform extensions; in specimen No. 19717 a single distinct metatracheal band, 4 to 10 cells wide, was noted. Deposits of dark brown gum common; crystals fairly so; occasional horizontal resin plates observed. Cells frequently tending to be disjunctive (conjugate).

Rays: Heterogeneous; marginal cells large and squarish to slightly upright; interior cells distinctly procumbent. Light to dark brown gum deposits abundant in all cells in heartwood; small rhombohedral crystals of calcium oxalate common, especially in marginal cells. On tangential section, rays are narrow lenticular in outline and 1 to 3 (rarely 4) cells (0.08 mm.) wide, with triseriate predominating (in specimen No. 19717, rays are rather frequently 4 cells wide); the wider rays occasionally fused vertically; procumbent cells mostly oval in section; cells of uniseriate margins squarish to somewhat axially elongated. Non-fused rays up to 37 cells (1.098 mm.) high; fused up to 66 cells (1.646 mm.) high.

Material

Yale Nos. 2193 (Phil. Bur. For. Mus. Plank 147), 2194 (Phil. Bur. For. No. 17550), and 19717 (trade sample).

Notes on Other Species of *Dracontomelum*

In addition to *Dracontomelum dao*, a number of other species of the genus have been described, all of them being reported from the Far East, as follows: *Dracontomelum celebicum* Koord. (Celebes); *D. costatum* Blume (Borneo); *D. cuspidatum* Blume (Borneo); *D. duperreanum* Pierre (Cochin China); *D. edule* (Blanco) Skeels (Phil. Is.); *D. laxum* K. Schum.

[1] It is likely that many of these so-called septations are actually horizontal resin plates. Weight is given this contention by the fact that similar features are occasionally observed in the wood parenchyma cells.

(New Guinea); *D. mangiferum* Blume (Java); *D. papuanum* Lauterb. (New Guinea); *D. pilosum* Seem. (Fiji Islands); *D. puberulum* Miq. (Sumatra); *D. sinense* Stapf (Tropical Asia); *D. sylvestre* Blume (Borneo); *D. vitiense* Engl. (Fiji Islands).

Dracontomelum sylvestre Blume (syn. *D. edule* Merr., non *D. edule* Skeels) occurs in the islands of Leyte, Palawan, Basilan, Mindanao, and Luzon. There are no authentic wood specimens of this species available to the writer.

Dracontomelum edule (Blanco) Skeels (syns. *Paliurus edulis* Blco., *P. lamiyo* Blco., *Comeuryo Cumingianum* Baill., *Dracontomelum Cumingianum* Baill., *D. lamiyo* Merr.) is rather widely distributed in the Philippines, from northern Luzon to southern Mindanao. It is generally known as Lamió. Other local names are: Aduás (Rizal); Alauíhau or halauíhau (Leyte, Samar, and So. Luzon); Bili-bili (Tablas Island); Bió (Pangarinan). According to Brown, the tree attains a height of about 65 feet and a diameter of about 24 inches. "The leaves are alternate, pinnate, and hairy; the leaflets are pointed at the apex, rounded at the base, and from 10 to 20 centimeters (4 to 8 inches) in length. The flowers are small, and occur on rather large, compound inflorescences. The fruits are rounded, yellow, and have an edible pulp around the seed."

The wood of *D. edule* (Yale Nos. 2192 and 5661; Phil. Bur. For. Nos. 12957 and 17547) is somewhat lighter in weight and color and slightly softer than that of Dao. Schneider reports that the wood has been sold with miscellaneous lumber on the Manila market and used for cheap construction and the like. The anatomy of the wood is practically identical with that of Dao. Kanehira records the presence of large horizontal resin ducts in the rays of *D. edule*, but no specimen of *Dracontomelum* in the Yale collections exhibits such ducts; Moll and Janssonius report them as absent in *D. mangiferum* and *D. mangiferum*, var. *pubescens*, the only representatives of the genus these authors describe.

Comparison with Orientalwood

As has been previously mentioned, the wood of Dao bears a marked resemblance to that of Orientalwood (*Endiandra*

Palmerstoni) and it is the opinion of the importers that the two can be used for the same purposes. The color of the lighter specimens of Orientalwood is quite close to that of Dao, and the two are alike in density, hardness, texture, and often in grain. However, Orientalwood possesses a characteristic sour odor, which is frequently considered objectionable, and, by virtue of a high silica content, is more difficult to mill or saw than Dao. On the other hand, it is somewhat freer from knot defects than Dao.

There are a number of characteristic anatomical differences between the two woods. Most outstanding is the arrangement of the wood parenchyma, which in Orientalwood is sparingly paratracheal, but profusely developed in distinct concentric lines, which are usually distant and commonly associated with one to several rows of flattened wood fibers, apparently terminating growth rings; at times, however, they are very close together. These concentric parenchyma lines are readily visible to the unaided eye on transverse section. Enlarged parenchyma cells are of frequent occurrence on all sections of Orientalwood, usually associated with the rays; these are presumably secretory cells, although generally devoid of contents. The wood fibers in Orientalwood are not septate and frequently contain gum; the slit-like simple pits are larger and more distinct than in Dao. Crystals, so common in the rays of Dao, are rare in those of Orientalwood.

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Notes on the Yale Wood Collections

A checkup of the Yale wood collections gives the following figures as of August 10: No. of samples, 20,000; named species of Angiosperms, 5723; named species of Gymnosperms, 261; genera, 1901; families, 195. There are still many herbarium specimens awaiting determination.

Dr. Adolpho Ducke, of the Jardim Botanico do Rio de Janeiro, left in July on a collecting trip to the Amazonian region in coöperation with the Yale School of Forestry. Dr. A. Rimbach, of Riobamba, Ecuador, expected to leave the latter part of August on a similar mission to the Western Cordillera and the valley of the Rio Chimbo. Plans for other coöperative excursions are now being formulated.

An exceptionally interesting collection of the woods of eastern Cuba has recently been made by Mr. G. C. Bucher, of Santiago de Cuba. The botanical material was determined by Dr. Roig. Out of eleven specimens supplied by the New York Botanical Garden from Mount Duida, Venezuela, six are from the types of new species, two of which represent new genera.

TWO NEW TREES FROM SOUTH AMERICA

By PAUL C. STANDLEY

Field Museum of Natural History

Among a few specimens of Brazilian trees recently received for determination from Professor Samuel J. Record there was found almost complete material of the well-marked tree described below as new. The specimens were submitted originally by Dr. A. J. de Sampaio, who reported that the tree represented was known locally by the vernacular name Canella Samambaia.

Sickingia Sampaioana, sp. nov.

Arbor, ramulis gracilibus teretibus ochraceis, novellis adpresse pilosis, internodiis brevissimis; stipulae deciduae lanceolato-oblongae acutae vel acuminatae 7–9 mm. longae extus dense pallide sericeae; folia opposita petiolata coriacea, petiolo crassiusculo 3–10 mm. longo sparse pilosulo vel fere glabro interdum fere ad basin anguste marginato; lamina oblongo-obovata 4.5–7 cm. longa 1.8–3 cm. lata acuta vel obtusa, interdum subrotundata et brevissime protracta, apice ipso obtuso, basin versus longe sensim attenuata et saepe decurrens, supra in sicco lucida, glabra vel tantum ad costam prominentem sparse pilosa, nervulis arcte reticulatis prominentibus, subtus vix pallidior, sublucida, ad venas sparse pilosa vel glabrata, in axillis nervorum minute barbata, costa gracili elevata, nervis lateralibus utroque latere c. 11 gracilibus prominentibus angulo latiusculo adscendentibus fere rectis prope marginem conjunctis, nervulis saepe transversis rectis et subparallelis vix prominulis aliis minoribus connexis; inflorescentiae axillares solitariae cymosae dense pauciflorae capituliformes, pedunculis crassis 6–8 mm. longis hirtellis, floribus sessilibus; hypanthium ut calyx dense pilis brevibus pallidis subadpressis pilosum 2–2.5 mm. longum anguste turbinatum, calyce campanulato 1.5–2 mm. longo subtruncato remote obscure dentato; corolla (perfecta non visa) parte inferiore tubi excepta extus dense griseo-sericea, tubo 3–3.5 mm. longo supra abrupte late dilatato, lobis patentibus tubo aequilongis oblongis obtusis intus sparse pilosis vel fere glabris; stamina lobis corollae aequilonga, filamentis longe exsertis villosis, antheris glabris in sicco fuscis oblongis fere 2 mm. longis; capsula depresso-globosa 1.5–2.5 cm. diam. brunnescens glabrata plus minusve pseudo-furfuracea basi et apice late rotundata; semina numerosa semielliptica c. 18 mm. longa et 6–7 mm. lata parte seminifera brunnea valde compressa 8 mm. longa ala tenerrima pallida terminata.—BRAZIL: Fazenda Pau Grande, Estado do Rio de Janeiro, "Arvore No. 28 do Servicio de Reflorestamento da Estradade Ferro Central do Brasil" (Herb. Field Mus. No. 625,842, type).

Among the relatively few species referred to the genus *Sickingia*, the present plant seems to resemble most closely *S. pikia* Schum., which was described from the Serra de Estrella in the same state. That species, represented in the herbarium of Field Museum by a photograph and fragment of the type, is conspicuously different in its larger, thinner leaves, which are widest at the middle and not at all attenuate at the base; also in its long petioles, much larger inflorescences, and broader, larger calyx.

In a small collection of Venezuelan plants obtained recently by George Newhall, and submitted to the writer for determination by Professor Record, there is incomplete but rather characteristic material of a *Machaerium* that appears to be new to the Venezuelan flora. Since the species of *Machaerium* occurring in that country have been treated recently by H. Pittier (Contrib. Dendrol. Venez. 178–186. 1928), it is possible to determine species of the genus with some degree of confidence.

Machaerium melanophyllum, sp. nov.

Rami ignoti; folia magna trifoliolata breviter petiolata omnino glabra in sicco nigra, petiolo cum rhachide 3–5 cm. longo gracili subtereti; foliola crasse 3–4 mm. longe petiolata, terminali ovali-oblongo 14.5–16 cm. longo 7–8 cm. lato subabrupte caudato-acuminato, acumine triangulari attenuato obtuso, basi late rotundato vel subtruncato, foliolis lateralibus rotundato-ovatis vel deltoido-ovatis 9–11 cm. longis c. 7 cm. latis abrupte vel sensim longe angusteque obtuso-acuminatis, foliolis sublucidis, venulis utrinque prominulis arctissime reticulatis; legumen glabrum magnum ad semen valde incurvum et hinc profunde intrusum, parte seminifera crassa 3–4 cm. longa 2–2.5 cm. lata, ala tenui 5–7 cm. longa 2–2.5 cm. lata acuta vel abrupte acuminata conspicue et laxiuscule reticulato-venosa; cetera ignota.—VENEZUELA: Near El Mene, April 25, 1931, George Newhall 7 (Yale No. 19925; type in Herb. Field Mus.).

A tree 4.5–6 meters high. Vernacular name is Cumarica. In Pittier's key to the Venezuelan species, this runs to *M. latialatum* Pittier, which has much smaller leaflets of decidedly different form, and broader, chiefly obtuse legumes.

NOTES ON BRAZILIAN TIMBERS

By SAMUEL J. RECORD

"Hudoke" and "Macawood"

These names have been coined by certain dealers for two Brazilian woods that are well-known in their native country, but of recent introduction to the markets of the United States. Hudoke[1] is Sucupira, *Bowdichia nitida* Spruce and/or *B. virgilioides* H.B.K. It is hard, heavy, tough, strong, and durable, and is preferred locally above all other woods for making felloes and hubs of carts. Its color exhibits various shades of brown with fine pencil-striping similar to Partridge Wood. Saws readily, but care is required in making veneers.

Macawood is short for Macacaúba (monkey-tree), one or more species of *Platymiscium* of the Amazon region, perhaps *P. Uhlei* Harms. According to Professor Emanuel Fritz, University of California, dealers in Los Angeles pronounce Macacaúba as though it had only four syllables—Mack-ah-kaw'-bah. The presence of a rather large quantity of the timber on the western market appears to have been due to a mistaken belief on the part of the importers that they were buying Brazilian Rosewood (*Dalbergia nigra* Fr. Allem.).

Mr. D. Olander, of Philadelphia, has kiln-dried both kinds of the lumber and found them no more difficult to handle than Black Walnut. The boards were 1 inch thick, 14–16 feet long, and mostly 8 inches wide. The initial moisture content at the center was 18–20 per cent, on a basis of dry weight. He used a National, cross-piled, ventilated kiln operated on hand control and followed Forest Service general hardwood kiln-drying schedule No. 5 (U. S. Dept. Agr. Bull. No. 1136, p. 49). The temperature did not exceed 150° F. and the humidity did not fall below 25 per cent. The time required to reach a final moisture content of 6 per cent was 14 days. He concludes that "Hudoke and Macawood can be very readily seasoned in almost any commercial kiln without checking or honeycombing if reasonable care is exercised."

[1] The first syllable of Hudoke is that of the surname of the inventor of the name—Mr. R. S. Huddleston. The second is a phonetic spelling of Oak.

Ipé Peroba

Ipé Peroba, *Paratecoma peroba* (Record) Kuhlmann, is a large and important tree in eastern Brazil and its timber has been well and favorably known in domestic commerce for many years. It is also called Peroba de Campos, Peroba Amarella, etc., and thus has become confused with *Aspidosperma*, various species of which are widely known as Peroba.

The writer's acquaintance with this wood dates back about 15 years. There were several samples of it in the Yale collections and obviously they were not of the genus *Aspidosperma* (fam. Apocynaceae). The anatomy and the presence of lapachol deposits in some of the vessels clearly indicated Bignoniaceae, and this conclusion was confirmed when Dr. H. N. Whitford collected the wood and fruiting herbarium specimens of Peroba Amarella in the forest of Espirito Santo. All attempts to identify this material with any known species proved unsuccessful and, for the purposes of description in *Timbers of Tropical America*, it was provisionally named *Tecoma peroba* Record. The wood differs from that of any other species of *Tecoma* (*Tabebuia*) so far studied, but was referred to that genus because at that time (1924) no other member of the family was known to contain lapachol deposits, though shortly afterward the writer identified this peculiar yellow substance in specimens of *Phyllarthron* from Madagascar. (See *Tropical Woods* 1: 8, March 1925).

It remained for Mr. J. Geraldo Kuhlmann to fix the botanical status of this tree and he has done so by proposing for it a new genus, *Paratecoma*. (See this issue of *Tropical Woods*, p. 36.) This increases the known distribution of lapachol to three genera of the Bignoniaceae and one (*Avicennia*) of the Verbenaceae (or what likely will eventually be known as the Avicenniaceae).

As stated in *Timbers of Tropical America* (p. 538), this is probably the same wood as the Moah or Edelteak encountered by Matthes & Schreiber in the course of their investigations of woods giving rise to dermatitis. (See *Ber. d. deutschen Pharm. Gesellschaft*, Berlin, 1914, pp. 19–22.) There is no evidence at hand, however, to the effect that the dust of Ipé Peroba is especially annoying to workmen.

NOTE ON WALNUT IN NORTHEASTERN PERU

By Llewelyn Williams

Field Museum of Natural History

On the recent Marshall Field Botanical Expedition to the headwaters of the Amazon, the writer had occasion to make botanical collections in the environments of Chachapoyas, capital of the Department of Amazonas. The flora of this region, which has received little attention from collectors, resembles that of temperate zones, but to the north in the forests flanking the river Marañón some of the species occurring in the eastern tropical forest extend westward across the Andean ranges.

The principal as well as the most useful timber tree growing in the vicinity of Chachapoyas and adjacent parts where it is propagated is a species of Walnut, probably *Juglans peruviana* Dode, locally known as Nogal. It grows in sandy or dry medium loam at altitudes varying between 6000 and 8000 feet, mostly in ravines and valleys which are below the general elevation of the country. The lumber is highly prized by the natives for furniture, cabinet-making, and also for musical instruments. A decoction of the leaves, fruit, and bark is employed for dyeing purposes.

Many of the trees encountered were 50 to 60 feet tall, with a spreading crown and a straight cylindrical trunk up to 36 inches in diameter, sometimes free from branches for half the height of the tree, but more frequently divided 10 or 15 feet above the ground. The bark on the smaller limbs is smooth and gray, while that on the trunk and older branches is moderately thick, brown, and somewhat fissured.

Although irregularly scattered, there is a fair abundance of large trees in this territory, principally along the banks of the river Urcu-bamba, an affluent of the Marañón; also at Bagua, two and a half days' journey from Chachapoyas. Due to the remoteness of the territory and physiographic obstacles, exploitation of this valuable wood is greatly hampered. One method of extraction is to raft the logs to Iquitos, but the journey is hazardous as a series of turbulent rapids, such as the

Pongo de Manseriche, must be negotiated in the River Marañón. Another means is to transport small lots on pack mules over the western Andean range to Celendín, a six days' journey, and afterwards by road and railroad to Pacasmayo, the nearest port on the Pacific Coast. The entire distance from Chachapoyas to Pacasmayo is approximately 210 miles.

According to Mr. Georges H. Barrel (*Tropical Woods* 10: 51–53), Walnut is found on the western Andean slopes bordering the upper reaches of the river Ucayali and large trees also grow in abundance in the Chanchamayo Valley and along the Pichis Trail, the principal overland route between Iquitos and Lima.

VERNACULAR NAMES OF SINALOA TREES AND SHRUBS COLLECTED BY J. G. ORTEGA

By Paul C. Standley

Field Museum of Natural History

It may be asserted conservatively that during the past dozen years no one has contributed so much to a knowledge of the Mexican flora as Sr. Jesús González Ortega, of Mazatlán, Mexico. The thousands of specimens he has collected have included many fine new species, besides hundreds of plants unknown previously from Sinaloa, in spite of the comparatively large amount of field work that had been done there previously. Sr. Ortega's publications have supplied valuable and informative data regarding Mexican trees, cactuses, and other plants. He has demonstrated in a practical manner the possibilities of reforestation along the Sinaloan coast, a coast that in natural beauty scarcely can be surpassed elsewhere in America.

One of Sr. Ortega's most useful contributions to botanical science consists in the great number of vernacular names of Mexican plants that he has assembled. Many of these were listed in the writer's *Trees and Shrubs of Mexico*, but a recent sending of his plants contains so large a number of unrecorded local names that it seems worth while to place them on record.

Sr. Ortega's recent work is proof, if one were needed, of the superior quality of data that can be collected by a resident botanist who takes advantage of his experience and opportunity. Imagine the amount of useful information that might be gathered if there were a hundred such investigators distributed from the Rio Grande to the Straits of Magellan!

ACANTHACEAE

Jacobinia mexicana Seem. YERBA DEL TORO. Shrub 1 m. high with red flowers.

BORAGINACEAE

Cordia Sonorae Rose. AMAPA BLANCA. Tree 6 m. high, the trunk 20 cm. in diameter; flowers white.

ERICACEAE

Arbutus xalapensis H.B.K. ROBLE. (Perhaps an erroneous name, although it is scarcely safe to make such a statement except after investigation of local conditions. The usual name for species of *Arbutus* is Madroño.)

LEGUMINOSAE

Acacia Rosei Standl. VARA COLORADA. Shrub or tree 3 m. high, with trunk 3–4 cm. in diameter. Flowers white.

Caesalpinia crista L. VILLA DE MAR; OJO DE VENADO. Seaside shrub with yellow flowers. The second name ("deer's eyes") refers to the appearance of the pretty gray seeds, one of the common "sea beans."

Caesalpinia Palmeri Wats. POLILLA. Shrub 4 m. high, with trunk 15 cm. in diameter; flowers yellow.

Caesalpinia sclerocarpa Standl. HUISACHE BOLA. Tree 4.5 m. high, the trunk 22 cm. in diameter; flowers yellow.

Diphysa occidentalis Rose. HUILOCHE. Tree 4.5 m. high, with trunk 12 cm. in diameter; flowers yellow.

Leucaena lanceolata Wats. HUAJILLO or GUAJILLO. Tree of 5 m., its trunk 12–15 cm. in diameter. Flowers white or yellowish white.

Lysiloma divaricatum (Jacq.) Macbr. TEPEMEZQUITE. Tree 6 m. high, with trunk diameter of 30 cm.

Pithecolobium confine Standl. GUAPINOLE. Tree of 6 m., the trunk 20 cm. in diameter.

Platymiscium trifoliolatum Benth. PALO SANTO. Tree 15 m. high, the trunk 30 cm. in diameter; flowers yellow. This is one of the rarest of Mexican leguminous trees, being known since the original collection only through its rediscovery by Sr. Ortega.

LOGANIACEAE

Buddleia Wrightii Robinson. SALVIA; TEPOZÁN. Shrub, 1.5–4 m. high, the trunk 1–5 cm. in diameter; flowers white.

MALPIGHIACEAE

Malpighia umbellata Rose. PALO CHINO. Shrub of 3 m., the trunk 8 cm. in diameter; flowers pink.

OPILIACEAE

Agonandra racemosa (DC.) Standl. SUELDA CON SUELDA. Tree of 5 m., with trunk diameter of 12 cm.; flowers white.

RHAMNACEAE

Karwinskia Humboldtiana (R. & S.) Zucc. MARGARITA; PIOJILLO. Tree of 4 m., the trunk 7 cm. in diameter.

RUBIACEAE

Randia armata (Sw.) DC. PAPACHE. Spiny shrub 3 m. high.

SOLANACEAE

Solanum hirtum Vahl. CHICHILEGUA. Prickly shrub or herb a meter high; flowers white. The plant, although common in Central America, seems to be rare in Mexico, and has not been found previously so far northward.

STERCULIACEAE

Helicteres baruensis Jacq. ALGODONCILLO. Shrub of 3 m., the trunk 3 cm. in diameter.

VERBENACEAE

Lantana involucrata L., var. **velutina** (M. & G.) Standl. SONORA. Shrub a meter high with white flowers.

CHECK LIST OF THE COMMON NAMES

Algodoncillo	*Helicteres baruensis* Jacq.	Sterculiaceae
Amapa blanca	*Cordia Sonorae* Rose	Boraginaceae
Chichilegua	*Solanum hirtum* Vahl	Solanaceae
Guajillo or Huajillo	*Leucaena lanceolata* Wats.	Leguminosae
Guapinole	*Pithecolobium confine* Standl.	Leguminosae
Huiloche	*Diphysa occidentalis* Rose	Leguminosae
Huisache bola	*Caesalpinia sclerocarpa* Standl.	Leguminosae
Margarita	*Karwinskia Humboldtiana* (R. & S.) Zucc.	Rhamnaceae
Ojo de venado	*Caesalpinia crista* L.	Leguminosae
Palo chino	*Malpighia umbellata* Rose	Malpighiaceae
Palo santo	*Platymiscium trifoliolatum* Benth.	Leguminosae
Papache	*Randia armata* (Sw.) DC.	Rubiaceae
Piojillo	*Karwinskia Humboldtiana* (R. & S.) Zucc.	Rhamnaceae
Polilla	*Caesalpinia Palmeri* Wats.	Leguminosae
Roble (?)	*Arbutus xalapensis* H.B.K.	Ericaceae

Salvia	*Buddleia Wrightii* Rob.	Loganiaceae
Sonora	*Lantana involucrata* L., var. *velutina* (M. & G.) Standl.	Verbenaceae
Suelda con suelda	*Agonandra racemosa* (DC.) Standl.	Opiliaceae
Tepemezquite	*Lysiloma divaricatum* (Jacq.) Macbr.	Leguminosae
Tepozán	*Buddleia Wrightii* Rob.	Loganiaceae
Vara colorada	*Acacia Rosei* Standl.	Leguminosae
Villa de mar	*Caesalpinia crista* L.	Leguminosae
Yerba del toro	*Jacobinia mexicana* Seem.	Acanthaceae

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

In accordance with the provisional arrangements made at Cambridge in August 1930 (see *Tropical Woods* 24: 1–5), a meeting of wood anatomists was held in Paris during the Congrès International du Bois et de la Sylviculture, July 1–5, 1931.

Five members of the Organizing Committee, namely, Messrs. Boulton, Chalk, Collardet, Ledoux, and Rendle, met on July 2 and agreed upon the form of constitution of the International Association of Wood Anatomists to be recommended for adoption at an open meeting to be held on July 4.

The meeting was duly held in the Chalet des Eaux et Forêts of the International Colonial Exhibition under the able chairmanship of M. Guinier, Director of the École Nationale des Eaux et Forêts, Nancy, and was attended by 25 persons, representative of the following countries: Belgium, France, Germany, Great Britain, Holland, Philippine Islands, and Spain.

The proposed constitution was read article by article in English and in French, and was adopted. A proposal that the present Organizing Committee should continue to function until such time as members of the Association could be elected and a statutory Council appointed, was carried unanimously. The meeting further decided that telegrams of greeting should be sent to Professor Record and Professor J. W. Moll. A proposal that Professor Henri Lecomte and Professor Moll should be recommended for election to Honorary

Membership was adopted unanimously. After a brief general discussion the proceedings terminated.

The present situation is that the International Association of Wood Anatomists has been formally constituted, and executive powers have been placed in the hands of the Organizing Committee, which will proceed with its task as expeditiously as possible. The work toward standard terminology and descriptions already begun by the secretary will be continued under the aegis of the Association. The editor of *Tropical Woods* has placed this magazine at the disposal of the Association for the publication of official announcements.

The constitution adopted at Paris is reproduced below. All persons interested in the activities of the Association are cordially invited to make that fact known to Secretary Record and to give him the benefit of any suggestions they may have to offer.

Constitution of the International Association of Wood Anatomists

(Adopted at Paris, July 4, 1931)

Name of the Association

ARTICLE I. The Association shall be called the *International Association of Wood Anatomists*.

Object

ARTICLE II. The object of the Association shall be to advance the knowledge of wood anatomy in all its aspects.

Activities

ARTICLE III. The activities of the Association shall be:

(*a*) To interchange ideas and information through correspondence and meetings.

(*b*) To facilitate the collection and exchange of material.

(*c*) To work toward standard terminology and descriptions.

(*d*) To stimulate the publication of scientific articles and abstracts.

(*e*) To encourage and assist the study and teaching of wood anatomy.

(*f*) To engage in any other activity consistent with the object of the Association.

Membership

ARTICLE IV. The Association shall consist of Ordinary Members, Corporate Members, and Honorary Members. Ordinary Members shall be persons who are actively engaged in the study of wood anatomy. Corporate Members shall be institutions or other corporate bodies interested in wood anatomy. Every such institution or corporate body shall delegate an individual to represent its views on all matters pertaining to the affairs of the Association. Honorary Members shall be persons who, in the opinion of the Council, have rendered notable service to the advancement of knowledge of wood anatomy.

Admission to Membership

ARTICLE V. The admission of members shall be controlled by the Council. Candidates for membership shall be nominated in writing by two members of the Association.

Council

ARTICLE VI. The Association, by a majority vote of the Ordinary Members, shall elect a Council consisting of not more than twelve Ordinary Members, of whom not more than four shall be subjects or citizens of the same country. Members of Council shall hold office for three years and shall be eligible for re-election. Any vacancy occurring during the term of office of the Council shall be filled by the Council.

The business of the Council shall normally be conducted by correspondence, but the Council shall endeavor to arrange meetings when suitable opportunities occur, and shall be empowered to conduct business at any such meeting by majority vote of the Council. The Council shall have power to appoint committees of members for the furtherance of the object of the Association.

The Council shall appoint a Secretary-Treasurer who shall be directly responsible to the Council. The Secretary-Treasurer shall receive all applications for membership of the

Association and shall submit them through the post to the members of the Council. Unless a majority of the Council reply adversely within four months, the Secretary-Treasurer shall declare the applicants elected.

The Council, with the approval of two-thirds of its members, obtained either by meeting or by correspondence, shall have power to suspend or expel any member whose subscription is two years in arrears or whose conduct is deemed by the Council to be prejudicial to the object or integrity of the Association.

In event of any question arising for which no provision has been made in the Constitution or by-laws, the Secretary-Treasurer is empowered to refer such questions to the members of the Council by registered letter, and to act upon the decision of the Council as expressed by a majority of the replies received within four months after the date of mailing the letters.

Finances

ARTICLE VII. The income of the Association shall be derived from subscriptions of Ordinary Members and Corporate Members and from voluntary contributions. The amount of the subscriptions shall be fixed by the Council every third year. The income of the Association shall be expended only in accordance with the object of the Association as defined in the Constitution. The disbursement of funds shall be vested in the Council who may depute powers to the Secretary-Treasurer.

By-laws

ARTICLE VIII. The Council shall have power to make by-laws for carrying into operation the terms of the Constitution, and to alter such by-laws from time to time, but only by a simple majority.

Alterations to the Constitution

ARTICLE IX. The Constitution shall not be altered or amended except by a vote of two-thirds of the Ordinary Membership of the Association.

CURRENT LITERATURE

Notes on the silviculture of the more important timber trees of Trinidad and Tobago with information on the formation of woods. By R. C. MARSHALL. Pub. by Forest Department, Trinidad, 1930. Pp. 50; 5½ x 8½; 6 full-page half-tone plates.

A report, based upon first-hand information, of exceptional value to all persons interested in silviculture in tropical America. Chapter I classifies the trees according to their suitability for different planting conditions. Chapters II and III deal with the formation and the tending of plantations. The substance of Chapter IV is reproduced in condensed form below.

SILVICULTURAL CHARACTERISTICS OF PRINCIPAL TREES

Acoma, *Sideroxylon quadriloculare* Pierre. Infrequent tree preferring clay soils. Root system superficial. Flowers in July. Fruit, a pale yellow succulent berry, ripens the following dry season, March–May; it is eaten by bats. Hard and brown seed suggests a large acorn. Germination requires from 2 to several months. No plantations have been made. The creamy yellow wood is hard, heavy, strong, and durable.

Angelin, *Andira inermis* H.B.K. Evergreen tree widely distributed, but nowhere abundant; predominates on clay soils, often on poorly drained areas; not exacting in its requirements. Root system moderately deep. Flowers in October. Fruit, which is the size of a small egg, ripens about the following June, but has been observed on the tree as late as October; it is eaten by bats; each fruit contains a single seed of the size of a walnut. Germination is irregular over several months. Seedling and subsequent growth slow. Not difficult to transplant. Likes protection when young. Coppices well and seems free from serious pests and diseases. Wood hard, heavy, strong, durable.

Balata, *Mimusops balata*, var. *Cruegeri* Pierre. Widespread evergreen tree, not exacting in soil requirements, though preferring hills and ridges. It is taprooted. Flowers January–February. Fruit, an edible berry, ripens April–May, good

seed years occurring every 3 or 4 years; may be collected from under trees. Seed about the size of a plum pit. Germination poor and irregular over many months. Seedling and subsequent growth very slow. Direct sowing not recommended. One-year seedlings have been transplanted successfully under shelterwood; two-year stock gave poorer results. Species tolerant of shade. Does not coppice. Wood dark reddish brown, very hard, heavy, durable, not difficult to work.

Balsam, *Copaifera officinalis* Willd. Evergreen tree of sporadic occurrence on both sands and clays, usually on sloping ground. Flowers in September–October. Fruit pods ripen the following May–June; small, black, bean-like seeds can be collected from under the tree. Seedling and subsequent growth slow. Intolerant of shade. Wood reddish brown, oily, strong, durable. Copaiba oil obtained by tapping.

Cedar, *Cedrela mexicana* Roem. Deciduous tree at its best on rich, well-drained clay soils of the older tertiary formations in Trinidad and on the igneous in Tobago; prefers calcareous soils in sheltered positions on slopes and hills; rather exacting in its requirements and highly intolerant of waterlogging. Root system superficial. Flowers in July. Fruit, a woody capsule containing about 40 seeds, ripens the following April or May. Trees in the open fruit every year, those in the forest less frequently. Ripe pods should be collected from tree and placed in the sun to open. Number of seeds to pound about 16,000. Germination usually good, up to 90 per cent or so within a fortnight. From early sowing on good, well-drained soil, with side protection but full light overhead, seedlings attain height of 4 feet, sometimes 6 to 8 feet, the first year. Direct seeding is feasible and sowing in strips 2 feet wide has given promising results. Seed should be covered lightly, if at all. Seedlings 4 feet high can be transplanted during the dry season when they are leafless; also at the beginning of the rains, if new growth is trimmed off. Cutting back to within a few inches of the ground has not given good results. Present indications are that Cedar should be grown in mixture with other trees which will give it the necessary side protection, and that an evergreen underwood is necessary

to keep the soil in good condition. Natural regeneration often possible by clearing around seed trees. Cedar does not coppice. Principal enemy is the shoot borer (*Hypsipyla grandella* Zell.).

Crappo or Crabwood, *Carapa guianensis* Aubl. Evergreen tree not exacting as to soil and site, provided they are not too dry. Young plants produce taproots, but the tree tends to become surface-rooted. Flowers about June. Fruit, which is about the size of a cricket ball and containing a dozen seeds, requires about a year to mature; falls throughout the year, though mostly at beginning of the rainy season. Seeds large and readily collected from under the trees; subject to insect damage and, therefore, should not be stored. High percentage of sound seeds germinate within six weeks. Early growth fairly rapid. For direct seeding, plant one or two seeds 1/2 inch deep in spots spaced 5 feet apart, without preliminary working of the soil. For transplanting, undercut the roots during rainy weather, leaving 4 or 5 inches of the taproot, and allow the plants to stand a few weeks until new roots are formed; in this way plants up to 3 feet high can be successfully transplanted. Young trees do best under partial shade; excessive cleaning should be avoided. Crappo coppices well when not too old. In plantations the borer (*Hypsipyla grandella* Zell.) attacks the shoots and also infests the seeds toward the end of the dry season. Young trees badly browsed by deer.

Cypre, *Cordia alliodora* Cham. Practically evergreen tree of limited distribution, occurring mostly in the hills where the rainfall is not too heavy. Produces a taproot when young, but also develops a spreading root system near the surface. Flowers January–March. Fruit, a small drupe, ripens April–May. Can be collected from ground or shaken into a fine-meshed net. Germination good within a few weeks, though first fruit to fall is lowest in fertility. Early and subsequent growth rapid. Direct sowing, with only light covering, gives good results. Seedlings can be transplanted easily with ball of earth. Cypre is intolerant of shade. Young and medium-sized trees coppice well and root suckers are sometimes produced. Most serious disease is a stem canker; as a preventive measure the

species should be grown only in airy places, avoiding humid localities. Wood yellowish brown, of medium weight, easy to work; in great demand locally for building construction, flooring, furniture, boat timbers, and oars.

Fiddlewood, Black, or **Bois Lezard,** *Vitex divaricata* Sw. Nearly evergreen tree, not exacting as to soil and site. Has large and deep root system. Flowers in June. Fruit, a small, purplish black, fleshy drupe, ripens in July and can be collected from under the tree. Care must be taken to avoid unripe fruit, which after a day or two on the ground, turns black and appears ripe. Germination variable and erratic over a period of a few weeks to several months. Seedling and subsequent growth rapid. Transplanting is easy; one-year seedlings pruned back to within a few inches of the ground give the best results. Species is a light demander. Coppices well. Has no serious pests. Wood light to dark brown, of medium density, strong, durable.

Fustic, *Chlorophora tinctoria* (L.) Gaud. Nearly evergreen dioecious tree of very limited distribution; not very exacting as to soils, though preferring the ridges. Produces a taproot. Flowers in July. Fruit in October; very small. No reliable information available about germination. Natural regeneration fairly good. Wild seedlings can be transplanted readily. Growth as rapid as that of Cedar. Fustic is a moderate light demander. Coppices well and appears free of disease. Wood very dense, yellow, durable; widely known as a dyewood; is in demand for felloes.

Galba, *Calophyllum antillanum* Britt. Evergreen tree at its best on low flats at the southern base of the Northern Range, particularly in the Cumuto district where the soil is poor quality fine sand often underlaid with very hard, well cemented sand and gravel pan; also scatteringly in most of the forests, usually on sandy soil. Root system moderately deep, with tap root when young. Flowers in October. Fruit, a green drupe, ripens next June–July and can be collected from under the trees; seed is the size of a small marble. Germination erratic, time required varying from few weeks to many months; best during a good seed year. Growth slow for first few months, being arrested at 6 inches or so for several weeks;

considerable cleaning is therefore necessary in direct sowing; once started, growth is fairly rapid, especially at the beginning of dry season. Transplanting difficult unless ball method is used. Tree moderate in its light requirements. Does not coppice.

Guatecare, *Lecythis laevifolia* Gris. Evergreen tree widely distributed on poor soils; not exacting in requirements, except that it avoids swampy areas. Root system moderately deep. Flowers any time from January to August. Fruit, a woody capsule containing 1–3 seeds, matures mostly during dry season April–May. Seeds, which are about the size of a large acorn, can be collected from under the tree. Germination good within a few weeks, but seedlings are tender and easily destroyed. Seedling and subsequent growth slow. Transplanting not difficult, but tops of seedlings should be trimmed back to within a foot or so of the ground. Species tolerant of shade. Does not coppice very well. Is free from serious diseases. Wood very hard and heavy, difficult to work, fairly to highly durable.

Jereton or **Matchwood,** *Didymopanax morototoni* D. & P. Evergreen tree of wide distribution, mostly on poor soils; not exacting in its requirements. Root system superficial. Flowers in October. The small, slightly fleshy, flattened fruits ripen a month later and contain 2 crescent-shaped seeds ⅛–¼ inch long. Germination tests in nursery have not been successful, but natural seedlings are common in cleared areas. Transplants easily, without special precautions. Grows very rapidly. Requires plenty of sunlight. Coppices fairly well and appears free from disease. Wood light and soft; used mostly for match splints and boxes.

Lauriers, *Nectandra* spp., *Ocotea* spp., *Aniba* spp. There is so much confusion regarding the identity of the Lauriers that the information concerning them is not considered sufficiently reliable to be included in the report. "In due course it is intended to standardize names, but until this has been done it is felt that more harm than good would be done in giving but partly formed conclusions and information which might be misleading through being wrongly applied." The Lauriers are widely distributed throughout the Colony and in some areas

certain species form a fair proportion of the crop. Woods generally light to medium, easy to work, well suited for interior work; are in regular demand.

Locust, *Hymenæa courbaril* L. Nearly evergreen tree, occurring in most of the forests, except the Mora areas, but nowhere plentiful; at its best on ridges, though also found on the lower slopes, but rarely on the flats. Taprooted when young, later with spreading root system. Flowers in April–May. Fruit pods ripen about August, but often remain on tree for a long time, finally falling without opening, thus permitting easy collection from the ground. Germination good, but extending over a period of a few weeks to several months. Seedlings grow rapidly but being succulent and tender when young they provide attractive food for animals—a serious drawback to direct sowing. One-year seedlings pruned back to about 1 foot in height transplant well at beginning of the rains. Growth for the first few years bushy, finally becoming erect. Wood hard and strong; in demand for wheelwright work, especially for felloes.

Mahogany, Honduras, *Swietenia macrophylla* King. Practically evergreen tree, not very exacting as to soil conditions and able to grow in fairly moist sites. Seedlings are taprooted. Flowers in the rainy season. Fruit, a large woody capsule containing many winged seeds, ripens in the dry season. Germination good and seedling growth rapid. Readily transplanted. Young trees fairly tolerant of shade, but conditions for optimum growth call for full overhead light combined with side protection. Too subject to disease and insect attack to be generally recommended for planting in Trinidad and pure crops of it should be avoided. Does not coppice well, and young trees are rather sensitive to mechanical injury.

Mahogany, West Indian or **Spanish,** *Swietenia Mahagoni* (L.) Jacq. This well-known tree is believed not to be indigenous to Trinidad or Tobago. "Trees in adjoining plots at St. Clair, aged approximately 30 years, gave an average girth of just over 2 feet for West Indian Mahogany compared with over 3 feet for the Honduras variety. The height growth also was proportionately less. Owing to its slower rate of growth it has been but little planted of recent years and practically no

considerable cleaning is therefore necessary in direct sowing; once started, growth is fairly rapid, especially at the beginning of dry season. Transplanting difficult unless ball method is used. Tree moderate in its light requirements. Does not coppice.

Guatecare, *Lecythis laevifolia* Gris. Evergreen tree widely distributed on poor soils; not exacting in requirements, except that it avoids swampy areas. Root system moderately deep. Flowers any time from January to August. Fruit, a woody capsule containing 1–3 seeds, matures mostly during dry season April–May. Seeds, which are about the size of a large acorn, can be collected from under the tree. Germination good within a few weeks, but seedlings are tender and easily destroyed. Seedling and subsequent growth slow. Transplanting not difficult, but tops of seedlings should be trimmed back to within a foot or so of the ground. Species tolerant of shade. Does not coppice very well. Is free from serious diseases. Wood very hard and heavy, difficult to work, fairly to highly durable.

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information is available as to its silvicultural requirements. Information is needed as to whether it suffers as badly from disease as the faster-growing variety. If not, it may yet come into prominence."

Mora, *Dimorphandra Mora* B.&H. Evergreen tree growing in nearly pure stands at Mayaro, Matura, and Irois; is generally considered an indicator of poor soil and thrives on flat damp areas and low hills. It is surface-rooted. Flowers in late August and September. Fruit, a pod containing one or more bean-like seeds, ripens in November–December; seeds exceptionally large, being 2–3 inches long. Some trees do not produce fruit every year. Germination prompt and seedlings attain a height of 30 inches in 60 days. Mora is tolerant of shade. Natural regeneration is abundant, trees of all age classes occur, and the floor of a Mora forest is covered with a dense mass of seedlings. Coppices to an advanced age and is comparatively free from pests and diseases, although often very large trees are hollow. If for any reason artificial regeneration is required, direct sowing is clearly indicated, probably under shelterwood.

Olivier, *Terminalia obovata* Steud. (probably). Practically evergreen tree of wide distribution; not exacting in its requirements, thriving on sands and clays, ridges and flats. Root system rather superficial. Flowers April–May. Fruit, small, double samara, ripens almost immediately in May–June; often shed in clusters. Natural regeneration fairly abundant in some localities and could probably be obtained by a light clearing about seed tree. Growth moderately fast. Fairly tolerant of shade. Coppices exceptionally well. Apparently free from serious diseases and pests. Wood yellowish brown, often striped with red; strong and durable.

Olivier, Yellow, or **Yellow Sanders,** *Buchenavia capitata* Eichl. Similar to preceding in distribution and sometimes confused with it. Flowers in May. Fruit, which resembles a small olive, ripens November–December. Seeds germinate in about 6 weeks. Seedling growth rapid, maximum over 7 feet in one year. Wood of medium weight and decidedly yellowish; might well be utilized more than at present.

Poui, Black and **Yellow,** *Tabebuia glomerata* Urb. and *T. serratifolia* Nichols, resp. Deciduous trees having many characteristics in common. Black Poui is commonest in southern Trinidad, preferring clay soils. Yellow Poui is generally distributed, thriving on pure sands, but preferring tops and sides of ridges and avoiding swampy areas. Taprooted when young, with well developed laterals. Flowers at intervals during dry season (January to March). Fruit ripens April–May, each capsule containing about 500 light, winged seeds. Ripe pods may be collected from tree and sunned open, or the seeds may be picked up from ground. Germination good to bad, requiring a few weeks. Care must be taken to prevent seeds becoming waterlogged. Seedling growth rapid in nursery, slow in forest, though young trees will persist for a long time under rather heavy shade. Transplanting easy at beginning of rains. "The manner of growth is unusual in that the main stem branches into 2 or 3 laterals having no leader. These laterals develop for a while, but after a period a bud appears near where the main stem should be and the plant rapidly sends out a long shoot up to 6 feet or more in length. Laterals again form and the process is repeated in due course." Yellow Poui is a larger tree than Black Poui and grows more rapidly. Young and medium-sized trees coppice well; root suckers sometimes produced. Wood greenish brown or blackish, extremely hard and heavy, and noted for strength and durability.

Purpleheart, *Peltogyne porphyrocardia* Gris. Evergreen tree, fairly common on poor soils. Flowers have been observed both in January and August (Tobago). Fruit, a woody, flat, usually 1-seeded pod, matures in April–May or October–November. Germination begins in 10 days, but percentage may be low. Seedlings will endure considerable shade.

Serrette, *Byrsonima spicata* DC. Evergreen tree, very common on poor, sandy soils; not exacting in its requirements. Small yellow flowers produced in masses in June. Fruit, a drupe about the size of a small marble, matures in October; is yellow when ripe; contains a hard, woody stone; can be collected from under the tree. Germination erratic, varying

from several weeks to many months. Seedling growth practically suspended during dry season, but rapid during rains. Direct sowings considered feasible. Species is light-demanding. Suggested for use in plantations of more important trees.

Tapana, *Hieronyma caribæa* Urb. Evergreen dioecious tree scattered generally through the forests and not exacting as to soil and site. Flowers in July. Fruit, a small black drupe with one tiny, hard, brown seed, ripens in August. Germination tests in nursery have so far been unsuccessful. Natural seedlings seem hardy and grow rapidly. Fairly tolerant of shade. Coppices well and appears free of enemies. Wood chocolate-brown, moderately hard and heavy, strong and durable; used to limited extent for furniture, building construction, and wheelwright work.

Teak, *Tectona grandis* L.f. Deciduous East Indian tree that seems very well suited to conditions in Trinidad and is being planted to an increasing extent, though still considered in an experimental stage. Its root system is deep. Sandy or clayey loam of good depth and drainage is essential; poor, shallow soils should be avoided. Flowers during the rains. Fruit ripens the following dry season, February–March; can be collected from the ground. Seed, the size of a small marble, can be separated from inflated calyx which surrounds it by shaking fruit in a bag and then winnowing. Germination in 3–4 weeks; is usually good. Seedling and subsequent growth rapid. One-year seedlings with stem pruned to within about an inch of the ground give cheapest and best plantations. Spacing recommended is 6 by 6 feet, followed by removal of half the trees in about 5 years. Understory of other species desirable. Full exposure to light essential.

Yoke, *Astronium obliquum* Gris. Evergreen tree confined to the hills of the Northern Range. Should not be confused with the Savannah Yoke (*Piptadenia peregrina* Benth.). "Unfortunately no silvicultural information is available about this tree. It appears to be a light-demander, as no regeneration has been observed around trees in the natural forest." Wood very hard, heavy, strong, durable; suitable for sleepers, posts, and heavy outdoor work.

TREES CLASSIFIED BY SILVICULTURAL CHARACTERISTICS

Intolerant of shade: Balsam, Cedar, Cypre, Black Fiddlewood, Galba, Jereton, Locust, Serrette, Teak.

Moderately tolerant: Acoma, Crappo, Fustic, Mahogany, Olivier, Poui, Purpleheart, Roble, Tapana.

Tolerant: Angelin, Balata, Guatecare, Mora.

Not exacting in soil requirements: Balata, Crappo, Black Fiddlewood, Galba, Guatecare, Jereton, Locust (moderately), Mora (but definitely localized), Olivier, Serrette, Tapana.

Having deep root systems: Angelin, Balata, Balsam, Cypre, Black Fiddlewood, Fustic, Galba, Guatecare, Locust, Mahogany, Poui, Serrette, Teak.

Surface-rooted: Acoma, Cedar, Crappo, Jereton, Mora, Olivier, Roble, Tapana.

Withstanding exposure to winds: Balata, Balsam, Cypre, Fustic, Galba, Guatecare, Poui.

Coppicing well: Angelin, Crappo, Black Fiddlewood, Fustic, Mora, Olivier, Tapana, Teak.

Not coppicing: Balata, Cedar, Cypre (sometimes), Galba, Guatecare (sometimes), Jereton (sometimes), Locust, Mahogany, Poui (sometimes), Purpleheart, Roble, Serrette.

Reproducing from root suckers: Cypre, Poui.

Rapid-growers (*cf.* Cedar): Cedar, Cypre, Black Fiddlewood, Fustic, Jereton, Honduras Mahogany, Serrette, Tapana, Teak.

Medium-growers (*cf.* Crappo): Crappo, Galba, Locust, Olivier, Yellow Poui, Roble.

Slow-growers (*cf.* Balata): Angelin, Balata, Guatecare, West Indian Mahogany, Black Poui.

Die Frucht von *Aspidosperma megalocarpon* Muell. Arg. und ihr Offnungsmechanismus. By ELISE HOFMANN. *Sitzungsberichten der Akademie der Wissenschaften in Wien (Math.-naturw. Klasse)*, I: 140: 1–2: 83–88, 1931. Ill.

Aspidosperma megalocarpon is a large and fairly common tree in the evergreen hardwood forests of British Honduras, Guatemala, and Honduras. Its fruits are large, flattened, ham-shaped pods with two woody valves, which upon drying split apart suddenly and liberate the circular, papery seeds.

Dr. Hofmann has investigated the opening mechanism and finds that the fruit stalk contains thin-walled parenchyma and very thick-walled sclerenchyma so arranged that the unequal shrinkage from desiccation pulls the two valves apart. The paper is illustrated with photographs of the fruit and photomicrographs showing details of the cellular structure.

Poderes calorificos de maderas Argentinas. By EDUARDO LATZINA. *Boletín del Ministerio de Agricultura de la Nación* (Buenos Aires) 30: 1: 23–47, Jan.–March 1931.

Gives the results of tests made in the mechanical laboratory of the Escuela Industrial de la Nación to determine the calorific power of 35 kinds of Argentine woods. There are also short descriptions of the trees and notes on their occurrence, size, etc. The report is a valuable contribution to the knowledge of South American timbers.

Diccionario das plantas uteis do Brasil e das exoticas cultivadas. Vol. II. By M. PIO CORRÊA. Pub. by Ministerio da Agricultura, Rio de Janeiro, 1931. Pp. 732; 8¾ x 12¾; 71 full-page plates; over 850 text figs.

The first volume (A to Cap) of this monumental work was published in 1926. It contains 762 pages, 1929 descriptive articles, 106 full-page illustrations, 657 text figures, and 5437 common and 5606 scientific names, including synonyms. The descriptions are arranged alphabetically according to the common names. The second volume is in keeping with the first and contains 1650 descriptive articles and 4945 common and 5109 scientific names. The third volume, beginning with the letter F, is now in preparation.

The reviewer's opinion of this work is quoted in the Preface (p. xv) as follows:

"The initial volume of Mr. Pio Corrêa's *Diccionario das plantas uteis do Brasil e das exoticas cultivadas* is truly a remarkable work and of such handsome and imposing appearance as to command instant admiration and respect. Closer acquaintance confirms this favorable first impression and the more occasion one has for consulting this book the more he appreciates how well the author is carrying out his very large and exacting task.

"So many and so appropriate are the illustrations that a person with only a slight knowledge of Portuguese can use this Dictionary intelligently. The completed work will be unrivalled in its field and will prove indispensable to all seeking ready and reliable information on Brazilian plants."

Pequena contribuição para um diccionario das plantas uteis do estado de São Paulo (indigenas e aclimadas). By HUASCAR PEREIRA. Pub. by Secretaria da Agr., Ind. e Com. do Estado de São Paulo, Brazil, 1929. Pp. 779; 6¼ x 9. Ill.

This convenient dictionary contains concise descriptions of the useful plants of the State of São Paulo, arranged alphabetically according to the vernacular names. It is in part an elaboration of *As madeiras do Estado de São Paulo*, which it was intended to replace, but has been extended to cover a much larger field. It is illustrated with photographs and many text figures. One particularly interesting feature, usually absent in works of this kind, is the inclusion of the etymology of the native names. The book as a whole provides a worthy monument to the author whose death occurred before his large undertaking was quite complete.

Études sur la flore du Bas-Amazone (État de Pará, Brésil). By PAUL LEDOUX. Extract from *Une Mission Biologique Belge du Brésil (1922–1923)*, Brussels, 1930. Pp. 9; 7¼ x 10½; 5 full-page half-tone plates.

Peltogyne paradoxa Ducke is a tall and slender tree of the Lower Amazon, which is peculiar in that the fertile branches resemble lianas, being long, flexible, and nearly leafless. On this account the natives call it Coataquiçaua (monkey-hammock). The few leaves on the fertile branches have much smaller leaflets than those of the rest of the tree and are also of different shape and consistency. The present paper is largely concerned with a study of the comparative anatomy of the two types of leaflets—"folioles micromorphes" and "folioles mégamorphes." The reduced surface of the former is in a

measure compensated for by greater thickness of the mesophyll. The five illustrations show the two types of leaves in natural size.

Die Edelhölzer brasiliens. By FRED W. FREISE. *Der Tropenpflanzer* (Berlin) 34: 4: 137–153, April 1931.

A compilation from the best Brazilian sources available of the area and distribution of the forests, the extent of the timber trade, and the properties and uses of the principal woods.

Um novo genero de Bignoniaceae. By J. GERALDO KUHLMANN. Bul. No. 4, Serviço Florestal do Brasil, Rio de Janeiro, 1931. Pp. 66; 7¼ x 10½; 1 plate.

The new genus proposed is *Paratecoma* Kuhlmann. The species was originally described under the name of *P. diandra*, but after a few copies of the bulletin had been distributed it was discovered that *Paratecoma diandra* Kuhlmann was synonymous with *Tecoma peroba* Record, and a note was inserted changing the name to *Paratecoma peroba* (Record) Kuhlmann.

Phytogeographia do Brasil. By A. J. DE SAMPAIO. *Boletim do Museu Nacional* (Rio de Janeiro) 6: 4: 271–299, June 1929.

In this paper the Chief of the botanical section of the National Museum at Rio de Janeiro reviews the various attempts that have been made from Martius to Engler to define the phytogeographical divisions of his country. Accepting Engler's floristic geographical classification in so far as this applies to Brazil, he proposes some minor modifications, the substitution of a more suitable name for one of Engler's two major provinces, and the addition of a general maritime zone instead of setting apart with Engler the small island of South Trinidad in the Atlantic off the east coast of Brazil.

The first treatment of the plant geography of Brazil is the famous one of Martius which, owing to the monumental importance of his great *Flora*, will always maintain its claim to attention. Dealing solely with Brazilian territory, Martius divided this into five floral provinces: (1) the mountain forest

of the East Coast, which he called the region of the Dryades; (2) the highlands to the west of the Serra do Mar, the region of the Oreades; (3) the plains of southern Brazil, the region of the Napæas; (4) the hot and dry catingas of the interior of Bahia, Pernambuco, and Ceará, that of the Hamadryades; (5) the region of the Amazon, the Naiades. Martius' selection of terms from mythology to designate his geographical provinces may now appear a bit fantastic, as it did to Caminhoá, but a hundred years ago Greek mythology was probably better known in Europe than was the geography of Brazil, and it was evidently for the purpose of suggesting in a word the respective physiognomic characters of his divisions that he gave to each of them the name of one of the orders of nymphs with which the imagination of the ancients had peopled forest and field. In this, as in his sometimes confusing latinizing of place names, names of Indian tribes and other vernacular terms, he did not depart widely from the academic fashion of his day. His classification was adopted by most of the numerous authors who contributed to his Flora of Brazil and in this connection it has been extremely useful and important. Four of his five provinces are to be recognized in the modern classification of Engler, though not all remaining in the same category.

The defect of Martius' geographical scheme lies in the unequal value of his five divisions. It furnishes a perfect instance of a brilliant phytogeographical treatment on an essentially physiognomic basis, formulated at a time when the importance of wide floristic affinities had not yet been realized. At the time of Martius the science of plant geography was still in its infancy. Humboldt's *Prolegomena*, emphasizing the relation of floras to climatic zones, had appeared years before, but even long after publication (1855) of A. de Candolle's *Geographie Botanique Raisonée* botanists were occupied with increasing the number of Humboldt's original 17 physiognomic character forms. The modern ideas of the distribution of floras as a result of the past history of continents and regions and past history of the vegetation as well as of the development and dispersal of plants in recent times had not yet taken form.

Grisebach's *Vegetation der Erde* (1872) was the first effort at all successful to obtain a comprehensive view of the floristic regions of the world in their larger aspect and various subdivisions of greater and lesser order. Though disregarding some of the most enlightened ideas of his time, Grisebach arrived at a classification which marks the point of definite departure from the earlier chaotic and formative stages of plant geography and the beginning of its modern treatment.

The two principal attempts that have been made since to arrive at an understanding of the world distribution of plants in accordance with more recent ideas of the development and history of floras on the basis of an increasingly large accumulation of floristic-systematic data have been those of Engler and Drude. Of these, Engler's *Versuch einer Entwickelungsgeschichte der Pflanzenwelt* (1879–82) is of foremost importance. Drude's *Florentreiche der Erde* followed a few years later (1884), appearing in *Petermanns Mittheilungen* and but little modified in his subsequent publications.

In connection with a review of the phytogeography of Brazil, a comparison of the treatment of the neotropical region by these authors is instructive and reveals a large measure of substantial agreement. Engler is found to differ from the other two in contenting himself with fewer main divisions. Aside from the groups of islands off the West Coast of South America, he admits only three major regions: (1) a xerophytic Central American region; (2) an Andean region; (3) a comprehensive tropical American, in recognition of the general correspondence existing in the flora of its various provinces: (a) a tropical Central American, (b) a West Indian, a subequatorial Andean, (c) a North Brazil-Guiana province, including the Amazon forest and adjacent savannahs, and (d) a South Brazilian province. This list of tropical American provinces was subsequently modified, as appears from the plant geography appended to Engler & Gilg's *Syllabus*, by the separation of a cisequatorial savannah province from the North Brazil-Guiana complex.

Two of Engler's tropical American provinces practically constitute the flora of Brazil: (1) the Amazonian (Naias of Martius, Hylaea of Humboldt), recognized also by both

Grisebach and Drude, but not well delimited by either to the south and east; (2) the South Brazilian, corresponding to the Brazilian of Grisebach and to the Paraná region of Drude.

Professor Sampaio objects with propriety to Engler's term South Brazilian to designate a region which includes so large a part of what in Brazil is called North Brazil, and he maintains with reason that South Brazil as a phytogeographical term should be restricted to the zone of *Araucaria* and Imbuia (*Phoebe porosa*). As a name for Engler's South Brazilian province, which includes four of Martius' five divisions, he proposes the adoption of the term extra-Amazonian, or "flora geral" (general or prevailing flora), either of which terms would be nearer correct and more satisfactory, especially from the Brazilian point of view, as a designation for the generally subxerophyllous vegetation which covers 60 per cent of Brazilian territory, as compared to 40 per cent occupied by the Hylaea. As names for a South American phytogeographical province, both terms, with or without a further qualifying adjective, are not incompatible with a territorial extension beyond the borders of Brazil, and this is important, since the province as defined by Engler includes also eastern Bolivia, Paraguay, part of Argentina, and Uruguay.

This extra-Amazonian or general Brazilian province is subdivided by Engler into five zones: (1) the East Brazilian tropical forest zone, Martius' Dryas; (2) the catinga zone, in which we recognize his Hamadryas; (3) the campos zone, Martius' Oreas; (4) the South Brazilian *Araucaria* zone; (5) the small island of South Trinidad. Instead of the last, which cannot be considered coördinate with the other zones, Professor Sampaio proposes the recognition of a maritime zone to include the littoral,—the islands and keys near and remote off the East Coast, as well as the phytoplancton. As to the Amazonian province with its large percentage of extra-Brazilian species, he concurs with Engler as to the present inadvisability of attempting to divide it into zones, contenting himself with indicating the well-known principal formations: (a) alluvial forest (*varzea*), (b) forest of higher grounds (*terra firme*), and (c) the included *campos*, mostly characterized by extra-Amazonian species, such as *Curatella americana*.

Professor Sampaio concludes his paper with a listing of the campos, open or inclosed by the Hylaea, grouping them with Ducke into (a) *campos*, grassy plains which may be flooded or not, (b) *campinas*, typically Amazonian with a woody vegetation relatively tall, thin, and dense in which no progress can be made without a bush-knife, and (c) *campinas-ranas*, or false campinas with an abundance of shrubs and trees in close stands, as in the *serradões* of Matto Grosso. The close relation of these included portions of savannah to similar formations to the north and south of the Amazon is pointed out and serves as a reminder that northernmost Brazil is also spoken of as Brazilian Guiana.

There is appended a list of grasses from the plains of Rio Cuminá and elsewhere with a comparative study of their ranges. A bibliography and a map form an essential and valuable part of Professor Sampaio's contribution to the phytogeographical literature of tropical America.—B. E. DAHLGREN, *Field Museum of Natural History*.

A manual for tree planting in the Hawaiian Islands. By THEODORE C. ZSCHOKKE. Extension Bul. No. 5, Univ. of Hawaii, Honolulu, Jan. 1930. Pp. 50; 6 x 9; 13 figs.

"The manual for tree planters is divided into three sections. The first is historical and briefly reviews forest conditions, both past and present, in order that landowners may feel encouraged to plant trees in waste places and on bare slopes that once were forested. The second section deals with saving the soil, because much of the tree planting and other reclamation work would have been unnecessary in former agricultural or grazing lands if soil losses had been prevented. Control measures are suggested and references are given to publications which discuss soil erosion more fully than is possible in this bulletin. In the third section are considered the different purposes for planting trees, such as for the control of erosion and for use as woodlots and windbreaks. Trees suitable for planting in different sites are listed and information regarding the uses of each tree is given. . . . The third section also contains general planting instructions."

Laboratory tests on the durability of Philippine woods against fungi. By A. O. REINKING and C. J. HUMPHREY. *Philippine Journal of Science* 45: 1: 77–89, May 1931.

"The paper presents data on the resistance to decay of fifteen kinds of common Philippine woods and a species of Southern Yellow Pine from the United States. These were tested against five named and nine unnamed species of common and destructive Philippine fungi. Small blocks of wood were inserted in 2-liter Erlenmeyer flasks, inoculated, and allowed to decay for periods varying up to twenty-eight months, but for the most part sixteen to seventeen months. The severity of decay is indicated by loss in weight as well as by the physical condition when removed from the flasks. The relative scale of durability derived accords well with the published records of the resistance of the same woods to fungus attack under natural or service conditions,—Molave (*Vitex*), Yakal (*Hopea* etc.), and Tindalo (*Pahudia*) leading the list for durability, while the softer woods, such as the Lauans (*Shorea*, *Parashorea*, *Pentacme*), Guijo (*Shorea*), Katmon (*Dillenia*), Dapdap (*Erythrina*), and Malaanonang (*Shorea*) are quite perishable under conditions favorable to decay. Narra (*Pterocarpus*) and Apitong (*Dipterocarpus*) proved moderately durable."

Nos bois coloniaux (Indochine). Dau (*Dipterocarpus* spp.). Pub by Assn. Colonies-Sciences & Comité National des Bois Coloniaux, 60 Rue Taitbout, Paris, 1931. Pp. 4; 5¼ x 7¼; 2 plates. Price 3 frs.

Dau (pronounced Yao) is the generic common name for several species of *Dipterocarpus*, namely, *D. alatus* Roxb., *D. obtusifolius* Teysm., *D. tuberculatus* Roxb., *D. intricatus* Dyer, *D. Dyeri* Pierre, *D. artocarpifolius* Pierre, *D. insularis* Hance, etc. The first three species are of commonest occurrence and tend to form nearly pure stands in Cochin China, Cambodge, and South Annam. They are mostly very large trees, with a trunk sometimes nearly 100 feet long and 4½ feet in diameter above the buttresses. The heartwood varies in color from grayish rose to reddish or purplish brown. Texture coarse, with harsh feel. Grain attractive when cut on the

quarter, but plain and dull on tangential surface. In spite of the oleoresin present, the wood is not resistant to the attacks of insects and fungi. It is strong in endwise compression and cross bending, but is brittle under impact. The timber is much used locally for general construction, joinery, carpentry, etc., about 100,000 cubic meters being consumed annually in Cambodge and Cochin China. Thousands of tons are exported to Hongkong and other Chinese ports, but only about 100 tons, mostly lumber, reach Europe. The large size and good form of the logs adapt them to the making of rotary-cut veneers for general utility plywood. Dau is one of the very few kinds of timber available in abundance in Indo-China.

Report on forest administration in the Andamans for the year 1928–29. By L. Mason. Central Publication Branch, Calcutta, 1930. Pp. 98; 6¼ x 9½. Price 17s.

Two items in this report are of special interest to the reviewer, both pertaining to efforts to promote the use of the little-known woods.

"In view of the favorable results of the preliminary tests carried out at the Research Institute [at Dehra Dun] on *Diospyros pyrrhocarpa* mentioned in last year's report, 50 axe handles of this wood were prepared locally and distributed to the leading Indian railway companies for trial. Two companies returned them, being unwilling even to try them, and one company returned them stating that when required they would notify the agents. No information was received from the other companies."

Another venture met with intelligent response. In the annual report for 1925–26 (see *Tropical Woods* 12: 39) is a record of a trial shipment of soft-wooded species to match factories in Rangoon, Calcutta, and Bombay. In the current report (p. 43) the Chief Forest Officer says: "The most remarkable feature of the year's working has been the continued and rapid development of soft woods as a result of the match industry in this country. Timbers which a few years back were unsalable are now in such demand that sufficient supplies cannot be shipped to meet it. The rise in the export of these logs can be judged by the following figures:

Year	*Tons exported*	*Year*	*Tons exported*
1925–26	329	1927–28	6,798
1926–27	4,069	1928–29	9,257

"The future demands are far in excess of what can be supplied with the present organization. Had this development occurred a few years earlier it is probably safe to say that the erection of new mills with all the attendant cost and worries from the moment the log enters the mill to the time of the disposal of the output would not have been undertaken."

From a study of Table 29 it is found that three species comprise these match timber shipment, namely, White Dhup (*Canarium euphyllum* Kurz), Papita (*Sterculia companulata* Wall.), and Bakota (*Endospermum malaccense* Benth.).

Australia. Experiments on moisture in timber. By M. B. Welch. *Journ. & Proc. Royal Soc. N.S.W.* 64: 337–351, May 4, 1931.

"The results of a series of experiments on the moisture content at different times of the year of certain flooring timbers at Sydney [*Eucalyptus microcorys*, *E. pilularis*, *E. saligna*, *E. marginata*, *E. obliqua*, *E. regnans*, *E. diversicolor*, *Callitris glauca*, *Agathis* sp., *Podocarpus dacrydioides*, and *Picea excelsa*] show that a variation of approximately 2 per cent occurs between the maximum and minimum results. The mean moisture content of 26 samples proved to be 12.7 per cent, although individual samples varied from 14.6 per cent to 10.1 per cent at different periods.

"A definite relationship exists between the atmospheric humidity and the moisture content of the wood.

"The mean moisture content of the softwoods is in general lower than that of the hardwoods, which seldom give a mean figure below 12.5 per cent. A variation of up to .9 per cent was found in the mean moisture content of different samples of the same species.

"Measurements were made of the lateral shrinkage and swelling of the wood corresponding to the loss and gain of moisture; the variation per inch width per 1 per cent moisture

gain or loss, ranging from .0019 inches in Cypress Pine to .0051 inches in Blackbutt. In general the heavier woods were found to 'move' more than those of low density. Radial and tangential cutting of the boards did not influence the amount of movement as much as was expected; apparently other factors must have influenced the results.

"The amount of shrinkage obtained by over-drying the wood samples was, in most cases, appreciably less than that found to occur by exposure to air, for the same range of moisture variation. Several kiln-dried samples did not appear to show any reduction of 'movement' or hygroscopicity in comparison with air-seasoned material."

The occurrence of intercellular canals in the wood of some species of *Flindersia*. By M. B. Welch. *Journ. & Proc. Royal Soc. N.S.W.* 64: 352–362, May 5, 1931. Ill.

Wood samples of 12 species of *Flindersia* were examined and intercellular canals were observed in *F. Bennettiana* White, *F. Brayleyana* F.v.M., *F. Orleyana* F.v.M., and *F. Pimenteliana* F.v.M., "though it is very probable that an examination of further material would result in their being found in some of the other species; at any rate, in those in which metatracheal parenchyma is strongly developed.

"These intercellular canals occur most commonly in the wood of *Flindersia Brayleyana*, known on the Sydney market as Queensland Maple. . . . They are usually found in metatracheal parenchymatous bands and form a more or less anastomosing network extending in a tangential direction, but not radially.

"The contents give lignin reactions, resembling 'wound gum,' and are in general similar to the contents of certain of the vessels.

"The development of the smaller canals may be schizogenous, whilst the larger ones are schizo-lysigenous, due to the disintegration of the wood parenchyma. Canals may arise by the breaking down of vessels and may be enlarged by the disintegration of the surrounding tissue.

"The occurrence in the metatracheal parenchyma is irregular since they may frequently be wanting; nevertheless

their recognition is undoubtedly a useful diagnostic character.

"They are usually so small that they do not interfere with the utilization of the wood; although when strongly developed they might exert a weakening effect, *e.g.*, in lowering the resistance to longitudinal shear.

"The insolubility of the contents is such that they are not likely to affect polish or other finishing materials."

Flowering periods of Victorian plants. By Jean Hayward. *Proc. Royal Society of Victoria* (Melbourne) 43 (n.s.): 2: 154–165, 1931.

"In the following pages an attempt has been made to give, in the form of graphs, a phenological record for all native Victorian genera of plants, with the exception of the genus *Eucalyptus*. This genus has been omitted on account of the irregularity of its flowering—some species flower biennially, others triennially, so that it would be impossible to give a satisfactory record in one graph for the genus as a whole. The graphs are intended to cover the flowering periods throughout the whole state, although these will necessarily vary slightly in different parts according to habitat, rainfall, etc. Just as they vary in different parts of the state in any one season, they also vary in the same part according to the season. In most cases, however, the variations in the time of flowering are not as great as one might expect, and do not amount to more than a few weeks even with great variation in rainfall, temperature, or elevation.

"The months during which each species was in flower were recorded from observations in the field, and from herbarium records. They, by combining the flowering periods of all species of a genus, a single flowering period for that genus was obtained. In this way a more generalized summary is made possible with less interference due to the irregular behavior of individual species. From these records, also, that portion of the flowering period during which the majority of species are in flower, can be observed. . . .

"Tables have been constructed from these graphs to test a hypothesis put forward by Illichevsky on the Data of Systematics and the Order of Flowering. On this hypothesis the

order of flowering of plants during a summer coincides with the order of their phylogenetic evolution, that is, the most highly developed plants—those with inferior ovaries, sympetalous flowers, etc.—being more complex, require for their maturation and flowering a longer time and a greater quantity of warmth than simpler plants. Further, it implies that plants should flower in the order in which they prevailed during geological periods. The following tables, set out on the lines of those of Illichevsky, show that the Victorian flora does not agree with this hypothesis."

Forest succession and ecology in the Knysna region. By JOHN F. V. PHILLIPS. Memoir No. 14, Botanical Survey of South Africa, Pretoria, 1931. Pp. 327; 6 x 9½; ill. with diagrams, maps, and 82 photographs. Price 5s.

A thesis submitted in partial fulfilment of regulations governing the degree of D.Sc. in the University of Edinburgh, 1927. It is "one of the results yielded by a systematic study of ecology and silviculture of the forests of the Knysna region since October 1922 under the direction of the Chief Conservator of Forests for the Union of South Africa. . . . The present paper is confined in its objects to a preliminary description of the general setting, nature, and development of the forests."

Quelques mots des forêts du Katanga. By G. DELEVOY. *Revue Internationale des Produits Coloniaux* (Paris) 6: 63: 173–179, March 1931.

The equatorial forest occurs only in the large river valleys of Katanga, while between these are great undulating plateaus covered with a savannah type of vegetation which varies from strictly herbaceous plants through brush land to groves and parks. About 20 per cent of the territory administrated by the Comité Spécial de Katanga is covered with usable timber amounting to about 900,000,000 stères of wood and 90,000,000 cubic meters of logs. Most of this, however, is not commercially valuable at the present time. In some regions the forest is receding, and vast areas formerly timbered are being converted, by the combined action of fire and axe, into scrubby

woodland and open savannah. Through the forest policy now being evolved it is hoped to remedy these conditions.

Le Congo Belge. La flore. By E. DE WILDEMANN. *Revue Internationale des Produits Coloniaux* (Paris) 6: 63: 162–172, March 1931.

A general account of the flora of the Belgian Congo, with a chronological list of the botanical collections that have been made. The forest is of the mixed hardwood type with many species in association. Occasionally a single species predominates as is notably the case with *Macrolobium Dewevrei*, a large tree attaining a diameter of over 5 feet and growing in nearly pure stands over considerable areas in the basins of the Itimbiri, Uélé, and Aruwimi-Ituri.

Essai sur le *Terminalia superba*. By BORGERHOFF and F. JASSOGNE. *Revue Internationale des Produits Coloniaux* (Paris) 6: 63: 180–185, March 1931.

A full account of what at present is the most important commercial timber of the Belgian Congo. The exports to Belgium began with a few tons in 1924 and increased to 11,000 tons in 1929, constituting 80 per cent of the value of all timber exports for that year. It is known to the trade as Limba, and two kinds of wood are recognized: (1) Limba Clair, with at least two-thirds of the diameter of the log light-colored; (2) Limba Noir, with a dark-colored heart thick enough to show on the surface of squared logs. The first is considered a satisfactory substitute for Oak, the second for Walnut.

A propos de *Butyrospermum Parkii* (G. Don) Kotschy ("karité") signalé dans la région de Mahagi (Congo Belge). By PAUL LEDOUX. Extract from *Bull. des Séances, Inst. Royal Colonial Belge* (Brussels) 1: 2, 1930. Pp. 10; 6½ x 10; 2 full-page half-tone plates.

In May 1929, Territorial Administrator Libert collected in the Mahagi region of the Belgian Congo some specimens of leaves, fruits, and seeds which have been definitely deter-

mined to be *Butyrospermum Parkii*, the source of the commercially important Shea Butter of the British colonies in West Africa. This is the first direct proof of the occurrence of the species in the Belgian Congo, although there were previous unconfirmed reports to that effect. The known southern range of the tree is thus very materially extended. The variety is believed to be near, if not identical with, var. *niloticum* (Kotschy) A. Chev. The importance of the discovery is discussed and the need for further field investigations emphasized.

Gold Coast. The shea tree (*Butyrospermum Parkii*) in the Northern Territories. By H. L. Hill. *Year Book 1929*, Bul. No. 22, Dept. of Agr., Gold Coast, 1930, pp. 226–232.

"This article is written as an illustrated addition to the previous publications and is restricted to a brief description of the tree and its fruits, native methods of extracting the butter, local trade and prices, transport facilities, a reference to a consignment of shea nuts to Europe, and the possibilities of creating an export trade."

Nos bois coloniaux (Côte d'Ivoire, Cameroun et Gabon). Makoré et douka (*Mimusops* spp.); moabi (*Baillonella* spp.). Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, 60 Rue Taitbout, Paris, 1931. Pp. 4; 5¼ x 7¼; 2 plates; 2 veneer samples. Price 3 frs.

Makoré (*Mimusops Heckeli* [Pierre] H. Lec.) occurs mostly in Ivory Coast, while Douka (*M. africana* [Pierre] H. Lec.) and Moabi (*Baillonella djave* Pierre and *B. obovata* Pierre) are found in Cameroons and Gaboon. All three are magnificent forest trees, with massive crowns supported by cylindrical, non-buttressed trunks sometimes 5 feet in diameter and 75 to 100 feet to the first branch. The woods, which are related to the Bulletwood of the Guianas and the Massaranduba of Brazil, are reddish or pinkish brown, plain and rather dull on tangential surface, but brighter and more attractive on the quarter on account of the fine but distinct rays. Makoré and Douka are moderately hard and heavy (sp. gr. 0.60 to 0.78, air-dry); Moabi is denser (sp. gr. 0.78 to 0.88). All are fairly

easy to work, take a high polish, and offer no difficulty in gluing and finishing. They are somewhat brittle and should not be employed in places where resistance to shock is an essential requirement. Ivory Coast exports about 5000 tons of Makoré annually, of which about half goes to Germany. The round or squared logs are from 12 to 24 feet long and 2 to 4 feet through. The exports of Douka and Moabi are as yet insignificant. Logging is difficult because the trees are scattered and the green logs will not float.

Nos bois coloniaux (Côte d'Ivoire). Niangon (*Tarrietia utilis* Sprague). Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, 60 Rue Taitbout, Paris, 1931. Pp. 4; 4¼ x 7¼; 2 plates; 2 veneer samples. Price 3 frs.

A moderately large tree, occasionally upward of 100 feet tall and 3 feet in diameter above the prominent, flat, wavy buttresses; of fairly common occurrence in the coastal evergreen forests from Liberia to Gold Coast. Sapwood gray, of medium thickness. Heartwood reddish, with a beautiful golden luster, suggesting Mahogany; somewhat oily to the touch. Sp. gr. 0.63 to 0.78 (at 15 per cent moisture content). Easy to work, finishes smoothly, is of very attractive appearance, especially when cut on the quarter and showing ribbon grain and ray flecks. The oil content tends to reduce the hygroscopicity, but interferes with gluing, staining, and varnishing and thus keeps it out of the class of fine cabinet woods. The timber is sold in round or squared logs, 12 to 18 feet long and 20 to 32 inches through. The annual exports from Ivory Coast are from 1500 to 1600 tons, all to France.

Nos bois coloniaux (Côte d'Ivoire, Cameroun et Gabon). Azobé (*Lophira procera* A. Chev.). Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, 60 Rue Taitbout, Paris, 1931. Pp. 4; 5¼ x 7¼; 2 plates; 2 veneer samples. Price 3 frs.

Azobé, also known as Bongossi, Bois de Fer, and Red Ironwood, is a large, well formed tree occurring in the coastal evergreen forests of West Africa from Liberia to Gaboon and

from Mayumba to Uganda. The savannah form (*Lophira alata* Banks) is a scrubby tree of little or no commercial importance for its timber.

Azobé has a rather thin pinkish sapwood, sharply contrasted with the chocolate-brown or purplish brown heartwood, which is noted for its great resistance to decay and the attacks of insects and marine borers. It is heavy (sp. gr. 0.95–1.10 at 15 per cent moisture), strong, holds it place well when manufactured, and is notably resistant to wear. It is used for heavy and durable construction of all kinds.

With the exception of a small quantity of railway crossties from Gaboon, almost all of the timber reaching the European market originates in Cameroon. It is exported in the form of round logs 20 to 32 inches in diameter and 18 to 30 feet in length. About 4000 tons were shipped in 1929, of which some 400 tons went to Germany. The trade is capable of very material expansion, as the timber is abundant and appropriate uses are numerous.

Flora of West Tropical Africa, Vol. II, Pt. 1. By J. Hutchinson and J. M. Dalziel. Pub. by the Crown Agencies for the Colonies, London, March 1931. Pp. 292; 6¼ x 10; figs. 100. Price 8s. 6d.

Parts 1 and 2 of this important work were published in March 1927 and July 1928, respectively. (See *Tropical Woods* 17: 59.) The first part of Vol. II deals with 33 families of 17 orders (cohorts) of the Metachlamydeae, and concludes the Dicotyledones. We understand that the Monocotyledones will be the subject for the second part. "In order to keep the systematic part as uniform as possible, native names, uses, and economic notes, which are mainly additional to Holland's work [*The useful plants of Nigeria*], will form an appendix at the end of the book."

Les produits coloniaux d'origine végétale. By Guillaume Capus. Libraire Larose, Paris, 1930. Pp. 499; 6 x 9¼; 173 figs.

A general treatise on the vegetal products of the French colonies. Its scope is indicated by the chapter headings as follows: I. Alimentary plants (cereals, tubers, legumes, fruits, etc.), pp. 1–207. II. Oil-producing plants (olive, coconut, peanut, oil palm, etc.), pp. 208–255. III. Sacchariferous plants (sugar cane, sorghum, palms, etc.) pp. 256–274. IV. Forage plants, pp. 275–279. V. Timbers, pp. 280–297. VI. Textiles (cotton, kapok, jute, ramie, sisal, etc.), pp. 298–349. VII. Dyestuffs and tannins (indigo, dyewoods, tanwoods, tanbarks), pp. 350–362. VIII. Rubber and gutta (*Hevea*, *Manihot*, *Castilla*, *Ficus*, lianas, *Palaquium*, *Mimusops*, etc.), pp. 363–411. IX. Gums, resins, gum-resins, oleoresins, vegetable wax, vegetable ivory, pp. 412–425. X. Essences and perfumes, pp. 426–436. XI. Narcotics, pp. 437–459. XII. Medicinal plants (quinine, kola, coca, maté, camphor, chaulmoogra, etc.).

La mise en valeur des forêts coloniales. Conditionnement des exportations et débit sur place d'une partie de la production. By Jean Meniaud. *Revue Internationale des Produits Coloniaux* (Paris) 6: 65: 247–268, May 1931.

Contains important statistics of timber production in the French colonies and a discussion of some of the practical problems involved in the successful exploitation of tropical forest products.

Description et classification industrielle des principales essences coloniales, dont l'exploitation et l'importation sont recommandées. By Jean Meniaud. *Revue Internationale des Produits Coloniaux* (Paris) 6: 65: 269–291, May 1931.

Empire timbers for decorative and building work. *Bulletin of the Imperial Institute* (London) 29: 1: 41–61, Apr. 1931.

"From time to time during recent years the Imperial Institute has furnished information to architects and others in regard to timbers derived from overseas countries of the Empire which can be recommended for decorative or constructional purposes in public and other buildings and in private houses. The interest in such timbers for use either as alternatives to the standard woods (mostly foreign) hitherto employed almost invariably for these purposes, or as materials

affording a welcome change in appearance and character from the established woods, is steadily increasing, and it has been considered that an account of some of the suggestions made in his connection by the Imperial Institute might usefully be published."

"The following pages contain suggestions as to timbers of Empire origin which can be employed with satisfactory results in the construction of public and commercial buildings and private houses. The principal uses for which timbers are suggested are panelling, staircases, joinery, flooring, and carcassing. The woods are not described in detail. Characteristic features are usually given and fuller particulars will be found in the 'Descriptive List of Some Empire Timbers recommended by the Imperial Institute Advisory Committee on Timbers (1928).' A further publication dealing with Empire woods is to be issued by the Empire Marketing Board."

The Empire forestry handbook. Edited by FRASER STORY. Pub. by Empire Forestry Assn., Trafalgar Sq., London, 1931. Pp. 189; 5½ x 8½. Price 3s. 6d.

In this, the second, issue of the Handbook the subject matter has been thoroughly revised and brought up to date. The usefulness of the publication is clearly indicated by the table of contents, the principal headings of which are as follows: Empire Forestry Association (names and addresses of officers and members); Forest officers of the Empire (names and addresses by countries); Higher forestry education (list of principal forestry schools in the British Empire); Research institutes (name, organization, and current program of each forest research institute and laboratory in the British Empire); Departments and institutions dealing with Imperial Forestry (concise accounts of important committees, boards, associations, etc.); Forest resources of the Empire (statistics of area, contents, and ownership of Empire forests, together with timber consumption, imports and exports by countries); Arrangements for the investigation of Empire timbers; Trade names of Empire timbers (with index).

Price 35 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 28 DECEMBER 1, 1931

CONTENTS

Yale University School of Forestry

TROPICAL WOODS

NUMBER 28 December 1, 1931

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

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

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

BRAZILIAN KINGWOOD (*DALBERGIA CEARENSIS*)

By SAMUEL J. RECORD

The Kingwood of Brazil has been known to the cabinetmakers of Europe and America for a great many years. Owing to the small size of the timber, its use has always been restricted to such purposes as inlays and marquetry and occasional fancy articles of turnery. Inlaid borders for fine panels are very frequently of Kingwood.

Kingwood comes from the dry forests of Ceará, Brazil, and the identity of the tree is not absolutely certain, although the evidence seems to point unmistakably to *Dalbergia cearensis* Ducke. At the time of writing *Timbers of Tropical America* I had no good specimens of this wood and omitted a description, but after the book was in type I added the statement (p. 278) that the true Kingwood of Brazil was probably produced by a species of *Dalbergia*. The following year (1925) Dr. Adolpho

Ducke published in *Archivos do Jardim Botanico do Rio de Janeiro*, Vol. IV, p. 73, a description of a new species which he named *Dalbergia cearensis*. According to him, this species furnishes a dark-colored wood called Violeté, a kind of Rosewood (Jacarandá) of the State of Ceará. A specimen (Yale No. 1334) labeled Violeta by the Serraria Claudio, Ltd., of Pará, is identical with what is known commercially as Kingwood.

D. cearensis Ducke is a small tree belonging to the section *Triptolemæa* Mart.; the aspect of the tree and the form of the leaflets resemble *D. Spruceana* Benth., which is the source of the Jacarandá of the Lower Amazon, but the flowers and fruits are of the type of *D. variabilis* Vog.; this last species also occurs in Ceará, but it is a liana. The timber is exported in the form of small logs or bolts, 3 to 6 feet in length and 3 to 8 inches in diameter, hewn free of sapwood.

Kingwood is finely striped, due to alternating concentric layers of violet-brown and black. The black or blackish violet portions are ordinarily much narrower than the brownish ones, and the two layers are so uniformly disposed as to give the appearance of true growth rings rather sharply differentiated into early and late wood portions. The figure is accordingly of the same type as that found in rather slowly grown hard Pine, being most conspicuous on the tangentially cut or flat-sawed material. In this it differs from the Brazilian Rosewood (*Dalbergia nigra* Fr. Allen.) which usually has very irregular blackish streaks. The sapwood is nearly white and the transition to heart is abrupt.

Kingwood has a very mild fragrance, scarcely noticeable in dry material. Some specimens are rather waxy in appearance, though less so than Cocobolo (*Dalbergia retusa* Hemsl.) and Brazilian Rosewood. The density is high; sp. gr. of thoroughly air-dry material about 1.20; weight 75 pounds per cubic foot; this is much greater than Brazilian Rosewood, somewhat above Honduras Rosewood (*D. Stevensonii* Standl.), and about the same as Cocobolo.

The texture is fine and uniform, though the darker layers are slightly harder than the others, due to greater abundance of infiltrated material. The wood is not difficult to work with sharp tools, contains no grit, finishes smoothly, and takes a high waxy natural polish. The grain varies from straight to finely roey, but even in specimens which appear straight-grained there are no distinct lines of cleavage and a split will cross the fiber layers in somewhat the same manner as in Ebony (*Diospyros* and *Maba*), though the fracture is not quite so short. The wood is very stiff, strong, and tenacious within the elastic limit, but breaks suddenly with diagonal fracture. It is highly resonant, approaching Honduras Rosewood in this respect. It is very resistant to decay and holds its place well when manufactured.

Kingwood bears a general resemblance to a wood from southwestern Mexico called Granadillo Morado or Granadillo Meco, believed to be a species of *Dalbergia*, but the two colors in the Mexican samples (Yale Nos. 4764 and 5251) are less sharply defined and the parenchyma bands are heavier than in Kingwood. Gonçalo Alves (*Astronium fraxinifolium*) of Brazil has sometimes been called Kingwood (see *Timbers of Tropical America*, p. 389), but there should be no occasion for confusing it with any kind of *Dalbergia*.

Anatomy of the Wood

Apparent growth rings very distinct in heartwood due to color contrasts; to what extent these alternating violet-brown and violet-black bands are seasonal could not be determined, since definite correlation with anatomical differences was not established. Pores variable in size, the largest scarcely visible without lens; irregularly distributed, without pattern, occurring singly or in radially flattened groups of 2 or 3, occasionally more, pores each; often with lustrous contents. Vessel lines fine and inconspicuous; dark gum deposits abundant. Parenchyma indistinct without lens; rather abundantly developed, occurring irregularly about the pores, confluent aliform, or in fine concentric lines mostly independent of the pores; also diffuse; frequently obscure in dark portions of wood. Rays minute, requiring lens on cross and tangential sections; low and inconspicuous on radial surface; in rather irregular storied arrangement. Ripple marks present; not visible to unaided eye; fairly regular; about 175 per inch; all elements storied, though some of the rays occupy portions of two tiers.

Material: Yale Nos. 1334, 7016, and 7017.

NOTES ON IROKO (*CHLOROPHORA EXCELSA*)

By E. H. B. Boulton, *Dept. of Forestry, Cambridge University, and* T. J. Price, *City of London College*

Chlorophora excelsa B. & H.f. is a large dioecious tree of the Mulberry family, of common occurrence in tropical West Africa from French Guinea to Tanganyika territory. The timber on the English market comes mostly from Nigeria, while the French supply is largely from the Ivory Coast, with smaller amounts from Cameroons and Gaboon.

The indigenous names recorded for this tree are as follows: Simmé (Fr. Guinea); Sime, Tema (Sierra Leone); Ge-ay, Semli (Liberia); Iroko, Bouzo, Edoum, Dou, Akede, Elwi (Ivory Coast); Odum, Kusaba, Eluwi, Erui (Gold Coast); Logo Asagu, Ssäre or Ssere, Ukloba, Odum (Togo); Roco or Rokko (Dahomey); Oroko, Oloko, Loko, Reko Zhiko (Nigeria); Abang, Bang, Bing, Adoum, Momangi (Cameroons); Mandji, Eloun, Kambala (Gaboon and Middle Congo); Kambala, Amoreira (Cabinda, Portuguese); Kambala, Kamba, Molundu, Molongo, Bolondo, M'Bara, Sangasanga (Belgian Congo); Muvule, M'Vule (Uganda); Mgunde, Magundo (Port. E. Afr.).

Among the English names for this tree are Mulberry (Liberia), Rock Elm, African Oak, and African Teak. Mulberry is not inappropriate since the tree belongs to the Mulberry family (Moraceae) and has fruits similar to those of *Morus*. The wood has little resemblance to Oak (*Quercus*), though employed for some of the same purposes, but does have about the same general color as Teak (*Tectona*). The best known trade name for the timber is Iroko and the use of this name to the exclusion of others for *Chlorophora excelsa* should be encouraged. In Germany and the United States the name Kambala is also employed. "African Oak" and "African Teak" are both misnomers and the use of the latter term will be still further misleading when the plantations of true Teak in West Africa reach maturity.

Iroko is imported into England in the form of hewed logs 14′ to 24′ long and 24″ to 42″ square. Sapwood is nearly always completely removed, but when present on corners is

1″ to 2″ thick. France imports considerable of the timber in the round, but hewed free of sapwood. The logs are free from worm holes and are not very shaky, though the largest are likely to be defective at the center and frequently contain stony concretions.

The wood is used in England for laboratory fittings, fascias, counter and table tops, sign posts, draining boards, and parquet flooring. In France it is employed for similar purposes and also for general carpentry, vehicle frames, and ship and boat building.

The accompanying table gives the results of shrinkage tests on seven boards 1¼″ thick, each taken from a different log. Four of these were sawed tangentially, the others radially or quarter-sawed. In drying to about 13 per cent moisture content, the average radial shrinkage (on a basis of dry width) was 0.94 per cent; tangential, 2.04 per cent.

Results of Shrinkage Tests on Iroko

No.	Section	Initial		Intermediate			Final		
		Moisture content	Width	Moisture content	Width	Shrinkage	Moisture content	Width	Total shrinkage
		Per cent	*Inches*	*Per cent*	*Inches*	*Per cent*	*Per cent*	*Inches*	*Per cent*
1	Tang.	97	12.13	35	12.11	.25	12	11.95	1.50
2	Rad.	95	12.25	31	12.20	.41	14	12.12	1.07
3	Rad.	107	14.50	35	14.43	.48	14	14.37	0.91
4	Rad.	100	15.81	36	15.81	...	13	15.68	0.83
5	Tang.	83	12.12	30	12.10	.16	10	11.93	1.59
6	Tang.	58	19.12	31	19.05	.31	13	18.69	2.30
7	Tang.	104	11.45	51	11.45	...	12	11.14	2.78

Description of the Wood

Heartwood olive yellow when fresh, deepening to russet upon prolonged exposure; sometimes with darker streaks; has a waxy or greasy appearance. Luster satiny in proper light, otherwise dull. Sapwood pale yellow or nearly white; thick in young trees, but rather thin in old ones; sharply defined and very distinct after darkening of heartwood. No distinctive odor or taste to dry wood. Suggests certain of the Leguminosae.

Moderately hard and heavy, though showing considerable variation. Sp. gr. (air-dry) 0.70 to 0.80; weight 44 to 50 lbs. per cu. ft. Texture somewhat coarse—the fiber areas compact, but the vessel lines deep. Grain mostly irregular, tending to roey. Saws easily and takes a high polish, though filler is needed in finishing. Hard to nail, but holds nails and screws firmly. Is inclined to split if exposed to alternately wet and dry conditions. French experts recommend that veneers for plywood be cut less than 2 mm. in thickness. Lumber stacked in piles is likely to be stained where in contact with the stickers, sometimes to a depth of a quarter inch. The dust arising in working the wood is annoying, though not known to be poisonous or to cause dermatitis.

GROSS ANATOMY

Growth rings variable in distinctness; when visible, due to peripheral alignment of elements or to zones with fewer pores. Parenchyma about the pores in irregular and often elongated and connected patches, visible on all sections and producing a zig-zag pattern of buff-colored lines against a darker background on tangential surface. Pores large, distinct because of parenchyma, fairly numerous, occurring singly or in pairs that generally are radial. Vessel lines prominent in proper light; tyloses and yellow deposits sometimes present. Rays fine, but visible, becoming more distinct when wood is wet; low and not highly conspicuous on radial surface.

MINUTE ANATOMY

Cross section: Growth rings sometimes distinctly defined by larger proportion of fibers and fewer and smaller pores in the late wood. Parenchyma abundant in tangential undulating bands tending to join the pores into an irregular network; also in lines appearing to terminate growth rings; crystals of calcium oxalate common. Pores oval, in radial pairs or solitary; thick-walled; mostly open, but frequently closed with thin-walled tyloses. Rays widen immediately before and after passing through parenchyma bands; spacing usually slightly less than one pore width. Wood fibers thick-walled.

Radial section: Vessels with simple perforations; end walls horizontal. Rays heterogeneous, the marginal cells square to

palisade; crystals of calcium oxalate common; pits into vessels few, half-bordered, variable in size and shape, often elongated radially, the orifices large and lenticular; pits between parenchyma cells very small and numerous. Parenchyma cells mostly large, thin-walled, irregular in shape. Wood fibers long-pointed, sometimes forked; cavities often irregular; pits few, minute, simple, slit-like.

Tangential section: Vessel segments variable in length; bordered pits abundant, but with rounded outlines; apertures nearly horizontal, included. Rays 1 to 4, mostly 3, cells wide and few to 35 cells high; edge cells large and thin-walled; inner (procumbent) cells very small.

Material: Nos. 3051 and 3067 (Govt. of Gold Coast); 3105 (Govt. of Nigeria); 3624 (Public Works Dept., Lagos); 4681 (Capt. Hicks, Mombassa); 5091 (Govt. Coast Agent, Mombassa).

NOTE ON *CHLOROPHORA EXCELSA* IN THE GOLD COAST

By C. VIGNE

Assistant Conservator of Forests, Gold Coast [1]

Chlorophora excelsa is probably the most valuable tree in the forests of the Gold Coast. Its value, however, lies in its local use, since, unlike African Mahogany, the timber is seldom exported. The principal reason for this is that the price obtainable in Europe does not justify the expense involved in extracting the logs, which are heavy and cannot be floated. There is a steady local demand for the timber.

The tree is not found in the savannah forest and is of only rare occurrence in the evergreen rain forest, but is well distributed throughout the greater part of the closed forest area, being most common near the zone of transition to the savannah forest. It is fairly common in secondary forest, as often it is left standing when the original growth is cleared for farm-

[1] On special leave as Commonwealth Fellow at Yale University School of Forestry.

ing and also because when young it is a quick-growing, light-demanding species. It is becoming rare in the vicinity of towns.

Both tree and timber are known throughout the Gold Coast as Odum, this being the name applied to it by the Ashantis and other tribes speaking the Twi group of languages, as well as being the "standard" name selected by the Forestry Department. The Appollonians, Aowins, and Sefwis, occupying the western and southern parts of the Colony, call it Eluwi or Erui, but generally know it also as Odum. Odumasi is a common village name, signifying "at (or under) the Odum tree."

The tree is large, with clear, full bole and a rather spreading crown of large branches. Leaves are absent for a short period about January. Flowers appear in February-March, the two sexes being borne on different trees. The Mulberry-like fruits mature quickly and are to be found in abundance under the female trees in April-May; they are very attractive to small antelopes and rodents, a fact taken advantage of by native hunters who conceal themselves nearby. The sex of the trees is not determinable except during the flowering or fruiting period.

Seed is plentiful and germinates readily, though somewhat slowly, considering its small size. It may be sown broadcast or in lines. The seedlings should be lined out, 6″ x 6″, when about 2″ high, for if left too long they produce a thick, yellow taproot that reduces the chances of success. Growth is vigorous and the right size for planting out is reached in from 3 to 6 months; older plants are likely to be too big. They are generally root- and shoot-pruned at the time of planting and, if put out during the rains, the loss is very small. Every plantation made in the Gold Coast, however, has suffered severely from galling due to the attack of an insect that deposits its eggs in the very young shoots. Even nursery stock is attacked and most of the natural seedlings are found to be galled. This seriously interferes with the growth, but observations on natural saplings provide grounds for belief that the plants will be able to overcome the attacks. Experimental plots have been established to test the advantage of growing Odum in mixture with various other species.

Although old trees develop rounded root spurs that make the base somewhat fluted, there are no true buttresses—a matter of decided advantage in conversion. The bark is thick and granular, with a yellow slash and a milky latex. The wood when first cut is yellow throughout, but after a short exposure the heartwood is readily distinguishable, gradually darkening to chocolate brown. The sapwood varies in thickness, being generally from 2 to 4 inches in large trees. The heartwood is noted for its resistance to termites, but it is necessary to reject all pieces containing sapwood as it is readily destroyed. The timber is extensively used, both by the natives and by the Government and the trading community, for the construction of houses and furniture, as it is strong and durable. Although rather coarse-grained, it makes attractive furniture, and some planks are beautifully figured with a wide, broken mottle.

Exploitation of Odum is in the hands of the natives who pitsaw the timber where felled. There is no special season for this work, except that times of heavy rains are avoided owing to the flooding of the deep pits in which the under-sawyers stand. Conversion is very wasteful, often only a single log being sawn, especially if the timber is for the cutter's own use. The Public Works Department of the Government purchases large supplies annually, and stacks of boards and beams are to be found for sale along all the roads out of the larger towns in the forest area. In 1930, boards 12″ wide, 1″ thick, and from 12′ to 16′ long could be obtained for from 3 to 4 shillings each. In this trade no distinction is made as to the sex of the tree from which the lumber is obtained, although there are natives who say that this has a bearing on the quality of the timber. Decision in the matter must await scientific investigation.

Odum wood floats when dry, but green timber sinks. On the analogy of Teak, an experiment was made to test the effect of girdling, but a log cut from a tree killed two years previously by girdling sank when thrown into the Ofin River.

The tree is readily recognized even in the dense forest, one of the most characteristic features being the large yellow-red lenticels on the heavy surface roots that extend a long way from the base. The only tree likely to be confused with it is *Morus mesozygia* Stapf, a latex-bearing member of the same

family. Large specimens of that tree resemble Odum somewhat in habit and bark, but the leaves differ. Latex from both of these species was used as an adulterant of rubber when the price was high, and scars from the tapping are still visible on the old trees.

Although the heavy demands of the Government and traders are exhausting the more readily accessible supplies, additional sources of Odum timber are being made available through new road construction. A more serious drain has been occasioned by a change in the natives' mode of living. With the spread of cacao cultivation, villages have become permanent and substantial houses are replacing the mud-and-wattle huts of the shifting settlement. This large and increasing demand will result in a shortage of the timber unless methods can be found for overcoming the attacks of the gall-fly, the only obstacle to the successful growing of the trees in plantations. It would appear to be well worth while to experiment with plantations of this fine timber tree in other tropical countries where the gall-fly is not known to exist.

THE MEXICAN AND CENTRAL AMERICAN SPECIES OF *PTEROCARPUS*

By PAUL C. STANDLEY

Field Museum of Natural History

The leguminous genus *Pterocarpus* contains important tropical timber trees of both the eastern and western hemispheres. In America it is best represented in South America. There are thirteen species from that continent in the herbarium of Field Museum, although it is by no means certain that all of them are distinct. On the other hand, a few additional species have been described from South America and it is not unlikely that several more await discovery.

In Mexico and Central America, with a relatively small area of tropical forest, it is natural that the genus should be less amply represented. During the last five years the writer has described from Central America two species of *Pterocarpus*, which at the time of publication were believed to be well based, but careful study now shows that it is necessary to reduce both to synonymy. Misunderstanding of the Central American species arose primarily from the erroneous determination of certain specimens in the United States National Herbarium, to whose labels too much importance was attached. It resulted also from the fact that there was little satisfactory material available for comparison, particularly of mature fruits. Apparently collectors never obtain flowers and fruits of these trees at one time, probably because both can not be found at the same season. However, during the past few years a substantial amount of good material of *Pterocarpus* with flowers and fruits has accumulated in the herbarium of Field Museum, and it is now possible to form a more accurate idea of the proper classification of the forms represented in North America. The results of recent consideration of the new material are summarized below. There is added a key for the discrimination of the four species known to occur in Mexico and Central America.

KEY TO THE SPECIES

Calyx glabrous. Pods sessile, the central portion surrounding the large seed broad and corky-thickened, the wings very narrow and thick, often obsolete..... *P. officinalis.*

Calyx densely pubescent with rusty or whitish hairs. Pods with broad and thin wings wider than the small hard seed-bearing portion.

Pods long-stalked within the calyx, acute, the style terminal or nearly so at maturity of the fruit..... *P. acapulcensis.*

Pods sessile or practically so, the style lateral at maturity, the apex of the pod thus broadly rounded.

Calyx about 6 mm. long, pubescent with short brown hairs. *P. Hayesii*

Calyx 8–9 mm. long, whitish-pubescent..... *P. orbiculatus.*

Pterocarpus officinalis Jacq., 1763; *P. draco* L., in part, 1763; *P. belizensis* Standl. Trop. Woods 7: 6. 1926.

Specimens are at hand from various places along the Atlantic coast of Central America, in British Honduras, Honduras, including Ruatán Island, Nicaragua, and Panama. No doubt the tree grows also in Guatemala and Costa Rica. It occurs, besides, in Jamaica, Porto Rico, and the Lesser Antilles, and in Colombia and the Guianas. In the *Trees and*

family. Large specimens of that tree resemble Odum somewhat in habit and bark, but the leaves differ. Latex from both of these species was used as an adulterant of rubber when the price was high, and scars from the tapping are still visible on the old trees.

Although the heavy demands of the Government and traders are exhausting the more readily accessible supplies, additional sources of Odum timber are being made available through new road construction. A more serious drain has been occasioned by a change in the natives' mode of living. With the spread of cacao cultivation, villages have become permanent and substantial houses are replacing the mud-and-wattle huts of the shifting settlement. This large and increasing demand will result in a shortage of the timber unless methods can be found for overcoming the attacks of the gall-fly, the only obstacle to the successful growing of the trees in plantations. It would appear to be well worth while to experiment with plantations of this fine timber tree in other tropical countries where the gall-fly is not known to exist.

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Shrubs of Mexico (Contr. U. S. Nat. Herb. 23: 508. 1922) it is reported incorrectly from Yucatan. It may well be that the tree does grow in Quintana Roo, but there are no specimens to substantiate its occurrence there. It would not be surprising, either, if *Pterocarpus officinalis* should be discovered in southern Mexico, in Tabasco or Campeche.

Along the Central American coast this species is confined to the lowlands. Although it often grows on hillsides, its favorite habitat is swamps, especially those inundated by the tide. There, in the spring months, the surface of the water sometimes is covered by a floating layer of the buoyant seed pods, which can be confused with those of no other plant. They are scattered in great abundance also on the beaches, among the fascinating array of seeds and other objects found in such places.

This most widely distributed of the American bloodwoods is well known in Honduras as Sangre. The name Sangre de Drago is reported from Guatemala and Nicaragua, and that of Sangregado from Nicaragua. In British Honduras it passes under the name of Kaway. *Pterocarpus officinalis* is a fine tall tree, often with large thick buttresses.

Pterocarpus belizensis is exactly the same as the West Indian and South American tree. When it was published as a new species no good fruiting specimens were available for comparison from those regions, and the fruits were compared with others from Panama labeled *P. officinalis* which now are found to be really those of *P. Hayesii*.

Pterocarpus officinalis and *P. Hayesii* are easy to separate when either flowers or pods are available, and even leaf specimens can be distinguished definitely, at least with properly named specimens for comparison. The leaflets of *P. officinalis* taper into a usually very long and narrow tip; those of *P. Hayesii* have only a short broad tip.

Herbarium specimens of *Platymiscium yucatanum* Standl. may easily be confused with those of *Pterocarpus officinalis*, since in both the foliage and flowers are closely similar. In the Yucatan tree the leaflets are opposite, while in *Pterocarpus* the leaflets are alternate. The fruits of *Platymiscium yucatanum* are still to be collected.

Pterocarpus acapulcensis Rose, 1897.

In the *Trees and Shrubs of Mexico* the species is reported from the states of Veracruz, Guerrero, and Oaxaca in Mexico. At the present time there are available to me only sheets of the original collection, from Acapulco, but it may be that some of the specimens in the National Herbarium from other states are conspecific. *P. acapulcensis* is definitely marked by its fruit, and by the form of the leaflets, which are ovate-elliptic, obtuse or bluntly short-tipped, and discolored beneath.

Pterocarpus Hayesii Hemsl., 1878; *P. reticulatus* Standl. Trop. Woods 16: 38. 1928.

The type specimen, collected by Sutton Hayes at Matachín, Canal Zone, is illustrated by Hemsley as plate 17 of the botanical report of the *Biologia Centrali-Americana*. The type of *P. reticulatus* was from Boca, British Honduras. Specimens are at hand from the vicinity of the Cockscomb Mountains, British Honduras, and from several localities in the Canal Zone and the region of Bocas del Toro, Panama. In 1926 I found the species growing at El Arenal in the Province of Guanacaste, Costa Rica, close to the Pacific but really on the Atlantic slope. It was a tall tree, 15–25 meters high, exceedingly handsome because of its profusion of deep dull yellow blossoms. It is called Bloodwood in Panama, and the name Dogwood is reported, very likely in error, since that term usually applies to *Lonchocarpus* species.

Strangely enough, all available specimens from the Canal Zone show fruits only, while those from other regions are in flower, but I am convinced that all are conspecific. The pods in this species are quite distinct from those of *P. officinalis*, in which the fruits are thick and corky, with scarcely any remnant of a wing. In *P. Hayesii* the pods have only a small hard central part surrounding the seed, and this is encircled by a fragile thin wing, by which the fruits float gently to the ground, instead of dropping straight down, like those of *P. officinalis*. *P. Hayesii* grows on Barro Colorado Island, where the paths often are found covered with the curious pods.

The type of *P. reticulatus* is unusually pubescent, the pubescence being much more copious and conspicuous than in any other material examined. Doubtless this is a mere indi-

vidual variation, dependent upon the fact that the leaves are young rather than aged.

Pterocarpus Hayesii is closely related to *P. Robrii* Vahl of Trinidad and northern South America. In general appearance as well as in details they are dangerously alike, but *P. Robrii*, besides having usually shorter pedicels, has conspicuously elongate bracts and bractlets, while those of *P. Hayesii* are minute and inconspicuous. The two appear, therefore, to be sufficiently distinct.

Pterocarpus orbiculatum DC., 1825; *Amphymenium pubescens* HBK., 1823; *P. Amphymenium* DC., 1825; *P. pubescens* Spreng., 1827, not Poir., 1804; *P. aphyllus* Micheli, 1903.

In the herbarium of Field Museum there are specimens from Guerrero, Oaxaca, and Veracruz, but, for lack of complete material, some of the determinations are open to question. It is not improbable that the material will be found divisible into two or more species when adequate collections have been gathered.

The names Llora-sangre and Guayabillo are reported for the tree. It and *P. Hayesii* are closely related, but with ample specimens of the Mexican tree for study, it is probable that the two can be distinguished more definitely.

THE HUANITA TREE OF MEXICO

By Paul C. Standley

Field Museum of Natural History

In 1824 the Mexican botanists La Llave and Lexarza described under the name *Morelosia huanita* a tree growing at Uruapan in the State of Michoacán, for which the vernacular name Huanita was employed by the people of that city. Only one tree was known to La Llave and Lexarza, and apparently the tree thus named is rare in Michoacán, for when the *Trees and Shrubs of Mexico* [1] was published no specimens were available from that state, and *Morelosia huanita* was listed there as an uncertain species of *Beureria* (the generic name is written sometimes *Bourreria* and *Beurreria*). Hemsley already had reduced *Morelosia* to synonymy under that genus of the Boraginaceae, and had transferred the species, calling it *Beureria huanita* (Llave & Lex.) Hemsl.

[1] Contr. U. S. Nat. Herb. 23: 1226. 1924.

The writer's attention was attracted recently to an article published by Professor Antonio Ramírez Laguna, in which he reported his discovery of the tree at Uruapan, and gave an account of its history, with a description and illustrations based upon the material he had collected. With the kind approval of Professor Isaac Ochoterena, Director of the Instituto de Biología of Mexico, Professor Ramírez Laguna has courteously forwarded to Field Museum an excellent specimen of the Uruapan tree. Comparison of this with others of *Beureria formosa* shows that the latter name must be reduced to synonymy, as the writer already had suspected (Trees and Shrubs of Mexico, *loc. cit.*). The synonymy of the Huanita tree is as follows:

Beureria huanita (Llave & Lex.) Hemsl. *Morelosia huanita* Llave & Lex. Nov. Veg. Descr. 1: 1. 1824. *Ehretia formosa* DC. Prodr. 9: 510. 1845. *E. formosa* var. *oaxacana* DC. loc. cit. *Beureria formosa* Hemsl. Biol. Centr. Amer. Bot. 2: 369. *pl. 59.* 1882. *B. huanita* Hemsl. op. cit. 370. *Crematomia huanita* Miers, Ann. Mag. Nat. Hist. IV. 3: 313. 1869.

It is a matter of satisfaction to be able to establish definitely another of the names published by the two pioneer botanists of Mexico, who must have labored under such great difficulties.

The Huanita tree ranges from Michoacán to Oaxaca and southward through Guatemala to Salvador. In the latter country it is known as Esquinsuche and Listón. The dried flowers are an ingredient of the fermented beverage *agua dulce*, which is prepared from crude sugar. In Costa Rica the tree is sometimes planted, and there it is known by the similar and evidently cognate name Quisjoche. An excellent account of its history in Mexico will be found in the paper by Professor Ramírez Laguna that is abstracted in this issue of *Tropical Woods* (p. 23.)

"THE EVERGREEN FORESTS OF LIBERIA"

This is the title of a report[1] published last September on investigations made in the West African Republic of Liberia by the Yale University School of Forestry in coöperation with the Firestone Plantations Company. The authors are G. Proctor Cooper, 3d, and Professor Record.

Foreword

"Late in 1927, Mr. Harvey S. Firestone, President of the Firestone Tire and Rubber Company, and Mr. Harvey S. Firestone, Jr., President of the Firestone Plantations Company, offered to place the facilities of the latter company at the disposal of the Yale University School of Forestry for the purpose of making a scientific study of timberlands being cleared for rubber plantations in Liberia, West Africa. This generous proposal, which had its origin in a suggestion by Mr. Rudolph Block,[2] was promptly accepted by the School, as it provided an unusual opportunity for determining the composition of an important portion of the tropical evergreen forest and for collecting authentic specimens of wood for testing and systematic study in the laboratory.

"It was realized at the outset that if the project was to have a scientific foundation it would be necessary to have the trees and other plants named by competent taxonomists associated with a large herbarium in which the West African flora was well represented. These conditions were ideally fulfilled at the Royal Botanic Gardens, Kew, England, where, under the supervision of the Director, a comprehensive *Flora of West Tropical Africa* was being prepared by Mr. J. Hutchinson, Assistant in the Herbarium, and Dr. J. M. Dalziel (late

[1] Bulletin No. 31, Yale University School of Forestry, New Haven, Conn., 1931. Pp. 164; 6 x 9; 1 map; 15 half-tone plates. Price $1.

[2] Rudolph Block, now residing in France, was for many years on the editorial staff of a newspaper syndicate in New York and is widely known as a writer under the pen name of Bruno Lessing. His attention was first attracted to the Firestone operations in Liberia during his world-wide search for rare and unusual woods to enrich his private collection of walking sticks, fourteen hundred of which are now on exhibit at the New York Botanical Garden after three years in the United States National Museum, Washington, D. C.

of the West African Medical Service), Assistant for West Africa. These eminent authorities obligingly assumed the important task of determining all the specimens of Liberian plants submitted to them, and they fulfilled their promise with accuracy and dispatch despite the inconvenience which it must have occasioned.

"Mr. G. Proctor Cooper, 3d, a graduate of the School who had had experience as a collector in Central America, was appointed Field Assistant in Tropical Forestry at Yale University for the duration of this project. He went to Liberia in August, 1928, and returned to New Haven in August, 1929. He was in direct charge of the field work, and his assistants were intelligent native employees of the Firestone Plantations Company. After a few months Mr. Cooper became seriously ill of some unknown malady that forced him to spend several weeks at different times in the hospital. On this account some of the objectives of his mission were abandoned, though he was able to complete the main part of the project as planned. That so much was accomplished under the circumstances is due to the coöperation of Mr. Firestone and his entire field staff, particularly Messrs. Gammie, Allen, Phillippe, and Drinkwater.

"The present is only one of several scientific collections of Liberian plants, the first being made about 90 years ago. The most extensive one, still in progress, is that of Herr M. Dinklage, a German formerly in business at Grand Bassa, now retired and living in Monrovia. His earlier material, determined by Professor A. Harms, of Berlin-Dahlem, was made the principal basis for the first report published on the flora of Liberia, which was compiled by Dr. Otto Stapf for Sir Harry Johnston's *History of Liberia*. Three or four other botanists have visited the country, but prior to the present investigation comparatively little attention had been given to the larger trees and none at all to the woods.

"The Yale-Firestone coöperative study was largely from the standpoint of the forester and wood technologist and had in view the practical as well as the scientific aspects of the situation. Trees, because of the difficulty they offer to the collector of botanical specimens, are very likely to be the least well known of plants. This is a serious handicap to the forester

and one that, under ordinary circumstances, is very slowly overcome. In the present instance, however, large blocks of forest were being felled, thus making it possible to obtain samples of every tree in the stand, though of course not all were in flower or fruit. Nearly 500 specimens were obtained, representing 300 species, 222 genera, and 68 families; at least 18 species have proved new to science. No attempt was made toward a general collection, and the few herbs included were incidental to the forest survey.

"The composition of the forest was studied on three different strips comprising a total of 52 half-acre sample plots. The size of every tree 2 inches and over in diameter at breast height (or above buttresses) was recorded and the results subsequently compiled so as to show in tabular form the relative abundance of the species and the distribution of size classes on typical areas of the Dukwia region. The forests there are of second quality, and for size of timber are easily surpassed in various other places in Liberia.

"From the Dukwia region also were obtained 118 hewed bolts, representing nearly all of the principal timber trees. Tests on the physical and mechanical properties of 104 of them were made at Yale under the direction of Professor George A. Garratt. Although the number of tests is limited, the results are believed to be fairly indicative of the character of the material. In addition, various samples of lumber from local mills were made into panels for exhibit purposes at the School and to demonstrate the appearance and working qualities of the woods.

"In most instances the amount of herbarium material was sufficient to make several sets, in addition to the one retained at Yale, which have been distributed as follows: Royal Botanic Gardens, Kew; Imperial Forestry Institute, Oxford; British Museum of Natural History, London; Field Museum of Natural History, Chicago; U. S. National Herbarium, Washington; New York Botanical Garden; Arnold Arboretum, Jamaica Plain, Mass.; Gray Herbarium, Cambridge, Mass.; Botanisches Museum, Berlin-Dahlem; and the Academy of Natural Sciences of Philadelphia. Samples of the woods are being distributed to various scientists and institutions

in connection with coöperative systematic studies now in progress.—Samuel J. Record."

GENERA ADDED TO YALE WOOD COLLECTIONS

May 1 to October 31, 1931

A mimeograph family-and-genera catalog of the Yale wood collections was distributed in December 1929. A supplement was published in *Tropical Woods* 26: 16, June 1, 1931. The additions made since then are listed below. Some of these represent new material, others recent determinations of specimens previously accessioned.

ANGIOSPERMAE

Acanthaceae
Aphelandra
Beloperone

Annonaceae
Aberemoa
Bocagea
Malmea
Uvariastrum

Apocynaceae
Pleiocarpa

Bignoniaceae
Paratecoma

Burseraceae
Zanha

Cactaceae
Nopalea

Capparidaceae
Isomeris
Morisonia
Steriphoma

Cneoraceae
Cneorum

Combretaceae
Strephonema

Compositae
Encelia
Pluchea

Cunoniaceae
Anodopetalum

Flacourtiaceae
Ophiobotrys

Gramineae
Lasiacis
Oxytenanthera

Leguminosae
Benthamantha
Chidlowia

Loasaceae
Petalonyx

Malpighiaceae
Diacidia
Stigmaphyllon

Malvaceae
Lavatera

Moraceae
Anonocarpus
Brosimopsis
Noyera
Sorocea
Trymatococcus

Oxalidaceae
Averrhoa

Proteaceae
Cenarrhenes

Rhizophoraceae
Poga

Rubiaceae
Aulacocalyx
Gleasonia
Tarenna

Sabiaceae
Ophiocaryon

Simarubaceae
Holacantha

Sterculiaceae
Melochia

Valerianaceae
Valeriana

CURRENT LITERATURE

Tropical forests of the Caribbean. By Tom Gill. Pub. by Tropical Plant Research Foundation in coöperation with the Charles Lathrop Pack Forestry Trust, Washington, D. C., 1931. Pp. xix+318; 6¼ x 8½; 80 full-page halftones; 4 small maps. Price $5.

The author is a trained forester of long experience in the U. S. Forest Service and has made a number of studies of tropical forests as a representative both of scientific and of private organizations. He has written several books on forestry and is forester for the Tropical Plant Research Foundation and the Charles Lathrop Pack Forestry Trust.

Tropical Forests of the Caribbean is the result of three years of travel and study through the countries of tropical America north of Brazil. It has to do with the existing forests of these countries, their influence on our own timber situation, tropical logging methods, problems of tropical enterprise, forest laws, and the progress of forestry.

The chapter headings are as follows: I. World wood needs. II. Tropical forest types. III. Forest wealth of Tropical America. IV. The white man's invasion. V. Effects of human occupancy. VI. Forestry beginnings. VII. British forestry in Tropical America. VIII. Porto Rico and Haiti. IX. Central America and the West Indies. X. Mexico. XI. Venezuela and Colombia. XII. Tropical logging. XIII. Wood use—present and potential. XIV. Tropical forest by-products. XV. Why capital hesitates. XVI. Tropical forests and tomorrow. The chapters on wood use and on northern South America are by William R. Barbour, former Forester for Haiti and now Forester for Porto Rico and the Virgin Islands.

In addition there is an appendix including a short discussion of the better known broadleaf species in the Caribbean region by family and genus, a list of common and botanical names of trees mentioned in the text, a selected bibliography, and four tables. The first of these tables is a list of principal North American hardwoods, with the amount consumed and uses to which they are put; the second gives the principal uses of native hardwoods by species; the third is a tabulation of the

forested areas of the Caribbean region by countries; the last is a list of tropical American woods consumed by wood-using industries in the United States.

Four text maps give the distribution of four general forest types, namely, the coniferous, deciduous, dry forest, and rain forest. For each country the author discusses the forests, the extent to which they have been exploited, the laws affecting them, and the question of the public attitude toward conservation. Tropical logging methods and some of the hazards that attend enterprise in exploiting tropical forests are fully discussed.

Realizing the partial and often unreliable nature of existing knowledge in regard to tropical forests, the author claims no minute degree of accuracy and no final word of authority. In the preface he states: "Writing a book on tropical forests is essentially in the nature of pioneering. It partakes of all the hazards of pioneering, in the absence of guide or precedent and in the uncertainty of the final result. One must paint the picture in bold, broad strokes, realizing that many details going to make up the total situation are only imperfectly known. The problem itself is still too incompletely solved to be dealt with in any but the broadest way."

The debt of natural history to the United Fruit Company. By Paul C. Standley. *Unifruitco* (Boston) 6: 12: 567–569, July 1931. Illustrated.

"Few employees of the United Fruit Company can have an adequate idea of the benefits that have been derived by natural history as a direct result of the activities of this organization in tropical America. The benefits are, indeed, realized by comparatively few scientists of the United States, but their value is appreciated profoundly by every scientist who has had occasion to conduct investigations in any of the regions in which the Company operates. . . .

"In the zoological gardens of the United States you find living animals whose labels record the fact that they were received from the United Fruit Company or its officials. In the museums there are many exhibits from the same source that help in their way to dispel the deep ignorance that

prevails so generally in the United States regarding tropical America. . . .

"Besides these more spectacular exhibits there are treasured in herbaria of the United States many thousands of carefully pressed and dried plant specimens, mounted neatly on sheets of paper, labeled with their Latin and local names, and filed methodically in cabinets, where they may be located instantly when wanted. They constitute libraries, one might say, for the study of tropical plants. These thousands of specimens were collected with not only the moral support of the Fruit Company, but with more substantial and concrete assistance. Scientific organizations are, for the most part, notoriously poor in finances, and these collections could not have been obtained without the assistance, both material and moral, so generously extended."

"All this botanical and zoological material that has been gathered from tropical lowlands, where bananas form so conspicuous a feature of the landscape, has contributed immeasurably to the world's knowledge of what lives and grows in the West Indies and in Central and South America. Many hundreds of species of plants and animals never before known have been named and described from these collections made with the help of the United Fruit Company and about its properties. And this is in addition to the research work of a practical nature conducted by the Company's own staff, and in a department organized especially for the purpose.

"That research work and the educational activities in practical science conducted by the Company have often been discussed in *Unifruitco*, but it is doubtful whether the employees of the Company realize the high repute which these enjoy generally among other workers in science. Nor do they know of the contributions made to science by many Fruit Company employees, who have devoted their spare hours, or time officially assigned to them, for making collections of woods, plants, insects, snakes, lizards, birds, and many other objects.

"In woods alone the results have been astonishing. Professor Samuel J. Record, of the Yale School of Forestry, has

been able to assemble woods of most of the important forest trees of Central America, and to list and describe them with their local names. Some of the most valuable of the wood collections were made in Guatemala by Henry Kuylen, and in Panama by G. P. Cooper.

"It is impossible to refrain from mentioning here another scientific achievement in whose success the United Fruit Company has had a part. For several years Professor Record has published at Yale University a quarterly magazine, *Tropical Woods*, whose name describes its scope. This magazine probably has a more cosmopolitan circulation than any single botanical publication in the world. Its contents are of direct practical value to wood producers and consumers everywhere. Each number of *Tropical Woods* bears on its cover a statement that its publication is made possible by the coöperation of the United Fruit Company."

Estado actual de nuestros conocimientos acerca de la planta conocida con el nombre de "huanita." By Antonio Ramírez Laguna. *Anales del Instituto de Biología* (Chapultepec, Mexico) 2: 3: 197–206, 1931. Illustrated.

The tree under consideration, or one similar to it, was described by Hernández in 1649 under the name Yzquixochitl, and by Llave and Lexarza in 1824 as *Morelosia huanita*. Hemsley reduced the genus *Morelosia*, calling the tree *Beurreria huanita* (L. & L.) Hemsl.

A detailed and extended account is given of the history of the tree, and particularly of the manner in which it once caused a war. Moctezuma II determined to obtain it for his celebrated botanical garden, and when he was unable to obtain it by peaceful means, about 1496 he sent an army to Tlaxiaco and took the plants by force. According to some authorities, the stock thus secured died before it could be planted, but other writers state that the tree was one of the treasures of Moctezuma's gardens.

The name Huanita is derived from a Tarascan word signifying approximately popcorn. The tree is called also Flor de Palomita; Guiexoba (Zapotec, meaning corn flower); and Ytayucuine (Mixtec).

In Michoacán the tree formerly was esteemed highly for its supposed medicinal virtues, but at the present time it is valued chiefly for ornamental purposes. The flowers sometimes are utilized for perfuming and flavoring sweetmeats. In Tehuantepec, Oaxaca, the flowers are employed to scent tobacco, and to flavor a conserve of Jicaco (*Chrysobalanus Icaco*) for which the locality is famous.

The author presents a photograph, as well as drawings of the foliage and flowers, of the only tree of Huanita that he was able to find at Uruapan, the original locality. Llave and Lexarza also knew only a single tree. The species has had the reputation of being difficult to propagate.

The status of the species *Beurreria huanita* is still somewhat uncertain, and it seems probable that the vernacular names are applied rather indiscriminately to the various Mexican species of the genus, a list of which is given, with a bibliography of works relating to them.—Paul C. Standley, *Field Museum of Natural History.*

The ethnobotany of the Maya. By Ralph L. Roys. Publ. No. 2, Middle American Research Series, Tulane University of Louisiana, New Orleans, August 1931. Pp. xxiv/359; 7¾ x 10½.

The paper consists primarily of translations and reproductions of old Maya texts relating to medicinal uses of plants in Yucatan, but more than 100 pages are devoted to an alphabetical list of Maya plant names, and another of Latin plant names with Maya equivalents.

The former list is copiously annotated. In many instances the meanings of the names are explained, and there are extended notes relating to not only medicinal but general economic applications of trees and other plants. The volume contains a vast amount of information taken from unpublished manuscripts or from Spanish texts.—Paul C. Standley, *Field Museum of Natural History.*

Settlement zones of the Sierra Nevada de Santa Marta, Colombia. By Griffith Taylor. *Geographical Review* (New York) 21: 4: 539–558, October 1931. Illustrated.

The Sierra Nevada de Santa Marta rises at a distance of only 23 miles from the sea to an elevation of 17,000 feet, and, as its name implies, is capped with perpetual snow. Behind the town of Santa Marta there is a mantle of tropical jungle over the entire slope almost from sea level up to 10,000 feet. Above this is a zone of grasslands or paramos, and finally eternal snow which feeds a few small glaciers. Nowhere in the world is an exact parallel found.

An account is given of the geology of the Santa Marta territory, of the distribution of the inhabitants, of the banana industry that has brought wealth to the region, and of a partial ascent of the Sierra Nevada. A table summarizes the control of environment by altitude, as illustrated in the development of agriculture and the native vegetation.

At 20–100 feet, where the land is irrigable, bananas are planted. Large areas of cactus are common. To 1000 feet extends a xerophytic zone, with thorny scrub and coarse grasses in the lower part and some cactus; also Ma-agua (Majagua?) or bottle trees and Stink-bark trees. In cleared areas at 1000–2000 feet sugar cane is planted; there is local grassland, and above trees of *Croton gossypiifolius*, Caracol, and Macondo, also much bracken and *Heliconia*.

Coffee is grown at 3000–4000 feet, and at this elevation there are forest trees 100 feet high. At 5000 feet there are many large tree ferns; the forest trees are mostly about 50 feet high. At 6000 feet is a jungle of palms and tree ferns; most trees are 1–2 feet in diameter and 40 feet high, but some are buttressed and 90 feet tall. At this altitude epiphytes are abundant. At 8000 feet there is a bamboo jungle, with some trees a foot in diameter, and an undergrowth of sphagnum and many ferns. Around 9000 feet there are dwarf bamboos, small palms, various rosette plants, lupines, and cycad-like ferns of the genus *Lomaria*. The paramos at 10,000–12,000 feet consist of wide areas of rocky grassland, utilized by the Indians as pasture for cattle. It is interesting to learn that these Indians chew coca leaves, this being probably the northern limit of that custom.

The Sierra is glaciated at 12,000–15,000 feet, with well-developed lateral moraines and small tarns and cirque lakes.

The snow fields extend from 15,000 feet to the summits, whose greatest elevation is 19,000 feet.—PAUL C. STANDLEY, *Field Museum of Natural History*.

El Inca Garcilaso de la Vega, primer botanista Cuzqueño. By FORTUNATO L. HERRERA. *Revista Universitaria* (Cuzco) 20, segunda época: 5–42. July, 1931.

A sketch is given of the life of Garcilaso de la Vega, son of one of the conquistadores of Peru, whose classic work, *Comentarios Reales*, was published in 1613 and 1617. The author has extracted the botanical information recorded in these ancient writings, adding the modern Latin names of the plants treated. Many fruit and other trees are mentioned, such as the Lucuma or Rucuma (*Lucuma obovata* HBK.); Paccai or Pacay (*Inga Feuillei* DC.); Sahuintu (*Psidium pyriferum* L.); Cuca (*Erythroxylon coca*); Quishuar (*Buddleia longifolia* HBK.); and numerous others.—PAUL C. STANDLEY, *Field Museum of Natural History*.

Estudios sobre la flora del Departamento del Cuzco. Ampliaciones. By FORTUNATO L. HERRERA. *Revista Universitaria* (Cuzco) 20, segunda época: 106–130. July, 1931.

There are enumerated many recent additions to the known flora of the Department of Cuzco, Peru. Among the woody plants reported are the following: *Escallonia resinosa* (R. & P.) Pers., called Chachacuma or Chachacomo; *Acacia macracantha* H. & B., Huarango; *Apurimacia incarum* Harms, Chaccanhuai, Chacanúai; *Schinus Pearcei* Engler, Chinamulli; *Triumfetta acuminata* HBK., R'ata-r'ata; *Baccharis odorata* HBK., Tayanca.—PAUL C. STANDLEY, *Field Museum of Natural History*.

Riquezas vegetales del Oriente cuzqueño. By FORTUNATO L. HERRERA. *Revista Universitaria* (Cuzco) 20, segunda época: 163–173. July, 1931.

Notes upon plants observed in the little-known eastern part of the Department of Cuzco, Peru. From the writings of Carlos Fry, published at Lima in 1889, there is compiled a list of the cultivated plants of the region, and a much more extensive one of native plants, chiefly trees. Most of them, unfortunately, are listed only by their vernacular names. Among the more important ones mentioned are rubber trees, Cedros (*Cedrela*), Aguano (Peruvian Mahogany), Cubi used for poisoning fish, Nogal (*Juglans*), Capirona, Huitoc (*Genipa*), Chonta (*Bactris*), Cocobolo, and Balsa.—PAUL C. STANDLEY, *Field Museum of Natural History*.

Araucarilandia. By F. C. HOEHNE. Pub. by Secretaria da Agricultura, Industria e Commercio do Estado de São Paulo, Directoria de Publicidade, São Paulo, Brazil, April 1930. Pp. 132; illustrated.

A narrative of a journey of botanical observation through the State of Paraná, the center of the South Brazilian region (Araucarilandia) characterized by the Pinheiro or Paraná Pine, *Araucaria brasiliana* Rich., as its most distinctive forest element. This noble Gymnosperm, a survivor from Tertiary times, is the most important timber tree of Brazil and the only one forming almost pure stands. It was once abundant from Uruguay and Rio Grande do Sul through Santa Catharina, Paraná, and São Paulo to southern Minas, but now exists only in greatly reduced numbers and is rapidly being still further decimated.

Two species of *Podocarpus*, namely *P. Sellowii* and *P. Lambertii*, called indifferently Pinheirinho or Pinheiro Bravo, occur with the Pinheiro and the three together form the Gymnosperm element of the *Araucaria* formation, which further includes as character plants two other equally well known and valuable elements in Imbuia and Maté. The former of these, *Phoebe porosa* Mez, of the Laurel family, furnishes the highly esteemed brown cabinet wood which in the Brazilian woodworking industries may be said to take the place of Mahogany or Walnut with us, and is disappearing as rapidly as the *Araucaria*. The other, *Ilex paraguensis* A. St. Hil. and related species of the Holly family, is well known as the source of the so-called "Paraguay tea," the characteristic beverage of the South American "Gaucho," and furnishes an important article of export of South Brazil. It is in no danger of extinction as its exploitation does not involve the felling of trees.

Araucaria and Imbuia are treated in separate chapters with reference to their botany and occurrence, the progress of their extermination through prevailing methods of logging, and the possibilities of reforestation. The author finds the different kinds of Imbuia, known respectively as "amarella," "preta," and "zebrina" or "revessa," to be simply forms of the same species,—the yellowish wood proceeding from young trees or trees grown in sheltered places, the "black" from the older or isolated trees, and the third with its contorted wood from old and gnarled trees in exposed situations. The account of Imbuia is followed by a report on tests of the physical qualities of the wood by the polytechnic School of São Paulo.

An interesting chapter is devoted to a discussion of the factors that regulate the distribution of plains and forests. Another deals with the forage plants of Paraná. One entire chapter is given to an account of the work of the Swedish botanist Dusén, who spent many years in the study of the flora of Paraná.

The excellent illustrations from photographs by the author give a vivid idea of the appearance of the vegetation and the general nature of the region transversed. Throughout the attractive folio one is aware of the author's attitude of energetic protest against the heedless destruction of natural resources that characterizes man's progress over the face of the earth.—B. E. Dahlgren, *Field Museum of Natural History*.

The genera *Hydnocarpus* and *Taraktogenos* in Siam. By A. Kerr. Technical and Scientific Supplement to *The Record*, issued by Ministry of Commerce and Communications, Bangkok, Siam, Nov. 1930. Pp. 16; 8¾ x 12: 2 maps, 5 full-page plates. Price 2 baht.

An interesting account of the trees which supply the seeds from which Chaulmoogra oil is obtained, with descriptions of the genera and species. This is followed by "Notes on the chemistry of *Hydnocarpus* and *Taraktogenos* oils" by A. Marcan, and "Notes on clinical benefits from the use of oil of *Hydnocarpus anthelmintbica*" by J. W. McKean.

La végétation de l'Indochine. By Paul Dop. *Travaux du Laboratoire Forestier de Toulouse*, Vol. I, Article IX, pp. 16, 1931.

A résumé in concise form of the available information concerning the vegetation of Indo-China. The different subject headings are: Orography; soil; climate; works on the flora; plant formations—littoral forests, continental forests, savannahs; affinities of the Indo-Chinese flora—with British India, China, and Dutch East Indies; origin of the flora; natural plant resources; bibliography.

Sandalwood and its Indian substitute. By K. A. Chowdhury. *Indian Forester* 77: 431–433, Sept. 1931. Ill. with 4 photomicrographs.

"True Sandalwood (*Santalum album*) has the reputation of having been used in India from ancient times, for, in classical Sanskrit literature, frequent mention is made of this wood as Chandana. The demand for Sandalwood has gradually increased, and since its supply is limited, various aromatic timbers from different parts of the world have been put on the market as substitutes for Sandalwood. Amongst these the most well-known are: *Fusanus spicatus* R. Br. (Australian Sandalwood), *Esenbeckia atata* Pittier (West Indian Sandalwood), *Amyris balsamifera* L. (Venezuelan Sandalwood), *Ximenia americana* L. (West African Sandalwood), *Osyris tenuifolia* Engl. (East African Sandalwood), and *Mansonia Gagei* Drum. from Burma.

"True Sandalwood is a native of South India and its distribution is confined to Mysore, Coorg, the Southern Maharatta countries, the Carnatic, and the Western Ghats. Occasionally this tree is cultivated outside its natural zone, but the main supply is from the localities mentioned above.

"Although the knowledge of an Indian substitute for true Sandalwood can be traced back to the European literature of the thirteenth century, its botanical name was not known till recently when Prain reported to the Linnean Society the identification of this tree as *Mansonia Gagei* Drum., locally

called Kalamet in Burma. Due to certain similarity in the general properties of Sandalwood and Kalamet there exists in commerce some confusion regarding their identity. The purpose of this paper is to consider the question of similarity of the two woods and the means of separating them."

The anatomical details considered are those visible with the naked eye or with a hand lens. The principal distinguishing features are as follows:

Sandalwood	*Kalamet*
Strongly scented.	Rather faintly scented.
Pores solitary; individually distinct with lens.	Pores in radial rows; barely visible with lens.
Ripple marks absent.	Ripple marks pronounced.

A comparison of the timbers of Burma with those of Europe and America as regards strength and other properties. By C. W. Scott. Paper No. 3, Association of Engineers in Burma, July 23, 1931. Pp. 17; 6½ x 9½.

"Most of the important timbers of Burma have now been tested for strength on standard scientific lines at the Forest Research Institute, Dehra Dun, India. The data obtained there are readily comparable with those recorded by similar apparatus and procedure in the United States, Canada, and England. . . . The American data are from the Forest Products Laboratory, Madison, Wisconsin; the Canadian from the Forest Products Laboratories of Canada; and the English from the Forest Products Research Laboratory, Princes Risborough, Bucks."

The subject matter of this report is considered under the following headings: Introduction; Elementary features common to all timbers; An outline of timber testing procedure and the method of expressing and using the results; The outstanding features of the Burma timbers in comparison with one another and with the woods of Europe and America.

Following the discussion are four tables: I. Strength of Burma timbers expressed in terms of strengths of Teak. II and III, ditto for English and American timbers. IV. Forest Research Institute, Dehra Dun, strengths of timbers [namely, Teak, Pyinkado, Kanyin, and Burma Padauk]. The kinds

compared with Teak in Table I are: Pyinkado (*Xylia dolabriformis*), In (*Dipterocarpus tuberculatus*), Kanyin (*D. turbinatus* and *D. alatus*), Thitya (*Shorea obtusa*), Ingyn (*Pentacme suavis*), Padauk (*Pterocarpus macrocarpus*), Thingan (*Hopea odorata*), Thitkado (*Cedrela Toona*), Yon (*Anogeissus acuminata*), Pyinma (*Lagerstroemia flos-reginae*), Taung-thayet (*Swintonia floribunda*), Letpan (*Bombax malabaricum*), and Kanazo (*Heritiera minor*).

"Of the 12 chief woods only three are more than 10 per cent lighter than Teak. Those three are Pyinma, Thitkado (or Yedama, as it is often called in Upper Burma), and Letpan. They are all much weaker than Teak and only one of them, Thitkado, resists white ants well. For beams, posts and struts Pyinkado, Thitya-ingyin, and Padauk are outstandingly strong. In low shrinkage the nearest to Teak are Padauk and Letpan. Very large shrinkage ranges are shown by Inkanyin, Thitya-ingyin, Yon, and Kanazo. Letpan, Thitkado, and Taung-thayet are much softer than Teak. Thitya-ingyin, Pyinkado, Padauk, and Kanazo are much harder than Teak. In shock resistance Padauk, Pyinkado, and Yon are outstanding.

"Burma Padauk is outstandingly strong, steady, and resistant to shocks. It is only 25 per cent heavier than Teak, but it is twice as hard and workshop experience shows that it involves one third more labor. The heartwood is white ant proof and very durable; the sapwood is not. Thitkado or Yedama is about three quarters the weight and half the strength of Teak. It is durable (much more so than Letpan), resists white ants, and is fairly steady. Letpan is about half the weight and strength of Teak. It is steady but very perishable and should be creosoted or treated with solignum if it is to last."

Growth of Malayan forest trees, as shown by sample plot records, 1915–1928. By J. P. Edwards, with introduction by J. P. Mead. *Malayan Forest Records* No. 9, Kuala Lumpur, F. M. S., 1930. Pp. 151; 7½ x 10. Price 4s. 6d.

The subdivisions of this report are: I. Introduction (pp. 1–6); II. History of inland plots (pp. 7–105); III. Results of

compilation (pp. 106–148); Index. Results of compilation include: A note on the compilation of girth increments from sample plot measurements; specimen tables; number of increments included in sample plot measurements; mean annual increments by species and tree dominance classes; ditto by species and girth classes; rate of growth as calculated from actual measurements and from curve; inches growth per decade; largest m.a.i. of individual tree of each species; record of m.a.i. over 2½"; light-demanding and shade-bearing qualities of species measured; notes by species; rates of growth of Malayan trees compared with those of other countries.

The statistics in Part II were compiled from the measurements of over 4500 trees representing 23 species. "In the evergreen rain forests of Malaya no species is known to produce annual rings. It is therefore necessary to employ a far more laborious method of determining the rates of growth. The method adopted is the measurement at regular intervals of the girth of a number of trees of the selected species. It is unnecessary to measure a series continuously from youth to maturity, as, by selecting the trees to be measured from different girth classes, it is possible to determine the length of time it takes for a tree to pass from one girth class to another, and so, by means of simultaneous measurements, to arrive comparatively quickly at the length of time necessary to attain an exploitable size."

"Most of the sample plots mentioned in this record are superficial plots. It is of course unnecessary to lay out superficial plots merely to ascertain the girth and height increments of individual trees. The desired results can be obtained just as well by measuring isolated trees. Superficial plots are absolutely necessary only when the volume of a crop is to be found or when the effects of a particular silvicultural treatment are to be studied. It has however been found that, in the very dense rain forests of Malaya, locating individual trees is nearly always a matter of great difficulty, that much time is wasted looking for them when they are being remeasured (in the past trees were often entirely lost) and that inspections are difficult. For these reasons it has been found that superficial plots, the boundaries of which can be easily surveyed and plotted on a map and within which each individual tree can be located by rectangular coordinates, are far more convenient."

"The object of volume plots is to ascertain the volume per acre of the crop under consideration. At the time of the formation of the plot and at regular intervals thereafter all trees in it are measured and classified by species into 1 inch diameter classes, calipers being used to measure the diameter. The volumes of each diameter class are found by the detailed measurement of a number of felled sample trees of the required sizes cut preferably outside the plot, but growing in forest that has been treated in a similar manner."

The identification of wood by chemical means. Part I. By H. E. Dadswell. Technical Paper No. 1, Division of Forest Products, Council for Scientific & Industrial Research, Melbourne, 1931. Pp. 16; 6 x 9½.

Summary

"1. The value of chemical methods for the identification of woods that are structurally similar has been investigated and demonstrated.

"2. The use of the aqueous or alcoholic extracts in color tests with certain reagents has been shown to have limited application on account of the wide variation in the amount of extractives present in different samples of the one species.

"3. Karri (*E. diversicolor*) and Jarrah (*E. marginata*) have been separated by chemical means, namely, on the basis of differences in the cellulose content and in the alkalinity of the ash.

"4. Tallowwood (*E. microcorys*), Blackbutt (*E. pilularis*), and White Mahogany (*E. acmenioides*, *E. carnea*, and *E. umbra*) have been separated on the basis of the alkalinity of ash together with the behavior of alcoholic extracts on dilution with water.

"5. The members of the Ironbark group, namely, *E. paniculata*, *E. sideroxylon*, *E. sideropbloia*, *E. crebra*, together with the related Gray Gums (*E. propinqua* and *E. punctata*) have been, and are being, investigated, and to date certain separations have been accomplished.

"6. A simple test has been developed for the separation of Red Box (*E. polyanthemos*) and Red Gum (*E. rostrata*) and for confirmation is being applied to further samples from different localities.

"7. The application of these methods is being extended to other pairs and groups of woods difficult to identify by ordinary methods."

The density of Australian timbers. A preliminary study. By H. E. Dadswell. Technical Paper No. 2, Division of Forest Products, Council for Scientific & Industrial Research, Melbourne, 1931. Pp. 16; 6 x 9½.

Summary

"(1) A method for the determination of density of woods has been investigated.

"(2) This method involves the determination of the oven dry weight and the volume of the sample after soaking, and the results thus obtained are used in the calculation of density figures.

"(3) From the experiments carried out, it has been concluded that soaking under water from five to six days is sufficient to restore the small samples used to their green dimensions and this has been found to be the case even with dried and collapsed samples.

"(4) The possibilities of the method for general and identification purposes have been briefly studied in relation to the determination of the density of a number of samples from different species."

The chemistry of Australian timbers. Part I. A study of the lignin determination. By W. E. Cohen and H. E. Dadswell. Technical Paper No. 3, Division of Forest Products, Council for Scientific & Industrial Research, Melbourne, 1931. Pp. 27; 6 x 9½.

Summary

"1. Representative samples of the Eucalypts in particular, and of all woods in general, cannot be obtained unless all of the wood is reduced to powder and included in the sample.

"2. Microchemical studies have shown that the Eucalypts and the softwoods, Hemlock and Spruce, contain substances which are of an extraneous nature and which are not soluble in benzene-alcohol.

"3. By means of the microscope, these substances have been shown to remain with lignin when it is isolated by the standard procedure.

"4. Microscopic examinations of wood powder have shown that a number of organic solvents and some neutral salts do not dissolve the extraneous material from Eucalypts, but that weak solutions of sodium hydroxide readily remove it.

"5. A sodium hydroxide solution, when applied to thin sections, removes all visible extraneous material in 80 minutes, without, as far as can be seen by the microscope, attack on the wood structure.

"6. Quantitative chemical analyses have been used to demonstrate that the sodium hydroxide in weak solutions does not attack the lignin of Hemlock and Spruce, an apparent loss in lignin being due to the removal of extraneous material from the ray cells.

"7. The chemical studies which have been extended to Jarrah, Red Ironbark, and Mountain Ash, have shown that reasonable values for lignin can be obtained when wood powder is previously purified by treatment with weak sodium hydroxide solution.

"8. A procedure for this preliminary purification is outlined."

Instruction générale sur les reboisements. By L. Lavauden. Pub. by Service des Eaux et Forêts, Colonie de Madagascar et Dépendances, Tananarive, 1931. Pp. 27; 6¼ x 10; 3 figs.

Outline of methods for reforestation for different purposes and under various conditions in Madagascar.

Textes réglant le régime forestier applicable à Madagascar. Tananarive, 1930. Pp. 23; 6¼ x 9½.

Contains the official regulations of the Forest Service as reorganized January 25, 1930. Includes a list of the vernacular

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Outline of methods for reforestation for different purposes and under various conditions in Madagascar.

Textes réglant le régime forestier applicable à Madagascar. Tananarive, 1930. Pp. 23; 6¼ x 9½.

Contains the official regulations of the Forest Service as reorganized January 25, 1930. Includes a list of the vernacular

and scientific names of the woods, which are divided into five classes, namely, special woods, cabinet woods, construction and carpentry, boxes, and fuel and charcoal.

The forest vegetation of South Central Tropical Africa. By J. Burtt Davy. *Empire Forestry Journal* (London) 10: 1: 73–85, July 1931. Illustrated.

"The region under discussion in this preliminary account of the forest vegetation of a small portion of Tropical Africa, includes only the British Colonies and Protectorates of Northern Rhodesia and Nyasaland; Southern Rhodesia, though a part of South Central Africa, has not been included, as it did not form part of the area investigated on my recent visit. It is bounded on the north by the Katanga Province of the Belgian Congo, and by Tanganyika Territory; on the west by Angola; on the south by Southern Rhodesia, and on the east and south-east by Mozambique Province.

"This area occupies approximately 330,000 square miles of the rectangle between 8 deg. and 18 deg. south latitude, and 22 deg. and 35 deg. east longitude, and includes the principal main northern tributaries of the Zambesi River (exclusive of those in Angola), and the drainage basins of the Shire River and of Lakes Nyasa, Chiuta, Shirwa or Chilwa, Malombe, Bangweolo and Mweru."

Most important commercial species

"(1) *Adina microcephala* Hiern. (Family Rubiaceae). Mwenya. A tall tree; a tropical rain-forest species, now rarely found away from the fringing forest. Fairly common in Nyasaland between 2,000 and 3,000 feet, and occasionally met with at higher elevations. Timber hard and durable, excellent for bridge construction, and very suitable for heavy beams where great strength and durability are required.

"(2) *Baikiæa plurijuga* Harms. (Family Caesalpiniaceae). Rhodesian Teak. Confined to the Kalahari sand-veld in the Upper Zambesi Basin (*e. g.* in the vicinity of the Victoria Falls and the upper reaches of the Zambesi), and adjacent Angola. A medium-sized tree, much exploited for railway-sleepers; also used for furniture. Three saw-mills in Northern and Southern Rhodesia are engaged in exploiting the timber of this tree.

"(3) *Khaya nyasica* Stapf. (Family Meliaceae). Mbawa; Nyasaland Mahogany. A species chiefly confined to fringing forests, in Nyasaland and the eastern part of Northern Rhodesia. Specimens with boles 70 to 80 feet high and 20 to 25 feet girth at breast-height, have been recorded. An excellent

wood for furniture and general cabinet making; suitable for house-building where cheaper wood is not available.

"(4) *Piptadenia Buchananii* Baker. (Family Mimosaceae). Nkweranyani; Chikwani. A tall tree; boles usually a little over 2 feet diameter at breast-height. A tropical rain-forest species, now chiefly found on the banks of streams, above 1,500 feet elevation, in Nyasaland. It is at present uncertain whether a second species of *Piptadenia* does not occur.

"(5) *Pterocarpus angolensis* DC. (Family Papilionaceae). Mlombwa; Bloodwood; Kajat. A deciduous tree 50 to 60 feet high; bole straight, 1 to 2 feet diameter at breast-height, with usually crooked branches and spreading crown; fruit a circular winged indehiscent pod with bristly center, about 3 to 4 inches across. The dark heartwood is moderately hard, strong, very durable, easily worked, termite proof, not liable to warp or crack, valued for furniture, building, bridge planking, wharf construction, boat-building; recommended for railway sleepers. Has only a very small amount of white sapwood. A species occupying comparatively low altitudes.

"(6) *Widdringtonia Whytei* Rendle. (Family Cupressaceae). Mkungusa or Mlanje Cypress (also called Mlanje Cedar). Occurs at 6,000 to 7,000 feet on Mt. Mlanje, in the temperate rain-forest, where it occupies about 2,000 acres. In good deep soil trees with boles 50 feet high, and 4 to 5 feet diameter at breast-height, occur. It is the most important timber tree of Nyasaland and is exploited for the Government Services, and for general building purposes. The average diameter is about 2½ feet, and the bole is usually 30 to 35 feet clear. The wood is of a pale reddish color, strongly but agreeably scented like that of the Cedrelas or scented Mahoganies, very durable, easily worked, and resistant to termites.

Other timber-producing species

"Other species are said to produce good timber, but are less well known; they deserve careful study with a view to local exploitation. The following are among the best known of these species but these do not exhaust the list:

"(7) *Afrormosia angolensis* (Bak.) Harms. (Family Papilionaceae). Mwanga; Mubanga. A small deciduous tree of the upper savannah forest with smooth pale-gray bark. Wood very hard and heavy, very durable, suitable for a variety of purposes including wheelwright's work. Used also for mallets for driving tent-pegs. Sporadic in *Brachystegia* forest.

"(8) *Afzelia quanzensis* Welw. (Family Caesalpiniaceae). Rhodesian Mahogany; Mkongomwa. A large or medium-sized deciduous tree, 45 to 60 feet high, with gnarled branches, a flat spreading crown, and a bole of medium height with diameter of 1½ to 2½ feet; Monro records trees up to 7 feet diameter. A savannah forest species, occurring at the lower altitudes up to about 2,000 feet. Timber hard, light in weight, somewhat subject to borers, used for furniture-making, wagon-building, wheel-naves, felloes and constructional work. The large black seeds with orange colored aril are sold as curios.

"(9) *Albizzia gummifera* (Gmel.) C. A. Smith. (Family Mimosaceae).

FLATCROWN; CHIKWANI. Deciduous tree 20 to 50 feet high, with clean bole, 1 to 2 feet diameter and flattish spreading crown. Tropical rain-forest up to about 2,000 feet elevation. Heartwood yellowish, valued for naves and felloes; used also for yokes and general purposes. Used locally as door-boards, not warping much.

"(10) *Albizzia* sp. (Family Mimosaceae). NTANGA-TANGA. Said to be a useful building timber in Nyasaland.

"(11) *Apodytes dimidiata* E. Mey. (Family Icacinaceae). WHITE PEAR; LUFEFE. A small or medium-sized evergreen tree of the temperate (montane) rain-forest from 2,000 to 5,000 feet elevation. Wood nearly white, very close-grained and solid, strong, hard and elastic. Much valued for felloes; all waste wood is said to be suitable for turnery.

"(12) *Bridelia micrantha* Baill. (Family Euphorbiaceae). MSOPA. A tree 20 to 50 feet high, with diameter of bole 1 to 2 feet. Wood light, soft, moderately strong and elastic, pale yellow or brown, satiny; durable in water and in contact with the ground. Easily worked; used for general building purposes, posts, boat-building and furniture.

"(13) *Chlorophora excelsa* Benth. and Hook. f. (Family Moraceae). MVULI, the IROKO of W. Africa. A large tree, up to 100 feet high, of the lower savannah forest zone. Timber light, yellowish-brown, darkening on exposure to light; hard, easy to work, and taking a good polish. Useful for cabinet work.

"(14) *Copaifera mopane* Kirk. (Family Caesalpiniaceae). MOPANI; SANYA. Tall straight tree, 50 to 60 feet high, often 2 feet diameter, found on poor dry clayey or sandy plains, up to 2,500 feet, often gregarious, but a very local species. Shows remarkable rejuvenation. Timber extremely hard. One of the most useful trees where it grows, suitable for mining purposes, fencing poles, disselbooms, felloes, etc. Owing to its resinous nature it burns well. The wood ash has been found to yield about 6 per cent potash, 32 per cent lime, and 2 per cent phosphoric oxide.

"(15) *Erythrophloeum guineense* G. Don. (Family Mimosaceae). ORDEAL TREE; MWAVI. A fairly large tree, leaves bipinnate, bark yielding a red sap, very poisonous. Timber hard and very durable, used for heavy beams where great strength and durability are required; said to be suitable for wheelwright's work.

"(16) *Lonchocarpus Stuhlmannii* Auct. (Family Papilionaceae). MSEWA. Small tree. Timber strong and durable.

"(17) *Pterocarpus Stevensonii* Burtt Davy. (Family Papilionaceae). MWANGURA; CHIVIRI. Kalahari sand-veld of upper Zambesi region. Medium-sized deciduous tree. Wood valued for axe handles and hoe handles.

"(18) *Terminalia sericea* Burch. (Family Combretaceae). NAPINI; YELLOWWOOD; VAAL BOSCH. Small to moderate-sized evergreen tree 15 to 75 feet high, 1 to 1½ feet diameter, with silvery-gray foliage tufted at the ends of the branchlets. Savannah forest up to 3,000 to 4,000 feet elevation. Timber yellow, hard and very durable in the ground, being ant-proof and borer-proof if properly seasoned before use. Used for bridge work, beams, supports, where strength and durability are required; also for furniture and fence-posts. Makes excellent fuel.

"(19) *Uapaca Kirkiana* Muell. Arg. (Family Euphorbiaceae). MDUKU; MAHOBO-HOBO. A small tree with large leathery evergreen leaves and edible fruits, common in *Brachystegia* forest on the Central Plateau. Timber reddish; makes excellent poles for bridge work, etc.; used also for ordinary building purposes.

"(20) *Vitex sbirensis* Baker. (Family Verbenaceae). MPINDIMBI. Small to moderate-sized tree. Wood Teak-like; used for various purposes."

Northern Rhodesia. Annual report on forestry for the year 1930. By DUNCAN STEVENSON. Part IV of Annual report of Dept. of Agr., Livingston, 1931, pp. 39–50.

Mr. Stevenson, Senior Assistant Conservator of Forests of Northern Rhodesia, is well known to the readers of *Tropical Woods* because of his numerous important contributions to the knowledge of the forests and timbers of British Honduras, where he was Deputy Conservator.

"Dr. L. Chalk, of the Imperial Forestry Institute, is undertaking a special anatomical study of certain Northern Rhodesia timbers with a view to early publication accompanied by botanical descriptions and illustrations. . . .

"A report on the 'Preliminary Investigation of the Timber of M'gongo (*Ricinodendron Rautanenii* Schinz)' has been received from the Forest Products Laboratory, Princes Risborough. The tests indicate that the timber is worthy of full-scale investigations and of trial as a substitute for the South American Balsa Wood (*Ochroma lagopus* Sw.)."

"The compilation of a check list of the trees and shrubs of Northern Rhodesia, with vernacular names, was continued, special attention being given to notes on their distribution and utilization."

Appendix III is an annotated list of the more important indigenous trees, from which the following check list has been compiled:

CHECK LIST OF THE COMMON NAMES

Bloodwood	*Pterocarpus angolensis* DC.	Leguminosae
Chimpampa	*Monotes* spp.	Dipterocarpaceae
Kalunguti	*Terminalia sericea* Burch.	Combretaceae
Kapanga or Kayimbe	*Amblygonocarpus obtusangulus* (Welw.) Harms	Leguminosae

Kipampa	*Monotes* spp.	Dipterocarpaceae
Knobby thorn	*Acacia pallens* Rolfe	Leguminosae
Mahogany	*Khaya nyasica* Stapf	Meliaceae
Mahogany, Pod	*Afzelia quanzensis* Welw.	Leguminosae
Maula	*Parinarium mobola* Oliv.	Amygdalaceae
Mbawa	*Khaya nyasica* Stapf	Meliaceae
Mkushi	*Baikiæa plurijuga* Harms	Leguminosae
Mkusu	*Ricinodendron Rautanenii* Schinz	Euphorbiaceae
Mofu	*Entandrophragma* sp.	Meliaceae
Mohobohobo	*Uapaca Kirkiana* Muell. Arg.	Euphorbiaceae
Msikizi	*Trichilia emetica* Vahl	Meliaceae
Mubako	*Erythrophloeum africanum* (Welw.) Harms	Leguminosae
Mubanga	*Afrormosia angolensis* (Bak.) Harms	Leguminosae
Mubula	*Parinarium mobola* Oliv.	Amygdalaceae
Mubulwebulwe	*Erythrophloeum africanum* (Welw.) Harms	Leguminosae
Mubyimbyi	*Amblygonocarpus obtusangulus* (Welw.) Harms	Leguminosae
Muchenja or Muchenje	*Diospyros mespiliformis* Hochst.	Ebenaceae
Muhonono	*Terminalia sericea* Burch.	Combretaceae
Mukamba	*Afzelia quanzensis* Welw.	Leguminosae
Mukangala	*Albizzia* spp.	Leguminosae
Mukoso	*Erythrophloeum africanum* (Welw.) Harms	Leguminosae
Mukotokoto	*Acacia pallens* Rolfe	Leguminosae
Mukuchumswa	*Diospyros mespiliformis* Hochst.	Ebenaceae
Mukuwe	*Parinarium Bequaertii* De Willd.	Amygdalaceae
Mukwa; Mulombe; Mulombwa	*Pterocarpus angolensis* DC.	Leguminosae
Mululu	*Khaya nyasica* Stapf	Meliaceae
Munga	*Acacia albida* Delile	Leguminosae
Mungongo	*Ricinodendron Rautanenii* Schinz	Euphorbiaceae
Mupani	*Copaifera mopane* Kirk	Leguminosae
Mupapa	*Afzelia quanzensis* Welw.	Leguminosae
Mupumena	*Entandrophragma* sp.	Meliaceae
Mupundu	*Parinarium mobola* Oliv.	Amygdalaceae
Musangu	*Acacia albida* Delile	Leguminosae
Musanya	*Marquesia macroura* Gilg	Dipterocarpaceae
Musase	*Albizzia antunesiana* Harms	Leguminosae
Museshe	*Marquesia macroura* Gilg	Dipterocarpaceae
Mushakashela	*Swartzia madagascariensis* Desv.	Leguminosae
Mushese	*Burkea africana* Hook.	Leguminosae
Mushikishi	*Trichilia emetica* Vahl	Meliaceae
Musibe	*Copaifera coleosperma* Benth.	Leguminosae

Musika	*Tamarindus indica* L.	Leguminosae
Musikili	*Trichilia emetica* Vahl	Meliaceae
Musokoto	*Faurea discolor* Welw.	Proteaceae
Musuku	*Uapaca Kirkiana* Muell. Arg.	Euphorbiaceae
Mutembo	*Monotes* spp.	Dipterocarpaceae
Mutobo	*Isoberlinia tomentosa* Hutch.	Leguminosae
Mutokelebwe	*Parinarium Bequaertii* De Willd.	Amygdalaceae
Mutondo	*Isoberlinia paniculata* Hutch.	Leguminosae
Muzaule	*Copaifera coleosperma* Benth.	Leguminosae
Muzwamaloa	*Pterocarpus angolensis* DC.	Leguminosae
Mwafi	*Erythrophloeum guineense* Don	Leguminosae
Mwande	*Afzelia quanzensis* Welw.	Leguminosae
Mwangula	*Pterocarpus Stevensonii* Burtt Davy	Leguminosae
Mwani	*Copaifera mopane* Kirk	Leguminosae
Mwansabuso	*Burkea africana* Hook.	Leguminosae
Nakasanga; Napini	*Terminalia sericea* Burch.	Combretaceae
Ndale	*Swartzia madagascariensis* Desv.	Leguminosae
N'dombe	*Pterocarpus angolensis* DC.	Leguminosae
Redwood	*Baikiæa plurijuga* Harms	Leguminosae
Saninga	*Faurea discolor* Welw.	Proteaceae
Sassy bark	*Erythrophloeum guineense* Don	Leguminosae
Siachibula	*Burkea africana* Hook.	Leguminosae
Sitantasokwe	*Acacia pallens* Rolfe	Leguminosae
Teak, Rhodesian	*Baikiæa plurijuga* Harms	Leguminosae

Sur la question forestière en Afrique. By É. DE WILDEMAN. *Bulletin de l'Institut Royal Colonial Belge* (Brussels) 1: 3: 504–516, 1930.

The author deplores the present state of forest management, or rather the lack of it, in Belgium's territory in Africa. He insists upon the necessity of the installation of a Forest Service, the creation of definite reserves, a competent and sufficient personnel to overlook and direct work on these reserves, and systematic study of the trees.

There must be a greater coöperation and collaboration between botanists and foresters, if much progress is to be made. Mr. Wildeman hopes to see eventually an international coöperation of all the nations possessing territories in Africa, a start having been made in the formation of an International Association of Wood Anatomists. He is of the opinion, though, that national collaboration must be more firmly established before international can succeed.

Danta timber from the Gold Coast. *Bulletin of the Imperial Institute* (London) 29: 2: 115–126, July 1931.

The Danta timber, *Cistanthera papaverifera* A. Chev. (fam. Tiliaceae), was tested "in connection with an enquiry received at the Imperial Institute from manufacturers in the United Kingdom as to the possibility of using Empire woods for the handles of pickaxes and shovels in place of American Hickory and Ash. Some years ago specimens of hammer and pick handles made in the Gold Coast from Danta wood were supplied to the Institute by the Ashanti Goldfields Corporation, and it appeared that this timber would be worth detailed investigation in order to determine its suitability for use in this country. Application was therefore made to the Conservator of Forests in the Colony, who forwarded three logs, cut from a single tree, for examination."

"The green timber had an average weight of 69 lbs. per cubic foot at 78 per cent moisture content; it was fairly hard and tough, strong, shock-resisting and of moderate stiffness.

"Danta compares favorably with timbers ordinarily used in the manufacture of tool handles, such as Hickories and Ashes from the United States and the Indian timbers, Yon (*Anogeissus acuminata*) and Axle Wood (*Anogeissus latifolia*), which are employed in India for the purpose. The table on page 118 gives the average strengths of these various species as determined by standard tests on the green timber. The figures show that Danta is slightly stronger, harder and tougher than the American species but a little less so than the Indian woods; in its shock-resisting ability it is inferior to the best Hickories, but appears to be better than Ash and quite as good as Yon and Axle Wood. It is slightly more flexible than most of the Hickories and the strongest Ash, and is less liable to breakage than Yon, which is the stiffest of the woods in question.

"The tests on air-dried timber are carried out at a standard moisture content of approximately 12 per cent, and a long period of natural seasoning proved to be necessary before the Danta timber attained this condition. . . .

"The air-dried timber had an average weight of 46.8 lbs. per cubic foot at 12 per cent moisture content.

"The table gives a comparison of the strengths of Danta and other timbers ordinarily used for the manufacture of tool handles, as determined by standard tests on the green timber.

"The figures for the air-dried material indicate that in comparison with English Ash, Danta is equally flexible, stronger in compression and static bending, and slightly tougher and harder, but possesses rather less shock-resisting ability. Danta is more flexible than any of the Hickories and Indian Yon, and approximately equal in this respect to the American Ashes and to Indian Axle Wood. In shock-resisting ability it is inferior to most of these timbers, and it is less strong, hard and tough than the Hickories and Yon. Danta is, however, as strong and hard, if not so tough, as the American Ashes, and it is slightly stronger than Axle Wood though not so hard.

"This comparison with the results recorded for timbers ordinarily used for tool handles suggests that Danta should prove suitable for the manufacture of the cheaper grades of handles and where high shock-resisting ability is not of paramount importance.

"Specimens of the timber, together with the results of its examination at the Imperial Institute and at the Forest Products Research Laboratory and the reports of the tool-handle manufacturers, were submitted to the Imperial Institute Advisory Committee on Timbers for their opinion as to the market possibilities of the wood in this country.

"The Committee regarded the investigation as one of much interest. There is a definite demand for a satisfactory substitute for American Hickory and American Ash for tool and implement handles, and a suitable Empire timber would be welcomed by manufacturers. The Committee agreed that selected material of Danta should prove satisfactory for hammer handles and for all but high-class pick and shovel handles, provided that the price of the wood permits of competition with American Hickory and Ash, and English Ash. As regards the comments of manufacturers on the finishing qualities of the wood, the results of the working trials at Princes Risborough indicated that, with modern

tools and careful methods, the working qualities of the wood are satisfactory, and well-finished handles should be obtainable. This is an important point since a good, clean finish is essential in this class of manufacture.

"The practical trials carried out afforded useful evidence of the technical value of the wood and suggested the desirability of more extended trials if enquiry showed that Danta could be supplied in commercial quantities at a satisfactory price."

Quelques Légumineuses de la Côte d'Ivoire à bois utilisable. By AUG. CHEVALIER and D. NORMAND. *Revue de Botanique Appliquée & d'Agriculture Tropicale* (Paris) 11: 118: 397–409, June 1931; 11: 119: 569–577, July 1931. Illustrated.

Contains accounts of five species of leguminous trees with reference to their taxonomy and range and the appearance, anatomy, and uses of their woods. The species are: *Calpocalyx brevibracteatus* Harms, *Tetrapleura Chevalieri* Baker f., *Xylia Evansii* Hutch., *Bussea occidentalis* Hutch. ex Chipp, *Erythrophloeum ivorense* A. Chev. The paper is illustrated with four photomicrographs of woods and two photographs of herbarium specimens.

Les *Entandrophragma* de la Côte d'Ivoire. By ANDRÉ AUBRÉVILLE. *Actes & Comptes Rendus de l'Association Colonies-Sciences* (Paris) 7: 72: 121–129, June 1931; 7: 73: 145–155, July 1931.

The author, who is Inspecteur Principal des Eaux et Forêts des Colonies, has returned to the subject of the Meliaceae of the Ivory Coast, previously dealt with by him in Nos. 57 & 58 (March–April 1930) of the same series. The present article deals with the *Entandrophragmas* of the Ivory Coast, and is in effect an amplification of an article by F. Pellegrin (Bull. Soc. Bot. de France, Vol. 77, 1929) on material supplied by Aubréville.

Entandrophragma is restricted to tropical Africa, but is widespread within those limits, extending in dense forest from French Guinea to Uganda, to the Katanga province in

the south of the Belgian Congo, and to Angola. The genus was founded in 1894 by C. de Candolle on a specimen from Angola which Welwitsch had referred to *Swietenia*. *Swietenia* and *Entandrophragma* are very closely related. Over twenty species of *Entandrophragma* have been described, but the descriptions are usually incomplete, only a few embracing both fruit and flowers, thus indicating the difficulty of collecting complete herbarium material of large trees. In the *Flora of West Tropical Africa* (Vol. I, Part II, 1928), Hutchinson & Dalziel have reduced several West African species to synonyms and it is probable that further knowledge will clear up the confusion of other species.

The author points out that the precise determination of species is of practical as well as scientific interest, since the genus furnishes important timbers of commerce, at present exported from various colonies under different native names. Vermoesen (Revue Zool. Afr. Supp. Bot., Vol. IX) has expressed the opinion that the various species are localized in their occurrence, and has explained the widely recorded range of *E. cylindricum* as due to imperfect knowledge of that species, and would separate out the Congo specimens as *E. pseudo-cylindricum*, on the differences in number of leaflets. The author disagrees with this opinion, pointing out that the number of leaflets varies greatly with the size of the tree and probably with different conditions of climate and soil, and that the tendency, as shown by Pellegrin and Hutchinson & Dalziel, is to include the local species such as *E. rufa*, *E. macrocarpa*, and *E. ferrugineum*, described by A. Chevalier from the Ivory Coast, within the limits of species with a wide range. He points out that forest floras of West and Central Africa have many species common to both, and that it is not surprising that species such as the *Entandrophragmas* with winged seeds should have a wide range.

The *Entandrophragmas* are very large trees reaching 40 to 50 meters in height with a bole of 25 meters. Their crowns are characteristic, due to the tufts of pinnate leaves at the ends of the stout branchlets. This character serves to distinguish them in the Ivory Coast from all other species except *Canarium Schweinfurthii* Engl. (Aiélé) and *Amphimas pterocar-*

poides Harms (Lati), and an examination of the bark easily distinguishes them from these species, as the whitish bark of Aiélé has a characteristic resinous odor when cut, and the brown scaly bark of Lati has not the reddish slash of the *Entandrophragmas*.

The trunk of the *Entandrophragmas* is cylindrical, very straight, and may attain very large dimensions, some specimens of *E. macrophyllum* being three meters in diameter. The leaves are compound; the leaflets opposite, sub-opposite, or alternate, and always with short stalks or even subsessile.

The inflorescence is a panicle of small greenish-white pentamerous flowers. The calyx is small, cupuliform. The 5 petals are free and, in the open flower, are usually displayed in a characteristic manner. The stamens are united into a tube, on the rim of which are the 10 anthers, completely exserted. The lower part of the staminal tube is attached to the disc bearing the ovary by 10 small transverse partitions. The short disc is surmounted by the ovary of 5 cells, each containing from 5 to 10 ovules.

The fruit is characteristic, being a capsule 15 to 25 cm. long and shaped like a club or big cigar. It opens by 5 woody valves, showing within the central pentagonal column of pith-like consistency, on the faces of which the seeds are attached. There are two sorts of dehiscence: *apical*, in which the valves remain attached at the base and open at the apex; and *basal*, in which the valves remain joined at the apex, but break away at the base and fall off united in the form of a cap. The flat seeds are furnished with a long membranous wing. They are either attached alternately along two parallel lines near the edge of each face of the column (marginal insertion), or along a central sinuous line (median insertion). They are oily and are quickly eaten by insects after falling to the ground.

The *Entandrophragmas* appear to have a preference for dry ground, slopes and plateau. They are restricted to dense forest; although a recently described species, *E. Delevoyi*, has been found in the Congo in savannah forest, the fact that it is not regenerating itself there suggests that it may be only

a remnant of dense forest. The woods of the *Entandrophragmas* are very close to those of the *Khayas* which formerly furnished practically all the woods exported from the Ivory Coast under the name of African Mahogany. From their appearance, structure, mechanical properties, and durability some species of *Entandrophragma* merit the designation African Mahogany (Acajou d'Afrique) fully as much as does *Khaya ivorensis* to which French usage now confines the name. To stress their particular qualities it is customary in the trade to couple the word Acajou to the official native name, as Acajou-Sipo to designate Sipo.

The author then deals more particularly with *Entandrophragma* in the Ivory Coast, and points out that in 1907 A. Chevalier described all the species now known from that colony, namely, *E. macrophyllum*, *E. septentrionale*, *E. rufa*, *E. macrocarpa*, *E. tomentosum*, *E. ferrugineum*, but unfortunately his material was not complete. As exploiters became interested in other Acajous besides *Khaya ivorensis* and *E. macrophyllum* they applied to the new timber the local native names; these varied from place to place. From among the many native names in use, four have been chosen officially. These represent four different timbers, and the author was able to correlate them with standing specimens, which have been determined by Pellegrin, as follows:

Tiama = *E. macrophyllum* A. Chev.
Aboudikro = *E. cylindricum* Sprague; syn. *E. rufa* A. Chev.
Sipo = *E. utile* Sprague; syn. *E. macrocarpa* A. Chev.
Kosipo = *E. Candollei* Harms; syn. *E. ferrugineum* A. Chev.

In the *Flora of West Tropical Africa* two other of Chevalier's species are kept up, namely, *E. septentrionale* A. Chev. and *E. tomentosum* A. Chev. These species are not distinguished by the natives or by the foresters from *E. macrophyllum* and *E. cylindricum*, respectively, and the author has not attempted to do so. Hence Tiama is applied to both *E. macrophyllum* and *E. septentrionale* and Aboudikro likewise to *E. cylindricum* and *E. tomentosum*.

The first instalment of this paper concludes with four keys to the species (or groups) based upon characters of the bark, leaves, flowers, and fruits, as follows:

KEY BASED UPON BARK CHARACTERS

A. Bark with regular longitudinal fissures..... **Sipo.**
B. Bark not fissured.
1. Smooth, rather thin; scaling in thin plates on old trees. Slash red..... **Tiama.**
2. Scaly. Slash pink.
(a) Highly aromatic like *Guarea cedrata*..... **Aboudikro.**
(b) Not aromatic. Only slightly scaly..... **Kosipo.**

KEY BASED UPON LEAF CHARACTERS

A. Rachis of the leaf glabrous. Leaflets glabrous except for the costa on the lower surface, which usually is densely hairy on its sides. Limb thick, rounded at the apex and ending in a short obtuse tip, often with revolute margin; reticulations inconspicuous..... **Tiama.**
B. Rachis of the leaf densely pubescent.
1. Base of the leaflets rounded or subcordate. Leaflets glabrous or glabrescent. Costa downy above. Tufts of hairs present on the lower surface in the axils of the lateral nerves. Leaflets oblong-lanceolate, gradually acuminate. Lateral nerves numerous, very regular. **Sipo.**
2. Base of the leaflets cuneate.
(a) Leaflets glabrous, not acuminate. Limb coriaceous, finely bullate. Secondary nerves numerous and very regular, conspicuously prominent on the lower surface and impressed on the upper..... **Kosipo.**
(b) Leaflets glabrous, gradually obtuse-acuminate. Secondary nerves often branched before reaching the margin; blade lustrous above, the veinlets conspicuous on the upper surface. **Aboudikro.**

KEY BASED UPON FLOWER CHARACTERS

A. Staminal tube deeply cleft into 10 lobes. Sepals hirsute externally; petals hirsute on both surfaces..... **Kosipo.**
B. Staminal tube entire.
1. Sepals glabrate, the petals glabrous..... **Tiama.**
2. Sepals and petals finely pubescent on the outer surface.
(a) Style evident. Stamen tube oblong, 4 mm. long..... **Sipo.**
(b) Stigma subsessile. Stamen tube urceolate, 2 mm. long. **Aboudikro.**

KEY BASED UPON FRUIT CHARACTERS

A. Columella acute at the base and long-pedunculate (1–2 cm.).. **Kosipo.**
B. Columella not pedunculate.
1. Fruit dehiscent at the apex. Valves very thick, covered outside with very numerous rusty lenticles. Insertion of the seeds medial... **Sipo.**
2. Fruits dehiscent at the base.
(a) Fruits small, not exceeding 15 cm. in length. Columella gray, swollen and rounded at the base, with 3 or 4 seeds on each face. **Aboudikro.**

(b) Fruits larger, 15–20 cm. long. Columella attenuate at base, reddish-blackish. Margin of the seed evidently winged. Seeds 5 or 6 to each face..... **Tiama.**

The second part of this paper takes up each of the four timbers in turn, giving a considerable amount of information about each species, and concludes with a table showing the number of trees of each felled annually in the Ivory Coast since 1924, from which it appears that Kosipo is not cut at all, being too rare and too heavy to be of importance. Tiama is the most important numerically, followed by Sipo.

The value of this section is reduced by the doubt as to the identity of *E. macrophyllum* and *E. septentrionale*, and of *E. cylindricum* and *E. tomentosum*. If the species of these pairs are distinct, as held by their authors and reaffirmed by Kew in *Flora of West Tropical Africa*, then their description under a single title (Tiama and Aboudikro, respectively) is of doubtful value, as one is not sure if the information is rightly applied to the one or to the other of the two species included in each group.—C. VIGNE, *Assistant Conservator of Forests, Gold Coast.*

Richesses françaises d'outre-mer. Nos bois coloniaux. Special issue of *Figaro Artistique Illustré* (Paris) Aug.–Sept. 1931. Price 12 frs.

Seventy-five pages of this magazine are devoted to a symposium of articles concerning French colonial woods from the forest to the finished product. The whole is profusely illustrated with 130 excellent photographs showing forest and logging scenes, methods of transport and manufacture, figure and grain, defects, and miscellaneous finished products. There are also four maps.

Die Verteilung des stockwerkartigen Aufbaues im Holz der Dikotylen. By H. H. JANSSONIUS. *Receuil des Travaux Botaniques Néerlandais* 28: 97–106, 1931.

At first sight the tier-like structure of wood appears to be of little systematic worth, since the elements may be storied in one species and not in another closely related to it; in fact

this difference may be found in individual specimens within a species. Upon closer examination, however, the character proves to be highly important and, instead of being an isolated and random feature, is revealed as a constant member of a group of characters of real systematic importance. Its importance in this combination is indicated by the fact that tier-like structure appears in some of the species of every family characterized by the other members of the group.

Some of the features correlated with tier-like arrangement have already been mentioned by Von Höhnel and Record. My enumeration includes the following characters: (1) Wood parenchyma fibers and substitute fibers exhibit little gliding growth in axial direction; their cuneiform ends are abundantly pitted and are tapering on tangential sections, rectangular on the radial. The parenchyma fibers often have only one or two transverse partition walls or even none. (2) The wood fibers have wide median portions which are arranged in horizontal layers; the ends are strikingly narrow and inserted as a bayonet along one of the radial sides of the middle part. Pits are mostly confined to the middle portions. (3) In stratified wood the serried elements are relatively short and all of nearly the same length. This applies to vessel segments, parenchyma fibers, substitute fibers, and median parts of libriform fibers.

To this storied structure complex I have given the name Stockwerkmerkmale. Every member of the complex exhibits a certain amount of individual variation without losing its place in the group. Thus in the same plant family one species may display the tier-like structure together with all of the correlated features, while another may show only the cuneiform ends of the parenchyma fibers, or the bayonet-like ends of the libriform fibers.

A striking proof of the reality of the above correlation is found in the fact that none of the characters involved is ever found in families having woods composed chiefly of fiber-tracheids. In these families the vessels nearly always have scalariform perforations; the wood parenchyma is interspersed between the fiber-tracheids; the rays are of two kinds, some of them being homogeneous and uniseriate, the others typically heterogeneous.

This latter correlation with the fiber-tracheids holds good only so long as one confines this name to the same elements originally designated as fiber-tracheids by Sanio. The fact that such a correlation has since Sanio's time been found to exist serves to prove that his classification is fundamentally sound.—H. H. Janssonius.

Some properties of alkaloids in relation to climate of habitat. By James B. McNair. *American Journal of Botany* 18: 6: 416–423, June 1931.

Summary

"Alkaloids are found in 51 plant families; of these 47 per cent are mostly tropical and 12 per cent are temperate. The ratio of tropical alkaloidal families to the total tropical families (16 per cent) is not far greater than the ratio of temperate alkaloidal families to the total temperate families (12 per cent).

"The curves of the average, the highest, and the lowest melting points of the various climatic groups of alkaloids diminishes from tropical to temperate. This coincides with the melting points of the oils and fats. Of the tropical group of alkaloids the greatest number of individuals have melting points between 200° and 250° C. while in the temperate group the maximum is between 100° and 150° C.

"The highest molecular weights of the climatic groups increase from tropical to temperate, but the lowest and average molecular weights are irregular. There is an indication that the number of carbon atoms on the alkaloid molecules increases from tropical to temperate. The number of hydrogen atoms in the alkaloid molecules increases from tropical to temperate. The average and minimum numbers of nitrogen atoms increase from tropical to temperate but the maximum decreases. The maximum number of oxygen atoms increases and the minimum number decreases from tropical to temperate.

"In alkaloids the pyridine group is widely distributed climatically, the isoquinoline group is confined mainly to temperate regions, and the quinoline group occurs mostly in the tropics. No consistent trend could be determined from

the data at hand for the solubility of alkaloids in relation to climate of habitat. Alkaloids of tropical origin are generally less toxic to man than those of temperate origin."

Some properties of plant waxes in relation to climate of habitat. By JAMES B. MCNAIR. *American Journal of Botany* 18: 7: 518–525, July 1931.

FUNCTION

"Most vegetable waxes seem to be produced by the integuments of the organism and not internally (as are fats and alkaloids), and their value to the plant is apparently to repel water or resist its action and prevent its ingress or egress. Whatever the function of wax may be to the plant it is perhaps of more value to tropical plants than to temperate ones, since practically twice as many wax-producing plant families are found in the tropics as in the temperate zone."

SUMMARY

"Data of approximately 232 waxes have been reclassified for use in this paper to develop new relationships. Plant waxes are considered to include as components higher fatty acids, mono- or di-hydroxy saturated alcohols of high molecular weight, esters formed from these, ketones, and hydrocarbons. Waxes are found in 84 plant families, or 28 per cent of all the higher plant families. Of these wax-producing families 38 per cent are tropical, 5 per cent tropical-subtropical, 1 per cent subtropical, 20 per cent temperate, and 36 per cent widely distributed. Of all tropical families 20 per cent have waxes; of all tropical-subtropical families, 26 per cent; of all temperate families, 34 per cent; and of all widely distributed families, 52 per cent.

"The melting points, molecular weights, and empirical formulæ of the acid, hydrocarbon, alcohol, and ester constituents of waxes indicate a variation in value in accordance with the climatic habitat of the source plants. Wax hydrocarbons, acids, and alcohols from the tropics have lower melting points, greater molecular weights, and larger empirical formulæ than those of the temperate zone. The value of wax constituents from widely distributed habitats, which include both tropical and temperate climates, are intermediate between those of tropical and temperate waxes. The corresponding values of tropical fats and alkaloids are higher than of temperate fats and alkaloids. This climatic variation is the opposite of that of waxes.

"For each climatic group wax hydrocarbons have a larger number of both carbon and hydrogen atoms in their molecules than either wax alcohols or wax acids. Wax alcohols have a greater number of both carbon and hydrogen atoms than wax acids. Conjectures are made as to the sequence of formation of these constituents."

The differential analysis of starches. By JAMES B. MCNAIR, Publication 275, Field Museum of Natural History (Chicago): Botanical series 9: 1: 1–44, June 19, 1930.

Eleven processes of analysis furnish data by which starches may be differentiated. These processes are: (1) Histological microscopic examination to determine the form and size of the grains, position, and character of the hila, characteristics of the lamellae, orientations, etc.; (2) the degree of polarization; (3) the iodine reaction; (4) the gentian violet reaction; (5) the safranin reaction; (6) the temperature of gelatinization; (7) the chloral hydrate-iodine reaction; (8) the chromic acid reaction; (9) the pyrogallic acid reaction; (10) the ferric chloride reaction; and (11) the Purdy solution reaction. These tests are carried out on small amounts of material by the aid of the microscope and require individually not more than one hour's time. By these tests it is posssible to tell the difference between starches of different plant families, as corn starch from potato starch; between the starches of the members of one family of plants as wheat, rye, and barley; or from different varieties of one species, *e.g.*, the starch of ginger root from Jamaica and the ginger root from Cochin China, or between the starches of pod corn, pop corn, flint corn, dent corn, soft corn, sweet corn, and starchy-sweet corn.

It is the reviewer's opinion that starch in sapwood offers an exceptional field for original research. The data might prove highly useful in the classification and identification of woods.

Jahresbericht (1930) des Instituts für angewandte Botanik Hamburg. Hamburg, Germany, 1931. Pp. 171; 6¾ x 9½. Illustrated.

Everyone concerned in any way with the field of applied botany is sure to find something of value in this annual report, for the investigations cover a seemingly infinite variety of problems. The reports by Dr. Hans Meyer are of particular interest to the wood technologist. Among other things, he determined many trade samples of wood and thus gave scientific meaning to the commercial names, some of which are new or unusual. He also gives the results of timber tests on three temperate and five tropical species. Investigations of woods are increasing in importance at the Institute and much new equipment has recently been added to the laboratory.

Die Bedeutung des Handels mit aussereuropäischen Harthölzen (unter besonderer Berüchsichtigung der Stellung Hamburgs). By Arnim Lühdorf. Inaugural-Dissertation zur Erlangung der Doktorwürde bei der philosophischen Fakultät der hessischen Ludwigs-Universität zu Giessen, 1931. Pp. 87; 6 x 9; 20 tables.

A concise survey of the trade in hardwoods, especially tropical hardwoods, with reference to the main sources of supply and to the problems of production, transport, and marketing. A chapter is given to the situation in the U. S. A. The concluding portion deals with the position of Hamburg as a timber market for extra-European hardwoods and the significance of this business to Germany. There are 20 tables and charts summarizing the more important aspects of the hardwood trade.

A matter of special interest is the author's definition of the term "hardwood." In English and American commerce, hardwood refers to broadleaf (Dicotyledonous) timber, while softwood applies to conifers (Gymnosperms), both being independent of the actual hardness of the woods. Various attempts have been made to devise scales of hardness, but none is entirely satisfactory, particularly in view of the range of variation of different samples of wood from the same species and even from different parts of the same tree. The hardness scale

in the sense used in mineralogy is of no practical value, since scarcely any wood is harder than gypsum, the second member in that scale.

Hardness, in the sense of resistance to indentation, is a matter of density; consequently a scale of hardness can be based upon specific gravity determinations. In order for such determinations to be comparable, however, they must be standardized with respect to moisture content at time of test. In the scale used by the author, the values are for air-dry wood, mainly because such figures are more readily available. The boundary between hardwood and softwood is arbitrarily fixed at 0.60, though all conifers are classed as softwoods even if their specific gravity exceeds 0.60. Since the density of wood varies, it is obvious that a species at the border line may be classed as either hard or soft or both, according to the particular samples tested.

As for the future of the tropical hardwood industry, the author points out that Germany must import hardwoods from the tropics to supply her expanding industries. Hamburg, a great ocean port on a river system supplying an industrial hinterland is strategically situated with reference to the trade in extra-European timbers.

The tropical timber business has suffered in the past from the poor selection and quality of the timber on the market. The consuming industries require (1) knowledge of the properties of a wood; (2) standardization according to quality; (3) availability in customary sizes; (4) assurance of an adequate and continual supply.

The field of wood anatomy. By Samuel J. Record. *Empire Forestry Journal* (London) 10: 1: 5–6, July 1931.

"Wood anatomy is a branch of botanical science which is concerned with wood as an organic structure, rather than as a substance or a material. It deals primarily with the form of cells and with their arrangement and organization in the cellular complex that constitutes wood. Systematic anatomy is principally concerned with such variations in structure as appear to indicate natural relationships and permit of orderly classification; it supplies the means for the identification of unknown specimens.

"Families, genera, and species of plants do not exist as such in nature, but are concepts of scientists and, therefore, arbitrary. The basis for their segregation is primarily the morphology of the reproductive organs. The interpretations of the facts concerning these organs are matters of opinion and constantly open to question. Closer approximation to a truly natural classification would be possible through the study of every plant in its entirety. Wood anatomy is but one of several branches of plant science capable of contributing to the solution of taxonomic problems. Sufficient progress has already been made in the systematic anatomy of woods to justify the belief that eventually it will be possible to refer any specimen of wood to its correct genus and often to its species or specific group.

"It should not be the object of anatomists to classify woody plants upon the sole basis of the woods, for to do so would but repeat the mistake of judging the whole by one of its several and unlike parts. Rather is it their task to contribute to a general fund of knowledge which can be drawn upon in devising better classifications than now are possible. There should be no occasion for discouragement if at the moment they cannot correlate or harmonize their findings with the results obtained in separate branches of the same subject, for if the facts are right any fault must reside in the interpretation of them.

"Assuming that evolutionary progress varies in different parts of a plant, it follows that the relative position assigned a plant in the phylogenetic scale may depend upon which particular organ is taken as the criterion. Natural relationships are three-dimensional and every attempt to reduce them to a single line or even to a plane results in so distorted an image that it is not surprising that many facts actually collateral appear wholly irrelevant. Then, too, there is the ever-present danger of drawing conclusions from insufficient data and of mistaking parallelism for sequence.

"At the present stage of our knowledge of wood anatomy the pressing need is for more facts and more detailed observations covering the widest possible range of material. When these are available the matter of interpretation will be greatly simplified."