M. M. Chattaway

Price 35 cents

Yale University School of Forestry

TROPICAL WOODS

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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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THE FOREST TREES OF MICRONESIA, JAPANESE MANDATE

By RYÔZÔ KANEHIRA

Division of Forestry, Kyushu Imperial University

Micronesia, Japanese Mandate, extending from 130° E. to 175° E. longitude and from the Equator to 22° N. latitude, consists of more than 1400 islands, inlets, and reefs comprising the Marianne, Caroline, and Marshall groups, yet the total area of land is but 830 square miles. Except for the Marshall group of atolls, all are of volcanic origin beneath a covering of coral rocks. The principal islands are Saipan, Tinian, and Rota of the Mariannes; Yap and Palau of the West Carolines; and Truk, Ponape, and Kusai of the East Carolines. The flora of these islands was studied during the time of German control, but the botanical survey was far from complete. I have had the opportunity of exploring this region for the past three

summers, and have collected about 1728 numbers of herbaceous and woody plant specimens and 279 wood samples.[1]

Ligneous Flora

The only endemic genera of ligneous plants are *Bentinckiopsis*, *Glubiopsis*, *Ponapea*, and *Guamia* (the first three belonging to the Palmae), while out of a total of 280 species of woody plants that I have collected, 130 species or 43 per cent are not known to occur outside of Micronesia.

The most interesting feature of the Micronesian flora is the distribution of the plants. In this connection, E. D. Merrill (*Philippine Journal of Science* IX (1914), Bot., 27) says: "The original vegetation of Polynesia is mainly of Malayan origin and, like aboriginal man, present species of plants, or their ancestors, entered the Archipelago from the west. Most of the original food plants of the Polynesian people were carried with them from island to island in their migrations or in their later inter-communication between islands and groups of islands and, with very few exceptions, are manifestly of Asiatic or Malayan origin."

It is worthy of note that there are five genera of trees, namely, *Couthovia*, *Excavatia*, *Myrtella*, *Pentaphalangium*, and *Soulamea*, which occur in Micronesia and New Guinea but not elsewhere, while there is no genus confined to Micronesia and its nearest neighbors, the Philippines. There are about eight species confined to the region comprising Micronesia, New Guinea, and that portion of the Philippines not further west than Wallace's Line.[2] It may be assumed that, as regards its

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ligneous flora, Micronesia is much more closely allied to New Guinea than to the Philippines. Weber's Line,[2] as proposed by Pelseneer (1904), extends between Timor and Australia northward through the Molucca Passage into the Pacific Ocean west of Obi, Ternate, and Halmahera. It is my opinion that *this line should extend further north so as to separate Micronesia from the Philippines.*

Types of Vegetation

The natural vegetation of Micronesia is readily divisible into three types, namely, Mangrove forests, Strand forests, and Mainland forests. Portions of the various islands are in cultivation, but large patches of grasslands, so common elsewhere in the tropics as a result of shifting agriculture, are almost entirely lacking, except to a limited extent in Saipan, Tinian, and Yap. The principal foods of the natives are breadfruit, coconuts, yams, bananas, and the papaya, mango, soursop, and Polynesian chestnut, which are cultivated or naturally propagated in the villages and on the lower slopes of the mountains. Some of the plants were brought in in prehistoric times, but numerous others owe their introduction to the Spanish and consequently are largely of tropical American origin.

Mangrove forests occupy the muddy saline swamps and are composed largely of the following species: *Rhizophora mucronata* Lam., *R. candelaria* DC., *Avicennia marina* (Forsk.) Vierh., var. *alba* (Bl.) Bak. f., *Lumnitzera littorea* (Jack) Voigt, *Bruguiera conjugata* (L.) Merr., *Xylocarpus granatum* Koenig, *Ceriops Roxburghiana* Arn., *Scyphiphora hydrophyllacea* Gaertn., *Samadera indica* Gaertn., and *Nypa fruticans* Wurmb.

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Mainland forests occur at comparatively low elevation as even the highest mountain does not exceed 1000 m. Since the islands consist of either coral or basaltic rock, the soil is naturally poor and the trees, with a few hardy exceptions, are small. The composition of the forest differs on each island, as will appear in the following brief summaries.

Saipan.—Area, 195 square km.; highest altitude, 474 m. The principal trees are *Guamia mariannae* (Safford) Merr., *Cynometra ramiflora* L., *Claoxylon marianum* Muell. Arg., *Gymnosporia Thompsonii* Merr., *Eugenia Thompsonii* Merr., *Pisonia umbellifera* (Forst.) Seem., *Aglaia mariannensis* Merr., *Laportea saipanensis* Kanehira, *Grewia mariannensis* Merr., and *Sideroxylon glomeratum* Volkens.

Tinian.—Situated near Saipan; area, 98 sq. km.; max. elevation, 172 m. The predominating trees are nearly the same as Saipan, the commonest species being *Psychotria mariana* Bartl., *Pisonia Brunoniana* Endl., *Randia racemosa* (Cav.) F. Vill., *Heritiera longipetiolata* Kanehira (ined.), *Ochrocarpus excelsus* (Zoll. & Mor.) Vesque, and *Intsia bijuga* (Colebr.) Ktze.

Palau.—Consists of several islands, with a total area of 378 sq. km.; max. elevation, 206 m. The flora is rich and there is much variation in the composition of stands of different localities. The principal trees are *Vitex cofassus* Reinw., *Serianthes grandiflora* (Wall.) Benth., *Fagræa ksid* Gilg & Benedict, *F. galilai* Gilg & Benedict, *Gmelina palawensis* H. Lam, *Urandra ammui* Kanehira, *Alphitonia philippinensis* Braid, *Ormosia calavensis* Azaola, *Parinarium palauensis* Kanehira, *Pterocarpus indicus* Willd., *Columbia scabra* (Sm.) Kanehira, *Trichospermum Ledermannii* Burret, *Commersonia Bartramia* (L.) Merr., *Calophyllum cholobtaches* Lauterb., *Eugenia Reinwardtiana* DC., *E. Suzukii* Kanehira, *Goniothalamus carolinensis* Kanehira, *Astronia palauensis* Kanehira, *Boerlegiodendron pulcherrimum* (Vid.) Harms, *Meryta Senfftiana* Volkens, *Couthovia calophylla* Gilg & Benedict, *Soulamea amara* L., *Rhus taitensis* Guill., *Semecarpus venenosa* Volkens, *Buchanania palawensis* Lauterb., *Symplocos palauensis* Koidz., and *Glubiopsis palauensis* Becc.

Yap.—Situated about 260 miles northeast of Palau; area, 216 sq. km.; max. elevation, 179 m. The trees are much the same as those on Palau, but there are some endemic species such as *Pentaphalangium Volkensii* Lauterb., *Trichospermum Ikutai* Kanehira (ined.), *Timonius albus* Volkens, *Garcinia rumiyo* Kanehira, *Buchanania Engleriana* Volkens, and *Myrtella Bennigseniana* (Volkens) Diels.

Ponape.—Largest island of the Japanese mandated territory, its area being 376 sq. km.; max. elevation, 785 m. The principal trees of the low and medium altitudes are *Elæocarpus carolinensis* Koidz., *E. Kusanoi* Koidz., *E. Kerstingianus* Schlecht., *Campnosperma brevipetiolata* Volkens, *Myristica hypargyræa* A. Gray, *Palaquium karrak* Kanehira, *Northia Hosbinoi* Kanehira (ined.), *Garcinia ponapensis* Lauterb., *Melicope ponapensis* Lauterb., *Macaranga carolinensis* Volkens, *Parkia korom* Kanehira, *Cinnamomum carolinense* Koidz., *Pittosporum ponapensis* Kanehira, *Eugenia carolinensis* Koidz., and two palms, viz., *Ponapea Ledermanniana* Becc. and *Bentinckiopsis carolinensis* Becc. Occurring at higher elevations are such species as *Ilex Mertensii* Max., var. *Volkensiana* Loes., *Timonius Ledermannii* Valeton, *Astronia ponapensis* Kanehira, and *Gynotroches axillaris* Bl.

Kusai.—Small island situated about 310 miles east of Ponape, its area being 116 sq. km.; max. elevation, 654 m. It is covered by dense forests and the interior has not yet been explored. The flora is similar to that of Ponape, but there is a considerable number of endemic species, including *Horsfieldia nunu* Kanehira (ined.), *Couthovia toua* Kanehira (ined.), *Astronia carolinensis* Kanehira (ined.), *Elæocarpus kusaiensis* Kanehira (ined.), and *Eugenia stelechantha* (Diels) Kanehira, var. *alata* Kanehira (ined.).

Truk.—Consists of about eight islands lying in the lagoon; area, 132 sq. km.; max. elevation, 410 m. There are several endemic species, such as *Pentaphalangium carolinense* Lauterb., *Timonius megacarpus* Kanehira (ined.), *Semecarpus trukkensis* Kanehira (ined.), and *Cleistanthus Morii* Kanehira (ined.).

Jaluit Islands.—A group of atolls rising only a few meters

above sea level. The flora is practically all of strand type, the principal trees being Coconut Palms and Pandangs.

Useful Timbers

The chief uses for timber in Micronesia are for buildings and canoes, the latter being the more important. Native houses, except the club houses (called *abai*), are of very simple construction and do not make heavy demands upon the forest. The species preferred are *Calophyllum Inophyllum*, *Premna Gaudichaudii*, *Couthovia toua*, *Campnosperma brevipetiolata*, *Myristica hypargyræa*, *Parinarium glaberrimum*, *Serianthes grandiflora*, *Palaquium karrak*, and *Intsia bijuga*. The trees supplying the best timber for canoes are *Artocarpus communis*, *Elæocarpus carolinensis*, *Serianthes grandiflora*, *Calophyllum Inophyllum*, and *Parkia korom*.

VERNACULAR NAMES OF TREES OF THE TAPAJOZ RIVER, BRAZIL

By Paul C. Standley

Field Museum of Natural History

There was received recently at Field Museum of Natural History a well-prepared series of plants, presented by the Companhia Ford Industrial do Brasil. The collection, transmitted by Mr. Roy Carr, was made by Sr. Raymondo Monteiro da Costa, chiefly in the vicinity of Boa Vista on the Tapajoz River, one of the larger tributaries of the Amazon, in the State of Pará, Brazil.

Boa Vista, on the left bank of the Tapajoz, is the headquarters of the Ford Company's Brazilian plantations, established for the production of rubber from the native rubber tree, *Hevea brasiliensis*, the world's primary source of this commodity. Other plants of potential economic value also are being tested with a view to their cultivation upon a large scale.

For its rubber plantations and other economic projects the Ford Company has received a concession of an extensive tract

of land, covering several hundred square miles, and lying eastward from the Tapajoz River. The area is covered with heavy Amazonian forest, and is watered by numerous streams. So great an expanse of lowland forest possesses an infinite variety of important timber trees, some of which are represented in the collection upon which the present paper is based. It is hoped that this sending may be the first of many, for exploration of such a tract of land as this will add much valuable knowledge to what is now available regarding the lumber resources of the Amazon Valley.

Although the regions bordering the Amazon have been explored by numerous botanists, some of whom have spent several years there, the nature of the terrain is such that long years of intensive exploration will be needed to exhaust its flora. Many of the trees are so tall that it is all but impossible to obtain specimens of them; others are represented only by a few isolated individuals that may easily be overlooked by even the most careful and diligent collector.

The two chief botanical explorers who have worked along the Amazon have been Richard Spruce, more than seventy years ago, and in recent years Dr. A. Ducke, who has not only collected but described hundreds of the most important trees of Amazonia. It will be noted that in the following list a considerable number of the species recorded were first made known by Dr. Ducke's exploration. The single new species detected in the present collection, a new tree of the Brazil-nut family, is named for Mr. Roy Carr, through whose interest the collection was made and forwarded to Field Museum.

Eschweilera Carrii, sp. nov.

Arbor excelsa praeter inflorescentiam fere omnino glabra; folia brevipetiolata, lamina anguste oblanceolato-oblonga longe acuminata basin versus sensim attenuata integra vel obscure sinuata firme membranacea; flores pauci breviter racemosi magni longe pedicellati, sepalis bene evolutis ovato-triangularibus acutis, petalis magnis tenuiter tomentellis; ovarium 5-loculare anguste 5-alatum.

A tree 16 m. high, glabrous or nearly so except in the inflorescence, the branchlets slender, densely leafy; leaves large, short-petiolate, the slender petioles 6–10 mm. long, the blades firm-membranaceous, narrowly oblanceolate-oblong, 17–22 cm. long, 5.5–6.5 cm. wide, narrowly long-acuminate,

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gradually attenuate to the base, dull and pale above, with about 10 pairs of primary veins, the ultimate veinlets prominent and rather laxly reticulate; racemes terminal, few-flowered, the bracts and bractlets deciduous, lanceoblong, about 5 mm. long, minutely puberulent, the rather slender pedicels 1–2 cm. long, puberulent; ovary very broad, minutely puberulent, 5-celled, 5-winged; calyx lobes ovate-triangular, sparsely puberulent outside or glabrate, acute, 7–11 mm. long, persistent; petals about 3 cm. long, thinly or rather densely cinereous-tomentulose outside, caducous; stamens much shorter than the petals, the filaments united at the base for 5 mm., the oblong anthers 2 mm. long.—BRAZIL: Boa Vista, Tapajoz River, State of Pará, in 1931, Raymondo Monteiro da Costa 51 (Herb. Field Mus. No. 648538, type).

The tree belongs to a difficult genus for which no general monograph is available, other than the account in the *Flora Brasiliensis*, now long obsolete. The material has been compared with material or descriptions of the species described from the Amazon Valley, but can not be referred satisfactorily to any of them.

The plants enumerated below are only a part of those represented in the collection received from the Ford Company. There are recorded here only shrubs and trees and of these only the ones for which vernacular names were supplied. It seems well worth while to list here the local names of the species, since many of them have not been discovered in the published lists of Brazilian names that have been consulted.

ANACARDIACEAE

Tapirira guianensis Aubl. CEDROHY. A tree 55 feet high.

ANNONACEAE

Duguetia sp. MEIJÚ. A tree of 50 feet.

Duguetia sp. TIASSUBA. A tree of 50 feet.

Guatteria inundata Mart. ENVIRA PRETA DO IGAPÓ. Tree 60 ft.

Guatteria Poeppigiana Mart. ENVIRA PRETA; ENVIREIRA. Tree of 50 ft.

Xylopia ligustrifolia Dunal. FACHEIRO. Tree of 60 ft.

APOCYNACEAE

Tabernaemontana macrophylla Muell. Arg. PAQUERETÊ. A shrub with milky latex and white flowers.

ARALIACEAE

Didymopanax Morototoni (Aubl.) Dcne. & Planch. MORÓRÓTÓ. A tree of 60 ft. with large, digitately compound leaves. The species ranges widely in tropical America, usually in the understory of tall lowland forest.

BOMBACACEAE

Matisia lasiocalyx Schum. INAJÁRANA ENVIRA. Tree of 50 ft.

BORAGINACEAE

Cordia alliodora (R. & P.) Cham. URUAZEIRO. Tree 80 ft. tall. One of the most widely distributed of tropical American trees, esteemed highly for its wood.

BURSERACEAE

Protium giganteum Engler (?). BREU BRANCO. Tree 75 ft.

CARICACEAE

Jacaratia spinosa (Aubl.) A. DC. MAMAORANA. Tree of 50 ft.

COMPOSITAE

Eupatorium odoratum L. CRUZEIRO. A shrub; one of the common weedy species of the American tropics, widely distributed.

Vernonia scabra Pers. PAU DE MOQUEM. A shrub.

EUPHORBIACEAE

Hevea brasiliensis Muell. Arg. SERINGUEIRA ROXA; S. ROSADA. A tree of 80 ft. Several collections representing local forms were included in the collection, but all seem referable to this species, which supplies the Pará rubber of commerce.

Hevea brasiliensis, var. **Randiana** (Huber) Ducke. SERINGUEIRA ROXA MANIVA. A tree of 60 ft. with white flowers. A form with much narrower leaflets than in typical *Hevea brasiliensis*.

Joannesia heveoides Ducke. CASTANHA DE ARARA (=Macaw Chestnut). A tree of 90 ft. with digitately compound leaves, similar to those of *Hevea*. It is remarkable chiefly for its huge fruits, as much as 20 cm. wide, each containing three large seeds.

Mabea paniculata Benth. TAQUARY. A shrub.

GUTTIFERAE

Symphonia globulifera L. f. ANANY. A tree of 60 ft. with red-violet flowers. One of the widely distributed forest trees of the American tropics.

Vismia guianensis (Aubl.) Pers. LACRE BRANCO. A tree of 50 ft.

LAURACEAE

Nectandra cuspidata Nees (?). LOURO TAMANCO. A tree of 50 ft. with white flowers.

Ocotea opifera Mart. (?). LOURO BRANCO. Tree 55 ft.

LECYTHIDACEAE

Eschweilera Carrii Standl., sp. nov. (*supra*). GENIPARANA.

Lecythis paraënsis (Huber) Ducke. SAPUCAIA. Tree of 80 ft. According to Ducke, this tree furnishes the Sapucaia nuts exported from the State of Pará.

LEGUMINOSAE

Acacia riparia Benth. MALICIA. A large woody vine, armed with short recurved prickles.

Bauhinia macrostachya Benth. MORORÓ; PE DE BOI. A tree of 30 ft.

Calopogonium caeruleum Benth. FEIJÃOSINHO DA MATTA. A vine, herbaceous or somewhat woody, with small violet flowers. A widely distributed species.

Canavalia albiflora Ducke. FEIJÃOSINHO RASTEIRO. A vine with white flowers.

Cassia xinguensis Ducke. FAVA DE BEZOURO. A tree of 45 ft. with yellow flowers.

Drepanocarpus inundatus Mart. ANDIRA UCHY. A tree 60 ft. high with yellow flowers.

Elizabetha paraënsis Ducke. ARAPARY VERMELHO. Tree 70 ft. tall.

Inga marginata Willd. INGÁ. Tree 55 ft. A widely distributed species.

Inga punctata Willd. INGÁ. Tree of 50 ft. One of the most widely dispersed species of this vast genus.

Inga scabriuscula Benth. INGÁ CHICHICA. A tree of 60 ft.

Ormosia excelsa Spruce. TENBEIRO. A large tree with bright red seeds.

Pithecolobium panurense Spruce. INGARANA DE BEIRA. A tree of 35 ft.

Pterocarpus Rohrii Vahl. SAPUPIRA AMARELLA. A tree of 80 ft. with yellow flowers. The species ranges widely in northern South America.

Tachigalia alba Ducke. TACHYZEIRO BRANCO. Tree 70 ft.

MALPIGHIACEAE

Heteropteris helicina Griseb. SARABATUCÚ. A woody vine with showy yellow blossoms.

Byrsonima coriacea (Sw.) Kunth. MURICY. Tree of 40 ft. with handsome yellow flowers.

MELASTOMACEAE

Mouriria apiranga Spruce. UAPIRANGA. Tree 35 ft.

MELIACEAE

Guarea guara (Jacq.) P. Wilson. CEDROHY. Tree of 75 ft. with white flowers.

Guarea paraënsis C. DC. JATUÁUBA. Tree 50 ft.

MORACEAE

Coussapoa nitida Miq. APUHY GRANDE. An epiphytic tree or large vine. The specific name is somewhat uncertain.

MYRISTICACEAE

Virola sebifera Aubl. UCUHUBÁ. A tree of 70 ft. whose seeds, closely similar to nutmegs, are said to yield 68 per cent of fat. The species ranges widely in northern South America.

MYRTACEAE

Eugenia sp. MURTA. A shrub.

Eugenia sp. ARAÇÁ DE IGAPÓ. Tree of 30 ft.

POLYGALACEAE

Securidaca volubilis L. CUMANDAHY. A large woody vine with showy pink flowers, suggestive of those of some Leguminosae.

ROSACEAE

Couepia glaucescens Spruce. UCHYRANA. Tree of 40 ft. with white flowers.

Parinarium barbatum Ducke. CARAIPÉ RANA. Tree 60 ft.

RUBIACEAE

Isertia hypoleuca Benth. CORALLEIRA. Tree of 50 ft. with panicles of showy, red, tubular flowers; leaves white beneath.

Palicourea corymbifera (Muell. Arg.) Standl. GENIPAPO ROSA. A shrub with small red flowers.

Randia formosa (Jacq.) Schum. AÇUCENA BRANCO. A shrub with showy white flowers having an exceedingly long and slender corolla tube.

Rudgea Dahlgrenii Standl. MULATINHO. A shrub. The species was described recently from this locality.

Warscewiczia coccinea (Vahl) Klotzsch. RABO DE ARARA; CURACY. A tree of 50 ft., the large panicles with showy, leaf-like, bright red calyx lobes. The first vernacular name, meaning "parrot tail," is a suggestive one.

SAPINDACEAE

Pseudima frutescens (Aubl.) Radlk. PITOMBEIRA. Tree of 30 ft. with large panicles of small white flowers.

SAPOTACEAE

Lucuma piriry Ducke (?). ABIORANA GUTTA. Tree 60 ft. The species represented by this *Lucuma* is decidedly uncertain.

SOLANACEAE

Solanum toxicarium Lam. JUÁ; JURUBEBA DO CAMPO. A coarse prickly shrub with white flowers.

STERCULIACEAE

Theobroma grandiflorum (Willd.) Schum. CUPUASSÚ. Tree 40 ft.

Waltheria americana L. MALVA BRANCA SANTAREM; MALVA VELLUDA. A shrub or coarse herb.

TILIACEAE

Apeiba petoumo Aubl. PENTE DE MACACO PRETO. A tree of 50 ft. The leaves are white beneath, and very unlike those of the more common species of the genus. The vernacular name, meaning "monkey comb," alludes to the form of the fruits, which suggest a sea urchin. The Spanish name Peine de Mico, applied in Central America to other species of the genus, has the same significance.

Mollia lepidota Spruce. SURURÚ. Tree 70 ft. tall with white flowers.

VERBENACEAE

Lantana Camara L. CHUMBINHA ROXO. A prickly shrub, one of the most common and widely distributed weedy species of tropical America.

Lippia alba (Mill.) N. E. Brown. HERVA CIDREIRA. Probably cultivated here for its aromatic foliage, which is much used in tropical America for flavoring food.

CHECK LIST OF THE COMMON NAMES

Abiorana gutta	*Lucuma piriry* Ducke (?)	Sapotaceae
Açucena branco	*Randia formosa* (Jacq.) Schum.	Rubiaceae
Anany	*Symphonia globulifera* L. f.	Guttiferae
Andira uchy	*Drepanocarpus inundatus* Mart.	Leguminosae

Apuhy grande	*Coussapoa nitida* Miq.	Moraceae
Araçá de igapo	*Eugenia* sp.	Myrtaceae
Arapary vermelho	*Elizabetha paraënsis* Ducke	Leguminosae
Breu branco	*Protium giganteum* Engler(?)	Burseraceae
Caraipé rana	*Parinarium barbatum* Ducke	Rosaceae
Castanha de arara	*Joannesia beveoides* Ducke	Euphorbiaceae
Cedrohy	*Guarea guara* (Jacq.) P. Wilson	Meliaceae
Cedrohy	*Tapirira guianensis* Aubl.	Anacardiaceae
Chumbinha roxo	*Lantana Camara* L.	Verbenaceae
Coralleira	*Isertia hypoleuca* Benth.	Rubiaceae
Cruzeiro	*Eupatorium odoratum* L.	Compositae
Cumandahy	*Securidaca volubilis* L.	Polygalaceae
Cupuassú	*Theobroma grandiflorum* (Willd.) Schum.	Sterculiaceae
Curacy	*Warscewiczia coccinea* (Vahl) Klotzsch	Rubiaceae
Envira preta	*Guatteria Poeppigiana* Mart.	Annonaceae
E. preta do igapó	*Guatteria inundata* Mart.	Annonaceae
Envireira	*Guatteria Poeppigiana* Mart.	Annonaceae
Facheiro	*Xylopia ligustrifolia* Dunal	Annonaceae
Fava de bezouro	*Cassia xinguensis* Ducke	Leguminosae
Feijãosinho da matta	*Calopogonium caeruleum* Benth.	Leguminosae
Feijãosinho rasteiro	*Canavalia albiflora* Ducke	Leguminosae
Genipapo rosa	*Palicourea corymbifera* (Muell. Arg.) Standl.	Rubiaceae
Geniparana	*Eschweilera Carrii* Standl., sp. nov.	Lecythidaceae
Herva cidreira	*Lippia alba* (Mill.) N. E. Brown	Verbenaceae
Inajárana envira	*Matisia lasiocalyx* Schum.	Bombacaceae
Ingá	*Inga marginata* Willd.	Leguminosae
Ingá	*Inga punctata* Willd.	Leguminosae
Ingá chichica	*Inga scabriuscula* Benth.	Leguminosae
Ingarana de beira	*Pithecolobium panurense* Spruce	Leguminosae
Jatuáuba	*Guarea paraënsis* C. DC.	Meliaceae
Juá	*Solanum toxicarium* Lam.	Solanaceae
Jurubeba do campo	*Solanum toxicarium* Lam.	Solanaceae
Lacre branco	*Vismia guianensis* (Aubl.) Pers.	Guttiferae
Louro branco	*Ocotea opifera* Mart. (?)	Lauraceae
Louro tamanco	*Nectandra cuspidata* Nees (?)	Lauraceae
Malicia	*Acacia riparia* Benth.	Leguminosae
Malva branca Santarem	*Waltheria americana* L.	Sterculiaceae
Malva velluda	*Waltheria americana* L.	Sterculiaceae
Mamaorana	*Jacaratia spinosa* (Aubl.) A. DC.	Caricaceae
Meijú	*Duguetia* sp.	Annonaceae
Mororó	*Bauhinia macrostachya* Benth.	Leguminosae
Morórótó	*Didymopanax Morototoni* (Aubl.) Dcne. & Planch.	Araliaceae

Mulatinho	*Rudgea Dahlgrenii* Standl.	Rubiaceae
Muricy	*Byrsonima coriacea* (Sw.) Kunth	Malpighiaceae
Murta	*Eugenia* sp.	Myrtaceae
Paqueretê	*Tabernaemontana macrophylla* Muell. Arg.	Apocynaceae
Pau de moquem	*Vernonia scabra* Pers.	Compositae
Pé de boi	*Bauhinia macrostachya* Benth.	Leguminosae
Pente de macaco preto	*Apeiba petoumo* Aubl.	Tiliaceae
Pitombeira	*Pseudima frutescens* (Aubl.) Radlk.	Sapindaceae
Rabo de arara	*Warscewiczia coccinea* (Vahl) Klotzsch	Rubiaceae
Sapucaia	*Lecythis paraënsis* (Huber) Ducke	Lecythidaceae
Sapupira amarella	*Pterocarpus Robrii* Vahl	Leguminosae
Sarabatucú	*Heteropteris helicina* Griseb.	Malpighiaceae
Seringueira rosada; S. roxa	*Hevea brasiliensis* Muell. Arg.	Euphorbiaceae
Seringueira roxa maniva	*Hevea brasiliensis*, var. *Randiana* (Huber) Ducke	Euphorbiaceae
Sururú	*Mollia lepidota* Spruce	Tiliaceae
Tachyzeiro branco	*Tachigalia alba* Ducke	Leguminosae
Taquary	*Mabea paniculata* Benth.	Euphorbiaceae
Tenbeiro	*Ormosia excelsa* Spruce	Leguminosae
Tiassuba	*Duguetia* sp.	Annonaceae
Uapiranga	*Mouriria apiranga* Spruce	Melastomaceae
Uchyrana	*Couepia glaucescens* Spruce	Rosaceae
Ucuhubá	*Virola sebifera* Aubl.	Myristicaceae
Uruazeiro	*Cordia alliodora* (R. & P.) Cham.	Boraginaceae

Intercellular Canals in Liberian Woods

The following notes apply to the woods studied in preparation of Yale Forest School Bulletin No. 31, "The evergreen forests of Liberia":

Vertical gum ducts of the gummosis type were found in *Bombax brevicuspe* Sprague (Bombacaceae); *Terminalia superba* Eng. & Diels (Combretaceae); *Berlinia* spp. and *Macrolobium macrophyllum* Macbr. (Leguminosae).

Vertical ducts of normal occurrence were observed in *Daniella thurifera* Bennett and *Detarium senegalense* Gmel. (Leguminosae). They are few, small, and inconspicuous.

In *Anthocleista nobilis* G. Don (Loganiaceae), "some of the rays contain open intercellular canals appearing to the unaided eye as tiny dark specks on tangential surface."

SIGNIFICANCE OF NUMERICAL VALUES FOR CELL DIMENSIONS

By H. E. Desch

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In describing the anatomy of a wood it is customary to include measurements of the cells, but inasmuch as the sizes of the elements are not constant, the significance of numerical values assigned to them is open to question. The reason for doubting the worth of such figures is the lack of assurance that they are truly representative of the specimen studied and that the specimen is truly representative of the species. Without some idea of their accuracy, figures of size are likely to be not only without positive utility, but actually misleading. At least, this is the impression the writer has gained from an investigation into the variation of cell dimensions in certain British hardwoods.[1] In studying the variation of such features as fibre length and vessel diameter it was found that in any one sample the variation in size was so great that the arithmetic mean was of very little significance unless based on a large number of measurements, and further that there was a very considerable range in the means of different samples.

Cell dimensions are most often given as a range with an average, but sometimes the range is omitted. Range alone, though interesting and frequently a useful guide, can rarely be used as a specific feature. The average or, to be more precise, the arithmetic mean, is the figure sought, and it is the accuracy of this quantity that is most open to suspicion. It is not practicable to obtain the mean fibre length of a small hand specimen with absolute accuracy, as the number of fibres would probably run into millions. Approximate accuracy, however, is obtainable by sampling, and by making a series of determinations, each based on the same number of "observations," the calculated mean will be found to vary within narrow limits. This range in the arithmetic mean is measured by the standard error.

[1] The results of this investigation are to be published shortly in *The New Phytologist*.

A simple analogy will make the position clear. The mean diameter of an even-aged stand can be obtained by summing all the diameters and dividing by the total number of trees. An approximately accurate mean diameter can be determined from a number of random measurements or "observations" in a large stand. If the calculation is repeated upon the measurements of several different series, of say 100 trees each, the mean diameters will be found to vary within narrow limits. This spread or range in the calculated mean for different determinations is measured by the standard error of the mean. From the standard error the probability that the true mean of a "population" lies within a certain range on either side of the calculated mean can be determined. Further it can be shown that for a large sample, drawn from a normally distributed population, the chances are about 3 to 1 that the true mean lies within the range measured by the standard error; the chances are nearly 22 to 1 that the true mean lies within twice the standard error; and 370 to 1 that it lies within three times the standard error. A probability of 22 to 1 is accurate enough for most types of experimental work.

Of the different methods available for calculating the standard error of the mean, two formulae may be recommended. For a large number of observations (say 100 or more), the method described by Thurstone,[2] using class intervals and an arbitrary origin, may be employed. In this case the formula is

$$E=\frac{\sqrt{\frac{\Sigma(fd^2)-c^2}{n}}}{\sqrt{n}}$$

where E = standard error; f = frequencies in each class interval; d = deviations from arbitrary origin; $c=\frac{fd}{n}$; n = number of observations. For a smaller number of observations (say 50 or less) the following formula may be used:

[2] L. L. Thurstone: *The fundamentals of statistics*. New York, 1925 Chap. XV.

$$E=\frac{\sqrt{\frac{\Sigma(X-\bar{X})^2}{n-1}}}{\sqrt{n}}$$

That is, each value is subtracted in turn from the mean, the squares of the differences are summed and divided by $n-1$, and the square root of the quotient is divided by the square root of n.

Obviously the smaller the standard error the more restricted is the range in the calculated mean. When cell dimensions are required for purposes of comparison, a mean moving within narrow limits should be the aim. A consideration of the factors controlling the standard error is therefore of importance.

If a large number of random observations be made of any population, the frequencies with which similar individuals occur are found to lie on a "distribution curve," and for a given number of observations, the standard deviation S may be calculated. Now if the number of observations is doubled, the proportions in which the similar individuals are present is unaltered, and there is no change in the standard deviation. This distribution occurs with the different types of elements in any given sample of wood; hence if enough measurements are made, the range in size of individual elements will, by the law of averages, be covered. The standard error of the mean, however, will be reduced inversely as the square root of the number of observations, since for the standard deviation of the mean, $E=\frac{S}{\sqrt{n}}$. The effect of increasing the number of observations will be readily seen when E, in the equation $E=\frac{K}{\sqrt{n}}$, is plotted against the number of observations. (The standard deviation, not being affected by the number of observations, is treated as a constant K, though this, of course, is not strictly true.) From the accompanying graph (Fig. 1) it will be seen that the standard error of the mean is reduced by one-half if the number of observations is increased from 100 to 400, but to reduce the standard error again by one-half, 1200 additional observations (1600 in all) will be necessary.

In experimental work, measurements are made for purposes of comparison and their value depends on the relative accuracy of the figures obtained. For example, the mean fibre

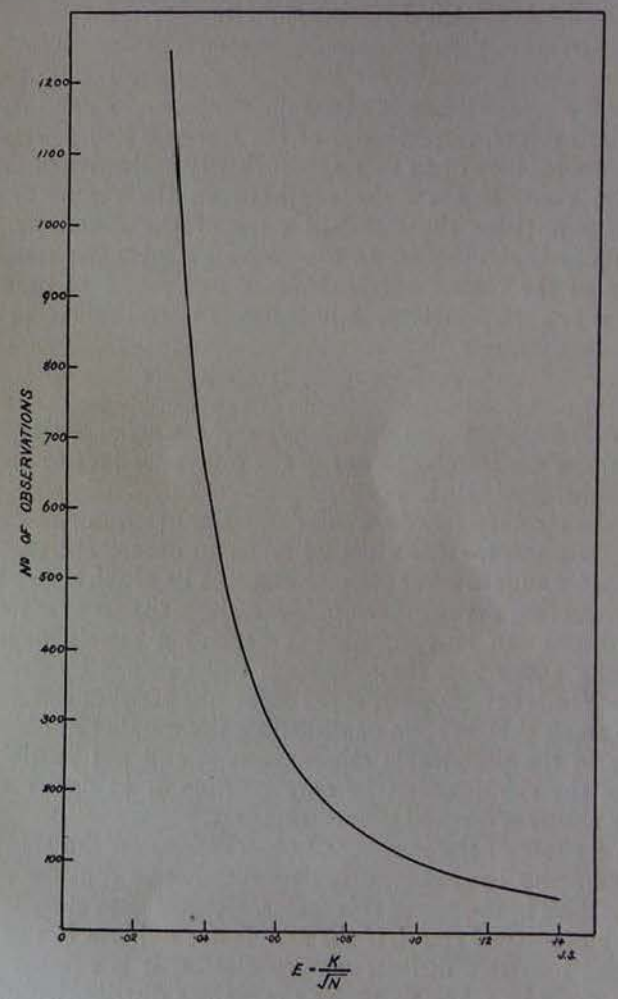

Fig. 1. Curve showing the effect of the number of observations on the standard error of the mean when the standard deviation is constant.

length of a sample x is 1144μ, and of a sample y, 1186μ; it is necessary to know whether the difference between the means is significant before it can be said that fibre length in y is greater than in x. The significance of a difference can be measured statistically by using the formula

$$E_d = \sqrt{(E_x)^2 + (E_y)^2}$$

where E_d = standard error of the difference, and E_x and E_y the standard errors, respectively, of the means x and y. Accepting a probability of 22 to 1 as sufficiently indicative of significance, then, if the difference between the means of two samples is twice the standard error of the difference, the difference is significant. In the above example the standard errors of the means were calculated and found to be ± 6.2 and ± 6.0, respectively. Substituting these values in the preceding formula,

$$E_d = \sqrt{(6.2)^2 + (6.0)^2} = \pm 8.6.$$

The difference between the means x and y is 42, which is nearly five times the standard error of the difference (± 8.6) and is, therefore, significant.

If the significance of a small difference between two means is to be proved, steps must be taken to obtain the smallest possible standard error for each mean. The graph shows that by increasing the number of observations the standard error of a mean can be reduced; but beyond a certain number, actually about 700, the advantage to be gained by such increase tends to disappear. If the difference between two means is so small that in spite of extending the number of observations to the practicable minimum it is still not possible to prove the significance, the only solution is to devise some more accurate method of measurement.

The effect of the number of observations on the standard error having been shown, it now remains to consider other limitations in the use of this factor. Returning to the analogy of the even-aged stand, if the area is not uniform but can be divided into two distinct quality classes, it is evident that steps must be taken to assure the proper distribution of the sample trees. If the mean diameter for the whole area is still

required, the 100 trees must be selected from the two quality classes proportionately to the number of trees on each area. Further, if the area includes several different quality classes, each one of these must be represented in the sampling. If this example is extended from an even-aged stand to a whole forest containing every age and several quality classes, and the mean diameter for the whole forest is required, again every quality class and every age class must be represented in the sampling. The analogy between the trees of a forest and the elements of a wood is very close. Though, for example, it is practicable to determine the mean fibre length of a single small specimen of wood, it would be a formidable task to determine it for a species because of the difficulty of securing representative samples.

Since the merits of statistical methods of obtaining average cell sizes have been discussed at some length, it may not be out of place to stress the limitations in the use of such methods in biological work. They are not a universal panacea for the solution of every problem, but their judicial application will assist the progress of research. It is important to bear in mind that data collected by bad sampling will become no more illuminating by the calculation of standard errors; such treatment may merely lend spurious support to false conclusions. Finally, limitation in the accuracy of the methods of measurement may be the deciding factor.

The points which the writer has endeavored to make clear in this paper are (1) that unqualified numerical values for the dimensions of wood elements are practically worthless and may be misleading and (2) that, where the sampling justifies it, statistical methods provide a means of assessing significance. It has been shown that the accurate determination of the size of elements for the wood of a whole species is impracticable, and, even for a small sample, extremely laborious. It is doubtful, therefore, whether the use of such figures is ever likely to be of much practical use for purposes of identification except in special cases. It is not suggested, however, that the practice of recording cell dimensions be abandoned, but rather that the limitations of the figures should always be defined. The information required regarding any figure is the

number of measurements it represents and the method used in sampling. The writer is convinced that the inclusion of these data would add very materially to descriptions of woods, and that without such data numerical values are not worth giving.

PROPOSED STANDARDS FOR NUMERICAL VALUES USED IN DESCRIBING WOODS

By M. M. Chattaway

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Many institutes of wood technology have rather recently begun to publish descriptions and to prepare keys for the identification of the less familiar tropical woods. It seems highly important that some attempt should be made at this time to standardize the terms employed in these descriptions so as to increase their usefulness, not only to the laboratory and country of their origin, but universally, wherever anyone is faced with the problem of identifying an unfamiliar wood.

In the paper preceding this, H. E. Desch (4) complains of the ubiquity of figures in wood descriptions and points out the dangers attending their use. But no matter how much the form of their expression is changed, they will continue in use, for otherwise it is difficult to assess such terms as large and small, many and few, etc., so as to be certain that they convey the same meaning to everyone. Since all these terms are likely to take on a different meaning according to the standard with which they are mentally compared, the only practicable way of defining them so that they will be universally understood is to assign them numerical values which have been obtained by proper sampling of mature material.

Some teachers of wood anatomy provide their students with standard sets of samples for matching and for use with descriptions and keys based on gross and simple-lens characters, and set up general size classes for work with the compound microscope. The sets used in different institutions are not identical, but it should be a simple matter to evaluate them so as to

bring them into universal alignment and provide the required standard. The purpose of this paper is to compare the classes suggested by Beekman (1), Den Berger (2), Chalk and Rendle (3), and Gamble (6), and to propose the adoption of a single standard with the range of each class numerically defined. The use of classes avoids the false impression of accuracy given by an average, the figures are sufficient to show differences between two woods, and the method is rapid in application. A laborious method for the identification of woods, involving many hundred measurements for each feature, is too cumbersome for practical use.

Even if an average value were easy to obtain it is not certain that is the best figure to use, since it must of necessity include minute vessels and fibres which are of little value as diagnostic features. For example, in comparing two woods the important fact is usually not that both have small vessels of 50μ diameter, but that in one the vessels may be as much as 270μ, while in the other they are never more than 80–100μ; thus the 50μ vessels are of little significance, and time spent on measuring them is wasted. If they are present in sufficient numbers or in any peculiar arrangement they become a noticeable feature of the wood and call for special comment; if not, they can be omitted—but the resulting value is not an average. This is roughly the method followed in lens work, where the smallest sizes are ignored, but the resulting figure is in this case probably a maximum, and not the figure most usually encountered. With actual measurement under a microscope, probably the best figures to give are the maximum, showing how large the feature in question can become, and a range of the sizes occurring most frequently. The form "up to 220μ (mostly 160–190μ)" will be found to be of most assistance for purposes of identification.

These figures can be obtained without too great effort. Random measurement of 50 vessels or fibres will often give a clear idea of the predominant sizes for the sample, though if the range is wide, 100 or more measurements may be necessary. The maximum can be obtained by selection over the whole area available. These measurements can be made in a very

short time and will be sufficient to indicate whether or not the matter of size is of diagnostic significance in separating two woods; if not, it is unlikely that an average would be any more useful.

Existing and Proposed Classifications

The problem of classifying measurements varies for the different elements and for different aspects of the same element. Some of the questions involved are briefly considered below in connection with the proposed standard classes. For purposes of comparison with each other and with the proposed standards, the classifications made by other authors are also presented.

VESSELS

Numerical distribution.—This can be measured in two ways; the number actually occurring on a single sq. mm. of cross section may be given as a range, or counts may be made over a large area and expressed as an average per sq. mm. The figures obtained by these two methods may differ considerably; for instance, a slide of *Copaifera mopane* measured by the first method gave a figure of 1–8 per sq. mm., while the average for 25 sq. mm. was 2.3. The latter method is open to all the objections of an average figure, while the former, though usually more satisfactory, is less accurate, as the errors in obtaining it are proportionately greater, and the problem of vessels which lie half in and half out of the measured area is troublesome.

Proposed classes		Beekman (1)	
No. per mm.²	Name of class	No. per mm.²	Name of class
Up to 2	Very few	Up to 2	Zeer spaarzaam
2–5	Few	2–5	Spaarzaam
5–10	Moderately few	5–10	Vrij spaarzaam
10–20	Moderately numerous	10–20	Matig talrijk
20–40	Numerous	20–40	Talrijk
Over 40	Very numerous	Over 40	Zeer talrijk

Diameter.—Although both the radial and the tangential diameters of vessels are frequently used in descriptions, it is probable that one is actually sufficient. The tangential diameter is preferable, as it is the less variable and the approximate radial diameter can be inferred if the shape of the pore is given.

Proposed classes		Beekman (1)	
Diam. range	Name of class	Diam. range	Name of class
Up to 30μ	Extremely small	Up to 20μ	Uisterst nauwe
30–50μ	Very small	20–50μ	Zeer nauwe
50–100μ	Small	50–100μ	Nauwe
100–200μ	Moderate-sized	100–200μ	Vrij nauwe
200–300μ	Rather large	200–300μ	Matig wijde
300–400μ	Large	300–400μ	Wijde
Over 400μ	Very large	Over 400μ	Zeer wijde

Gamble (6)		Chalk & Rendle (3)
Name of class	Examples	Examples
Extremely small	*Buxus sempervirens*	Box (*Buxus*); Holly (*Ilex*)
Very small	*Acer cultratum*	Hazel (*Corylus*); Horse Chestnut (*Aesculus*)
Small	*Adina cordifolia*	Plane (*Platanus*); Beech (*Fagus*)
Moderate-sized	*Bassia latifolia*	Walnut (*Juglans*); Elm (*Ulmus*)
Large	*Albizzia Lebbek*	Chestnut (*Castanea*); Oak (*Quercus*)
Very large	*Erythrina suberosa*	.....
Extremely large	Many climbers	.....

Segment length.—Classes are suggested by F. H. Frost (5) to fit the specialization of the end wall of the vessel segments. The figures are possibly of little value in wood descriptions, but deserve placing upon record, as they may occasionally be of use in helping to assign an unfamiliar wood to a particular family.

The problem of measuring segment length requires further investigation. Frost does not state how his figures are obtained, and, judging from measurements which have been made at the Imperial Forestry Institute, Oxford, this is an

important consideration. An average is obtainable by dividing the total length of vessel exposed on a longitudinal section by the number of segments included, or individual segments can be measured either on longitudinal sections or in macerated material. Measurement of the individual cells raises the question of where to limit the measurements on segments with oblique ends. It appears to the writer that the length of tail-like extensions of segments may be more or less fortuitous and that the total length in such cases is probably too variable to have significance. On the other hand, the distance between the top of one perforation and the bottom of the other is usually closely related to the length of the cambial initial and is more nearly constant because it is less likely to be affected by conditions of growth.

Proposed classes		Frost (5)	
Length range	Name of class	Length	Type of perforation
Up to 300μ	Very short	.....	.....
300–500μ	Short	0.41 mm.	Simple horizontal
500–750μ	Long	0.69 mm.	Simple oblique
750–1000μ	Very long	0.81 mm.	Scalariform and simple
Over 1000μ	Extremely long	1.09 mm.	Entirely scalariform

RAYS

Numerical distribution.—If the results of ray counts are to be used in lens descriptions, they should be made on a solid block rather than on a section under the compound microscope. A count made on the end of a block is, however, likely to be too high, since the transparency of the fibres may permit the inclusion of some rays which do not quite reach the surface. To less degree the same objection applies to counts made on a transverse section under the microscope. Furthermore, in the case of storied rays the plane of section may miss them completely or leave wide gaps. The most reliable counts are obtainable on straight lines directly across the tangential section.

Proposed classes		Beekman (1)		Den Berger (2)	
No. per mm.	Name of class	No. per mm.	Name of class	No. per mm.	Name of class
Up to 2	Very few	Up to 2	Zeer weinig talrijk	Up to 3	Zeer spaarzaam
2–4	Few	3–4	Weinig talrijk	4 or 5	Spaarzaam
4–7	Moderately numerous	5–7	Matig talrijk	6 or 7	Vrij spaarzaam
7–10	Numerous	8–10	Talrijk	8–10	Vrij talrijk
Over 10	Very numerous	Over 10	Zeer talrijk	11–15	Talrijk
				Over 15	Zeer talrijk

Width.—The width of rays should, of course, be determined only from tangential sections, since measurements taken from cross sections will be misleading unless the rays are entirely uniseriate. Reference to the transverse section is often desirable to detect inequalities in width due to a ray's position in a growth ring or to the kind of cells with which it is in contact. For instance, a ray may be noticeably broader near the margin of a ring or in passing through a band of parenchyma, and much compressed where in contact with a large vessel. A ray may be considered at its normal size when surrounded by wood fibres. Conspicuous variations should be noted in the description. If a wood has rays of two or more definite size classes, there should be separate measurements for each class.

Proposed classes		Beekman (1)	
Width range	Name of class	Width range	Name of Class
Up to 15μ	Extremely fine	Up to 15μ	Zeer smal
15–30μ	Very fine	15–30μ	Smal
30–50μ	Fine	30–50μ	Vrij smal
50–100μ	Moderately broad	50–100μ	Matig breed
100–200μ	Broad	100–200μ	Breed
200–400μ	Very broad	200–400μ	Zeer breed
Over 400μ	Extremely broad	Over 400μ	Buitengewoon breed

Gamble (6)		Chalk & Rendle (3)
Name of class	Examples	Examples
Extremely fine	*Euonymus lucens*	.....
Very fine	*Diospyros tomentosa*	Poplar (*Populus*); Chestnut
Fine	*Albizzia Lebbek*	Ash (*Fraxinus*); Walnut
Moderately broad	*Dillenia pentagyna*	Holly; Sycamore (*Acer pseudoplatanus*)
Broad	*Platanus orientalis*	Plane; Beech
Very broad	*Quercus dilatata*	Oak; Alder (*Alnus*); Hazel
Extremely broad	*Quercus incana*	Evergreen Oak (*Q. Ilex*)

In addition to measurement of width, the number of cells should also be stated. Dividing the width by the number of cells will give the approximate tangential diameter, which is probably as useful as an average obtained from measurements of individual cells.

Height.—The height of rays must, of course, be determined from tangential sections or surfaces. Since the height often exceeds the limit of a microscopic mount, it may be necessary to make the measurements on the solid wood. This is usually not difficult, as these high rays are generally wide enough to show distinctly on a smooth surface.

Proposed classes		Beekman (1)	
Height range	Name of class	Height range	Name of class
Up to 0.5 mm.	Extremely low	Up to 0.5 mm.	Uiterst laag
0.5–1 mm.	Very low	0.5–1 mm.	Zeer laag
1–2 mm.	Low	1–2 mm.	Laag
2–5 mm.	Rather low	2–5 mm.	Vrij laag
5 mm.–1 cm.	Moderately high	0.5–1 cm.	Matig hoog
1–2 cm.	High	1–2 cm.	Hoog
2–5 cm.	Very high	2–5 cm.	Zeer hoog
Over 5 cm.	Extremely high	Over 5 cm.	Buitengewoon hoog

FIBRES

Length.—In spite of the extreme variability of fibre length,

classes based upon the most frequently occurring range will usually give a satisfactory figure for distinguishing two woods. There is no authority upon which to base these classes, but the following is suggested as a tentative scheme for dicotyledonous woods. The tracheid length of conifers is so very different from the fibre length of hardwoods that there seems little object in attempting to combine the two.

Proposed classes	
Length range	Name of class
Up to 1 mm.	Very short
1–1.5 mm.	Short
1.5–2 mm.	Long
Over 2 mm.	Very long

Thickness of wall.—Measurement of the actual thickness of fibre walls involves an amount of work out of all proportion to the value of the figure obtained, and it is therefore suggested that the classes should be based on the ratio of lumen to wall thickness. In order to simplify this measurement the ratio proposed is that of the width of the lumen to the combined thickness of the walls between it and the lumen of the next cell. When cells are flattened radially the lumen becomes oval and will give a different ratio with the wall according to whether it is measured radially or tangentially; the radial measurement is suggested.

Proposed classes	
Name of class	Definition
Very thin	Lumen much greater than thickness of walls
Thin	Lumen greater than thickness of walls
Thick	Lumen less than thickness of walls
Very thick	Lumen almost completely closed

Recommendation

The foregoing classifications are proposed as a contribution toward the standardization of terms used in describing woods, and are recommended for consideration by the International Association of Wood Anatomists.

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3. L. Chalk and B. J. Rendle: *British hardwoods. Their structure and identification*. Bul. No. 3, Forest Products Research, Dept. Sci. & Ind. Res. and Imp. For. Inst., 1929, pp. 4–6.

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NOTE ON THE WOOD OF THE GENUS *GIRONNIERA*

By H. H. Janssonius

Handelsmuseum, Koloniaal Instituut, Amsterdam

My histological investigations of the woods of the Ulmaceae for the twelfth part of *Mikrographie des Holzes der auf Java vorkommenden Baumarten* included two species of *Gironniera*, namely, *G. subaequalis* Planch. and *G. cuspidata* Kunz. The differences noted in the anatomy of these woods clearly indicate that the two species do not belong to the same genus.

The wood of *G. subaequalis* closely resembles that of the various species of *Parasponia* and *Trema* so far examined; the parenchyma is very scarce and is exclusively paratracheal in a thin layer 1 to 3 (mostly 1) cells thick. This is additional evidence of the natural relationship of the three genera as set forth in Bentham & Hooker's *Genera Plantarum* (III, p. 344) and in Engler & Prantl's *Pflanzenfamilien* (III, 1, p. 63).

The wood of *G. cuspidata* is quite different. Its parenchyma is in numerous metatracheal layers and the bilateral bordered pits of the vessels have small borders—structures that I have not found elsewhere in this family or subfamily. On the basis of the wood of this species, *Gironniera* cannot be placed in the immediate neighborhood of *Trema* and *Parasponia*.

The authors cited above and also Smith in Kooders & Valeton's *Additamenta ad cognitionem Florae arboreae javanicae* (XII, p. 666) recognize two divisions of the genus *Gironniera*, namely, (1) *Nematostigma* Planch. and (2) *Galumpita* Blume (as a genus). *Gironniera subaequalis* belongs to the first group, *G. cuspidata* to the latter. The results of my investigations on the woods of the two species clearly indicate that they cannot properly be included within a single genus.[1]

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

At a meeting of wood anatomists in Paris on July 4, 1931, a constitution for this Association was adopted and the Organizing Committee was authorized to select the initial group of members (see *Tropical Woods* 27: 20, Sept. 1, 1931). Nominations were accordingly made by the several members of the committee and these names voted upon. The polls closed December 21, 1931, and 36 charter members or founders, representing 15 countries, were declared elected. They immediately proceeded to the election of a Council of not to exceed 12 members, whose term of office will be three years.

The first business of the Council will include the following items:

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[1] Examination of 11 specimens of four species of *Gironniera* in the Yale collections confirms the findings of Dr. Janssonius. *G. nervosa* Planch. and *G. subaequalis* (subgenus *Nematostigma*) have distinct, rather high, very coarse-celled rays, while *G. cuspidata* and *G. nitida* Benth. (subgenus *Galumpita*) have fine, low, rather small-celled rays. Tendency to the formation of metatracheal parenchyma was noted in the first group, esp. in *G. nervosa*. The parenchyma bands in both species of the second group are very distinct, suggesting some of the Leguminosae. Based upon the woods of twelve genera of the Ulmaceae, *Galumpita* appears closest to *Chaetacme*.—S. J. R.

(1) Election of a secretary-treasurer. Professor Record will continue meanwhile to act as secretary.

(2) Fixing of annual dues for the first three years. The Organizing Committee recommends that the amount be not less than one dollar or more than two dollars (U. S. A.) per annum.

(3) Formal election of Professor Henri Lecomte (France) and Professor J. W. Moll (Netherlands) as honorary members, as recommended at the Paris meeting.

(4) Consideration of nominations for membership.

(5) Appointment of committees for special projects.

Founders of the I. A. W. A.

Algeria

Dr. J. de Saint-Laurent, Station de Recherches Forestières du Nord d'Afrique, Alger.

Australia

Mr. Charles E. Carter, Australian Forestry School, Canberra.
Mr. E. H. F. Swain, Queensland Forest Service, Brisbane.
Mr. M. B. Welch, Technological Museum, Sydney.

Austria

Dr. Josef Kisser, Baumgartenstrasse 93, Vienna.

Belgium

Dr. Paul Ledoux, Institut Botanique Léo Errera, Brussels.

Brazil

Mr. Arthur de Miranda Bastos, Serviço Florestal do Brasil, Rio de Janeiro.
Mr. Fernando Romano Milanez, Serviço Florestal do Brasil, Rio de Janeiro.

Federated Malay States

Dr. F. W. Foxworthy, Forest Research Institute, Kapong, Selangor.

France

Mr. Jean Collardet, Comité National des Bois Coloniaux, 60 Rue Taitbout, Paris.

Germany

Prof. Dr. G. Bredemann, Institut für angewandte Botanik, Bei den Kirchhöfen 14, Hamburg.
Dr. Hans Meyer, Institut für angewandte Botanik, Bei den Kirchhöfen 14, Hamburg.
Dr. Edgar Mörath, Holzforschungsinstitut der techn. Hochschule, Darmstadt.

Great Britain

Mr. E. H. B. Boulton, University of Cambridge, Department of Forestry, Cambridge.
Dr. Laurence Chalk, Imperial Forestry Institute, University of Oxford, Oxford.
Mr. S. H. Clarke, Forest Products Research Laboratory, Princes Risborough, Bucks.
Dr. C. R. Metcalfe, Royal Botanic Gardens, Kew, Surrey.
Mr. B. J. Rendle, Forest Products Research Laboratory, Princes Risborough, Bucks.

Italy

Prof. Lodovico Piccioli, R. Instituto Superiore Forestale, Firenze.

Japan

Prof. Mitsunaga Fujioka, Tokyo Imperial University, Komaba.
Dr. Ryôzô Kanehira, Division of Forestry, Kyushu Imperial University, Fukuoka.

Netherlands

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Dr. J. R. Beversluis, Agricultural University, Wageningen.
Dr. H. H. Janssonius, Koloniaal Instituut, Abt. Handelsmuseum, Amsterdam.
Dr. J. Ph. Pfeiffer, Rhijnvis Feithlaan 3, Bussum.

Philippine Islands

Mr. Luis J. Reyes, Philippine Bureau of Forestry, Manila.

Switzerland

Prof. P. Jaccard, Pflanzenphysiol. Institut, Zurich.

U. S. A.

Prof. Irving W. Bailey, Bussey Institution for Research in Applied Biology, Harvard University, Forest Hills, Massachusetts.
Dr. Forest B. H. Brown, Bernice P. Bishop Museum, Honolulu, Hawaii.
Prof. George A. Garratt, Yale University School of Forestry, New Haven, Connecticut.
Dr. Eloise Gerry, U. S. Forest Products Laboratory, Madison, Wisconsin.
Prof. Edward C. Jeffrey, Biological Institute, Harvard University, Cambridge, Massachusetts.
Mr. Arthur Koehler, U. S. Forest Products Laboratory, Madison, Wisconsin.
Prof. Samuel J. Record, Yale University School of Forestry, New Haven, Connecticut.
Mr. Harry D. Tiemann, U. S. Forest Products Laboratory, Madison, Wisconsin.
Prof. Walter W. Tupper, Department of Botany, University of Michigan, Ann Arbor, Michigan.

THE YALE WOOD COLLECTIONS

The principal contributors to the Yale wood collections during the calendar year 1931 are as follows:

AFRICA, WEST: Mr. E. Parlongue, Brussels, Belgium (Belgian Congo); Mr. C. Vigne (Gold Coast).

AUSTRALIA: Mr. James A. G. Davey, New York; Queensland Forest Service, Canberra.

BRAZIL: International Paper Company, Glens Falls, New York.

BRITISH HONDURAS: Forest Department, Belize; Mr. C. L. Lundell, New York.

CHINA: Mr. Y. Tang, Peiping.

CUBA: Mr. G. C. Bucher, Santiago de Cuba.

GREAT BRITAIN: Dr. L. Chalk, Oxford; Royal Botanic Gardens, Kew.

HAITI: Service Technique d'Agriculture, Port-au-Prince.

JAVA: Mr. C. Van de Koppel, Buitenzorg.

MEXICO: Dr. Román S. Flores, Yucatan; Mr. J. G. Ortega, Mazatlán.

MICRONESIA: Dr. R. Kanehira, Fukuoka, Japan.

PARAGUAY: Field Museum of Natural History, Chicago.

PORTO RICO: Dr. N. L. Britton, New York.

SALVADOR: Dr. S. Calderón, San Salvador.

TASMANIA: Australian Forestry School, Canberra, Australia; Mr. James A. G. Davey, New York.

U. S. A.: Brooklyn Botanic Garden; Field Museum of Natural History, Chicago; Dr. R. M. Harper, Tallahassee, Florida; Dr. Irma Webber, Berkeley, Calif.

VENEZUELA: Mr. George Newhall, Berkeley, Calif.; Mr. H. Pittier, Caracas.

Recent Additions to Yale Wood Collections

During January 1932, the following authentic material was added to the Yale wood collections:

BRITISH NORTH BORNEO: 165 samples collected by Lt. Edward L. Foster on Mt. Kinabalu. Herbarium specimens not yet identified.

MICRONESIA: 168 samples collected by Dr. R. Kanehira. Seventeen of the genera were not previously represented at Yale.

BRAZIL: The first shipment of 47 samples obtained by Dr. Adolpho Ducke in the Lower Amazon region contains 20 genera new to the Yale collections. Six specimens are marked "sp. nov." and one, "gen. nov., sp. nov."

Yale Collectors in Colombia and Ecuador

When the editor visited the Santa Marta region of Colombia in January 1930 (see *Tropical Woods* 23: 9), tentative plans were made for later collecting in the Sierra Nevada range under the supervision of Mr. Henry Kuylen, of the United Fruit Company. Sr. Ramón Espina, a local teacher and an experienced collector, was selected to head a party which left for the mountains the latter part of December. The first shipment, received early in February, contained woods and herbarium material of 92 trees.

Dr. A. Rimbach, of Riobamba, Ecuador, reported on January 8 that he had just returned from a successful collecting trip to the coast.

Formation of "Stone" in the Wood of *Chlorophora excelsa*

Stony concretions are often found in the wood of *Chlorophora excelsa*, but the reason for their occurrence is not fully understood. The Agricultural Chemist for Uganda Protectorate has studied the ratio of "stone" to sap content in a number of different trees of that species and finds that it is not constant, thus proving that the stone is not formed by a simple drying of the sap. "However, the carbon and nitrogen content figures of the stone point definitely to organic origin, and the theory is favored that stone is formed from the sap flow at a wound, the tree exerting some form of preferential solution action." (Annual Rept. For. Dept., Uganda Protectorate, for 1930, p. 17.) Perhaps the Molisch theory with reference to deposits of calcium carbonate (*Tropical Woods* 12: 22) is applicable in this case.

CURRENT LITERATURE

Contribución al estudio de las palmas de Cuba. By HERMANO LEÓN. *Revista de la Sociedad Geográfica de Cuba* (Havana) 4: 2: 3–29, 1931. 7 plates.

The contribution consists of a monographic account of the palms of the genus *Copernicia* growing in Cuba. A key is provided for the 25 species, of which 14 are described as new, three of them being supposed hybrids. The genus consists of chiefly tall trees (there are many habit photographs of them in the paper) having fan-shaped leaves.

The name Jata usually is applied to the slender-boled species having brittle leaves of little value for their fibers. The term Yarey is given to those with thick and sometimes fusiform trunks, and tough leaves supplying fiber of good quality which is employed in Cuba for making hats and many other articles and formerly was exported in large amounts. The leaves have a thin coating of wax, and this, also, has been exploited commercially. It is a curious fact that although the Yareyes are so important commercially, they were entirely unknown to science until 1929!

Copernicia macroglossa H. Wendl. is the Guano Jata, whose wood is used in rural carpentry. *C. pauciflora* Burret is called Guano Espinoso and Guano Prieto. *C. clarensis* León, known as Guano Hediondo, is avoided by the native people, and several instances are known of its causing a persistent eruption upon the skin of collectors handling it, though whether the harm comes from the plant itself or from some insect living upon it has not been determined. The vernacular name for *C. gigas* Burret is Yareyón; those of *C. excelsa* León are Barrigón and Hediondo.—PAUL C. STANDLEY, *Field Museum of Natural History.*

Situation forestière de la Guadeloupe. By GRÉBERT. Congrés de la Production Forestière Coloniale et Nord-Africaine, Emp. Col. Int., Paris, 1931. Pp. 12; 6¼ x 9½.

A short account of the forests of Guadeloupe with reference to their occurrence and composition, the principal timbers and their local uses, and the need for conservation. Much of

the lumber consumed on the island is imported from the United States.

The composition of the forest varies according to the moisture content of the soil and also with respect to altitude. Thus Résolu and Palétuvier Jaune prefer the wet lowlands and the borders of streams back of the Mangrove (*Rhizophora*, *Conocarpus*, and *Pterocarpus*) association. Spanish Cedar and Mahogany do not extend above an altitude of 350 m., while the Laurier Rose is not found below an elevation of 600 m. Although there are between 200 and 300 species of trees in the forest, most of them are not utilized. The more important kinds are listed below.

CHECK LIST OF THE COMMON NAMES

Acajou blanc	*Simaruba amara* Aubl.	Simarubaceae
Acajou rouge	*Cedrela odorata* L.	Meliaceae
Balata rouge	*Oxythece Habnianum* Pierre	Sapotaceae
Bois bandé	*Richeria grandis* Vahl	Euphorbiaceae
Bois caconnier rouge	*Ormosia dasycarpa* Jacks.	Leguminosae
Bois côte noir	*Tapura guianensis* Aubl.	Dichapetalaceae
Bois de fer	*Ixora ferrea* Benth.	Rubiaceae
Bois de rose	*Cordia gerascanthus* L.	Boraginaceae
Bois d'Inde	*Amomis caryophyllata* (Jacq.) Krug & Urb.	Myrtaceae
Bois doux	*Phoebe elongata* Nees	Lauraceae
Bois gris	*Licania* sp.	Amygdalaceae
Bois jaune	*Aniba bracteata* Mez	Lauraceae
Bois marbré	*Richeria grandis* Vahl	Euphorbiaceae
Bois négresse	*Nectandra coriacea* (Sw.) Gris.	Lauraceae
Bois pistolet	*Guarea Perrottetii* Gris.	Meliaceae
Bois résolu	*Chimarrhis cymosa* Jacq.	Rubiaceae
Bois rouge	*Coccoloba barbadensis* Jacq.	Polygonaceae
Châtaignier grandes feuilles	*Sloanea Massoni* Sw.	Elæocarpaceae
Citronnier blanc	*Ilex sideroxyloides* Gris.	Aquifoliaceae
Courbaril	*Hymenæa courbaril* L.	Leguminosae
Cypre oranger	*Styrax glabrum* Sw.	Styracaceae
Ebène plaque minier	*Diospyros ebenaster* Retz.	Ebenaceae
Epineux blanc	*Zanthoxylum* sp.	Rutaceae
Gommier blanc	*Dacryodes hexandra* Gris.	Burseraceae
Goyavier montagne	*Myrcia deflexa* (Poir.) DC.	Myrtaceae
Gueppois	*Eugenia octopleura* Krug & Urb.	Myrtaceae
Icaque	*Hirtella triandra* Sw.	Amygdalaceae
Laurier rose	*Podocarpus salicifolia* Klotzsch & Karst.	Podocarpaceae

Mahogany	*Swietenia Mahagoni* (L.) Jacq.	Meliaceae
Mahot noir	*Guatteria ouregou* Dunal	Annonaceae
Marbri	*Richeria grandis* Vahl	Euphorbiaceae
Mauricif	*Byrsonima spicata* Rich.	Malpighiaceae
Merisier jaune	*Eugenia* sp.	Myrtaceae
Olivier montagne	*Cyrilla antillana* Michx.	Ericaceae
Palétuvier	*Conocarpus erecta* L.	Combretaceae
Palétuvier	*Rhizophora mangle* L.	Rhizophoraceae
Palétuvier jaune	*Symphonia globulifera* L. f.	Guttiferae
Poirier	*Tecoma pentaphylla* A. Juss.	Bignoniaceae
Pois doux	*Inga laurina* Willd.	Leguminosae
Pomme rose	*Eugenia Jambos* L.	Myrtaceae
Sapotiller	*Sapota Achras* Mill.	Sapotaceae

Colombia. Contribuciones del Herbario Nacional. By E. Pérez Arbeláez. *Revista de Industrias* (Bogotá) 7: 76/77: 680–681, Jan./Feb. 1931.

A list of plants added to the Colombian National Herbarium of the Ministry of Industries. Among the trees and shrubs listed are *Befaria ledifolia* H.B.K., Pega-pega or Pegamosco; *Datura arborea* L., Borrachero; and *Vallea stipularis* L.f., Raque.

Colombia. Informe del botánico al señor Ministro de Industrias. By E. Pérez Arbeláez. *Revista de Industrias* (Bogotá) 7: 76/77: 677–679, Jan./Feb. 1931.

A brief and general account by the botanist of the Department of Agriculture of the expedition made by the Scientific Commission to the Caquetá region of Colombia. The region consists of a series of hills covered by dense wet forest. There were collected about 700 herbarium specimens, representing 150 species of plants. It was difficult to obtain specimens because of the height of the trees, 20 to 30 meters or more, and in the case of Laurel Comino it was necessary to fell 15 large trees. The country people recognize the trees by the aspect and odor of the bark.

"But the chief obstacle in these forests is the ants. They are everywhere; they swarm on the branches; they rain down in showers when foliage is shaken, like an avenging spirit of the forest, immortal and omnipresent. Small and large, all are troublesome, and some, such as the *congas* or wasp ants that possess a poisonous abdominal sting, are dangerous."

The young and tender leaves of the tall Cumare Palm, *Astrocaryum vulgare*, have been utilized by the Indians for ages as a source of fiber for cordage and the manufacture of their famous hammocks. This spiny palm is abundant in the Orteguasa and Caquetá regions, and might become the basis of a profitable industry.

A species of *Caryocar* is called Maní in Caquetá, Almendrón in Tolima, and Achiotillo in Antioquía. It is a tree of 35 meters, furnishing excellent wood. The pulp of the fruit is used as a fish poison. The edible seeds are rich in oil, which is reputed a remedy for cutaneous diseases and even for leprosy. —Paul C. Standley, *Field Museum of Natural History*.

The Rubiaceae of Venezuela. By Paul C. Standley. Pub. 302, Field Museum of Natural History (Chicago); Botanical series 7: 4: 343–485, Oct. 12, 1931.

This account of the known Rubiaceae of Venezuela enumerates 81 genera and 351 species, numbers that undoubtedly are much smaller than those existing in the country, many parts of which are still unexplored botanically. Most of the plants listed are shrubs or trees. A key is provided for distinguishing the tribes and genera, and there are brief descriptions of the species. Under each species are listed all the specimens examined, from American and European herbaria.

The largest genus is *Psychotria*, with 68 species. The genus *Cinchona*, which reaches its northeastern limit in Venezuela, is represented by only three species.

Two new genera, *Duidania* and *Gleasonia*, are described. A large part of the numerous new species were collected on Mount Duida, an isolated peak comparable to Roraima, quite unknown botanically until it was explored by G. H. H. Tate. The species of Mount Roraima also form a peculiar and interesting element of the Venezuelan Rubiaceae. It is worthy of note that Mount Roraima, although commonly associated with British Guiana, probably because it usually is approached from that direction, really is shared also by Vene-

zuela and Brazil, whose boundaries meet those of British Guiana on the summit of Roraima.

CHECK LIST OF THE COMMON NAMES

Aguacatire or Aguatire	*Sickingia erythroxylon* Willd.
Araguato	*Calycophyllum candidissimum* (Vahl) DC.
Betún	*Calycophyllum candidissimum* (Vahl) DC.
Bosch marmel doos (Surinam)	*Duroia eriopila* L.
Botoncillo	*Borreria capitata* (R. & P.) DC.
Caá-jusará (Brazil)	*Duroia saccifera* (Mart.) Hook.f.
Cabrito negro	*Coutarea hexandra* (Jacq.) Schum.
Cafecillo de danta	*Faramea occidentalis* (L.) A. Rich.
Café de monte	*Palicourea* spp.
Campanilla	*Coutarea* spp.
Canillo de venado	*Rondeletia Purdiei* Hook.f.
Caruto	*Genipa* spp.
Chaparro bobo	*Palicourea rigida* H.B.K.
Cipo do sapo (Brazil)	*Relbunium hypocarpium* (L.) Hemsl.
Coralillo	*Hamelia* spp.
Cruceta	*Randia spinosa* (Jacq.) Karst.
Cruceta de sabana	*Rondeletia Purdiei* Hook.f.
Cruceta negra; C. real	*Randia spinosa* (Jacq.) Karst.
Cruceto	*Guettarda ambigua* DC.
Folha de comminâo (Brazil)	*Duroia saccifera* (Mart.) Hook.f.
Fruta de paloma	*Rudgea Hostmanniana* Benth.
Guacharaco	*Anisomeria polyantha* (Blake) Rusby
Guarichamaca	*Tocoyena foetida* Poepp. & Endl.
Jagua	*Genipa* spp.
Jazmín de estrella	*Faramea occidentalis* (L.) A. Rich.
Jazmín de Malabar	*Gardenia jasminoides* Ellis
Liane-acrochet (French)	*Uncaria guianensis* (Aubl.) Gmel.
Limón de piedra	*Borreria pygmæa* Spruce
Malabar	*Gardenia jasminoides* Ellis
Marmelade doosjes-boom (Surinam)	*Duroia eriopila* L.
Namú	*Tobagoa maleolens* Urban
Palo cucharo	*Sickingia erythroxylon* Willd.
Paraguatán	*Sickingia* spp.
Peo	*Tobagoa maleolens* Urban
Pepa de ratón	*Morinda roioc* L.
Quina	*Cinchona pubescens* Vahl
Quinaquina	*Ladenbergia undata* Klotzsch
Quipito hediondo	*Randia spinosa* (Jacq.) Karst.
Raicita	*Relbunium hypocarpium* (L.) Hemsl.
Ruivinha or Ruivinia (Brazil)	*Relbunium hypocarpium* (L.) Hemsl.
Sajadito	*Randia spinosa* (Jacq.) Karst.
You rouoari (Carib)	*Uncaria guianensis* (Aubl.) Gmel.

An enumeration of woody plants collected in Micronesia, Japanese Mandate, in 1929 and 1930. By RYÔZÔ KANEHIRA. *The Botanical Magazine* (Tokyo) 45: 534: 271–296, June 2, 1931; 45: 327–352, July 20, 1931. Reprinted, with consecutive paging and with index to scientific names.

"The first botanical collections made in this region were those of the Malaspina Expedition (Haenke and Nee) in 1792. Little further was done until after the islands came under the control of Germany in 1898. Since the islands came under Japanese mandatory no comprehensive botanical collections have been made, although some field work was done by representatives of Educational Department of Japan in 1914–15; this party, however, only made a few days' stop at the principal islands and scarcely penetrated the interior of any of the larger islands.

"With the help of His Excellency G. Yokota, the Civil Governor of the Japanese Mandate Territory, I collected plants in Palau and Ponape in the summer of 1929 and in Saipan, Tinian, and Yap in the summer of 1930. About 1263 numbers were secured, including herbaceous as well as the woody plants; the latter are enumerated in this preliminary report."

Flora of southeastern Polynesia. I. Monocotyledons. By FOREST B. H. BROWN. Bernice P. Bishop Museum Bull. No. 84 (Bayard Dominick Expedition Pub. No. 20), Honolulu, Hawaii, Sept. 1931. Pp. 194; 7 x 10; 35 plates, 18 text figs.

"During the period from April 16, 1921, to September 27, 1922, as botanist of the Bayard Dominick Expedition of Bernice P. Bishop Museum, it was the privilege of the author to spend 17 months in an intensive survey of the Marquesas, visiting all the inhabited islands."

"This treatise is based upon collections made by the writer supplemented by those of other collectors whose names appear in connection with the types and reference types cited after each description. The discovery of considerable new material in the collections obtained from the islands en route has made it necessary to identify numerous extra-Marquesan species and varieties before the systematic position of close

relatives in the Marquesas could be determined. The new data obtained are valuable, not only in connection with the taxonomic phases of the problem, but also in connection with the ecology of the Pacific floras and problems dealing with the migration of the Polynesians. Therefore it has seemed best to extend this treatise to include significant records from the Tuamotus, Austral Islands, and Rapa."

Plant Associations

"If it is true, as all evidences seem to indicate, that altitudes throughout the Marquesas are being appreciably reduced by submergence of land and surface erosion, then it is clear that the climate of the inhabited islands is gradually becoming warmer and more arid and that regions favorable for cold-climate associations and rain forests must be decreasing in area. At least five successive climatic zones may be distinguished in order as follows:

"1. High altitude, cold-climate vegetation, characterized by *Cladium nukuhivense*, *Gahnia*, *Carex tahitensis*, *Dianella*, *Astelia*, *Habenaria*, *Freycinetia*, *Weinmannia*, *Cheirodendron*, *Cyathodes*, *Vaccinium*, and *Lycopodium cernuum*. Only relics of this vegetation now occur.

"2. Rain forests, composed of tall tree ferns and angiospermous trees, are characterized by the luxuriant growth of epithytes (lichens, mosses, liverworts, *Hymenophyllum*, *Trichomanes*, *Acrostichum spicatum*, *Lycopodium phlegmaria*, *Peperomia*, *Procris*, *Liparis*) and an undergrowth of ferns, broad-leaved species of *Cyrtandra*, Lobelioideae, *Piper*, *Crossostylis*, *Alstonia*, *Pipturus*, and *Boehmeria*.

"3. Mesophytic forest, characterized by *Hibiscus*, *Pandanus*, *Zingiber zerumbet*, *Ceodes*, *Wikstroemia*, *Metrosideros*, *Santalum*, *Celastrus*, *Alphitonia*, *Terminalia*, *Campylotheca*, *Premna*, and *Celtis*. This zone extends down from the rain forest along the mesophytic slopes into the valleys. The clearings are occupied by *Gleichenia* (creeping fern), *Paspalum conjugatum*, and *Miscanthus japonicus*.

"4. Semiarid forest, characterized by *Myroxylon*, *Pelea*, *Sapindus*, *Dodonæa*, *Guettarda*, *Plectronia*, *Ficus marquisensis*, and *Casuarina*. This forest covers semiarid slopes, especially the shallow ravines and mild slopes of the semiarid grass belt in western Nukuhiva, western Hivaoa, and eastern Fatuhiva, and extends downward, in certain localities, along the grass-covered slopes of the coastal cliffs.

"5. Arid and semiarid grassland associations, characterized by endemic species and varieties of *Pennisetum* and *Eragrostis*, and *Aristida subspicata*. These grasses cover the coastal cliffs, the arid slopes of western Nukuhiva, and many of the smaller islands of the archipelago. The tall reed-like *Miscanthus japonicus* forms an almost impenetrable growth in extensive areas of the arid slopes of eastern Fatuhiva."

Species and Varieties of Monocotyledons

"The total number of species and varieties of monocotyledons found in the Marquesas, Rapa, Austral Islands, and the Tuamotus is 328. Excluding 191 varieties which have evidently originated in the region through native cultivation, there remain 137 indigenous and introduced species and varieties.

"The flora of the Marquesas comprises a total of 289 monocotyledons, of which 191 are varieties apparently derived by the Marquesans through cultivation of agricultural plants introduced by them. Of the 45 species and varieties that may be conservatively regarded as indigenous, 39 (84 per cent) are endemic. The indigenous monocotyledons are allied mainly to those of the Society Islands, Hawaii, and America; 33 per cent of the species and varieties having close allies in the Society Islands, 29 per cent in Hawaii, and 26 per cent in America. A slight affinity is indicated with Antarctica, New Zealand, Rapa, and Fiji.

"Of the 18 indigenous monocotyledons of Rapa and the Austral Islands, 15 (83 per cent) are endemic, 22 per cent have close relatives in the Society Islands, 22 per cent have close allies in the Marquesas, 11 per cent are Antarctic in affinities, and 11 per cent are Malaysian.

"The monocotyledons of the Tuamotus are of interest from their remarkably local distribution; 14 (87 per cent) of the indigenous species and varieties are endemic. Close affinities are shown with the coral islands of Polynesia and Malaysia."

Stamtafels voor rasamala. By H. E. Wolff von Wülfing. Korte Mededeelingen van het Boschbouwproefstation No. 19. Reprinted from *Tectona* (Buitenzorg, Java) 24: 4, 1931. Pp. 115; 6 x 9½. (Summary in English.)

Rasamala, *Altingia excelsa* Noronha (fam. Hamamelidaceae), is one of a series of commercial trees for which volume tables are being prepared by the Forest Research Institute in coöperation with the Working-plans Service. The number of trees measured in this instance was 243, although the results of only 174 of them could be used completely. The number will be gradually increased to about 500 for each species, and

crown measurements and other details will be added. The volume tables are divided roughly into two classes, namely, general and local. The first deals with the form and dimension of the bole without regard to existing methods of exploitation, while the other gives volumes based upon local methods of conversion and sale.

Rasamala occurs in parts of West Java and Sumatra at elevations of 600 m. and more where there is plenty of rain. It attains very large size and generally has a straight, well-formed bole. "The cards of the trees showed that the observers had discriminated between 'red' and 'white' Rasamala, a discrimination based on the color of the wood. An investigation of the distribution of the numbers and the frequency distributions for diameters and heights of the trees for red and white Rasamala showed that this discrimination resulted in a typical division and a real sorting according to diameter and height (red Rasamala being, on the average, thicker and higher than white). This does not prove that in this case different strains or varieties are present. It may be possible that the color of the wood in some way is related to the age of the tree."

Stamtafels voor poespa. By H. E. WOLFF VON WÜLFING. Korte Mededeelingen van het Boschbouwproefstation No. 21. Reprinted from *Tectona* (Buitenzorg, Java) 24: 5–6, 1931. Pp. 49; 6 x 9½. (Summary in English.)

Poespa, *Schima Noronhae* Reinw. (fam. Theaceae), occurs gregariously in the mountain forests of West Java. It may attain large size, is usually well formed, with no or very small buttresses. The timber is moderately durable and has a regular local market, being used principally for posts and beams of houses and for bridge building.

Volume tables were constructed on the measurements of 202 trees, the methods being the same as for Rasamala (see above). From the color of the wood and also from the color and the form of the leaves, three varieties were distinguished in the field, namely "white" Poespa, "red" Poespa, and Poespa without qualification; the red kind predominated. The differences in appearance are attributed to variations in conditions of growth.

De opening van het nieuwe gebouw voor het Boschbouwproefstation. Reprinted (with change of paging) from *Tectona* (Buitenzorg, Java) 24: 8/9; Aug./Sept. 1931. Pp. 203; 6¼ x 9½. Illustrated.

An account of the dedication of the new building of the Forest Research Institute at Buitenzorg on July 20, 1931. In addition to the speeches made on that occasion by Dr. H. Ten Oever and Dr. R. Wind, there are eight scientific contributions which serve to indicate the scope of the important investigations made at the Institute. The subjects and authors are as follows:

Bijdrage tot de bloembiologie van dem djati (*Tectona grandis*), by Ch. Coster, pp. 36–50 (with summary in German).

Doorlatendheidsonderzoek van gronden, by H. W. Japing, pp. 61–92 (with summary in German).

Een vergelijking van het djatiplantsoen met opstanden van Europeesche houtsoorten, by H. E. Wolff von Wülfing, pp. 93–133 (with summary in English).

Een voorbeeld van natuurlijke djativerjonging, by F. Kramer, pp. 135–151 (with summary in German).

Een nieuwe determinatie-methode, by A. T. J. Bianchi, pp. 152–161 (with summary in English).

Over het voorkomen van eenige bijzondere kenmerken bij Nederlandsch Indische houtsoorten, by L. G. den Berger and A. T. J. Bianchi, pp. 162–171 (with summary in English).

De proefbaanmetingen bij Besitang (Sumatra's oostkust), by F. H. Endert, pp. 172–202 (with summary in English).

Over het voorkomen van eenige bijzondere kenmerken bij Nederlandsch Indische houtsoorten. By L. G. DEN BERGER and A. T. J. BIANCHI. *Tectona* (Buitenzorg, Java) 24: 8/9: 894–903, Aug./Sept. 1931.

SUMMARY

"The authors of this article have been able to study the wood collection of the Forest Research Institute at Buitenzorg, which to date contains more than 15,000 samples of wood from all parts of the Dutch East Indian Archipelago, each authenticated by herbarium material from the same

tree. The lists of special features given in this article therefore may be regarded to be more or less complete for this region.

"All observations on which the lists are based were made with a ten-fold pocket lens. Only those genera are mentioned in which occur trees that normally reach a diameter of at least 20 cm.

"The features dealt with are: 1. Interxylary phloëm. 2. Tier-like structure or elements arranged in horizontal series visible on radial [?] surface. 3. Axial resin or gum ducts. 4. Radial resin or gum ducts and latex tubes. 5. Oil cells or mucilage cells. 6. Rays built up of alternate layers of cells with and without deposits. 7. Sulphur-yellow deposits in vessels. 8. Yellow or yellowish green discoloration of the wood. 9. Scalariform perforations in most or all vessels."

Some Antarctic beeches. By H. F. COMBER. *Gardeners' Chronicle* (London) 90 (3rd series): 2340: 348, Oct. 31, 1931; 2341: 364–366, Nov. 7, 1931. Illustrated.

The genus *Nothofagus* comprises one of the chief groups of the trees of the south temperate zone, the only other important genus being *Eucalyptus*. The species grow in all the southern continents, except South Africa, and support the theory of the former continuity of the antarctic continents. Species widely separated geographically have strange similarities and also similar parasites.

The genus is most important in South America, where eight species form hundreds of miles of dense forest in the cooler, moister parts of the southern Andes. Other species occur in New South Wales, Victoria, and Tasmania, and there are six species and numerous hybrids between them in New Zealand.

The best-known South American species is *N. antarctica* Oerst. called Nerie, which ranges from Tierra del Fuego north to Chillán, and eastward into the drier regions. It occurs at 2000–4000 feet as a tree, then gives way to the taller *N. pumilio* Reiche, but at 6000 feet reappears to form an almost impenetrable fringe to the forest for the next few hundred feet. The foliage in autumn is red and orange. Trees often are attacked by an orange-yellow fungus (*Cyttaria Darwinii*) that produces clusters as large as a small apple which are sweet and juicy and much eaten.

The Roble of Chile is *Nothofagus obliqua* Mirb., often more than 100 feet high and four feet in diameter; its lumber is fairly good and easily worked, but it warps considerably. *N. procera* Oerst. is called Rauli; its wood is lighter in color and cleaner and warps but little, selling for ten times the price of Roble. *N. pumilio* Reiche, which grows as a tree of 100 feet or as a sprawling shrub, is called Lenga; its wood is light, soft, and brittle, and decays easily. *N. Dombeyi* Blume is equally tall, and its trunk often 6–8 feet in diameter; its vernacular name is Coyghue.

N. Cunninghami Oerst. is called Myrtle in Tasmania. It likewise is the host of a *Cyttaria* that was eaten by the aborigines. The wood is close-grained and useful. *N. Gunnii* Oerst. of the mountain tops of Tasmania is a spreading shrub that is given the significant name of Tanglefoot.—PAUL C. STANDLEY, *Field Museum of Natural History*.

Australia. The functions of the Division of Forest Products. Trade Circular No. 4, Council for Sci. & Ind. Research, Div. of For. Products, Melbourne, 1931. Pp. 10; 6 x 9½.

The Division of Forest Products of the Council for Scientific and Industrial Research was created in July, 1929, and began its actual work about a year later. It is a Commonwealth organization concerned with research in utilization and is not a forestry department, although it coöperates with the State forestry organizations and the Commonwealth Bureau of Forestry. Its present activities are largely concerned with the collection of all existing data regarding the properties, treatment, and uses of Australian timbers and the application of this information to the practical solution of the problems of the forester and of the timber-using industries. The main sections of the work so far attempted are seasoning, utilization, preservation, and the anatomy and chemistry of wood.

Northern Rhodesia. Some important native timbers. By DUNCAN STEVENSON. *First Annual Bulletin of the Dept. of Agriculture, 1931* (Livingstone), pp. 43–52.

"Northern Rhodesia is consuming increasing quantities of

wood each year. In 1924 the value of timber and wood manufactures imported into the Territory was £18,626; by 1930 importations had risen to £214,525, or more than eleven and a half times as much as in 1924. Timber is a bulky and heavy commodity whose transport over any long distance, especially by rail, renders the price extremely high. It is therefore a matter of considerable economic importance to utilize local indigenous timbers as far as possible in order to reduce the importation of high-priced foreign material. Roughly 60 per cent of the total area of Northern Rhodesia is covered by forest growth, and, although these forest areas are rarely well-stocked and contain many species for which uses have not been found, they nevertheless constitute the raw material which, under scientific management, can be made to meet almost indefinitely many of the Territory's requirements in timber. There are certain classes of wood in which the indigenous forests are deficient, but it is hoped that plantations of suitable exotic tree species, based on experiments now being carried out in the Territory, will considerably reduce importations of those classes in the future and provide a more economical supply. The study of Northern Rhodesian timber trees, of their uses, of the localities where they thrive best, and of methods of improving and of regularizing their supplies, are matters deserving considerable attention, consequently it is hoped that the list of some of the more important native timbers will prove of interest and value to residents of the Territory."

This is followed by brief descriptions of 40 native trees, with their scientific and various vernacular names and notes on the properties and uses of their timber. (For a check list of many of these names see *Tropical Woods* 28: 39–41, Dec. 1, 1931.)

Afforestation in Northern Rhodesia. By Duncan Stevenson. *First Annual Bulletin of the Dept. of Agriculture, 1931* (Livingstone), pp. 53–55.

"An aspect of afforestation calling for particular attention in this Territory is that of meeting the permanent and probably increasing demand for softwoods by establishing plantations of suitable conifers as near as possible to the chief centers of consumption. It is also desirable to introduce fast-growing hardwoods for fuel, shelter belts, etc., on farms and municipal areas; and eventually to produce from plantations such high quality hardwood timber as the indigenous forests may not be able to supply.

"A considerable amount of experimental work is entailed in this connection. Over the greater part of the Territory the season of rainfall rarely exceeds four months and the quantity is very variable. The long dry season, frosts, insect pests, and abnormal periods of drought within the rainy season, provide some of the difficulties to be contended with in tree planting, consequently the depth and physical nature of the soil assumes a greater importance than under more favorable climatic conditions. Suitable species for different localities and varying soils have to be found by introduction and a study of their growth in each area."

Among the trees which seem to have the best prospects of success are the following: *Callitris calcarata*, *Cassia siamea*, *Cedrela Toona*, *Cupressus arizonica*, *C. lusitanica*, *Eucalyptus citriodora*, *E. robusta*, *E. rostrata*, *E. saligna*, *Grevillea robusta*, *Jacaranda mimosaefolia*, *Maesopsis Eminii*, *Pinus caribæa*, and *P. longifolia*.

Notes à propos de la limite Nord de la forêt tropicale dans la rêgion de l'Uele (Congo Belge). By É. de Wildeman. *Bulletins de la Classe des Sciences* (5e série) 17: 4: 494–503, 1931. Illustrated.

In this note the author returns to the subject of the extent of the tropical forest (closed high forest) in the Belgian Congo. In 1926, in "Les forêts Congolaises et leurs principales essenses economique," he gave a map indicating provisionally the limits of the tropical forest, and the present note, as the result of additional information received, deals more fully with the northern limits in the region of the Uele River, which flows westward into the Ubangi River, a northern tributary of the Congo. The sketch map covers an area from 2° to 5° N. and 23° to 31° E., and shows the distribution of the vegetation types in the central portion of this region.

The limits of the tropical forest are not clear cut, as extensions of it exist as galleries following the rivers into the savannah forest region. Towards its limits also, the forest type is unstable and easily altered by man. This is the case in the area between the Bomokandi and Uele Rivers, south of the Uele, which from the presence of Musanga and other indicators, may be regarded as covered by the remnants of tropical forest previously extending north to the Uele in this area, but recently altered by farming and prevented from reverting to tropical forest by annual fires. Repeated burning will transform this area into permanent savannah forest and, in places with poor soils, into savannah.

Borassus, *Elæis*, and bamboos are considered of uncertain value in judging the type, actual or past, as these species are widely introduced by man in this region. The best way to follow the changes in vegetation in the tension belts is by means of a series of aerial photographs, taken at intervals over the same area. The evidence available indicates that the area of tropical forest is being reduced by the encroachment of the savannah forest, a type of less economic value.—C. VIGNE, *Assistant Conservator of Forests, Gold Coast.*

Contribution à l'étude analytique de quelques bois coloniaux. By PIERRE MARMASSE. Pub. by Assn. Colonies-Sciences & Comité Natl. des Bois Coloniaux, 60 Rue Taitbout, Paris, 1931. Pp. 72; 6¼ x 9½. Price 10 francs.

This investigation was undertaken with a view to establishing the approximate composition of the following eleven species of wood found in the French colonies: African Mahogany, *Khaya ivorensis* A. Chev.; Angélique, *Dicorynia paraënsis* Benth.; Avodiré, *Turræanthus africana* Pellegr.; Azobé, *Lophira procera* A. Chev.; Dabéma, *Piptadenia africana* Hook.f.; Dina, *Dialium* aff. *connaroïdes* Harms; Evino, *Vitex pachyphylla* Baker; Iroko, *Chlorophora excelsa* B. & H. f.; Makoré, *Mimusops Heckeli* (Pierre) H. Lec.; Manil, *Symphonia globulifera* L. f.; and Teak, *Tectona grandis* L. f. These species are native to West Africa, with the exception of Angélique, which is found in French Guiana and northern Brazil, and Teak, which is native to Asia but has been planted

in Togo, Cameroons, and Indo-China. A specimen of Teak from Laos (Indo-China) was also included in the study. Brief descriptions of the trees and woods of these species are included.

The following quantitative determinations were made:

(a) Specific gravity (based on volume and weight at approximately 8 to 10 per cent moisture content).

(b) Moisture content (wood dried under vacuum in the presence of phosphorous anhydride).

(c) Fixed mineral matter (ash).

(d) Extractive principles soluble in water (inorganic and organic salts, tannins, gums).

(e) Extractive principles soluble in acetone (waxes, fats, oleoresins, resins).

(f) Pentosans (direct extraction by a slight modification of Brown's method).

(g) Celluloses (Cross & Bevan method).

(h) Lignins (adaptation of Willstäter's method to very hard woods).

The methods used in the analyses are discussed and the derived analytical data are tabulated for each determination, as well as being assembled in a general summary table.

The woods investigated were found to contain a high percentage of lignin, comprising from 29 to 43 per cent of the original weight of the wood. The three densest woods, *viz.*, Dina, Azobé, and Angélique, contained more than 40 per cent, but there was only a very rough relationship evidenced between lignin content and specific gravity. The carbon content of the derived lignins ranged from 60 to 64 per cent, the hydrogen content from 5.40 to 5.80 per cent.

The proportion of cellulose was found to vary between the limits of approximately 28 and 56 per cent of the original weight of the wood, and that of the pentosans from 2.75 to 21.80 per cent.

It is difficult to draw any general conclusions as to the relations existing between the different constituents of the woods analyzed. However, a curious fact noted is that Dina, which has the highest pentosan content of all of the woods investigated, is very low in cellulose (27.80 per cent), coin-

cident with exceptionally high specific gravity and lignin content.—GEORGE A. GARRATT, *Yale University School of Forestry*.

Variations in vessel pattern in a single trunk of *Entandrophragma cylindricum* Sprague. By M. M. CHATTAWAY. *Empire Forestry Journal* (London) 10: 2: 263–265, 1931. Illustrated.

"A strip of wood was cut out on the longest radius of the trunk (17 inches) and sections were made at intervals along it. The majority of these showed the normal structure associated with *Entandrophragma cylindricum*, but on one there was a patch of tissue where the pores were arranged in concentric bands, giving a ring-porous appearance to the wood. . . . The disc in question measured 32 inches by 25 inches. The apparently ring-porous wood did not extend right round the stem, but lay in an arc 6½ to 7 inches long, stretching from a point 7½ inches from the center of the tree on the longest radius to a point about 6 inches from the center midway between the longest and shortest radii. This arc was interrupted at one point for about half-an-inch, where the normal structure was resumed, immediately outside a pith fleck.

"The normal wood of *E. cylindricum* has moderate-sized vessels, scattered rather evenly through the wood, usually about 5 per sq. mm., solitary and in radial pairs, occasionally in groups of 3 or 4. The parenchyma is very abundant, surrounding the vessels as borders, usually 1, sometimes 2 or 3 cells wide, or as metatracheal bands. The distribution and width of these bands of parenchyma are rather variable, generally they are 4 to 6 cells wide, but occasionally fuse to give broad bands enclosing islands of fibres; narrow bands, often widely separated and apparently terminal, may occur singly or several bands together.

"This structure, with only the usual amount of variation in pore and parenchyma distribution, was found for the first 7 inches from the center of the disc on the radius examined, and was then followed by the apparently ring-porous zone. Here the bands of parenchyma were absent, though lines similar to the parenchyma lines were visible to the naked eye on the surface of the wood. Under the microscope these were seen to be bands of pores with their accompanying vasicentric parenchyma. There were seven such bands, and they contained nearly all the pores, only a few isolated pores lying between the bands. The vasicentric parenchyma was much reduced, usually only a few cells being present, either in a group on one side of, or scattered around, the pore. No other parenchyma was present in this region, but as soon as the region of normal distribution of the pores was reached abundant parenchyma again occurred."

Notes sur les forêts de l'Algerie. By H. MARC. Paris: Libraire Larose, 1930. Pp. 702; 7¼×9¼; 24 plates, 1 map.

An economic survey and history of the forests of Algeria, well supplied with graphs and tables showing the production, export and import of timber, revenue and expenditure, customs receipts, etc. No botanical notes are included. The whole is attractively illustrated with views of the country and forests, and there is a colored map showing the extent of exploitable forest and the railways.

The work is divided into nine parts, and a summary of the contents of these will indicate its scope. I. Receipts from all sources, showing a constantly increasing revenue from 1871 onwards. II. The cork industry; the export of cork products increased from 4½ million francs in 1915 to nearly 72 million francs in 1927. III. Imports and exports of timber; production; rail rates. IV. Forest works, and expenditure of loan funds. V. Forest fires, a serious problem in Algeria. VI. Concessions to the natives, grazing, minor produce. VII. Forest administration; additions and reductions in area under control. VIII. Supplementary work of the Forest Service. To this part is an "annexe" dealing with the esparto trade, which is controlled by the Forest Service. IX. Forest Service personnel: material; present organization; public relations.

This survey shows the benefits of a strong forest code, under which the forest resources of Algeria, rapidly being destroyed by fire and uncontrolled exploitation, have been conserved and improved. Much remains to be done, however; the author points out that the timber resources are not as large as

the area of forest would indicate. Of the 3,000,000 hectares classed as forest, perhaps two-thirds, owing to fire, over-grazing, and over-cutting, are good for the production of fire-wood only. The chief timber species are Oaks, Cedars, and Aleppo Pine.—C. VIGNE, *Assistant Conservator of Forests, Gold Coast.*

Notes on the Congrès Internationale du Bois et de la Sylviculture, Paris, 1931. By L. CHALK. *Empire Forestry Journal* (London) 10: 2: 259–262, 1931.

"This congress was held during the first week of July in the grounds of the French Colonial Exhibition and was attended by over 400 members, representing many nationalities, of which 25 were officially represented. The scope of the congress was rather unusual, as it included both the scientific and the commercial aspects of forestry and was particularly directed towards tropical problems. Originally two congresses —one on forestry and the other on tropical timbers—had been planned independently, but ultimately it was decided to combine the two. The emphasis on tropical forestry and tropical timbers was increased by the extraordinarily fine exhibits of French colonial timbers in the rooms where the sessions were held and throughout the exhibition; these created a very appropriate atmosphere."

"Two points about these timbers were particularly striking —the price and the absence of any attempt to pass them off as substitutes for old-established timbers. . . . It was very noticeable that the French have entirely discarded the practice of using artificial selling names, such as African Teak. Every wood is known by a distinctive name, almost invariably an adaptation from the vernacular. Each wood has thus become a separate entity with its own special needs in manufacture and the possibility of its own special market and price. This tendency was also noticeable in the designs used for the woods. A new timber needs new designs. Mahogany did not replace Oak in furniture as a cheaper substitute, but was used as an alternative which demanded and received entirely new treatment in the matter of design. The combination of a new design and a new timber can be extremely effective, whereas the use of a new timber in a form associated with another often merely achieves oddness."

Nos bois coloniaux. L'Exposition Coloniale Internationale, Paris, 1931. *La France Forestière et Industrielle* (Paris) 13: 19, October 10, 1931.

The entire number of this magazine (115 pages) is devoted to French colonial forests and timbers. It is profusely illustrated with photographs and maps. The two leading articles are "Nos richesses forestières coloniales," by Jean Méniaud, and "L'exploitation et l'utilisation rationnelle de nos forêts coloniales," by F. Cermak.

Een nieuwe determinatie-methode. By A. T. J. BIANCHI. *Tectona* (Buitenzorg, Java) 24: 8/9: 884–893, Aug./Sept. 1931.

"For this method a card is divided by lines into a number of squares or rectangles. On this card each species (or genus) to be included in the key gets its definite square, in which the name of the species is inscribed (if necessary abbreviated). . . . The card thus filled out is multiplicated (*e.g.*, printed) in a sufficient number. A few cards are printed on red paper, the rest on paper of an inconspicuous color, *e.g.*, white. For each feature to be used for identification a separate white card is prepared. The feature is written at the top of the card and the squares of all species which may show this feature are marked and then carefully cut out along the lines of demarcation.

"When using the card-system a red card is taken as a base; when a white 'feature-card' is laid on top of it, the species which may show the feature in question are to be seen in red through the holes of the white card. When a second feature card is added only the species showing both features remain red. Adding further cards, the number of red squares diminishes gradually, until at last only one red square remains, which gives the desired identification."

Several years ago the reviewer investigated a commercial form of selector card index and was convinced of its practicability in classifying and identifying woods. The idea is this: Suppose you had a round hole bored through all the cards in

your ordinary index and a steel rod passed through them. Then suppose, in the particular group you wanted to get at quickly, you had elongated that hole downward by punching a slot below it—wide enough for the rod to pass through, but a half-inch long. When you want these slotted cards you put the rod in place and turn over the card index, drawer and all. The rod will hold fast all cards that have round holes, but all the slotted cards will slide down the length of the slot. These are the cards desired. By using many holes, slots, and rods a very large number of combinations is possible. The practical difficulty in the application of this index to woods is in devising a scheme of classification which will include all the critical features without making the cards too large for convenient handling. The largest size of card the reviewer has seen is 8″ x 8″, with 196 holes one-half inch apart each way, thus allowing for 182 slots. While 182 classes may at first seem large, in reality it is very small. One realizes this when he notes that, for use in descriptions, Miss Chattaway (see p. 20 of this issue) proposes over 50 classes for numerical values alone of only three elements, namely, vessels, rays, and fibers. In order to include color, odor, taste, texture, density, types of pits and perforations, pore and parenchyma patterns, resin ducts, oil cells, and all the other important features, it is necessary to choose the classes with extreme care. Once this is done, the rest is very simple and easy. It is a project well worth the effort.

"White pine" again denied. By EMANUEL FRITZ. *Journal of Forestry* (Washington, D. C.) 29: 8: 1210–1212, Dec. 1931.

"In the October 1931 *Journal of Forestry* was reported the recent order of the Federal Trade Commission to the producers of lumber from *Pinus ponderosa* in the western states to cease and desist from further use of the trade names California White Pine, Arizona White Pine, and similar names when applied to the species in question. Twenty-three companies of Oregon, California, New Mexico, and Arizona immediately petitioned the Commission for a rehearing. On September 28, 1931, the Commission announced to the press that this petition had been denied.

"Thus ends the second phase of a celebrated nomenclature case, which doubtless will be carried further. In denying the rehearing the Federal Trade Commission shakes one's faith in its consistency and competence, for in almost the same breath, actually only two months earlier, it dismissed its proceedings in the even more celebrated 'Philippine Mahogany' case. The latter case was begun in 1925 on complaint of producers of genuine Mahogany. The Commission, in July 1926, ordered the dealers of the Philippine product to discontinue calling it Philippine Mahogany, and the Circuit Court of Appeals sustained the Commission, while the U. S. Supreme Court refused to review the case. [See *Tropical Woods* 15: 27, Sept. 1, 1928.] Then followed a protest of the Philippine hardwood dealers and producers to the Commission against its original findings, and new arguments were introduced. Last July, after six years of very costly trials and arguments, the Philippine hardwood dealers won their case.[1] But it was exceedingly good advertising and cheap as such.

"It seems that, if the Commission wishes to retain the confidence of the public, it should, when the 'White Pine' producers present their case again as did the Philippine producers and dealers, dismiss the complaint against them and permit them to call their wood a White Pine, in fact anything they wish, undesirable as either might be. Nor would it be inconsistent with its Philippine Mahogany decision to permit the continuance of the name 'Oriental Walnut' for the wood of *Endiandra Palmerstoni* of the family Lauraceae. Western

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[1] This is the first instance in which the Federal Trade Commission has reversed itself *after* an affirmative decision by the Circuit Court of Appeals. Before dismissing the complaints, the Commission exacted the following stipulation from each of the 14 respondents: "Respondent hereby stipulates and agrees that in its sale, description, and advertisement of the wood of the Philippine Islands, which it has heretofore designated and described as 'Philippine Mahogany' and articles of commerce made therewith, it will not employ the word 'Mahogany' in connection with the sale of said wood without the modifying term 'Philippine.'" The Commission gave no reasons for dismissing the complaints, but evidently it now holds that the modifying term "Philippine" is sufficient warning to the purchasing public that "Philippine Mahogany" is spurious.—S. J. R.

Yellow Pine (*Pinus ponderosa*) is much more nearly the equal of a true White Pine than any one of the several 'Philippine Mahoganies' is the equal of any species of true Mahogany (*Swietenia* spp.). At least Western Yellow Pine *is* a Pine; *none* of the Philippine woods in question are even closely related to true Mahogany botanically, and it takes a mighty stretch of the imagination to see in them the qualities and properties of true Mahogany.

"The case illustrates the great power of united action and the value of perseverance. The western 'White Pine' house is one divided against itself; the 'Philippine Mahogany' house was drawn into a powerful unity by its nomenclature vicissitudes.

"The first 'White Pine' order has already resulted in the merging of the two western Pine manufacturers' associations and the adoption of a new trade name, 'Ponderosa Pine,' for the lumber of *Pinus ponderosa*. Entirely aside from the merits of the case in the eyes of the Federal Trade Commission, economists, and technologists, there are many producers who believe that a trade name like California 'White Pine' is really not the business asset it has long been thought to be. Probably the 'Philippine Mahogany' producers will find the same to be true in their case when they try to get Mahogany prices for their wood. The public has come to the point where a trade name means a disguise or else a sum total of just nothing, and it has learned to inform *itself* rather than be informed by dealers."

Practical value of the botanical classification of wood. By Arthur Koehler. *Wood Working Industries* (Jamestown, N. Y.), Nov. 1931, pp. 23–24.

The author points out "that the classification and naming of lumber from a botanical standpoint is the best guarantee of desired quality and already is in everyday use in the lumber trade, that no other generally used basis for naming lumber is in existence, and that physical properties alone are not practical for classifying wood for the purpose of naming it, commercially or otherwise."

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Yale University School of Forestry

TROPICAL WOODS

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Yale University School of Forestry

TROPICAL WOODS

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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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THE COHUNE PALM AN *ORBIGNYA*, NOT AN *ATTALEA*

By PAUL C. STANDLEY

Field Museum of Natural History

The Cohune Palm, *Attalea cohune* Mart., is one of the most abundant and handsome trees of the wet Atlantic lowlands of northern Central America, growing in either swamps or uplands, and ranging from British Honduras and probably Quintana Roo southward to Honduras and perhaps also as far as Nicaragua or even Costa Rica. It does not grow on the Pacific coast of Central America, unless possibly in Guatemala, but it ranges northward through western Mexico to Jalisco, and is reported as particularly plentiful in the state of Oaxaca. In Panama and perhaps elsewhere the Cohune, called also Corozo and Manaca, is replaced by a palm of similar habit and appearance, *Attalea gomphococca* Mart.

Heretofore the Cohune has figured as the one Central American palm, besides the Coconut, regarding whose Latin name there could be no dispute, therefore it is more than ordinarily unfortunate that this belief proves to be a delusion. In the present instance, however, it is not a mere case of coining a new name for a well-known tree, but the reference of a palm to its proper genus, an altogether different matter.

Attalea cohune was known to Martius only or chiefly by fruits that he assumed to be those of an *Attalea*. Since they came from Honduras and since, as figured, they agree with those of the Atlantic coast Cohune, there can be no doubt as to the application of Martius' name.

While engaged in British Guiana in assembling the handsome palm material that now forms a unique exhibit in the botanical halls of Field Museum, Dr. B. E. Dahlgren observed a palm growing in the botanical gardens at Georgetown, labeled as *Attalea cohune*, and he was surprised to discover upon examination of the flowers that it was really a member of the genus *Orbignya*. Although there was little reason to question the accuracy of the label, it was necessary, in order to determine the status of *Attalea cohune*, to obtain for examination staminate flowers from the region where it is native. This proved to be no easy matter, especially because the staminate flowers fall as the spathe opens, and are seldom noticed. Staminate flowers collected at Punta Gorda, British Honduras, in February 1932 by Mr. W. H. Turner have now been received through Professor Samuel J. Record.

In these flowers the slender, pale anthers are contorted and spirally twisted in the manner characteristic of the genus *Orbignya*, and not at all of *Attalea*. Flowers of *Attalea gompbococca*, sent to Professor Record from the Canal Zone by Mr. J. E. Higgins, Director of the Canal Zone Experiment Gardens, are altogether different, the anthers being much smaller and not at all contorted. The Panamanian Corozo, and probably also that of Costa Rica, is, then, a true *Attalea*. Because of the importance of the palms involved, it has appeared desirable to place these facts on record without awaiting Dr. Dahlgren's return from a vacation.

While it is to be regretted that the name of the northern Corozo or Cohune must be altered, regret is tempered by

the fact that it is now possible to add another genus to the list of Central American palms. *Orbignya* of Martius has been supposed previously to be confined to South America, particularly Brazil and Bolivia. In order to determine the exact ranges in Central America of these two distinct Corozos, it will be necessary to collect the flowers and fruits, by either of which the two palms may be separated.

The proper name for the Cohune or Corozo of northern Central America and Mexico is the following:

Orbignya cohune (Mart.) Dahlgren, comb. nov. *Attalea cohune* Mart. Hist. Nat. Palm. 3: 300. pl. 167. 1836–50.

THE COHUNE PALM IN BRITISH HONDURAS

By Neil S. Stevenson

Conservator of Forests, Belize

The Colony of British Honduras is a coastal strip some 175 miles in length by 65 miles in breadth in its widest part, situated on the east coast of Central America and bounded on the landward side by the republics of Mexico and Guatemala. Roughly half of the total area is over 1000 feet in elevation, while 36 per cent ranges from sea level to 500 feet; the hill area is in the southwest part of the Colony. The annual rainfall varies from about 65 inches in the north to 150 inches or more in the south.

Occurrence of Cohune Palm

The Cohune Palm occurs extensively throughout the Colony from sea level to 1800 feet and is considered indicative of the climax forest type. It appears on all the various types of soil, namely, marls, limestones, granite and slate derivative soils, and on the Toledo beds, which are chiefly thin-bedded shales and mudstones.

In the low-lying northeastern plains the Cohune is in small congested patches called "corozals" from Corozo, its Spanish name. Such areas are obviously the old cayes of the time when the coastal plain was submerged, and the dense

growth is explained by the fact that the aboriginal Maya Indians never destroyed the palms in their cultivation of these cayes.

In the central coastal plain Cohune occupies the banks of the larger streams and, while it may extend back for upwards of a mile, it is generally confined to the levees.

In the rolling northwestern plain the palm is found typically in pockets of richer soil in the depressions and gives place on the ridges to the Bayleaf Palm, *Sabal excelsa*.

In the better drained lands of the south it occurs more extensively both on hills and in valleys, but there again its optimum development is on the richer soils of the depressions.

Uses and Commercial Possibilities

The Cohune plays an important rôle in the life of the forest laborer in the south of the Colony. He uses the leaves (fronds) for thatch, and the leaf stems for the sides of his house, the top of his table, and his bed. He obtains oil from the nuts and food from the heart of the "cabbage."

There have been many unsuccessful attempts to utilize the nuts and kernels commercially. Some concerns failed to crack the nuts satisfactorily, while others were unable to keep their mills running with erratic collections of nuts of wild palms.

Attention has again been focused on the commercial exploitation of this product since the Tropical Oil Products Company, Ltd., of California, commenced operations in the south of the Colony in November 1928. After years of testing in the Republic of Honduras they evolved a machine said to be capable of giving excellent results, but realizing that a mill can only be run economically if large supplies of nuts are readily available and accessible, their first work in British Honduras has been silvicultural in nature. They began by choosing areas of dense stocking from the lands made available to them, and proceeded to clear off all growth but Cohune.

Silviculture

The Cohune Palm growing in its natural habitat, tied up with creepers and lianas and suppressed by the surrounding

hardwood forest, does not generally bear fruit until its crown is free in the canopy, so that although it may be said that Cohune is plentiful in the forests it does not thereby imply that the nuts are lying on the ground in heaps several feet in depth. On the other hand in the riverain pastures, where Cohune Palms have been left for shade purposes and freed from all other vegetative competition, each plant bears prolifically.

A short cruise in Crown lands adjacent to the Company's property indicates that the stock of palms in raw forest is as follows:

Tall palms (bearing)	6.0 per acre
Medium-sized palms (bearing)	9.2 " "
Small palms (capable of bearing)	17.8 " "
Small palms (not immediately capable of bearing)	86.0 " "
Total	119.0 " "

From the foregoing figures it is obvious then that the silvicultural treatment in freeing palms from competition should result immediately in 33 palms per acre bearing fruit, while the remaining 86 palms per acre will, in the increased light, come rapidly into bearing. There is therefore ample scope for the formation of fully stocked "plantations" of some 40 palms per acre from the materials provided by nature. The problem now to be solved concerns the disposal of the slash produced by the fellings and in the cleaning of the second growth, which in that area of high rainfall encroaches rapidly and luxuriantly. Fire cannot be used as it hinders development where it does not kill, and it appears that intensive machete work is the only solution until the "plantations" are reduced to what are locally termed "Cohune pastures."

This silvicultural work on the Cohune has been suspended, owing to the general financial depression in the U. S. A., but it is sincerely to be hoped that better times will see the continuance of this valuable experiment. There appears to be no reason why, with such treatment, the Cohune forests of the Colony should not be made into a real commercial asset.

REVISION OF SOME AMERICAN SPECIES OF *CALOPHYLLUM*

By PAUL C. STANDLEY

Field Museum of Natural History

The species of *Calophyllum* native in Mexico and Central America are important because of their wood, which is of good quality and is utilized locally for a wide variety of purposes. The trees are known almost everywhere by the name Santa María, but Oviedo is authority for the statement that the "Santa" is superfluous, and the word María a modification of an indigenous, probably Carib, name of similar sound. In a Spanish country the addition of the "Santa" would be inevitable.

When the text of the *Trees and Shrubs of Mexico* was prepared, there were available in the U. S. National Herbarium very few specimens of *Calophyllum* from the region covered. There were separated and described two forms which, with the scant material at hand, seemed reasonably distinct. In more recent years there have accumulated numerous specimens from Central America, most of which have been determined by the writer as *Calophyllum Rekoi*. Recent casual examination of the material has revealed its great variability and suggested the possibility of further segregates, and it has therefore become necessary to study it with some care, in the hope of attaining a satisfactory disposition of it. It must be admitted that the results have been far from satisfactory.

Through the courtesy of Dr. William R. Maxon there has been lent for study the material in the National Herbarium, which with that in Field Museum gives 55 sheets for study. The majority of these are sterile, but examination of flowers of fertile specimens has not helped to solve the question of classification. The result of the study is summarized below.

Calophyllum longifolium Willd. *C. brasiliense* Camb., subsp. *longifolium* (Willd.) Vesque.—To this species are referred collections from Panama—Barro Colorado Island, Canal Zone; and La Palma, southern Darien, where the tree

is called María. Among Central American forms of the genus this may be recognized at once by the usually deeply emarginate apex and the thick texture of the leaves, which vary in outline from narrowly oblong to oval. There is uncertainty regarding the specific name, since authentic material of *C. longifolium*, described from Peru, is not at present available for comparison. If not that species, the Panama tree must represent an undescribed one.

Calophyllum brasiliense Camb., var. **Rekoi** (Standl.), comb. nov. *C. Rekoi* Standl. Contr. U. S. Nat. Herb. 20: 192. 1919. *C. chiapense* Standl. loc. cit.

The specimens referred here are exceedingly variable in leaf shape, and some of the forms, if isolated, appear obviously distinct, but when the whole series is reviewed, there are so many intermediate forms that it seems quite impossible or at least decidedly futile to group them. The flowers do not afford distinguishing characters, for they vary almost as much as the leaves. There remains, therefore, only the choice of a name to be applied to the Mexican and Central American trees, which may be considered as constituting an aggregate, variable unit.

The name *Calophyllum Calaba* L. has been used for the Central American tree, but that binomial relates to a tree of Ceylon, and is therefore excluded from consideration. The West Indian tree formerly called *C. Calaba* has been renamed *C. antillanum* Britton (*C. Jacquinii* Fawc. & Rendle is a synonym), and it has been suggested that the Central American tree is referable to that species. Strangely enough, the West Indian specimens, unlike the Central American, are almost mechanically uniform, exhibiting scarcely any variation in leaf form. They are unlike any of the Central American forms, however, in the relatively wide leaves, broadly rounded or slightly emarginate at the apex. As suggested by Vesque, the West Indian form is closely related to *C. brasiliense*, and there appears to be no good character, except the so often invoked "widely different range," by which it may be separated definitely from *C. brasiliense* It should be called, therefore, **C. brasiliense** Camb., var. **antillanum** (Britton), comb. nov.

The Central American forms evidently approach too closely the Brazilian *C. brasiliense* Camb., to which *C. lucidum* Benth. of British Guiana probably will have to be reduced. In the few specimens of *C. brasiliense* that I have seen, the costa of the leaf is sulcate on the upper surface almost or quite to the apex of the blade. In all the Central American specimens the costa is conspicuously elevated, at least above the middle of the blade and often almost from the base. This is the only constant character that I have been able to discover for separating the northern material from the Brazilian. Evidently such a character, unless bolstered by others, is scarcely of great systematic importance, and the northern forms at best can be assigned to no higher than varietal status.

The type of *C. Rekoi*, from Oaxaca, is a form with large and narrow leaves that can be matched fairly well by specimens collected as far south as Panama. The type of *C. chiapense*, from Chiapas, has much smaller but relatively little broader leaves, and it does not appear practical to recognize it as a distinct variety. Apparently, as a general rule, the leaves of flowering branches are decidedly smaller and often broader than those of sterile ones, although this is not invariably the case. In British Honduras, particularly, but also in other regions, there have been collected forms with small and relatively broad leaves, but they likewise merge almost insensibly into large-leaved or narrow-leaved forms. *Schipp No. 434* from British Honduras is a rather well-marked form with exceptionally narrow leaf blades, but not otherwise noteworthy. The length of the petioles in relation to that of the blades varies widely, but is not clearly associable with other variations. *Calderón No. 147* from Salvador is remarkable for its greatly elongated petioles.

The leaf blades of var. *Rekoi*, in distinction from those of var. *antillanum*, almost uniformly are acute or acutish, or at least bluntly protracted at the apex. Only very rarely are they rounded or markedly obtuse. In certain Guatemalan specimens they are even acuminate or long-acuminate.

It is possible that more ample material from Mexico and Central America will throw light on the relationship of all these variants, and make it possible to separate some of them specifically or otherwise. It is suspected, however, that further material will merely complicate the matter, and emphasize the futility of an attempt at their separation.

Calophyllum brasiliense, var. *Rekoi* occurs at chiefly low elevations on both the Atlantic and Pacific slopes from Mexico (Nayarit, Michoacán, Oaxaca, Veracruz, Chiapas) to Panama (Chiriquí). The following vernacular names are applied to it: Santa María (in general use; given also in the West Indies to var. *antillanum*); Leche de María (Chiapas); Palo María (Nayarit); Cimarrón, Cedro cimarrón (Oaxaca); Barillo, Marío, Varío (Salvador); María (Honduras, Panama).

SANTA MARÍA: A NEOTROPICAL TIMBER OF THE GENUS *CALOPHYLLUM*

By Edward C. Greene, Jr.

Student at the Yale University School of Forestry[1]

María and Santa María are the names most generally applied in Mexico, Central America, and the West Indies to large forest trees of the genus *Calophyllum* (fam. Guttiferae). The timber is well known locally and limited quantities have appeared from time to time in the markets of the United States and Great Britain. There has of late been a noticeable increase of interest in it on the part of dealers and consumers and there appears to be no reason why Santa María should not become a familiar timber of commerce.

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[1] This paper is condensed from a thesis submitted in partial fulfillment of the requirements for the degree of Master of Forestry. The work was done under the direction of Professors Record and Garratt. The timber test specimens were from two sources: (1) trade samples from Panama, furnished by the Williamson Veneer Company, Baltimore, Maryland; (2) authenticated samples from British Honduras, supplied by the Conservator of Forests, Belize. The herbarium material from the latter source was examined at the New York Botanical Garden, the U. S. National Herbarium, and Field Museum of Natural History and provided the occasion for Mr. Standley's proposed revision of certain species of *Calophyllum* as set forth in the paper preceding this.—Editor.

The common trade name is Santa María and this will probably be extended to include the produce of all of the different species and varieties found in tropical America. The name Birmah was coined by a New York importer for Santa María from British Honduras, but the term did not get established. Some efforts have been made to designate it as a kind of Mahogany—Chijole Mahogany, Brazilian Mahogany, etc.—but these misleading names are no longer in use.

The use of a single trade designation to include all of the American woods of the genus will doubtless prove justifiable, as the differences in the specimens studied do not indicate a greater range of variation than might be expected in the same species growing on different sites. That this close relationship, as evidenced by the wood, also holds for the morphological characters is shown by Mr. Standley's proposed new classification.

Common Names

Trade: Santa María (general). Bolivia: Balsamaría. Brazil: Guanandy, Jacareúba. British Guiana: Edaballi, Kurahura. British Honduras: Santa María. Colombia: Arbol de María, Chaqualo, María. Costa Rica: María. Cuba: Ocuje, María, Santa María. Dominican Republic: Baría, María, Santa María, Varilla. Dutch Guiana: Karahara, Kariraro, Koehora, Koerahara or Koeraharoe, Koerali, Koerarahara, Mani-kwaka, Penoga, Tamoené. Haiti: Dame-Marie, Galba, Mara. Honduras: María. Jamaica: Santa María. Guadeloupe and Martinique: Galba. Mexico: Barí, Barillo, Cedro Cimarrón, Leche de María, Limoncillo de Cordóba, María, Palo María, Santa María. Nicaragua: Krassa, Santa María. Panama: Calaba, Santa María. Porto Rico: Galba, María, Palo de María. Salvador: Barillo, Marío, Varillo. Trinidad: Galba, Galopa, Galpa. Venezuela: Cachicamo, María, Palo María.

Botanical Relationships

From the standpoint of the timber, the genus *Calophyllum* is the most important member of the Guttiferae—a large family widely distributed in the tropics of both hemispheres. About 100 species of *Calophyllum* have been described, most of them occurring in tropical Asia and Oceania; there is none in Africa, except on the island of Madagascar. Of the Asiatic species, the best known are *C. Inophyllum* L., called Palo María in the Philippines and Alexandrian Laurel in India, and *C. tomentosum* Wight of India that yields the Poon spars of commerce. The woods of both are used in shipbuilding, bridge work, railway ties, general construction, and machinery.

The Tree

Santa María occurs in the evergreen hardwood forests of the same general localities as Mahogany (*Swietenia*) and Spanish Cedar (*Cedrela*). In reference to British Honduras, Duncan Stevenson says of it (*Tropical Woods* 4: 13): "This is probably the commonest large tree in the mixed rain forests throughout the Colony and is found on all types of soil. It attains a height of 120 feet and, except in some of the Broken Ridge country, has a clean, straight bole. A girth of 10 feet is common and individual trees measuring over 20 feet in circumference are occasionally found. Boles 50 feet in length and squaring 24 inches are common.

"The bark varies in color from yellowish green on the young trees to yellowish gray on the older ones. It is marked with diamond-shaped fissures, rendering the trees easily distinguishable in the bush, and becomes more corrugated with age. When the bark is cut or crushed a yellow gum is obtained."

The leaves are opposite, simple, ovate, and entire, with very fine, parallel veining. The young leaves are much lighter in color than the old ones. The white, scented flowers are borne in short racemes. The fruits are round, green drupes. The seeds yield an oil suitable for illuminating purposes. The tree reproduces itself readily from seed, grows rapidly in youth, and is fairly tolerant of shade. The seedlings are tap-rooted and not easy to transplant. (See *Tropical Woods* 27: 27.)

The Timber

Duncan Stevenson says (*loc. cit.*, p. 14): "Three classes of

timber are recognized locally [in British Honduras], namely, the 'white' and the 'red,' which are of a very light to pink color and floatable, and the 'dark,' which is of a reddish color and not floatable. No way of distinguishing these classes before cutting has as yet been found.

"The wood is sometimes mistaken for Mahogany, being somewhat similar in color and often showing good figure, but it is heavier, stronger, and more lasting. On account of its durability it is used for the construction of logging trucks for hauling Mahogany and Logwood. It is also utilized for shingles, bridge stringers, trestle work and planking, beams, masts, heavy machine work, building constructions, and indoor trim. It is one of the best timbers for dugouts, or dories, and gives long service. . . .

"The timber ordinarily has a tendency to warp and split, unless mature and well seasoned. . . . The sawn timber, when properly stacked in the shade, has been found to behave fairly well. Rotary veneers have been obtained which give very handsome figure, but there is a tendency to flake which has not yet been overcome. The lumber would probably make excellent flooring, particularly if a successful system of seasoning were evolved."

Description of the Wood

Heartwood variable in color from pink to brick-red, marked with darker striping due to thin bands of parenchyma. Sapwood much lighter, generally well defined, although the line of demarcation from the heartwood is not always sharp. Luster rather low, but the wood takes a good polish. Odor and taste not distinctive.

Specific gravity (based upon oven-dry weights and volumes of 29 test specimens), 0.52 to 0.62. Weight, air-dry (based upon 6 test specimens), 30 to 33 lbs. per cu. ft. Grain usually interlocked or crossed; sometimes straight. Texture medium; fairly uniform. Sawed surfaces have a harsh feel.

Wood works fairly easily, but the thin parenchyma layers cause it to "pick up" rather badly when planed on the tangential surface; with proper treatment yields a very

smooth surface. Not difficult to saw or to bore, holds nails and screws firmly, has good gluing qualities, and takes stain and varnish well. All lumber intended for use in heated rooms should be thoroughly kiln-dried.

Gross Anatomy

Growth rings poorly defined; sometimes indicated by differences in density or in color or by apparently terminal parenchyma. Pores readily visible, mostly oval and solitary, disposed in diagonal rows or chains. Vessel lines fine, but distinct; tyloses present. Parenchyma in irregular bands of uneven width; not visible without lens on cross section, but may produce a noticeable pattern on longitudinal surfaces, particularly the tangential. Rays very fine; invisible to unaided eye on cross section and inconspicuous on radial.

Minute Anatomy

Vessels with simple perforations; tyloses thin-walled; intervascular pits small, screw-head type and apparently are not cribriform.[2] Rays mostly uniseriate, occasionly 2 or 3 cells wide in median portion; up to 32 cells high; heterogeneous, the interior cells distinctly procumbent, the marginal ones large and squarish to slightly upright; dark gum deposits abundant; pits into vessels large, simple, often vertically elongated. Wood parenchyma cells large, in bands few to several cells wide, which frequently touch but do not include the vessels. Wood fibers in fairly definite radial rows; walls rather thick; lumina often filled with gum; pits with small borders and slit-like exserted apertures. Gum ducts absent.

Measurements: Tangential diameter of vessels, 120 to 280μ, av. 200μ. Length of vessel members, 0.38 to 1.00 mm., av. 0.61 mm. Length of wood fibers, 0.60 to 1.60 mm., av. 1.21 mm. Height of tallest rays 0.60 to 0.84 mm

Mechanical Properties

Timber tests were made in the Yale laboratory on two lots of four bolts each from the following sources: (1) Commercial material (Yale No. 20,765) of an unknown species of *Calophyllum* from Panama, donated by the Williamson Veneer

[2] Cribriform pits (so-called) were reported by Ursprung for *Calophyllum Inophyllum* L., and I thought that I recognized them in American woods of this genus (see *Tropical Woods* 2: 11), but recent investigations lead me to believe that the dotted appearance of the membranes was due to the presence of foreign particles.—S. J. R.

Company, Baltimore, Maryland; (2) authenticated specimens of *Calophyllum brasiliense* Camb., var. *Rekoi* Standl. supplied by the Conservator of Forests of British Honduras, together with the following data regarding the tree:

Tree No. 2. Co-dominant in several-storied, sub-climax rain forest of natural origin, characterized by a canopy of scattered large trees with interstices of canopy filled by Cohune Palm and with underwood of Cohune and Cabbage Palms and species of *Rinoria* and *Mouriria*; located in small, sheltered valley at about 400 ft. elevation above sea level, along Middlesex tramline, on red brown, semi-lateritic loam, 3 to 4 ft. deep overlying granite. Tree felled September 8, 1931; specimens extracted November 14 following. Age unknown. Height: to top, 133 ft.; to crown collar, 62 ft.; to base of 4-ft. bolt from which test specimens were cut, 21 ft. Girth: at heart height, 133 in.; at crown collar, 100 in. Crown full and vigorous. Bark clean. Stem sound, except for occluded branch at 40 ft.

The British Honduras specimens were received in a virtually green condition and were tested without seasoning. Those from Panama, being already partially seasoned, were carefully air-dried before testing, and the strength values were adjusted to a uniform moisture content of 12 per cent by means of the correction factors given on page 45 of U. S. Department of Agriculture Bulletin No. 556. The methods of testing are those of the U. S. Forest Service and conform to the standards adopted by the American Society for Testing Materials and approved by the American Standards Association (Part 2, 1927 Book of Standards, Am. Soc. Test. Mat., Philadelphia).

Results of the tests are summarized in the accompanying tables. Since the amount of material was limited, the tabulated values should be considered merely as indices of the approximate strength of Santa María, rather than true average strength values. The results obtained from the tests on air-dry timber from British Honduras are in substantial agreement with those derived in 1923 by the Imperial Institute on Santa María timber from that country. (See *Bulletin of the Imperial Institute* (London) 21: 4.)

RESULTS OF TESTS ON UNSEASONED SANTA MARÍA

Kind of test	*Maximum*	*Minimum*	*Mean*
A. Static bending:			
Maximum calculated shear (lbs. per sq. in.)	380	310	360
Modulus of rupture (lbs. per sq. in.)	10,680	8,520	9,910
Fiber stress at elastic limit (lbs. per sq. in.)	6,690	6,140	6,310
Modulus of elasticity (1000 lbs. per sq. in.)	1,614	1,381	1,535
Elastic resilience (in.-lbs. per cu. in.)	1.80	1.33	1.46
Sp. gr. (wt. and vol. oven-dry)	0.57	0.59	0.58
B. Compression parallel to grain:			
Crushing strength (lbs. per sq. in.)	5,000	5,380	5,160
Fiber stress at elastic limit (lbs. per sq. in.)	4,350	4,950	4,850
Modulus of elasticity (1000 lbs. per sq. in.)	1,623	1,425	1,507
Elastic resilience (in.-lbs. per cu. in.)	7.55	6.48	6.87
Sp. gr. (wt. and vol. oven-dry)	0.52	0.52	0.52
C. Compression perpendicular to grain:			
Fiber stress at elastic limit (lbs. per sq. in.)	750	590	640
Sp. gr. (wt. and vol. oven-dry)	0.58	0.56	0.57
Sp. gr. (wt. oven-dry, vol. green)	0.51	0.49	0.50
D. Hardness:			
End (lbs.)	1,010	960	990
Side (lbs.)	900	800	860
Sp. gr. (wt. and vol. oven-dry)	0.58	0.56	0.57
E. Shearing strength parallel to grain:			
Radial (lbs. per sq. in.)	1,180	980	1,060
Tangential (lbs. per sq. in.)			1,330
F. Tensile strength perpendicular to grain:			
Radial (lbs. per sq. in.)	670	470	560
G. Cleavage strength:			
Radial (lbs. per in. of width)	350	280	320

NOTE: No. of specimens: A, C, D, and G, 4; B and E (radial), 3; E (tang.), 1.

RESULTS OF TESTS ON AIR-DRY SANTA MARÍA

Kind of test	*Maximum*	*Minimum*	*Mean*
A. Static bending:			
Maximum calculated shear (lbs. per sq. in.)	510	370	460
Mod. of rupture (lbs. per sq. in.)	14,220	10,450	12,650
Fiber stress at elastic limit (lbs. per sq. in.)	9,800	7,460	8,740
Modulus of elasticity (1000 lbs. per sq. in.)	1,789	1,551	1,695
Elastic resilience (in.-lbs. per cu. in.)	2.69	1.75	2.20
Sp. gr. (wt. and vol. oven-dry)	0.57	0.53	0.55
B. Compression parallel to grain:			
Crushing strength (lbs. per sq. in.)	6,760	6,590	6,670
Fiber stress at elastic limit (lbs. per sq. in.)			5,060
Modulus of elasticity (1000 lbs. per sq. in.)			1,619
Elastic resilience (in.-lbs. per cu. in.)			7.84
Sp. gr. (wt. and vol. oven-dry)	0.55	0.53	0.54
Sp. gr. (wt. oven-dry, vol. air-dry)	0.53	0.49	0.51
C. Compression perpendicular to grain:			
Fiber stress at elastic limit (lbs. per sq. in.)	1,250	1,170	1,210
Sp. gr. (wt. and vol. oven-dry)	0.57	0.53	0.55
Sp. gr. (wt. oven-dry, vol. air-dry)	0.52	0.50	0.51
D. Hardness:			
End (lbs.)	1,480	1,210	1,370
Side (lbs.)	990	760	870
Sp. gr. (wt. and vol. oven-dry)	0.62	0.52	0.56
E. Shearing strength parallel to grain:			
Diagonal (lbs. per sq. in.)	1,580	1,420	1,480
F. Tensile str. perpendicular to grain:			
Diagonal (lbs. per sq. in.)	332	333	332
Radial (lbs. per sq. in.)			333
G. Cleavage strength:			
Diagonal (lbs. per in. of width)	460	440	450
Radial (lbs. per in. of width)			340

NOTE: Values adjusted to moisture content of 12 per cent. No. of specimens: A, B, (in part), and D, 4; E and F (diag.), 3; G (diag.), 2; others, 1.

TREES OF THE SIERRA NEVADA DE SANTA MARTA [1]

By RAMÓN ESPINA *and* JUAN GIACOMETTO

Santa Marta, Colombia, South America

The Sierra Nevada de Santa Marta occupies the northern portion of the Department of Magdalena, Republic of Colombia, S. A. It is bounded on the north by the Caribbean Sea; on the east by the basins of the Calancala and César Rivers, which flow in opposite directions; on the south by an alluvial strip of land connecting the basin of the César with that of the Ariguaní; and on the west by the Ariguaní and what is known as the Santa Marta Valley. The mountains attain a maximum height of 5500 (some say 6000) meters above sea level. Beyond elevations of 4000 to 4200 meters is a region perpetually covered with snow and supplying vast quantities of frigid water to most of the rivers of the Department.

VEGETATIVE ZONES

Starting from the base, the Sierra Nevada can be considered as being divided into six horizontal and parallel zones, as outlined below. In all of the zones there is a fairly well marked rainy season from April to December and a dry season from January to April.

First Zone (few to 500 meters). This zone is the most extensive on account of its being the base of the cone or pyramid. The average temperature is about 28° C., and the rainfall is scanty. The slopes are very steep and there is almost no rich top soil except in the hollows and along the banks of the rivers where "meadows" (*vegas*) are formed. The vegetation is directly affected by the character of the soil and by the scarcity of water so that trees attain considerable size only along the banks of the rivers or other damp places.

Second Zone (500 to 1000 meters). The terrain is generally much broken, the slopes often precipitous, and the beds of the turbulent streams very deep. The average temperature

[1] Introduction translated from the Spanish by Mr. L. R. Sawyer, Santa Marta District of the United Fruit Company.

is about 23° C. Rainfall is abundant during the wet season, but usually entirely absent the rest of the year, as is also the case in the zone previously described. There is a very thin layer of rich top soil. There is a considerable growth of trees in places where the subsoil is favorable to their development.

Third Zone (1000 to 2000 meters). The climate is spring-like, the average temperature ranging, according to elevation, from about 22° to 15° C. Rainfall varies, but as a rule it is frequent. There have been years, like the past one for instance, during which 22 inches of water have fallen in a single month. The torrential rains wash the soil from the steeply inclined ground, but in general it is not so thin as in the two lower zones, and the vegetation is highly developed.

Fourth Zone (2000 to 3000 meters). The average temperature varies with the altitude between 15° and 10° C. Rainfall is abundant. The top soil is scanty on account of the very steep slopes. The vegetation gradually decreases in height as the elevation rises and the effects of the lower temperature become noticeable. At 3000 meters the growth is predominately shrubby.

Fifth Zone (3000 to 3800 meters). The temperature varies from 10° to 5° C. Rainfall is abundant. Trees are few and shrubs numerous. At 3200 meters appear the bleak plateaus (*páramos*) covered with grass not over 80 cm. high. Topsoil is scanty and granite rock appears at a little depth. At 3800 meters vegetation completely disappears.

Sixth Zone (above 4000 meters). For the first 200 meters or so are immense masses of bleak granite fringing the perpetually snowclad crests of the mountains above. This snow is continually melting and feeds the streams which in all directions water the slopes of the Sierra Nevada and finally reach the lower part occupied by tropical forests.

Localities of Collections

Excursions for collecting wood samples and botanical specimens were made by the writers in the latter part of December 1931 and in January and part of February 1932 for the Yale University School of Forestry in coöperation with the United Fruit Company.

In total, 308 specimens were obtained. Samples bearing the numbers 1 to 30 came from the Matojiro Valley, 50 to 500 meters above sea level; Nos. 31 to 92, from the Cerro del Campo, 200 to 500 meters elevation, near the Matojiro Valley. Nine others, Nos. B1A to B9A are also from this region, but collected at a different time.

A new series, Nos. A1 to A207, was collected at higher elevations, 500 to 3000 meters. Minca, María Teresa, Mundo Nuevo, and Río Jabalí (La Victoria) are in the second zone. Cincinati, Bellavista, El Campano, Vista de Nieve, and Río Toribio are located in the second zone, while the Cerro Quemado and San Lorenzo localities are in the third. All three districts are situated in the northeastern angle of the Sierra Nevada, the portion nearest to the city of Santa Marta.

Valley of the Matojiro.—Alluvial lands formed by detritus of top layers, of which the principal ones are as follows: red sandstone bound with clay; gray sandstone, very friable, composed of coarse sand of felspathic origin mixed with dark mica-like particles and horn-blende; yellow clay turned to reddish in the low parts and mixed with rocky detritus of deposits higher up, seldom forming layers of homogeneous material. These alluvial deposits frequently are augmented by the introduction of rocks of volcanic origin, and a characteristic feature is the presence of large granitic blocks erratically disposed as if left by glaciers. For the most part the lands of this valley are low in fertility on account of the lack of moisture, and for the same reason and due to the fact that humus is almost absent, vegetation is poorly developed. Rainfall in this valley is limited during the months of from May to December; and during the rest of the year there is none at all. The average temperature is about 28° C.

Minca, Río Jabalí (La Victoria), and María Teresa.—The formations of this zone are all of sedimentary origin. Layers of red and light clays, some strongly magnesian, are frequently crossed by outcrops of slightly ferruginous quartz. The most noticeable feature of the rock is the felspar.

Rainfall in this zone is more abundant than in the preceding, particularly in the higher portions (at 1000 m.) where it rains copiously from April to December. As happens in the preced-

ing zone, there is no precipitation at all during the rest of the year. Even though the top soil is not very thick, the vegetation in this zone is fairly vigorous. The slopes of the ground are steep, and due to clearings and to torrential rains, big landslides occur from time to time.

Cincinati, Río Toribio, etc.—These localities are on the slope of San Lorenzo. The formation is sedimentary as in the preceding, but composed of a denser and more homogeneous material. Argillaceous, micaceous, and carbonaceous schists form the greater part of the hills of Cincinati and Vista de Nieve, alternating with stretches of amorphous quartz and yellow ferruginous clays formed by a variety of limonite. The top layer is scanty, but due to the great humidity the vegetation is very luxuriant. In this zone the rainfall in a single month (November 1931) amounted to 22 inches.

The formations higher up on the slope of San Lorenzo (Cerro Quemado and San Lorenzo) are densely metamorphosed schists, which have been transformed into gneiss and, in turn, greatly altered by tectonic upheavals. In various places the ferruginous schist has been transformed into hematite and forms typical agglomerates.

The top layer of soil of these upper portions is scanty and it is only in the basins of the creeks that there is any ground suitable for the growth of plants. Owing, however, to low temperatures at such heights, plants lose their luxuriance and disappear, except for various sorts of Ericaceae, such as small Rhododendrons and the so-called Cebolleta.

Rainfall is more abundant in this zone than in the preceding and gives rise to the rivers that supply water to Santa Marta and Gaira.

List of the Specimens Collected [3]

AMYGDALACEAE

Hirtella americana L. Guamo mestizo. No. A15 (Y. 20,790), Minca.

ANACARDIACEAE

Anacardium rhinocarpus DC. Caracolí. No. A203 (Y. 20,978), María Teresa and Mundo Nuevo region.

[3] Determinations by Paul C. Standley.

Astronium Planchonianum Engler. Quebracho. No. 61 (Y. 20,510), Cerro del Campo region.

Spondias mombin L. Jobo blanco; J. de castilla; Pedro Hernández. Nos. 35 (Y. 20,484) and 66 (Y. 20,515), region of Cerro del Campo; No. A51 (Y. 20,826), Cincinati region.

APOCYNACEAE

Aspidosperma ellipticum Rusby. Amargo; Chivato; Macuiro. No. 28 (Y. 20,477), Matojiro Valley; No. 81 (Y. 20,530), Cerro del Campo region.

Rauwolfia heterophylla R. & S. (?). Cruceta. No. 47 (Y. 20,496), Cerro del Campo region.

ARALIACEAE

Didymopanax Morototoni (Aubl.) Dcne. & Pl. Yarumero. No. A12 (Y. 20,787), Minca region.

Gilibertia amplifolia I. M. Johnston. Banco. No. A48 (Y. 20,823), Cincinati region.

Sciadodendron excelsum Gris. Maduro plátano. No. 20 (Y. 20,469), Matojiro Valley region.

BIGNONIACEAE

Tabebuia pentaphylla (L.) Hemsl. Coralibe. No. A201 (Y. 20,976), María Teresa and Mundo Nuevo region.

Tecoma stans (L.) H. B. K. Roble amarillo. No. 26 (Y. 20,475), Río Jabalí region.

BOMBACACEAE

Bombax barrigon (Seem.) Dcne. (?). Majagua. No. 6 (Y. 20,455), Matojiro Valley region.

Quararibea sp. No. A60 (Y. 20,835), Cincinati region.

BORAGINACEAE

Cordia alba (Jacq.) R. & S. Uvita. No. 16 (Y. 20,465), Matojiro Valley region.

Cordia alliodora (R. & P). Cham. Canalete de humo. No. A34 (Y. 20,809), Río Jabalí region.

Cordia sericicalyx A. DC. Muñeco; M. canalete. Nos. A49 (Y. 20,824) and A65 (Y. 20,840), Cincinati region.

Cordia sp. Canalete de humo. No. 69 (Y. 20,518), Cerro del Campo region.

BRUNELLIACEAE

Brunellia comocladiifolia H. & B. Jobo macho de tierra fría; Majagüito de tierra fría. Nos. A151 (Y. 20,926) and A169 (Y. 20,944), Cerro Quemado region.

BURSERACEAE

Bursera graveolens Tr. & Pl. Bija. No. 74 (Y. 20,523), Cerro del Campo region.

Bursera Simaruba (L.) Sarg. Almácigo. No. 5 (Y. 20,454), Matojiro Valley.

Bursera tomentosa (Jacq.) Tr. & Pl. CARAÑA. No. 56 (Y. 20,505), Cerro del Campo region.

CAPPARIDACEAE

Capparis odoratissima Jacq. OLIVO. No. B9A (Y. 20,991), Matojiro region.

Crataeva tapia L. NARANJITO. No. 63 (Y. 20,512), Cerro del Campo.

CELASTRACEAE

Maytenus myrsinoides Reiss. ARIZÁ; CAMARÓN; CANEY. Nos. 41 (Y. 20,490), 77 (Y. 20,526), and 79 (Y. 20,528), Matojiro Valley region.

CHLORANTHACEAE

Hedyosmum Bonplandianum H. B. K. MALIBÚ MORADO. No. A159 (Y. 20,934), Cerro Quemado region.

CLETHRACEAE

Clethra lanata Mart. & Gal. NÍSPERO MACHO. No. A68 (Y. 20,843), Bellavista region.

COCHLOSPERMACEAE

Cochlospermum vitifolium (Willd.) Spreng. PAPAYOTE. No. 34 (Y. 20,483), Cerro del Campo region.

COMPOSITAE

?**Senecio** sp. PAPECILLO. No. A161 (Y.20,936), Cerro Quemado region.

Verbesina helianthoides H. B. K. TABACO MACHO. No. A152 (Y. 20,927), Cerro Quemado region.

CUNONIACEAE

Weinmannia pinnata L. ARENILLO. No. A39 (Y. 20,814), Las Partidas region.

ELÆOCARPACEAE

Sloanea sp. No. A94 (Y. 20,869), Río Toribio; No. A188 (Y. 20,963), near San Lorenzo.

ERYTHROXYLACEAE

Erythroxylon densum Rusby. MANZANITA DE ROSA. No. 64 (Y. 20,513), Cerro del Campo region.

Erythroxylon orinocense H. B. K. CAGUIMO; HUEVO DE ZUIDERE. No. 30 (Y. 20,479), Matojiro Valley; No. 82 (Y. 20,531), Cerro del Campo.

EUPHORBIACEAE

Alchornea grandiflora Muell. Arg. (?). No. A162 (Y. 20,937), Cerro Quemado region.

Alchornea sp. LÁTIGO. No. A30 (Y. 20,805), Río Jabalí; No. A40 (Y. 20,815), Las Partidas; No. A91 (Y. 20,866), Río Toribio region.

Croton gossypiifolius Vahl. BALSILLO. No. A9 (Y. 20,784), Minca region.

Croton panamensis Muell. Arg. BERENGENO; GENGIBRE ARBORESCENTE. No. A158 (Y. 20,933), Cerro Quemado; No. A185 (Y. 20,960), near San Lorenzo.

Hieronyma laxiflora (Tulasne) Muell. Arg. No. A63 (Y. 20,838), Cincinati; No. A104 (Y. 20,879), Vista de Nieve region.

Hura crepitans L. CEIBA DE LECHE. No. 48 (Y. 20,497), Cerro del Campo region.

Jatropha urens L. PRINGAMOZA DE MONTE. No. 72 (Y. 20,521), Cerro del Campo region.

Manihot Pittieri Pax & Hoffm. YUCA ESCORSONERA. No. 59 (Y. 20,508), Cerro del Campo region.

Phyllanthus conami Sw. ACEITE. No. A6 (Y. 20,781), Minca region.

Phyllanthus nobilis (L.) Muell. Arg. PINTURERO; YAYO or LLALLO. Nos. 33 (Y. 20,482) and 75 (Y. 20,524), Cerro del Campo region.

Sapium Hippomane Meyer (?). PIÑICO. No. A105 (Y. 20,880), Vista de Nieve region.

FLACOURTIACEAE

Casearia nitida (L.) Jacq. (?). CUCHILLO; VARA BLANCA. No. 2 (Y. 20,451), Matojiro Valley; No. 68 (Y. 20,517), Cerro del Campo region.

Hasseltia lateriflora Rusby. CABO DE HACHA. Nos. A116 (Y. 20,891), A120 (Y. 20,895), and A149 (Y. 20,924), Cincinati region.

Xylosma prunifolium Gris. CORONA. No. 49 (Y. 20,498), Cerro del Campo.

GUTTIFERAE

Chrysochlamys membranacea Tr. & Pl. HUEVO DE TANGA; SANGRE DE TORO. No. A25 (Y. 20,800), Río Jabalí; No. A115 (Y. 20,890), Cincinati; No. A187 (Y. 20,962), near San Lorenzo; No. 193 (Y. 20,968), Cerro de la Danta.

Clusia alata Pl. & Tr. COPEI DE PIRAMO; C. NEGRO. No. A144 (Y. 20,919), Cincinati; No. A181 (Y. 20,956), near San Lorenzo.

Clusia oblanceolata Rusby. COROCITO DE TITÍ. No. A165 (Y. 20,940), Cerro Quemado region.

Clusia popayanensis Tr. & Pl. MANGLE DE MONTAÑA; RAPABALBO. No. A4 (Y. 20,779), Minca region.

HYPERICACEAE

Vismia guianensis (Aubl.) Pers. CAIMITO; CARATE; SAN FRANCISCO; SANGREGADO DE TIERRA FRÍA. No. A3 (Y. 20,778), Minca; No. A41 (Y. 20,816), Las Partidas; No. A83 (Y. 20,858), Bellavista region.

ICACINACEAE

Calatola costaricensis Standl. VENENITO. No. A146 (Y. 20,921), Cincinati region.

LAURACEAE

Croton panamensis Muell. Arg. OREGANITO. No. A157 (Y. 20,932), Cerro Quemado region.

Nectandra globosa (Aubl.) Mez. LAUREL BLANCO; L. LUNA; SINCOGOLLO. No. A47 (Y. 20,822), Cincinati; No. A81 (Y. 20,856), Bellavista; No. A101 (Y. 20,876), Vista de Nieve region.

Nectandra Moritziana Klotzsch. POMPADUR. No. A175 (Y. 20,950), near San Lorenzo.

Nectandra pichurim (H. B. K.) Mez. GUAYABO PIMIENTO. Nos. A56 (Y. 20,831) and A119 (Y. 20,894), Cincinati; Nos. A92 (Y. 20,867) and A97 (Y. 20,872), Río Toribio region.

Nectandra sp. ACHIOTE MACHO; LAUREL NEGRO. Nos. A52 (Y. 20,827) and A136 (Y. 20,911), Cincinati region.

Ocotea sp. AMARILLO; BALAUSTRE DE TIERRA FRÍA; LAUREL MORADO. No. A28 (Y. 20,803), Río Jabalí; Nos. A53 (Y. 20,828), A137 (Y. 20,912), and A147 (Y. 20,922), Cincinati; No. A184 (Y. 20,959), near San Lorenzo; No. A192 (Y. 20,967), Cerro de la Danta region.

Persea americana Mill. AGUACATE. No. 21 (Y. 20,470), Matojiro Valley region.

Persea caerula (R. & P.) Nees. AGUACATILLO. No. A13 (Y. 20,788), Minca region.

Persea sp. No. A170 (Y. 20,945), Cerro Quemado region.

Phoebe cinnamoniifolia Nees. LAUREL HIGUITO. No. A1 (Y. 20,776), Minca region.

LEGUMINOSAE

Acacia sarmentosa Dcne. GUACAMAYO. No. 13 (Y. 20,462), Matojiro Valley region.

Acacia sp. AROMO. No. 17 (Y. 20,466), Matojiro Valley region.

Andira inermis H. B. K. MAJAGUA GALLINA; PELOTO. Nos. 91 (Y. 20,540) and B1A (Y. 20,983), Matojiro Valley region.

Caesalpinia ebano Karst. (?). LUMBRE. No. 43 (Y. 20,492), Cerro del Campo region.

Calliandra magdalenae Benth. TAMARINDO DE MONTE. No. 7 (Y. 20,456), Matojiro Valley region.

Cassia bacillaris L. PLANTANITO. No. A17 (Y. 20,792), Minca region.

Cassia biflora L. BOMBITO. No. 92 (Y. 20,541), Cerro del Campo region.

Cassia emarginata L. CARANGANITO. No. 4 (Y. 20,453), Matojiro Valley region.

Cassia grandis L. f. (?). GROSELLA MACHO. No. A19 (Y. 20,794), Minca region.

Clitoria Fendleri Rusby. No. A18 (Y. 20,793), Minca region.

Coursetia arborea Gris. RAMONCILLO. No. 37 (Y. 20,486), Cerro del Campo region.

Enterolobium cyclocarpum (Jacq.) Gris. OREJERO. No. B5A (Y. 20,978), Matojiro region.

Erythrina rubrinervia H. B. K. CANTA GALLO; PERONIO. No. 53 (Y. 20,502), Cerro del Campo; No. A87 (Y. 20,862), Río Toribio region.

Gliricidia sepium (Jacq.) Steud. MATA RATÓN. No. 14 (Y. 20,463), Matojiro Valley region.

Hymenæa Courbaril L. ALGARROBO. No. 19 (Y. 20,468), Matojiro Valley region.

Inga edulis Mart. GUAMO. No. A85 (Y. 20,860), Río Toribio region.

Inga spuria H. & B. GUAMO ARROYERO. No. B3A (Y. 20,985), Matojiro region.

Inga sp. GUAMO COLORADO. No. A109 (Y. 20,884), Vista de Nieve region.

Leucaena trichodes (Jacq.) Benth. CAÑAFÍSTULA DE MONTE. No. 85 (Y. 20,534), Cerro del Campo region.

Lonchocarpus latifolius H. B. K. PAPO DE ZAMBA. No. 83 (Y. 20,532), Cerro del Campo region.

Lonchocarpus punctatus H. B. K. MAHOMO; PRIETO. Nos. 51 (Y. 20,500) and 71 (Y. 20,520), Cerro del Campo region.

Machaerium Moritzianum Klotzsch. SIETE CUEROS BLANCO; S. C. ESPINOSO. No. 55 (Y. 20,504), Cerro del Campo; No. A206 (Y. 20,981), María Teresa and Mundo Nuevo region.

Pithecolobium cauliflorum Mart. GUAMO MACHO. No. A72 (Y. 20,847), Bellavista region.

Pithecolobium cochleatum Mart. CALENTURA. No. 84 (Y. 20,533), Cerro del Campo region.

Pithecolobium dulce (Roxb.) Benth. OJITO DE NENA. No. B8A (Y. 20,990), Matojiro region.

Pithecolobium saman (Jacq.) Benth. CAMPANO. No. A202 (Y. 20,977), María Teresa and Mundo Nuevo region.

Platymiscium polystachyum Benth. TRÉBOL. No. 3 (Y. 20,452), Matojiro Valley region.

Pterocarpus heterophyllus Pittier. SANGRE DE DRAGO. No. 29 (Y. 20,478), Matojiro Valley region.

Undetermined. AMARILLO. No. 76 (Y. 20,525), Cerro del Campo region.

Undetermined. MATE. No. A102 (Y. 20,877), Vista de Nieve region.

LYTHRACEAE

Grislea secunda Loefl. GUAYABITO DE CERRO. No. A207 (Y. 20,982), María Teresa and Mundo Nuevo region.

MALPIGHIACEAE

Bunchosia argentea (Jacq.) DC. MUÑECO. Nos. A46 (Y. 20,821) and A61 (Y. 20,836), Cincinati; Nos. A107 (Y. 20,882) and A111 (Y. 20,886), Vista de Nieve region.

MELASTOMACEAE

Henriettella verrucosa L. CAMASEY NEGRO; C. PELUDO. Nos. A123 (Y. 20,898) and A150 (Y. 20,925), Cincinati; No. A196 (Y. 20,971), Cerro de la Danta region.

Meriania longifolia Cogn. No. A62 (Y. 20,817), Cincinati region.

Miconia calvescens DC. CAMASEY MORADO. No. A155 (Y. 20,930), Cerro Quemado region.

Miconia dodecandra (Desr.) Cogn. CAMASEY; C. ESQUINADO; MORTIÑO. Nos. A38 (Y. 20,813) and A43 (20,818), Las Partidas; No. A82 (Y. 20,857), Bellavista region.

Miconia floribunda DC. (?). No. A98 (Y. 20,873), Río Toribio region.

Miconia lepidota DC. No. A27 (Y. 20,802), Río Jabalí region.

Miconia minutiflora DC. JAYO MACHO. No. A96 (Y. 20,871), Río Toribio.

Miconia spicellata Bonpl. CANILLA DE VENADO. No. A11 (Y. 20,786), Minca region.

Miconia sp. Árnica; Camasey; C. amarillo; Tintillo. Nos. A163 (Y. 20,938) and A164 (Y. 20,939), Cerro Quemado; Nos. A176 (Y. 20,951) and A189 (Y. 20,964), near San Lorenzo.

Ossæa micrantha Macfad. No. A135 (Y. 20,910), Cincinati region.

Undetermined. Cordoncillo negro. No. A180 (Y. 20,955), near San Lorenzo.

MELIACEAE

Cedrela mexicana Roem. (?). Cedro Caoba; C. cebollino. No. A35 (Y. 20,810), Río Jabalí; No. A45 (Y. 20,820), Cincinati region.

Guarea fulgens Karst. Guacharaco de tierra fría. No. A177 (Y. 20,952), near San Lorenzo.

Guarea guara (Jacq.) P. Wils. Zambo cedro. No. A8 (Y. 20,783), Minca region.

Guarea humilis Bert. No. A24 (Y. 20,799), Río Jabalí region.

Trichilia hirta L. Pata de vaca. No. 11 (Y. 20,460), Matojiro Valley.

MORACEAE

Brosimum columbianum Blake (?). Guáimaro comestible; Mondongo. Nos. 44 (Y. 20,493) and 80 (Y. 20,529), Cerro del Campo region.

Brosimum sp. Hoja verrugosa; Vara de pedra. No. A75 (Y. 20,850), Bellavista; Nos. A114 (Y. 20,889), A129 (Y. 20,904), and A130 (Y. 20,905), Cincinati region.

Cecropia arachnoidea Pittier (?). Guarumo morado. No. A198 (Y. 20,973), Cerro de la Danta region.

Cecropia sp. Guarumo. No. 10 (Y. 20,459), Matojiro Valley region.

Chlorophora tinctoria (L.) Gaud. Mora. No. 1 (Y. 20,450), Matojiro Valley region.

Ficus nymphæifolia L. Higuerón blanco. No. A69 (Y. 20,844), Bellavista region.

Ficus panamensis Standl. (?). Jaguey. No. A36 (Y. 20,811), Las Partidas.

Ficus radula Willd. Higuerón blanco. No. 8 (Y. 20,457), Matojiro Valley region.

Ficus Tonduzii Standl. Guaimarito; Higuerón negro. No. A50 (Y. 20,825), Cincinati; No. A89 (Y. 20,864), Río Toribio region.

Ficus velutina H. B. K. Copei de tierra fría. No. A64 (Y. 20,839), Cincinati region.

Ficus sp. Copei. No. 58 (Y. 20,507), Cerro del Campo region.

Inophloeum armatum (Miq.) Pittier. Cucuá. No. A33 (Y. 20,808), Río Jabalí region.

Trophis racemosa (L.) Urban. Guáimaro lechoso; Pan y cacao. No. 73 (Y. 20,522), Cerro del Campo; No. A118 (Y. 20,893), Cincinati region.

MYRSINACEAE

Ardisia foetida Willd. Guayabo fruta de pava; Huesito; Tacaloa. No. 23 (Y. 20,472), Matojiro Valley; Nos. 62 (Y. 20,511) and 89 (Y. 20,538), Cerro del Campo region.

Conomorpha peruviana A. DC. Caimito macho; Olivo. No. A171 (Y. 20,946), Cerro Quemado; No. A200 (Y. 20,975), Cerro de la Danta region.

Grammadenia sp. Aguacatillo de tierra fría. No. A153 (Y. 20,928), Cerro Quemado region.

MYRTACEAE

Eugenia Jambos L. Manzanita de rosa prieta. No. A2 (Y. 20,777), Minca region.

Eugenia oblongifolia Sagot. Vara real. No. 42 (Y. 20,491), Cerro del Campo region.

Eugenia roraimana Berg. Nos. A127 (Y. 20,902) and A131 (Y. 20,906), Cincinati region.

Eugenia sp. Arrayán de tierra fría; Guayabo colorado hoja menuda; G. de león; Raiján. No. 24 (Y. 20,473), Matojiro Valley; No. A14 (Y. 20,789), Minca; No. A106 (Y. 20,881), Vista de Nieve; No. A143 (Y. 20,918), Cincinati region.

Myrcia sp. Guayabo macho. No. A32 (Y. 20,807), Río Jabalí; No. A93 (Y. 20,868), Río Toribio; No. A99 (Y. 20,874), Vista de Nieve region.

Psidium Sartorianum (Berg) Ndzu. Guayabito pirú. No. 78 (Y. 20,527), Cerro del Campo region.

Undetermined. Guayabito. No. A166 (Y. 20,941), Cerro Quemado.

NYCTAGINACEAE

Pisonia macranthocarpa Donn. Smith. Pegapega. No. B7A (Y. 20,989), Matojiro region.

Torrubia fragrans (Dum. Cours.) Standl. Estribo. No. 67 (Y. 20,516), Cerro del Campo; No. A110 (Y. 20,885), Vista de Nieve region.

OLACACEAE

?Heisteria sp. Café macho; Cascarilla amarilla; C. negra; Huesito negro de tierra fría. No. A23 (Y. 20,798), Río Jabalí; Nos. A59 (Y. 20,834), A124 (Y. 20,899), and A145 (20,920), Cincinati; No. A103 (Y. 20,878), Vista de Nieve region.

Ximenia americana L. Caimito de monte; Espino de brujo. Nos. 60 (Y. 20,509) and 65 (Y. 20,514), Cerro del Campo region.

OPILIACEAE

Agonandra brasiliensis B. & H. Caimancillo; Hoja menuda. Nos. 45 (Y. 20,494) and 50 (Y. 20,499), Cerro del Campo region.

Undetermined. No. A108 (Y. 20,883), Vista de Nieve region.

PIPERACEAE

Piper aduncum L. Cordoncillo; C. verde. No. A5 (Y. 20,780), Minca; No. A112 (Y. 20,887), Vista de Nieve region.

Piper geniculatum Sw. Cordoncillo de tierra fría. No. A58 (Y. 20,833), Cincinati region.

Piper sp. Cordoncillo gigante. No. A122 (Y. 20,897), Cincinati region.

POLYGALACEAE

Monnina phytolaccifolia H. B. K. No. A156 (Y. 20,931), Cerro Quemado.

POLYGONACEAE

Coccoloba Candolleana Meisn. HUESO DE NEGRO. No. 87 (Y. 20,536), Cerro del Campo region.

Coccoloba leptostachya Benth. JUAN GARROTE; J. GARROTE PRIETO. No. 32 (Y. 20,481), Cerro del Campo; No. A10 (Y. 20,785), Minca region.

Coccoloba sp. GUARA; TACALOA. No. A73 (Y. 20,848), Bellavista; No. A95 (Y. 20,870), Río Toribio region.

Triplaris americana L. VARA SANTA. No. A16 (Y. 20,791), Minca region.

Undetermined. CARDO SANTO. No. A79 (Y. 20,854), Bellavista region.

PROTEACEAE

?Roupala sp. ZAMBO CEDRO HEMBRA. No. A77 (Y. 20,852), Bellavista region.

ROSACEAE

Parinarium pachyphyllum Rusby. PEREHUÉTANO. No. B2A (Y. 20,984), Matojiro region.

RUBIACEAE

Calycophyllum candidissimum (Vahl) DC. GUAYABO COLORADO; G. JOVEROSO. No. 27 (Y. 20,476), Matojiro Valley; No. A20 (Y. 20,795), Minca region.

Chimarrhis sp. LOMO DE CAIMÁN. No. A54 (Y. 20,829), Cincinati region.

Chomelia spinosa Jacq. CHOCOLATICO. No. 36 (Y. 20,485), Cerro del Campo region.

Coffea arabica L. CAFÉ. No. A100 (Y. 20,875), Cincinati region.

Coussarea grandifolia Rusby. MANZANO NEGRO. No. A138 (Y. 20,913), Cincinati region.

Faramea cestroides Standl. BRASIL DE TIERRA FRÍA. No. A140 (Y. 20,915), Cincinati region.

Genipa americana L. JAGO. No. 52 (Y. 20,501), Cerro del Campo region.

Guettarda roupalifolia Rusby. FRUTA DE PAVA. No. 39 (Y. 20,488), Cerro del Campo; No. A67 (Y. 20,842), Bellavista; No. A132 (Y. 20,907), Cincinati.

Holtonia myriantha Standl., comb. nov. BLANQUITO; HUESITO DE TIERRA FRÍA. No. A22 (Y. 20,797), Río Jabalí; No. A66 (Y. 20,841), Cincinati region.

?Ixora sp. CARRETILLO AMARILLO; CIMBREADERA. No. 90 (Y. 20,539), Cerro del Campo; No. A205 (Y. 20,980), María Teresa and Mundo Nuevo region.

Palicourea crocea (Sw.) R. & S. MALIBÚ. No. A57 (Y. 20,832), Cincinati region.

Palicourea sp. No. A179 (Y. 20,954), near San Lorenzo.

Posoqueria latifolia (Rudge) R. & S. MANZANA AMARILLA. A121 (Y. 20,876), Cincinati region.

Psychotria Fendleri Standl. FRUTA DE PAVA DE TIERRA FRÍA. Nos. A71 (Y. 20,846) and A76 (Y. 20,851), Bellavista region.

Psychotria longirostris (Rusby) Standl. No. A195 (Y. 20,970), Cerro de la Danta.

Psychotria sanmartensis Rusby. HUESITO AMARILLO. No. A29 (Y. 20,804), Río Jabalí; No. A194 (Y. 20,969), Cerro de la Danta.

Psychotria sp. ANONCITO DE TIERRA FRÍA. No. A128 (Y. 20,903), Cincinati region.

Randia aculeata L. MARÍA ANGOLA. No. 86 (Y. 20,535), Cerro del Campo region.

Sickingia cordifolia Hook. f. PIGINIO. No. 46 (Y. 20,495), Cincinati region.

RUTACEAE

Zanthoxylum microcarpum Gris. BARBASCO. No. A84 (Y. 20,859), Río Toribio region.

Zanthoxylum sp. MAPURITO; TACUELO DE TIERRA FRÍA. No. 38 (Y. 20,487), Cerro del Campo; No. A113 (Y. 20,888), Vista de Nieve region.

SAPINDACEAE

Cupania americana L. GUACHARACO. No. A7 (Y. 20,782), Minca region.

Matayba scrobiculata Radlk. CULO DE INDIO; LIJO. No. 57 (Y. 20,506), Cerro del Campo; No. A139 (Y. 20,914), Cincinati region.

Melicoccus bijugatus Jacq. MAMÓN COTOPLIX; M. DE CASTILLA; M. DE LECHE; M. DE MICO. Nos. 18 (Y. 20,467) and 22 (Y. 20,471), Matojiro Valley; No. 31 (Y. 20,480), Cerro del Campo; No. B6A (Y. 20,988), Matojiro region.

SAPOTACEAE

Lucuma Espinae Standl., sp. nov. (ined.) No. A168 (Y. 20,943), Cerro Quemado.

Lucuma sp. MANZANO MORADO; SAPOTE MACHO. No. A148 (Y. 20,923), Cincinati; No. A167 (Y. 20,942), Cerro Quemado; No. A199 (Y. 20,974), Cerro de la Danta region.

Sideroxylon colombianum Standl. JOVEROSO. No. 70 (Y. 20,519), Cerro del Campo region.

SAURAUIACEAE

Saurauia sp. AZUCENO; CANELO. No. A55 (Y. 20,830), Cincinati; No. A70 (Y. 20,845), Bellavista region.

SAXIFRAGACEAE

Escallonia floribunda H. B. K. CORRALEROS. No. A154 (Y. 20,929), Cerro Quemado region.

SIMARUBACEAE

Picramnia villosa Rusby. MANGLE AMARILLO. No. 88 (Y. 20,537), Cerro del Campo; No. A133 (Y. 20,908), Cincinati region.

SOLANACEAE

Cestrum latifolium Lam. JUAN DE LA VERDAD. No. 40 (Y. 20,489), Cerro del Campo region.

STERCULIACEAE

Guazuma ulmifolia Lam. GUÁSIMO. No. 15 (Y. 20,464), Matojiro Valley region.

Sterculia apetala (Jacq.) Karst. CAMAJURÚ. No. 9 (Y. 20,458), Matojiro Valley region.

SYMPLOCACEAE

Symplocos quindiuensis Brand (?). Nos. A173 (Y. 20,948), A174 (Y. 20,949), and A190 (Y. 20,965), near San Lorenzo.

TAXACEAE

Podocarpus macrostachyus Parl. PINO CRIOLLO. No. A172 (Y. 20,947), Cerro Quemado region.

THEACEAE

Eurya nervosa (H. B. K.) Blume. AVISPA. No. A42 (Y. 20,817), Las Partidas region.

Haemocharis semiserrata (Camb.) Mart. & Zucc. NÍSPERO MACHO DE TIERRA FRÍA; VARA DE LEÓN. No. A37 (Y. 20,812), Las Partidas; No. A160 (Y. 20,935), Cerro Quemado region.

THEOPHRASTACEAE

Clavija longifolia R. & P. HUEVO DE ICOTEA. No. 25 (Y. 20,474), Matojiro Valley region.

TILIACEAE

Heliocarpus diclinus Hochr. MAJAGUA MELADA. No. A86 (Y. 20,861), Río Toribio region.

Luehea speciosa Willd. ALGODÓN MONTAÑERO. No. A204 (Y. 20,979), María Teresa and Mundo Nuevo region.

ULMACEAE

Trema micrantha (L.) Blume. MAJAGUA COLORADA; MAJAGÜITO. No. A44 (Y. 20,819), Cincinati; No. A88 (Y. 20,863), Río Toribio region.

URTICACEAE

Myriocarpa magnifica Rusby. TRIPA DE PATO. No. A80 (Y. 20,855), Bellavista region.

Urera caracasana (Jacq.) Gris. PRINGAMOZA DE MONTAÑA. No. A21 (Y. 20,796), Minca region.

VERBENACEAE

Lippia hemisphaerica Cham. OREGANITO MACHO. No. B4A (Y. 20,986), Matojiro region.

Vitex cymosa Bert. ACEITUNA. No. 12 (Y. 20,461), Matojiro Valley region.

VIOLACEAE

Rinorea dichotoma Rusby. Nos. A126 (Y. 20,901) and A141 (Y. 20,916), Cincinati; No. A191 (Y. 20,966), Cerro de la Danta region.

UNCLASSIFIED

AVELLUELO; COROCITO; MALAMBITO. No. A26 (Y. 20,801), Río Jabalí; No. A74 (Y. 20,849), Bellavista; No. A125 (Y. 20,900), Cincinati region.

FRUTA DE PERRO. No. 54 (Y. 20,503), Cerro del Campo region.

HUESITO DE DIABLO; MAMEICILLO. No. A90 (Y. 20,865), Río Toribio; No. A142 (Y. 20,917), Cincinati region.

POPA. No. A31 (Y. 20,806), Río Jabalí region.

TORNASOL. No. A117 (Y. 20,892), Cincinati region.

Unknown. Nos. A178 (Y. 20,953), A182 (Y. 20,957), A183 (Y. 20,958), and A186 (Y. 20,961), near San Lorenzo.

Unknown. No. A197 (Y. 20,972), Cerro de la Danta region.

CHECK LIST OF THE COMMON NAMES

Aceite	*Phyllanthus conami* Sw.	Euphorbiaceae
Aceituna	*Vitex cymosa* Bert.	Verbenaceae
Achiote macho	*Nectandra* sp.	Lauraceae
Aguacate	*Persea americana* Mill.	Lauraceae
Aguacatillo	*Persea caerula* (R. & P.) Nees	Lauraceae
Aguacatillo de tierra fría	*Grammadenia* sp.	Myrsinaceae
Algarrobo	*Hymenæa Courbaril* L.	Leguminosae
Algodón montañero	*Luehea speciosa* Willd.	Tiliaceae
Almácigo	*Bursera Simaruba* (L.) Sarg.	Burseraceae
Amargo	*Aspidosperma ellipticum* Rusby	Apocynaceae
Amarillo	*Ocotea* sp.	Lauraceae
Amarillo	?	Leguminosae
Anoncito de tierra fría	*Psychotria* sp.	Rubiaceae
Arenillo	*Weinmannia pinnata* L.	Cunoniaceae
Arizá	*Maytenus myrsinoides* Reiss.	Celastraceae
Árnica	*Miconia* sp.	Melastomaceae
Aromo	*Acacia* sp.	Leguminosae
Arrayán de tierra fría	*Eugenia* sp.	Myrtaceae
Avelluelo	?	?
Avispa	*Eurya nervosa* (H.B.K.) Blume	Theaceae
Azuceno	*Saurauia* sp.	Saurauiaceae
Balaustre de tierra fría	*Ocotea* sp.	Lauraceae
Balsillo	*Croton gossypiifolius* Vahl	Euphorbiaceae
Banco	*Gilibertia amplifolia* I. M. Johnston	Araliaceae
Barbasco	*Zanthoxylum microcarpum* Gris.	Rutaceae
Berengeno	*Croton panamensis* Muell. Arg.	Euphorbiaceae
Bija	*Bursera graveolens* Tr. & Pl.	Burseraceae
Blanquito	*Holtonia myriantha* Standl., comb. nov.	Rubiaceae
Bombito	*Cassia biflora* L.	Leguminosae
Brasil de tierra fría	*Faramea cestroides* Standl.	Rubiaceae
Cabo de hacha	*Hasseltia lateriflora* Rusby	Flacourtiaceae
Café	*Coffea arabica* L.	Rubiaceae
Café macho	*?Heisteria* sp.	Olacaceae
Caguimo	*Erythroxylon orinocense* H. B. K.	Erythroxylaceae

Caimancillo	*Agonandra brasiliensis* B. & H.	Opiliaceae
Caimito	*Vismia guianensis* (Aubl.) Pers.	Hypericaceae
Caimito de monte	*Ximenia americana* L.	Olacaceae
Caimito macho	*Conomorpha peruviana* A. DC.	Myrsinaceae
Calentura	*Pithecolobium cochleatum* Mart.	Leguminosae
Camajurú	*Sterculia apetala* (Jacq.) Karst.	Sterculiaceae
Camarón	*Maytenus myrsinoides* Reiss.	Celastraceae
Camasey; C. amarillo	*Miconia* spp.	Melastomaceae
Camasey esquinado	*Miconia dodecandra* (Desr.) Cogn.	Melastomaceae
Camasey morado	*Miconia calvescens* DC.	Melastomaceae
Camasey negro; C. peludo	*Henriettella verrucosa* L.	Melastomaceae
Campano	*Pithecolobium saman* (Jacq.) Benth.	Leguminosae
Cañafístula de monte	*Leucaena trichodes* (Jacq.) Benth.	Leguminosae
Canalete de humo	*Cordia* spp.	Boraginaceae
Canelo	*Saurauia* sp.	Saurauiaceae
Caney	*Maytenus myrsinoides* Reiss.	Celastraceae
Canilla de venado	*Miconia spicellata* Bonpl.	Melastomaceae
Canta gallo	*Erythrina rubrinervia* H. B. K. (?)	Leguminosae
Caracolí	*Anacardium rhinocarpus* DC.	Anacardiaceae
Caraña	*Bursera tomentosa* (Jacq.) Tr. & Pl.	Burseraceae
Caranganito	*Cassia emarginata* L.	Leguminosae
Carate	*Vismia guianensis* (Aubl.) Pers.	Hypericaceae
Cardo santo	?	Polygonaceae
Carretillo amarillo	*?Ixora* sp.	Rubiaceae
Cascarilla amarilla; C. negra	*?Heisteria* sp.	Olacaceae
Cedro caoba; C. cebollino	*Cedrela mexicana* Roem. (?)	Meliaceae
Ceiba de leche	*Hura crepitans* L.	Euphorbiaceae
Copei; C. de tierra fría	*Ficus* spp.	Moraceae
Copei de piramo; C. negro	*Clusia alata* Pl. & Tr.	Guttiferae
Coralibe	*Tabebuia pentaphylla* (L.) Hemsl.	Bignoniaceae
Cordoncillo; C. de tierra fría; C. gigante; C. verde	*Piper* spp.	Piperaceae
Cordoncillo negro	?	Melastomaceae
Corocito	?	?
Corocito de tití	*Clusia oblanceolata* Rusby	Guttiferae
Corona	*Xylosma prunifolium* Gris.	Flacourtiaceae
Corraleros	*Escallonia floribunda* H. B. K.	Saxifragaceae
Chivato	*Aspidosperma ellipticum* Rusby	Apocynaceae
Chocolatico	*Chomelia spinosa* Jacq.	Rubiaceae

Cimbreadera	*?Ixora* sp.	Rubiaceae
Cruceta	*Rauwolfia heterophylla* R. & S. (?)	Apocynaceae
Cuchillo	*Casearia nitida* (L.) Jacq. (?)	Flacourtiaceae
Cucuá	*Inophloeum armatum* (Miq.) Pittier	Moraceae
Culo de Indio	*Matayba scrobiculata* Radlk.	Sapindaceae
Espino de brujo	*Ximenia americana* L.	Olacaceae
Estribo	*Torrubia fragrans* (Dum. Cours.) Standl.	Nyctaginaceae
Fruta de pava	*Guettarda roupalifolia* Rusby	Rubiaceae
Fruta de pava de tierra fría	*Psychotria Fendleri* Standl.	Rubiaceae
Fruta de perro	?	?
Gengibre arborescente	*Croton panamensis* Muell. Arg.	Euphorbiaceae
Grosella macho	*Cassia grandis* L. f. (?)	Leguminosae
Guacamayo	*Acacia sarmentosa* Dcne.	Leguminosae
Guacharaco	*Cupania americana* L.	Sapindaceae
Guacharaco de tierra fría	*Guarea fulgens* Karst.	Meliaceae
Guaimarito	*Ficus Tonduzii* Standl.	Moraceae
Guáimaro comestible	*Brosimum columbianum* Blake (?)	Moraceae
Guáimaro lechoso	*Trophis racemosa* (L.) Urban	Moraceae
Guamo; G. arroyero; G. colorado	*Inga* spp.	Leguminosae
Guamo macho	*Pithecolobium cauliflorum* Mart.	Leguminosae
Guamo mestizo	*Hirtella americana* L.	Amygdalaceae
Guara	*Coccoloba* sp.	Polygonaceae
Guarumo; G. morado	*Cecropia* spp.	Moraceae
Guásimo	*Guazuma ulmifolia* Lam.	Sterculiaceae
Guayabita	?	Myrtaceae
Guayabito de cerro	*Grislea secunda* Loefl.	Lythraceae
Guayabito pirú	*Psidium Sartorianum* (Berg.) Ndzu.	Myrtaceae
Guayabo colorado; G. joveroso	*Calycophyllum candidissimum* (Vahl) DC.	Rubiaceae
Guayabo colorado hoja menuda; G. de león	*?Eugenia* spp.	Myrtaceae
Guayabo fruta de pava	*Ardisia foetida* Willd.	Myrsinaceae
Guayabo macho	*Myrcia* sp.	Myrtaceae
Guayabo pimiento	*Nectandra picburim* (H. B. K.) Mez	Lauraceae
Higuerón blanco; H. negro	*Ficus* spp.	Moraceae
Hoja menuda	*Agonandra brasiliensis* B. & H.	Opiliaceae
Hoja verrugosa	*Brosimum* sp.	Moraceae
Huesito	*Ardisia foetida* Willd.	Myrsinaceae

Huesito amarillo	*Psychotria sanmartensis* Rusby	Rubiaceae
Huesito de diablo	?	?
Huesito de tierra fría	*Holtonia myrianthа* Standl., comb. nov.	Rubiaceae
Huesito negro de tierra fría	*?Heisteria* sp.	Olacaceae
Hueso de negro	*Coccoloba Candolleana* Meisn.	Polygonaceae
Huevo de icotea	*Clavija longifolia* R. & P.	Theophrastaceae
Huevo de tanga	*Chrysochlamys membranacea* Tr. & Pl.	Guttiferae
Huevo de zuidere	*Erythroxylon orinocense* H. B. K.	Erythroxylaceae
Jago	*Genipa americana* L.	Rubiaceae
Jaguey	*Ficus panamensis* Standl. (?)	Moraceae
Jayo macho	*Miconia minutiflora* DC.	Melastomaceae
Jobo blanco; J. de castilla	*Spondias mombin* L.	Anacardiaceae
Jobo macho de tierra fría	*Brunellia comocladiifolia* H. & B.	Brunelliaceae
Joveroso	*Sideroxylon colombianum* Standl.	Sapotaceae
Juan de la verdad	*Cestrum latifolium* Lam.	Solanaceae
Juan garrote; J. garrote prieto	*Coccoloba leptostachya* Benth.	Polygonaceae
Látigo	*Alchornea* sp.	Euphorbiaceae
Laurel blanco; L. luna	*Nectandra globosa* (Aubl.) Mez	Lauraceae
Laurel negro	*Nectandra* sp.	Lauraceae
Laurel higuito	*Phoebe cinnamomiifolia* Nees	Lauraceae
Laurel morado	*Ocotea* sp.	Lauraceae
Lijo	*Matayba scrobiculata* Radlk.	Sapindaceae
Llallo	*Phyllanthus nobilis* (L.) Muell. Arg.	Euphorbiaceae
Lomo de caimán	*Chimarrhis* sp.	Rubiaceae
Lumbre	*Caesalpinia ebano* Karst. (?)	Leguminosae
Macuiro	*Aspidosperma ellipticum* Rusby	Apocynaceae
Madura plátano	*Sciadodendron excelsum* Gris.	Araliaceae
Mahomo	*Lonchocarpus punctatus* H. B. K.	Leguminosae
Majagua	*Bombax barrigon* (Seem.) Dcne. (?)	Bombacaceae
Majagua colorada	*Trema micrantha* (L.) Blume	Ulmaceae
Majagua gallina	*Andira inermis* H. B. K.	Leguminosae
Majagua melada	*Heliocarpus diclinus* Hochr.	Tiliaceae
Majagüito	*Trema micrantha* (L.) Blume	Ulmaceae
Majagüito de tierra fría	*Brunellia comocladiifolia* H. & B.	Brunelliaceae
Malambito	?	?
Malibú	*Palicourea crocea* (Sw.) R. & S.	Rubiaceae
Malibú morado	*Hedyosmum Bonplandianum* H. B. K.	Chloranthaceae

Mameicillo	?	?
Mamón cotoplix; M. de castilla; M. de leche; M. de mico	*Melicoccus bijugatus* Jacq. (?)	Sapindaceae
Mangle amarillo	*Picramnia villosa* Rusby	Simarubaceae
Mangle de montaña	*Clusia popayanensis* Tr. & Pl.	Guttiferae
Manzana amarilla	*Posoqueria latifolia* (Rudge) R. & S.	Rubiaceae
Manzanita de rosa	*Erythroxylon densum* Rusby	Erythroxylaceae
Manzanita de rosa prieta	*Eugenia Jambos* L.	Myrtaceae
Manzano morado	*Lucuma* sp.	Sapotaceae
Manzano negro	*Coussarea grandifolia* Rusby	Rubiaceae
Mapurito	*Zanthoxylum* sp.	Rutaceae
María angola	*Randia aculeata* L.	Rubiaceae
Mata ratón	*Gliricidia sepium* (Jacq.) Steud.	Leguminosae
Mate	?	Leguminosae
Mondongo	*Brosimum columbianum* Blake (?)	Moraceae
Mora	*Chlorophora tinctoria* (L.) Gaud.	Moraceae
Mortiño	*Miconia dodecandra* (Desr.) Cogn.	Melastomaceae
Muñeco	*Bunchosia argentea* (Jacq.) DC.	Malpighiaceae
Muñeco; M. canalete	*Cordia sericicalyx* A. DC.	Boraginaceae
Naranjito	*Crataeva tapia* L.	Capparidaceae
Níspero macho	*Cletbra lanata* Mart. & Gal.	Clethraceae
Níspero macho de tierra fría	*Haemocharis semiserrata* (Camb.) Mart. & Zucc.	Theaceae
Ojito de nena	*Pithecolobium dulce* (Roxb.) Benth.	Leguminosae
Olivo	*Capparis odoratissima* Jacq.	Capparidaceae
Olivo	*Conomorpha peruviana* A. DC.	Myrsinaceae
Oreganito	*Croton panamensis* Muell. Arg.	Lauraceae
Oreganito macho	*Lippia hemispbaerica* Cham.	Verbenaceae
Orejero	*Enterolobium cyclocarpum* (Jacq.) Gris.	Leguminosae
Pan y cacao	*Tropbis racemosa* (L.) Urb.	Moraceae
Papayote	*Cochlospermum vitifolium* (Willd.) Spreng.	Cochlospermaceae
Papecillo	*?Senecio* sp.	Compositae
Papo de zamba	*Lonchocarpus latifolius* H. B. K.	Leguminosae
Pata de vaca	*Trichilia birta* L.	Meliaceae
Pedro Hernández	*Spondias mombin* L.	Anacardiaceae
Pegapega	*Pisonia macranthocarpa* Donn. Smith	Nyctaginaceae
Peloto	*Andira inermis* H. B. K.	Leguminosae
Perehuétano	*Parinarium pachyphyllum* Rusby	Rosaceae
Peronio	*Erythrina rubrinervia* H. B. K.	Leguminosae
Piginio	*Sickingia cordifolia* Hook. f.	Rubiaceae
Piñico	*Sapium Hippomane* Meyer (?)	Euphorbiaceae

Pino criollo	*Podocarpus macrostachyus* Parl.	Taxaceae
Pinturero	*Phyllanthus nobilis* (L.) Muell. Arg.	Euphorbiaceae
Plantanito	*Cassia bacillaris* L.	Leguminosae
Pompadur	*Nectandra Moritziana* Klotzsch	Lauraceae
Popa	?	?
Prieto	*Lonchocarpus punctatus* H. B. K.	Leguminosae
Pringamoza de montaña	*Urera caracasana* (Jacq.) Gris.	Urticaceae
Pringamoza de monte	*Jatropha urens* L.	Euphorbiaceae
Quebracho	*Astronium Planchonianum* Engler	Anacardiaceae
Raiján	*Eugenia* sp.	Myrtaceae
Ramoncillo	*Coursetia arborea* Gris.	Leguminosae
Rapabalbo	*Clusia popayanensis* Tr. & Pl.	Guttiferae
Roble amarillo	*Tecoma stans* (L.) H. B. K.	Bignoniaceae
San Francisco	*Vismia guianensis* (Aubl.) Pers.	Hypericaceae
Sangre de drago	*Pterocarpus heterophyllus* Pittier	Leguminosae
Sangre de toro	*Chrysochlamys membranacea* Tr. & Pl.	Guttiferae
Sangregado de tierra fría	*Vismia guianensis* (Aubl.) Pers.	Hypericaceae
Sapote macho	*Lucuma* sp.	Sapotaceae
Siete cueros blanco; S. cueros espinoso	*Machaerium Moritzianum* Klotzsch	Leguminosae
Sincogollo	*Nectandra globosa* (Aubl.) Mez	Lauraceae
Tabaco macho	*Verbesina heliantboides* H. B. K.	Compositae
Tacaloa	*Ardisia foetida* Willd.	Myrsinaceae
Tacaloa	*Coccoloba* sp.	Polygonaceae
Tacuelo de tierra fría	*Zanthoxylum* sp.	Rutaceae
Tamarindo de monte	*Calliandra magdalenae* Benth.	Leguminosae
Tintillo	*Miconia* sp.	Melastomaceae
Tornasol	?	?
Trébol	*Platymiscium polystachyum* Benth.	Leguminosae
Tripa de pato	*Myriocarpa magnifica* Rusby	Urticaceae
Uvita	*Cordia alba* (Jacq.) R. & S.	Boraginaceae
Vara blanca	*Casearia nitida* (L.) Jacq.	Flacourtiaceae
Vara de león	*Haemocharis semiserrata* (Camb.) Mart. & Zucc.	Theaceae
Vara de pedra	*Brosimum* sp.	Moraceae
Vara negra	*Nectandra pichurim* (H. B. K.) Mez	Lauraceae
Vara real	*Eugenia oblongifolia* Sagot.	Myrtaceae
Vara santa	*Triplaris americana* L.	Polygonaceae
Venenito	*Calatola costaricensis* Standl.	Icacinaceae
Yarumero	*Didymopanax Morototoni* (Aubl.) Dcne. & Pl.	Araliaceae

Yayo	*Phyllanthus nobilis* (L.) Muell. Arg.	Euphorbiaceae
Yuca escorsonera	*Manihot Pittieri* Pax & Hoffm.	Euphorbiaceae
Zambo cedro	*Guarea guara* (Jacq.) P. Wils.	Meliaceae
Zambo cedro hembra	*?Roupala* sp.	Proteaceae

HOLTONIA, A NEW GENUS OF TREES OF THE FAMILY RUBIACEAE

By PAUL C. STANDLEY

Field Museum of Natural History

In 1930 the writer described in *The Rubiaceae of Colombia* a new tree, *Sickingia myriantha*, based upon several flowering specimens. Even at that time reference of the species to *Sickingia* was not altogether satisfactory, and material that has accumulated more recently has shown clearly that it could not remain in *Sickingia*. A further study of the whole series of specimens was undertaken in connection with the determination of a large series of trees collected in the Santa Marta region of Colombia by Ramón Espina and Juan Giacometto for the School of Forestry of Yale University. Careful consideration of all the evidence leads to the conclusion that the Colombian tree represents a distinct genus, to be described as follows:

Holtonia, gen. nov.

Arbores fere glabrae; folia decussata crasse membranacea integerrima petiolata; stipulae interpetiolares resiniferae persistentes in tubum truncatum vel breviter bilobum connatae; inflorescentia terminalis decussato-paniculata floribunda, floribus parvis bibracteolatis pentameris; calyx cupularis brevissimus obsolete remote denticulatus; corolla alba parva tubuloso-campanulata extus glabra intus supra basin ad insertionem staminum barbata, lobis brevibus late triangularibus obtusis tubo triplo brevioribus in alabastro valvatis vel leviter imbricatis; stamina exserta, filamentis subulatis ad basin pilosis insuper glabris, antheris oblongis rimis longitudinalibus dehiscentibus ad basin sagittatis ad medium dorsifixis; capsula parva subglobosa calyce persistente coronata loculicide bivalvata, seminibus minutis numerosis angulatis.

The single species is the following:

Holtonia myriantha (Standl.), comb. nov. *Sickingia myriantha* Standl. Field Mus. Bot. 7: 27. 1930.

The following Colombian collections are represented in the herbarium of Field Museum: Region of Santa Marta, H. H. Smith 1810, type. Santa Marta, Río Jabalí region, 1000–1200 m., Espina & Giacometto A22 (Yale No. 20,797). Santa Marta, Cincinati region, 1000–1250 m., Espina & Giacometto A66 (Yale No. 20,841). Highlands of Popayán, 1600–2000 m., Lehmann 7692, 5535. Popayán, 1750 m., Lehmann 2799. Paniquitá, Lehmann B. T. 1112. Tolima, Goudot. La Cumbre, Dept. El Valle, 1550–1700 m., Pennell 5028; Pennell & Killip 5829.

Espina and Giacometto report the vernacular names as Huesito de Tierra Fría and Blanquito, and state that the tree is 10–15 meters high, with a trunk 30–60 cm. in diameter.

The flowers, although small, are similar to those of various species of *Sickingia* and, as in that group, it is not easy to decide certainly whether the corolla lobes are really valvate or slightly imbricate. The capsules, however, are altogether unlike those of any *Sickingia*, being only a few millimeters in diameter, and containing numerous minute, obtusely angled seeds. In *Sickingia* the large capsules, often of the size of a walnut or even greater, contain relatively few broad compressed corky seeds that are winged on at least one side. The wood, Professor Record states, is unlike that of *Sickingia*.

Holtonia myriantha is best referred, probably, to the tribe *Condamineae*, and is related to *Chimarrhis*, but in that genus the corolla is lobed almost to the base. It bears some resemblance also to *Elæagia*, which likewise has a deeply lobed corolla, with contorted lobes.

This new genus is named for Isaac F. Holton, once Professor of Chemistry and Natural History in Middlebury College, whose *New Granada: Twenty Months in the Andes* was published in 1857. As a descriptive work written from the standpoint of a naturalist, and marred only by too frequent allusion to the author's religious prejudices, this volume has few equals among English books devoted to Latin America. Holton made an extensive collection of plants in 1852–53 in the highlands of Colombia, but the majority of his material, although of great interest, seems to have received scant attention during the 80 years that it has lain in English and America herbaria.

YALE WOOD COLLECTIONS

Collecting in the Lower Amazon

Dr. Adolpho Ducke is continuing his botanical explorations in coöperation with Yale. Two shipments of specimens have been received and many of the woods are of exceptional interest. One of them, *Monopteryx uacu* Spruce, has rays of unique structure and as conspicuous as in Oak (*Quercus*). It is now under investigation.

Collecting in Melanesia

Mr. J. H. L. Waterhouse, of Cairnleith, Chatswood, New South Wales, has been engaged by Yale to collect botanical and wood specimens in Melanesia. His first consignment, obtained at Kieta, Bougainville, has been received and the herbarium material has been forwarded to Kew for determination. On February 25, Mr. Waterhouse wrote that he was then en route to San Cristoval in the southern Solomon Islands.

Specimens Distributed for Systematic Study

The distribution of classified material is being continued, and the following can be reported to supplement the information contained in *Tropical Woods* 22: 2, June 1930, and 25: 26, March 1931:

Betulaceae and **Corylaceae.** To Mr. Ernst C. Abbe, Harvard Biological Institute, Cambridge, Mass., 75 samples of *Betula* and *Alnus*, and 31 of *Carpinus*, *Corylus*, and *Ostrya*.

Fagaceae. To Dr. R. Schönfeld, Wiessenstrasse 3, Borna bei Leipzig, Germany, 16 samples of *Fagus* and *Nothofagus*.

To Mr. G. F. West, Department of Botany, University of Michigan, Ann Arbor, Mich., 20 samples of *Fagus* and *Nothofagus*.

Flacourtiaceae. To Professor Walter W. Tupper, University of Michigan, Ann Arbor, Mich., 17 specimens of 9 genera.

Malvaceae. To Dr. Irma E. Webber, Rubidoux Laboratory, Riverside, California, 6 specimens of 6 genera.

Oleaceae. To Mr. Ernst C. Abbe, Harvard Biological

Institute, Cambridge, Mass., 7 samples of *Syringa* and *Ligustrum*.

Pinaceae. To Mr. R. Rol, Ecole Nationale des Eaux et Forêts, Nancy, France, 131 specimens of *Abies*, *Larix*, *Picea*, and *Pinus*.

Podocarpaceae. To Mr. Ernest C. Crocker, of Arthur D. Little, Inc., Cambridge, Mass., 21 samples of *Podocarpus* for chemical tests.

Rubiaceae. Miss Minnie M. Hilton, Department of Botany, University of Michigan, Ann Arbor, Mich., 5 samples of *Mitragyne* and *Sarcocephalus*.

Sterculiaceae. To Dr. L. Chalk, Imperial Forestry Institute, Oxford, England, 26 specimens of *Sterculia* and *Cola*.

Taxodiaceae. To Dr. R. H. Thomson, University of Toronto, Toronto 5, Canada, 6 samples of *Cunninghamia*.

Ulmaceae. To Mr. Frank W. Jane, University of London College, Gower Street, London, England, 180 specimens of 12 genera.

Genera Added since November 1, 1931

The following list constitutes the third supplement to the mimeographed family-and-genera catalog distributed in December 1929. (See *Tropical Woods* 26: 16, June 1931, and 28: 19, December 1931, for other supplements.) With a few exceptions, the genera enumerated below represent new material.

ANGIOSPERMAE

ANNONACEAE
- Cymbopetalum
- Goniothalamus
- Guamia
- Orophea
- Osteophloeum

APOCYNACEAE
- Excavatea
- Northia
- Zschokkea

ARALIACEAE
- Boerlagiodendron

BIGNONIACEAE
- Adenocalymma

BOMBACACEAE
- Neesia

BURSERACEAE
- Hemisantiria

COMBRETACEAE
- Conocephalus

COMPOSITAE
- Chuquiragua
- Gynoxys
- Loricaria
- Verbesina

DATISCACEAE
- Tetrameles

EUPHORBIACEAE
- Melanolepis
- Nealchornea
- Piranhea
- Pogonophora

FLACOURTIACEAE
- Lindackeria
- Marquesia
- Mayna
- Patrisia

GUTTIFERAE
- Chrysochlamys
- Pentaphalangium

LAURACEAE
- Ajoua

LECYTHIDACEAE
- Asteranthus

LEGUMINOSAE
- Aldina
- Batesia
- Campsiandra
- Cedrelinga
- Clathrotropis
- Clitoria
- Dussia
- Fordia
- Goniorrhachis
- Jacqueshuberia
- Lecointea
- Monopteryx
- Vataireopsis

LINACEAE
- Ochthocosmus

LOGANIACEAE
- Couthovia
- Geniostoma
- Pagamea

MAGNOLIACEAE
- Aromadendron
- Elmerrillia

MALVACEAE
- Erioxylum
- Lagunaria

MELASTOMACEAE
- Melastoma

MONIMIACEAE
- Bracteanthus

MORACEAE
- Malaisia

MYROTHAMNACEAE
- Myrothamnus

MYRSINACEAE
- Conomorpha
- Discocalyx
- Giammadenia

MYRTACEAE
- Aphanomyrtus
- Myrtella

OCHNACEAE
- Elvasia

OLEACEAE
- Jasminum

OPILIACEAE
- Agonandra

PALMACEAE
- Bentinckiopsis

PASSIFLORACEAE
- Passiflora

QUIINACEAE
- Lacunaria

RHIZOPHORACEAE
- Sterigmapetalum

ROSACEAE
- Osteromeles

RUBIACEAE
- Anthocephalus
- Henriquezia
- Pseudochimarrhis

RUTACEAE
- Erythrochiton
- Sohnreyia

SAPOTACEAE
- Chromolucuma
- Sarcosperma

SIMARUBACEAE
- Samadera

STERCULIACEAE
- Scaphium

THEACEAE
- Adinandra

THEOPHRASTACEAE
- Clavija

THYMELÆACEAE
- Lasiosiphon

TILIACEAE
- Brownlowia
- Lueheopsis
- Trichospermum

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

Election of Councilors

Ballots for this election were sent to all members on December 21, 1931. Two of the ballots were not returned and inasmuch as the vote was close it was necessary to hold the polls open until the expiration of the time limit of four months. A majority of the members voted for a Council of twelve, but owing to a triple tie, only eleven were elected, thus leaving a

vacancy which will be filled by the Council. The eleven Councilors elected for a term of three years are as follows:

Mr. M. B. Welch, Technological Museum, Sydney, Australia.

Dr. Paul Ledoux, Institut Botanique Léo Errera, 40 Rue Botanique, Brussels, Belgium.

Dr. Laurence Chalk, Imperial Forestry Institute, University of Oxford, Oxford, England.

Mr. B. J. Rendle, Forest Products Research Laboratory, Princes Risborough, Bucks, England.

Mr. Jean Collardet, Comité National des Bois Coloniaux, 60 Rue Taitbout, Paris, France.

Prof. Dr. G. Bredemann, Institut für angewandte Botanik, Bei den Kirchhöfen 14, Hamburg, Germany.

Dr. Ryôzô Kanehira, Division of Forestry, Kyushu Imperial University, Fukuoka, Japan.

Dr. H. H. Janssonius, Koloniaal Instituut, Abt. Handelsmuseum, Amsterdam, Netherlands.

Prof. P. Jaccard, Pflanzenphysiologisches Institut, Universitätstrasse 2, Zürich, Switzerland.

Prof. I. W. Bailey, Bussey Institution for Research in Applied Biology, Harvard University, Forest Hills, Massachusetts.

Prof. S. J. Record, Yale University School of Forestry, New Haven, Connecticut.

Transactions of the Council

Professor Samuel J. Record, 205 Prospect Street, New Haven, Connecticut, U. S. A., has been elected Secretary-Treasurer of the Association.

The subscriptions or dues of Ordinary Members for the first three years have been fixed at One Dollar each. For the first group of members (the 36 founders) annual subscriptions begin with January 1, 1932.

The Secretary-Treasurer has been authorized to collect subscriptions from members and to receive voluntary contributions for the benefit of the Association; also to pay expenses incurred in the conduct of ordinary official business of the Association.

All committee reports, standards for terminology and descriptions, manuals, etc., which may be approved by the Council are to be considered merely as recommendations or suggestions for the general guidance of the members.

Nominations for membership may be made (in writing) at any time by any two members of the Association. They should be sent, with biographical data, to the Secretary-Treasurer for submission to the Council.

HONORARY MEMBERS ELECTED

Professor Henri Lecomte, Paris, France.

Professor J. W. Moll, Groningen, Netherlands.

MEMBERS ELECTED

Mr. André Aubréville, Inspecteur Principal des Eaux et Forêts des Colonies, Paris, France.

Miss M. M. Chattaway, Assistant in Structure and Properties of Wood, Imperial Forestry Institute, Oxford, England.

Mr. Harold E. Desch, Forest Research Officer (Wood Technologist), Kuala Lumpur, Federated Malay States.

Professor Arthur J. Eames, Professor of Botany, Cornell University, Ithaca, New York.

Professor Félix Gallego, Profesor de Anatomía y Fisiologia vegetal, Escuela Especial de Ingenieros de Montes, Madrid, Spain.

Professor Ph. Guinier, Directeur de l'Ecole Nationale des Eaux et Forêts à Nancy, France.

Professor H. S. Holden, Professor of Biology, University of Nottingham, Nottingham, England.

Mr. Frank W. Jane, Assistant Lecturer in Botany at University College, London University, London, England.

Professor Torsten Lagerberg, Professor of Forest Botany, Skogshögskolans Botaniska Avdelning, Experimentalfältet, Stockholm, Sweden.

Mr. Marcel Monnin, Conservateur des Eaux et Forêts détache au Ministère de l'Air, Paris, France.

Professor Stanislaw Sokolowski, Jagiellon University in Kraków, Kraków, Poland.

Mr. Llewelyn Williams, Assistant in Wood Technology, Field Museum of Natural History, Chicago, Illinois.

CURRENT LITERATURE

Etude sur les principaux arbres et arbustes d'Haiti propres a l'ornamentation. By P. G. SYLVAIN. Bull. No. 21, Service Technique du Dépt. de l'Agr. et de l'Enseignement Professionnel. Port-au-Prince, October 1930. Pp. 57; 6 x 9; 50 half-tones.

An attractive, well illustrated publication giving short accounts of the principal trees and shrubs used for decorative planting in Haiti.

La flore d'Haiti. By HENRY D. BARKER and WILLIAM S. DARDEAU. Pub. by Service Technique du Dépt. Agr. et de l'Enseignement Professionnel, Port-au-Prince, 1930. Pp. 456; 6 x 9¼.

This substantial, well printed volume contains descriptions of the orders, families, and genera, together with a list of most of the species, of spermatophytes growing in Haiti. It is supplied with numerous keys, a glossary, and an index to the common and scientific names.

Contributions to the flora of tropical America. IX. The *Tabebuias* of British Guiana and Trinidad. By T. A. SPRAGUE and N. Y. SANDWITH. *Kew Bulletin of Miscellaneous Information* 1: 18–28, 1932.

"The genus *Tabebuia* Gomes (Bignoniaceae) is here understood almost in the same sense as in Bentham and Hooker's *Genera Plantarum*, but as including also the genus *Couralia* Splitg, which seems to differ in nothing but the opaque corky wings of the seeds. It thus includes, in addition to the typical simple-leaved species, the trifoliolate and quinquefoliolate ones referred by K. Schumann to a separate genus, for which he adopted the name *Tecoma* Juss. sensu Seem."

"The genus *Tabebuia* is of considerable economic importance as containing numerous species yielding valuable timbers (vide Record, *Timbers of Tropical America*, pp. 532–544). Among those included in the present paper are the 'Black Poui' of Trinidad or 'Cogwood' of Tobago (*T. rufescens*), the 'Hakkea' or 'Hackia' of sandy soil in British Guiana (*T. hypolepra*, sp. nov.), and the 'Yellow Poui' of Trinidad or 'Washiba' of British Guiana (*T. serratifolia*).

"The species of *Tabebuia* have not been adequately studied hitherto, and some of those yielding important timbers have not yet been identified, owing to absence of corresponding herbarium material. As the result of the present investigation, the three important timber trees mentioned above have been critically determined, and it has been established that *T. glomerata* is a synonym of the previously described *T. rufescens*, and that *T. araliacea* of Brazil is synonymous with *T. serratifolia* of the West Indies and Venezuela. Up to the present these have been treated respectively as independent species in all botanical works."

1. **Tabebuia stenocalyx** Sprague & Stapf. *Schlegelia violacea* Gris., partim, excl. syn. Trinidad, British Guiana, Brazil.

2. **Tabebuia longipes** Baker. WHITE CEDAR, WARAKURE or WARIKURI (B. G.).

3. **Tabebuia roraimae** Oliv. *Tecoma roraimae* K. Schum. *Tabebuia triphylla* Klotzsch. British Guiana.

4. **Tabebuia dura** (Bur. & K. Schum.) Sprague & Sandwith, comb. nov. *Tabebuia fluviatilis* Klotzsch, non DC. British Guiana.

5. **Tabebuia aquatilis** (E. Mey.) Sprague & Sandwith, comb. nov. *Bignonia aquatilis* E. Mey. *B. digitata* E. Mey. *B. fluviatilis* G. F. W. Meyer. *Couralia fluviatilis* Splitg. *Zeyheria fluviatilis* Miq. *Z. digitata* Miq. *Tabebuia fluviatilis* DC. *Tecoma Meyeriana* DC. *T. fluviatilis* Miq. *T. insignis* Miq. Guianas and Brazil. HACKOOYA, WHOUA-WHOUA (B. G.); COURALI (Surinam).

6. **Tabebuia rufescens** J. R. Johnston. *Tecoma spectabilis* Gris., non Planch. *Tabebuia serratifolia* Rolfe, non (Vahl) Nichols. *T. glomerata* Urb. Colombia, Venezuela, Trinidad, Tobago, Grenada, St. Vincent, Martinique, Jamaica. BLACK POUI, POUI VERT (Trin.); COGWOOD (Tobago); POUI, GREENHEART (Grenada).

7. **Tabebuia subtilis** Sprague & Sandwith, sp. nov. ARAWNIG-YEK (B. G.).

8. **Tabebuia hypolepra** Sprague & Sandwith, sp. nov. British and French Guianas. HAKKEA or HACKIA (B. G.).

9. **Tabebuia serratifolia** (Vahl) Nicholson. *Bignonia serratifolia* Vahl. *B. flavescens* Vell. *B. araliacea* Cham. *B. conspicua* Rich., pro syn. *Tecoma serratifolia* G. Don. *T. flavescens* Mart. *T. araliacea* DC. *T. speciosa* DC. *T. conspicua* DC. *T. nigricans* Klotzsch, nomen. *Tabebuia araliacea* Morong & Britton. *Guirapariba* Maregr. Colombia, St. Vincent, Trinidad, Guianas, Brazil, Bolivia. POUI, YELLOW POUI, WHITE POUI (Trin.); CURARÍ, CURARI-

GUO, CURARIRE, CORALIBE, PUI (Venez.); WASHIBA (B. G.); GROENHART (Surinam); PÁO D'ARCO (Lower Amazon); IPÉ (Braz.).

10. **Tabebuia floccosa** (Klotzsch) Sprague & Sandwith, comb. nov. *Tecoma floccosa* Klotzsch, nomen. British Guiana.

Contribuciones para la flora de Venezuela. By H. PITTIER. Reprinted from *Boletin de Ministerio de Relaciones Exteriores*, Dec. 1931, pp. 357–388.

Contains descriptions of the Venezuelan representatives of the families Burseraceae, Meliaceae, and Malpighiaceae, with keys to the species, notes on the products, and lists of vernacular names.

Studies in Solanaceae. I. The species of *Cestrum* collected in Venezuela up to 1930. By H. PITTIER. *Journ. Wash. Acad. Sci.* (Washington, D. C.) 22: 2: 25–37, Jan. 19, 1932.

An account of 23 species of *Cestrum* known to occur in Venezuela, of which eight are described as new.

Plantarum Cuzcorum Herrerarianum. Estudios sobre la flora del Departamento del Cuzco. By FORTUNATO L. HERRERA. Lima, Peru, 1930. Pp. 257; 6 x 8 ¼; 19 plates.

This publication lists all the plants known to occur in the Department of Cuzco, Peru. There are descriptions of the new species and varieties and notes as to the uses, if any, of the plants listed. The introduction contains a brief historical account of the botanical expeditions and collectors of the region and a bibliography of publications relating to the flora. The following list includes only ligneous plants.

CHECK LIST OF THE COMMON NAMES

Alamo	*Buddleia longifolia* H. B. K.	Loganiaceae
Aliso	*Alnus jorullensis* H. B. K. var. *acutissima* Winkl.	Betulaceae
Angel-tauna	*Jatropha urens* L.	Euphorbiaceae
Añil or Añil-añil	*Indigofera suffruticosa* Mill.	Leguminosae
Campancho	*Datura arborea* L.	Solanaceae
Cánirca	*Lantana canescens* H. B. K.	Verbenaceae
Canlli	*Margyricarpus setosus* R. & P.	Rosaceae
Canlli	*Tetraglochin strictum* Poepp.	Rosaceae
Ccantu, Ccantus, Ccantut, or Ccantutai	*Cantua buxifolia* Juss.	Polemoniaceae

Cceuña	*Polylepis incana* H. B. K.	Rosaceae
Ccjamata	*Nicotiana glauca* Graham	Solanaceae
Chacanhuai or Chacanúai	*Apurimacia incarum* Harms	Leguminosae
Chachacomo or Chachacuma	*Escallonia resinosa* (R. & P.) Pers.	Saxifragaceae
Chamanuai	*Eupatorium Volkensii* Hieron.	Compositae
Chamba	*Leucaena trichodes* Benth.	Leguminosae
Chchiclurmai or Chchijllur	*Vallea stipularis* L. f.	Elæocarpaceae
Chchillca	*Baccharis polyantha* Kth. and *B. prostrata* (R. & P.) Pers.	Compositae
Chchillca	*Eupatorium amygdalinum Lam.* and *E. inulaefolium* Kth.	Compositae
China-canlli	*Margyricarpus setosus* R. & P.	Rosaceae
China-molle	*Schinus diversifolius* Rusby	Anacardiaceae
Chipi-cuca	*Stevia cuzcoensis* Hieron.	Compositae
Cjafra-cjafra	*Ophryosporus piquerioides* (DC.) Benth. & Hook.	Compositae
Cjari-cjari	*Rubus rosiflorus* Benth. and *R. urticaefolius* Poir.	Rosaceae
Cjaru	*Colletia spinosa* Lam.	Rhamnaceae
Cjuñuca or Cjuñumuña	*Satureja brevicalyx* Epling	Labiatae
Ckamato	*Eupatorium Urubambense* Robinson	Compositae
Ckoto or Ckotoquishuar	*Gynoxys Seleriana* Muschler	Compositae
Cocániro	*Embothrium grandiflorum* Lam.	Proteaceae
Cola de caballo	*Ephedra americana* H. B. K.	Gnetaceae
Floripondio	*Datura arborea* L.	Solanaceae
Huairuru	*Citharexylum Herrerae* Mansf.	Verbenaceae
Huarango	*Acacia macracantha* H. & B.	Leguminosae
Huaranhuai	*Tecoma mollis* H. B. K.	Bignoniaceae
Jarac-chama or Jayac-chchillca	*Eupatorium cuzcoense* Hieron.	Compositae
Jettecca	*Ophryosporus origanoides* (Meyen & Walp.) Hieron.	Compositae
Kipa-quishuar	*Gynoxys Seleriana* Muschler	Compositae
Kiuña	*Ophryosporus origanoides* (Meyen & Walp.) Hieron.	Compositae
Kuchu-kuchu	*Baccharis genistelloides* Pers.	Compositae
Lambrán	*Alnus jorullensis* H. B. K., var. *acutissima* Winkl.	Betulaceae
Lauraimana	*Lippia scorodonioides* H. B. K.	Verbenaceae
Liga	*Psittacanthus cuneifolius* (R. & P.) Engl.	Loranthaceae
Llaulli	*Chuquiragua Seleriana* Muschler and *C. spinosa* (R. & P.) Don	Compositae
Lloqque	*Kageneckia lanceolata* R. & P.	Rosaceae

Lucma	*Lucuma obovata* H. B. K.	Sapotaceae
Manca-ppaqui	*Eupatorium Sternbergianum* DC.	Compositae
Matapalo	*Gaiadendron punctatum* (R. & P.) Don	Loranthaceae
Matapalo	*Phrygilanthus ellipticus* (R. & P.) Eichl.	Loranthaceae
Mate-matico	*Piper acutifolium* R. & P.	Piperaceae
Matico	*Piper angustifolium* R. & P. and *P. charopampanum* C. DC.	Piperaceae
Mayu-chchillca	*Baccharis polyantha* Kth.	Compositae
Michi-ccallo	*Mimosa revoluta* H. B. K.	Leguminosae
Mocco-mocco	*Piper acutifolium* R. & P., *P. angustifolium* R. & P., *P. charopampanum* C. DC., *P. elongatum* Vahl, and *P. limatum* R. & P.	Piperaceae
Molle	*Schinus molle* L.	Anacardiaceae
Motuy	*Cassia latepetiolata* Dombey	Leguminosae
Mulli	*Schinus molle* L.	Anacardiaceae
Mutui	*Cassia glandulosa* L., *C. latepetiolata* Dombey, and *C. tomentosa* L. f.	Leguminosae
Ñucjau	*Cestrum coriaceum* Miers	Solanaceae
Ñuñuma, Ñuñumea, Ñuñumia, Ñuñuncca, Ñuñunccai, or Ñuñunquía	*Solanum pulverulentum* Pers.	Solanaceae
Orcco-canlli	*Tetraglochin strictum* Poepp.	Rosaceae
Pacae or Paccai	*Inga Feuillei* DC.	Leguminosae
Pacha-lloque	*Krameria Weberbaueri* Ulbrich	Leguminosae
Pfauca	*Escallonia Herrerae* Mattf.	Saxifragaceae
Pfirco or Pfiuco	*Ephedra americana* H. B. K.	Gnetaceae
Pinco-pinco	*Ephedra americana* H. B. K., *E. andina Poepp.* & Endl., and *E. rupestris* Benth.	Gnetaceae
Pisonay	*Erythrina falcata* Benth.	Leguminosae
Pupa	*Psittacanthus cuneifolius* (R. & P.) Engl.	Loranthaceae
Queuña	*Polylepis incana* H. B. K.	Rosaceae
Quimsa-kuchu	*Baccharis genistelloides* Pers.	Compositae
Quishuar	*Buddleia longifolia* H. B. K.	Loganiaceae
Ractania	*Krameria Weberbaueri* Ulbrich	Leguminosae
Retama	*Spartium junceum* L.	Leguminosae
R'ocke	*Colletia spinosa* Lam.	Rhamnaceae
Suelda que suelda	*Psittacanthus cuneifolius* (R. & P.) Engl.	Loranthaceae
Supai-ccarcco	*Nicotiana glauca* Graham	Solanaceae

Tara	*Caesalpinia tinctoria* (H. B. K.) Dombey	Leguminosae
Tayanca	*Baccharis microphylla* H. B. K. and *B. odorata* H. B. K.	Compositae
Ttancar	*Duranta rupestris* Hayek	Verbenaceae
Ttinquir or Ttitir	*Solanum pseudo-lycioides* Rusby	Solanaceae
Tumana	*Gaultheria brachybotrys* DC.	Ericaceae
Upa-ttancar	*Solanum pseudo-lycioides* Rusby	Solanaceae
Yerba santa	*Cestrum coriaceum* Miers	Solanaceae
Zarza-mora	*Rubus rosiflorus* Benth.	Rosaceae

—Edith M. Vincent, *Field Museum of Natural History.*

Argentina. Nomina de las maderas del pais. Pub. by Division de Bosques y Yerbales, Direccion General de Tierras, Darsena Norte, Buenos Aires. Pp. 8; 11 x 15½.

Contains the vernacular and scientific names of about 450 trees and woods.

Propagation of narra (*Pterocarpus indicus* Willd.) by cuttings. By Porfirio San Buenaventura. *The Makiling Echo* (Manila, P. I.) 11: 1: 8–22, Jan. 1932.

"Narra is the most popular of the cabinet wood-producing trees in the Philippines. It is indigenous to the Malay Peninsula and Archipelago, and has a very wide distribution in the Islands. However, it does not grow so abundantly in any one place as to lose its value through over supply. It is found to thrive best on moist sandy loam or clay loam soil along gullies and stream banks of low or medium elevation. Though the tree is usually most valued for its beautiful wood, yet in many places it is also used for ornamental purposes on account of its vase-shaped crown and bright yellow, fragrant flowers. When grown in absolutely open land, it sometimes produces drooping branches. It is not uncommon to find Narra trees in gardens and along roadsides. Some people have recommended Narra to be the National Tree of the Philippines.

"In the Bicol region where it is customary to grow Abaka (*Musa textilis* Née) under shade, Narra is especially preferred as shade trees. Narra is semi-deciduous so I can not account for such preference, except that probably being a legume, it has an enriching effect upon the soil. Whatever may be the

reason, it is a fact that Narra trees are found in abundance in the Abaka plantations in the Bicol provinces, particularly in Albay and Sorsogon.

"There are four species of Narra found in the Philippines: *Pterocarpus indicus* Willd. (syn. *P. pallidus* Blanco). *Pterocarpus Vidalianus* Rolfe (syn. *P. erinaceus* F. Vill., *P. echinatus* Prain, and *P. Klemmei* Merr.). *Pterocarpus Blancoi* Merr. (syn. *P. santalinus* Blanco). *Pterocarpus pubescens* Merr.

"No other well-known Philippine trees produce wood of such a variable color as does Narra. The sapwood is distinctly whitish when freshly cut and very distinguishable from the heartwood; the latter varies in color—yellow brown, light salmon, bright red or dark red. One may also hear of 'White Narra,' referring to the wood that is pale yellow, and may often find yellow or brown wood with wide streaks of red or deep red. The brilliant red wood generally commands a better price. It is interesting to note that from standing trees no one seems to be able to tell the color of the wood. Each of the four *Pterocarpus* species found in the Philippines is believed to produce wood of any of the above colors. Some foresters claim that the red coloring may be due to soil conditions; others, that fungus attack during the early life of the tree may cause the coloring. It is also said that when the tree has been blown down, indicating that it has already exceeded maturity, the red color of the heartwood is very distinct."

"This study on the vegetative propagation of Narra [*P. indicus*] was conducted in the forest nursery of the School of Forestry, Los Baños, Laguna, from August 1929 to July 1930, followed by casual observations up to the present writing. It had for its objects to find: (1) The time it takes for the cuttings to sprout; (2) The effect of the size (diameter) of the cuttings upon the success of propagation; (3) Whether or not the part of the branch from which the cuttings are taken had any effect on their growth and development; and (4) Which would give better results, planting the cuttings on open field or on shaded ground?"

SUMMARY

"(1) It takes about from 4 to 16 days for Narra cuttings to begin sprouting if planted in open lands and from 6 to 19 days if set out in shaded ground. The bigger cuttings generally sprout sooner than small ones, due to normal buds.

"(2) Better success can be attained in propagation of Narra with the use of big cuttings, 7 to 12 centimeters in diameter; cuttings 3 to 6 centimeters may also be used. The smaller ones are not suitable for planting.

"(3) The part of the branch from which the cuttings are obtained has no appreciable effect on the growth and development of the plants. Cuttings may be taken from the tip, middle, or bottom parts of the branches.

"(4) Narra cuttings are quite intolerant of shade. There was less percentage of success with the cuttings planted under shade compared with those in the open. The plants under shade showed very poor growth, short shoots, fewer leaves, and pale, sickly leaflets. This conclusion is strengthened by the fact that the same poor plants, after about half of the shade trees were removed, became vigorous in about three months."

Diaxylary laticiferous cells of *Beaumontia grandiflora*. By R. H. WOODWORTH. *Journ. Arnold Arboretum* (Jamaica Plain, Mass.) 13: 1: 35–36, Jan. 1932. Illustrated.

Descriptions and photomicraphs of latex cells in the phloem, pith, and xylem rays of *Beaumontia grandiflora* Wall., a giant East Indian climber of the family Apocynaceae. The specimens were obtained from the Harvard Botanical Gardens in Cienfuegos, Cuba.

Tests in the Rangoon River on the damage by marine borers to various woods, including Burma teak and British Guiana greenheart, creosoted and untreated. By C. W. SCOTT. Burma Forest Bull. No. 28 (Econ. ser. No. 5), Rangoon, 1932. Pp. 10; 6¼ x 9¾. Illustrated.

"The work recorded here was done by the Forest Department at its own expense in collaboration with the Commissioners for the Port of Rangoon."

"The reputation of various Burma timbers for immunity

from teredo is undeserved and usually based on inaccurate observation, *e.g.*, use in water too fresh for teredo."

"Tests at Rangoon of 20 different woods show that the best for marine piling and fenders in Rangoon Harbor is creosoted Kanyin (*Dipterocarpus* spp.), known elsewhere as Gurjun and Apitong."

"Burma Teak and British Guiana Greenheart offer about equal resistance to the Rangoon teredo (*Xylotrya*). Whether creosoted or not both are inferior to creosoted Kanyin for use at Rangoon.

"The Rangoon test results should be applied with caution in other parts of the world where different species of teredo occur. Local tests are advisable. Creosoted Kanyin is likely to do well. The stronger and harder Burma timber Pyinkado (*Xylia dolabriformis*), even untreated, surpasses creosoted Kanyin in durability except in salt water infested by teredo."

Notes on woods for furniture making. By E. J. STRUGNELL. *The Malayan Forester* (Kuala Lumpur) 1: 2: 69–73, November 1931.

Notes on the behavior of 39 Malayan woods when made into furniture in the experimental plant of the Forest Department during the years 1925–28. The three kinds to which most space is devoted are as follows:

"**Rengas** (Anacardiaceae). This is one of the most promising of our furniture woods. It is a handsome red wood, obtainable in large sizes and in large quantity. There are several species which vary very considerably in ease of working. One kind has taken several hours on the saw bench to reduce it to planks, others go through quite easily. On the whole it is somewhat difficult to work; heavy; lasts well when made up; does not split or open; bunga [figure] plentiful; varies in color from a dark to a yellowish red, sometimes with a tinge of green; easy to polish. Contains a poison which, with those sensitive to it, sets up an unbearable itching accompanied by swelling. The poison is apparently not effective when the wood is polished."

"**Sena** (*Pterocarpus indicus*). An excellent furniture wood related to Rosewood; a pretty figure is often found; medium ease of working; light and not very strong but lasts well in use; does not open or split; the dark wood is the best, as it is much stronger than the light-colored wood; gives a fine polish but consumes a great deal of polish in doing so. All our supplies have been from roadside trees; it is very rare in jungle.

"**Sepetir** (*Sindora* spp.). A very successful furniture wood; the tree is common but it is always a gamble whether a tree of large size will contain sufficient heartwood to make its extraction worth while. There are several kinds, some of which, like *Rengas*, are extremely difficult to saw with the set of tooth used in this country; a special set is needed. Only the heartwood can be used; the sapwood must be rigidly excluded as it is immediately attacked by insects, even when made up. Easy to work but darker heartwood is difficult to plane. Light in weight but if carefully selected lasts well. Rather difficult to polish, taking a great deal of polish."

Ergebnisse der Reise von Dr. A. U. Däniker nach Neu-Caledonien und den Loyalitäts-Inseln (1924/25). 2. Neue Phanerogamen von Neu-Caledonien und den Loyalitäts-Inseln. 3. Die Loyalitäts-Inseln und ihre Vegetation. By A. U. DÄNIKER. *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 76: 160–213, Oct. 14, 1931. Illustrated.

In his second paper on the results of his botanical studies in New Caledonia and the Loyalty Islands, carried out in 1924–25, Dr. Däniker describes a number of new woody species. Two of these attain the dimensions of trees; *Weinmannia monticola* Däniker is a tall shrub or a tree which, together with other species of *Weinmannia*, is an important constituent of the forest in the higher parts of the islands, while *Licania lifouana* Däniker is a tree of more rare occurrence.

The vegetation of the Loyalty Islands forms the subject of a third paper. Forest is the characteristic vegetation of the islands and three distinct types are recognized. The most interesting is probably the *Araucaria* forest (*Araucaria columnaris* Hook., syn. *A. Cookii* R. Br.) which forms close stands of fine columnar trees averaging 30 to 40 m. in height. In some parts the stocking is so dense as to suppress other tree growths and here there are abundant signs of natural regeneration. The general impression obtained was that the natural distribution of this species is extending; but unfortunately, even in this out-of-the-way group of islands, timber exploitation is rampant; the finest stands have already been destroyed and the further spread of this fine tree is probably doomed.

The bush forest consists of mixed hardwoods, among the dominant species being *Aglaia elæagnoides*, *Claoxylon insulanum*, *Diospyros Olen*, *Micromelum minutum*, *Melochia*

odorata, *Trema Vieillardii*, and *Chalcas crenulata*. Large trees of *Ficus* spp., *Dysoxylum albicans*, *Celtis paniculata*, and *Elæocarpus rotundifolius* were observed. Many species of this formation, which are little more than shrubs in some parts of the forest elsewhere, attain tree dimensions, *e.g.*, *Gardenia Aubrii*.

In the interior of the islands the bush forest gives place to mesophytic forest characterized by larger trees than those of the bush forest. The majority of the species are the same as those of the bush forest but are of a larger size. Species peculiar to the mesophytic forest are *Intsia bijuga* (very characteristic), *Geijera Balansae*, *Elæocarpus persicifolius*, *Celtis paniculata*, *Hernandia cordifera*, *Aleurites triloba*, and *Cordia myxa*. Very abundant are *Dizygotheca Vieillardii* and *Garcinia pedicellata*. As in the bush forest the number of Sapindaceous genera is noticeable. Sapotaceae are represented by *Mimusops Pancheri*, Myrtaceae by *Eugenia* and *Syzygium* spp., and Combretaceae by *Terminalia Catappa*.—B. J. RENDLE, *Forest Products Research Laboratory, Princes Risborough, England.*

The relation between durability and the extractives of the cypress pines (*Callitris* spp.). By I. W. DADSWELL and H. E. DADSWELL. Reprint No. 4, Div. of For. Products, from *Journ. Council for Sci. & Ind. Research*, Melbourne, Nov. 1931. Pp. 10; 6 x 9½. Illustrated.

"From the volatile oils and the alcoholic extracts [of the woods of *Callitris glauca*, *C. calcarata*, and *C. intratropica*], several specific fractions have been isolated, namely gaujol, a sweet-smelling oil, a liquid acid, a non-volatile viscous oil, an ether-soluble resinous material, and an ether-insoluble resinous material.

"These fractions, together with the hot and cold aqueous extracts from *C. glauca* and *C. calcarata*, have been used in laboratory toxicity tests towards the fungus *Fomes annosus*, and it has been shown that (i) the liquid acid is most toxic, killing at a concentration of 0.015 per cent, and (ii) that the aqueous extracts inhibit the growth of this fungus.

"The same fractions have been used in laboratory resistance tests towards termites (*Eutermes exitiosus*), and it has been shown that, of the various fractions tested, the volatile acid and the ether-soluble resin were the most distasteful."

Wood taint in butter. By W. J. WILEY. Reprint No. 5, Div. of For. Products, from *Journ. Council for Sci. & Ind. Research*, Melbourne, 1932. Pp. 20; 6 x 9½.

This reprint includes two papers, both dealing with laboratory experiments on preventing wood taint, with special reference to *Pinus radiata* (*insignis*) and Hoop Pine (*Araucaria Cunninghamii*). "The tainting of butter sometimes experienced when Hoop Pine and *P. radiata* boxes are used is due to the presence, in the wood, of volatile, fat-soluble substances. No practical means of removing these from the wood appears to be satisfactory, and experiments were therefore directed to preventing their access to the butter. This can be accomplished either by wrapping the butter in an impermeable paper or by coating the box with an impermeable varnish or similar type of material."

Wood borers in Australia. Part I. *Lyctus*, or the powder post beetle. Trade Circular No. 6, Council for Sci. & Ind. Research, Div. of Forest Products, Melbourne, 1931. Pp. 14; 6 x 9½. Illustrated.

The preservative treatment of fence posts (with particular reference to Western Australia). By J. E. CUMMINS. Pamphlet No. 24, Council for Sci. & Ind. Research, Melbourne, 1932. Pp. 34; 6 x 9½. Illustrated.

"This publication sets out methods of treatment which can be practised by the farmer or other user of fence posts. . . . In order to obtain data for this pamphlet, about 1800 fence posts were treated in Western Australia. . . . The main principles of treatment as outlined can be extended to cover all Australian species."

"TRUEWOOD"

"The term 'truewood' has been adopted to describe what

is usually termed heartwood. In Australia, the central portion of a tree is very often affected by decay or has little strength. This portion, which is really part of the heartwood, is called 'heart.' The terms 'heart' and 'heartwood' are therefore confusing, and that portion of the tree between the 'heart,' or the pith, and the sapwood has been named the truewood." —Footnote, p. 13.

Forest trees and timbers of the British Empire. I. Some East African Coniferae and Leguminosae. By L. CHALK, J. BURTT DAVY, and H. E. DESCH. Imperial Forestry Institute, Oxford, 1932. Pp. 68; 6 x 9½. Illustrated.

"This is the first of a series dealing with the forest trees and timbers of the British Empire, an accurate knowledge of which is so essential a preliminary to the development of our forest resources. There are still extensive regions, particularly in the tropics, where this work has scarcely been attempted. This series introduces an important innovation in dealing simultaneously with the systematy of the tree and the anatomical structure of the wood, and every precaution will be taken to ensure that the wood and the botanical specimens described belong to the same species. The relation between systematy and wood anatomy is a close one, and the convenience of publishing botanical and anatomical descriptions together will thus be readily appreciated. The botanical descriptions, however, are not intended to take the place of a flora; their object is rather to correlate the wood with the tree.

"The need for a special series dealing with this type of work will be obvious. Such work is intended for reference purposes, and requires a self-contained index, which will be issued periodically; it would lose much of its value if it appeared in publications dealing with a variety of subjects. An attempt will be made as far as possible to keep together woods of the same geographical region or botanical group, but the limiting factor is material, and it is considered to be of more importance to publish descriptions of woods of which good material is available than to hold them up for the sake of geographical completeness. . . .

"The magnitude of the task now begun by Dr. Burtt Davy and Dr. Chalk may appear overwhelming, but of its importance there can be no question. A beginning having been made, it is hoped that reliable material may be forthcoming in greater quantity, and that in different parts of the Empire collaborators may be found whose local experience should prove invaluable. With such co-operation the systematic description of the trees and woods of the Empire should make steady progress and the large gaps in our knowledge of them should be filled within a measurable space of time."—Preface by R. S. TROUP, *Director, Imperial Forestry Institute.*

The species described and illustrated with line drawings, photomicrographs, and photographs are as follows: *Juniperus procera* Hochst., *Widdringtonia Whytei* Rendle, *W. juniperoides* Endl., *Podocarpus gracilior* Pilger, *P. milanjianus* Rendle, *Afzelia quanzensis* Welw., *A. africana* Smith, *A. bipindensis* Harms, *Baikiæa plurijuga* Harms, *Copaifera mopane* Kirk, *C. coleosperma* Benth., *Piptadenia Buchananii* Baker, *P. africana* Hook. f., *Pterocarpus angolensis* DC., and *P. Stevensonii* Burtt Davy.[1]

The headings for the descriptions are: Common names; Vernacular names; Botanical name; Historical; Botanical description; Distribution; Climatic conditions; Vegetation type; Regeneration and afforestation; Diseases and pests; Importance and uses; Description of the wood: general properties; macroscopic features; microscopic features; material. The work concludes with a bibliography and supplementary references. The publication maintains a high standard throughout.

***Chidlowia*, a new tree genus of Caesalpiniaceae from West Tropical Africa.** By A. C. HOYLE. *Kew Bulletin of Miscellaneous Information* 2: 101–103, 1932. Illustrated.

Chidlowia sanguinea Hoyle is "a small spreading tree 6–10 m. high in closed forest, or a medium or tall tree up to 25 m.,

[1] "The specific epithet is given in compliment to Mr. Duncan Stevenson, Chief of the Forest Service of Northern Rhodesia, who first sent botanical specimens to the Imperial Forestry Institute, and furnished information as to the uses of the timber."

sometimes with bark 'channelled, grooved, knotted and gnarled,' and with wine red flowers in long pendulous racemose panicles, and large woody pods. Said to be common at York Pass, Sierra Leone, where it is a 'big tree.'

"Vernacular names:—Samantawa, Breni-Atawa (Ashanti). The generic name *Chidlowia* is given in honor of the collector, Mr. Chidlow Vigne, Silviculturist, Gold Coast Forest Service; Mr. Vigne was the first to suggest that his specimens represented a new genus."

Chromosome numbers and the anatomy of the secondary xylem in the Oleaceae. By KARL SAX and ERNST C. ABBE. *Journ. Arnold Arboretum* (Jamaica Plain, Mass.) 13: 1: 37–48. Illustrated.

"The Oleaceae form a natural family of plants, although there are well marked differences between most of the genera. The family is divided into the Oleoideae which includes *Fraxinus*, *Forsythia*, *Syringa*, *Forestiera*, *Chionanthus*, *Olea*, and *Ligustrum*, and the subfamily Jasminoideae which includes *Jasminum*. According to Rehder there are more than 20 genera with over 400 species, most of which are trees and shrubs."

"The Oleaceae have been differentiated into rather well marked genera and species and have attained a wide geographic distribution with little change in chromosome number or chromosome morphology."

Five pages are devoted to brief descriptions of the anatomy of the secondary xylem of the different genera. Comparison of the principal structural features is shown in a diagram.

"On the whole there is a suggestive parallelism between chromosome number, grafting relationships, and anatomical structure."

Neue Erfahrungen auf dem Gebiete des Schneidens harter Objekte. By J. KISSER. *Zeitschrift für wissenshaftliche Mikroskopie und für mikroskopische Technik* (Leipzig) 48: 3: 320–342, 1931.

This paper discusses the methods which have been perfected

in recent years for softening hard plant tissues in order that they may be sectioned satisfactorily. The softening can be accomplished by means of water, either with or without the addition of certain indifferent substances, by treatment with chemical agents, and by treatment with certain organic solvents under the action of heat and pressure.

In water softening, where it is desirable to preserve the cell contents, the immersion must be carried out in a cold or only slightly warm liquid. If it is not necessary to consider the cell contents, the material may be boiled in water or dilute glycerine, or exposed to flowing steam for a prolonged period. The final favorable cutting consistency may then be obtained by exposing the wood to the action of a mixture of alcohol, water, and glycerine, of varying proportions. Very hard objects may be cut by means of warm or hot water irrigation or under steam.

Softening can also be effected by various chemical agents, such as diaphanol (a solution of chlorine dioxide), a mixture of chlorine dioxide and nitric acid (Niesmann), dilute hydrogen peroxide, and hydrofluoric acid. The last named agent not only works on the infiltrated mineral matter, but also acts to soften the hard cell membranes; it is also particularly advantageous in that it does not alter the cell contents, when used with care.

Softening is also accomplished by a treatment with alcohol, under the action of heat and pressure (Jeffrey). Acetone acts in a like manner, while a mixture of alcohol and ether is somewhat less effective. Consequently a limited softening is accomplished by imbedding in celloidin under pressure.

The various methods of softening may also be combined to some extent, thereby giving a greater range of treatments.

The softening effect that has been claimed for cellulose acetate used in imbedding is discounted, such softening as does occur being attributed to the acetone used as a solvent.

As an imbedding medium, celloidin is particularly recommended, especially if Jeffrey's method of treating under pressure is used. Attention is also called to the fact that in paraffin imbedding, a certain pliability is given to hard tissues which facilitates their preparation.—GEORGE A. GARRATT.

Handbuch der biologischen Arbeitsmethoden. Abteilung XI: Chemische, physikalische und physikalisch-chemische Methoden zur Untersuchung des Bodens und der Pflanze, Teil 4, Heft 2, Lieferung 353. Under the general editorship of EMIL ABDERHALDEN. Urban and Schwarzenberg, Berlin and Vienna, 1931. Pp. 178; 3 plates; 20 figs.

This issue includes three articles by Dr. Josef Kisser of Vienna on micro-technical methods, as follows: Preparation of plant-ash pictures and silica skeletons from anthrakogramms; Preparation of thin sections of recent plant material; Maceration methods applied to recent plant material.

The term "anthrakogramm" is used to describe microscopic preparations of organic material produced by heating in various ways until it turns quite black. The method is of use in comparing the structure of normal plant tissues with that of charcoal. Examination of the ash produced by further heating reveals structural details of the cell wall and cell contents which cannot otherwise be detected, and various methods of preparation are described in detail. The practice recommended is first to heat the material quite gently over a small luminous flame until carbonization is complete, and then to heat more strongly over a hotter flame for a further period of 30 to 90 minutes.

The second article mentioned deals briefly with the preparation of sections of normal plant material and describes methods of infiltrating and embedding fragile or brittle objects, including charcoal.

The application of the maceration method is dealt with in detail, with separate sections on the maceration of living tissues without destroying the cell contents, algae and fungi, parenchyma, latex tubes, sieve tubes and excretory cells, lignified tissue, bast fibres, cork, and methods of isolating individual tissues such as epidermal layers and plant cuticles.

There is an extensive list of literature references. It is announced that a future issue in this series will contain a further article by Dr. Kisser on the preparation of sections (Botanisch-mikro-technische Schneidemethode).—B. J. RENDLE, *Forest Products Research Laboratory, Princes Risborough.*

L'essai des bois. By M. Monnin. Paris, 1931. Pp. 31; 7½ x 10½.

This paper, which was presented at the meeting of the Association pour l'Essai des Matériaux, held at Zurich in September 1931, discusses the testing of wood, with special reference to the French methods. The subject matter is treated in seven sections.

Section I is devoted to a brief consideration of the size of test pieces for bending tests, and explains the advantages of the small-sized specimens (2 cm. square and 30 cm. long, tested over a span of 24 cm.) adopted in France.

Section II contains a discussion of the factors to be considered in generalizing the results of various tests. These include moisture content (correction factors for air-dry material), specific gravity (indices of quality), volume and linear dimensions (coefficients of shrinkage), and knots and other defects in relation to bending exponents (indices of form).

Section III treats of those test results and notations which are considered of little importance in characterizing wood. Tests in tension parallel to the grain are held to be impractical, while the Janka ball test for hardness is considered unsatisfactory, since it is complicated by the compressive and shearing stresses introduced. For determining side hardness, the French have adopted the Chalais-Meudon method, by which a cylinder, 3 cm. in diameter, is applied to the radial face of the wood. This measure of hardness is directly related to transverse compression and transverse shear and, hence, serves as a summation of these properties. The utility of the notation of elastic limit and of modulus of elasticity is questioned. For the latter, the French have substituted "stiffness at rupture." The orientation of the growth rings in test pieces, in relation to the direction of the applied force, is also considered.

Section IV deals with the summation of the mechanical properties by means of the rapid impact test. This test is advanced as the best criterion of the quality of wood, since

wood fails in practice only by impact or like stresses, and also because it represents an automatic summation of the strength factors. The topics briefly considered include resilience, formulæ for the homology of resilience, and estimation of the dynamic quality of wood.

Section V is concerned with the relation between the appearance of wood and its mechanical properties. The question of botanical identification is briefly dealt with and the balance of the discussion is given over to a consideration of the significance of grain and texture as applied to wood.

In Section VI the properties of wood are classified according to esthetic features, chemical properties (durability), physical properties (moisture content, shrinkage, and specific gravity or density), technological features (grain and texture, defects, methods and dimensions of cutting, and finishing characteristics), and mechanical properties (hardness, compression and static bending, resilience and impact bending, cleavability and tension perpendicular to the grain).

Section VII and the appended tables give a résumé of the French methods of testing. Table I and the related subject matter outline the procedure for making the various physical and mechanical tests, summarizing the number and size of test pieces, the method of operation, the measurements recorded, the values computed, and the moisture corrections for air-dry wood. In Table II, scales of comparison are set up for the various physical and mechanical properties, to afford a means of classifying various woods in the several properties. Table III gives, in applying the preceding, the minimum requirements for the woods likely to enter into aircraft construction. In Table IV are incorporated sample data sheets for recording test results. The section is completed with a list of the equipment needed in a wood-testing laboratory and a brief bibliography of official references.

In conclusion, the author recommends the international adoption of the outlined methods because of their simplicity and practicability, as demonstrated by ten years of continuous experience.—GEORGE A. GARRATT, *Yale University School of Forestry.*

Forestry statistics for 31 countries. Extract from the *International Yearbook of Agricultural Statistics 1930–31*, Int. Inst. Agr., Rome, 1932. Pp. 50; 6¾ x 9½.

"The third part of the Appendix to the International Yearbook of Agricultural Statistics 1930–31 contains a series of tables in which there have been grouped together the statistical data concerning forests that are to be found in the official publications of several countries.[1]

"This year the number of countries dealt with has been added to, there now being included Europe, with the exception of the southern and western parts and, outside Europe, many forest regions of considerable importance. . . . For each country, to the degree permitted by the existing material, there have been indicated successively the extent and nature of the forest lands, the conditions of ownership and management, the distribution of the forests according to species and age, the volume of woody material existing in the forests, the mean annual increment and, finally, the production of wood. It has not been possible to take into consideration either the statistics of international trade or those of prices of forest products."

Bulletins of Yale University School of Forestry

5. The Den: A preliminary report, with map, of a tract of woodland given to the School by Mr. and Mrs. Winthrop Perry. By JAMES W. TOUMEY & RALPH C. HAWLEY. 1920. Free.
8. Cocobolo. By SAMUEL J. RECORD & GEORGE A. GARRATT. 1923. Price 50 cents.
9. Some effects of cover over coniferous seedbeds in southern New England. By JAMES W. TOUMEY & ERNEST J. NEETHLING. 1923. Price 35 cents.
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12. Hemlock: Its place in the silviculture of the southern New England forest. By PERRY H. MERRILL & RALPH C. HAWLEY. 1924. Price 50 cents.

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[1] Algeria, Austria, Bulgaria, Canada, Czechoslovakia, Denmark, Estonia, Finland, Germany, Great Britain, Greece, Hungary, India, Irish Free State, Japan, Jugoslavia, Latvia, Lithuania, Netherlands, Netherlands Indies, New Zealand, Nigeria, Norway, Poland, Rumania, Sweden, Switzerland, Turkey, Union of South Africa, United States, U. S. S. R.

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26. Factors controlling germination and survival of spruce seedlings. By PERCY M. BARR. 1930. Price 50 cents.
27. The Eli Whitney Forest: A demonstration of forestry practice. By RALPH C. HAWLEY & WILLIAM MAUGHAN. 1930. Price $1.50.
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31. The evergreen forests of Liberia. By G. PROCTOR COOPER, III, & SAMUEL J. RECORD. 1931. Price $1.00.
32. Root growth of white pine (*Pinus Strobus* L.). By CLARK LEAVITT STEVENS. 1931. Price 50 cents.
33. The Yale Demonstration and Research Forest near Keene, New Hampshire. By JAMES W. TOUMEY. 1932. Price $1.00.

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Yale University School of Forestry

TROPICAL WOODS

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TROPICAL WOODS

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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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THE FORESTS OF ECUADOR

By AUGUST RIMBACH [1]

Riobamba, Ecuador

The Republic of Ecuador, lying upon the Pacific coast of South America, directly across the Equator, is bounded on the north and east by Colombia, and on the south and east by Peru. The boundary between Ecuador and Peru is still a subject of litigation. The area of the Republic, including dis-

[1] Dr. Rimbach is a trained botanist who has studied the vegetation of many different regions of the New World from the United States to southern Chile. He taught botany and microbiology for a year at the University of Nebraska, Lincoln, Nebraska, and later was Professor of Agricultural Botany and Plant Pathology at the Instituto Nacional de Agricultura at Montevideo, Uruguay. In Ecuador he has been engaged on a study of the diseases of Cacao trees. During the past two years, when he has had opportunity, he has collected herbarium and wood specimens for the Yale School of Forestry.—EDITOR.

puted territory, is approximately 700,000 square kilometers. The population, estimated at 2,500,000, consists in large proportion of persons of the white race, but there are also a great number of Indians, relatively few negroes, and many persons of mixed blood.

Traversing the whole country in a general north and south direction are the Eastern and the Western Cordillera,—two parallel chains of the Andes about 50 km. apart, which give rise to three natural divisions: (1) the coast region between the Pacific Ocean and the Western Cordillera; (2) the Interandine region (Sierra), a highland with an average elevation of 2000 meters between the two Cordilleras; and (3) the Oriental region between the Eastern Cordillera and the boundaries of Colombia and Peru in the basin of the Upper Amazon River. Drainage to the Pacific is through the Mira, Santiago, Esmeraldas, Guayas, Jubones, and Tumbez Rivers, while that eastward to the Amazon is through the Napo, Tigre, Pastaza, Morona, Santiago, and Chinchipe. About 20 mountain peaks extend above the snow line, which is reached at 4600 meters. Apart from the Cordilleras, there is a low coastal range lying to the west of the Guayas River system and extending from Guayaquil to Esmeraldas.

The temperature is almost uniform throughout the year. Rainfall in the Oriental region is heavy and diminishes only a little from November to January. In the Interandine highland, the western Cordillera, and the lowland of the coastal region there is a well-marked rainy season (*invierno* or winter) from January to May and a corresponding dry season (*verano* or summer) from June to December. On the outer slopes of the Western Cordillera, especially in the northern part, the seasonal differences are not so pronounced and there is some precipitation during the *verano*. The coastal region becomes progressively more arid southward toward the deserts of Peru. The basins of the Interandine highland have a temperate climate, but in some places irrigation is necessary for the growing of crops.

The character of the Ecuadorian vegetation is largely dependent on the quantity and distribution of the rainfall. The wet regions, comprising the greatest part of the Republic,

are forested, and mostly in primeval condition. So few botanical collections have been made that it is not yet possible to convey an adequate idea of the composition of these forests.

The Coast Region

The outer slope of the Western Cordillera and the adjoining lowland are covered with dense evergreen forest. In the northern part as far south as Cabo Pasado, and on two other narrow tracts near Manglaralto and Balao, the compact forest reaches the seashore. Only upon the lower slopes and at the very foot of the Cordillera is this vegetation real rain forest. Farther west it gradually becomes drier, while to the south the wooded belt diminishes in width and almost disappears near the Peruvian frontier. The forest extends up the mountains as far as 3400 meters, the general limit of tree growth in Ecuador, although stands or single trees may, in sheltered sites, reach 4000 meters. Beyond the tree line is the paramo, a grass and herb mat covering the wide ridges of the Cordilleras up to the snow at 4600 meters. The composition of the forest is affected by the temperature, which changes at the rate of about 1° C. for every 200 m. difference in altitude.

The forests in the highest situations include the following characteristic trees and large shrubs: Sisín or Sumí (*Podocarpus oleifolius* and *P. glomeratus*), the only Ecuadorian conifers; Aliso (*Alnus* spp.), *Piper Miersinum*, Guishcas, Tarquí (*Hedyosmum scabrum*), Paccha, Mandur (*Clusia*), Motilón, Quinua or Panza (*Polylepis*), Guishmo, Platuquero, Sacha-peral (*Vallea stipularis*), Muille, Samal (*Rapanea andina*), Puma-maqui (*Oreopanax*), Arrayán (*Eugenia?*), Pujín (*Hesperomeles latifolia*), Caisha-pujín (*Crataegus quitensis*), Colca (*Miconia pastoënsis*), Chachacoma (*Escallonia myrtilloides*), and *Gynoxis* sp. In places the upper limit of arborescent vegetation is formed by pure stands of *Escallonia*, *Polylepis*, or *Gynoxis*, bordering, sometimes abruptly, upon the paramo. The trees near this border are only 10 to 15 m. tall, with thick trunks occasionally 1 m. or more in diameter.

On the middle slope of the Cordillera are found Nogal (*Juglans*), Cedro Colorado (*Cedrela*), Cedro Blanco, Caucho Blanco (*Sapium verum*), Saumerio, Cargabola, Chirimoya

(*Annona cherimolia*), Cascarilla (*Cinchona* spp.), Palma de Cera (*Ceroxylon andicola*), and many tree ferns.

On the lower slopes of the Cordillera and on the adjacent lowland are Chipero; Tamajagua, the bast of which was used formerly as clothing by the Indians; Sapotillo, Fernansánchez (*Triplaris guayaquilensis*), Guarumo (*Cecropia*); Mahagua, Higuerón, and Matapalo Blanco (*Ficus* spp.); Matapalo Colorado (*Coussapoa*), Caucho Negro (*Castilla*); Moral Bobo (*Chlorophora tinctoria*) and Moral Fino, both with excellent yellow wood; Tillo, Candángulo, Ébano, Roble (*Tabebuia pentaphylla*), Pechiche (*Vitex gigantea*), Matasarna, Laurel (*Cordia*), Quiebrahacha, Huaiji, Caimito, Suche, Sasafrás, Caimitillo, Guasango, Guion, Jujan, Jagua Dulce (*Genipa*), Morito, Jigua, Sapan, Caracolí (*Anacardium excelsum*), Canelón, Cativo, Naranjo de Monte, Palo María (*Calophyllum*), Figueroa, Cacao Común (*Theobroma cacao*), Cacao Blanco (*T. bicolor*), Balsa (*Ochroma lagopus*), Ceibo (*Ceiba pentandra*), Beldaco, Palo de Leche (*Sapium biglandulosum*), Caoba (*Swietenia*), Monterillo (*Brownea ariza*), Palo Prieto (*Erythrina umbrosa*), Guachapelí (*Lysiloma guachapele*), Bantano, Porotú, Guabo (*Inga* spp.), Guitarro, Cañafístula (*Cassia fistula*), Amarillo (*Centrolobium ochroxylon*). Of the palm trees, the more noticeable are Palma Mocora, the material for the manufacture of hammocks; the majestic Palma Real (*Cocos butyracea*), 25 m. high and 45 cm. thick, bearing fruits with reddish pericarp and oily kernel; Cadi (*Phytelephas macrocarpa* and *P. microcarpa*), the seeds of which supply the "vegetable ivory" of commerce, locally known as *tagua*, occurs in great quantity from the lowland up to 1400 m. In certain places the forest is interrupted by thickets of *Guadua* (Bamboo) 20 to 30 m. high; it is found also on the lower slopes of the mountains, but at greater altitudes is replaced by the genus *Chusquea*, which has thinner and shorter stems.

The appearance of the forest varies according to differences in soil and situation. For instance, Laurel (*Cordia*), Moral, Guasango, Bantano, and Amarillo (*Centrolobium ochroxylon*), grow on elevations, while Jagua, Jagua de Lagarto (*Crataeva tapia*), Pechiche (*Vitex gigantea*), Roble (*Tabebuia pentaphylla*), and Figueroa prefer moist depressions. The Cacao (*Theobroma cacao*) seems to occur wild only in the moist region at the very foot of the Cordillera, but the chief plantations are established in the drier land on the banks of the Daule, Vinces, Zapotal, and Chimbo Rivers (the source of the "Cacao de arriba" of commerce), and farther south from Naranjal to Sta. Rosa ("Cacao de abajo" of commerce). Coffee plantations, on the contrary, are found everywhere from the low land up to 1500 m. In the coastal plain and the lower parts of the Cordillera the average height of the forest trees is between 30 and 40 m., but some species attain 60 and even 70 m. Stem diameters of 1 to 2 m. are common. In the shade of these tall trees are found smaller ligneous species, such as Cacao de Monte (*Theobroma Mariae*), Arete (*Heisteria Spruceana*), Petaquilla (*Tabernaemontana*), Membrillo de Monte (*Gustavia pubescens*), *Passiflora gigantifolia*, Palma Mulata (*Zamia muricata*). In many of these latter species flowers and fruits appear on the main stem and the older branches instead of on the young twigs. The forest floor is in some places quite devoid of vegetation, in others covered by an undergrowth of ferns, aroids, *Heliconia*, *Calathea*, and *Piper*. Here is found also the palm-like Toquilla (*Carludovica palmata*); its leaves supply the material for the so-called "Panama" hats, which are manufactured only in Ecuador. In the wet forest the trunks of the trees are locally covered with climbing ferns, Cyclanthaceae, and Aroids; the exceedingly long, tough, aerial roots of *Heteropsis ecuadoriensis* are an excellent binding material. High in trees the vanilla, of similar growth, makes known its presence by its well-known fragrance.

Near the sea coast, about Portoviejo, Manta, and Jipijapa, around Daule and Guayaquil, on the Peninsula of Sta. Helena, the island of Puná, and near the Peruvian frontier, the woodland changes into savanna or a shrub vegetation with isolated trees. In summer many of these trees and shrubs are leafless. Characteristic arborescent species are Ciruelo (*Spondias mombin* and *S. purpurea*); various kinds of Ceibo (Bombacaceae), some with swollen trunks; Guasmo, Manzanillo (*Hippomane mancinella*), Guanábano (*Annona*),

Algarrobo (*Prosopis chilensis*), Tamarindo (*Tamarindus occidentalis*), Barbasco (*Jacquinia armillaris*), Jaboncillo (*Sapindus saponaria*), Madera Negra (*Tabebuia rufescens*), Palo Santo, Bototillo (*Cochlospermum vitifolium*), and arborescent cacti (*Cereus sepium* and *Opuntia tuna*). In the south, near the Peruvian border, is said to grow Balsámo del Peru (*Myroxylon peruiferum*).

Limited to the brackish water belt of the seashore is a particular forest formation known as the Manglar (Mangrove). Mangrove forest is splendidly developed in two main districts: one in the extreme north, at the mouths of the Mira, Santiago, and Cayapas Rivers; the other in the south, about the estuary of the Guayas River and from there southward along the narrow coastal plain as far as the Peruvian boundary. The principal species is the Mangle Colorado (*Rhizophora mangle*), which in Ecuador grows very tall, sometimes up to 40 m. Behind it are the Mangle Salado (*Avicennia nitida*) and the Jelí (*Conocarpus erecta*).

The Oriental Region

This region bears a dense arborescent vegetation without any natural interruption and is in appearance much like the rain forests of the coastal plain. The enormous buttresses of many trees, the great quantity of palms with stilt roots (*Iriartea*), the extraordinary number of root climbers, and the immense variety of lianas indicate the humidity of the country. Some of the best known trees are the resin-producing Copal (*Hymenæa courbaril*), frequent at an altitude of 800 m. near Canelos and Macas; the Canelo, a Lauraceous tree that furnishes as an article of commerce the *ishpingu*, the persistent, fleshy, highly aromatic calyx of the fruit; the thorny Chonta Ruru or Egg Palm (*Guilielma speciosa*), 25 m. tall and 20 cm. in diameter, whose egg-like, red, edible fruits, ripening from March to May, are an important article of food among the native Indians. Cascarilla (*Cinchona* spp.) grows at the middle height of the Cordillera, and rubber is obtained from the lowlands. In these lowlands along the rivers are extensive stands of tall palm trees: the Cadirina with stiffly upright leaves, the Shiona with hanging feathery fronds, the

Miriti (*Mauritia*) with fan-like leaves and scaly, dark red fruits.

The Interandine Region

The forests of the Interandine region are limited to a strip along the higher and cooler inner slopes of both Cordilleras and are similar to those at the same altitude on the outer slopes. The central portions of the Sierra bear a chaparral of such shrubs as *Baccharis polyantha*, *Duranta triacantha*, *Byttneria parviflora*, and *Lantana quitensis*, or are semi-desert with Agaves and cacti. Here also are a few isolated trees, including the Molle (*Schinus molle*), the Capulí (*Prunus salicifolius*), and the Huarango (*Caesalpinia spinosa*), the last two with good, durable wood. Near Gonzanamá, south of Loja, good timber is supplied by *Lafoensia speciosa*.

The Interandine region has always been densely populated and produces many of the crops characteristic of the temperate zone, such as alfalfa, wheat, barley, potatoes, peas, apples, peaches, strawberries, etc. The demand on the native forest has been heavy and much of the original timber has been cut. Considerable planting has been done throughout the entire region during the past 60 years, especially of *Eucalyptus globulus*, which does well at elevations of 1500 to 3000 meters.

Check List of the Common Names

Agave	*Agave americana* L.	Amaryllidaceae
Algarrobo	*Prosopis chilensis* (Mol.) Stuntz	Leguminosae
Aliso	*Alnus* spp.	Betulaceae
Amarillo	*Centrolobium ochroxylon* Rose	Leguminosae
Arete	*Heisteria Spruceana* Engl.	Olacaceae
Arrayán	*Eugenia* sp. (?)	Myrtaceae
Balsa	*Ochroma lagopus* Sw.	Bombacaceae
Balsamo del Perú	*Myroxylon peruiferum* L. f.	Leguminosae
Barbasco	*Jacquinia armillaris* Jacq.	Theophrastaceae
Beldaco	?	Bombacaceae
Bototillo	*Cochlospermum vitifolium* (Willd.) Spreng.	Cochlospermaceae
Cacao; C. común	*Theobroma cacao* L.	Sterculiaceae
Cacao blanco	*Theobroma bicolor* H. & B.	Sterculiaceae
Cacao de monte	*Theobroma Mariae* Schum.	Sterculiaceae
Cactus	*Cereus sepium* H. B. K. and *Opuntia tuna* Mill.	Cactaceae

Cadi	*Phytelephas macrocarpa* Ruiz & Pav. and *P. microcarpa* Ruiz & Pav.	Palmaceae
Caisha-pujín	*Crataegus quitensis* Benth.	Rosaceae
Cañafístula	*Cassia fistula* L.	Leguminosae
Canelo	?	Lauraceae
Caoba	*Swietenia* sp.	Meliaceae
Capulí	*Prunus salicifolius* H. B. K.	Amygdalaceae
Caracolí	*Anacardium excelsum* (Bert. & Balb.) Skeels	Anacardiaceae
Cascarilla	*Cinchona* spp.	Rubiaceae
Caucho blanco	*Sapium verum* Hemsl.	Euphorbiaceae
Caucho negro	*Castilla* sp.	Moraceae
Cedro colorado	*Cedrela* sp.	Meliaceae
Ceibo	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
Chachacoma	*Escallonia myrtilloides* L. f.	Escalloniaceae
Chilca	*Baccharis polyantha* H. B. K.	Compositae
Chirimoya	*Annona cherimolia* Mill.	Annonaceae
Chonta ruru	*Guilielma speciosa* Mart.	Palmaceae
Ciruelo	*Spondias mombin* L. and *S. purpurea* L.	Anacardiaceae
Colca	*Miconia pastoënsis* Triana	Melastomaceae
Copal	*Hymenæa courbaril* L.	Leguminosae
Egg Palm	*Guilielma speciosa* Mart.	Palmaceae
Fernansánchez	*Triplaris guayaquilensis* Wedd.	Polygonaceae
Guabo	*Inga* spp.	Leguminosae
Guachapelí	*Lysiloma guachapele* Benth.	Leguminosae
Guadua	*Guadua latifolia* Kunth and *G. angustifolia* Kunth	Gramineae
Guanábana	*Annona muricata* L.	Annonaceae
Guarumo	*Cecropia* sp.	Moraceae
Guitarro	?	Leguminosae
Higuerón	*Ficus* sp.	Moraceae
Huarango	*Caesalpinia spinosa* Kuntze	Leguminosae
Jaboncillo	*Sapindus saponaria* L.	Sapindaceae
Jagua	*Genipa* sp.	Rubiaceae
Jagua de lagarto	*Crataeva tapia* L.	Capparidaceae
Jagua dulce	*Genipa* sp.	Rubiaceae
Jelí	*Conocarpus erecta* L.	Combretaceae
Jigua	?	Lauraceae
Laurel	*Cordia* sp.	Boraginaceae
Madera negra	*Tabebuia rufescens* J. R. J.	Bignoniaceae
Mahagua	*Ficus* sp.	Moraceae
Mandur	*Clusia* sp.	Guttiferae
Mangle colorado	*Rhizophora mangle* L.	Rhizophoraceae
Mangle salado	*Avicennia nitida* Jacq.	Verbenaceae
Manzanillo	*Hippomane mancinella* L.	Euphorbiaceae
Matapalo blanco	*Ficus* sp.	Moraceae

Matapalo colorado	*Coussapoa* sp.	Moraceae
Membrillo de monte	*Gustavia pubescens* R. & P.	Lecythidaceae
Miriti	*Mauritia* sp.	Palmaceae
Molle	*Schinus molle* L.	Anacardiaceae
Monterillo	*Brownea ariza* Benth.	Leguminosae
Moral bobo	*Chlorophora tinctoria* (L.) Gaud.	Moraceae
Nogal	*Juglans* sp.	Juglandaceae
Palma de cera	*Ceroxylon andicola* H. & B.	Palmaceae
Palma mulata	*Zamia muricata* Willd.	Cycadaceae
Palma real	*Cocos butyracea* L. f.	Palmaceae
Palo de leche	*Sapium biglandulosum* Muell. Arg.	Euphorbiaceae
Palo María	*Calophyllum* sp.	Guttiferae
Palo prieto	*Erythrina umbrosa* H. B. K.	Leguminosae
Panza	*Polylepis* sp.	Rosaceae
Pechiche	*Vitex gigantea* H. B. K.	Verbenaceae
Petaquilla	*Tabernaemontana* sp.	Apocynaceae
Platanillo	*Heliconia* spp.	Scitaminaceae
Pujín	*Hesperomeles latifolia* M. Roem.	Rosaceae
Puma-maqui	*Oreopanax* sp.	Araliaceae
Quinua	*Polylepis* sp.	Rosaceae
Quishuar	*Gynoxis* sp.	Compositae
Roble	*Tabebuia pentaphylla* (L.) Hemsl.	Bignoniaceae
Sacha-peral	*Vallea stipularis* L. f.	Tiliaceae
Samal	*Rapanea andina* Mez	Myrsinaceae
Sisín or Sumí	*Podocarpus oleifolius* Don and *P. glomeratus* Don	Podocarpaceae
Tamarindo	*Tamarindus occidentalis* Gaertn.	Leguminosae
Tarquí	*Hedyosmum scabrum* Solms	Chloranthaceae
Toquilla	*Carludovica palmata* R. & P.	Cyclanthaceae
Vijao	*Calathea* spp.	Scitaminaceae

"Check List of British Honduras Trees"

The eighth revision of this list of the vernacular and scientific names of the trees, shrubs, and lianas of British Honduras has been compiled by Professor Record in coöperation with the B. H. Forest Department and Field Museum of Natural History. The report is typewritten (95 pages) and is not available for general distribution. (See *Tropical Woods* 24: 15.) It may be consulted at Yale School of Forestry, the Conservator's office in Belize, Field Museum in Chicago, and Imperial Forestry Institute, Oxford.

FIFTEEN NEW FOREST TREES OF THE BRAZILIAN AMAZON

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The species described below as new are hylæa trees that I have collected in different parts of the Brazilian State of Amazonas, in coöperation with the Yale University School of Forestry. The type specimens are preserved in the Jardim Botanico do Rio de Janeiro; cotypes have been distributed among the principal institutions of Europe and America, of which special mention may be made of the U. S. National Herbarium at Washington. The herbarium specimens sent to Yale were accompanied by samples of the heartwood, sapwood, and bark from the trunk of the trees.

Moraceae

Brosimum amplicoma Ducke, sp. nov.—Arbor ultra 40 metros alta, trunco cylindrico crasso latice albo copiosissimo, coma amplissima, ligno toto flavo-albido. Ramuli juniores brunneo- vel cinereo-tomentelli, vetustiores glabri, longitudinaliter striato-sulcati. Gemmae 1–2 cm. longae robustae conicae apice acuminatae vulgo subincurvae, sat dense rufo- vel cinereo-tomentosae, stipulis non persistentibus. Folia petiolo 1.25–1.75 cm. longo robusto leviter tomentello supra plurisulcato, lamina 15–30 cm. longa et 7–14 cm. lata, ovato-oblonga vel ovata margine distincte undulata, basi aequali late subcordata rotundata vel obtusa interdum in medio anguste acutata, apice breviter abrupte acuminata, papyracea vix elastica, supra glabra valde nitida, subtus opaca et praesertim in nervis pilis densis brevissimis flavido-canis pilisque minus densis longioribus albidis tomentosa, costa mediana supra impressa subtus crassa, costis secundariis in utroque latere 22–32 supra impressis subtus validis ante marginem arcuato-conjunctis, venulis supra obsoletis subtus elevato-reticulatis praesertim transversalibus distinctis. Receptacula ad foliorum novellorum axillas solitaria vel bina, undique tenuiter cano-tomentella, pedunculo anthesi usque ad 18 millim. longo sat valido, semiglobosa diametro 8–12 mm., bracteis basalibus paucis quam bracteolae peltatae parum maioribus, floribus masculis numerosis perianthio destitutis staminibus solitariis, flore femineo 1.

Habitat in silvis non inundatis circa São Paulo de Olivença ad ripam meridionalem fluvii Solimões, leg. A. Ducke cum ligno n. 68 [Yale 21,327]. Arbor defoliata receptaculis novissimis 29-10-1931; foliis adultis, receptaculis delapsis sub arbore numerosis, nonnullis sat bene conservatis, 17-2-1932. Vidi arbores prope Tabatinga ad ripam septentrionalem eiusdem fluvii. —Nomen vulgare: "Caucho macho."

This new tree is especially noteworthy because of its great height and the wide extension of its crown, and also because of the abundance of latex, which perhaps even exceeds that of *B. potabile* Ducke. The species is akin to this latter one and particularly to *B. parinarioides* Ducke (see the synopsis of *Brosimum* species of the State of Pará in the "Archivos do Jardim Botanico do Rio de Janeiro," Vol. III, p. 29), but is distinguished perfectly by the form, pubescence, and texture of the leaves and by their nervation.

Helicostylis asperifolia Ducke, sp. nov.—Arbor media trunci ligno interiore fusco, ramulis sat tenuibus, novissimis cano- vel ferrugineo-tomentellis, cito glabratis. Folia petiolo 0.5–1 cm. longo, valido, tenuiter puberulo, vulgo 8–15 cm. longa et 3–6 cm. lata, obovato-oblonga rarius obovata vel oblonga, basi acutata, apice brevissime acuminata vel apiculata, coriacea, vix nitentia, subtus pallida vel ferruginescentia, utrinque minime pilosula et scabrida, costis lateralibus in utroque latere 8–12 supra subtusque sat tenuiter prominentibus ante marginem arcuato-anastomosantibus, venulis subtus prominulo-reticulatis. Receptacula mascula ut in speciebus reliquis at pedunculis (cano-puberulis) solum 3–6 mm. longis, 4–6 mm. in diametro metientia, antheris exsertis, alba. Receptacula feminea ut in *H. Poeppigiana* sessilia iisque simillima at circiter ⅓ minora; fructifera non vidi.

Habitat civitate Amazonas secus fluvium Solimões silvis non inundatis, leg. A. Ducke, Octobre et Novembre florens: typus prope São Paulo de Olivença (Herb. Jard. Bot. Rio n. 19,496, mas et femina); prope Tonantins (H.J.B.R. n. 19,497) et prope Fontebôa (H.J.B.R. n. 19,498), mares. Lignum ex arbore typica masculina (Ducke n. 28 [Yale 20,709]).

This new species is distinguished by its comparatively small leaves, rough on both sides, and by its short-pedunculate staminate receptacles.

Myristicaceae

Iryanthera tricornis Ducke, sp. nov.—Arbor dioica, media vel sat elata, trunci vulgo parum crassi cortice fusco vel cinereo partim in laminas soluto, ligno interiore rufo bono, innovationibus tenuiter ferrugineo-tomentellis. Folia disticha petiolo 1–1.5 cm. longo valido glabro fusco, lamina 7–13 (rarius 15) cm. longa et 3–6 cm. lata, obovata vel rarius sublanceolato-obovata, basi plus minus cuneata acuta, apice brevissime et obtuse acuminata vel obtusa summo apice saepe levissime emarginata, adulta coriacea supra glabra fuscescentia subtus sublepidoto-tomentella ferruginescentia, novella pellucido-punctulata, costa mediana subtus crassa, costis lateralibus (utrinque 9–11) basi subtus tenuiter prominulis marginem versus evanescentibus, venulis nullis. *Inflorescentiae utriusque sexus* super petiolorum insertiones axillares solitariae vel binae. *Inflorescentia mascula* ad 10 cm. rarius 15 cm.

longa gracilis saepe flexuosa, floribus circa apices incrassatos ramulorum distantium usque 1 cm. longorum fasciculatis, rhachidibus sparsim puberulis; flores cum pedicellis (2–3 mm. longis, tenuibus) et bracteola (parva, sub ipso flore inserta) dense ferrugineo-sericei, perianthio adulto 1–1.5 mm. longo statu clauso subgloboso statu aperto late campanulato lobis tribus profunde partitis intus glabris, columna staminali infra obconica antheris 5 vel 6 (3 maioribus, 2 vel 3 minoribus, albidis, obtusis, columnae adnatis) aequali vel parum breviore. *Inflorescentia feminea* vix ultra 2 cm. (demum 3 cm.) longa, ramulis floriferis quam in mascula brevioribus, floribus validius pedicellatis et parum maioribus; ovarium glabrum stigmate sessili. Fructus (ferre adultus) unus per inflorescentiam (in speciminibus nostris), pedunculo ad 3 cm. longo, 2 cm. altus et 2.5–3 cm. latus, compressus, vertice et in utroque latere apophysibus cornutus (apophysi apicali truncata, lateralibus obtusis), glaberrimus.

Frequens in silvis non inundatis circa Fontebôa (Rio Solimões, civ. Amazonas), leg. A. Ducke 26–11–1927 fructibus junioribus, 4–9–1929 florif. (typus in Herb. Jard. Bot. Rio n. 19,568); prope São Paulo de Olivença 29–2–1932 fructibus fere adultis (Ducke n. 69, cum ligno [Yale 21,328]). Lignum frequenter usitatum; "Punán" appellatur.

This species is distinguished from all others by the bark and wood of the trunk, by the obovate leaves, and by the tricornigerous fruit.

Leguminosae

Peltogyne excelsa Ducke, sp. nov.—Arbor maxima, trunco cortice cinereo-brunneo, ligno interiore demum laete violaceo. Ramuli juniores, petioli, petioluli et foliolorum costa subtus dense cano- vel brunneo-pilosi. Folia petiolo 10–15 mm., petiolulis 2–4 mm. longis; foliola 3.5–6 cm. longa et 1.5–2 rarius 2.5 cm. lata, plus minus subfalcato-oblonga, basi inaequilatera obtusa vel rotundata, apice breviter acuminata acumine emarginato, rigide coriacea, utrinque venulosa et nitida, subtus parum pallidiora, praeter costam subtus pilosam utrinque glabra. Paniculae breves vulgo in ramulis aphyllis numerosae in inflorescentiam magnam densifloram unitae, rhachidibus ut ramulis cano- vel brunneo-pilosis; bracteae et bracteolae caducissimae non visae; pedicelli vix 1 mm. longi. Calix utrinque dense albido-sericeus, tubi disciferi turbinati anthesi ad 2 mm. longi stipite ad 3 mm. longo, limbi segmentis 6–7 mm. longis 5–6 mm. latis ovatis obtusiusculis; petala alba ad 8 mm. longa vix ad 2 mm. lata (parum ante apicem), anguste lineari-spatulata, eglandulosa; filamenta staminum maiorum circa 1.5 cm. longa, omnia glabra, alba; ovarium brevissime stipitatum dense albido-hirtum, stilo glabro stamina maiora aequante. Legumen solum vidi novissimum ut videtur eo *P. Lecointei* simile.

Habitat silva non inundabili infra Camanáos (regione cataractarum Rio Negro, civitate Amazonas), 20–11–1929 leg. A. Ducke, Herb. Jard. Bot. Rio. n. 23,276, ligni numero 62 [Yale 21,006].

Affinities with *P. Lecointei* Ducke are indicated by the form of the inflorescences and the flowers, and by the beautiful bright violet wood; it differs in having hairy young branchlets, etc., and smaller and much more coriaceous leaves. *P. parvifolia* Benth. (which I have not seen) has, according to its description, glabrous branchlets and leaves (the latter almost without veins), and comparatively large petals.

Peltogyne catingae Ducke, sp. nov.—Arbor media vel sat magna cortice fusco, ligno interiore saturate purpureo-violaceo, praeter inflorescentias tota glabra. Ramuli saepe purpurascenti-fusci vel fere nigri. Folia petiolo 2–5 cm. longo, petiolulis 0.5-ultra 1.5 cm. longis; foliola (sat pauca adsunt) 7–16 cm. longa et 3.5–9 cm. lata, plus minus falcato-oblonga, basi valde inaequilatera obtusa rotundata vel subcordata, apice vulgo brevissime acuminata, coriacea, utrinque nitida subconcolora, supra distinctius quam subtus prominenti-reticulata. Paniculae in axillis foliorum anthesi incipiente caducorum subcymoso-subpyramidatae vulgo 8–15 cm. longae ramulis primariis sat distantibus alterne distichis, rhachidum partibus novellis ferrugineo-pilosis; pedicelli breves vix ultra 2 mm. longi; bracteolae latae, concavae dorso carinatae, pallide brunneae extus praeter marginem tenuiter fulvo-sericeae, ante anthesin caducae. Calix extus totus densissime fulvido-sericeus, tubo discifero turbinato 2–2.5 mm. longo, stipite brevissime (1.5 mm.) vel a tubo non bene distincto, limbi segmentis 6–7 mm. longis vix ad 5 mm. latis, ovatis obtusis, sericeis intus margine glabris; petala alba circa 8 mm. longa ante apicem vix ad 2 mm. lata, lineari-spathulata, obsolete glandulosa; stamina alba, maiora ut stilus circa 2 cm. longa; pistillum glabrum ovario brevissime stipitato. Legumen solum novissimum visum eo *P. campestris* Ducke simile videtur.

Frequens in silvis "catinga" circa Camanáos (regione cataractarum Rio Negro, civitate Amazonas), leg. A. Ducke, typus in Herb. Jard. Bot. Rio n. 23,277, ligni numero 63 [Yale 21,007]. Arbor altera, omnino defoliata et abundanter florifera, solum floribus magis albido-sericeis differt certeque ad hanc speciem pertinet (H.J.B.R. n. 23,278). Novembre et Decembre florifera.

This new species is related evidently to *P. campestris* Ducke, but differs by its larger leaves, its amply branched inflorescences, and its silky bracts. The wood is of a dark purple-violet, magnificent, and very hard. The tree forms one of the characteristic elements of the "catinga" forest near Camanáos at the foot of the cataracts of the Rio Negro and of the region of its tributary, the Rio Curicuriary.

Peltogyne rigida Ducke, sp. nov.—Arbor media vel sat magna, trunco cortice cinereo-brunneo, ligno interiore fusco-violaceo, praeter calicem et

ovarium undique glaberrima. Ramuli steriles cinerei, fertiles nigro-fusci. Folia ramulorum sterilium petiolo usque ad 2 cm. longo; foliola petiolulis usque ad 1.5 cm. longis, 10–15 cm. longa et 5–8 cm. lata, plus minus falcato-oblonga, basi inaequilatera rotundata vel obtusa, apice obtusa vel brevissime acuminata, sat rigide coriacea, utrinque nitidula subconcolora et plus minus distincte prominenter penninervia et reticulata. Folia ramulorum fertilium (dum adsunt) semper minora (saepe parva) dure coriacea nervis et venulis magis obsoletis. Paniculae in axillis foliorum delapsorum ramuli defoliati vel infra foliis parvis fulti, subcymosae vel subpyramidatae, usque ad 10 (rarius 12) cm. longae, densiflorae, rhachidibus rigidibus lignosis; bracteae et praesertim bracteolae usque ad anthesin persistentes, latae concavae, extus glandulosae, in vivo virides, siccitate fuscae margine pallidiore translucido. Flores brevissime (1–2 mm.) pedicellati; calix extus totus dense fulvido-sericeus, tubo discifero viridi turbinato 3–3.5 mm. longo, stipite 2–2.5 mm. longo, limbi segmentis in vivo pallidius viridibus 5–8 mm. longis 4–6 mm. latis ovatis obtusis intus sericeis margine glabro; petala rosea 6–8 mm. longa ante apicem ad 3 mm. lata, spathulata, glandulis numerosis bene conspicuis; stamina praeter basin roseam alba, glabra, maiora ut stilus usque ad 20 mm. longa; ovarium dens flavido-sericeum, stipite brevi ut stilus glabro. Legumen magnitudine et forma ut in speciebus *P. campestris* Ducke, *P. densiflora* Benth., *P. Lecointei* Ducke, junius flavido-sericeum.

Habitat circa Manáos in silva primaria non inundabili locis arenosis humosis rivulis nigris vicinis, florifera fructibusque novellis et vetustis 19-3-1932, leg. A. Ducke (n. 80, cum ligno [Yale 21,339]).

This species is near *P. densiflora* and especially *P. campestris*. It is distinguished from the first by the hard coriaceous leaves, the form of the inflorescences, and the smooth bracts and bractlets; from the second by the silky ovary; from both by the dark brownish violet wood. The color of this wood is intermediate between the pure violet of the above-mentioned species and the brown red of *P. paniculata*, which only after a long time acquires weak traces of purple.

Jacqueshuberia purpurea Ducke, sp. nov.—A specie *J. quinquangulata* Ducke differt praesertim inflorescentiis multum longioribus floribusque purpureis, dimensionibus partium fere omnium aliquanto maioribus, indumento tenuiore. Arbor ad 15 metros alta, trunco quinquangulari sat debili ligno duro, ramis paucis elongatis inter arbores vicinas fere subscandens. Ramuli quinquangulares, novelli parce canotomentelli. Folia ad 40 centim. longa petiolo usque ad 7 centim. longo, pinnis ad 15 centim. longis subsessilibus, foliolis ad 80-jugis nervis secundariis utrinque obsoletis. Stipulae et foliorum characteres reliqui ut in specie citata. Racemi tenuius cano-sericei elongati multiflori longe pedunculati, rhachide florifera 15–25 centim. longa; bracteae non visae; calix viridis, petala et stamina purpurea, filamentorum pili ferruginei, ovarium flavido-sericeum. Legumen ignotum.

Habitat in silva riparia periodice inundabili fluminis nigerrimi Curicuriary Rio Negro superioris affluentis, 23-12-1931 leg. A. Ducke (n. 54, cum ligno [Yale 20,998]). Arbores vidi duas.

This is the second species of a genus that previously has been considered monotypic. The first species is known only on a "campina" near Gurupá at the beginning of the Amazon estuary.

Melanoxylon amazonicum Ducke, sp. nov.—Arbor magna ligno interiore duro fusco, praeter inflorescentiam undique glaberrima. Folia rhachide supra anguste canaliculata; foliola saepissime 7 (rarissime pauciora), vulgo opposita, longiuscule (7–10 millim.) petiolulata, maiora 8–11 centim. longa et 4–5 centim. lata, plus minus oblongo-ovata, basi parum obliqua subcordata, apice obtusa et breviter retusa rarius subacuminata, coriacea, supra nitida, subtus subopaca, subconcolora, utrinque tenuiter penninervia et dense tenuiter reticulata. Panicula terminalis erecta magna rufo-tomentella, e racemis paucis paucifloris composita; bracteae et bracteolae caducissimae, non visae; pedicelli 1 cm. et ultra longi, tenues, cum calicis stipite articulati; calix extus dense rufo-sericeus, tubo 7–8 mm. longo campanulato-turbinato et mediocriter stipitato, limbi segmentis 8–9 mm. longis subaequalibus oblongo-ovatis obtusis intus praeter margines glabris brunneis; petala pulchre aurea, 22–25 millim. longa et 11–18 millim. lata, oblongo-obovata, basi breviter unguiculata, apice rotundata, glabra; stamina libera, glabra; ovarium breviter stipitatum ferrugineo-sericeum, stilo basi glabro. Legumen maturum vulgo ad 12 rarius ad 17 centim. longum fere 2 centim. latum compressum planum valvis dehiscentibus non elasticis, ad 0.5–1 centim. stipitatum, glabrum, seminibus 4–7 vulgo circa 1.25 centim. longis et 0.75 centim. latis valde compressis non alatis at subcarinato-marginatis, testa brunnea nitidula dura.

Habitat in silva riparia non vel vix inundabili super Santa Izabel (Rio Negro), leg. A. Ducke, Herb. Jard. Bot. Rio n. 23,323, ligni numero 58 [Yale 21,002]. Decembre florebat et fructificabat.

This species is distinguished from the other two of the same genus by the smaller number of leaflets; from *M. speciosum* R. Ben. also by the tomentum of its inflorescence and its ovary; from *M. brauna* Schott by its glabrous stamens and by its furrowed, but not winged, seeds. I found several trees in the forest on the high banks of the Rio Negro, a little above the currents of Santa Izabel.

Vouacapoua pallidior Ducke, sp. nov.—Arbor media speciei *V. americana* Aubl. habitu et dimensionibus partium omnium sat similis, differt ligno interiore multum pallidiore (castaneo), foliolis saepe aliquanto latioribus, inflorescentiae et florum tomento pallidius canescenti-ochraceo, calicis tubo

discifero longius turbinato, petalis pallide flavis calicem non vel vix excedentibus obovato-oblongis basi parum attenuatis non spathulatis extus usque ad medium et intus basi ad margines tomentosis, fructu vulgo aliquanto longiore basi sat longe stipitiformi-attenuato, hujus tomento ut in specie citata rufo-ferrugineo at minus denso. Flores valde odorati.

Habitat circa Manáos in silvis non inundatis locis silico-humosis humidis, 25-1-1932 florifera et fructibus novellis et fere adultis, leg. A. Ducke (n. 67, cum ligno [Yale 21,326]). Prope Santa Izabel (Rio Negro) sat frequenter visa. Nomen vulgare: "Acapú."

This is the second species of a genus that previously has been considered monotypic; the sterile plant approximates the other species, but its aspect is quite different when flowering. Its wood is good, but little known. This new species has so far been found only in the forests of the Rio Negro. The other species (*V. americana* Aubl.), well known for its celebrated wood (the Acapú of Pará), grows in the Guianas and the State of Pará; according to Baillon, it has also been found in the Upper Rio Negro, but the herbarium samples collected in that region may perhaps belong to the new species described above.

Clathrotropis macrocarpa Ducke, sp. nov.—Arbor vulgo media cortice foetido, ligno sordide albido, ramulis lenticellosis glabris vel glabratis. Stipulae non visae. Folia in ramis sterilibus saepe fere metralia, in fertilibus vulgo 25–55 cm. longa, longe petiolata; foliola 5 vel 7, opposita cum terminali solitario, longiuscule et crasse petiolulata, terminale 12–25 cm. longum et 5–12 cm. latum, reliqua non multum minora, omnia obovata basi longe cuneata apice rotundata vel late obtusa, rigide herbaceo-coriacea margine recurvo, supra glabra nitida, subtus tenuiter cano-ferrugineo-tomentosa opaca, costa mediana et costis lateralibus (utrinque 8–11, fortiter adscendentibus) supra tenuibus subtus validis et fortiter prominentibus, venulis supra inconspicuis subtus transverse prominulo-reticulatis. Panicula usque ad 3 dm. alta modice ramosa ramulis floriferis racemosis, cum pedicellis et calice dense ferrugineo-sericea; bracteae bracteolaeque parvae concavae caducissimae; pedicelli floriferi 3–4 mm. longi; calix herbaceus, 8–10 mm. longus ac plus minus aequaliter latus, late oblique canpanulatus, basi brevissime turbinatus, apice vix ad ⅓ bilabiatus, dentibus labii superioris 2 latis, labii inferioris 3 longius acuminatis. Petala roseo-violacea, subaequilonga 12–15 mm. longa, glabra (praeter vexilli basin subsericeam); vexillum superne 8–10 mm. latum obovatum basi mediocriter unguiculatum et utrinque super unguem minime auriculatum; alae vexillo multum angustiores leviter falcatae; carinae liberae alis sat similibus parum minores et tenuius membranaceae. Stamina filamentis basi subtilissime puberulis, 5 longiora, 5 parum breviora. Ovarium sessile, 2-ovulatum (semper?), albido-hirsutum,

stilo glabro, stigmate parvo terminali. Legumen sessile, maturum 14–21 cm. longum 6–8 cm. latum, compressum planum solum marginibus ob suturam utramque plurinerviam et dilatatam incrassatis, sutura vexillari (fere recta) magis dilatata quam sutura carinali (valde arcuata), undique pilis brevibus densissime rufo-ferrugineo-velutinum, valvis lignosis demum elastice dehiscentibus; semen 1 (vel rarissime 2), 6–7 cm. longum et 5–6 cm. latum oblongum vel subreniformi-oblongum vel subtriangulare, valde compressum, testa rufo-brunnea subcrustacea fragili nitida, embryone in vivo viridi.

Habitat frequens in silvis non inundatis locis humidis prope Rio Negro superiorem ubi "Cabary" appellatur, loco Yucabi super ostium fluminis Curicuriary leg. A. Duke 19–11–1929, florif. et valvis seminibusque recentissime delapsis (typus in Herb. Jard. Bot. Rio n. 23,368); aequaliter frequens in regione fluvii Solimões prope Fontebôa (leg. A. Ducke 4–9–1929, alabastris novellis, H.J.B.R. n. 23,367), Tonantins (leg. J. G. Kuhlmann 24–1–1924, fructibus fere adultis, H.J.B.R. n. 18,209) et São Paulo de Olivença (Ducke n. 25, cum ligno [Yale 20,706]) ubi saepe "Timbó-páo" vel "Timbó-rana" appellatur.

This species is quite distinct in habit from the common *C. nitida* (Benth.) Harms (of the middle portions of the Amazon), but approximates it in the principal botanical characters, especially of the flowers. The pod, with winged sutures, gives this plant a peculiar aspect, but this does not seem to me a sufficient basis for a new genus. The third species of this genus, *C. grandiflora* (Tul.) Harms (which I have not seen), has membranous leaflets, the calyx slightly silky, etc.; its pods are unknown.

Swartzia ingaefolia Ducke, sp. nov.—Ad sectionem *Orthostyleae*. Arbor media vel sat elata, ligno interiore fusco duro. Ramuli adulti glabri. Stipulae parvae lanceolatae dorso fusco-pubescentes, sat caducae. Folia glabra vel glabrata; petioli sat breves, ut rhachides supra canaliculati, haec sub jugis distincte dilatatae stipellis subulatis persistentibus; foliola 5 vel 7 breviter crassiuscule petiolulata magnitudine et forma sat variabilia, vulgo 5–9 cm. longa et 2–4 cm. lata ovato- vel lanceolato-oblonga, basi saepius obtusa vel rotundata, apice vulgo sat longe sensim acuminata, elastice submembranacea, utrinque nitida, nervis sat dissitis in utroque latere 6–10 subtus prominentibus valde arcuatis ante marginem anastomosantibus, venulis maioribus reticulatis dissitis tenuibus et minoribus subobsoletis densis fere foveolatis. Racemi saepissime e ramorum ligno vetustiore, saepe bini vel terni, simplices, demum recurvi et ad 6–15 cm. longi, dissite pauciflori, dense ferrugineo-tomentelli; bracteae parvae crassae concavae caducae; pedicelli anthesi circa 2 cm. longi robustissimi, apicem versus sensim crassiores, ad ⅔ longitudinis bracteolis duabus minimis subulatis fulti. Alabastra adulta circa 1 cm. longa et fere aequaliter lata, subglobosa, dense subtuberculato-rugulosa et tomento densissimo subaureo-nitente vestita. Flores odorati; calix per

anthesin quadripartitus laciniis ad 1.5 cm. longis recurvis crasse coriaceis intus glabris tuberculato-rugosis; petalum late suborbiculare circa 2.5 cm. longum et 3 cm. latum, subaurantiaco-flavum, glabrum venis extus pilosulis. Stamina glabra, maiora 10 et ultra, minora numerosa, antheris in maioribus 1.5–2 mm., in minoribus circa 1 mm. longis. Carpidia 1–4 saepius 2, elongata plus minus falcata longe stipitata cano-sericea, stilo ultra 0.5 cm. longo glabro, stigmate capitato parvo. Legumen ignotum.

Habitat circa Manáos in silva locis altis, 3–5–1932 florifera, leg. A. Ducke cum ligno no. 94 [Yale 21,353]. Arbores vidi tres. "Coração de Negro" appellatur.—Speciei *S. polycarpa* Ducke affinis, differt praesertim partibus vegetativis glabris et foliolis paucioribus. Arbor sterilis species nonnullas generis *Inga* habitu et foliorum adspectu rememorat.

This is the third species of the genus *Swartzia* with more than one ovary; the others are *S. polycarpa* (mentioned above, at the end of the diagnosis) and *S. dicarpa* Moric., the latter with small flowers and short style. The new species is one of the trees which furnish the dark brown wood known by the common name of Coração de Negro (Negro's heart). But this name is applied in Manáos also to the species *S. corrugata* Benth.; in the State of Pará to the *S. fugax* Benth., *Cassia scleroxylon* Ducke, *Cassia adiantifolia* Benth., and sometimes *Zollernia paraënsis* Hub.; in the State of Maranhão to *Cassia apoucouita* Aubl.; in the State of Ceará to the *Zollernia Ulei* Harms.

Lecythidaceae

Cariniana integrifolia Ducke, sp. nov.—Arbor magna undique glaberrima, ramulis gracilibus saepe lenticellatis. Folia 9–15 cm. longa et 6–9 cm. lata petiolo usque ad 1.5 cm. longo applanato, obovato-elliptica vel oblongo-elliptica basi in petiolum breviter decurrentia apice vulgo brevissime obtuse acuminata, margine integro subtus tenuiter lineiformi, tenuius coriacea utrinque dense rugulosa subconcolora parum nitida, costis lateralibus valde adscendentibus ante marginem arcuato-anastomosantibus in utraque pagina tenuibus, venulis obsoletis. Racemi terminales et ad axillas superiores laxe paniculati foliis longiores parum ramosi, floribus breviter pedicellatis; calix 2.5–3.5 mm. longus apice circa 4 mm. latus lobis 5 brevissimis obtusis vel obsoletis; petala 5, alba, 7–8 mm. longa, tenuiter carnosa, imbricata, obovato-oblonga; androphorum apice laciniis antheriferis inflexis 5, cum staminibus 5 parvis deflexis alternantibus; ovarium triloculare. Pyxidium eo speciei *C. decandra* Ducke magnitudine et forma simile at costis longitudinalibus obsoletis nec clathrato-rugosum.

Sat frequens circa Manáos, silva non inundabili locis humosis et paludosis, typum leg. A. Ducke florif. 17–10–1929, fructibus nondum maturis 11–1930 (Herb. Jard. Bot. Rio n. 23,641).—Varietas aequaliter frequens a typo

differt foliis solum 6–11 cm. longis 4–7 cm. latis vulgo late obovatis apice rotundatis, floribus subsessilibus, petalis vulgo 8–9 mm. longis, androphoro laciniis antheriferis 8 vel 9, staminibus deflexis parvis 6 vel 7. Florifera 26–9–1929, leg. A. Ducke, Herb. Jard. Bot. Rio n. 23,642.—Arborem sterilem cum pyxidiis vetustis, foliis inter formas supra descriptas intermediis, leg. Ducke cum ligno n. 78 [Yale 21,337].

This species is near *Cariniana decandra* Ducke, but its leaves are quite entire (not crenate), shorter and broader, and not at all or only very shortly acuminate.

Sapotaceae

Ecclinusa balata Ducke, Revue Bot. Appliquée vol. X (1930) p. 2 (provisional description).—Arbor media vel sat magna cortice rufo-brunneo, latice albo copioso. Ramuli fertiles crassi, novelli (ut innovationes omnes) cano-sericei. Stipulae ad 2.5 cm. longae lanceolatae acuminatae caducissimae. Folia petiolo valido 2–4 cm. longo supra profunde canaliculato, lamina vulgo 13–30 cm. longa et 8–15 cm. lata saepissime elliptico-obovata basi obtusa vel subcordato-rotundata medio breviter in petiolum acutata, apice breviter acuminata, adulta herbaceo-coriacea margine revoluta, supra glabra parum nitida, subtus pilis brevissimis appressis flavescenti- vel fulvescenti-sericeomicantia, costis utrinque 13–20 modice distantibus supra immersis subtus valde elevatis, venulis oblique transversalibus plus minus obsoletis. Flores in ramulis infra folia e nodis modice distantibus parum elevatis fasciculati, pedicellis vulgo 1.5–3 mm. longis cano-sericeis; calix anthesi circa 4–5 mm. longus ac latus, turbinatus, basi actus, phyllis 5 imbricatis fere usque ad basin solutis ovatis intus glabris extus cano-sericeis, duobus internis pellucido-marginatis; corolla calicem parum superans usque fere ad medium in tubum connata alba omnino glabra lobis 5 imbricatis late ovatis apice obtusis; stamina 5 glaberrima filamentis tubi corollae parti mediae adnatis, antheris crassis extrorsis connectivo apiculatis; ovarium rufo-hirsutum 5-loculare, stilo corollae subaequilongo stigmatibus parvis. Bacca calici demum lignoso usque ad 3–3.5 cm. diametri aucto cupuliformi insidens, sphaeroidea ad 3 cm. longa et 3.5 cm. lata obsolete striata pube brevissima fulvida demum cana et rariore, pericarpio crasso; semina pluriora, libera, circa 1.5–2 cm. longa 1–1.25 cm. lata et 6–8 mm. crassa testa nitidissima area pallida opaca sat angusta supra abbreviata solum ⅗ marginis dorsalis occupante, intus insectis rosa.

Habitat in silvis, praecipue minus densis, humosis, non inundatis at humidis vel leviter paludosis secus rivulos, Amazoniae mediae et occidentalis. Specimina proveniunt e civitatis Pará parte occidentali (Rio Erepecurú affl. fluminis Trombetas, Herb. Jard. Bot. Rio n. 22,237, nomen vulgare "Abiurana"; Rio Trombetas circa cataractam Porteira, n. 22,238, nom. vulg. "Coquirana"; prope lacum Faro loco Infiry, n. 22,239, nom. vulg. "Coquirana"; prope Juruty Velho, n. 22,241, nom. vul. "Coquirana" et civitatis Amazonas parte media (Manáos n. 22,242, speciei typus, nom. vulg. "Ucuquirana") et occidentali (Rio Jacurapá affl. fluminis Içá inferioris,

n. 22,240, nom. vulg. "Balata"). Specimen cum ligno leg. Ducke (n. 49 [Yale 20,993]) prope Manáos. Vidi arbores frequentes in regionibus fluminum Madeira inferioris et Rio Negro.

Evidenter affinis speciei *E. sanguinolenta* Pierre (*Ragala sanguinolenta* Pierre), qua antem recedit floribus distincte pedicellatis et tubo corollae lobis aequilongo. Latex albus resinam "balata inferior" appellatam praebet.

Ecclinusa balata produces almost all the inferior quality of balata of the Brazilian Amazon. This product contains only about 30 per cent of gutta (according to Le Cointe, Director of the Museu Commercial do Pará), but the total value of its exports greatly exceeds that of the superior balata derived from *Mimusops bidentata* A. DC., which, in Brazil, occurs only in the relatively narrow region along the frontier of the Guianas. Enormous quantities of this inferior balata have been exported, especially from Manáos, but this industry is destined to disappear because all the trees in accessible regions are being felled to obtain the latex.

Verbenaceae

Vitex spongiocarpa Ducke, sp. nov.—Arbor 10–30 m. ligno albido, ramulis lenticellosis, novellis tenuissime tomentellis. Folia longe (4–9 cm.) petiolata, 5 (rarissime 3–4)-foliolata; foliola sat longe (1–3 cm.) petiolulata, medianum usque ad 18 cm. longum et ad 8 cm. latum, externa vulgo multo minora, omnia saepius plus minus lanceolato-ovata basi acuta apice longe acuminata, integerrima, margine subtus elevato, rigide coriacea, glabra, nitida, subtus pallidiora, dissite penninervia et reticulata (subtus multum magis conspicue quam supra). Panicula terminalis amplissima vulgo 30–40 cm. alta et 20–30 cm. lata, pyramidata, ramulis primariis et secundariis paucis parce tomentellis; cymae mediocriter pedunculatae bis vel ter dichotomae ferrugineo- vel cano-tomentellae, pauciflorae, bracteis concavis et bracteolis lanceolatis sat longe persistentibus, pedicellis brevissimis. Calix circa 1.5 mm. longus campanulatus breviter at distincte 5-dentatus, ferrugineo- vel cano-tomentellus; corolla 4–6 mm. longa alba fauce flavo-signata, extus albido-sericea, tubo apicem versus parum dilatato, limbo breviter bilabiato, labio inferiore (maiore) tubo multum breviore breviter barbellato. Drupa calici demum fisso insidens, adulta 1.5–2.5 cm. lata et aliquanto minus alta leviter quadrituberculata apice depressa, glabra, nitida, matura rubescenti-nigra, exsucca, epicarpio tenuissimo, mesocarpio crasso spongioso albido, endocarpio tenuiter crustaceo fragili, columna placentaria crassa spongiosa.

Habitat circa urbem Manáos (civitate Amazonas) frequens terris altis silva paludosa secus rivulos, leg. A. Ducke, florif. 15–10–1929 (typus in Herb. Jard. Bot. Rio n. 22,577), fructibus maturis Februario 1930, ligni specimen n. 41 [Yale 20,722]; silva paludosa rivuli affluentis Rio Curcicuriary (affluentis Rio Negro superioris) leg. A. Ducke florif. 28–11–1929, H.J.B.R. n. 22,578.

This new species is frequent in the environs of Manáos, but apparently has been overlooked by previous collectors. The tree reaches greater dimensions than any other Brazilian species of this genus. It is also remarkable because its cymes of small, white, yellow-throated flowers are disposed in great terminal panicles, and especially on account of the voluminous spongy mesocarp of its fruits, which, during the rainy season, floats in the swamps of the upland forests, sometimes in abundance. The blossoming trees, crowned by their wide upward-raised inflorescences, suggest Teak (*Tectona grandis*) rather than the other Brazilian *Vitex* species.

Rubiaceae

Ladenbergia amazonensis Ducke, sp. nov.—Ad sectionem *Euladenbergia*. Arbor media vel elata, cortice succo obscure rubro fluente amarissimo. Ramuli cinerei, glabri, novelli rufi complanati subappresse pilosi. Stipulae ad 1.5 cm. longae longe acuminatae membranaceae, caducissimae. Folia petiolo 2–6 cm. longo depresso plus minus pubescente, lamina usque ad 18 cm. longa et ad 13 cm. lata, maiora late ovato-elliptica basi subcordata apice rotundata, minora oblongo-lanceolata basi medio in petiolum acutata apice obtusa, crassius herbacea vel subcoriacea, utrinque nitida, penninervia (nervis in utroque latere 8–11) et dissite sat obsolete reticulata, subtus parum pallidiora et ad nervos parce pilosa. Inflorescentia terminalis decussato-paniculata folio brevior, pedunculo rhachidibusque complanatis praesertim supra appresse ferrugineo-pilosis, bracteis minimis subulatis, pedicellis plus minus brevibus, bracteolis inconspicuis. Flores odorati; ovarium anthesi 2–2.5 mm. longum subcampanulatum dense et pulchre ferrugineo-sericeum; calix ovario subaequilongus nigrescens glaber dimidio vel tertio apicali subirregulariter dentatus marginibus ciliatulis; corolla alba 18–21 mm. longa, ultra tertium apicale in lacinias 6 lineares angustas subobtusas demum reflexas divisa, tubo supra parum incrassato, tubi apice et laciniis utrinque cano-puberulis; stamina tertio superiori tubi inserta, filamentis brevibus, antheris apiculatis basin versus dorsifixis; discus brevis; stilus glaber. Capsulae maturae usque ad 4 vel 5 cm. longae calice coronatae, striatae, glabrae, compresse subcylindricae bisulcatae, basi et apice breviter attenuatae, ab apice ad basin dehiscentes; semina 15–18 mm. longa circa 1.5 mm. lata basi bicaudata nucleo circa 1.5 mm. longo.

Frequens prope São Paulo de Olivença (ad fluvium Solimões, civitate Amazonas) locis altis arenosis et humosis praesertim in silvis humilioribus "catinga" dictis, florif. 19–18–1929, leg. A. Ducke (typus in Herb. Jard. Bot. Rio n. 22,857), ligni specimen n. 27 [Yale 20,708]; circa Camanáos regione cataractarum Rio Negro in silva "catinga" leg. A. Ducke 30–11–1929 (H.J.B.R. n. 22,858) et prope São Gabriel ejusdem regionis leg. Ducke n. 27*a*. Specimina e regione ultima a typo parum divergunt foliis vulgo angustioribus, inflorescentiis saepe folio aequilongis, ovario sub anthesi parum longiore (3 mm.) magis cylindrico et pallidius ferrugineo-sericeo.

This species approaches *L. Lambertiana* (of which, however, I have not seen the corolla), but the leaves and the calyx are different. It is frequent in the "catinga" (low forest) near São Paulo de Olivença (a village situated on the southern bank of the Solimões or Upper Amazon River), and is undoubtedly one of the most characteristic components of the vegetation there. I found it also, though less frequently, in the catinga of the Upper Rio Negro. Examination of the very bitter bark did not reveal the presence of alkaloids.

NOTES ON NEW SPECIES OF BRAZILIAN WOODS

By Samuel J. Record

The fifteen woods described below were collected by Dr. Adolpho Ducke in the Brazilian Amazon region and are all cited by him in the article preceding this. Nine of the specimens are from the type trees. With probably one exception, all are from mature stems and are of sufficient size to show the heartwood and to give a good idea of the appearance and quality of the timber.

Moraceae

Brosimum amplicoma Ducke. Caucho macho. Bark about 1 inch thick; smooth, granular on outer surface, ribbed on inner face. Wood grayish brown throughout. Luster silky. No characteristic odor or taste when dry. Of medium density; grain somewhat irregular; texture coarse. Not difficult to cut, saws woolly when fresh, finishes smoothly when dry; perishable in contact with soil.

Growth rings absent or poorly defined. Pores large, distinct, open, scattered without definite pattern. Vessel lines prominent, appearing darker than background. Parenchyma short to long aliform from pores but usually not including them; sometimes wings are confluent. Rays fine and uniform, barely visible on cross and tangential sections; low but distinct on radial surface, appearing darker than background.

Vessels with exclusively simple perforations; intervascular pits large, alternate, often crowded; apertures lenticular, included. Parenchyma surrounding pores, about 2 cells wide on inner and outer faces, 4 to 6 cells wide at sides, diminishing to a point or uniting with wings from other pores; cells short, irregular, abundantly pitted. Rays 1 to 5, mostly 3 or 4, cells broad and few to 50, mostly about 25, cells high; heterogeneous, the marginal cells 2 or 3 times taller than broad, the others mostly procumbent and slender; cells abundantly pitted in all walls; pits to vessels large, often elongated. Fibers in fairly definite radial rows; inter-fiber pits very numerous, small, irregularly distributed; bordered, the borders distinct; apertures narrow-lenticular, exserted; pits to ray cells numerous and of same appearance as those between fibers.

Material: Yale No. 21,327; Ducke No. 68; from type tree.

Helicostylis asperifolia Ducke. Sapwood yellow, sharply defined. Heartwood dark brown, variegated in lighter shades of brown and olive; looks rather waxy. Hard and heavy; rather fine-textured; grain somewhat roey; finishes very smoothly; is probably highly durable.

Growth rings absent or terminated by parenchyma. Pores small, scarcely distinct without lens; numerous, but not crowded, occurring singly or sometimes in radial pairs or threes; fairly uniformly distributed, with some tendency to diagonal rows; closed with tyloses in heartwood. Vessel lines fine, distinct in heartwood as light-colored pencil-striping against a dark background. Rays fine, near limit of vision on cross and tangential sections, low but distinct on radial surface. Parenchyma in small, diamond-shaped patches about pores, sometimes extending to narrow, confluent wings; occasionally in concentric lines independent of pores.

In comparison with *Brosimum amplicoma* the following differences in minute anatomy were observed: Parenchyma-vessel pitting with distinct tendency to scalariform; occasionally unilaterally compound. Rays more heterogeneous and more variable in size; width about the same at median portion, but with greater taper to margins (tang. section). Fibers smaller, with minute pits having very narrow borders and slit-like, exserted apertures.

Material: Yale No. 20,709; Ducke No. 28.

Myristicaceae

Iryanthera tricornis Ducke. Punán. Bark 2–4 mm. thick, dark brown, laminated, peeling off in long, thin flakes; phloem rays fine and uniform. Sapwood brownish yellow, 2 inches or

more in thickness, sharply defined. Heartwood a rich deep brown with fine striping of light brown, probably deepening to a fairly uniform chocolate brown in old trees; has a waxy appearance. Luster high. No distinctive odor and taste when dry. Hard and heavy, rather fine-textured, straight-grained, easy to work, finishes very smoothly, with high natural gloss; appears durable. An attractive cabinet wood.

Growth rings limited by parenchyma lines, not distinct without lens; the stripes sometimes appear like growth layers on radial surface. Pores near limit of vision, mostly in radial pairs or threes, the groups uniformly distributed, without pattern; tyloses present in heartwood. Vessel lines fine and inconspicuous. Rays very fine, not visible to unaided eye on cross and tangential sections; low but distinct in proper light on radial surface.

Vessel perforations sometimes simple, more often scalariform with several, rather widely spaced bars, or reticulate-scalariform. Intervascular pits opposite, elongated, with tendency to scalariform arrangement; apertures parallel to margins of borders or somewhat inclined, not exceeding borders. Tyloses abundant in heartwood; some of them sclerosed. Rays decidedly heterogeneous; mostly biseriate, few to 30 cells high, the cells coarse, mostly square or upright; brown deposits abundant; some tube-like, procumbent cells filled with dark red material show conspicuously; pits to vessels very large, often elongated, with tendency to scalariform arrangement; vascular borders usually distinct. Wood fibers in fairly definite radial rows; pits numerous, the borders very small, the apertures slit-like and exserted.

Material: Yale No. 21,328; Ducke No. 69. Similar to Yale No. 21,053, a commercial sample of Iquê from J. G. Araujo & Co., Manáos.

Leguminosae

Peltogyne excelsa Ducke, **P. catingae** Ducke, and **P. rigida** Ducke. Páo roxo. These three new species of Purpleheart or Amaranth are much the same in general appearance and properties. They have a smooth bark, suggesting Beech (*Fagus*), a gray sapwood 1 to 2 inches thick, sharply separated from the heart, which upon exposure acquires a characteristic deep violet color. The structural differences observed in the three kinds do not appear to be greater than can be found in

different parts of the same specimens. (See *Timbers of Tropical America*, pp. 233–235, for further description of *Peltogyne*.)

Material: Yale Nos. 21,006, 21,007, and 21,339; Ducke Nos. 62, 63, and 80, resp.; from type trees.

Jacqueshuberia purpurea Ducke. Bark thin (2 to 4 mm.), fibrous, smoothish on the outside, prominently ribbed on inner surface; interior dark red. Sapwood grayish brown, sharply demarcated from dark brown heart. No distinctive odor or taste when dry. Wood very hard and heavy, rather fine-textured, horn-like, not easy to cut, is probably durable.

Growth rings absent or poorly defined. Pores small, near limit of vision; occurring singly or more often in radial pairs or compressed groups that are irregularly scattered. No parenchyma visible. Rays minute, scarcely distinct with lens on cross and tangential sections; inconspicuous on radial surface. Ripple marks absent.

Intervascular pits minute, crowded; apertures coalescent. Wood parenchyma very sparingly developed about vessels. Rays uniseriate, few to 15 cells high; homogeneous, but with tendency to heterogeneous; cells thick-walled, abundantly pitted; ray-vessel pits small, often unilaterally compound. Fibers small, with very thick walls and minute lumina; pits numerous, simple.

Material: Yale No. 20,998; Ducke No. 54; from type tree; specimen small, probably from a branch.

Melanoxylon amazonicum Ducke. Sapwood thin, white, rather sharply demarcated. Heartwood yellowish brown, with pencil striping of parenchyma as in Sucupira (*Bowdichia*). Odorless and tasteless when dry. Very hard, heavy, horn-like, difficult to cut; texture coarse, with harsh feel; grain fairly straight; probably highly durable.

Growth rings absent or poorly defined. Pores open; distinct because of parenchyma about them; rather numerous, occurring singly or in radial pairs or threes; no definite arrangement, except as linked diagonally by parenchyma, which is in circular or diamond-shaped patches. Vessel lines very distinct because of parenchyma sheaths, which appear lighter than background. Rays very fine, not visible without lens on cross and tangential sections; low and inconspicuous on radial surface. Ripple marks absent.

Rays mostly biseriate, few to 25 cells high; homogeneous; cells small; ray-vessel pits rather large, showing distinct vascular borders; vestured. Parenchyma cells in contact with vessels are very short; some of them are very thick-walled. Wood fibers with thick walls and very narrow lumina.

Material: Yale No. 21,002; Ducke No. 58; from type tree. Structure different from *Melanoxylon brauna* Schott., if specimens of it in Yale collections are correctly determined. (See *Timbers of Tropical America*, pp. 255–257.)

Vouacapoua pallidior Ducke. Acapú. Bark thin (about 3 mm.), finely wrinkled vertically; dark red inside; phloem rays widen outward irregularly. Sapwood nearly white, 1 to 1.5 in. thick, sharply demarcated. Heartwood chestnut-brown, with some narrow streaks of dark brown and fine pencil-striping of light-colored vessel lines. Except for color, this wood is very much like that of *V. americana* Aubl. (For description of the latter see *T. of T. A.*, pp. 273–274.)

Material: Yale No. 21,326; Ducke No. 67; from type tree.

Clathrotropis macrocarpa Ducke. Cabary; Timbo-páo; Timbo-rana. Bark about 5 mm. thick, chaffy on outer surface, woolly inside. Sapwood thick, yellowish, rather sharply demarcated. Heartwood brown; not lustrous. No distinctive odor or taste. Hard and heavy, straight-grained, coarse-textured, with harsh feel; appears tough and strong, but probably is not highly durable.

Pores distinct; closed with tyloses in heartwood; rather few and scattered, occurring singly or less often in radial pairs. Parenchyma abundant in concentric bands of irregular width and spacing, usually including the pores. Rays homogeneous; fine; visible on cross section but requiring lens on the tangential; low but distinct on radial surface. Ripple marks absent.

Material: Yale No. 20,706; Ducke No. 25.

Swartzia ingaefolia Ducke. Coração de Negro. Bark thin (about 4 mm.), smooth, finely laminated. Sapwood white, about 3 inches thick, sharply demarcated. Heartwood dark purplish brown to almost black, somewhat streaked; lustrous. Odorless and tasteless when dry. Exceedingly hard, heavy, tough, and strong; fine-textured, difficult to cut, finishes very smoothly, looks highly durable.

The structure of the wood agrees closely with that of

Wamara (*S. tomentosa* DC.) of British Guiana. (For description see *T. of T. A.*, pp. 257–258.)

Material: Yale No. 21,353; Ducke No. 94; from type tree.

Lecythidaceae

Cariniana integrifolia Ducke. Bark about 6 mm. thick, the surface gray, with long shallow fissures; finely laminated within; phloem rays very narrow and uniform. Sapwood pinkish, about 3 inches thick, merging into the pinkish brown heartwood. Odor and taste not distinctive. Of medium density and weight, straight-grained, rather fine-textured, easy to work, finishes smoothly, is tough and strong, but probably not resistant to decay or insects.

Growth rings indicated by difference in spacing of parenchyma lines; not distinct without lens. Pores visible, open, not very numerous, fairly evenly distributed, occurring mostly in radial pairs or short, radially flattened groups. Vessel lines appearing as long scratches. Parenchyma not visible without lens; in very numerous, fine, concentric lines of about the same size as the rays and usually spaced a little less than a pore-width apart; more closely spaced in late wood. Rays very fine, not visible without lens on cross and tangential sections; low and inconspicuous on radial surface. No gum ducts observed.

Vessels with simple perforations; thin-walled tyloses present in heartwood; intervascular pits alternate, of screw-head type. Parenchyma in uniseriate or biseriate laminae; chambered crystal-strands common. Rays homogeneous; uniseriate, or biseriate in part; few to 25 cells high; ray-vessel pits of same size and appearance as intervascular, or sometimes large and unilaterally compound. Fibers small, rather thick-walled, not in definite radial rows; pits very numerous, the borders subcircular, the apertures slit-like and exserted.

Material: Yale No. 21,337; Ducke No. 78.

Sapotaceae

Ecclinusa balata Ducke. Abiurana; Balata; Coquirana; Ucuquirana. Sapwood pinkish gray, merging into the light reddish brown heartwood. Odorless and tasteless. Of medium density and weight, coarse-textured, fairly straight-grained, easy to work, finishes smoothly, is probably not resistant to decay or insects.

Growth rings not distinguishable. Pores near limit of vision; occurring in short to long (2 to 10 pores) radial or diagonal series, the individual pores in contact, but not much flattened. Vessel lines appearing as long, coarse scratches. Parenchyma not visible without lens; in numerous, very fine, concentric lines of the same width as the rays and a pore-width apart. Rays require lens on cross and tangential sections; low but fairly distinct on radial surface, appearing darker than background.

Vessel perforations simple; tyloses present, often sclerosed; intervascular pits crowded, mostly of the screw-head type. Parenchyma laminae 1 to 3 cells wide, mostly uniseriate. Rays uniseriate, or biseriate in part; decidedly heterogeneous, most of the cells square or upright; ray-vessel pits very irregular in size and shape, frequently large and elongated. Fibers in fairly definite radial rows; small; pits with very small borders and exserted, slit-like apertures.

Material: Yale No. 20,993; Ducke No. 49.

VERBENACEAE

Vitex spongiocarpa Ducke. Bark thin (3 or 4 mm.), smooth. Sapwood gray, merging into pale olive-brown heart. Odorless and tasteless. Rather light, but firm and tough; coarse-textured; fairly straight-grained; easy to work, saws somewhat woolly when fresh, finishes smoothly, does not appear resistant to decay or insects.

Growth rings indistinct. Pores open; small, but visible; numerous, but not crowded; fairly evenly distributed, occurring singly or occasionally in radial pairs or short radially flattened groups; some tendency to diagonal arrangement. Vessel lines fine and inconspicuous. Parenchyma not visible with lens. Rays fine, near limit of vision on cross and tangential sections; very low and inconspicuous on radial surface.

Vessel perforations simple; intervascular pits uncommon, owing to fewness of vessels in contact. Parenchyma sparingly developed in contact with pores; occasionally in uniseriate, concentric lines apparently terminal; pits to vessels often large and elongated. Rays 1 to 4 cells wide, mostly biseriate; few to 25 cells high, mostly less than 15; usually heterogeneous, with 1 or 2 rows of square, marginal cells; ray-vessel pits decidedly variable in size and shape, being frequently unilaterally compound. Fibers small, with medium thick walls; pits rather few, minute, simple or indistinctly bordered; apertures slit-like, exserted.

Material: Yale No. 20,722; Ducke 41.

RUBIACEAE

Ladenbergia amazonensis Ducke. Sapwood thick, yellowish, merging into the light pinkish brown heart. Not highly lustrous. Odorless and tasteless. Hard and heavy, cross-grained, of medium texture, with harsh feel; not very easy to work, but finishes smoothly; does not appear durable.

Growth rings poorly defined by slight differences in porosity. Pores barely visible; variable in size; numerous, but not crowded; irregularly distributed without definite pattern; occurring singly or in short radial series or occasionally in radially flattened groups. Parenchyma scarcely visible with lens. Rays fine, distinct on cross section, hardly visible on tangential, low and inconspicuous on radial.

Vessels with simple perforations; intervascular pits small. Parenchyma sparingly developed; in contact with pores and diffuse. Rays decidedly heterogeneous; 2 to 5 cells wide in median portion, few to 50 cells high; ray-vessel pits of same size and appearance as intervascular, though with tendency to be unilaterally compound. Fibers in fairly definite radial rows; thick-walled; pits numerous, with distinct round borders and exserted, slit-like apertures.

Material: Yale No. 20,708; Ducke 27; from type tree.

Progress of Work on International Glossary

The first edition of a "Polyglot Glossary of Terms Used in Describing Woods" was compiled by Professor Record and given a limited distribution in February 1931. Since then several revisions have been made through coöperation with members of the International Association of Wood Anatomists.

A conference of wood anatomists was held at the Yale University School of Forestry on May 27–28 to consider the various suggestions received, with particular reference to the choice and definition of English terms. Those in attendance were Professors BAILEY and WETMORE of Harvard, EAMES of Cornell, and GARRATT and RECORD of Yale. A second meeting will be held during the latter half of October.

PERUVIAN MAHOGANY

By L. Williams

Field Museum of Natural History

In his *Monographiae Phanerogamarum* (1: 723), published in 1878, Alphonse de Candolle described *Swietenia Mahagoni*, based on specimens collected many years before by Ruiz near Posuso, at an altitude of 3000 feet, in the Department of Huánuco, central Peru.

About eight years ago a number of logs, consigned to a firm in New York as "South American hardwoods" and reported to have originated in eastern Peru, were found by Professor Record to be a species of Mahogany. In 1925, Dr. Tessmann, at the time associated with the Standard Oil Company, secured specimens of *Swietenia* at Yarina Cocha on the Ucayali River. This material was subsequently described by Dr. Harms of the Berlin Botanical Garden as *Swietenia Tessmannii* Harms. (See *Notizb.* 10: 180, 1927; *Tropical Woods* 16: 49, December 1928.) Early in 1926 fruit and leaf specimens were gathered along the left bank of the Itaya River, close to Iquitos, by Mr. Georges H. Barrel, President of the former Aguna Mahogany & Timber Company of Boston, Mass. These were submitted to Dr. S. F. Blake, U. S. Bureau of Plant Industry, for determination and were tentatively identified as *Swietenia macrophylla* King. (See *Tropical Woods* 6: 1, June 1926; 14: 33, June 1928.) The forests along the Ucayali and Itaya Rivers are of the same character, with little or no difference in altitude, so that, in all likelihood, the specimens collected from trees observed by Dr. Tessmann and Mr. Barrel represent the same species.

The botanical collections made by the writer[1] in northeastern Peru during 1929 and 1930 for Field Museum included several sets of wood and herbarium specimens of Mahogany gathered in different regions of varying types of forest growth and altitude, both in the lowlands and uplands.

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

Occurrence of the Tree

Assuming the total area of the Republic of Peru, including the new territory of Tacna, to be 534,000 square miles, more than half of this is covered by forests, which would be equivalent to about 300,000 square miles or approximately 192,000,000 acres. Practically all of this forest area, the "montaña" as it is usually known in Peru, lies within the Departments of Loreto, San Martín, Amazonas, and Madre de Dios. Its location may be visualized by thinking of it as a vast wedge extending from Ecuador and Colombia to the north as far south as Madre de Dios, the region adjacent to the Peruvian-Bolivian border, while its eastern and western limits are formed respectively by the Brazilian forests and the Peruvian Andes. Forming an almost unbroken western extension of the Amazonian hylæa, it is composed on the one hand of evergreen tropical forests, occurring at the lower elevations, and on the other of forests of the higher altitudes, where a temperate climate prevails.

Although the montaña harbors a great variety of trees of magnificent size, Mahogany is the only species that has assumed an appreciable commercial importance during the last few years. (See *Tropical Woods* 25: 8, March 1931.) It is by far the best known wood locally and is the most valuable timber for export. The vernacular name is Aguano, but in some highland regions the term Caoba is sometimes applied.

Mahogany trees grow in the montaña at altitudes of from 400 to 4500 feet and appear to be limited to a belt, varying in width up to several hundred miles, and extending from southern Ecuador to the headwaters of the Tambo and Urubamba Rivers in the south. This belt, as if bisecting the montaña, forms the watershed of a number of large rivers and a network of smaller tributaries and streams. Flowing in an easterly direction is the Marañon, while to the north, and draining into it, are the Tigre and its two affluents, the Corientes and Pacaruro; also the Chambira, Pastaza, and Morona Rivers. From the south, the main tributaries are the Huallaga River and the Urubamba and Tambo which unite to form the Ucayali River. The latter, flowing in a northerly course,

joins the Marañon, about 100 miles above Iquitos, to form the Peruvian Amazon River.

Although of common occurrence in Loreto in low-lying regions, adjacent to rivers and streams where the forest is subject to inundations during the rainy season, or where the soil is wet the year round, Mahogany trees always attain their best development in dense forest growth on slight elevations with dry, firm soil (known locally as *alturas*) away from the water courses, but never in extensive stands. In the upland forests, of the upper Huallaga and Mayo Rivers, for example, where the altitude ranges between 1000 and 3500 feet, the trees are generally smaller, the wood is slightly harder and heavier, apparently less susceptible to insect attacks and is believed to be of better quality. No Mahogany trees were encountered between the Nanay River and the Peruvian-Brazilian border and they do not appear to grow west of Moyobamba, the capital of the Department of San Martín. A species of Mahogany is believed to grow in moderate quantities in Brazil in the upper regions of the Jurua and Purus Rivers. The logs are floated for several hundred miles down these rivers as far as Manáos, where, as in Peru, they are sold under the name of Aguano. According to a reliable exporter in Manáos it is possible to develop in this region a steady supply for several years of from 1500 to 2000 logs annually.

In the vicinity of Iquitos, especially along the banks of the Amazon and the main tributaries, the more valuable timbers have been cut over a long period for general rough uses and domestic purposes, so that Mahogany trees now grow in that region at great distances apart. Unexplored territories in which valuable timber occurs are continually being found, and in these unexpected areas, where little or no cutting has been done, the average occurrence of Mahogany trees appears to be approximately one tree per hectare. Other regions, sparsely settled, are known to be rich in Mahogany, but the means of communication are so precarious, owing to rapids and strong currents, that no practical attempts have so far been made to exploit the timber.

Description of the Tree

Peruvian Mahogany is a tall, stately tree, of from 90 to 160 feet in height, forming with other species the upper story of the forest. Buttresses heavy, often 15 feet high. Crown full, spreading and sometimes approaching umbrella-shape. Trunk straight, cylindrical, from 3 to 8 feet in diameter above the buttresses, although frequently larger, and free of limbs from one-third to one-half the height of the tree. Bark thick, scaly, deeply furrowed, of a reddish brown color; has a bitter taste and is believed by the natives to possess astringent properties. A small quantity of slightly bitter, light brown resin exudes when incisions are made in the bark.

Leaves alternate; leaflets in 4 or 5 pairs, petiolate, oblique oblongate to ovate- or lanceolate-oblongate, base obliquely round or somewhat obtuse, apex acuminate or with a narrow terminal point, glabrate, 2¼ to 5¾ in. long, and 1 to 2⅛ in. broad; petiole moderately long, ¼ to ⅝ in. in length. Flowers in September and beginning of October; calyx small; petals and staminal tube pale or yellowish green; anthers brown. Fruit ovoid, about 6 in. long and 3½ in. in greatest width, the thick woody exocarp light brown, the central pentagonal column about 4½ in. in length; seeds winged, lustrous reddish brown and bitter to taste.

Description of the Wood

Heartwood deep reddish brown, turning on exposure to light pink with occasional darker striping, or in some instances to a uniform rich brown; has a distinct scent when fresh; taste absent or not distinctive. Sapwood thin, pale yellow or yellowish brown. Firm and of moderate density; specific gravity, air-dry, 0.656. Texture moderately fine to medium; grain resembles the Honduras Mahogany, although not so highly figured. Lumber easy to work, takes a smooth polish with a high luster, holds its place well when finished.

Seasonal growth rings indicated by wood parenchyma in fine, unbroken concentric lines, unevenly spaced, of lighter color than background, and showing distinctly on trans-

verse section, especially when moistened. Pores fairly numerous, distinguishable with the naked eye, occurring solitary or in radially disposed rows of from 2 to 4, infrequently in diagonal pairs or small clusters; distribution fairly uniform, although some specimens show distinct tendency to zonate arrangement; mostly open, but frequently with dark reddish brown gum and sometimes also with white deposits. Vessel lines of variable length, producing fine markings on longitudinal surface; of deeper color than background. Rays fine and uniform, barely visible in some samples without lens on cross section, of lighter color than adjacent fibers; distinct but not conspicuous on radial section, where they are of deeper color than background; storied arrangement gives rise on the tangential surface to uniform "ripple marks," about 62 per inch in length.

A chemical analysis of a dried sample gave the following results:

Ash	7.09
Fat, waxes, resins	1.11
Lignin	28.31
Cellulose	54.28
Water soluble	9.21
Total	100.00

Insect Damage

A serious defect of frequent occurrence in Peruvian Mahogany logs is caused by a species of *Platypus*. The family to which this borer belongs has a wide range and is typically tropical. It belongs to that class of beetles sometimes known as Platypodids or Scolytids, which usually cause pin-hole defects in lumber.

The female insect bores through the bark and deposits its eggs just inside the bark, from which the larvae emerge and later pupate within the wood. The holes are small, round, and generally open. Although it often penetrates deeply into the wood, sometimes for several inches, the borer feeds, not on the wood, but on the ambrosia fungus, the spores of which are carried by the female insect. The fungus growth causes a longitudinal stain which usually extends along the sides of

the pin holes. Timber is attacked immediately after or within a few weeks of felling. Since the borers are unable to live in seasoned timber, because the drying process prevents the growth of the ambrosia fungus, their development is necessarily rapid and the life cycle takes only a few weeks. Although the value of Mahogany timber is reduced by pin holes that spoil its appearance, the actual mechanical injury is slight except in heavily attacked logs. The stain caused by the fungus growth is often more important than the pin holes themselves. Butt logs often show a large number of pin holes, whereas relatively small logs, cut from the upper part of the bole, do not appear to be so heavily infested.

In such tropical regions as the montaña of Peru, where the borers are active during most of the year, it is possible that their attacks may be reduced by barking or removal of trees immediately after felling, or stripping of both bark and sapwood from the logs a few days later. Green logs should be placed in the water as soon as possible after being cut, especially during damp weather, and turned over frequently.

Peruvian Mahogany trees are subject to the attacks of what are commonly known as spotworms, the larvae of an undetermined beetle. The tunnels are a quarter inch or more in width, may penetrate to a depth of several inches, and may be straight or U-shaped; they are found in trees of all sizes, including saplings. In some instances the insects return year after year so that a dozen tunnels, apparently of different ages, may be found in a single square foot of lumber; again a tree may escape attack for several years as indicated by several inches of undamaged wood between the inner and the outer worm holes.

Exploitation of the Timber

Until about twelve years ago, when the commercial value of rubber began to decline, little importance was attached to the potential productiveness of the forests and wood-using industries of eastern Peru. Except for small quantities of Spanish Cedar and dyewoods, practically no wood was exported. Peru has no forest service or organization to encourage the study and exploitation of its forest resources. Even

Iquitos, 2300 miles from the estuary of the Amazon in the heart of the forest regions, had only two small sawmills and a few local concerns cutting lumber by hand.

The development of rubber plantations in the Far East deprived the inhabitants of the montaña of their staple industry. Consequently the natives were compelled to turn their attention to coffee-growing and the exploitation of other forest products, such as timber, balata, and vegetable ivory nuts.

The first practical attempt to exploit Peruvian Mahogany on a commercial scale was made by the Aguna Mahogany & Timber Company of Boston, Mass. Concerning this, Mr. Georges H. Barrel, formerly associated with that concern, writes: "A number of years ago Mr. Arthur Rushforth of Liverpool, England, informed me of having seen on a dock in New York some logs consigned as 'South American hardwoods.' Mr. Rushforth was of the opinion that these were Mahogany logs.

"I therefore entered in relation with some firms in Iquitos and received in due time a few boards labelled 'Aguano de Altura' and 'Andiroba.' Having become convinced that Aguano de Altura was a true Mahogany we decided to send Mr. Rushforth to Iquitos with instructions to purchase a sample parcel of logs. I followed shortly afterwards and personally secured on the left bank of the Rio Itaya botanical specimens of the so-called Aguano." Soon afterwards twenty logs were bought from Cecilio Hernandez y Hijos of Iquitos. During the period 1920–1924 it is estimated that at least 2000 logs, or approximately 500,000 log feet, of Mahogany were shipped. In 1925 the S.S. "Omega" made two voyages to Iquitos and brought back 4000 logs.

In 1926 a band-mill, known as the Nanay Mills (Aguna) Ltd., was built at the mouth of the Nanay River, which has its confluence with the Amazon at a point about six miles below Iquitos. The outlet of a small stream, close to the mill, was dammed to form a log pond with a minimum capacity of 10,000 logs. In 1928 the Aguna Mahogany & Timber Company discontinued operations and since then the Astoria Importing & Manufacturing Company, Inc., has been actively engaged in the exploitation of Mahogany in eastern Peru. According to Mr. D. H. Allen, President of the concern, the production rose during the three years, 1926–1928, from the negligible quantity of 1920–1925 to from 1,000,000 to 2,000,000 log feet, while during the logging seasons of 1929–1930 and 1930–1931 the total output amounted to 6,000,000 log feet per annum. It is estimated that each tree yields an average of two logs and that each log contains approximately 400 board feet of lumber.

EXPORTS OF MAHOGANY FROM PERU

Destination	1927		1928		1929	
	Tons	Value	Tons	Value	Tons	Value
United States	2,070	$32,908	1,745	$19,588	13,548	$208,768
Brazil	560	9,428	179	1,973	178	2,876
United Kingdom	110	2,175	529	5,367	81	2,288
France	....	.....	160	1,274	103	1,948
Spain	....	.....	2	71	19	560
Netherlands	....	.....	....	.....	22	356
Germany	57	1,263	632	14,280	.....	.....
Portugal	3	60	....	.....	.....	.....
Total	2,800	$45,834	3,247	$42,553	13,951	$216,796

NOTE: A ton=1000 kilos (2200 lbs.). Values are in dollars (U. S. A.) computed at the following rates of exchange for the Peruvian pound: 1927, $3.737; 1928, $3.97; 1929, $4.00. Data by Pan American Union, Washington.

The principal area where cutting is now being done is the central part of the montaña, encompassed by the Ucayali and Huallaga Rivers. The logs are rafted down stream, often for considerable distances, to the Nanay mills either to be sawed or to be shipped to the United States and Europe. Several thousand acres of concessions, in which Mahogany trees grow, have also been granted by the Government along the Tigre, Pastaza, and Morona Rivers. A few of the foreign concerns located in Iquitos also do some cutting.

ADDITIONS TO THE SAPOTACEAE OF CENTRAL AMERICA

By Paul C. Standley

Field Museum of Natural History

In *Tropical Woods* 4: 1–11, December 1925, the writer published an enumeration of the Sapotaceae known at that time from Central America. The family is one of such high economic importance, because of its wood, fruit, and gum, that no apology need be offered for further publications regarding it.

During the past seven years there has accumulated a relatively large amount of new material, especially from British Honduras and adjacent Guatemala, chiefly as the result of field work undertaken by men engaged in problems related to chicle production. Messrs. C. L. Lundell, William C. Meyer, and J. S. Karling have contributed most of the specimens from British Honduras, and the first has collected also in Campeche during 1931 and 1932. In the early part of 1931 Prof. H. H. Bartlett of the University of Michigan[1] made an especially important collection of this group, chiefly about Uaxactún, Petén, Guatemala. Mr. G. Proctor Cooper obtained a number of new species of the family in Panama, and the writer has collected various species in Honduras and Costa Rica.

Practically all these collections are represented in the herbarium of Field Museum, and all the Central American species of the family are now represented in this herbarium by full specimens, photographs, or otherwise, except one, which probably is absent from all American herbaria. The accumulation of so much material, especially that of recent date, has necessitated a revision of the group, resulting in the discovery of several forms that seem to represent undescribed species, and revealing certain errors that need correction. The work has been facilitated by the loan from the United States National Museum of the numerous types deposited in the National Herbarium.

[1] An expedition of the Herbarium and the Museum of Zoölogy of the University of Michigan, collaborating with the Department of Historical Research of the Carnegie Institution of Washington in a biological survey of the Maya area.

Encouraging as the collections now available for study are, they still leave much to be desired. There is scarcely a Central American member of the family that is known by complete material, and this is conspicuously true in the case of the trees of greatest economic importance. The desirability of collecting further and unusually ample material of the group can not be stressed too strongly, even in the case of the most common species. Such material is not easy to obtain, for the writer must confess that his best intentions and personal interest in the group through several seasons of collecting in Central America have accomplished little, but it must be admitted that he never has visited the regions where the species are most plentiful.

In the present paper, a supplement to the former one, there are listed only the species discovered since 1925 or those about which new information has been obtained. Fifty trees of the family are now known to occur in Central America, a number that probably will be increased substantially by further work in the Yucatan Peninsula and Panama.

Achras L.

Achras chicle Pittier. The species was described from the Atlantic slope of Guatemala, and perhaps occurs also in Salvador. There are at hand recent collections from British Honduras: Xcanha; Orange Walk District; Hills above Roaring Creek. Called Chicle Macho in British Honduras. Mr. C. L. Lundell thinks that the material referred here may represent two species, but I have been unable to discover any means of separating them. He describes the plant as a majestic tree, often 30–38 meters high, with a trunk almost a meter in diameter. The fruits are smaller than those of *A. zapota*, but the seeds are almost equally large. In some trees the gum, although of poor quality, is used as a chicle adulterant; in other trees there is a high yield of white latex, difficult to coagulate, the gum being somewhat inferior to pure chicle, and exported under the name of "crown gum."

Achras zapota L. Those who have studied this species in the field recently believe that the material currently referred to it may represent several distinct species or forms. Careful study of the collected material leads one to suspect that such forms, although perhaps recognizable in the forest, never can be separated by characters of specific importance. They are designated locally as Zapote Blanco, Zapote Colorado, Zapote Morado, and by still other names.

Bumelia Swartz

Bumelia conglobata, sp. nov.—Arbor ut videtur dense ramosa spinis brevibus crassis rigidis patentibus 4–6 mm. longis armata, ramis crassis nigrescentibus vel obscure ferrugineis rimosis, novellis dense ochraceo-sericeis; folia mediocria subcoriacea petiolata, petiolo crassiusculo 5–6 mm. longo sericeo vel glabrato; lamina oblonga vel elliptico-oblonga, interdum elliptica, 3–6 cm. longa 1.5–2.5 cm. lata apice late rotundata et breviter emarginata, basi inaequaliter acuta vel acuminata, anguste incrassato-marginata, supra in statu juvenili sericea sed cito glabra venulis subimpressis, subtus primo dense griseo-sericea serius glabrata, nervis lateralibus utroque latere c. 9 prominulis; flores in axillis densissime capitato-congesti arcte sessiles vel brevissime pedicellati numerosissimi, capitulis subglobosis 1 cm. diam.; sepala late elliptica vel subrotundata 2.2 mm. longa apice rotundata vel obtusissima extus dense brunneo-sericea; corolla calyce paullo brevior glabra 5-loba, lobis obovato-ellipticis, appendicibus lanceolatis acutis; staminodia 5 petaloidea petalis paullo breviora; stamina 5 petalis paullo breviora, filamentis brevibus filiformibus, antheris late oblongis; ovarium dense pilosum ovoideum in stylum glabrum sensim attenuatum.—Guatemala: Salamá, Dept. Baja Verapaz, alt. 825 meters, March 2, 1907, W. A. Kellerman (Herb. Field Mus. No. 220,918, type).

In its small and densely clustered, sessile or subsessile flowers this is similar to *B. nicaraguensis*, but the latter differs in its thin, practically glabrous leaves on long slender petioles, and in having a glabrous ovary.

Bumelia Lankesteri, sp. nov.—Arbor 8–10-metralis dense ramosa spinis paucis crassis adscendentibus 8–15 mm. longis armata, ramulis teretibus nigro-ferrugineis rimosis et lenticellatis, novellis dense vel sparse ochraceo-sericeis vel mox glabratis; folia breviuscule petiolata mediocria crasse membranacea vel subcoriacea, petiolo crasso vel gracili 4–8 mm. longo sparse sericeo vel glabrato; lamina late oblonga vel elliptico-oblonga 4.5–7.5 cm. longa 3–3.5 cm. lata apice late rotundata anguste marginata basi inaequaliter obtusa vel subacuta, supra glabra lucidissima nervis pallidis prominulis, subtus opaca sparse minute sericea vel fere omnino glabra, nervis lateralibus utroque latere c. 9 prominulis angulo latiusculo adscendentibus; flores in

axillis aggregati pauci vel numerosi, pedicellis glabris 3–4 mm. longis supra incrassatis in statu fructifero usque ad 5 mm. longis et magis incrassatis; sepala crassa late ovata vel elliptico-ovalia 3 mm. longa, exteriora glabra vel glabrata, interiora extus sparse sericea, apice late obtusa; corolla glabra 3 mm. longa, lobis ellipticis apice rotundatis tubo duplo longioribus, appendicibus lineari-lanceolatis attenuatis lobis corollae brevioribus; staminodia petaloidea ovata lobis corollae paullo breviora acuta denticulata; stamina 5 corolla breviora, filamentis brevibus crassis, antheris sagittatis; ovarium depresso-globosum glabrum, abrupte in stylum crassum elongatum contractum; fructus subglobosus 12 mm. longus et fere aequilatus apice depressus et stylo persistente terminatus monospermus.—Costa Rica: Las Cóncavas, south of Cartago, in 1930, C. H. Lankester 1258 (Herb. Field Mus. No. 650,606, type; in flower). Dulce Nombre, near Cartago, May 13, 1928, Lankester 1194, in fruit. Vernacular name, Espino Blanco.

Bumelia mayana, sp. nov.—Frutex vel arbor, trunco interdum 20 cm. diam., spinis numerosis rigidis brevibus vel elongatis adscendentibus vel subpatentibus armata, ramulis teretibus griseo-ferrugineis vel ochraceis, novellis sparse vel dense ochraceo-sericeis mox glabratis; folia mediocria petiolata subcoriacea, petiolo 5–10 mm. longo glabrato; lamina late oblonga, elliptica vel subrotundata 3–7.5 cm. longa 1.5–3.5 cm. lata apice rotundata vel late obtusa et saepissime breviter emarginata, basi inaequali acuta vel acuminata vel interdum subrotundata, supra nitida venis interdum prominulis primo sericea mox glabrata, subtus paullo pallidior statu juvenili dense ferrugineo- vel ochraceo-sericea serius glabrata nervis lateralibus utroque latere c. 10 prominulis angulo acuto adscendentibus; flores in axillis numerosi dense aggregati, pedicellis vulgo 2–3 mm. longis dense sericeis; sepala elliptica obtusa vel rotundata 2.5 mm. longa extus dense sericea; corolla glabra fere 3 mm. longa, tubo brevi late cylindraceo, lobis obovato-rotundatis tubo duplo longioribus apice late rotundatis, appendicibus lineari-lanceolatis attenuatis lobis brevioribus; staminodia lanceolata acuta; stamina 5 corolla breviora, filamentis elongatis crassis; ovarium glabrum abrupte in stylum elongatum contractum; fructus ellipsoideo-globosus 8–10 mm. longus apice late rotundatus et stylo persistente terminatus monospermus.—Guatemala: Tikal, Dept. Petén, April, 1931, H. H. Bartlett 12593 (Herb. Field Mus. No. 650,885, type). Uaxactún, Petén, Bartlett 12290, 12739.—British Honduras: Jungle beyond Little Mountain Pine Ridge, El Cayo District, Bartlett 13099.—Yucatan: Mérida, Schott 341B, 341a, 341. Between Sisal and Progreso, Gaumer 23238. Chichankanab, Gaumer 1572, 1791, 23845. Without locality, Gaumer, 473.

In the *Flora of Yucatan* this plant was listed as *Bumelia retusa* Swartz. That species does occur in Yucatan, but it is clearly different from the endemic form of the Yucatan Peninsula here described as new. The Yucatan collections have been referred at various times to *Bumelia buxifolia* Willd., *B. glomerata* Griseb., and *B. microphylla* Griseb.

Bumelia nicaraguensis Loes. Bot. Jahrb. 60: 367. 1926. Type collected in dry forest between Esquipulas and San Dionisio, Dept. Matagalpa, Nicaragua, Rothschuh 463. Vernacular name, Naranjo. A photograph and fragment of the type are in the herbarium of Field Museum.

Bumelia retusa Swartz. This species may now be reported for Central America: All Pines, British Honduras, growing among mangroves, W. A. Schipp 585; a tree 6 m. high, the trunk 10 cm. in diameter.

Calocarpum Pierre

Calocarpum viride Pittier. The species has been collected in British Honduras, Guatemala, Salvador, Atlantic Honduras, Nicaragua, Costa Rica, and Atlantic Panama. Called White or Red Faisán in British Honduras, Zapote in Nicaragua, Zapote Blanco in Costa Rica, and Zapotillo in Honduras. Lundell reports that in British Honduras it is a tree 24 meters high, with a trunk diameter of 45 cm. Its gum is similar to that of chicle. Mr. F. C. Englesing states that in Nicaragua the tree attains a height of 31 meters and a trunk diameter of 90 cm. There it is esteemed only for its edible fruit.

Chrysophyllum L.

Chrysophyllum oliviforme L. (*C. mexicanum* Brandeg. ex Standl. Contr. U. S. Nat. Herb. 23: 1114. 1924.) Careful examination of a large number of sheets of this plant, as represented in Mexico and Central America, shows that it can not be separated from the West Indian *C. oliviforme*. On the mainland it has been collected in Oaxaca, Veracruz, Campeche, Yucatan, British Honduras, Guatemala (Petén), Salvador, and the Atlantic coast of Honduras. The vernacular names are Wild Star-apple (British Honduras); Caimito (Salvador, Honduras); Zapotillo, Guayabillo (Salvador); Chiceh (Yucatan and British Honduras, Maya name). In Honduras I found this tree at Siguatepeque, Department of Comayagua, at an elevation of 1100 meters.

Dipholis A. DC.

Dipholis minutiflora Pittier. Described from El Copey,

Costa Rica, at 1800 meters. Collected by the writer in 1926 in forest at Naranjos Agrios, Guanacaste, Costa Rica, at 600 meters. A tree about 18 meters high, with purple plumlike fruit; local names Tempisque and Níspero Amarillo.

Dipholis salicifolia (L.) A. DC. The tree has been discovered in Central America recently, being known now from British Honduras (Honey Camp) and Petén, Guatemala. Called Cháchiga and Mijico in the former country. Mr. J. S. Karling reports that at Honey Camp the trees are frequently 1.5 meters in girth and 15–23 meters tall. They are rich in latex and frequently are tapped for chicle by the chicleros.

Dipholis Stevensonii Standl. Trop. Woods 11: 21. 1927. Known only from the Mopán region, British Honduras, collected by Duncan Stevenson in 1927. Called Zapote Faisán. The latex, called chicle faisán, is gathered with that of true chicle. The generic position of this tree is uncertain.

Labatia Swartz

Labatia Standleyana Pittier. Originally described from the Atlantic lowlands of the Canal Zone region, this species has been collected in recent years in the Almirante region of Panama, and in the Tela region on the Atlantic coast of Honduras. In the latter area it is a tall forest tree known by the name Zapotillo.

Labatia euryphylla (Standl.), comb. nov. (*Lucuma euryphylla* Standl. Field Mus. Bot. 4: 252. 1929.) Type from Buena Vista Camp on Chiriquí Trail, Province of Bocas del Toro, Panama. (Yale No. 12,244.) More careful study proves that this tree should be referred to *Labatia* rather than *Lucuma*.

Lucuma Molina

Lucuma calistophylla Standl. Field Mus. Bot. 4: 252. 1929. Cricamola Valley, Province of Bocas del Toro, Panama. Vernacular name, Mameicillo. Known only from sterile specimens. The foliage suggests that of some species of *Labatia*.

Lucuma campechiana H. B. K. I have seen a photograph of an authentic specimen of this species, collected near Cam-

peche by Humboldt and Bonpland. *Lucuma Palmeri* Fernald appears to be a synonym, and at least the Central American specimens that have been determined as *L. salicifolia* H. B. K. are referable to *L. campechiana*. They vary markedly in the size and form of the leaves, but are uniform in flower characters. In Central America *L. campechiana* is known from British Honduras (Honey Camp, San Antonio), Petén in Guatemala, Honduras, Salvador, Costa Rica, and Panama. The vernacular names recorded from British Honduras are Mamey Cerera and Mamey Serilla.

Lucuma chiricana Standl. Field Mus. Bot. 4: 251. 1929. Type collected at Progreso, Chiriquí, Panama; specimens from the Almirante region may be conspecific. Called Níspero or Níspero Colorado.

Lucuma Durlandii Standl. Trop. Woods 4: 5. 1925. Type from El Paso, Petén, Guatemala; collected in 1931 at Uaxactún, Petén, by H. H. Bartlett. Trunk diameter 10–18 cm.

Lucuma Heyderi Standl. Trop. Woods 11: 22. 1927. Mamee Ciruela. Type from British Honduras.

Lucuma hypoglauca Standl. Trop. Woods 4: 4. 1925. Reported originally from Salvador and Yucatan. No recent Central American specimens have been seen, but one Mexican collection may be reported: Colipa, Veracruz, in 1841, Karwinsky 61 in the Leningrad Herbarium; vernacular name, Palo de Calentura. The names employed in Yucatan are Zapote Blanco and Choch (Maya).

Lucuma izabalensis Standl. Trop. Woods 4: 6. 1925. Described from the Atlantic slope of Guatemala; collected more recently in the Tela region of Honduras and the Braggman's Bluff region of Nicaragua. Throughout its range the tree seems to be known as Silión. It is a large or medium-sized tree, often with a trunk diameter of one meter or more.

Lucuma lucentifolia Standl. Field Mus. Bot. 4: 251. 1929. Type from the Talamanca Valley, Costa Rica. A sterile specimen from the Bocas del Toro region of Panama probably represents the same species.

Lucuma pentasperma Standl. Field Mus. Bot. 4: 251. 1929. Type from the region of Almirante, Province of Bocas del Toro, Panama. Called Wild Sapote.

Manilkara Rheede

As indicated by Dubard in 1915, the American *Mimusops* species from which balata is obtained, with their close relatives, should be referred to the genus *Manilkara*. The Central American species still are imperfectly known, and their relationship to the South American balatas remains to be determined.

Manilkara darienensis (Pittier), comb. nov. (*Mimusops darienensis* Pittier, Contr. U. S. Nat. Herb. 18: 249. 1917.)

Manilkara spectabilis (Pittier), comb. nov. (*Mimusops spectabilis* Pittier, Contr. U. S. Nat. Herb. 13: 465. 1912.)

Sideroxylon L.

Sideroxylon amygdalinum (Standl.), comb. nov. (*Lucuma amygdalina* Standl. Trop. Woods 4: 5. 1925. *Bumelia laurifolia* Standl. Trop. Woods 18: 31. 1929.) With more ample and complete material now available for study, it is evident that the names listed above, which were based upon insufficient material, are synonymous. The tree has been found in Petén, Guatemala (El Paso, Uaxactún, San Clemente to Dos Arroyos) and British Honduras (Honey Camp). The vernacular names are Zapote Faisán in Guatemala and Silly Young in British Honduras. The latter name is apparently a corruption of the term Silión applied by Spanish-speaking people to various trees of the family. This species is reported as a medium-sized or very large tree, with scant latex.

Sideroxylon capiri (A. DC.) Pittier. In Central America now known from Guatemala (Morán, Dept. Amatitlán), Nicaragua (Tepetapa), Costa Rica (Irazú), and Panama (Penonomé).

Sideroxylon Gaumeri Pittier. Yucatan, apparently frequent; Campeche (Monterrey), the vernacular name Caracolillo; British Honduras (Honey Camp), where it is known as Zoy, Dzoi, or Cream Tree.

Sideroxylon Meyeri, sp. nov.—Arbor alta vel mediocris, trunco 30 cm. et ultra diam., praeter flores omnino glabra; folia mediocria petiolata subcoriacea, petiolo 5–15 mm. longo crasso; lamina elliptico-oblonga vel

elliptica 6.5–15 cm. longa 2.5–6 cm. lata abrupte longiacuminata, acumine angusto attenuato obtuso, basi acuta vel interdum longe decurrens, supra opaca, venulis prominulis arcte reticulatis, costa subtus elevata, nervis lateralibus utroque latere c. 14 angulo acutiusculo adscendentibus prominentibus gracillimis, venulis prominulis arctissime reticulatis; flores parvi in axillis dense aggregati, pedicellis gracilibus 3–6 mm. longis sparse brunneo-sericeis; sepala 5 ovato-rotundatis apice rotundatis vel late obtusis 2 mm. longis extus tenuiter ferrugineo-sericeis ciliatis; corolla alba glabra fere 3 mm. longa, lobis late rotundatis albo-ciliatis tubo latissimo plus quam duplo longioribus; stamina 5 apice tubi inserta, filamentis brevibus, antheris late oblongis brevibus; staminodia 5 anguste lanceolata staminibus paullo breviora.—CAMPECHE: Tuxpeña, a frequent tree, Feb. 17, 1932, C. L. Lundell 1345 (Herb. Field Mus. No. 655,191, type); Feb. 4, 1932, Lundell 1287.—BRITISH HONDURAS: Honey Camp, Orange Walk, William C. Meyer 66, 158; Lundell LP5. Freshwater Creek, March 1928, Duncan Stevenson.—GUATEMALA: Uaxactún, Dept. Petén, Bartlett 12361, 12681.

Known as Zapotillo in both Campeche and British Honduras.

PRELIMINARY NOTES ON CRIBRIFORM AND VESTURED PITS

By IRVING W. BAILEY

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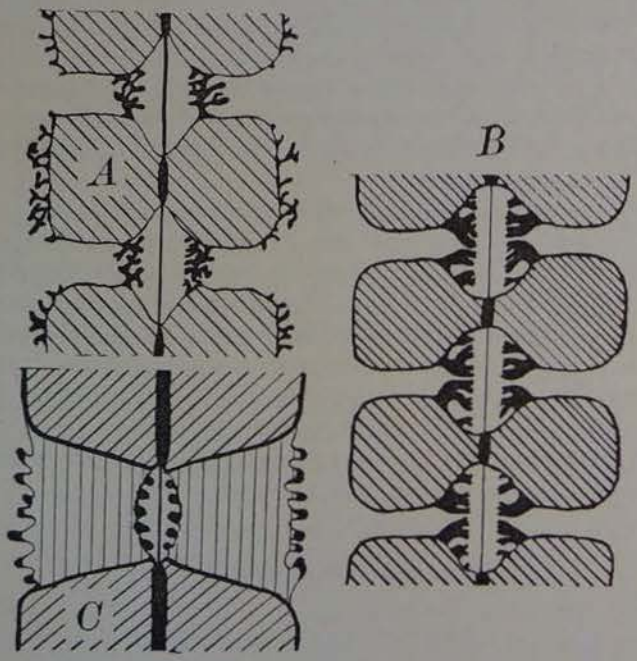
Since the publication of Jönsson's[1] paper in 1892, the pit membranes in the vessels of Leguminosae and of certain other families of Dicotyledons have been referred to as "sieve-like" or "cribriform." This nomenclature is based upon the assumption that the pit membranes are perforated by numerous small openings through which protoplasmic connections occurred in the immature vessel members.

Recently in connection with an extended investigation of so-called plasmodesma in tissues of the higher plants, I have had occasion to study the pit membranes in a wide range of Gymnosperms and Angiosperms. The punctate or sieve-like appearance described by Dutailly, Jönsson, and others, is

[1] B. JÖNSSON: Siebähnliche Poren in den trachealen Xylemelementen der Phanerogamen, hauptsächlich der Leguminosen. *Ber. Deut. Bot. Ges.* 10: 494–513. 1892.

not due to perforations of the pit membranes, but to minute projecting outgrowths from the free surfaces of the secondary walls. The size, form, number, and distribution of the papillae vary greatly in different plants. In certain cases they are confined to the chambers of the bordered pits (Fig. B) or to the margins of the inner and outer apertures (Fig. A), whereas in



SECTIONS OF VESTURED PITS

Fig. A. Transverse section through pair of adjacent bordered pits in *Eugenia dichotoma*, showing imperforate pit membrane in median position and projecting outgrowths from the margins of the inner and outer apertures.

Fig. B. Radial longitudinal section through four pairs of adjacent bordered pits in *Combretum* sp., showing imperforate pit membranes in median position, and outgrowths from the overhanging walls of the pit chambers.

Fig. C. Radial longitudinal section through two pairs of adjacent bordered pits in *Prosopis juliflora*, showing hair-like outgrowths within the pits and on the inner surface of the secondary walls of the vessels.

other cases (Fig. C) they may occur as well in the pit canal or on the inner surface of the walls of the vessel members.

In an investigation of 33 orders, 155 families, and more than 900 genera of Dicotyledons, I have found these hair-like outgrowths in the bordered pits of 8 orders and 26 families. A detailed discussion of their distribution and of their significance in the identification and classification of woods will be given in a subsequent paper. It should be emphasized in this connection, however, that, particularly in heartwood, punctate appearances may be produced by granular precipitates. Sections 5 microns or less in thickness and treatments with solvents must be resorted to in doubtful cases to avoid confusing such artifacts with the hair-like outgrowths from the secondary wall.

The terms sieve-like or cribriform obviously should not be used in discussing the structures originally described by Dutailly and Jönsson. The terms *vestured pit* and *vestured walls* are suggested as substitutes. This raises the question whether the term cribriform should be dropped in descriptions of woods. Sieve-like pitting occurs in the ray and wood parenchyma of various Gymnosperms and Angiosperms. It is suggested accordingly that the term cribriform be retained for designating the type of pitting which occurs, for example, in the ray parenchyma of *Sequoia*.

Colombian "Masábalo" Wood

Mr. Armando Dugand G., of Barranquilla, Colombia, South America, recently sent to the Yale School of Forestry for determination some specimens of lumber obtained at a local sawmill, "Aserrado San Ignacio." One of these woods has been identified as *Carapa guianensis* Aubl., the same as the Crabwood of British Guiana and the Andiroba of Brazil. The Colombian name is given as Masábalo. According to the collector, the timber is generally considered somewhat inferior to Abarco (*Cariniana pyriformis* Miers), but is readily accepted as a substitute for that wood. He also states that shoemakers prefer Masábalo to all other woods for the making of heel pieces.

CURRENT LITERATURE

Useful plants of Yucatan. By Roland M. Harper. *Bulletin of the Torrey Botanical Club* (New York) 59: 279–288, May 24, 1932.

"Existing knowledge of the plants of the peninsula has been brought together in convenient form in Paul C. Standley's recent *Flora of Yucatan*. . . . On account of the large number of economic plants mentioned in it, and the full notes on them, it has seemed worth while to the writer (who has never been any nearer to Yucatan than Key West) to pick out such plants from the text and group them by uses; which was a rather tedious task, but makes an interesting story."

The uses are considered under the following headings: "Shade trees and ornamentals," "Timber trees," "Fiber plants," "Decorations," "Forage plants," "Human foods," "Medicinal and poisonous plants," "Chicle gum," "Dyes," and "Other products."

Trinidad woods as paper-making materials. *Bulletin of the Imperial Institute* (London) 30: 1: 1–12, April 1932.

"During recent years the Forest Department, Trinidad, have carried out enumeration surveys over fairly extensive areas of forest in the island and as a result have been able to obtain a reasonably accurate estimation of the composition of large areas of mixed forest. The work has shown that the species which occur in the greatest quantity are, unfortunately, those for which, so far, there is practically no market. The possibility of using the timber of these species for paper-making is being considered, and in September 1931 a supply of seven of the more abundant woods was forwarded by the Conservator of Forests to the Imperial Institute in order that paper-making trials might be carried out. The woods received were as follows:"

1. Acurel, *Trichilia oblanceolata* Rusby (Meliaceae).
2. Hog Plum, *Spondias mombin* L. (Anacardiaceae).
3. Yellow Mangue, *Symphonia globulifera* L. f. (Guttiferae).
4. Wild Chataigne, *Pachira insignis* DC. (Bombacaceae).
5. Jiggerwood, *Bravaisia floribunda* DC. (Acanthaceae).

6. Bois Mulatre, *Pentaclethra filamentosa* Benth. (Leguminosae).

7. Mahoe, *Sterculia caribæa* R. Br. (Sterculiaceae).

As an indication of the quantities of these woods that are available, the Conservator of Forests furnished the accompanying statement showing their distribution by girth classes over an area of 12,000 acres in the Central Range Reserve (Charuma).

STOCK OF SPECIES ON 12,000 ACRES

No.	Girth in feet									
	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10+
1.....	12,330	8,370	3,870	3,780	1,620	90	180	...	...	...
2.....	5,490	3,060	450	540	1,350	1,080	720	720	630	900
3.....	4,140	3,510	1,440	720	180	180	...	...	...	...
4.....	22,500	16,470	8,640	10,260	7,560	2,430	1,800	450	540	630
5.....	18,630	10,620	4,410	5,760	2,880	900	900	720	...	180
6.....	138,690	98,550	35,550	19,260	2,160	180	....	...	...	...
7.....	6,840	3,600	1,260	1,710	450	90	270	...	...	...

"The best yield of pulp was obtained from the Mahoe wood (*Sterculia caribæa*), but good yields were given by most of the other samples.

"Apart from specks which occurred in the paper from No. 2, the papers produced from Nos. 1, 2, 5, and 6 were similar in character, and resembled those obtained from some commercial soda wood pulps; the pulps from Nos. 1, 2, and 6 were, however, difficult to bleach. The paper made from No. 3 differed from that obtained from any of the other samples in being appreciably softer and not so strong, though the pulp from this wood bleaches the most readily of the whole series.

"Nos. 4 and 7 yielded the longest-fibred pulps, and produced rather better papers than any of the other samples, but the yield of bleached pulp from No. 4 was somewhat low. The amounts of caustic soda consumed in the treatment of these two woods were appreciably lower than in the case of the other samples with the exception of No. 5. The Mahoe wood (No. 7) gave the best results in respect of the high yield of pulp and the good quality of the paper.

"The fibers in the pulp prepared from the seven woods had a rather higher average length in each case than those of pulp made from Aspen, which is the 'hardwood' most commonly employed in the manufacture of soda pulp."

Les vrais et les faux balatas. By AUG. CHEVALIER. *Revue de Botanique Appliquée et d'Agriculture Tropicale* (Paris) 128, 129: 261–282, 347–358, April, May 1932. Illustrated.

The name Balata designates certain trees of the Sapotaceae, growing in the Guianas, Brazil, and the Antilles, that furnish either a hydrocarbon similar to gutta percha or woods to which the same name is applied. The English names for the same species are Bully Tree or Bullet Tree.

A detailed account is given of the history of the word balata and of early and modern references to it in literature. As a result of a study of the literature and of herbarium material at the Paris Museum, the following statements are made:

I. *Achras balata* Aubl. has been considered by all botanists to be the true Balata of Guiana, but the name really pertains to a tree of Mauritius and Madagascar, *Mimusops Commersonii* (G. Don) Engler.

II. The proper name for the Balata Franc of the Guianas is *Manilkara bidentata* (A. DC.) A. Chev., synonyms of which are *Manilkara balata* Dubard, *Mimusops balata* Pierre, *M. bidentata* A. DC., and *M. Pierreana* Baill. The tree was studied and described in manuscript by Aublet, who reported its name as Jaune d'Oeuf. Pierre distinguished eight varieties of the tree, some of which have been treated as distinct species by later writers, but all are closely related and most of them imperfectly known. *Mimusops Sieberi* A. DC. is probably one of the races yielding balata of Trinidad, while some of the product of that island comes from *Manilkara bidentata*, var. *Cruegeri* (Pierre) A. Chev. The Guiana races or varieties producing balata are *Gutta*, *Schomburgkii*, and *Melinonis*. *Manilkara surinamensis* (Miq.) Bubard of Surinam, close to *M. bidentata* if not identical with it, is called Balata Rouge in French Guiana.

The milky latex that issues immediately and abundantly when the bark of the Balata tree is cut, solidifies on contact with the air and assumes a pinkish tint. It contains 42 to 48 per cent of gutta and 37 to 44 per cent of resins. Since the species of *Manilkara* are difficult to distinguish in the field and it is important to collect latex of only *M. bidentata*, it is customary to make a rough field test of the latex before tapping the tree. The production of a single tree varies greatly, but generally is about 2.5 kilograms. Coagulation is obtained by exposure to the air or by boiling. Balata is the only substance so far known that may be substituted for gutta percha in all its applications.

Manilkara bidentata occurs throughout the Amazon Valley, but is most abundant in the municipality of Rio Branco in Amazonas, Brazil, forming regular forests. In 1922 the amount of balata gum exported through Manáos was 517,554 kg. Surinam exported 549 tons, British Guiana 413 tons, and Venezuela 996 tons. French Guiana exported 437 tons in 1925, a smaller quantity than in former years, since the trees are being destroyed by too frequent tapping. No plantations of Balata trees have been made.

III. Certain false balatas of French Guiana produce valuable wood, but not true balata gum or any gum of much value. Among them are numerous species, such as: *Micropholis Melinoniana* Pierre (Balata Blanc, Bois Crapaud) with yellowish white wood; *M. guyanensis* Pierre and *M. mucronata* Pierre; *Sideroxylon cyrtobotryum* Ducke and *S. resiniferum* Ducke, accidental producers of balata in Brazil, according to Ducke; *Lucuma rivicoa* Gaertn. f. (Jaune d'Oeuf) cultivated in French Guiana for its edible fruits; *Pouteria guianensis* Aubl. (Balata Indien, Balata Singe Rouge, Wapi, Wapo, Jaune d'Oeuf); *Ecclinusa sanguinolenta* Pierre (Balata Saignant, Balata Rouge, Balata Pommier, Wapo, Bois Cochon) with latex of little value; *Ecclinusa balata* Ducke (Balata, Coquirana, Ucuquirana) of the lower Amazon, supplying 30 per cent of the balata exported from Amazonia, according to Ducke; *Chrysophyllum Macoucou* Aubl. (Macoucou) and various other species of the same genus.

IV. In the Antilles there are several false balatas. *Manilkara Sieberi* Dubard of Trinidad may be one of these, or perhaps only a variety of the Balata Franc. There are also *M. Sideroxylon* (Gris.) A. Chev., the Bullet Tree of Jamaica; and *M. Riedleana* (Pierre) A. Chev., of Martinique and Porto Rico, very close to *M. bidentata*, and known in Martinique as Balata. Species of *Dipholis* are known in the West Indies by the names Balata Batard, Acomat Batard, and Bastard Bullet Tree. *Micropholis balata* Pierre, of Porto Rico and St. Lucia, is known on the latter island as Balata. Closely related to *Mimusops*, also, are the species of *Oxythece: O. fabrilis* Pierre (Balata, Balata Blanc) and *O. Habniana* Pierre (Balata Rouge, Bois Balata).

V. In the Amazon Valley balata is produced by *Manilkara bidentata* and *Ecclinusa balata*. *M. Huberi* (Ducke) A. Chev. of the Obidos-Tumuc-Humac region also yields a good product, which has been found to contain 33 per cent of balata. Nothing is known of the trees producing the balata of Venezuela.

VI. Detailed descriptions are given, with photomicrographs, of the woods of *Manilkara bidentata* and *Ecclinusa sanguinolenta*.—P. C. Standley, *Field Museum of Natural History*.

Neue Gattungen aus der Hylæa brasiliens. By A. Ducke. *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 11: 105: 341–347, March 30, 1932.

Nycticalanthus speciosus Ducke is a small shrub of the family Rutaceae. *Dodecastigma amazonicum* Ducke, *Anomalocalyx Uleanus* Ducke, and *Polygonanthus amazonicus* Ducke are small to medium-sized trees of the family Euphorbiaceae. Wood samples of the last two have been added recently to the Yale collections.

An anatomical study of the woods of the Philippine mangrove swamps. By Alexis J. Panshin. *Philippine Journal of Science* (Manila) 48: 2: 143–207, June 1932. 24 plates.

Descriptions of the woods of *Cerbera manghas* L. (Apocynaceae); *Xylocarpus granatum* Koen. and *X. moluccensis* (Lam.) M. Roem. (Meliaceae); *Excoecaria agallocha* L. (Euphorbia-

ceae); *Camptostemon philippinense* (Vid.) Becc. (Bombacaceae); *Heritiera littoralis* Dryand. (Sterculiaceae); *Sonneratia caseolaris* (L.) Engl. and *S. acida* L. f. (Lythraceae); *Bruguiera conjugata* (L.) Merr., *B. cylindrica* (L.) Blume, *B. sexangula* (Lour.) Poir, *B. parviflora* (Roxb.) W. & A., *Ceriops Roxburghiana* Arn., *C. tagal* (Perr.) C. B. Rob., *Rhizophora mucronata* Lam., and *R. apiculata* Blume (Rhizophoraceae); *Osbornia octodonta* F. Muell. (Myrtaceae); *Lumnitzera littorea* (Jack) Voigt., *L. racemosa* Willd. (Combretaceae); *Aegiceras corniculatum* (L.) Blanco and *A. floridum* R. & S. (Myrsinaceae); *Avicennia marina* (Forsk.) Vierh. (Verbenaceae); *Dolichandrone spathacea* (L. f.) K. Schum. (Bignoniaceae); *Scyphiphora hydrophyllacea* Gaertn. f. (Rubiaceae).

There are two keys to the identification of the woods, one based on macroscopic characters, the other on the minute anatomy. There are 24 plates, each with two photomicrographs (X 15 and X 110) of cross sections of one species.

"The results of this brief anatomical survey of the woods of the Philippine Mangrove forests are in agreement with Solereder's hypothesis, namely, that habitat does not impress any definite type of anatomical structure upon different species. This is shown by the fact that no matter what structural changes have taken place in the wood of the Mangroves, these changes are not identical in different species."

The mechanical properties of some Malayan timbers tested in a green condition. By A. V. Thomas. *Journal of the Institute of Architects of Malaya* (Singapore) 2: 4: 11–21, March 1932.

"The data shown in the table at the end of this publication have been compiled from tests of small specimens of green timber free from defects. To provide these data one half of each consignment of each species received at the laboratory was selected; one sixth will be tested when partially air dry, and the remaining one third will only be tested when fully seasoned.

"A brief description of the methods of test employed, a glossary of the terms used in the table, and some notes on the manner in which the data may interpret the qualities of the timber are given. The methods adopted in the selection of the material, the performance of the tests, and the evaluation of the results conform to standard practice in timber-testing laboratories in Britain, United States of America, India, and Canada, and the testing machines used were of the latest design to meet the requirements of this type of testing. It is thus possible to compare the results of tests on Malayan timbers with those obtained in other countries."

"Obvious influences on the mechanical properties of timber such as moisture content, defects, etc., have been eliminated from these series of tests, but owing to the heterogeneous and anisotropic structure of wood there are certain to be other factors the effect of which cannot be estimated. It is, therefore, necessary to test a large number of specimens to obtain results which may represent the average strength qualities of timber. In order to provide the figures shown in the table, 10,102 tests were made."

The twelve timbers tested are as follows: (1) Keruing, *Dipterocarpus cornutus* Dyer; (2) Meranti Tembaga, *Shorea leprosula* Miq.; (3) Chengal, *Balanocarpus Heimii* King; (4) Kapur, *Dryobalanops aromatica* Gaertn. f.; (5) Kempas, *Koompassia malaccensis* Maing.; (6) Kumus, *Shorea costata* King (?); (7) Keruing, *Dipterocarpus Scortechinii* King; (8) Meranti, *Shorea parvifolia* Dyer; (9) Kulim, *Scorodocarpus borneënsis* Becc.; (10) Betis, *Payena utilis* Ridley; (11) Meranti Bukit, *Shorea platyclados;* (12) Merbau, *Intsia Bakeri* Prain. As a basis for comparison, corresponding strength values are given for Teak, *Tectona grandis* L. f., and Scots Pine, *Pinus silvestris* L.

Timber tests: Merbau (*Intsia Bakeri*). By A. V. Thomas. *The Malayan Forester* (Kuala Lumpur) 1: 4: 159–162, April 1932.

"Three species of trees which are very closely related provide timber known as Merbau. The most important species is *Intsia Bakeri*, and it was from this species growing in the Trolak Forest Reserve, in the district of Batang Padang, that the timber for testing was supplied. . . .

"The power necessary to saw this timber was considerable, but very little difficulty was experienced in the actual sawing. In 'breaking down' the largest log, the saw was buried in the timber during two or three cuts, but even this did not cause any trouble. After running the saw for some time the teeth were found to be covered with gummy substance, but they were not badly blunted. The surface was smooth after machine planing except in some cases on the radial surface, where the grain was 'picked up' by the planer blades; the appearance of the surface of the wet timber was often spoiled by the exudation of a slightly oily liquid."

"Three outstanding qualities of Merbau, its soundness, particularly its immunity to heart rot, its durability, and the small amount of shrinkage that takes place during seasoning make it undoubtably suitable for both inside and outside construction. It is in nearly all properties stronger than Teak, but is not as strong as Chengal and Resak. . . . It is tougher and harder than those species with which it is equal in strength.

"Merbau is said to have a corrosive effect on iron and steel, and this has been detrimental to its utilization for a number of purposes. The pleasing appearance which Merbau has when properly polished, together with the fact that it is unlikely to 'work' much after being properly seasoned, makes it very suitable for panelling, flooring, and furniture."

Identifying Australian timbers. The value of structure, composition, and precise names. Trade Cir. No. 8, Div. For. Products, Council for Sci. & Ind. Research, Melbourne, 1932. Pp. 15; 6 x 9½; 7 photomicrographs.

"There will shortly be published the first portion of a key to the identification of Australian timbers, and this circular will help to make clear to the trade the value of fundamental studies of this type."

The Use of Common Names

"Is it unfortunate that in Australia the use of common names for trees and the wood taken from the trees has been rather indiscriminate and thus very confusing, especially to

overseas buyers. The Division of Forests Products is making a list of the common names applied to each species in the different localities of its distribution, and it is surprising how many different species are classified under the one common name. This is specially noticeable in the case of the Eucalypts, of which there are numerous White Gums, Red Gums, Blue Gums, Mahoganies, etc. For example, there are more than six species which are called Blue Gum. In Victoria, this name is generally applied to *Eucalyptus globulus*, while in New South Wales it often refers to *Eucalyptus saligna*. Again, the name of the same tree varies in the different States; thus Messmate in Victoria is Stringybark in Tasmania, and Mountain Ash in Victoria is Swamp Gum in Tasmania. It is easy to imagine the suspicion of an overseas buyer who is offered Swamp Gum and is assured that it is identical with Mountain Ash. That this confusion of common names, of which many other examples could be quoted, is very dangerous will be more readily appreciated when it is realized that the structure and properties of timbers sold under the one common name may be quite different. . . .

"The origin of these common names in Australia is simply explained. To the early settlers, the trees of this country were strange, and as they were utilized, they or the timbers from them were given names. The majority of these names were descriptive of the trees such as Ironbarks, Boxes, Stringybarks, Blackbutts, etc. Other names were based on the general appearance and color of the wood, such as Mahogany, Oak, Ash, Tallowwood, etc. While some of the latter were descriptive of the wood, as in the case of Tallowwood, the majority were based on resemblances to those woods of the Northern Hemisphere with which the early settlers were familiar. However, these Australian woods have been found to be quite dissimilar in structure, properties, and uses from their Northern Hemisphere namesakes. In addition, as the early settlers opened up new country, they applied to the trees of the new districts the names that had already been given to those of the older settlements, although in many cases the trees were botanically very different—a difference

which was also reflected in differences of structure in the timbers.

"In Western Australia this type of confusion was largely overcome many years ago by substituting the aboriginal names of the more important trees for the original common names. Thus, Western Australia Mahogany has become Jarrah, White Gum has been changed to Tuart and Wandoo, Red Gum to Marri, and so on. This was a step in the right direction, and the value of it has been demonstrated by the fact that the timbers of the West are now known throughout the world under these aboriginal names. Although a similar procedure has in the past been followed to a small extent in the East, it might not be feasible at this late stage to make such a change general, but there is no reason why the confusion should not be overcome in many cases by bringing into use the botanical names of timbers."

Notes on wattle barks. Part III. By M. B. Welch, F. A. Coombs, and W. McGlynn. *Journ. & Proc. Royal Soc. N. S. W.* 65: 207–231, March 3, 1932.

Summary

"An investigation has been made of the tannin contents of the barks of the principal *Acacias* belonging to the so-called 'decurrens' group, and botanical material has also been critically examined. Six species which can be recognized as distinct are described, and details are given of their leaf and general characters, together with the results of a number of bark analyses.

"In reviewing the results of the analyses dealt with in this paper it is apparent that the species can be divided into two main groups so far as the value of their barks is concerned. Thus *A. mollissima*, *A. decurrens*, and *A. Arundelliana* can be placed in this order of merit in the superior group, and *A. filicifolia*, *A. irrorata* (*pauciglandulosa*), and *A. dealbata* in the inferior group.

"On the whole those species with thin barks give low tannin contents, but even with barks of similar thickness the inferior species possess lower tannin content than those belonging to the superior group.

"*Acacia mollissima* is the outstanding species with regard to tannin content, although *A. decurrens* and *A. Arundelliana* also yield useful barks, and may prove of value under conditions which are unfavorable to *A. mollissima*."

Australia. Notes on the shrinkage of wood. By M. B. Welch. *Journ. & Proc. Royal Soc. N. S. W.* 65: 235–250, March 16, 1932.

"The figures given [for 54 Australian and 7 exotic species] were obtained by cutting small sections 1 inch long in the direction of the grain, 4 inches wide and 1 inch thick from wood which was obtained as soon as possible after sawing from the log, being wrapped in damp paper to minimize moisture losses. These sections were weighed and measured and their volume determined; they were stored inside and measured weekly to the nearest 0.001" for periods varying from three to twelve months, the average width being taken as the mean of the maximum and minimum widths after the samples had reached an equilibrium moisture condition. A similar-sized sample, cut from the same board as the specimen which was air-dried, was also weighed and measured, etc., and dried at 102° C. for some days to constant weight and again weighed and measured. From these results the density at air-dry volume and weight; density, green volume and oven-dry weight; per cent of shrinkage green to air-dry; per cent of shrinkage green to oven-dry, and volumetric shrinkage, green to oven-dry, have been calculated. The moisture content was determined on sections cut adjacent to the samples which were used for shrinkage tests."

Identification of timbers available in the moist deciduous to savannah forests in Lagos Colony, Abeokuta, Ondo and Oyo Provinces. Govt. Printer, Lagos, Nigeria, 1931. Pp. 10; 8½ x 13.

A key, based upon gross characters, to the identification of 51 kinds of the most common woods of Southern Nigeria (west of the Niger).

The wood of the Sterculiaceae. I. Specialisation of the vertical wood parenchyma within the sub-family Sterculieae. By MARGARET CHATTAWAY. *The New Phytologist* (Cambridge) 31: 2: 119–132, May 25, 1932. 2 plates.

"The Sterculiaceae is a family of tropical and sub-tropical plants, comprising 48 genera and about 600 species, of which many are trees. Systematically it is placed by Engler in the Malvales (Dicotyledons, Archichlamydeae), and shows many features in common with the other families of that group. Three genera are economically important—*Theobroma* and *Cola* (fruits) and *Tarrietia* (timber). Many of the arborescent genera give a soft wood which is used locally, and some have a tough bark which is used as fiber."

"1. An investigation of the arborescent genera of the Sterculiaceae shows that the existing classification of the family needs revision.

"2. There are two distinct lines of specialization within the family, the one affecting the vertical wood parenchyma, and the other involving an elaboration of the tissues of the rays.

"3. The distribution of the wood parenchyma in the Sterculieae shows great variation, and this sub-family has therefore been chosen for special study.

"4. There is a range from species with little parenchyma in short tangential lines, one or two cells wide, which are difficult to distinguish under a microscope, to broad concentric bands which include the vessels and are visible to the naked eye.

"5. The strands comprising the former are typically long and two-celled, without intercellular spaces between the cells. Those of the latter are typically four-celled, shorter strands, the individual cells often rounded at the corners, leaving intercellular spaces.

"6. The woods with narrow lines of parenchyma have usually longer vessel segments than those with broad bands.

"7. *Heritiera* and *Tarrietia* are different in many respects from the other genera of the Sterculieae, though they agree with one another, and they should not be placed in this sub-family."

M. M. Chattaway. Price 35 cents

Yale University School of Forestry

TROPICAL WOODS

NUMBER 32 DECEMBER 1, 1932

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Yale University School of Forestry

TROPICAL WOODS

NUMBER 32 December 1, 1932

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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NOTES ON TROPICAL TIMBERS

By SAMUEL J. RECORD

Brazilian Itapicurú Identified

At the time of publication of *Timbers of Tropical America* (1924) I was unable to assign a scientific name to a Brazilian timber known as Itapicurú, but I did indicate its position next to *Peltogyne* (Leguminosae). According to Taubert's classification (*Pflanzenfamilien* III. 3. 137) the genus occupying that place is *Goniorrhachis*, but the single species, *G. marginata* Taub., was described as a small, branching shrub, whereas the wood specimens I had were said to have come from tall, well-formed trees.

I have recently received a letter from Mr. J. Geraldo Kuhlmann, of the Serviço Florestal do Brasil, stating that the tree in question has been described by him as a variety, namely, *Goniorrhachis marginata* Taub., var. *elata* Kuhlmann.

No Native Pine in Costa Rica

The question having been raised regarding the possible occurrence of Pine (*Pinus*) in Costa Rica, I have made several inquiries, the results of which seem to prove that the only trees of that genus growing there have been planted, numerous published statements to the contrary, notwithstanding.

Mr. F. Charles Clark, of Melendez & Clark, lumber manufacturers and exporters at San José, says in a letter that he is familiar with the forests throughout Costa Rica and has yet to find a single tree of native Pine (genus *Pinus*).

Mr. H. Pittier, author of *Ensayo sobre las plantas usuales de Costa Rica*, omitted mention of Pine in that book and in a recent letter says: "I am certain that no species of *Pinus* is indigenous in Costa Rica. The southernmost boundary of the genus goes through the middle of Nicaragua, or nearly so."

Gumaan Driftwood in the Philippines

There appears to be a special fascination to the quest for the "lightest wood in the world." The latest claimant for this distinction has been found among driftwood in the Philippine and Caroline Islands. Its source is unknown and its provisional determination as a species of *Alstonia* needs confirmation.

Public interest in the matter was aroused by an article entitled, "Manila seeks origin of strange new wood," which appeared in the Sunday edition of *The New York Times*, December 13, 1931, as follows:

"Manila, Nov. 7.—Wood technologists and forest rangers in the Pacific basin are intensely occupied in the search for the origin of a newly discovered wood, which has great commercial possibilities. If it can be identified and cultivated, its uses will be revolutionary, since it is less than half the weight of Balsa, the lightest known wood in commercial use.

"Specimens have been found in the form of driftwood on the eastern coast of Luzon, and to these the natives have given the name 'Gumaan,' meaning very light. Recently the Japanese Forestry Department sent a specimen to Luis J. Reyes, wood technologist of the Bureau of Forestry of the Philippines for identification, believing that the wood was indigenous to the Philippines. The Japanese wood had been discovered in one of the Japanese mandated territories in the Pacific. Similar driftwood has been found as far south as the Celebes group.

"Field men of the Bureau of Forestry have conducted an exhaustive search for possible growths in the Philippine hinterland, but have been unsuccessful, and have come to the conclusion that the wood is native to some other island or group of islands in the Pacific. Specific gravity tests show that the wood has ranges from 0.051 to 0.073, which means that its weight is only 3 to 4½ pounds to the cubic foot. Balsa, heretofore considered the lightest wood in existence, weighs about 7½ pounds.

"Microscopic analysis shows that Gumaan has an exceedingly thin cell wall, and is therefore highly porous. Nevertheless the cells are small and straight, so that the wood presents a solid appearance.

"The commercial uses of this wood, if its origin is discovered and propagation is possible, should be remarkable. Balsa is now in wide use in the airplane industry for streamlines and pontoons, and is very valuable in the radio and refrigerator industries because of its sound-deadening [and insulating] properties. Gumaan possesses the same qualities to a far higher degree and will therefore be even more useful."

Both Mr. Reyes and Dr. R. Kanehira have sent specimens of the unknown wood to Yale. The latter wrote: "During my exploration of Micronesia last summer [1931], I got a log 20 cm. in diameter and 120 cm. long that had drifted on the shore of a small island near Pelew, one of the West Carolines. The wood is, I think, the lightest in the world, having a specific gravity of 0.068 (measured when the sample had a moisture content of 14.4 per cent). Logs of this kind are often found on the shores of the islands mentioned and sometimes they have roots that are still covered with mud, indicating that the trees must grow in Mangrove flats or river swamps. I think the original source is the Philippines, Celebes, or some place other than Micronesia."

Samples of the driftwoods were forward to Dr. Forest B. H. Brown, the well-known wood technologist at the Bernice P. Bishop Museum, Honolulu, Hawaii, who identified it as a species of *Alstonia*, perhaps *Alstonia spathulata* Blume, "a small tree growing along streams from Java and Sumatra to Borneo, and known as Kajoe Gaboes in Sumatra. The wood is remarkably light, having a specific gravity of 0.04. Fishermen use it for making floats for nets, preferring the root because the trunks are full of holes. I am told that the Chinese line their coats with the shavings, which act as a non-conductor of heat (like feathers), but this information may be wrong."

According to K. Heyne (*De nuttige planten van Nederlandsch Indië*, p. 1277), the name Kajoe Gaboes is applied to the light wood of the aerial roots (pneumatophores) of *Alstonia pneumatophora* Backer, which is stronger, harder, and heavier than the root wood of the Poelai Gaboes (*A. spathulata*). The latter is a crooked tree, rarely more than 15 m. tall and 50 cm. in diameter, distributed over the western portion of the Malay Archipelago, being confined to the deeper parts of freshwater swamps and bogs. The wood of the thick, straight roots is extremely light in weight and is used in Palembang as a substitute for cork for floats for fishing nets (*loc. cit.*, p. 1279).

West Indian Boxwood

During the course of preparation of data for Record & Garratt's *Boxwoods* (Bulletin No. 14, Yale School of Forestry, 1925), I asked Mr. R. M. Gardner if the firm of Joseph Gardner & Sons had had any experience with a Boxwood substitute from Cuba. He replied as follows: "My firm in Liverpool did some years ago make a trial of a wood known as Agracejo in Cuba. It was much like the Venezuelan Boxwood in appearance and it would probably have been used in competition with that wood had it not been so expensive. As I remember, it cost some 25 per cent more than Zapatero and as it had no virtues which would enable it to command this additional price we did not buy any more. I know nothing about its botanical species, but would suggest—judging by the similarity in appearance of the logs and the texture of the wood—that it is closely akin to Maracaibo Zapatero."

At the time of the receipt of this letter there were no specimens of Agracejo in the Yale collections, and according to Maza & Roig's *Flora de Cuba* (p. 83), that vernacular name was applied to one of the Myrsinaceae having a hard, reddish wood—obviously not of the Boxwood type.

In 1928, Mr. Alberto J. Fors sent a wood sample with fruiting herbarium material (his No. 70; Yale 13386) labeled Agracejo, *Casearia praecox* Griseb., which he had collected near San Cristobal, Pinar del Río. The wood agreed perfectly with the Venezuelan Zapatero which Sprague and Boodle

(*Kew Bulletin*, 1914, pp. 214–219) determined as *Casearia praecox*.

According to Roig's *Diccionario botanico de nombres vulgares Cubanos* (Havana, 1928, pp. 12–13), there are several different kinds of Agracejo in Cuba, but the one in question is identified with *Gossypiospermum eriophorum* (Wr.) Urb. It is described as follows: A forest tree, abundant on hillsides and rocky limestone soils of the whole island, especially in Guantánamo, Camagüey, and Pinar del Río. Its leaves are similar to those of Fustete (Fustic) or Mora del País (*Chlorophora tinctoria*) and the seed is enveloped in a kind of gilt wool or cotton [hence the generic name, *Gossypiospermum*, meaning cotton seed]. In some parts of Pinar del Río it is known as Aguedita and Quina because of the bitterness of the leaves. Other names are Jía, Jía de Monte, and Agracejo de Monte, the last to distinguish it from the Agracejo de Sabana, which is the myrsinaceous plant referred to above.

In 1930, four wood samples with herbarium vouchers of *Gossypiospermum eriophorum* (C. Wr.) Urban were received from the Arnold Arboretum. They were collected in Soledad, Cienfuegos, Cuba, 1927–29, by Mr. J. G. Jack (his Nos. 4970, 5691, 6947, and 7298; Yale 16605, 16664, 16753, and 16765, resp.). A recent study of these specimens clearly indicated that they were the same as the Fors sample (Yale 13386) and the Venezuelan Zapatero, the principal Boxwood of commerce.

I referred this problem to Mr. Alfred Rehder, Curator of the Herbarium at Arnold Arboretum, who called my attention to a paper entitled, "Notes on Flacourtiaceae," by Percy Wilson, New York Botanical Garden, in *Torreya* 30: 3: 72–73, May–June 1930. There Mr. Wilson combines *Casearia praecox* and *Gossypiospermum eriophorum* (and two other species in addition) under the designation of *Gossypiospermum praecox* (Griseb.) P. Wilson. "As he was the first to unite these two species published on the same date," Mr. Rehder remarks, "his choice of the name has to stand [under the International Rules], notwithstanding the fact that Urban already had made the combination *Gossypiospermum eriophorum*."

From the foregoing it appears that the Venezuelan Zapatero and the Cuban Agracejo are one and the same species and that its latest scientific name is *Gossypiospermum praecox* (Griseb.) P. Wils. It is also shown that the Cuban timber has met with favor in the market, except in the matter of price, and it is probable that additional supplies are available. It is a species worthy of consideration for forest plantations on appropriate sites in Cuba, Puerto Rico, and elsewhere. The trade name of West Indian Boxwood for timber coming exclusively from Venezuela may not be so inappropriate after all.

A SECOND SPECIES OF *GOSSYPIOSPERMUM*

By ALFRED REHDER

Curator of the Herbarium, Arnold Arboretum

When describing *Casearia praecox* and *C. eriophora*, Grisebach knew the former only from flowering and the latter from fruiting material; he placed *C. praecox* in the section *Crateria* and for *C. eriophora* he created the new section *Gossypiospermum*. Warburg (in Engler & Prantl, *Nat. Pflanzenfam.* III-6a, p. 52, 1893) also places *C. praecox* into the section *Crateria* and attributes pellucid-punctate leaves to it, though Grisebach says "punctis lineolisque pellucidis nullis," a statement which the examination of Wright's type confirms; *C. eriophora* he refers to the section *Piparea* (Aubl.) Benth., which is characterized by the processes of the disk being united into a corona inside of the staminal whorl, but in *C. eriophora* the processes alternate with the stamens as in the section *Crateria*. Gilg (*op. cit.*, ed. 2, XXI, p. 455, 1925) repeats these erroneous statements. The section *Gossypiospermum* is not mentioned by either one of these authors. After having examined the types of *C. praecox* and *C. eriophora* and additional copious material from Cuba and also specimens from Colombia and Venezuela I follow Wilson (in *Torreya* XXX, p. 72, 1930) in uniting *C. praecox* and *C. eriophora* under *Gossypiospermum praecox*, the specific epithet he selected when uniting the two simultaneously published species.

Gossypiospermum paraguariense Rehder, nom. nov.

Casearia gossypiosperma Briquet in Bull. Herb. Boissier, VII. App. 1. 55 (1899); sér. 2, VII. 673 (Chodat & Hassler, Pl. Hassler. 689) (1907).

Gossypiospermum paraguariense is closely related to *G. praecox* (Griseb.) P. Wils. (*G. eriophorum* [Wright] Urb.), but readily distinguished by the larger flowers with the processes of the disk about a fourth or a fifth as long as the filaments and only slightly pubescent at the apex, while in *G. praecox* the processes are about half as long as the filaments and conspicuously pilose their whole length. Otherwise the two species are very similar in general habit, in leaf and fruit, so that I was inclined to consider them conspecific before examining the flowers.

In transferring *Casearia gossypiosperma* Briq. to the genus *Gossypiospermum* the specific epithet had to be changed, otherwise a tautonym would have resulted.

TYPE LOCALITY: Paraguay: near S. Bernardino (E. Hassler 1107).

SPECIMENS EXAMINED: Paraguay: Cordillera de Altos, E. Hassler 3476; same locality, K. Fiebrig 196a, Oct. 3, 1902; prope Concepción, E. Hassler 7276, Aug. 1901–2; prope Sapucay, E. Hassler 12265, Sept. 1913.

Note on the Wood of *G. paraguariense*

I have not seen the wood of this South American species, but Venturi says (*Contribución al conocimiento de los arboles de la Argentina*, Buenos Aires, 1910, p. 27) that it is yellowish, hard, and brittle. He describes the tree as tall, straight, smooth-barked, about a foot in diameter, and gives the source as Laguna Porá, Formosa. The vernacular name is Mbavy. The wood is listed (No. 89) as Mbavy (Formosa and Misiones) and Catiguá-oby (Chaco) in *Nomina de las maderas del pais* (Argentine Forest Service, 1932). While these references indicate that the species has a fairly wide distribution and that its timber is known, its commercial possibilities are yet to be determined.—S. J. R.

SCHIZOCARDIA, A NEW GENUS OF TREES OF THE FAMILY *CLETHRACEAE*

By Albert C. Smith and Paul C. Standley

Of the many rare or otherwise interesting plants collected during the past few years in British Honduras by that diligent explorer, Mr. William A. Schipp, none, probably, is quite so remarkable and unexpected as a large tree that he has discovered in the Stann Creek region. The first specimens of it, complete except for mature fruit, which still remains a desideratum, were received several years ago at Field Museum of Natural History. Prolonged search through literature failed to reveal any description of a similar plant, and the tree had been recognized at once as something altogether unknown previously in the Central American flora. There was given it a provisional name as a new genus, and under this name, *Schizocardia belizensis*, Mr. Schipp distributed specimens.

From several herbaria of America and Europe there have come letters asking to what family the new genus was to be referred, and it was necessary to reply to the effect that its proper position was unknown. It was because of this uncertainty that publication of the name was delayed, with the hope that mature fruit, when collected, would decide definitely the proper position of the new genus. It is believed now that the small fruits present on the original specimens are almost mature, and little inferior in size to fully developed ones.

The collector himself happily suggested, in the end, the true relationship of the tree, when he forwarded new and better material. His statement that its alliance was with *Clethra* proved to be correct, although that relationship had not been suspected previously by the second author of this paper. Certainly, at first glance, the plant has little resemblance to the rather uniform species of that genus, the type of a family heretofore presumed to consist of a single genus.

Although the relationship indicated by Mr. Schipp appeared to be the correct one, it seemed so improbable that Central America should yield a second genus of this family,

that confirmation of this judgment was desirable, and the specimens were submitted to Mr. Albert C. Smith, who has devoted much time to study of the Ericaceae and related groups. He has contributed the essential parts of the following descriptions and discussion.

Schizocardia Smith & Standley, gen. nov.

Arbores; folia versus apicem rami conferta alterna simplicia brevipetiolata penninervia; flores in racemos axillares dispositi, pedicellis brevibus basi unibracteatis; calyx pedicello articulatus, sepalis distinctis imbricatis persistentibus profunde laciniatis accrescentibus; petala 5 late imbricata basi lata inserta; stamina 10, disco annulari tenui inserta, filamentis liguliformibus, antheris dorsifixis versatilibus in alabastro extrorse inversis ad anthesin erectis, loculis 2 apice distinctis poris terminalibus dehiscentibus; ovarium superum 5-loculare, placentis centralibus carnosis, ovulis minutis numerosis; stylus simplex in alabastro declinatus, stigmate simplici minuto; fructus capsularis, stylo persistente.

Schizocardia belizensis Smith & Standley, sp. nov.

Arbor 15–18-metralis, trunco 25–90 cm. diam., ramulis subteretibus vel leviter angulatis glabratis, primo ferrugineo-puberulis, cortice deciduo subnigrescente; folia conferta, petiolo subrugoso glabro 4–10 mm. longo anguste marginato; lamina subcoriacea supra fusco-viridis subtus pallidior oblonga vel oblanceolato-oblonga 4–11 cm. longa 1.3–2.6 cm. lata basi attenuata apice obtusa et leviter emarginata, marginibus integris leviter recurvis, glabra, penninervia, costa supra leviter impressa subtus elevata, nervis utroque latere 12–17 brevibus adscendentibus prope marginem conjunctis utrinque prominulis, venulis numerosis prominentibus reticulatis; racemi axillares solitarii ut videtur basi ebracteati 4–8 cm. longi, rhachide gracili subtereti saepe curva dense pallide ferrugineo-puberula, pedicellis c. 5 mm. longis gracilibus curvis puberulis atque sparse pilis longis puberulis villosis basi unibracteatis, bracteis submembranaceis ovato-oblongis 3–3.3 mm. longis 2.5 mm. latis basi truncata sessilibus apice obtusis vel subacutis subintegris utrinque fusco-puberulis, floribus ut videtur ebracteolatis; sepala papyracea ovato-rotundatis 3.6 mm. longis, 3 exterioribus aequilatis basi truncatis apice rotundatis minute puberulis laciniatis, laciniis densis uniformibus saepe ramosis 1 mm. longis, sepalis 2 interioribus 2 mm. tantum latis basi angustatis; petala 5 distincta membranacea glabra rotundato-reniformia c. 3 mm. longa et 4 mm. lata basi lata inserta obscure crenata; stamina glabra, fila-

mentis liguliformibus tenuiter carnosis 1 mm. longis, antheris submembranaceis leviter granulosis medio dorsifixis ovato-oblongis 1.5 mm. longis 0.7 mm. latis basi apiculatis, loculis 2 apice distinctis poris subterminalibus 0.2 mm. diam. dehiscentibus; ovarium depresso-globosum 1–1.5 mm. latum pilis pallidis 0.5–0.8 mm. longis villosum, stylo carnoso glabro 2 mm. longo superne attenuato; pedicelli sub fructum usque ad 8 mm. longi, sepalis usque ad 7 mm. longis et aequilatis convexis basi capsulae arcte adpressis.—British Honduras: On mountain ridges, Stann Creek Valley, Nineteen Mile, alt. 240 m., July 8, 1932, *William A. Schipp* 965 (Herb. Field Mus. No. 657,788, type; fragm. in herb. N. Y. Bot. Gard.). Near Middlesex, mountain forest, 540 m., November, *Schipp* 443 (F, N. Y.).

The collector notes the petals as pink, the anthers as yellow; flowers perfumed like those of *Erica*.

Schizocardia differs from *Clethra* in having the racemes axillary rather than terminal, the sepals accrescent, persistent, and deeply laciniate rather than entire, and a 5-celled rather than 3-celled ovary. The latter character might indicate that the new genus bears a relationship with the Ericaceae.

Stamens of *Schizocardia* were submitted to Dr. R. P. Wodehouse, who has described the pollen, as follows:

"Grains single, spheroidal or ellipsoidal, 13–17μ broad; furrows long, reaching nearly to the poles. Furrow margins and pores marked by an inwardly projecting rim. Exine smooth. As compared with the grains of *Clethra* (*C. lanata*, *C. cubensis*, *C. alnifolia*, *C. hondurensis*), these latter are likewise single, smooth, and approximately spheroidal in form, and range in size from 12.5–22.8μ in diameter, virtually indistinguishable from those of *Schizocardia* . . . Apparently the only other members of the Ericaceae (using the term in its broadest sense) which have the grains single are the Monotropoideae. Of these, the grains of *Monotropa* have no furrows. . . . The grains of the remainder of the family, including Pyroloideae, appear to be always in tetrads, and with each grain of the tetrad much larger than those of *Schizocardia*. . . . An interesting sidelight comes out of this: It seems that the Clethraceae, including *Schizocardia*, constitute a family quite distinct from and probably not even related to the Ericaceae. Among the Pyrolaceae of Engler and Prantl the Pyroloideae (*Chimaphila* and *Pyrola*) are unquestionably ericaceous, while the Monotropoideae are not. The pollen forms of the latter are so far reduced that they reveal little of their relationships, but are decidedly against their being ericaceous."

WOODS OF THE ERICALES, WITH PARTICULAR REFERENCE TO *SCHIZOCARDIA*

By Samuel J. Record

The order Ericales includes a large number of plants of wide distribution, and there has been no comprehensive systematic study made of their woods. The following tentative summary is based upon investigations of material in the Yale collections representing 27 genera of the families Clethraceae, Ericaceae, Vacciniaceae, and Epacridaceae.

The color ranges through various shades of brown to reddish brown, occasionally deepening to rich red. Odor and taste are not distinctive in dry material. Density medium to rather high. Texture very fine to medium. Grain variable, often irregular; in some cases silver grain (rays on radial surface) is conspicuous and attractive.

Growth rings generally not very clearly defined; occasionally distinct. Diffuse-porous, the pores small to very small, not distinct without lens, rather few to numerous, not crowded and not arranged in definite pattern. Vessels mostly with scalariform perforations, with few to many bars, sometimes reticulated; areas of elongated pits replacing perforation plate occasionally found in some species; simple perforations may also be present and sometimes predominate, especially where the end walls are not steeply inclined; spirals occur in the vessels of some woods, but generally are confined to the ends of the members; pits to parenchyma simple or bordered, rather small to very large. Xylem parenchyma present, mostly in very fine, irregular, tangential lines, rarely distinct without lens. Rays heterogeneous and of two size classes: (1) uniseriate, with all of the cells upright or square, thick-walled and abundantly pitted; (2) multiseriate, with the body composed of low, often short cells and sheath cells, the margins one to several cells high and of the type of the uniseriate rays; in the

Epacridaceae the larger rays are as conspicuous as in *Quercus;* pits to vessels variable from small to large; crystals absent or uncommon; intervascular pitting with tendency to scalariform. Ground mass of wood composed of fiber-tracheids having thick to moderately thick walls abundantly pitted throughout, with distinctly bordered, non-vestured pits, the apertures lenticular, inclined, and reaching to or extending beyond the margin of the comparatively large, circular border; spirals present in a few species.

From the studies so far made of the woods of this order it appears that they comprise a fairly homogeneous group without sharp division into families along the lines proposed by taxonomists, except probably in the case of the Epacridaceae. Generic and some specific differences often are pronounced. Relationship of the Ericales to the Theaceae seems to be strongly indicated.

The Wood of *Schizocardia belizensis*

Sapwood pale brown (perhaps white when first cut), merging gradually into the dull, reddish brown heartwood. Taste slightly astringent. Odor mild and not distinctive in dry material.

Wood hard, heavy, tough, strong, not difficult to cut; suggests Applewood (*Malus*), but is not so fine-textured; grain irregular and rather interlocked. No particular uses suggested.

GROSS ANATOMY

Growth rings absent or poorly defined. Pores small, not visible without lens; numerous, but not crowded; uniformly distributed, without pattern; nearly all solitary; open. Vessel lines indistinct. Parenchyma not visible. Some of the rays rather coarse, but scarcely visible on cross and tangential sections because of lack of contrast with the background; low and inconspicuous on radial surface.

MINUTE ANATOMY

Pores circular to oval; 23–27 per sq. mm.; rarely in contact radially; tangential pairs (overlapping vessel members) common; tangential diameter of larger pores, 75–100μ.

Vessel members variable in length from 0.4–0.7 mm., being mostly 0.5–0.6 mm.; having either simple or scalariform perforations (or both, in opposite ends), in the ratio of at least 4 simple to 1 multiple; bars of the latter slender and fairly numerous, with narrow apertures between; inclination of perforation plate variable, but generally about 45° for both types; ends of members mucronate to short ligulate, without spirals; intervascular pits on tangential walls rare, owing to isolation of vessels.

Wood parenchyma cells numerous, diffuse or more often in irregular, uniseriate (occasionally biseriate), tangential lines usually touching the vessels on the outer side, but not surrounding them; disjunctive cells, with short processes, fairly common; pits often elongated, with tendency to scalariform arrangement.

Rays heterogeneous; of two fairly distinct size classes: (1) uniseriate (occasionally biseriate in part), 1–12 cells high, with all of the cells upright or square; max. height about 0.8 mm.; (2) multiseriate, 3–6 cells wide (80–115μ) and 25–50 cells high (0.5–1 mm.), sometimes vertically fused, all with one to several rows of upright or square marginal cells, the body composed of low and rather short procumbent cells, sometimes with a mixture of larger cells and sheath cells; ray-vessel pit-pairs half-bordered and similar in face view to the intervascular, or simple, irregular, and tending to scalariform in the largest cells; no crystals observed.

Fiber-tracheids composing ground mass of wood; in fairly definite radial rows; angular in section; av. diam. of median portion about 25μ; walls thick; very abundantly pitted on all sides with distinctly bordered pits having circular border and lenticular, diagonal, included aperture; cells rather uniformly tapering without distinct shoulders, but frequently serrate and sometimes forked from contact with ray cells; length 0.90–1.34 mm., av. about 1.20 mm.

Material: Yale No. 21,551; William A. Schipp No. 965 (from type tree).

Comparative Anatomy of *Clethra* and *Schizocardia*

From the foregoing descriptions it is obvious that the wood

of *Schizocardia* is in general conformity with the description of the order. The data available, however, do not indicate a close relationship of that genus to *Clethra*. The most noticeable structural differences are as follows: In *Clethra* the vessel members and fibers are about twice as long, the perforation plates are much more steeply inclined, and the number of bars is from 3 to 10 times as many as in *Schizocardia*. These distinctions are of a fundamental character and indicate that *Clethra* is more primitive than *Schizocardia*.

SIX ADDITIONS TO THE FOREST FLORA OF CENTRAL AMERICA AND MEXICO

By PAUL C. STANDLEY

Field Museum of Natural History

The trees here described or discussed have been found among various collections of Mexican and Central American plants received for determination during 1932. Two of them are of prime importance because they represent genera unknown previously as members of the continental North American flora.

Prunus Salasii, sp. nov.—Subgenus *Laurocerasus*. Arbor glabra, ramulis gracilibus laevibus; folia majuscula firme membranacea petiolata in sicco laete viridia, petiolo gracili 13–18 mm. longo versus apicem glandulis 2 majusculis sessilibus onusto; lamina oblongo-lanceolata 7.5–14 cm. longa 3–4.5 cm. lata longiacuminata basi rotundata arcte argute serrulata, subtus paullo pallidior eglandulosa costa gracili elevata; racemi e nodis defoliatis nascentes efoliati flexuosi 16–18 cm. longi et ultra multiflori, pedicellis gracilibus 3–4.5 mm. longis; cupula c. 2.5 mm. longa et 3.5 mm. lata intus glabra, sepalis late ovato-triangularibus obtusis 1.5 mm. longis, petalis albis late rotundatis 4–4.5 mm. longis apice late rotundatis; drupa globosa apice late rotundata 13 mm. longa et fere aequilata.—GUATEMALA: Cafetales de El Pintado, Antigua, alt. 1500 m., January, 1932, *Jorge García Salas* 1437 (Herb. Field Mus. No. 652,134, type).

There is at hand also a photograph of a branch taken from a tree seven years old that is planted in the Parque Central of Guatemala City. The vernacular name is Carreto. The heavy wood is reported to be employed for construction purposes. It is believed that the tree is native in the mountains of central Guatemala.

The species here described is probably related to *Prunus tuberculata* Koehne of Oaxaca, Mexico, but differs from it in floral details. It is named for its collector, the Director of Agriculture of Guatemala, from whom the writer has received for determination numerous collections of exceptionally interesting plants.

Lonchocarpus Castilloi, sp. nov.—Arbor 9-metralis et ultra, trunco 15–75 cm. diam., ramulis ferrugineis lenticellis parvis albidis notatis fere glabris; folia mediocria petiolata, petiolo cum rhachide 5–9 cm. longo gracili subtereti fere omnino glabro; foliola circa 15 subopposita coriacea 2–3 mm. longe petiolulata anguste oblonga vel lanceolato-oblonga 2.5–4.5 cm. longa 7–12 mm. lata versus apicem obtusum paullo angustata basi cuneato-acuta vel subobtusa supra glaberrima vel tantum ad costam valde impressam puberula viridia, subtus pallida dense minute strigillosa, costa valde elevata, marginibus valde revolutis; legumen oblongum vel lanceolato-oblongum 7–10 cm. longum 2–3 cm. latum glabratum, valvis tenuissimis ad semina 1–2 valde elevatis.—BRITISH HONDURAS: Freshwater Creek Reserve, in high swamp forest, fairly common, sometimes as much as 30–35 meters high and 1 meter in diameter, February 12, 1932, *A. Castillo* 30 (Herb. Field Mus. No. 651,846, type).—GUATEMALA: Uaxactún, Petén, in jungle, March 21, 1931, *H. H. Bartlett* 12215.

Among the numerous *Lonchocarpus* species known from Mexico and Central America it is not easy to refer the present one to its exact position. It is, however, conspicuously unlike any known to the writer, its foliage, in particular, being unique in the numerous rather small and narrow leaflets with characteristically revolute margins.

Amanoa grandiflora Muell. Arg. Flora 55: 2. 1872.—The genus *Amanoa* of the family Euphorbiaceae consists of nine known species, three of them African, five South American, and one West Indian—in the Lesser Antilles. The group may now be reported for the continent of North America, from extreme northern Central America: British Honduras: Temash River, 12 miles from the bar, February, 1932, *J. B. Kinloch* 45; Moho River, December, 1930, *H. P. Smart & N. S. Stevenson* 149 (Yale No. 19798); Temash River, De-

cember, 1930, *Stevenson & Smart* 141 (Yale No. 19792). The British Honduras material agrees perfectly with specimens from British Guiana, and the tree furnishes another of the rather numerous examples of species that occur in the Guianas and British Honduras, but are unknown in the intervening areas. The collectors report that in British Honduras this is a large or small tree, growing in swamps or on river banks, sometimes with a height of 12 meters and a trunk diameter of 30 cm.

Allophylus Kinlochii, sp. nov.—Arbor 9-metralis, trunco 20 cm. diam., ramulis gracilibus cinereo-cinnamomeis elevato-lenticellatis, novellis dense pilosulo-tomentulosis; folia mediocria longe petiolata, petiolo gracili 2.5–4 cm. longo dense pilosulo; foliola 3, terminale paullo majus 7–8 mm. longe petiolulata, lateralia 2–4 mm. longe petiolulata, omnia elliptico-oblonga vel obovato-oblonga 5–9 cm. longa 2–3.5 cm. lata longiacuminata basi acuta grosse argute serrata, supra viridia sublucida sparse pilosula vel glabrata, subtus pallidiora ubique dense molliter pilosa, nervis ut venulis prominentibus; inflorescentiae axillares graciliter 4–4.5 cm. longe pedunculatae basi trichotomae, ramis simplicibus gracillimis 5–8 cm. longis dense fulvo-pilosis, floribus laxe racemosis solitariis breviter crasse pedicellatis, bracteis minutis; drupae rubrae sparse pilosulae vel fere glabrae globosae vel obovoideo-globosae 6–7 mm. longae apice late rotundatae.—British Honduras: Temash River 14 miles from the bar, levee forest, common, of bushy habit and overhanging the river, February 6, 1932, *J. B. Kinloch* 43 (Herb. Field Mus. No. 651,851, type).

Similar to *Allophylus longeracemosus* Standl., likewise described from British Honduras, but in that the racemes are simple and the pubescence of the lower leaf surface consists merely of small tufts of hairs in the axils of the nerves.

Zizyphus yucatanensis, sp. nov.—Ramuli crassi cinerei puberuli vel glabrati; stipulae subpersistentes anguste triangulares 1.5 mm. longae; folia subfasciculata parva petiolata coriacea laete viridia, petiolo crasso glabro 3–5 mm. longo; lamina ovalis vel rotundato-ovalis interdum obovato-ovalis 2–3 cm. longa 1–2 cm. lata apice late rotundata basi contracta et subacuta trinervia integra glabra vel in statu juvenili minute puberula lucida, venulis utrinque prominentibus et arcte reticulatis; flores cymoso-paniculati, paniculis interrupte spiciformibus usque ad 4 cm. longis et 1 cm. latis, cymulis densis paucifloris, floribus breviter pedicellatis; calyx 2 mm. longus pallide viridis extus dense minute puberulus; petala rotundato-ovalia viridescentia glabra longe unguiculata calyce paullo longiora.—Mexico: Progreso, Yucatán, in 1932, *Dr. Román S. Flores* (Herb. Field Mus. No. 655,097, type).

Vernacular names (Maya), Uayum and Uayumke. The plant has no close relatives among the Mexican Rhamnaceae, nor is it identical with any of the West Indian ones of which I have seen material. It somewhat suggests some of the West Indian species of *Sarcomphalus*, a genus that apparently has no basis other than long usage for its recognition.

Olmediella Betschleriana (Goepp.) Loes.—The genus *Olmediella*, with a single species, is described in the recent edition of the *Pflanzenreich*, and it has been discussed at length in the *Notizblatt* of the Berlin Botanic Garden (4: 175–181. 1905), by Loesener, who refers the genus to the family Flacourtiaceae and gives a detailed account of its curious history.

The tree or shrub has been in cultivation in Europe for 75 years or more, but there, apparently, it seldom flowers. Its origin has been unknown. Because of the holly-like form of the handsome leaves, it was first described as a species of *Ilex*. Rippa, who observed it in cultivation at Naples, described it as a new genus, *Licopolia*, disregarding the earlier name *Olmediella* of Baillon, who had referred the plant, fantastically enough, to the Moraceae. According to Loesener and Gilg, the genus is most closely related to *Dovyalis*, a group represented most extensively in Africa. It is altogether unexpected to discover such a genus in America, since there are no other close relatives in the western hemisphere.

A short time ago the writer received from Sr. Jorge García Salas, Director of Agriculture of Guatemala, specimens of a tree whose determination offered much difficulty, but they were finally associated with the descriptions of *Olmediella*. Their identity with the plant cultivated in Europe has been confirmed by comparison with material kindly supplied from Berlin by Dr. Loesener.

Sr. García Salas has supplied complete specimens of the tree, including mature fruits, which are irregularly rounded, strongly depressed, 6 cm. or more in diameter and about 3.5 cm. high, and have a hard thick shell. The tree, which is reported to be a handsome one and well worthy of more extensive planting, is said to be cultivated frequently in the parks and plantations of central Guatemala. The first specimens

sent were obtained at the Finca La Cienaguilla, San José Pinula, elevation 1600 meters, and the tree is reported as native in the mountains in that general region. Other specimens were collected at Antigua and along the Boulevard La Reforma in Guatemala City. It is worthy of note that in the larger trees the leaves are entire; in the younger ones they have numerous spinose teeth, and thus are strongly suggestive of those of the evergreen Hollies. The vernacular name is Manzanote.

It is a matter of satisfaction to be able at last to place geographically this interesting tree, whose source has been so long in doubt. It is possible at the same time to add to the recorded flora of Central America an exceptionally distinct genus, belonging to a family that is composed of the most heterogeneous elements.

THE WOOD OF *GLEASONIA DUIDANA*

By SAMUEL J. RECORD

The wood described below is from the type tree of *Gleasonia duidana* Standley, a recently described genus and species of the family Rubiaceae. It was collected from a small tree at an altitude of 1500 m. on Mount Duida, Venezuela, by Mr. G. H. H. Tate and contributed to the Yale collections by Dr. H. A. Gleason in whose honor the genus is named.

Standley says:[1] "When growing, this must be an exceedingly showy and handsome plant. The form of the calyx lobes and the general appearance of the inflorescence are strongly suggestive of the genus *Triplaris*, which contains some of the most gorgeous of tropical American trees.

"Because of the absence of fruit, and uncertainty whether the seeds are winged or not, there is some question as to the tribal position of the tree, but it is probable that it is referable to the Rondeletieae, and allied with *Pallasia* and *Pteridocalyx*, both of which are natives of British Guiana. However, it is conspicuously distinct from both these genera, in which only one or two of the calyx lobes are enlarged and colored. In *Gleasonia* all the calyx lobes are about equally developed, and all are brightly colored. Such a calyx is not found in any other American representative of the family Rubiaceae."

[1] *The Rubiaceae of Venezuela.* Pub. 302, Field Museum of Natural History, Bot. Ser. 7: 4: 373, Oct. 12, 1931.

DESCRIPTION OF THE WOOD

General features: Color pale brown, somewhat streaked. Not highly lustrous. Odor and taste absent or not distinctive. Sp. gr. (air-dry) 0.92; weight about 57 lbs. per cu. ft. Texture rather fine and uniform.

Gross anatomy: Growth rings poorly defined by narrow zones with few pores. *Wood parenchyma* not visible with lens. *Pores* mostly single, numerous but not crowded, irregularly disposed without definite pattern; appearing as whitish dots in heartwood owing to gum deposits; scarcely distinct without lens. *Vessel lines* fine and inconspicuous. *Rays* minute, numerous, spaced about one pore-width apart; not visible without lens on cross and tangential sections, inconspicuous on radial surfaces; individual cells distinct with simple lens, being mostly coarse and upright.

Minute anatomy; Pores sub-circular; rarely in radial contact; radial diam. 46 to 157μ (av. 106μ), tang. diam. 46 to 137μ (av. 91μ); walls thin. *Vessel members* sub-cylindrical, their end walls slightly to steeply inclined; perforations simple, with distinct rims; pits to fiber-tracheids and parenchyma numerous, small, bordered; intervascular pits few, owing to isolation of vessels; gum deposits abundant. *Wood parenchyma* sparingly developed; a few cells in contact with some of the pores; also terminal in narrow line, mostly uniseriate. *Rays* heterogeneous; up to 25 cells high; most of the cells upright, often palisade; procumbent cells few, coarse, short, usually only two or three times as long as high; uniseriate, except for procumbent portions which often are biseriate; height up to 2.44 mm. (av. 1.0 mm.); width 17 to 34μ (av. 26μ); parenchyma-vessel pitting often unilaterally compound, more or less scalariform, a single simple pit of ray or wood parenchyma cell subtending 2–5 bordered pits of vessel; gum deposits common; no crystals observed. *Fiber-tracheids* compose the ground mass of the wood; arranged in fairly definite radial rows owing to the close spacing of the rays; secondary wall with thin outer layer and thick inner layer inclosing very small lumen; pits numerous in both radial and tangential walls, distinctly bordered, the narrow lenticular apertures vertical (because of the narrow lumen) and extending to or beyond the borders; pits to vessels numerous.

Material: Yale No. 16, 185 (G. H. H. Tate No. 467). (All measurements were made by Henry H. Flickinger, a student at the Yale University School of Forestry.)

THREE NEW TREES FROM COLOMBIA

By Paul C. Standley

Field Museum of Natural History

The three species here described were discovered in two important series of specimens representing the forest trees of Colombia, forwarded to the writer for determination by Professor Samuel J. Record. Most interesting of them, perhaps, is the new *Zizyphus*, a member of a group that has few representatives in northern South America.

Ficus Dugandii, sp. nov.—Arbor 15–17-metralis, trunco 160 cm. diam., ramulis crassis ferrugineis glabris, internodiis brevibus; stipulae (perfectae non visae) anguste triangulares acuminatae extus dense albido-sericeae; folia mediocria petiolata firme papyracea in sicco fusca, petiolo gracili 2.5–4.5 cm. longo glabro; lamina oblonga vel lanceolato-oblonga 11–17 cm. longa 4–6 cm. lata subabrupte acuta basi obtusa vel acutiuscula glabra, subtus fere concolor, costa gracili elevata, nervis lateralibus utroque latere c. 12 tenerrimis angulo latiusculo adscendentibus fere rectis; receptacula geminata sessilia globosa 13–15 mm. diam. densissime minute tomentulosa, apice ostiolo prominente mamillata, involucro bilobo 6 mm. lato, segmentis rotundato-ovalibus apice late rotundatis extus minute sericeis.—Colombia: Near Galapa, common, growing near a seasonal stream, June 28, 1932, *A. Dugand G. 27* (Herb. Field Mus. No. 658,080, type).

The *Ficus* species of Colombia and adjacent parts of northern South America are in a chaotic state systematically, and badly in need of revision, consequently it is impossible to indicate the nearest relatives of the species here described. I have been altogether unsuccessful in identifying it with any of the rather few species described from Colombia.

Zizyphus angolito, sp. nov.—Arbor 15-metralis, trunco 35–45 cm. diam., ramulis cinereis vel fuscis glabris vel glabratis, internodiis brevibus; stipulae deciduae; folia mediocria breviter petiolata coriaceo-membranacea, petiolo rigido 2–6 mm. longo; lamina late ovalis vel ovato-ovalis 5–7 cm. longa 3–4.5 cm. lata obtusa vel rotundata, interdum obtuse acutata, basi rotundata vel late obtusa, trinervia, supra in sicco fusco-viridis glabra lucida, venulis prominulis arcte reticulatis, subtus pallidior in statu adulto glabra prius ut videtur saltem ad nervos puberula, ad marginem remote obscure crenato-serrulata; flores cymosi, cymis parvis paucifloris petiolo duplo longioribus, floribus crasse pedicellatis; drupa teres ellipsoidalis 1 cm. longa obtusa vel acutiuscula glabra lenticellis parvis pallidis elevatis densiuscule comspersa. —Colombia: Road from Malambo to Sabanagrande, July 3, 1932, *A. Dugand G. 33* (Herb. Field Mus. No. 658,079, type).

Vernacular name, Angolito. Of the two species of *Zizyphus* described previously from Colombia, *Z. Cinnamomum* Triana & Planch. has much larger, oblong leaves, and *Z. strynchifolia* of the same authors has oblong acuminate leaves.

Lucuma Espinae, sp. nov.—Arbor 10-metralis, trunco 15 cm. diam., ramulis crassiusculis ochraceis, novellis sparse sericeis cito glabratis, internodiis brevibus; folia parva petiolata coriacea in sicco brunnescentia, petiolo crassiusculo 10–13 mm. longo glabro; lamina obovato-ovalis vel oblongo-obovata 5–9 cm. longa 3–4.5 cm. lata apice late rotundata vel subtruncata basi late acuta in statu adulto glabra vel tantum ad nervos sparse sericea, sublucida, costa supra subimpressa venulis prominulis, subtus fere concolor, costa crassa elevata, nervis lateralibus utroque latere c. 9 elevatis fere rectis vel leviter arcuatis angulo lato adscendentibus in marginem desinentibus, venulis crebris oblique transversis subparallelis prominulis et arcte reticulatis; flores axillares solitarii vel fasciculati sessiles imperfecti tantum visi; sepala ovali-elliptica 4–5 mm. longa obtusa extus dense brunneo-sericea; ovarium dense tomentosum, stylo gracili 6–7 mm. longo et ultra; bacca juvenilis ovoidea dense brunneo-sericea 2 cm. longa acuminata; cetera ignota.—Colombia: Santa Marta, Cerro Quemado Region, alt. 2250 m., in 1932, *Ramón Espina and Juan Giacometto A168* (Yale No. 20943; Herb. Field Mus. No. 654,730, type).

Proposed New Botanical Garden in Brazil

Plans are said to have been formulated for the establishment of a Botanical Garden in Bello Horizonte, the capital of the important Brazilian State of Minas Geraes. The garden is to be devoted to the Brazilian flora, especially that of Minas, and is to have ample terrain. It is intended to function at the same time as a plant biological station and as an arboretum and garden for the display and study of the flora of the State with particular reference to its ecological aspects.—B. E. Dahlgren.

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

New Members Elected

Mr. H. E. Dadswell, Division of Forest Products, Council for Scientific and Industrial Research, Melbourne, Australia.

Mr. Alexander Robert Entrican, In Charge of Branch of Forest Products, New Zealand State Forest Service, Wellington, New Zealand.

Mr. Joseph D. Hale, Forest Products Laboratories of Canada, Ottawa, Canada.

Mr. Ralph O. Marts, Forest Products Laboratory, Madison, Wisconsin.

Professor Robert Boyd Thomson, Department of Botany, University of Toronto, Toronto, Canada.

Professor Ralph H. Wetmore, Associate Professor of Botany, Harvard University, Cambridge, Massachusetts.

Professor Robert H. Woodworth, Assistant Professor of Botany, Harvard University, Cambridge, Massachusetts.

Meeting of Committee on Glossary

Following the meeting in New Haven last May (see *Tropical Woods* 31: 29), a revision of the English portion of the glossary of terms used in describing woods was sent to the members of the Association who had collaborated. A second conference was held at Harvard University October 28–29 and all of the proposed terms and definitions were reconsidered in the light of the many suggestions received. Those in attendance were Professors Bailey, Wetmore, and Woodworth of Harvard, Eames of Cornell, and Garratt and Record of Yale.

In order to avoid the extra work and expense of supplying copies of committee reports to members who are not actively interested in the subject, the mailing list for each succeeding report is based upon the returns of the one before.

Reprints for Distribution

The editor has left for free distribution 75 reprints from *International Critical Tables*, Vol. II, 1927, pp. 39–42, giving bulk densities of 179 tropical American woods as determined at the Yale University School of Forestry.

CURRENT LITERATURE

Forests of British Honduras. By Sir John Burdon (late Governor). *The Timber Trades Journal* (London) 122: 350, Aug. 6, 1932.

"Forestry has been the main, and practically the only, industry of British Honduras, almost from the very beginnings. The 'Settlement on the Bay of Honduras,' which became, about the middle of the nineteenth century, the Colony of British Honduras, undoubtedly owed its actual origin to the safe refuge which its lines of reefs and cays (small islands) provided for the British buccaneers of the early seventeenth century. The intricacies of navigation, sufficiently difficult even now, despite lighthouses and beacons, gave sanctuary at the mouth of the Belize River from the Spanish pursuer.

"In 1655 the buccaneers, who had been wont to burn their Logwood prizes, discovered that the cargo was extraordinarily valuable. The Logwood in a prize brought to London fetched £100 per ton. Thereafter privateers, if they failed to capture Logwood ships, landed and cut the wood themselves, on the Belize River, among other places. This procedure was stimulated by the Treaty of 1667 for the suppression of privateering; and the profit to be made by Logwood cutting attracted others besides buccaneers.

"Logwood was in those days, omitting the treasure from Mexico or from Peru via the Gulf of Darien, the most valuable product obtained from West Indian waters, as the price mentioned above goes to prove. It was the basis of practically all dyes. Unfortunately for the Bay Settlers, Spain objected to their encroaching on her monopoly of this trade as strongly as she had formerly objected to their buccaneering activities. Claiming the land as hers on the strength of a papal bull, she regarded them as pirates and thieves and spent an unsuccessful century and a quarter trying to eject or exterminate them.

"Logwood remained the principal export of the Settlement for a century. It is recorded that 18,000 tons were shipped in 1756 and that there were 40 to 75 ships continually loading in the Bay down to 1770. The price then fell to about £5

per ton owing to overproduction; and soon afterwards Mahogany came to the front as the chief export. The demand for Logwood eventually crumbled, on the invention of aniline dyes. A certain quantity, however, is still required for specialized uses. The present export averages some 500 tons a year, of which about half comes to England. It seems probable that the industry would be capable of improvement if the product could be exported in manufactured form instead of in the log.

"Dickens, in 'All the Year Round,' tells of the introduction of Mahogany into England. Some planks were brought home about 1700 from a log obtained in the West Indies for ship repairs. The captain's brother had a bureau made from them for his wife and the Duchess of Buckingham ordered one like it, so making Mahogany the rage. From 1771 until now, Mahogany has been the main export of the Colony, almost the only product worth considering. In the five years ending with 1930, the export totalled about 15 million superficial feet a year, of which under two million—largely selected logs —came to England direct. A large portion of the remaining export reaches England as lumber, via American saw mills. One of the heaviest blows for which the hurricane of 1931 was indirectly responsible is the frustration of the erection of an up-to-date saw mill at Belize, though it is to be hoped that this setback to the progress of the Colony is only temporary.

"The hurricane, though of great intensity, was very small in size, perhaps only 25 miles in diameter. It therefore did little harm to the forests of the Colony; but it did great damage to the nerve center, the business end of the industry, especially coming on top of overstocked markets and world-wide depression, from which luxuries such as Mahogany are among the first to suffer. The immediate outlook is depressing; but this will undoubtedly pass before long and Mahogany will come back once more to its rightful place.

"The prospects for the more distant future, however, are more serious. The Forest Department estimates that 20 years hence, or thereabouts, there will be few merchantable trees left within the range of profitable haulage. The prophecy that

Mahogany is on the verge of extinction dates back at least as far as 1816. It has been falsified repeatedly by the discovery of new forests, by the unexpected recovery of cut-out areas, and by the invention of mechanical transport. Mahogany will never become extinct. It will always reproduce itself, though slowly, 80 years being the period of growth under natural conditions; but the considered report of experts, based on personal examination, cannot be neglected. The day when the supply of Mahogany will be insufficient, unaided, to maintain the prosperity and revenues of the Colony must be recognized as not far off—unless some startling improvement in mechanical traction appreciably increases the range of profitable haulage.

"The Forest Department has regenerated large areas of Government Mahogany forest, and one important private area also has been intensively improved. The result will be great wealth from these regenerated tracts in 40 years' time, the period for maturity under conditions of scientific forestry. But how is the Colony to live till then? How is the rest of the Colony to live thereafter? For these comparatively small tracts will only bring wealth to the Government and to one private owner.

"The answer is, by new industries—forest, agricultural, or marine. Concessions granted over Pine lands and Cohune lands will, it is hoped, result in the export of Pine lumber and Cohune nut oil within a very few years. Hope is entertained, as the result of efforts in progress, that the value of the lesser-known hardwoods may be realized before long by the timber trade."

Der Parasit *Psittacanthus Schiedeanus* (Cham. et Schlectend.) auf *Persea gratissima*. By ELISE HOFMANN. *Sitzungsberichten der Akademie der Wissenschaften in Wien* (mathem.-naturw. Klasse) Abt. I, 141: 3, 4: 175–181, 1932. Illustrated.

Psittacanthus Schiedeanus (fam. Loranthaceae) grows as a parasite on Avocado trees in Central America. After three or four years it dies and falls away, exposing at the union with its host a peculiar flower-like growth of gnarled wood known

locally as "flor de palo" and in German as "Holzrose." This structure is a whorl of flattened ribs of wood which have extended from the normal part of the branch of the host into the less durable tissue of the parasite. The paper contains descriptions of the wood of both plants and is illustrated with a photograph of a "Holzrose" and four photomicrographs.

Bálsamo de El Salvador. By SALVADOR CALDERÓN. *Revista de Agriculture Tropical* (San Salvador) 8: 14: 14–17, Jan.–March, 1932.

The Balsam tree of Salvador, *Myroxylon Pereirae* Klotzsch, is generally 15–20 meters high, but sometimes as much as 27 meters, with a trunk 50–75 cm., rarely 90 cm., in diameter. It flowers in February and March, most of the fruits maturing in September and October. The trees grow slowly, reaching a height of 9 meters in 10–12 years, and 18 meters in 25 years or more. They often are planted for coffee shade, usually in alternation with *Inga* or *Gliricidia* trees. They are native in the Balsam Coast, in the Departments of Sonsonate and La Libertad, Salvador; likewise in Mexico and Honduras, and southward to Colombia.

The balsam is collected from wounds on the trunks. Some begin exploitation of the trees at 10 years, but others prefer to wait until they have reached a greater size. About 30 cm. above the soil there is removed a piece of bark 15 by 25 cm., and a rag is placed over the exposed place. When the sap has ceased flowing, the rag, now soaked with balsam, is removed, the wound scorched with a flame, and the rag replaced. Further laceration and heating continues until no more balsam issues from the wound, which then is allowed to heal.

The impregnated rags are boiled in water, and part of the balsam settles to the bottom of the vessel; the remainder of the balsam is extracted from the rags by pressure. The liquid thus obtained is Bálsamo de Trapo. That obtained from the pieces of bark removed from the tree is Bálsamo de Cáscara. The purified balsam is placed for export in tins of 50 pounds each, two of which are placed together in a wooden container.

The harvest proceeds throughout the year, but chiefly during the dry season, from December to April. The best trees yield 4–5 pounds every year. The annual production is about 53,000 kilograms, almost half of which goes to the United States.

Trees killed as a result of tapping are valuable for lumber. The wood is fine-grained and colored almost like Mahogany, but somewhat more reddish. Locally it is considered the best wood for railroad ties and is used also for wood engraving and for models of castings, besides being highly esteemed for house finishing and cabinetwork.

The Balsam tree has been introduced into the Old World, for example, Cameroon, Ceylon, and India. The name Balsam of Peru sometimes given to its product is misleading, and was derived from the fact that in colonial days balsam from Salvador sometimes was stored or transshipped at Peruvian ports when on its way to European markets.—PAUL C. STANDLEY.

Contributions to the flora of tropical America: XII. By N. Y. SANDWITH. *Bulletin of Miscellaneous Information*, Royal Botanic Gardens, Kew, No. 5: 209–229. 1932.

The paper is devoted to descriptions of new plants, chiefly forest trees, of British Guiana, and to critical notes upon old species. Among the trees described or discussed are the following: *Thyrsodium dasytrichum* (Uluballi); *Eugenia Arawakorum* (Baniaballi); *Lecythis Davisii* (Wadaduri, Monkey Pot); *Eschweilera decolorans* (Smooth-leaved Kakaralli); *Couratari pulchra* (Wadara); *Iryanthera paraënsis* Huber (Kirikowa); *Aniba hypoglauca* (Yellow or Gale Silverballi); *Ocotea rubra* Mez (Determa); *Nectandra praeclara* (Shirua; Broad-leaved Soft Silverballi); and *Panopsis sessilifolia* (Mahoballi).—PAUL C. STANDLEY.

Notes sur l'origine du copahu de la région amazonienne. By A. DUCKE. *Revue de Botanique Appliquée et d'Agriculture Tropicale* (Paris) 12: 130: 433–437, June 1932.

There are 35–40 species of *Copaifera* in tropical America and Africa. There are numerous species in Brazil, all of which apparently are capable of furnishing copaiba balsam—"balsamo de copahiba" or "oleo de copahiba"—hence their vernacular names of Copahibera (in Amazonia) and Páo d'Oleo (northeastern, central, and southern Brazil). The species of central Brazil are in need of revision, since, because

of their economic importance, certain botanists have created species upon insufficient materials existing in European herbaria. The Amazonian species, however, have been almost unknown in literature, so that the author has been able to study them in nature, without having to refer to types inaccessible in Europe. The following supply the greater part of the copaiba exported from Brazil.

Copaifera multijuga Hayne. COPAHIBA ANGELIM or COPAHIBA MARIMARY. Grows in the State of Pará and in northern Matto Grosso. Wood grayish, almost white, marked with irregular brownish undulations; in the fresh state it has an agreeable scent since the resinous copaiba odor is obscured by a strong perfume of cumarin. Its balsam, very liquid and transparent, without too strong or disagreeable odor, is evidently the greater part of the commercial copaiba of Manáos.

Copaifera guianensis Desf. grows along the Rio Sapó and the middle Rio Negro. No information is available regarding its balsam.

Copaifera reticulata Ducke. COPAHIBA MARIMARY; COPAHIBA JUTAHY. The species most widely distributed in Amazonia, supplying almost all the copaiba exported from the State of Pará. Wood as in *C. multijuga*, but with a purely resinous scent. Balsam thick, yellowish brown, with strong and disagreeable odor.

Copaifera officinalis L. A species of more northern distribution, found by Kuhlmann near São Marcos, State of Amazonas.

Copaifera Martii Hayne. COPAHIBA JUTAHY. Occurs in the States of Pará and Matto Grosso and in the Guianas; the var. *rigida* (Benth.) Ducke in the States of Maranhão and Piauby. Heartwood brownish red, hard, fine-textured, resinous. The tree seldom attains sufficient size to be an important source of balsam, its product resembling that of *C. multijuga*.

Copaifera glycicarpa Ducke. COPAHIBA CUIARANA; COPAHIBA PRETA. Occurs in the States of Pará, Amazonas, and Matto Grosso. Wood whitish with faint resinous odor. Balsam dark, thick, and viscous, the tree rarely exploited.

The gum appearing in the trade of Pará and Manáos under the name of "jacaré copahiba" is the product of *Eperua oleifera*, n.sp., growing in the region of the lower Rio Madeira. Its very thick and resinous, brown balsam is used for making varnish.

For *Eperua purpurea* Benth., a related species, the name Copahiba-rana sometimes is reported. Its wood is very resinous, but it does not furnish balsam. The proper name of the tree, which grows on the upper Rio Negro, is Yébaro.—PAUL C. STANDLEY.

Lumber and rubber come from Ford's jungle for commercial distribution in United States. *The Wall Street Journal* (New York), September 20, 1932.

"The Ford Motor Co. soon will start commercial distribution in the United States and other countries of the products from its Boa Vista plantation in Brazil. The first shipment of commercial products recently arrived in this country. It consisted mainly of logs and lumber, but rubber and fibers from tropical trees were included. The lumber, amounting to 160,000 board feet, is the first kiln-dried material ever to be shipped out of Brazil.

"In 1927, the Ford Motor Co. acquired a tract of approximately 4,000,000 acres of jungle land in the Amazon Valley, Brazil, for development as a rubber plantation. As the dense jungle was cleared preparatory to the planting of rubber seedlings, many trees were felled and hauled to the plantation sawmill for conversion into lumber which was used for plantation buildings and for houses for the white and native workers. Some of these buildings contain woods which are said to be more beautiful than many used in the choicest examples of present American cabinet work.

"Soon after the clearing was started, Ford specialists began to investigate the possibilities of commercial use of these woods. Almost four years of experimental work by the Ford Motor Co. both in Dearborn, Mich., and on the Ford Brazil plantation preceded the first shipping. Exhaustive scientific inquiries into the qualities of the various woods were conducted. They were tested for relative weight, strength, hardness, moisture content, resistance to deterioration, adaptability to interior trim, veneering and cabinet making and also for their ability to take stains, wax and varnish finishes.

"These experiments, recently completed, revealed that these new woods were readily adaptable to processing and in many respects were superior to domestic materials for the entire field of fine cabinet work.

"Most of the woods range from 28 to 56 pounds a cubic foot. Another, of the Balsa type, weighs less than 7 pounds a cubic foot. Woods of this type are expected to prove to be of great utility in sound-proofing and insulation.

"The first commercial use of this imported lumber in the United States will be in the new service branch of the Ford company at Alexandria, Virginia, now being built to serve the Washington, D. C., territory. Kiln-dried lumber also will be supplied to manufacturers for conversion into furniture for the new plant offices.

"Some of the woods will be used in automobiles made by the Ford Motor Co. One use is to be in the interior decorative moldings of Lincoln cars, which previously have been fashioned of woods imported from northern South America, Central America, and Europe. The company also will use some of these woods in the manufacture of patterns, forms and models, replacing the woods now used.

"Among the first consignment were stumps and crotches of trees found on the Ford plantation. These are to be used in the manufacture of burl veneers to indicate the possibilities which the Brazilian woods offer.

"The Ford sawmill at Boa Vista has a capacity for 90,000 board feet a day."

Revista Florestal II: 1. Numero especial de anniversario. Rio de Janeiro, Brazil, July-August 1930.

It is noted with regret that this, the only Brazilian periodical in the field of forestry, forest products, and forest conservation, has been forced to suspend publication temporarily after a brief but creditable existence of a little more than a year. Its anniversary number, which has just come to hand, is distinguished for the high character of its contents, technical and literary.

Francisco de Assis Iglesias, Director of the Forest Service, writes (pp. 5–10) of the rate of growth of Brazilian forest trees. On the basis of recently discovered records of the systematic planting of trees undertaken 70 years ago about the sources of the water supply of Rio de Janeiro it has become possible to obtain definite information about the rate of growth of various important species. These records of plantings on the heights of Tijuca go back to 1862 when 13,617 trees were set out, and continue to 1873, covering in all the planting of more than 60,000 trees. A few of these measured in

1928, together with others of much more recent planting in the experimental grounds of the Forest Service, furnish data presented in the form of tables in the article. Special mention is made of a Cedro Rosa and a *Eucalyptus globulus* which furnish an interesting comparison. Both were planted in 1862 and both now measure 28 m. in height and 0.81 m. and 0.60 m. in diameter, respectively. Though the length of bole suitable for lumber may be placed at 11 m. for the Cedro and 17 m. for the Eucalypt, the Cedro, owing to its greater diameter, has the larger volume. Sr. Iglesias' general conclusions are, that under the favorable conditions prevailing in Brazil even hard woods of slow growth will in 50 to 60 years reach a development that for economic purposes compares favorably with that of conifers of the same age in countries such as Scandinavia, Canada, and the United States where the growing season is limited to a part of the year; that the growth of soft woods, such as Cedro and Jequitibá, is at least twice as rapid, giving lumber in 25 to 30 years and pulpwood in 10, as against 50 to 60 and 25 to 30 years, respectively, in northern countries.

Sampaio Ferraz, Director of the Meteorological Service, writes (pp. 11–13) of the influence of the forest on rainfall. Taking issue with the deep-rooted popular belief that the presence or absence of forests has an important influence, either direct or indirect, on the amount of precipitation, he reviews the physical causes of precipitation as they are understood to present-day meteorological science, pointing out that two-thirds of the precipitation over the continents is from water vapor of oceanic origin, and that cultivated ground contributes more water vapor to the atmosphere than does the forest. Aridity or semi-aridity are effects of the lack of water, not the cause of insufficient rainfall. There are so many important reasons for conserving the forest, that it is unnecessary for its defense to adduce in addition a timeworn argument which has little or no basis in fact.

Arthur Torres Filho, Director of the Agricultural Inspection and Promotion Service, contributes (pp. 27–30) an eloquent appeal for the appreciation of the forest, of its esthetic as well as utilitarian importance, for its conservation

through suitable regulation of its exploitation, and for the establishment of a nation-wide forest service in Brazil.

WILLIAM T. COX, technical organizer to the Forest Service, writes (pp. 23–24) of the great importance of the forest to the national welfare—extending even to the strategic in case of war—its relation to hydrographic conditions and the prevention of soil erosion, of its many products which in Brazil consist not only of a large variety of useful woods, but include a host of well known, typically Brazilian forest products such as Maté, Babassú, Brazil and Sapucaia nuts, rubber and gutta percha, as well as fibers, dyes, and medicinal plants. Mr. Cox ends with a plea for rational conservation.

LUIS SIMÕES LOPEZ points out (pp. 31–32) that the public lands of Brazil are almost entirely in the hands of the various States and that consequently the national Forest Service can operate only by encouraging the separate States to establish their own individual forest services with the coöperation of the national one and under its supervision; that contracts made with the States for this purpose must be adapted to the varying needs of the different States, the forest conditions in Rio Grande do Sul, for example, being very different from those prevailing in Alagoas or Amazonas. Then follows as an illustration a tentative draft of an agreement providing for the establishment of a forest service for the State of Rio Grande do Sul.

A. J. DE SAMPAIO, Professor of Botany at the National Museum, writes (pp. 40–42) of ecology and genetics in reforestation. He directs attention to the value of the forest to human health and comfort as well as to its esthetic significance, and makes a plea for the establishment of further natural forest preserves, of which a few already are in existence in Brazil. He goes on to discuss the practical steps required for the reforestation of bare or barren ground.

PAULO DE SOUZA furnishes (pp. 44–46) notes on the flora of Goyaz gathered on an excursion to the river Araguaya, "the Nile of Goyaz." Included, except for its northern and northeastern parts, within Martias province "Oreades," characterized by distinct dry and wet seasons, the State presents a flora varying with topography, soil, climate, altitude, etc. The

chief formations in the area visited were found to be the *cerrado* (shrub), *matto* (forest), and *campos* (grass land). The first mentioned is a rather scanty brush land, relatively poor in species, more or less stunted and gnarled, yellowish, leather-leaved, and with cracked or corky bark. The list of these includes Lixeira, Mangabeira, Cajueiro do Campo, Pique, Vinhatico, and many others. Such is the vegetation for 304 km. along the railroad from Araguary in Minas to Anhanguera in Goyaz, continuing to the village called Posse beyond Annapolis. Then the transition to the forest begins and the railroad enters the "Matto Grosso of Goyaz" continuing for 120 km. to Lagoa Velha on the road leading to the capital of the State. Favored by a humid climate the forest reaches an admirable development producing an abundance of excellent timber trees. Most important for their woods and preferred to all others for purposes of durable construction are the Aroeira (*Schinus molle* L.) and Jatobá (*Hymenæa* sp.) distinguished for its great size which is rivaled in this forest only by the Balsamo (*Myrospermum Erythroxylon* Fr. All.). Other well known forest trees recognized are Pau Brasil, Jacarandá, Gonçalo Alves, Cedro, Sebastião de Arruda, Pau d'Arco, Peroba, Angelim, and Massaranduba. The campos or grass lands are distinguished as "covered" or "open" according to the presence or absence of the woody vegetation of the shrub or bush land. The article concludes with a note on the occurrence of extensive stands of Babassú Palms in the northern part of the State and of stands of *Mauritia* Palms along the margins and about the sources of the streams.

Graphs by LUIZ SIMÕES LOPEZ show the growth of 70 Teak trees planted 5 years ago and now varying in height from 1 m. to 10 or 11 m., the most numerous group, 18 individuals or 25 per cent, showing a growth of 5–6 m.

ARTHUR DE MIRANDA BASTOS contributes (pp. 25–26) some notes on the paper industry. Brazilian paper mills, 22 in number, produce about 60,000 tons per year, and it is interesting to note that some of this is obtained from Eucalypts planted for the purpose. Imports of paper and paper pulp from U. S. A., Canada, and Scandinavia amount to as much more. Sr. Bastos writes of the desirability of utilizing the lighter

Amazonian woods for paper pulp and finds the chief difficulty in the mixed composition of the forest of some 50 species per acre, of which 12 may be useful for paper. In almost every other respect Amazonia furnishes most favorable conditions for the economical production of paper pulp.

Ed. Navarro de Andrade, of the Companhia Paulista, writes (pp. 33–35) of the value of Eucalypts as fire wood. Tests undertaken by the company and the experience of other large concerns supplied with Eucalypt wood by the Companhia Paulista demonstrate that in spite of its rapid growth it is one of the best of fire woods, superior to the general run of miscellaneous wood for fuel, and that its planting on a large scale is fully justified in a region where the fuel question is a problem of prime importance to many major industries.

J. G. Kuhlmann, botanist of the Forest Service, writes (pp. 54–55) of the rediscovery within the federal district of *Rhamnidium glabrum* Reiss., one of the few representatives of its family in Brazil. Instead of being a small tree or shrub as described in the *Flora Brasiliensis*, it grows at Rio as a tree 20 m. or more in height and 45–50 cm. in diam. Its well-developed heartwood is of a light red color, deepening on exposure to a fiery red, which is one of its claims to distinction. The wood is described as fine-textured, durable, and eminently suitable for cabinet work.

The same author also contributes (pp. 47–48) an article on the trees flowering in the federal district in April and June. He describes the abundant flowering in 1930 of the rutaceous *Dyctioloma pubescens;* the Sobragy or Saguaragy, *Colubrina rufa; Prunus sphaerocarpa*, known as Pecegueiro Bravo (wild peach) in Rio Grande de Sul; the Jequitibá, *Cariniana brasiliensis*, which with its relative *Couratari rufescens* are the giants of the east coast forests, the former reaching to 2 m. in diameter; the recently discovered *Luetzelburgia trialata* Ducke and the climber *Camptosema erythrinoides;* the Louro Pardo, *Cordia excelsa;* the abundant, always admirable, Quaresma, *Tibouchina granulosa*, and others.

For the wood anatomist the most interesting article is by Fernando Romano Milanez (pp. 17–24) on the wood of the Braúna (scientific name not given). It is illustrated by four photomicrographs.

Heitor V. da Silveira Grillo contributes a study of *Septobasidium albidum*, a thelephoraceous fungus attacking Citrus trees (pp. 51–53).

Octavio Silveira Mello writes (pp. 49–50) of the trimming of trees in street and other formal plantings. Arsene Puttemans deals with trees as ornamental or decorative objects in an article on trees in relation to landscape architecture (pp. 36–39). To the landscape architect tree form, color and other characteristics of the foliage, length and time of flowering, and response to trimming are of prime importance and, in respect to these points, many foreign trees cultivated in Brazilian parks and gardens are better known than the elements of the native flora. A classification of trees according to their form for the purposes of the landscape architect is illustrated by a series of drawings.

Geraldo F. de Sampaio, civil engineer, writes (pp. 14–16) of the construction of wooden conduits, suggesting the possibility of using native timber for this purpose in Brazil instead of Redwood, Cypress, Fir, and Pine, which are preferred in the U. S. A.

This anniversary number of the *Revista Florestal* is attractive in appearance, typographically excellent, with few accidental errors, and is embellished by numerous illustrations including portraits of the contributors. Besides the technical articles mentioned it contains a large number of purely literary features, poetry and short extracts about the forest and trees from the pen of various well-known Brazilian literati.—B. E. Dahlgren, *Field Museum of Natural History*.

Album floristico. By F. de Assis Iglesias. Pub. by Serviço Florestal do Brasil, Ministerio de Agricultura, Rio de Janeiro, June 1932. Pp. 30; 10 x 7¼; 29 illustrations in color.

An album intended for the popularization of some of the most conspicuous flowering trees of Brazil, with special reference to their suitability for planting in public parks and gardens.

Each page consists of a color plate of a tree in flower, accompanied by some descriptive text treating of esthetic

qualities, flowering period of each species, etc., by the Director of the Forest Service of Brazil. The illustrations, some of which are strikingly handsome, *e.g.*, that of *Vochysia oppugnata*, while others are exceedingly sketchy, are reproduced from a series of paintings in oil, apparently made especially for this album by two artists, Srs. Gagarin and Masriera. Direct color photographs would meet with much more general approval. Oil paintings seem to require explanation, which is perhaps to be found in the difficulty of obtaining a satisfactory set of color photographs of any given list of thirty forest trees. The three-color plates thus produced are suggestive of the appearance of flowering Tecomas, Cassias, Caesalpinias, Tibouchinas, and other forest trees, one or other of which, sometimes several jointly, may be depended on at almost all times of the year to give a touch of brilliant color to the woodland in eastern central Brazil. The text is intended chiefly for the landscape architect, amateur or professional, who should be able to achieve magnificent effects with material furnished by the native forest flora.

This publication, and succeeding numbers which are promised, should be welcome to those interested in trees, especially to Brazilians who justly take pride in the beauty and natural resources of their country. In view of the scarcity of popular treatises on natural history in Brazil, such an album should be useful in the public schools, though for this purpose its text would probably require to be specially recast. Widely distributed the publication should furnish excellent conservation propaganda.—B. E. Dahlgren, *Field Museum of Natural History*.

Timber studies of Chinese trees. I. Timber anatomy of Rhoipteleaceae. By Y. Tang. *Bulletin of the Fan Memorial Institute of Biology* (Peiping) 3: 10: 127–131, June 15, 1932. Illustrated with 2 photomicrographs.

A description of the wood of *Rhoiptelea chiliantha* Diels & Hand. (Repert. Nov. Spec. Reg. Veg., 1932, pp. 75–80), a tree 8–20 m. tall and 60 cm. in diameter discovered in 1928 by R. C. Hing during his expedition to Kwangsi Province, and found later by Grenze and Fenzel in Indo-China bordering

Yunnan and by Y. Tsiang in Kweichow. Following is a summarized description:

Color brownish, with dark grayish tinge, without sharp demarcation between heart and sapwood. Grain straight. Texture medium. Wood moderately light and easy to cut. Growth rings distinct. Pores mostly visible, fairly evenly distributed though largest and somewhat more numerous in early wood with gradual diminution, solitary or in short radial groups; tyloses present. Parenchyma vasicentric and terminal. Rays narrow, the larger ones visible to unaided eye in cross section, at limit of vision on tangential, rather conspicuous on radial.

Minute anatomy: Pores numerous, solitary or in radial groups of 2–4; tang. diam. of largest, 0.144 mm., of smallest, 0.027 mm.; thickness of wall, about 4μ. Vessel members up to 0.72 mm. long, with tongue-like projections; perforations exclusively scalariform, with 4–11 bars; intervascular pits rather small, not crowded, with circular border and elliptic aperture; pits to parenchyma similar. Wood parenchyma rather highly developed about vessels; also in terminal band, 3–5 cells thick. Rays heterogeneous; widening at termination of growth ring; of two types: (1) uniseriate, 2–10 cells high, the cells upright or square; (2) 2–4 cells wide (0.33–0.053 mm.) and 6–40 (mostly 20) cells high. Wood fibers rather short (av. about 1.4 mm.); usually arranged in regular radial rows; some with gelatinous layer; pits very few, indistinct, bordered, confined to radial wall.

Timber studies of Chinese trees. II. Identification of some important hardwoods in northern China by their gross structures. I. By Y. Tang. *Bulletin of the Fan Memorial Institute of Biology* (Peiping) 3: 13: 157–210, July 4, 1932. Illustrated with 24 photomicrographs.

"The present fascicle represents the first part of a series of publications on the timber studies of Chinese trees. It aims at providing the means of identification for some important Chinese hardwoods in Northern China by their gross structures. As the correct identification of various species, whether from the viewpoint of utilization or research, is the foremost

requirement in dealing with timber, the writer begins in describing the structures of Chinese timber in Northern China first, with a view to carrying on research covering all Chinese trees."

A key to the genera (24 in number) is followed by descriptions and specific keys. For each genus there is a photomicrograph showing the cross section of the wood of a representative species.

The anatomical structure of Ceylon woods. By C. P. JAYAWARDANA. *Annals of the Royal Botanic Gardens, Peradeniya* 11: 4: 307–317, Feb. 20, 1932. Illustrated with 7 photomicrographs.

Contains descriptions of general properties, macroscopic features, and minute anatomy of seven woods, namely, *Artocarpus integra* Merr., *Chukrasia velutina* W. & A., *Melia composita* Willd., *Azadirachta indica* A. Juss., *Berrya cordifolia* Burret, *Pityranthe verrucosa* Thev., and *Madhuca longifolia* Macbr. The work was done at the Imperial Forestry Institute, Oxford.

Timber tests: Seraya (*Shorea Curtisii*). By A. V. THOMAS. *The Malayan Forester* (Kuala Lumpur) 1: 5: 205–7, July 1932.

The name Seraya (often misspelt Seriah) is used throughout Malaya, particularly in Singapore, to designate almost any soft wood, and timber is exported under the name from Borneo to Great Britain. The true Seraya, however, is produced only by *Shorea Curtisii* Dyer, which forms one of the most distinctive features of ridge forests in Malaya.

"Seraya is an easy timber to work either by machine or hand tools, though, by comparison, it may be somewhat more difficult to saw than the Merantis that have been tested at the laboratory. The finish of the surface after planing was spoilt in places where the grain had 'picked up,' but this defect should be less in evidence when the timber is dry."

"A timber which has, in some respects, a strength almost equal to Teak ought to be suitable for many forms of construction beside weather boarding, ceiling, doors, etc., provided it can be protected by preservatives from damage by termites

and fungus, to which it is rather susceptible. It is not readily impregnated by creosote mixtures under pressure treatment, but it is hoped that sufficient may be injected to prolong its life considerably."

The paper concludes with a table of results of mechanical and physical tests and there are percentage comparisons with Meranti Tembaga (*Shorea leprosula* Miq.), Kapur (*Dryobalanops aromatica* Gaertn. f.), and Teak (*Tectona grandis* L. f.).

Dipterocarpaceae of the Malay Peninsula. By F. W. FOXWORTHY. *Malayan Forest Records* No. 10, 1932. Pp. 289; 7¼ x 10½; 23 plates; 1 large map in colors. Price 8s. 6d., postpaid.

"Ridley and Boden Kloss have indicated that there is a definite change, in the neighborhood of 7° N. lat., between the definitely Malayan and the more northern floras, and that a line drawn between Alor Star and Singgora will roughly indicate the place where the change occurs. . . . This line also approximates roughly to the political boundaries, except that the Siamese circles of Pattani and a part of Nakawn Sritamarat are to the south of it, while Perlis, the Langkawai Islands, and a small part of Kedah are to the north of it. Much the largest part of the Peninsula is to the south of this line and most of the Malayan forms are not found to the north of it. It is this extensive portion south of the line that is mainly considered in this paper, with the addition of northern Kedah, Perlis, and the Langkawi Islands. Such forms as have not been found in this part of the Peninsula receive only incidental mention in this paper, and the general discussion applies only to this portion, unless otherwise stated.

"The climate is one of even, rather high temperature and relatively uniform high humidity. It is a region without very marked seasonal change and without violent storms. There are considerable areas of mountainous or hilly country with steep to very steep slopes. All of this area was originally covered by a forest of predominantly Dipterocarp type, except such portions as were swampy and such as were so high as to have a distinctly mountain flora. This means that approximately 80 per cent of the surface of the Peninsula was covered by this type of forest."

"Our knowledge of the group Dipterocarpaceae remains very incomplete, in spite of the fact that it contains our most important group of timber trees. Attention has often been called to the difficulty of obtaining herbarium material of species of this group, because of the very large size of many of the trees, the scarcity of population in the forests, and the relatively infrequent flowering and fruiting of many species. There have been relatively few botanists specializing in the group, and collections, until recent years, have been few.

"My work with this group has been carried on for many years and has included the examination of types and critical material in the herbaria at Leyden, Kew, Calcutta, Singapore, Buitenzorg, and Manila. Field work has been done in nearly all of the countries where our species are known to occur. . . .

"There are still meager materials and scanty information for many species. A great deal more of collecting and the making of many field observations are needed to make our understanding of the group complete. It is probable that there are still an appreciable number of species to be discovered. Our collections contain sterile, or incomplete, material of a number of forms that are probably distinct. This account is published now because I am shortly retiring from Government service, and it seems well to record what is known of the group, in the hope that further study and collection of material may be stimulated."

The contents of this highly valuable and handsomely presented work are indicated by the chapter headings, as follows: 1. The area (pp. 1–2). 2. History and present state of our knowledge (pp. 2–3). 3. Family characteristics (p. 4). 4. Anatomical peculiarities: accumulations of resin; leaf and petiole; secondary wood—historical, general characteristics, microscopic features, key to 12 woods, which are described; bark (pp. 5–26). 6. Germination and growth: flowering and fruiting; dropping of fruit; description of embryos and young seedlings; conditions favorable to germination and early seedling growth (pp. 27–46). 7. Distribution (pp. 47–48). 8. Products: wood; resinous substances; fats and starch; tannin; bark (pp. 47–51). 9. Size of trees (p. 51). 10. Common names (pp. 52–53). 11. Divisions of the family (pp. 54–55). 12. Systematic consideration of 11 genera and 124 species (pp. 56–279). Index (pp. 281–289). Plates I–XXIII, half-tone illustrations mostly of herbarium specimens on a background of 2-inch squares. Map of Malay Peninsula on a scale of 35 miles to 1 inch.

The production of tannin extract from the kino-impregnated bark of marri (*Eucalyptus calophylla*). By W. E. Cohen. Div. of For. Prod. Reprint No. 7 from *Journ. Council for Sci. & Ind. Research*, Australia, May 1932. Pp. 13; 6 x 9½.

"Marri, or Western Australian Redgum (*Eucalyptus calophylla*), grows very abundantly in the southwest portion of Western Australia. The forest is approximately 350 miles long by 50 miles broad at the northern end, widening to 200 miles in the south. The tree occurs mixed with Jarrah (*E. marginata*) and Karri (*E. diversicolor*), but patches of pure stands of Marri are quite frequent. Hence the collection of bark for the production of tannin extract can be carried out under conditions conducive to low costs. The timber has at present little or no commercial value on account of the extent and frequency of gum veins and pockets."

"Recent investigations have shown that, by a simple process, an extract of satisfactory quality can be made from kino-impregnated Marri bark."

Les "bois d'or" d'Afrique occidentale. By François Pellegrin. *Bulletin de la Société Botanique de France* 79: 3, 4: 221–225. 1932.

There are designated by the name Bois d'Or certain good, bright yellow West African woods that are resistant to the attacks of insects and are used for construction purposes. According to their place of origin, they bear various vernacular names, such as Bilinga (Mpongué, Gabonais, N'koumi), Badi (Malinké), N'Gulu (Vili), Bahia, etc. They belong to the genera *Sarcocephalus* and *Mitragyna* of the tribe Naucleeae of the family Rubiaceae. The author lists with synonymy and indication of distribution, 6 species of *Sarcomphalus* of West Africa that furnish the wood called Badi or Bilinga. Of *Mitragyna* there are reported two species: *M. inermis* (Willd.) Kuntze,

called Khoss; and *M. stipulosa* (DC.) Kuntze, variously known as Bahia, N'tovo, N'tobo, N'vuku Masi, Fofo, Popo.—PAUL C. STANDLEY.

New trees and shrubs from tropical Africa. By J. BURTT DAVY and A. C. HOYLE. *Bulletin of Miscellaneous Information*, Royal Botanic Gardens, Kew, No. 6: 257–270. 1932. Illustrated.

Describes one new genus and 13 new species of woody plants from tropical Africa, sent by forest officers to the Imperial Forestry Institute, Oxford, for identification. Among them may be mentioned: *Acioa Johnstonei* (Tileelee) from British Cameroons; *Dialium reticulatum* (mPepeta) from Kenya Colony; *Pterocarpus Stevensonii* (mWangura; ChiViri) from South Tropical Africa; *Homalium neurophyllum* (Asun-Kruma) from Gold Coast; *Tecleopsis glandulosa* (Munderendu), a new genus of Rutaceae from Kenya Colony; *Entandrophragma lucens* (mTembo) from Tanganyika Territory; *Chrysophyllum edule* (Omumu) from S. Nigeria; *Strychnos reticulata* (mTete) from Kenya Colony.—PAUL C. STANDLEY.

Subsidios para o conhecimento da flora da Guiné Portuguesa. By ANTONIO DE FIGUEIREDO GOMES E SOUSA. *Memorias da Sociedade Broteriana* (Coimbra), Vol. 1. Pp. 94; pls. 44; colored phytogeographic map. 1930.

Portuguese Guinea, West Africa, has an area of 36,000 square kilometers. It is chiefly a plain with an elevation of 50 meters or less, but there is a small isolated mountain portion where the elevation rises to 300 meters.

Much of the region is forested. Comprising the evergreen forests are the Mangrove associations, the forest galleries along streams, and the *Elaeis* and *Borassus* palm forests of dry soils. The deciduous forests consist of types in which Bombacaceae (*Eriodendron*, *Bombax*, *Adansonia*) predominate, and types dominated by Leguminosae such as *Parkia*, *Daniella*, and *Albizzia*, as well as mixed types.

About 50 of the principal trees are listed and described, and the foliage, flowers, and fruits of most of them are illustrated. An interesting feature of the plates is a small sketch showing

the habit of the tree illustrated. Among the more important of the trees discussed are: *Acacia albida* (Marroné); *Prosopis oblonga* (Pau carvão; Culengo; Tentéra); *Albizzia Brownei* (Marroné) and *A. pallida*; *Pterocarpus erinaceus* (Pau Sangue) whose resin was formerly an important article of export; *Afzelia africana* (Pau Conta; Gongo); *Eriodendron anfractuosum* (Poilão), whose huge trunks are employed for making large canoes; *Bombax Buonopozense* (Poilão Encarnado), of similar use; *Adansonia digitata* (Calabaceira; Baobab); *Khaya senegalensis* (Bisselon; N'bale; Kai; Lacuma; Djalô), frequent in the whole plains region, and furnishing valuable wood; *Carapa toloucouna* (Cola Amarga), the oil of whose seeds is employed locally in making soap; *Erythrophloeum guineense* (Manconi; Buirane), furnishing excellent wood, its bark poisonous; *Parkia biglobosa* (Farrobe); *Parinarium excelsum* (Mampataz) and *P. macrophyllum*; *Daniella thurifera* (Pau Incenso); *Pentaclethra macrophylla* (Marroné); and *Copaifera Guibourtiana* (Pau Ferro).—PAUL C. STANDLEY.

Über die sogenannten Atemwurzeln der Mangroven. By WILHELM TROLL. *Natur und Museum* (Frankfurt a. M.) 62: 4: 112–117, April 1932. Illustrated.

In addition to any aerating function they may have, the so-called air-roots of *Sonneratia* and the root knees of *Bruguiera* are of direct service to the tree in providing the means for ready response of the root system as a whole to changes in the depth of the soil. These features are illustrated by photographs and drawings.

Sur la présence probable du bossé au Cameroun. By D. NORMAND. *Revue de Botanique Appliquée et d'Agriculture Tropicale* (Paris) 12: 130: 469–471, June 1932.

Certain corrections of nomenclature should be made in L. Hédin's account of the forests and woods of French Cameroon, published in 1932. The Edoucié, reported as *Entandrophragma Leplaei* Verm., is not that species, but another whose identity is doubtful. The tree bearing the names Timbi (Douala) and probably Edoucié (Yaoundé) is to be referred with some reservation to *Guarea cedrata* Pellegr. Its foliage

is similar to that of the type specimen of *Trichilia cedrata* A. Chev., and the wood, here described anew, agrees well with the Bossé of Ivory Coast. It is probable, therefore, that the same tree that produces the Bossé of Ivory Coast occurs also in French Cameroon, where it must be very rare and sold under different names.

Études sur les caractères anatomiques du bois et du liber secondaire dans les essences du Sahara et particulièrement du Hoggar. By J. DE SAINT-LAURENT. *Bulletin de la Station de Recherches Forestieres du Nord de l'Afrique* (Alger) 2: 1: 1–48, June 1932. Illustrated with 29 text figs. and 48 photomicrographs.

This work is in continuation of the author's investigations of the wood and bark of the woody plants of northern Africa. (See *Tropical Woods* 17: 56 and 26: 40.) It deals with 29 species and varieties of 26 genera and 20 families. In addition to the descriptions and illustrations, there are synoptical tables of anatomical characters, an artificial key, and an introductory discussion of the unique features and specialization exhibited in the Sahara specimens.

Études sur les caractères anatomiques du bois et du liber secondaire dans quelques essences forestières du Maroc dernièrement récoltées par M. le Dr. R. Maire. By J. DE SAINT-LAURENT. *Bulletin de la Station de Recherches Forestieres du Nord de l'Afrique* (Alger) 2: 1: 49–60, June 1932. Illustrated with 12 photomicrographs.

Contains tabular synopses of the wood and bark of six species, namely, *Abies pinsapo* Boiss., ssp. *marocana* (Trabut) Emb. & Maire; *Quercus Tozae* Bosc., *Acer granatense* Boiss., *Argania spinosa* (L.) Maire, *Pinchea ovalis* D. C., and *Santolina rosmarinifolia* L., var. *fruticosa* Maire.

Die botanisch-mikrotechnischen Schneidemethoden. By JOSEF KISSER. Reprinted from *Handbuch der Biologischen Arbeitsmethoden* 11: 4: 391–738, 1932. Illustrated with 120 text figs. and 2 plates.

This 350-page manual for the cutting (but not the staining and mounting) of all sorts of plant parts should prove of great usefulness to botanists and wood technologists. In it the author has brought together in convenient form the substance of several of his former papers and deals with practically all of the methods, old and new, now in use. There is a good bibliography of the many papers on the subject.

Fifty pages are devoted to the microtome knife alone: its steel, cross-section, use of various types, the cutting edge, methods of sharpening, angles for cutting, etc.

The part on washing material should be especially helpful to those who are working with delicate tissues. Several methods are discussed and illustrated.

The greater part of the book deals directly with methods of softening, embedding, and cutting, all of which are covered thoroughly and with attention to every detail.—HERBERT F. MARCO, *Yale University School of Forestry*.

YALE WOOD COLLECTIONS

Genera Added June 1—November 1, 1932

ANGIOSPERMAE

ACANTHACEAE
- Pachystachys
- Sanchezia

APOCYNACEAE
- Condylocarpus
- Parahancornia
- Pteralyxia

CARYOCARACEAE
- Anthodiscus

CLETHRACEAE
- Schizocardia

COMPOSITAE
- Helianthus

EUPHORBIACEAE
- Anomalocalyx
- Cunuria
- Dodecastigma
- Glycydendron

ICACINACEAE
- Poraqueiba

LEGUMINOSAE
- Amblygonocarpus
- Dinizia
- Drepanocarpus
- Ecastophyllum
- Isoberlinia
- Notodon
- Phyllocarpus
- Tetrapleura
- Vataireopsis

MALVACEAE
- Tetrasida

MENISPERMACEAE
- Abuta

MYRTACEAE
- Gomidesia

MYRISTICACEAE
- Asteophlœum

NYSSACEAE
- Camptotheca

OLACACEAE
- Liriosma

ROSACEAE
- Adenostoma
- Spiræa

RUBIACEAE
- Emmenopterys
- Gouldia

RUTACEAE
- Hortia
- Plethadenia
- Rhabdodendron

SALICACEAE
- Chosenia
- Toisusu

SAPINDACEAE
- Phialodiscus
- Tapiscia

SIMARUBACEAE
- Simaba

GENERAL INDEX

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