JOURNAL

OF THE

ARNOLD ARBORETUM

EDITED BY

ALFRED REHDER

AND

ERNEST H. WILSON

VOLUME IX + 10

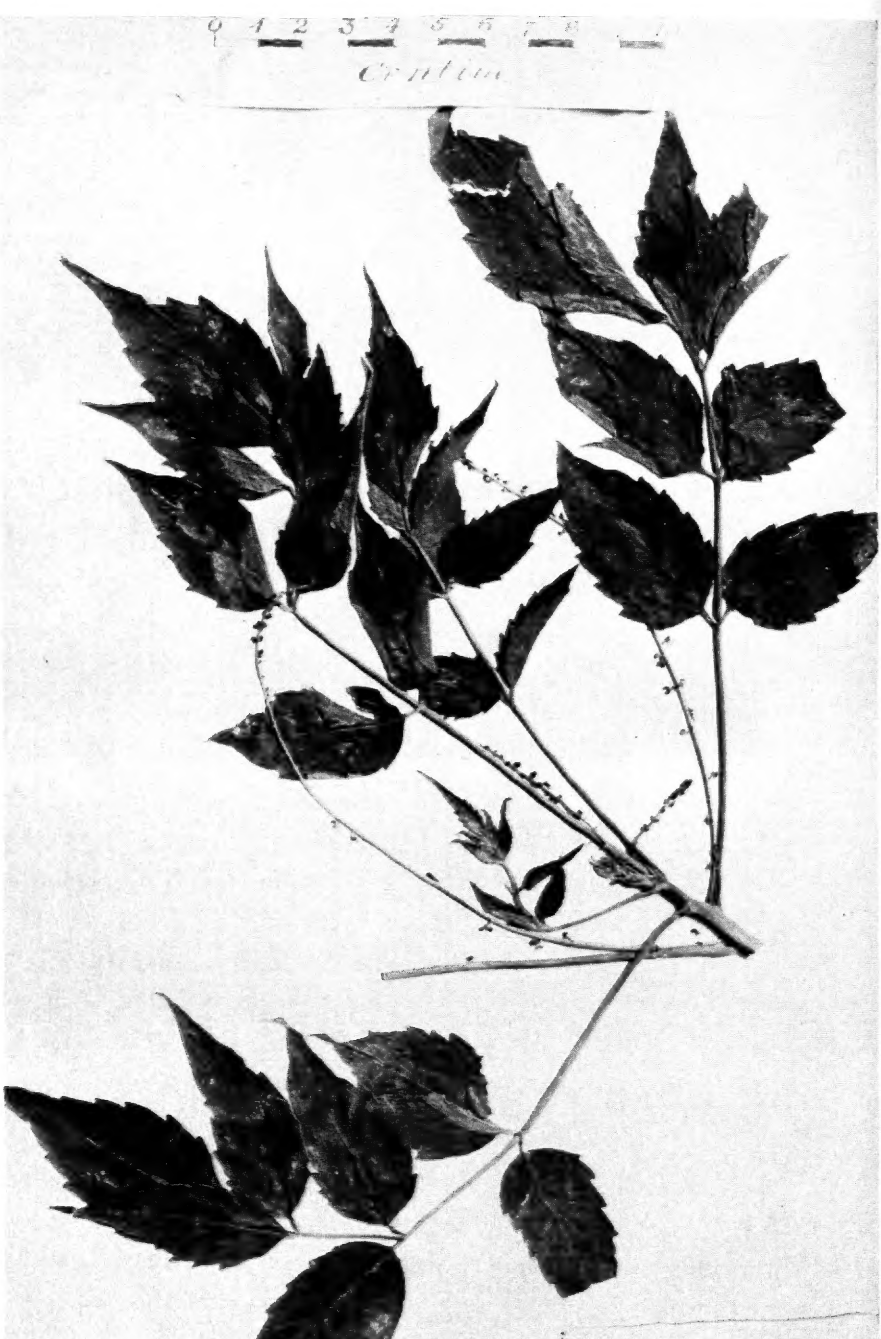
1928-1929

PRINTED FOR THE ARNOLD ARBORETUM BY THE
INTELLIGENCER PRINTING COMPANY
LANCASTER, PA.
1928

DATES OF ISSUE

No. 1. (pp. 1–36, pl. 10, 11) issued March 12, 1928.
Nos. 2–3 (pp. 37–142, pl. 12, 13) issued July 13, 1928.
No. 4. (pp. 143–200, pl. 14) issued December 12, 1928.

TABLE OF CONTENTS



BRUCEA JAVANICA (L.) Merr.

Type of Rhus javanica L. in the Linnean Herbarium

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME IX MARCH, 1928 NUMBER 1

ON THE TYPE OF RHUS JAVANICA LINNAEUS

E. D. MERRILL

Plates 10 and 11

Recently in checking certain references in Bennett's Plantae Javanicae Rariores I was impressed with a statement appearing on page 200, under *Picrasma javanica* Blume, referring to the specimens representing *Rhus javanica* in the Linnean Herbarium. In discussing *Brucea antidysenterica* and *B. sumatrana* Bennett[1] states: "DeCandolle omits Salisbury's synonym of *Rhus Javanica*, L., for this plant [*Brucea gracilis* (Salisb.) DC.]; which is, however, quite correct so far as regards the specimen in the Linnean Herbarium so marked by Linnaeus himself; but there is also a specimen of a true *Rhus* (*R. Javanica* of authors) pinned on the specimen of *B. Sumatrana* thus misnamed."

Turning to Linnaeus[2] we find the brief original description of *Rhus javanica* to be as follows:

"Rhus foliis pinnatis ovatis acuminatis serratis subtus tomentosis. Habitat in Java. Osbeck."

In the second edition of the Species Plantarum[3] the description is repeated with the alteration of one word only, the locality "Java" being changed to "China" without comment.

I then communicated with Mr. B. Daydon Jackson, late custodian of the Linnean collections and for the preceding forty-six years Secretary of the Linnean Society, to see if further evidence could be secured regarding the matter under discussion. Mr. Jackson courteously had prepared for me photographs of the two specimens in the Linnean Herbarium (plates X and XI), and regarding these states: The print marked a (= plate X) is of the specimen determined to be *Brucea sumatrana*. The other sheet b (= plate XI) is that pinned, presumably by Linné, to a. Neither sheet bears any data on the back, but sheet a is marked in Linné's handwriting "2. Rhus javanicum," while sheet b bears only the figure 2 in the handwriting of Linné to indicate his determination of it as synonymous with the first sheet, the number in both cases, corresponding with the Species Plantarum, edition one, where *Rhus javanica* is the second species.

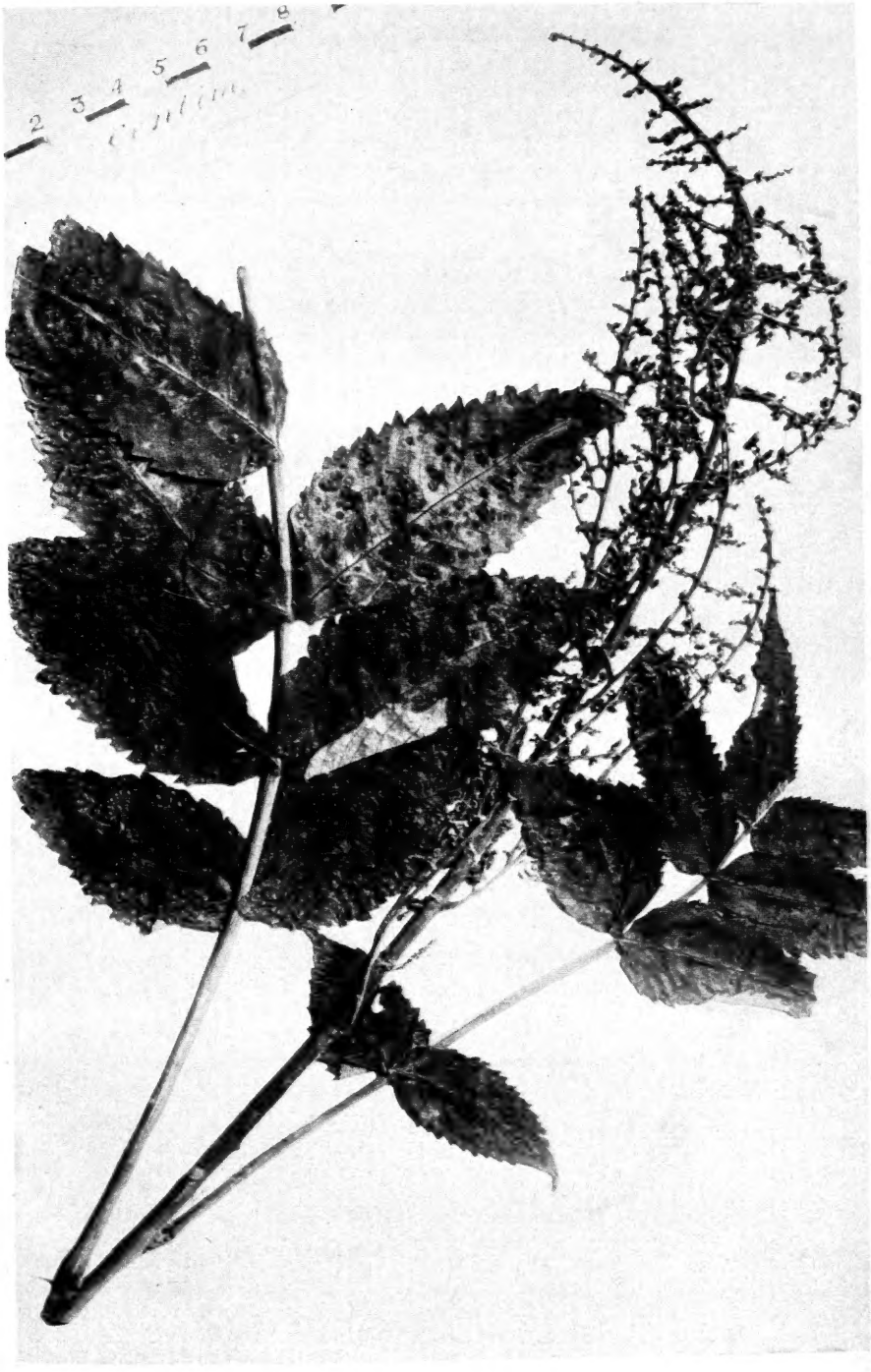
[1] Bennett, J. J., et Brown, R. Plantae Javanicae rariores, 200 (1844).
[2] Linnaeus. Species Plantarum, 265 (1753).
[3] Linnaeus. Species Plantarum, ed. 2, 380 (1762).

A glance at the accompanying plates clearly shows that two totally different species are represented, one marked by Linnaeus himself as *Rhus javanicum*, a *Brucea*, manifestly a form of the common and widely distributed oriental species currently known as *Brucea sumatrana* Roxb., the other *Rhus javanica* as commonly interpreted by numerous authors. Two questions immediately arise. Which is the actual type? Why did Linnaeus change the locality from Java of 1753 to China in 1762? It is to be noted that the original brief description, quoted above, applies equally well to the two very different specimens, the *Brucea* and the *Rhus*, for in both the leaflets are tomentose beneath.

Turning to Osbeck[1] we find that his actual botanizing in Java was confined to a few hours on the afternoon of July 16, 1751, at or near Anjer Point at the west end of the island. He lists nothing in his Dagbok that can possibly represent either *Rhus javanica* or *Brucea sumatrana*, but it is possible that he did not mention all the plants he actually collected. He reached southern China on August 25, 1751, and sailed thence January 4, 1752. His botanical field work in China was very much more extensive than in Java, his actual collecting being done in the immediate vicinity of Whampoa, near Canton, in Kwangtung Province. Now *Brucea sumatrana* Roxb. (*Rhus javanica* Linn., according to the extant specimen so named by Linnaeus himself) is locally common at low altitudes in Java, while *Rhus javanica* as currently interpreted occurs in Java only as an introduced plant and is apparently not common; on the other hand both are very common in thickets throughout the entire region about Canton, southeastern China. It is thus possible that Osbeck collected the *Brucea* in Java, but this is improbable in view of the fact that the extant specimen represents the Chinese, not the Javan form of *Brucea sumatrana* Roxb. It is most improbable that he observed or collected a true *Rhus* in Java. It is hence probable that the use of the specific name *javanica* was a pure error. It should be remembered that Osbeck did not reach Sweden on his return voyage until June 26, 1752, while the Species Plantarum was published in 1753. It is clear that the rather numerous references to Osbeck's plants must have been interpolated in the manuscript by Linnaeus, and probably this was rather hurriedly done.

As noted above, among the few plants cited by Osbeck as having been collected in Java, no *Rhus* is mentioned; on the other hand in his Dagbok, page 232 (1757) he cites among the plants collected on September 27, 1751, on Dane's Island (near Whampoa, South-eastern China) "*Rhus chinensis* blommade wid grafwarna, och kallades af Chineserna Monchi" and "*Rhus javanica*, germine rubro, Chin. Taj-scha," the two Chinese local names being translated by Forster as *monkhi* and *tay-sha*. It seems to be evident then that Osbeck had in mind two entirely different plants.

[1] Osbeck, P. Dagbok öfwer en ostindisk Resa . . . 1–367, pl. 1–12 (1757); Reise nach Ostindien und China . . . 1–552, pl. 1–13 (1765); A voyage to China and the East Indies . . . I. xx, 1–396, pl. 1–13. (1771); II. 1–367 (1771). See also Merrill, E. D. Osbeck's Dagbok öfwer en ostindisk Resa. (in Am. Jour. Bot. III. 571–588. 1916).



RHUS SEMIALATA Murr. var. ROXBURGHII DC.

The unnamed Rhus in the Linnean Herbarium pinned to the type sheet of Rhus javanica L.

Doubtless both plants are those now in the Linnean Herbarium, the *Brucea*, marked by Linnaeus as *Rhus javanica*, and the true *Rhus* which is pinned to the same sheet and unnamed except by inference. What apparently happened is that Linnaeus actually based his short and imperfect description of *Rhus javanica* on the *Brucea*, and later pinned the sheet of *Rhus chinensis* Osbeck to the *Brucea*, altering the locality from "Java" to "China" but without changing the specific name in the second edition of his Species Plantarum, and without adding Osbeck's specific name *chinensis* to the specimen; Osbeck, as quoted above, had used the binomial *Rhus chinensis* as a *nomen nudum*, in 1757. This being the case a strict interpretation of types would involve dropping the specific name *javanica* in *Rhus*, adopting this name for the common and widely distributed *Brucea sumatrana* Roxb. and the further adoption of some other specific name for the *Rhus*.

The evidence of the local Chinese name cited by Osbeck for *Rhus javanica*, "taj-scha," is in favor of the assumption that the *Brucea* in the Linnean Herbarium is the actual type of *Rhus javanica* if additional evidence be needed. Loureiro cites for his *Gonus amarissimus* (= *Brucea amarissima* Desv. = *Brucea sumatrana* Roxb.) the Cantonese name *a tam tsao;* on one recent collection from Canton the name *tam shu* appears while several specimens bear the name *a tam* and one *lo ah tam; tam shu* manifestly corresponds closely to Osbeck's *taj-scha*. None of the recorded Chinese names *Rhus javanica* auctt. available to me remotely resemble any of these forms, that recorded by Osbeck for his *R. chinensis* being *monchi*. After giving due consideration to all the evidence I am reluctantly forced to the conclusion that the actual type of *Rhus javanica* Linn. is the *Brucea* in the Linnean Herbarium, as named by Linnaeus, and that this name has nothing to do with *Rhus javanica* of recent authors. The following adjustment of synonymy for the species currently known as *Brucea sumantrana* and *Rhus javanica* is proposed.

Brucea javanica (Linn.), comb. nov. (Plate X).

Rhus javanica Linnaeus, Spec. 265 (1753); ed. 2, 380 (1762); type in herb. Linné.
Gonus amarissimus Loureiro, Fl. Cochinch. 658 (1790).
Brucea sumatrana Roxburgh, Hort. Bengal. 12 (1814), nomen nudum; Fl. Ind. ed. 2, I. 449 (1832).—Sprengel, Syst. Veg. I. 441 (1825).
Brucea amarissima Desvaux apud Gomes in Mem. Acad. Sci. Lisb. n. ser. IV. 30 (1872).—Merrill in Philip. Jour. Sci. Bot. X. 18 (1915); Interpret. Herb. Amboin. 299 (1917); Enum. Philip. Pl. II. 347 (1923).
Ailanthus gracilis Salisbury, Prodr. 171 (1796).
Brucea gracilis DeCandolle, Prodr. II. 88 (1824).
Brucea sumatrensis Sprengel, Pl. Pugil. II. 90 (1815).

Commonly and widely distributed, India to southeastern China through Malaysia and the Philippines to Australia.

Rhus semialata Murray in Comm. Soc. Goetting. v. 27, t. 3 (1784). (Plate XI).

Rhus chinensis Osbeck, Dagbok Ostind. Resa, 232 (1757), *nomen nudum*.

Rhus javanicum Thunberg, Fl. Jap. 121 (1784) et auctt.—Non Linnaeus.
Rhus semialata Murr. var. *Osbeckii* De Candolle, Prodr. II. 67 (1825).
Rhus Osbeckii Decaisne ex Steudel, Nomencl. Bot. ed. 2, II. 452 (1841), synon.

Widely distributed in China, extending as far north as Korea, very abundant in south-eastern China, introduced in Java, native in Sumatra (*Yates no. 2125*, with wingless petioles), a form or variety in Indo-China, India and Formosa.

This is the unnamed *Rhus* in the Linnean Herbarium pinned to the type sheet of *Rhus javanica* Linn. It is apparently the form considered by Rehder and Wilson as *Rhus javanica* Linn. var. *Roxburghii* (DC.) Rehd. et Wils. in Sargent Pl. Wilson. II. 179 (1914) (*Rhus amela* D. Don) as the leaf rachises are wingless; *Rhus Osbeckii* Decne. (*R. semialata* Murr. β *Osbeckii* DC.) would seem to be identical with *R. javanica* Linn. var. *Roxburghii* Rehd. et Wils. On account of the numerous intergrading forms there is grave doubt as to whether or not a variety should be recognized here, and I prefer to refer these names to *Rhus semialata* Murr. as synonyms.

ENUMERATION OF THE LIGNEOUS PLANTS COLLECTED BY J. F. ROCK ON THE ARNOLD ARBORETUM EXPEDITION TO NORTHWESTERN CHINA AND NORTHEASTERN TIBET

ALFRED REHDER AND ERNEST H. WILSON

IN charge of the Arnold Arboretum expedition to northwestern China and northeastern Tibet Mr. J. F. Rock sailed from San Francisco on September 30, 1924. Originally planned to occupy two years, the expedition, owing to the disturbed political condition in China, occupied until September, 1927. Travelling by the usual route across the Pacific Ocean Mr. Rock disembarked at Shanghai. Later he proceeded to Hongkong and to Haiphong in Tonkin, where he arrived on November 5th. From Haiphong he went by railway to Yunnan-fu, where his caravan was collected and by arrangement the collectors he had employed on a former expedition met him. From there the expedition proceeded overland to Suifu on the Yangtsze River arriving on January 27th after a dangerous and arduous trip. From Suifu Mr. Rock went on to Chentu-fu, the provincial capital of the Szechuan province, and later proceeded northward by the main highway to the Kansu border, reaching the town of Choni early in May, 1925. After the necessary arrangements were completed the exploration of the almost unknown Tebbu country to the south—south-west of Choni—was commenced and continued until late August.

In October Mr. Rock explored the Kokonor region in northeastern Tibet and from there journeying in an easterly direction spent some time examining the Richthofen chain, which was found very bare of vegetation.

Mr. Rock wintered in Choni and in the spring of 1926 set out for the unknown region of Amnyi Machen toward the headwaters of the Yellow River, a journey fraught with grave dangers and hardships. He found the Amnyi Machen range high and barren, but in the valley of the Yellow River heavily wooded ravines. The autumn of 1926 was spent in the further investigation of the Tebbu country, the flora of which proved to be very rich.

Owing to the continued disturbed state of the country it was necessary for Mr. Rock to again winter in Choni. On March 10, 1927 he left that town travelling in a southwesterly direction to Sungpang-ting. From there he descended the Min River to Kuan hsien, crossed the plain to Chentu, then by the overland route to Chungking, hence by steamer down the Yangtsze River to Shanghai, where he arrived on May 7th.

On this expedition Mr. Rock collected 2,939 numbers of herbarium specimens estimated in all at about 20,000 sheets. Of these approximately 1,606 numbers are ligneous plants and these will be enumerated in this Journal. References to species collected by Rock elsewhere than in Kansu and Tibet will appear in smaller type. The herbaceous plants will be named by specialists and it is hoped to publish a numerical list of them at the end of this enumeration.

GINKGOACEAE

Determined by E. H. Wilson

Ginkgo biloba Linnaeus, Mant. Alt. 313 (1771).—Shirasawa, Icon. Ess. For. Jap. I. 10, t. 8, fig. 1–14 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. II. 1 (1914), where full account of the literature and synonomy is given.—Rehder in Jour. Arnold Arb. IV. 117 (1923).

Southwestern Kansu. Tao River basin: in valley, 10 li beyond Pi kou, no. 12088, April 1925.

TAXACEAE

Determined by E. H. Wilson

Cephalotaxus Fortunei Hooker in Bot. Mag. LXXVI. t. 4499 (1850).—Rehder & Wilson in Sargent, Pl. Wilson. II. 4 (1914), where full account of the literature and synonomy is given.—Wilson in Jour. Arnold Arb. VII. 29 (1926).

Southwestern Kansu. Tao River basin: gorge of Minchow ho, south of Minchow, alt. 1830–2135 m., no. 12086, April 1925 (shrub 1.5–3 m. high).

Western Szechuan. Mountains of Ching chuan, no. 12053, April 1925 (shrub 1.5–1.8 m. high).

Northeastern Yunnan. Near Laitoupu, alt. 2740 m., no. 12002, Dec. 1924 (shrub 3 m. high).

The scaling red-brown bark serves as a ready means of distinguishing

this plant from the related *C. drupacea* S. & Z. This species has not before been reported from Kansu.

The Chinese Yew (*Taxus chinensis* Rehd.) was collected in Kansu by F. N. Meyer but was not seen by Mr. Rock.

PINACEAE

Determined by E. H. WILSON

With the great number of specimens collected by J. F. Rock and those of several other collectors represented in this herbarium it is possible to get some idea of the coniferous wealth of Kansu and adjacent Tibet. Mr. Rock in his notes and letters tells of the rich forests of Spruce and Silver Fir which he met with, notably in the Tebbu country and on the Minshan. Further west in the gorges of the upper Yellow River he tells of large areas covered with Juniper forests. Evidently, there is much coniferous forest wealth in these remote regions. In the paucity of species the flora, however, shows not only its boreal character but the influence of the dry, arid regions of the Gobi desert to the north and northwest and the austere region of Tibet to the west. In the south and southwestern parts of the province the climate is more moist and the flora, correspondingly, richer in variety. The flora in general appears to be on one hand an extension of that of northern and northwestern Szechuan and of Shensi on the other, a condition which from its geographical position one would naturally suspect.

Of Conifers, apart from Junipers, no species appears to be peculiar to Kansu. The two species of *Pinus* collected by Rock are widely distributed in China. One other species, *Pinus Bungeana* Zucc., which has been reported from Kansu, was not collected by Rock. The Larch (*Larix Potaninii* Batal.) is widely distributed in the alpine regions of northern and western China. Of the three species of Spruce, *Picea Wilsonii* Mast. has been reported from many parts of northern China ranging from the eastern province of Chili westward to Kansu. The other two species are abundantly represented in northwestern Szechuan. Of the four species of *Abies* three form forests in northwestern Szechuan; the fourth species, *A. chensiensis* Van Teigh., has so far been reported only from Shensi and western Hupeh. Of these Silver Firs *A. chensiensis* Van Teigh. and *A. recurvata* Mast. have not before been found in Kansu.

The *Cupressus* is found also in the river valleys of Szechuan and Yunnan. The Arborvitae (*Thuja orientalis* L.), also known from Kansu, was not collected by Rock. *Juniperus* with nine species and several varieties is by far the best represented genus of Conifers in Kansu. Of these species five are critical and further knowledge may reduce their number. Fortunately, Rock collected seeds of all, so in the course of time it will be possible to observe the behavior of these plants under cultivation and get a better idea of their relationship. Of the newer monospermous species three had been collected by the Russian travellers, Przewalski, Roborowski and Potanin, and have been recently described by Komarov. Two, *J. distans*

Florin and *J. glaucescens* Florin, were first collected by H. Smith in 1921–22 in northwestern Szechuan and described by Florin in 1927. One dwarf variety of *J. chinensis*, found on the sand dunes of the Kokonor, is apparently new.

Pinus Armandi Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 95, t. 12 (Pl. David. I. 284) (1885).—Shaw in Sargent, Pl. Wilson. II. 12 (1914).—Wilson, Conif. Tax. Jap. 20 (1916).—Rehder in Jour. Arnold Arb. IV. 119 (1923).—Wilson in Jour. Arnold Arb. VII. 45 (1926), where full account of the literature is given.

Pinus koraiensis Beissner in Nuov. Giorn. Bot. Ital. n. ser., IV. 184 (1897).—Non Siebold & Zuccarini.

Pinus scipioniformis Masters in Bull. Herb. Boissier, VI. 270 (1898).

Pinus mandschurica Masters in Jour. Linn. Soc. XXVI. 551 (1902).—Non Ruprecht.

Pinus Mastersiana Hayata in Gard. Chron. ser. 3, XLIII. 194 (1908).

Pinus Armandi var. *Mastersiana* Hayata in Jour. Coll. Sci. Tokyo, XXV. art. XIX. 215, f. 8 (Fl. Mont. Formos.) (1908).

Pinus levis Lemée & Léveillé in Fedde, Rep. Spec. Nov. VIII. 60 (1910).

Pinus excelsa var. *chinensis* Patschke in Bot. Jahrb. XLVIII. 657 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: Wantsang ku, limestone cliffs, alt. 2740–2890 m., no. 15019, Sept.–Oct. 1926.

CENTRAL KANSU. Lien hoa shan: among rocks, alt. 3050 m., nos. 12707, 13463, July 14–20 and Oct. 1925 (tree 12–18 m. tall).

This Pine so abundant in central and southwestern China and on the mountains of Formosa is apparently not common in Kansu.

Pinus tabulaeformis Carrière, Traité Conif. ed. 2 510 (1867).—Rehder in Jour. Arnold Arb. VII. 22 (1926).—Wilson in Jour. Arnold Arb. VII. 42 (1926).

Pinus leucosperma Maximowicz in Bull. Acad. Sci. St. Pétersb. XVI. 558 (1881).

Pinus Thunbergii Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 95 (Pl. David. I. 285 (1884); in Jour. de Bot. XIII. 253 (1899).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 185 (1897).—Masters in Jour. Linn. Soc. XXVI. 552 (1902); XXXVII. 417 (1906).—Patschke in Bot. Jahrb. XLVIII. 658 (1912).—Non Parlatore.

Pinus densiflora Franchet in Jour. de Bot. XIII. 253 (1899).—Masters in Jour. Linn. Soc. XXVI. 549 (1902); XXXVII. 416 (1906).—Shaw in Sargent, Pl. Wilson. I. 2 (1911).—Patschke in Bot. Jahrb. XLVIII. 658 (1912).—Non Siebold & Zuccarini.

Pinus funebris Komarov in Act. Hort. Petrop. XX. 177 (1901).

Pinus densiflora var. *tabuliformis* Masters in Jour. Linn. Soc. XXVI. 549 (1902).

Pinus Henryi Masters in Jour. Linn. Soc. XXVI. 550 (1902); XXXVII. 416 (1906).—Patschke in Bot. Jahrb. XLVIII. 658 (1912).

Pinus sinensis Mayr, Fremdl. Wald. & Parkb. 349, fig. 113 (1906), in part.—Shaw in Sargent, Pl. Wilson. II. 15 (1914); Gen. Pinus, 60, t. 23, fig. 201–207 (1914).—Rehder in Bailey, Cult. Evergreens, 320 (1923); in Jour. Arnold Arb. IV. 120 (1923).—Dallimore & Jackson, Handb. Conif. 451, fig. 99 (1923).

Pinus Argyi Lemée & Léveillé in Fedde Rep. Spec. Nov. VIII. 60 (1910).

Pinus Cavaleriei Lemée & Léveillé, l. c.

Pinus Wilsonii Shaw in Sargent, Pl. Wilson. I. 3 (1911).

Pinus Cavendishiana Hort. ex Dallimore & Jackson, Handb. Conif. 451 (1923), synonym.

SOUTHWESTERN KANSU. Upper Tebbu country: Kadjaku valley, at Tatsuto, alt. 2620–2800 m., nos. 12538, 12996, 13449, June, July and Nov. 1925 (tree 12–18 m. tall).

CENTRAL KANSU. Lien hoa shan: Haku, along streams, alt. 2740 m., nos. 12776, 13461, July and Oct. 1925 (tree 21–24 m. tall).

Larix Potaninii Batalin in Act. Hort. Petrop. XIII. 385 (1893).—Masters in Jour. Linn. Soc. XXVI. 558 (1902); XXXVII. 424 (1906); in Gard. Chron. ser. 3, XXXIX. 178, fig. 68 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 18 (1926).—Rehder in Jour. Arnold Arb. IV. 121 (1923).—Wilson in Jour. Arnold Arb. VII. 46 (1926).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 2 (Pl. Sin. XVII. 2) (1927).

Larix spec. Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 97 (Pl. David. I. 287) (1884).

Larix chinensis Beissner in Mitt. Deutsch. Dendr. Ges. V. 68 (1896).

Larix thibetica Franchet in Jour. Bot. XIII. 262 (1899).

Larix Griffithii Masters in Jour. Linn. Soc. XXVI. 558 (1902).—Non Hooker f. & Thomson.

Pinus sinensis Voss in Putlitz & Meyer, Landlexicon. IV. 769 (1913).—Non Lambert.

SOUTHWESTERN KANSU. Tao River basin: Shimen of Hsiaoku, East Tebbu land, alt. 3050–3400 m., nos. 12803, 13723, 13465, July and Oct. 1925 (tree 12–18 m. tall). Upper Tebbu country: Tsarekika, northwest of Adjüan, no. 13465, Oct. 1925.

The collector remarks that this tree is common on conglomerate cliffs in the Tao River basin.

Picea asperata Masters in Jour. Linn. Soc. XXXVII. 419 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 22 (1914).—Wilson in Garden, LXXXVIII. 166 figs. (1924).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 2 (Pl. Sin. XVII. 2) (1927).

Picea Meyeri Rehder & Wilson in Sargent, Pl. Wilson. II. 28 (1914), in part, as to the Kansu specimens.—Rehder in Jour. Arnold Arb. IV. 122 (1923), in part, as to the Kansu specimens.

Picea Schrenkiana Rehder & Wilson in Sargent, Pl. Wilson, II. 29 (1914), in part, as to Purdom's nos. 813, 790.—Non Fischer & Meyer.

SOUTHWESTERN KANSU. Tao River basin: mountains southwest of Choni, Valley of Laliku, alt. 2890 m., nos. 12934, 12938, July 1925 (tree 21–24 m. tall); along Taoho, east of Choni, alt. 2530 m., no. 12341, June 1925 (tree 24 m. tall); mountains south of Choni, alt. 2890 m., no. 12932, July 1925 (tree 18–24 m. tall); Choni, alt. 2740–3350 m., nos. 12120, 12157, 12590, May and July 1925 (tree 18–30 m. tall); mountains west of Choni, alt. 2890 m., no. 12931, July 1925 (tree 24 m. tall, bark greyish brown, scaly); Maerhku, Choni district, alt. 2740 m., nos. 13428, 13431, Oct.–Nov. 1925 (tree 18–24 m. tall); east of Adjuan, in Hsiaoku gorge, alt. 2890 m. no. 12659, July 5, 1925 (tree 15–24 m. tall, ascending branches); Kadjaku, northern slopes of Minshan, alt. 2890 m., no. 13433, Oct. 1925 (tree 24 m. tall). Lower Tebbu country: Wantsang Ssu, alt. 2440 m., nos. 14815, 15045, Sept.–Oct. 1926 (tree 15–

24 m. tall); Valley of Peshwekiang, alt. 2195 m., no. 14567, Aug. 29, 1926 (tree 15–18 m. tall); Mayaku valley, alt. 2740 m., nos. 14755, 15065, Sept.–Oct. 1926 (tree 18 m. tall). Upper Tebbu country: Kadjaku valley, slopes of Minshan, alt. 2890 m., nos. 12993, 12549, 12548, June 1925 (tree 18–30 m. tall); Tougwa camp, southern slopes of Minshan, alt. 2920 m., nos. 12545, 12969, June and Aug. 1925 (tree 18–30 m. tall); Drjakana district, alt. 2920 m., no. 13438, Nov. 1925 (tree 18–21 m. tall); Drjakana, Pandrukika, alt. 3350 m., no. 13446, Nov. 1925 (tree 15–21 m. tall); Between Kwang ke and Drjakana, alt. 3050 m., no. 15080, Sept.–Oct. 1926 (tree 9–12 m. tall); Opposite Lassungomba, alt. 3050 m., no. 12968, Aug. 1925 (tree 18–24 m. tall, bark flaky and grey); Valley of Chulungapu, below Pashetenga, alt. 2440 m., no. 15092, Oct. 1926 (tree 15–18 m. tall); Valley leading to Tsarekika, east Tebbu land, alt. 3050 m., no. 13459, Oct. 1925 (tree 24 m. tall).

Central Kansu. Lien hoa shan: alt. 3050–3350 m., nos. 12708, 13464, July–Oct. 1925 (tree 18–24 m. tall, bark flaky and grey, branches ascending).

Northwestern Kansu. Richthofen range and adjacent region: slopes of Mt. Ngui sin shan, between N. Kokonor barrier and R. range, alt. 3050–3400 m., no. 13309, Oct. 1925 (tree 30–36 m. tall, forming pure stands); northern slopes of N. Kokonor barrier range, in deep gorge, alt. 3050 m., no. 13307, Oct. 1925 (tree 27–30 m. tall, with short descending branches); dry rocky slopes on Hung shin gorge, northern slopes of Nanshan, Richthofen range facing Mongolia, alt. 2740 m., no. 13310, Oct. 1925 (tree 6–9 m. tall); Rako gorge, alt. 3050 m., no. 13662, Sept. 28, 1925 (tree 12–18 m. tall, trunk straight); slopes of the mountains in Babo district, back of the village and beyond Huangantassu, Baboho valley, alt. 3350 m., no. 13663, Oct. 1925 (tree 12–18 m. tall); mossy slopes of mountains opposite Komang Ssu monastery, northeast of Tankar, alt. 2890–3350 m., no. 13304, Oct. 1925 (tree 24–36 m. tall, trunk 0.6–1 m. in diameter, bark grey and scaly); mountains of Kanlungssu, alt. 2890–3050 m., no. 13313, Nov. 1925 (tree 15–21 m. tall).

Western Kansu. Forests of Labrang, valley opposite Labrang monastery, alt. 2920–3200 m., no. 13699, Dec. 1925 (tree 15–18 m. tall).

Eastern Tibet. Kokonor Region: Kako gorge, alt. 3350 m., no. 13281, Sept. 1925 (tree 15–24 m. tall, erect or branching from base); Bamba, southeast of Kokonor, alt. 2890 m., no. 13282, Sept.–Oct. 1925; between Tango and Kokonor in Lalaku, alt. 2890 m., no. 13341, Sept. 22, 1925 (tree 18–24 m. tall). Radja and Yellow River gorges: below Dzang monastery, near mouth of Gochen valley, above Radja gomba, alt. 3140, nos. 13901, 13903, May 13, 1926 (tree 15–24 m. tall); opposite Radja, slopes of Yellow River, alt. 3200–3350 m., nos. 13960, 13961, 13963, May 24, 1926 (12–45 m. tall); Dachso canyon, forming pure stands, alt. 3050–3350 m., no. 14063, June 1926 (tree 30–45 m. tall). Jupar Range: Jupar valley, alt. 3200–3650 m., nos., 14316, 14323,

14324, 14325, 14326, June 26–27, 1926 (tree 10–45 m. tall, bark grey, scaly, branches long, descending). Amnyi Machen range (west of Yellow River): Hjachen valley, near Yellow River, no. 14444, July 16, 1926 (tree 18–24 m. tall, trunk 0.3–0.6 m. in diameter, bark scaly, greyish brown, branches horizontal, forms forests).

From the abundance of material collected by Rock this species appears to be the commonest Spruce in Kansu, being particularly abundant on the mountains of the west and southwest. With its southern limits in northwestern Szechuan, this species is found over a vast tract of country. It would appear to be the only species found in northwestern Kansu and extends westward into eastern Tibet, where it forms forests at the mouth of the Hjachen valley near the upper waters of the Yellow River and under the shadow of the Amnyi Machen range of mountains.

This species is a tree of from 10–45 m. tall with a trunk sometimes 3 m. in girth with the general aspect of the Norway Spruce (*Picea Abies* Karsten). The leaves are thick, more or less curved, pungent and vary from dark green to glaucous. The branchlets are stout, often pruinose, yellow-orange to pale brown, sometimes crowded with peg-like, spreading or ascending-spreading, sometimes recurved petioles tumid at the base, yellowish grey and more or less pubescent. The degree of pubescence varies greatly and often on the same tree from year to year. In nos. 12993 and 13309 the shoots are densely clothed with a short, curled villose pubescence; in nos. 13960 and 15080 the pubescence is almost wanting; in no. 12932 the branchlets are glabrous. The winter-buds are very characteristic, conical, always much swollen at the base, with thin, loosely imbricated, shining bud-scales, free and often inclined to be recurved at the summit. The cone varies in size from 6–12 cm. in length. Its comparatively wide range of variation, notwithstanding, *Picea asperata* Mast, is a well-marked and easily recognizable species.

Without questioning the specific validity of *P. Meyeri* Rehder & Wilson the suite of specimens collected by Rock convinces me that the material from Kansu referred to this species by my colleague, Alfred Rehder, and self when first describing Meyer's Spruce belongs to *P. asperata* Mast. Discovered in the neighborhood of Sungpang-ting by E. H. Wilson in August, 1903, and by him introduced into cultivation in 1910, *P. asperata* Mast. is perfectly hardy in the Arnold Arboretum. It grows fairly rapidly, is of handsome appearance, and promises to be a useful addition to the list of Spruces hardy in Massachusetts.

Picea Wilsonii Masters in Gard. Chron. ser. 3, XXXIII. 133, fig. 55, 56 (1903).—Rehder & Wilson in Sargent, Pl. Wilson. II. 27 (1914).—Rehder in Jour. Arnold Arb. IV. 122 (1923).—Wilson in Garden LXXXVIII. 166, figs. (1924).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 2 (Pl. Sin. XVII. 2) (1927).

Picea obovata var. *Schrenkiana* Pritzel in Bot. Jahrb. XXIX. 217 (1900).—Masters in Jour. Linn. Soc. XXVI. 554 (1902).—Non Carrière.

Picea Maximowiczii Masters in Jour. Linn. Soc. XXVI. 554 (1902), as to the Chinese specimen.—Non Regel.

Picea Watsoniana Masters in Jour. Linn. Soc. XXXVII. 419 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 27 (1914).

Picea Mastersii Mayr, Fremdl. Wald. & Parkb. 328, figs. 105, 106, 107 (1906).

Abies spec. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 23, no. 22671 (1909).

Picea Schrenkiana Rehder & Wilson in Sargent, Pl. Wilson. II. 29 (1914), in part.—Non Fischer & Meyer.

SOUTHERN KANSU. mountains of Motzuping, alt. 1525 m., no. 12062, April 1925 (tree 12 m. tall, pyramidal).

SOUTHWESTERN KANSU. Tao River basin: south of Minchow, mountains beyond Tan chang, alt. 2440 m., no. 12087, April 1925 (tree 24 m. tall); Choni, slopes of Taoho valley, alt. 3050 m., no. 12132, May 1925 (tree 15–21 m. tall); forests of Choni, alt. 2740–3200 m., no. 12119, May 1925 (tree 18–24 m. tall, branches drooping); Choni, Maerhku valley, alt. 2890 m., nos. 12930, 13426, July and Nov. 1925 (tree 9–21 m. tall, branches drooping); mountains southwest of Choni, valley of Laliku, alt. 2890 m., nos. 12933, 12663, 14935, July and Oct. 1925 (tree 9–24 m. tall). Lower Tebbu country: Wantsang valley, alt. 2440–2590 m., nos. 14678, 14694, 14740, Sept. 1926 (tree 24–39 m. tall, bark pale brown in small square flakes); mountains back of Wantsang gomba, alt. 2740 m., no. 14808, Sept. 1926 (tree 18–24 m. tall); forests of Wantsang ku, alt. 2890 m., no. 15021, Sept.–Oct. 1926 (tree 30–45 m. tall); mountains of Wantsang valley of Chulungapu, alt. 2890 m., no. 15048, Sept.–Oct. 1926 (tree 15–24 m. tall); upper Mayaku valley, alt. 2740–2890 m., nos. 14754, 14756, 14776, 14775, 15068, Sept.–Oct. 1926 (tree 15–24 m. tall); Mayaku, Picea forest, alt. 2740 m., no. 15064, Sept.–Oct. 1926 (tree 18 m. tall); Ngongo, gorges of Chulungapu, alt. 2890 m., nos. 14964, 14975, Sept.–Oct. 1926 (tree 30–45 m. tall). Upper Tebbu Country: Tougwa camp, southern slopes of Minshan, alt. 2990 m., nos. 12543, 12544, 12546, June 1925 (tree 12–24 m. tall); Djrakana district, alt. 3050–3200 m., nos. 12971, 12980, 12982, 12995, 13443, 13452, 13453, August and Nov. 1925 (tree 9–54 m. tall, bark greyish brown, fissured into irregular elongated scales, branches ascending or spreading); Yiwaku, beyond Drjakana, alt. 2600–2800 m., nos. 14574, 14575, 15086, Aug. 28 and Oct. 1926 (tree 9–24 m. tall); Gadza, alt. 2490 m., no. 14571, Aug. 28, 1926 (tree 30–45 m. tall, branches short, drooping in old trees); forests around Gadza and Boho gomba, alt. 2740 m., nos. 15089, 15091, Oct. 1926 (tree 12–45 m. tall); Lissedzadza, East Tebbu land, alt. 3350 m., no. 13457, Oct. 1925 (tree 4–6 m. tall).

This the most widely distributed of the Chinese species of Spruce is apparently abundant in southwestern Kansu and there reaches its western limits. Eastward its range extends across north China to the Weichang region in northern Chili. The southern limits appear to be northern Hupeh and the most southwestern point from which it has been reported is the neighborhood of Sungpang-ting. It is easily distinguished by its

ashy gray branchlets and very numerous ovoid, chestnut-brown winter-buds, its pectinately arranged, slender, pungent leaves, green on both surfaces. According to Rock it is a tree sometimes up to 45 m. tall with a trunk 1 m. in diameter. The branchlets vary considerably in degree of thickness, though they are usually slender or relatively so. Almost invariably they are quite glabrous but occasionally, as in nos. 12930 and 15021, a minute pubescence is present. The petioles are short, ascending and purplish. The cone varies in length from 4 to 7 cm.

With the great number of specimens collected by Rock it becomes evident that *P. Watsoniana* Mast. can no longer be regarded as a species distinct from *P. Wilsonii* Mast. or even as a variety. It represents merely an extreme condition of *P. Wilsonii* Mast. characterized by its very slender branches, and leaves and by its small cones. The other extreme is represented by Rock's number 12132, which has very stout branchlets, short, thick leaves and represents the plant named *P. Mastersii* by Mayr.

This Spruce was discovered and introduced into cultivation in 1901 by E. H. Wilson who found it in northern Hupeh. In 1903 he discovered and introduced from Sungpang-ting the form which Masters named *P. Watsoniana* and this has been growing in the Arnold Arboretum since 1907. Subsequently in 1908 W. Purdom collected seeds of *P. Wilsonii* Mast. in quantity both in the Weichang, in Shensi and in Kansu and many plants raised from these seeds are now growing freely in this country. Like the other Spruces of northwestern China it has proved perfectly hardy in the Arnold Arboretum, where it grows fairly rapidly but its leading shoots suffer from attacks of boring insects.

Picea purpurea Masters in Jour. Linn. Soc. XXXVII. 418 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 29 (1914).—Rehder in Jour. Arnold Arb. IV. 123 (1923).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 2 (Pl. Sin. XVII. 2) (1927).

SOUTHWESTERN KANSU. Tao River basin: mountains southwest of Choni, Valley of Laliku, alt. 2890 m., nos. 12937, 12935, 12936, July 1925, (tree 12–15 m. tall, branches drooping); Choni district, Maerhku valley, alt. 2890–2950 m., nos. 13424, 13427, 13430, Oct. 1925, (tree 12–15 m. tall); mountains of Choni, west of Taoho, alt. 3050 m., no. 12146, May 1925 (tree 18–24 m. tall); east of Adjüan, Hsiaoku gorge, alt. 2890 m., nos. 12660, 12662, July 1925, (tree 15–24 m. tall, branches short, drooping); Tao River watershed, alt. 2890 m., nos. 12256, 12257, June 1925, (tree 12–24 m. tall); Kadjaku, northern slopes of Minshan, alt. 2890 m., no. 13434, Oct. 1925, (tree 7.5–9 m. tall). Lower Tebbu country: Wantsang valley, alt. 2920–3050 m., no. 14835, Sept. 1926, (tree 24–36 m. tall). Upper Tebbu country: Valley of Kadjaku, west of Choni, no. 12992, July 1925 (tree 18–21 m. tall, cone-shaped and symmetrical); Kadjaku, northern slopes of Minshan, alt. 3050 m., no. 13472, Oct. 1925, (tree 18 m. tall); Laluku, en route to Shimen, alt. 3050 m., no. 13439, Nov. 1925, (tree 12–15 m. tall); Adjuan-Tayüku, beyond Shimen, East

Minshan, alt. 3050 m., no. 13458, Nov. 1925, (tree 18–24 m. tall); Tougwa camp, southern slopes of Minshan, alt. 2920 m., nos. 12540, 12550, June 1925, (tree 15–30 m. tall); Tayüku, Lissedzadza, eastern end of Tebbu country, alt. 3050 m., no. 13455, Nov. 1925, (tree 12–15 m. tall); Tsaluku valley, Minshan, alt. 3200 m., no. 12985, Aug. 1925, (tree 15 m. tall); West Adjüan, East Tebbu land, alt. 3200 m., no. 13460, Oct. 1925, (tree 18–21 m. tall); Upper Chabaku valley and Tsang ayeku valley, west of Kwang Kei, no. 12991, Aug. 1925, (tree 24 m. tall, branches short, horizontal, branchlets drooping); Drjakana district, alt. 3050–3200 m., nos. 12974, 13441, 13442, Aug. and Oct.–Nov. 1925, (tree 12–15 m. tall); enroute to Pandrukika; alt. 3350–3500 m., nos. 12966, 12967, 12975, 12986, Aug. 1925, (tree 15–18 m. tall).

Central Kansu. Lien hoa shan: alt. 2740–3050 m., nos. 12706, 12709, 13462, July and Oct. 1925, (tree 15–21 m. tall); between Taochow and Titao, alt. 3200 m., no. 12671, July 1925, (tree 12 m. tall, branches ascending, bark scaly).

Eastern Tibet. Kokonor Region: forest opposite Labrang monastery, alt. 2740 m., nos. 13344, 13345, Dec. 1925 (tree 12–15 m. tall).

This species appears to be common in the forests of southwestern Kansu and to have its northern limits around Labrang in northeastern Tibet and its southern in northwestern Szechuan. In the upper Wantsang valley, lower Tebbu land, Rock states that it forms pure forests with Fir and Birch. It was first reported from Kansu in the neighborhood of Taochau by William Purdom in 1911. In 1925 the Wulsin Expedition also collected it in Kansu.

A well-marked species *P. purpurea* is characterized by its small, violet-purple cones, which vary from 3 to nearly 5 cm. in length. The cone-scales are narrowed abruptly above the middle and are acute or truncate and often erose. The leaves are from 5 to 15 mm. long and from 1 to 2 mm. wide, inclined forward with apex bevelled and obtuse. The collector notes that the leaves vary from deep green to glaucous and that in habit the tree is sometimes pyramidal, at other times spreading, and sometimes the branchlets are drooping. The shoots are usually densely clothed with pale gray spreading villose pubescence, but occasionally as in no. 12985 the pubescence is sparse. The winter buds are small, broadly ovoid to subglobose, shining chestnut-brown to purplish brown. It was discovered around Sungpang ting in 1903 by E. H. Wilson and introduced into cultivation by him in 1910. In the Arnold Arboretum this Spruce has proved perfectly hardy but of slow growth.

Keteleeria Davidiana Beissner, Handb. Nadelholzk. 424, fig. 117 (1891).—Rehder & Wilson in Sargent, Pl. Wilson. II. 39 (1914).—Wilson in Jour. Arnold Arb. VII. 53 (1926), where full account of the literature and synonomy is given.

Western Szechuan. South of Ching chuan, dry slopes near San Ko shi, alt. 900 m., nos. 12027, 12056, March, 1925 (tree 7.5–18 m. tall).

Abies Faxoniana Rehder & Wilson in Sargent, Pl. Wilson II. 42 (1914). Dallimore & Jackson, Handb. Conif. 98, fig. 16 (1923).—Rehder in Bailey,

Cult. Evergreens, 253 (1923).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 1 (Pl. Sin. XVII. 1) (1927).

SOUTHWESTERN KANSU. Tao River basin: Choni district, Maerhku valley, alt. 3050 m., nos. 13425, 13429, Oct. 1925 (tree 18–24 m. tall, cones purplish black); Maerhku valley, northern slopes of Minshan, alt. 3050 m., nos. 13422, 13423, Oct. 1925 (tree 12–30 m. tall, branches ascending); Mt. Kwang ke, northern slopes of Minshan, alt. 3350 m., no. 14646, Aug. 26, 1926 (tree 7.5–9 m. tall); upper Laluku, near summit of Mt. Lissedzadza, alt. 3350–3650 m., nos. 14929, 12661, July 6 and Oct. 19, 1926 (tree 12–18 m. tall, forming pure stands). Lower Tebbu country: summit of spur dividing Mayaku from Sambaku, alt. 3440 m., nos. 14768, 14809, Sept. 1926 (tree 4.5–18 m. tall); valley of Chulunga gapu, forests of Wantsang ku, alt. 3050 m., nos. 14989, 15009, 15044, Sept.–Oct. 1926 (tree 12–30 m. tall). Upper Tebbu country: Tsaluku valley, in front of Shimen, alt. 3200 m., nos. 12989, 12990, Aug. 1925 (tree 12–15 m. tall); forests, southern slopes of Minshan, alt. 2920 m., no. 12539, June 1925, (tree 24–27 m. tall, drooping branches); valley of the great Shimen, en route to Koang Kei, no. 12984, Aug. 1925 (tree 15–18 m. tall); forests below Panrukika, en route to Szechuan-Kansu border; alt. 3350 m., nos. 12965, 12987, 15081, 15082, Aug. and Oct. 1926 (tree 12–18 m. tall); between Drjakana and Pandrukika, alt. 2920 m., no. 15084, Oct. 1926 (tree 9–12 m. tall); Drjakana, alt. 3050–3350 m., nos. 12979, 12981, 12994, 13437, 13440, 13444, 13445, Aug., Oct. and Nov. 1925, (tree 15–45 m. tall, bark, pale brown, longitudinally furrowed, branches short, descending, trunk slender, cones bluish black); forests of Drjakana, opposite Lassungomba, no. 13436, Nov. 1926 (tree 18 m. tall); North Tebbu land Koang Kei shan, alt. 3200–3650 m., nos. 13447, 13448, Nov. 1925 (tree 12–15 m. tall).

CENTRAL KANSU. Lien hoa shan: alt. 3800 m., no. 13466, Oct. 1925 (tree 30–45 m. tall, cones dark purplish black).

From the large number of specimens collected by Rock this species would appear to be common on the mountains of the southern half of Kansu with its northern limits in the central part of that province. The type locality is the mountains northeast of Sungpang-ting and its southern limits the Pan lan shan range west of Kuan Hsien. Its type locality would, therefore, represent about the centre of its distribution. The cones vary greatly in the quantity of resin present, those from the Kansu-Szechuan border being very resinous, whereas specimens from Maerhku on the northern slopes of the Minshan are almost entirely without resin. The winter buds are always very resinous. It is distinguished from the closely related and equally common *A. sutchuenensis* Rehd. & Wils. by its lesser branchlets being clothed with a short, red-brown pubescence and by its usually large cone. The resin-ducts in both species are median.

In Kansu this species was first found near Kagobo by F. N. Meyer on October 30, 1914. By a slip of the pen my colleague, Alfred Rehder,

in his enumeration of "The Ligneous Plants of Northern China" (in Jour. Arnold Arb. IV. 124 (1923) refers Meyer's specimen to *A. Fargesii* Franch. *Abies Faxoniana* was discovered and introduced into cultivation in 1910 by E. H. Wilson from the forests northwest of Sungpang-ting. Although it has proved quite hardy in the Arnold Arboretum it has grown slowly and does not appear to take kindly to cultivation in Massachusetts.

Abies sutchuenensis Rehder & Wilson in Sargent, Pl. Wilson. II. 48 (1914).—Dallimore & Jackson, Handb. Conif. 132 (1923).—Rehder in Jour. Arnold Arb. IV. 124 (1923); in Bailey, Cult. Evergreens, 253 (1923).

Abies Fargesii var. *sutchuenensis* Franchet in Jour. de Bot. XIII. 256 (1899).

SOUTHWESTERN KANSU. Tao River basin: Choni district, Maerhku valley, alt. 2890–3350 m., nos. 12940, 12939, 14904, July 1925, Aug.–Sept. 1926 (tree 7.5–15 m. tall); mountains of Choni, west of Tao ho, alt. 3050 m., no. 12145, May 1925, (tree 21–24 m. tall); east of Adjuan, Hsiaoku gorge, alt. 2890 m., no. 12658, July 5, 1925 (tree 15–18 m. tall, trunk rough and scaly); upper Laluku, alt. 3050 m., nos. 14930, 14931, 14932, Oct. 1926 (tree 12–15 m. tall, trunk pale brown, longitudinally furrowed, horizontal branches); Mt. Kwang ke, northern slopes of Minshan, alt. 3350–3650 m., nos. 14635, 14648, Aug. 26, 1926 (tree 6–12 m. tall, fruits blackish blue). Lower Tebbu Country: Upper Wantsang valley, alt. 3050 m., nos. 14837, 15020, Sept.–Oct. 1926 (tree 7.5–30 m. tall, fruits purplish black); Chatseti gorge, below Tsarekika, eastern Minshan range, alt. 2920 m., no. 14865, Sept. 17, 1926 (tree 12–18 m. tall). Upper Tebbu Country: Tsaluku valley, in front of Shimen, alt. 3200 m., no. 12988, Aug. 1, 1925 (tree 12 m. tall, branches ascending); forests, southern slopes of Minshan, alt. 3261 m., no. 12983, Aug. 1925 (tree 15–18 m. tall, bark greyish brown, longitudinally furrowed); Tougwa camp, slopes of Minshan, alt. 2980, nos. 12541, 12542, 12547, June 1925 (tree 24–30 m. tall, bark flaky, greyish-brown); Lissedzadza, East Tebbu country, alt. 3650 m., no. 13456, Nov. 1925 (tree 9–12 m. tall, cones blackish purple); Mt. Kwang ke, northern slopes of Minshan, alt. 3500 m., no. 15079, Sept.–Oct. 1926 (tree 6 m. tall); Drjakana, alt. 3050–3350 m., nos. 12970, 12972, 12973, 12976, 12977, 12978, 13450, 13451, 13454, Aug.–Nov. 1925 (tree 18–60 m. tall, bark brown, in regular square scales, longitudinally furrowed, branches short, stout, drooping, cones purplish-black); forests of Djrakana, opposite Lassungomba, alt. 3050 m., no. 13435, Oct. 1925 (tree 24–30 m. tall).

CENTRAL KANSU. Lien hoa shan: between Taochow and Titao, alt. 3050 m., nos. 12678, 12692, 13467, July and Oct. 1925 (tree 7.5–30 m. tall).

The perfectly glabrous branchlets serve to distinguish this species from the closely related *A. Faxoniana* Rehd. & Wils. and as a rule the cone is smaller. Another related species, *A. Fargesii* Franch., which also has glabrous branchlets is distinguished by its much longer, relatively thinner and wider leaves in which the resin-ducts are lateral. *A. sutchuenensis*

is evidently a common species in southwestern Kansu, yet so far it has not been recorded from the adjacent region of northwestern Szechuan. The type locality is the mountains of eastern Szechuan. The specimens collected in Shensi by Purdom (no. 405) and by Rehder & Wilson (in Pl. Wilson. II. 49 (1914)) doubtfully referred to this species belong to *A. Fargesii* Franch.

Abies recurvata Masters in Jour. Linn. Soc. XXXVII. 423 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 44 (1914).—Rehder in Bailey, Cult. Evergreens, 254, (1923).—Dallimore & Jackson, Handb. Conif. 129 (1923).

SOUTHWESTERN KANSU. Upper Tebbu country: Yiwaku, bebetween Drakana and Boho gomba, alt. 2890 m., no. 15087, Oct. 1926 (tree 15–24 m. tall, cone dull grey-brown, 8.75cm.); Yiwaku, between rock gate and Boho gomba, alt. 2740 m., no. 15088, Oct. 1926 (tree 18–24 m. tall, cone dull black, densely grey pubescent).

Mr. Rock's material is the first record of this species of Silver Fir from the province of Kansu, where it would appear to be rare. The type locality is the mountains to the south and west of Sungpang-ting, northwestern Szechuan, where it forms extensive and nearly pure forests. It was discovered in 1903 by E. H. Wilson and by him introduced into cultivation in 1910. In the Arnold Arboretum it has proved perfectly hardy, has grown moderately fast and promises to be a very useful ornamental tree.

Abies chensiensis Van Tieghem in Bull. Soc. Bot. France, XXXVIII. 413 (1891).—Franchet in Jour. de Bot. XIII. 256 (1899).—Rehder & Wilson in Sargent, Pl. Wilson. II. 44 (1914).—Rehder in Jour. Arnold Arb. IV. 124 (1923); in Bailey, Cult. Evergreens, 254 (1923).—Dallimore & Jackson, Handb. Conif. 93, (1923).

Abies sp. Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 100 (Pl. David. I. 290) (1884).

Abies firma Masters in Jour. Linn. Soc. XXVI. 557 (1902), as to the specimen from Shensi.—Non Siebold & Zuccarini.

SOUTHWESTERN KANSU. Lower Tebbu country: Wantsang valley, alt. 2135–2375 m., no. 14831, Sept. 1926 (tree 30–45 m. tall, bark drab colored, longitudinally furrowed).

This is the first record of the occurrence of this rare and interesting Silver Fir in Kansu. Discovered on the Tsin-ling Mountains in Shensi by Père A. David in 1872, it was introduced into cultivation by E. H. Wilson who collected seeds on the mountains of western Hupeh in the autumn of 1907. In the Arnold Arboretum this Silver Fir has proved perfectly hardy, has grown fairly rapidly and promises to be a useful ornamental tree.

Cunninghamia lanceolata Hooker in Bot. Mag. LIV. t. 2743 (1827).—Rehder & Wilson in Sargent, Pl. Wilson. II. 50 (1914).—Rehder in Jour. Arnold Arb. IV. 23 (1923).—Wilson in Jour. Arnold Arb. VII. 57 (1926).

NORTHEASTERN YUNNAN. Tung chuan, temples, alt. 3000 m., nos. 12000, 12005, Dec. 1924, Jan. 1925 (tree 24 m. tall).

In the warmer parts of China this is one of the most common coniferous trees.

Cryptomeria japonica D. Don in Trans. Linn. Soc. XVIII. 166, t. 13, fig. 1 (1841).—Rehder & Wilson in Sargent, Pl. Wilson. II. 52 (1914).—Wilson, Conif. & Tax. Jap. 66, tt. 48–49 (1916), where complete references to the literature and synonomy will be found.—Rehder in Jour. Arnold Arb. IV. 125 (1923).—Wilson in Jour. Arnold Arb. VII. 59 (1926).

NORTHEASTERN YUNNAN. Without locality, no. 12001, Dec. 1924 (tree 24 m. tall).

Cupressus Duclouxiana Hickel in Camus, Cyprès, 91, t. 3, figs. 419–424 (1914).—Dallimore & Jackson, Handb. Conif. 195 (1923).—Stapf in Bot. Mag. CL. t. 9049 (1925).—Wilson in Jour. Arnold Arb. VII. 60 (1926).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 3 (Pl. Sin. XVII. 3) (1927).

Cupressus sempervirens Franchet in Jour. de Bot. XIII. 263 (1899).—Non Linnaeus.

Cupressus torulosa Rehder & Wilson in Sargent, Pl. Wilson. II. 54 (1914), excluding all references and synonyms.—Hayata in Tokyo Bot. Mag. XXXI. 118 (1917).—Chun, Chin. Econ. Trees, 38, fig. 12 (1922).—Rehder in Jour. Arnold Arb. IV. 125 (1923).—Non D. Don.

SOUTHERN KANSU. Between Kaichow and Minchow on Wuto ho, beyond granite gorge, no. 12073, April 1925 (tree 12–15 m. tall).

Juniperus formosana Hayata in Jour. Coll. Sci. Tokyo, XXV. art. XIX. 209, t. 38 (Fl. Mont. Formosa) (1908).—Rehder & Wilson in Sargent, Pl. Wilson. II. 56 (1914).—Rehder in Jour. Arnold Arb. IV. 126 (1923).—Wilson in Jour. Arnold Arb. VII. 63 (1926), where a full account of the literature and synonomy is given.—Florin in Meddel. Göteborgs Bot. Trädgård, III. 3 (Pl. Sin. XVII. 3) (1927).

SOUTHWESTERN KANSU. Tao River basin: Mountains of Choni, alt. 2860 m., no. 12102, May 1925 (tree 3 m. tall); river bank, between Choni and Kadjaku, alt. 2590 m., no. 13432, Oct. 1925 (tree 3–4.5 m. tall); shale slopes outskirts of Choniku, alt. 2590–2740 m., no. 14934, Oct. 20, 1926 (tree 4.5 m. tall); Minshan range, along Kwadjaku stream, near Tatsuto, alt. 2740 m., no. 12430, June 1925 (tree 9–12 m. tall).

Mr. Rocks states the fruits are bluish-black or black, but this is evidently the color before they are ripe. At maturity the fruits are brownish orange and slightly bloomy.

Juniperus squamata Lambert, Descr. Gen. Pinus, II. 17 (1824).—Rehder & Wilson in Sargent, Pl. Wilson. II. 57 (1914).—Wilson in Jour. Arnold Arb. VII. 64 (1926), where a full account of the literature and synonomy is given.

Juniperus Franchetiana Léveillé, Cat. Pl. Yunnan. 57 (1915–16), nomen nudum.

The material collected by Mr. Rock belongs to the following variety:

Juniperus squamata var. **Fargesii** Rehder & Wilson in Sargent, Pl. Wilson. II. 59 (1914).—Rehder in Jour. Arnold Arb. IV. 126 (1923).—Wilson in Jour. Arnold Arb. VII. 65 (1926).

Juniperus saltuaria Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLIII. 65, no. 40677 (1918).—Non Rehder & Wilson.
Juniperus Fargesii Komarov in Herb. Mus. Paris (1911); in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 30 fig. 2, (1924).
Juniperus kansuensis Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 31, fig. 1 (1924).
Sabina kansuensis Komarov, l. c., synon.

SOUTHWESTERN KANSU. Lower Tebbu country: Mayaku, upper right branch, alt. 2890 m., no. 15066, Sept.–Oct. 1926 (tree 7.5–9 m. tall); forests of Ngongo, valley of Chulungapu, alt. 2890 m., no. 15093, Oct. 1926 (tree 7.5–9 m. tall). Upper Tebbu country: Djrakana, alt. 3050 m. no. 13470, Oct. 1925 (tree 6–9 m. tall).

We have in this herbarium an excellent photograph of the type of Komarov's *Juniperus kansuensis* and also F. N. Meyer's specimen, no. 1827, cited as a co-type by Komarov. The seed in the Meyer specimen is larger than that figured for *Juniperus kansuensis* and slightly smaller than that figured for *Juniperus Fargesii*. I do not think the difference is sufficient to separate this as a species distinct from the polymorphic *Juniperus squamata* Lamb.

Juniperus squamata f. **Wilsonii** Rehder in Jour. Arnold Arb. I. 191 (1920); in IV. 126 (1923), where a full account of the literature and synonomy is given.

SOUTHWESTERN KANSU. Lower Tebbu country: Upper Mayaku valley, alt. 2740 m., no. 14757, Sept. 6, 1926 (tree 4.5–6 m. tall).

Juniperus Przewalskii Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 28, fig. 11 (1924).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 10, t. 4, fig. 3-a, 3-b (Pl. Sin. XVII. 10) (1927).
Juniperus pseudosabina Komarov in Act. Hort. Petrop. XXXIV. 118, 119, 135 (1920).—Non Fischer & Meyer.
Sabina Przewalskii Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 28, (1924), synon.

EASTERN TIBET. Radja and Yellow River gorges: on mossy rocks in Howa valley, one stage north of Radja, alt. 3740 m., no. 14044 May 31, 1926 (tree 4.5–6 m. tall).

The markedly dimorphic foliage, the bloomy black, plum-like, globose fruit and globose, sculptured seed would appear to distinguish this species.

Juniperus zaidamensis Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 29, fig. 10 (1924).
Juniperus pseudosabina Komarov in Act. Hort. Petrop. XXXIV. 118, 119, 125 (1920).
Sabina zaidamensis Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross., v. 28 (1924), synon.

NORTHWESTERN KANSU. Richthofen range and adjacent region: northern slopes of N. Kokonor barrier range; in deep gorge or rocky slopes, alt. 3350 m., no. 13305 Oct. 1925 (tree 7.5–12 m. tall).

The roughly sculptured, globose seed, often slightly depressed at the summit, is characteristic of this species.

Juniperus tibetica Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross. v. 27, fig. 9 (1924).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 10, t. 1, fig. 4-a, 4-b (Pl. Sin. XVII. 10) (1927).

Sabina tibetica Komarov in Notul. Syst. Herb. Hort. Bot. Reipubl. Ross., v. 27, (1924), synon.

EASTERN TIBET. Radja and Yellow River gorges: Rocky slopes of Yellow River gorges between Nyavruch and Howa canyons, also Dachso canyon, alt. 3440 m., no. 13946, May 27, 1926 (tree 6 m. tall). Jupar Range: Upper Jupar valley, rocky slopes, alt. 3700 m., no. 14302, June 27, 1926 (tree 9–12 m. tall, trunk 3.5 ft.).

In this species the seed varies from broadly-ovoid to globose and is roughly sculptured. In spite of the differences in the shape of the seed I think it is doubtful if this and *Juniperus zaidamensis* Komarov are really distinct species. Moreover, it appears highly probable to me that these and also *Juniperus Przewalskii* Komarov are forms and conditions of one variable species.

Juniperus distans Florin in Meddel. Göteborgs Bot. Trädgård, III. 6, t. 3, figs. 1, 2-a, 2-b (Pl. Sin. XVII. 6) (1927).

SOUTHWESTERN KANSU. Tao River basin: Kwadjaku stream on limestone rocks, no. 12472, June 1925 (tree 9–12 m. tall). Lower Tebbu country: forests in upper Mayaku, alt. 2740–2930 m., nos. 14774, 14875, Sept. 1926 (tree 9–15 m. tall, trunk 0.3 to 1. m.); mouth of Tayuku and Hsiaoku at Adjuan, alt. 2740 m., no. 14864, Sept. 1926 (tree 10.5–12 m. tall, trunk 0.3 m.). Upper Tebbu country: Kuang kei shan, Tebbu country, alt. 3650 m., no. 13469, Oct. 1927 (tree 7.5–9 m. tall).

The subglobose to ovoid or slightly oblong-ovoid, pruinose fruit and ovoid to obovoid, often apiculate, slightly sculptured seed appears to distinguish this species.

Juniperus glaucescens Florin in Meddel. Göteborgs Bot. Trädgård, III. 5, t. 4, figs. 1, 2-a, 2-b (Pl. Sin. XVII. 5) (1927).

EASTERN TIBET. Grasslands between Labrang and Yellow River: arid slope in Gochen valley near Yellow River gorge, south of Dzangar, alt. 3110 m., nos. 13913, 13918, May, 1926 (tree 6.8–15 m. tall, trunk 1 m. in diameter).

This species is closely related to *Juniperus distans* but has a somewhat smaller, more globose fruit and usually obovoid seed. However, they are certainly very closely related. Indeed, the same may be said of the several heterophyllous, large-fruited, monospermous, arborescent species of Juniperus found in Kansu and eastern Tibet and recently described by Komarov and Florin.

Juniperus saltuaria Rehder & Wilson in Sargent, Pl. Wilson. II. 61 (1914).—Rehder in Jour. Arnold Arb. IV. 128 (1923).—Florin in Meddel. Göteborgs Bot. Trädgård, III. 3 (Pl. Sin. XVII. 3) (1927).

SOUTHWESTERN KANSU. Tao River basin: Mountains of Tao River valley, alt. 3050 m., nos. 12258, 12396, 12646, June–July, 1925 (tree 4.5–9 m. tall). Lower Tebbu country: Between Mayaku and Chatseti, alt. 3350–3410 m., nos. 14771, 14868, Sept. 1926 (tree 6–9 m. tall, trunk 1 ft.). Upper Tebbu country: Kuang kei shan, Eastern Tebbu land, alt. 3650 m., nos. 13468, 13471, Oct. 1925 (tree 6–12 m. tall).

Juniperus chinensis Linnaeus, Mant. 127 (1767).—Miquel in Ann. Mus. Lugd.-Bat. III. 167 (1867); Prol. Fl. Jap. 331 (1867); in Siebold & Zuccarini, Fl. Jap. II. 58, t. 126, 127, fig. 1, 2, 4 (1870).—Rehder & Wilson in Sargent, Pl. Wilson. II. 60 (1914), where a full account of the literature and synonomy is given.—Rehder in Jour. Arnold Arb. IV. 127 (1923).—Wilson in Jour. Arnold Arb. VII. 67 (1926).

SOUTHWESTERN KANSU. Lower Tebbu country: At Pezku, on banks of Peshwekiang, alt. 2141 m., no. 14562, Aug. 1926 (tree 12–15 m. tall, round crown); Pezhu, on banks of Chulungapu, the Tan shiang mu, nos. 14952, 14952-A, Sept.–Oct. 1926.

Juniperus chinensis var. **pendula** Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 101 (Pl. David. I. 291) (1884).—Rehder in Jour. Arnold Arb. IV. 128 (1923).

SOUTHWESTERN KANSU. Lower Tebbu country: Banks of Chulungapu, no. 14951, Sept.–Oct. 1926 (tree 12–18 m. tall, branches long, slender, bright green, branchlets drooping).

Juniperus chinensis var. **arenaria** Wilson, var. nov.

Frutex circiter 30 cm. altus, ramis patentibus basi plerisque decumbentibus, apice ascendentibus, ramulis satis congestis erectis vel suberectis: folia adpressa vel arcte adpressa, opposita, in ramis primariis terna, ovato-lanceolata, 3–4 mm. longa, acuminata, pungentia, glandula resinifera conspicua, ad basin ramulorum ovata, 1–2 mm. longa, acutiuscula vel breviter acuminata.

EASTERN TIBET. Kokonor Region: sand-dunes of Kokonor and along main lake on high dunes, alt. 3350 m., no. 13346, Sept. 1925 (shrub 0.3 m. high).

This is a low-growing, spreading variety with ascending branches and distinct appearance. The branchlets are densely crowded with appressed, sharp-pointed leaves which lower down merge into shorter more scale-like leaves. On the dorsal surface the resin-gland is usually prominent. The 2–4 seeded fruit is typical of *J. chinensis* L.

LILIACEAE

Determined by A. REHDER

Smilax trachypoda Norton in Sargent, Pl. Wilson III. 3 (1916).—Rehder in Jour. Arnold Arb. IV. 131 (1923).

SOUTHWESTERN KANSU. Lower Tebbu country: Wantsang valley, alt. 2300 m., no. 14722 (erect shrub 1.50–1.75 m., in dense shade of forests) and no. 14833 (shrub 1–1.25 m., outskirts of forests), Sept. 1926.

In Rock's specimens the rough papillate pubescence on the petiole and veins is often only slightly developed.

Smilax rubriflora Rehder, sp. nov.

Frutex scandens ramis ramulisque inermibus teretibus vel ramulis ultimis leviter angulatis, ramulis geniculatis. Folia disticha, decidua, ovato-elliptica ad 2–4 cm. longa et 1.2–2.5 cm. lata (in specimine florente nondum matura et minora), obtusa et mucronulata, rarius acuta, basi rotundata vel subito in basin late cuneatam contracta, trinervia vel interdum 5-nervia pari laterali inconspicuo, rete venularum subtus elevato, glabra, luteoviridia, subtus glaucescentia; petioli 6–10 mm. longi, graciles, ½–⅔-vaginati, alis angustis costatis, cirrhifera, in ramulis robustis sterilibus ad 2.5 cm. longi et cirrhis longissimis, in ramulis ultimis floriferis saepe cirrhis debilibus vel ecirrhosi. Inflorescentiae axillares, pedunculis petiolo longiores, plerumque una tantum ad basin ramulorum; flores masculi intense rubri, in umbellis 3–6-floris graciliter pedunculatis pedunculo filiformis 7–12 mm. longo; pedicelli ebracteati, 5–8 mm. longi, filiformes; sepala ovato-lanceolata, circiter 2 mm. longi, patentia vel reflexa, intense rubra ("dark red" sec. coll.); stamina 6, segmentis multo breviora, antheris suborbicularibus albidis circiter 0.5 mm. diam., filamentis brevissimis vix 0.5 mm. longis. Baccae 1–6, graciliter pedicellatae, in umbellis graciliter pedunculatis, globosae, 5–8 mm. diam., 1–3 spermae, nigrae vix vel levissime pruinosae; semina subglobosa, 3 mm. diam.

SOUTHWESTERN KANSU. Upper Tebbu country: southern slopes of Minshan, along banks of mountain streams, alt. 3200 m., no. 12506, June 1925 (woody climber, flowers dark red; type). Lower Tebbu country: in streambed of Wantsang valley, alt. 2130 m., no. 14676, Sept. 1, 1926 (climber over shrubs); Mayaku, alt. 2900 m., no. 15067, Sept.–Oct. 1926 (rambling shrub, fruit black, in small umbels).

This new species differs from all the Chinese species known to me in its dark red flowers. It appears to be most nearly related to *S. vaginata* Decne. which agrees in its slender inflorescence, small flowers, suborbicular anthers and short filaments and in its unarmed stems, but its flowers are yellowish or brownish yellow, it is totally different in its habit, being an upright or perhaps sometimes rambling shrub without tendrils and its leaves are larger, distinctly ovate with a broad, truncate or subcordate base. Those, however, of the upper leaves of the smaller branchlets of *S. rubriflora* which have no tendrils differ very little from the leaves of *S. vaginata*. The new species has also some resemblance to *Smilax glauco-china* Warb., but that species is easily distinguished by its larger greenish flowers, with the stamens nearly as long as the sepals, by the

many-flowered umbels, the bloomy fruits and the glaucous or glaucescent under side of the larger leaves.

SALICACEAE

The enumeration of the species of *Populus* and *Salix* will appear in a later issue.

JUGLANDACEAE

Determined by A. REHDER

Pterocarya stenoptera C. De Candolle in Ann. Sci. Nat. sér. 4, XVIII. 34 (1862).—Lavallée, Icon. Arb. Segrez. 65, t. 19 (1885).—Rehder & Wilson in Sargent, Pl. Wilson. III. 181 (1916), where full citation of literature and synonyms is given.—Rehder in Jour. Arnold Arb. IV. 146 (1923).

SOUTHERN KANSU: beyond Pi kou along banks of Wen hsien ho, alt. 900 m., no. 12079, April 1925 (tree 12 m.).

This species which is distributed throughout the whole of China, except the extreme northeast, and extends into Tonkin is apparently rare in Kansu and only found in the southern part of that province where it had been collected before by P. J. Piasezki.

BETULACEAE

Determined by A. REHDER

Ostryopsis Davidiana Decaisne in Bull. Soc. Bot. France, XX. 155 (1873).—Lavallée, Icon. Arb. Segrez. 5, t. 3 (1880).—Schneider in Sargent, Pl. Wilson. II. 423 (1916), where full citation of literature and synonymy is given.—Rehder in Jour. Arnold Arb. IV. 149 (1923).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao ho, east of Choni, alt. 2530, nos. 12219, June 1925 (shrub 1.25–1.5 m); among rocks and boulders along the river, below Choni, alt. 2450 m., no. 12799, June–July 1925 (shrub 1.75–2 m.); on rocky banks of river, Choni district, no. 13513, Oct. 1925 (shrub 1 m.).

This species had been collected before in Kansu by P. J. Piasezki and by R. C. Ching collector on the Wulsin Expedition.

Corylus Sieboldiana Bl. var. **mandshurica** Schneider in Sargent, Pl. Wilson. II. 454 (1916), where full citation of literature and synonymy is given.—Rehder in Jour. Arnold Arb. IV. 153 (1923).

Corylus mandshurica Maximowicz & Ruprecht in Bull. Acad. Sci. St. Pétersb. XV. 137 (1856); in Mél. Biol. II. 431 (1857).—Skan in Bot. Mag. CXLI. t. 8628 (1915).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao River, east of Choni, alt. 2530 m., no. 12212, June 1925 (shrub 2–2.25 m.); Tao ho road to Poyüku, alt. 2750 m., no. 13511, Oct. 1925 (shrub 3 m.).

CENTRAL KANSU. Lien hoa shan: scrub forest, northern slope, above Shan shen miao, alt. 2900 m., no. 13214, Aug. 1925 (shrub 3–4.5 m.).

This species had been collected before in Kansu by R. C. Ching who accompanied the Wulsin Expedition.

Betula albo-sinensis Burkill in Jour. Linn. Soc. XXVI. 497 (1899).—Diels in Bot. Jahrb. XXIX. 282 (1900).—Schneider in Sargent, Pl. Wilson. II. 457 (1916), with citations of literature and synonyms.—Rehder in Jour. Arnold Arb. IV. 153 (1923).

Betula utilis var. *sinensis* Winkler in Engler, Pflanzenr. IV.-61, p. 62 (1904).

SOUTHWESTERN KANSU. Tao River basin: grassy slopes and ravines, west of Adjüan, alt. 3050–3500 m., nos. 12609, 12632, July 5–10, 1925 (small tree or shrub, 7–8 m.); limestone cliffs of Shiao ku, beyond Adjüan, alt. 2900 m., no. 12811, July 1925 (shrub or tree 4.5–5 m.); mountains west of Adjüan, east Tebbu land, alt. 3200 m., no. 13621, Sept.–Oct. 1925 (shrub or small tree 4.5–5.5 m.). Upper Tebbu country: in crevices of limestone walls, southern slopes of Minshan, alt. 3500, no. 12526, June 1925 (shrub 2–3 m., with long drooping branches); among boulders at foot of Shimen, alt. 3600 m., no. 13080, July–Aug. 1925 (tree 7 m., bark glossy, copper-colored); rocky slopes of Djrakana, alt. 3200–3350 m., no. 13641, Sept.–Oct. 1925 (tree 7–8 m., strobiles brown); Hsiao ku, along stream, northeast of Adjüan, east Tebbu land, alt. 3200 m., no. 13646, Sept.–Oct. 1925 (tree 12–15 m.; strobiles brown); forest at Pandrukika pass, border of Tebbu and Szechuan, alt. 3050–3350 m., no. 15083, Oct. 1926 (tree 3–4.5 m., bark red). Lower Tebbu country: only in upper regions with Fir, alt. 3450, no. 14772, Sept. 7, 1926 (tree 7–10 m., trunk 30 cm. diam., bark greyish black). CENTRAL KANSU. Lien hoa shan: in Spruce forests and outskirts between Tao chow and Titao, alt. 3050 m., no. 12732, July 14–20, 1925 (tree 4.5–5.5 m.); alt. 3020 m., no. 13616, Oct. 1925 (tree 7.5–9 m.).

Betula albo-sinensis var. **septentrionalis** Schneider in Sargent, Pl. Wilson. II. 458 (1916).—Rehder in Jour. Arnold Arb. IV. 154 (1923).

SOUTHWESTERN KANSU: Lower Tebbu country: common tree in upper Wantsang forest, alt. 2450–2600 m., no. 14709, Sept. 3, 1926 (tree 18 m., bark copper-color with short white lines); forming pure forests with Spruces and Firs, alt. 2900 m., no. 14823, Sept. 11, 1926 (tree 18–25 m., trunk 30–60 cm. diam., bark red); Ngongo gorges with Firs and Spruces, alt. 2800–3000 m., nos. 14966, 14969, Oct. 1926 (tree 10–25 m., trunk up to 60 cm. diam., bark red). Upper Tebbu country: Tatsuto, Kadjaku valley, west Tebbu, Minshan, alt. 2800 m., no. 13648, Sept.–Oct. 1925 (tree 15–18 m.).

Schneider distinguishes this variety from the type by the more or less distinctly glandular branchlets and the more distinctly silky-pubescent midrib and veins. To these characters may be added the generally oblong-ovate shape of the leaves, usually ovate or sometimes broadly ovate in the type, and the greater height of the tree; according to Rock's notes the type is often only a shrub or at best a small tree up to 10 m. high, while the variety is always a tree, 10–25 m. tall with a trunk up to 60 cm. in diameter. The type seems to occur chiefly at altitudes of

3050 and 3500 m., while the variety is found at lower altitudes of between 2450 and 3000 m. Both, the type and the variety, have been collected before in Kansu by W. Purdom, F. N. Meyer and R. C. Ching.

Betula Delavayi Franchet in Jour. de Bot. XIII. 205 (1899).—Winkler in Engler, Pflanzenr. IV.–61, p. 67, fig. 19 m. (1904).—Schneider in Sargent, Pl. Wilson. II. 460 (1916).—Rehder in Jour. Arnold Arb. IV. 154 (1923).

SOUTHWESTERN KANSU. Lower Tebbu country: in Spruce forests in upper Mayaku, alt. 2750 m., no. 14758, Sept. 6, 1926 (tree 4.5–6 m., with horizontal branches).

This very distinct small-leaved Birch seems to have been collected in Kansu only once before by W. Purdom near Lotani, Minchow district.

Betula japonica Sieb. var. **szechuanica** Schneider in Jour. Arnold Arb. III. 454 (1917).

Betula japonica Sieb. var. *mandshurica* Schneider, op. cit. II. 461 (1916).

SOUTHWESTERN KANSU. Tao River basin: mountains of Choni, in scrub forest, below Spruce forest, alt. 3050 m., no. 12118, May 1925 (tree 6–7 m., bark white); mountains of Choni, outskirts of Spruce forests, alt. 3200 m., no. 12129, May 1925 (tree 7 m., branches slender, erect, ends drooping, bark white); common in lower forests, outskirts of Spruce forests, alt. 2750 m., no. 12301, June 1925 (tree 9–12 m., bark smooth copper colored [?], leaves bright green); Minshan range, forming forests around Pine forests on grassy banks of Kwadjaku stream, no 12434, June 1925 (tree 15–18 m.); west of Choni, outskirts of Pine forests at Tatsuto, alt. 2600 m., no. 12477, June 1925 (tree 18–24 m.); Poyuku, on forest slopes, alt. 3050 m., no. 13657, Sept.–Oct. 1925 (tree 9–12 m.); in loess on banks of river, alt. 2600 m., no. 14916, Oct. 20, 1926 (tree 18 m., trunk 60–90 cm. diam., dark silvery gray to blackish). Lower Tebbu country: forest of lower Wantsang valley, alt. 2130 m., no. 14718, Sept. 3, 1926 (tree 12 m., trunk 30–60 cm. diam., bark with white and black rings); forest back of Wantsang monastery, alt. 2750 m., no. 14805, Sept. 1926 (tree 7–9 m.; bark yellowish white); on steep slopes of lateral valley near camp in Wantsang valley, alt. 2800 m., no. 14818, Sept. 11, 1926 (tree 15–18 m., bark greyish black), slopes of Wantsang valley, alt. 2750 m., no. 14820, Sept. 11, 1926 (tree 9–12 m.; bark pale yellow); forests of Wantsang valley, alt. 2300 m., no. 14824, Sept. 11, 1926 (tree 12–15 m., bark whitish); on top of ridges and spurs, Wantsang valley, alt. 2900 m., no. 15017, Sept.–Oct. 1926 (tree 9–12 m., bark greyish pink to dark grey); Wantsang ku, alt. 2600 m., no. 15018, Sept.–Oct. 1926 (tree 12–15 m., bark flesh color). Upper Tebbu country: mountains west of Adjüan, east Tebbu land, alt. 3200 m., no. 13644, Sept.–Oct. 1925 (tree 9–10 m., bark red, copper-colored).

EASTERN TIBET. Radja and Yellow River gorges: with Juniper and Spruce, alt. 3350 m., no. 13952, May 25, 1926 (tree 4.5–6 m.);

northern slopes of Yellow River, south of and opposite Radja, alt. 3200 m., no. 13962, May 24, 1926 (tree 4.5–6 m.); lateral valley of Yellow River gorges, north of Radja, alt. 3200 m., no. 14034, May 28, 1926 (tree 4.5–6 m., bark pinkish); in and on outskirts of Spruce forest in Dachso canyon, alt. 3200 m., no. 14072, June 3, 1926 (tree 6–7.5 m., bark pinkish to flesh color). Jupar Range: gravelly slopes, with Willows, alt. 3200 m., no. 14290, June 1926 (tree 4.5–6 m., bark bronze color).

This Birch is apparently a common tree in the valleys of southwestern Kansu and the adjoining regions of eastern Tibet. It is often found associated with Coniferous forests and occurs usually on the outskirts of these forests. It grows approximately at the same altitudes as the preceding species, but does not seem to ascend to quite as high altitudes and descends to about 2100 meters. It had not before been recorded from Kansu or eastern Tibet.

Most of the specimens agree well with the type of var. *szechuanica*, others differ in their smaller markedly cuneate and more unequally and often slightly doubly serrate leaves, as no. 14916 from the Tao River basin, nos. 14805, 14818, 14820 and 14824 from the Lower Tebbu country and no. 13644 from the upper Tebbu country. Of no. 12301 from the Tao River basin Rock describes the bark as copper-colored, which is the color of the bark of *B. albo-sinensis;* there is no sample of the bark with the specimen and I assume Rock must have made a mistake. Of no. 12477 there is a good photograph showing the habit of the tree which is much like that of *B. pendula* Roth and of no. 14916 a photograph of the trunk which measures 60–90 cm. in diameter.

Betula japonica var. Rockii Rehd., var. nov.

A typo recedit foliis minoribus rhombico-ovatis 3–4 cm. longis basi late cuneatis rarissime fere truncatis duplicato-serratis et interdum lobulatis, strobilis minoribus, circiter 2 cm. longis, bractearum lobis lateralibus suberectis.

Eastern Tibet. Kokonor region: common in Koko gorge, alt. 3350–3500 m., no. 13283, Sept.–Oct. 1925 (tree 6–9 m., crown oblong, pointed, bark silvery gray to blue).

This Birch is apparently nearest related to *B. japonica* var. *szechuanica* from which it differs chiefly in its smaller, cuneate, doubly serrate or even lobulate leaves and in the suberect or ascending lateral lobes of the fruiting bracts, otherwise the bracts and also the seeds agree with those of the type specimen of var. *szechuanica*. In the shape of the leaves the specimen resembles *B. pendula* Roth., but the leaves have fewer veins, generally only four pairs, and the fruiting bracts are quite different, those of *B. pendula* having markedly recurved or at least spreading lateral lobes and a longer stipe; the wings of the seeds are about as wide as the body in var. *szechuanica* and in this new variety, while in *B. pendula* they are about twice as wide. The suberect lobes of the bracts suggest *B. pubescens*

Ehrh., but the shape of the leaves and the glabrous and glandular branchlets do not allow it to be referred to that species.

Betula luminifera Winkler in Engler, Pflanzenr. IV.-61, p. 91, fig. 23a–c (1904).—Schneider, Ill. Handb. Laubholzk. II. 882, fig. 552d, 553g–h (1912); in Sargent, Pl. Wilson. II. 455 (1916), with citation of literature and synonyms.

WESTERN SZECHUAN: north of Kiang yu, along Fu kiang river, no. 12033, March 1925 (tree 8 m.).

FAGACEAE

Determined by E. H. WILSON

Quercus liaotungensis Koidzumi in Tokyo Bot. Bag. XXVI. 166 (1912); in Matsumura, Icon. Pl. Koisikav. I. 109, t. 55 (1912).—Rehder & Wilson in Sargent, Pl. Wilson. III. 233 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXIX. 101, no. 38181 (1917).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).—Rehder in Jour. Arnold Arb. IV. 159 (1923).

Quercus funebris var. *undulatifolia* Nakai, Rep. Veg. Quelpaert. Isl. 37 (1914). Name only.

Quercus mongolica β. *liaotungensis* Nakai in Tokyo Bot. Mag. XXIX. 58 (1915); Fl. Sylv. Koreana III. 24 (1917).

Quercus undulatifolia Leveille in Litt. ex Nakai in Tokyo Bot. Mag. XXIX. 58 (1915). As a synonym.

Quercus funebris Leveille in Litt. ex Nakai l. c. As a synonym.

SOUTHWESTERN KANSU—Lower Tebbu country: Peshwekiang valley, Pezhu, alt. 2280 m., nos. 14568, 14959, 14941, Aug.–Oct. 1926 (tree 9–18 m. tall, crown spreading, trunk 0.3–0.6 m. diam.); Wantsang valley, alt. 2280 m., nos. 14671, 15030, Aug., Sept.–Oct. 1926 (tree 7.5–12 m. tall, crown large, spreading, trunk 0.3–0.6 m. diam.); Mayaku below Zehga, alt. 2280–2590 m., nos. 15075, 15057, 14789, 14788, 15073, Sept.–Oct. 1926 (tree 1.3–12 m. tall, trunk 0.3–0.6 m. diam.); Forests of Tsaoshiku, alt. 2440 m., no. 15002, Sept.–Oct. 1926 (tree 9–12 m. tall); Forests of Ngongo, alt. 2440 m., nos. 14974, 14967, Sept.–Oct. 1926 (tree 9–12 m. tall). Upper Tebbu country: Lower Yiwaku, near Tsaruku, alt. 2370 m., no. 14578, Aug. 28, 1926 (tree 3–4.5 m. tall); Lien hoa shan: Shanshen Miao, Ha Kou stream, alt. 2740–2890 m., nos. 12782, 13222, 13487, 13482, July, Aug., Oct. 1926 (tree 1.8–15 m. tall, trunk 1 m. in diam., acorns sweet, edible).

This is a critical species very closely related to *Q. mongolica* Fischer from which it may be distinguished by its smaller, more shallow cupules and smaller, slightly, if at all, thickened cupule-scales. The leaves are always auriculed at the base and vary much in size as does the petiole in length. No. 15073 appears to represent a teratological form with relatively long petioles, narrow-oblong leaves, varying from nearly entire to deeply lobed or even pinnatifid. Such monstrosities are known in other Oaks including the related *Q. robur* L. It would appear to be a tree of no great size widely spread in the more southern half of Kansu.

Quercus Baronii Skan in Jour. Linn. Soc. XXVI. 507 (1899).—Seemen in Bot. Jahrb. XXIX. 291 (1900).—Rehder & Wilson in Sargent, Pl. Wilson.

III. 226 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).—Rehder in Jour. Arnold Arb. IV. 163 (1923).

SOUTHWESTERN KANSU—Lower Tebbu country: Peshwekiang valley, Pezhu, alt. 1980–2171 m., nos. 14561, 14686, 14940, 14950, 14942, Aug., Sept., Oct. 1926 (tree 4.5–15 m. tall); Near mouth of Wantsang Ku, alt. 2135 m., no. 15037 Sept.–Oct. 1926; Forests near Nyingo, alt. 2135 m., no. 14995, Sept.–Oct. 1926 (tree 9–12 m. tall).

ABNORMAL FRUITS OF JUGLANS NIGRA

ALFRED REHDER

IN 1919 Dr. Fairchild of Washington sent to the Arnold Arboretum some abnormal Walnuts he had received from Mr. J. W. Ray of Greensburg, Indiana, who had gathered them from a tree growing on land of Mr. Wm. H. Cramer, in the same town. With these nuts which were supposed to represent a hybrid between a Hickory and a Walnut photographs were sent showing nuts with and without husk of the supposed hybrid and its parents, *Juglans nigra* and *Carya laciniosa*. In the accompanying letter, however, Mr. Ray doubts the hybrid origin of the tree, since only a small portion of the fruits on the tree are abnormal, and states that the abnormal fruits appear only in those years when the Hickory, which stands at about 200 feet distant in the direction of the prevailing winds, is found to bear, and he, therefore, concludes that these fruits are the result of the direct influence of the Hickory pollen on the Juglans flower. This year we received through Mr. Charles C. Deam of Bluffton, Indiana, additional material including branches from the same tree. The tree was struck by lightning in 1917, but according to Mr. Ray's letter dated December 24, 1918 it seems to have borne abnormal fruits even before it was injured.

The number of freaky nuts varies as to season; in some years there are more than in others.

Similar freaky fruits of Black Walnut have been reported before. In 1887 A. A. Crozier of the Department of Agriculture, Washington, describes[1] an abnormal Walnut received from J. R. Johns, Millersburg, Pennsylvania, who thinks that the appearance is due to pollen of the Hickory of which the nearest tree is about 800 yards distant. The nut is described as having "nearly the size of an average Walnut with its lower third seated in an adherent two-lobed cup-like body, in texture much like the outside of a Walnut. The upper part is thinner and smoother than usual and still shows the four parts of the adherent calyx as when young, thus causing it to resemble a Hickory nut, on cutting it open the shell and kernel were found to be those of the Walnut." According to J. R. Johns the lower or Walnut part was more fully developed in some specimens than in the one sent.

[1] In Bot. Gaz. XII, 167 (1887).

A similar case has been described under the title "A Walnut freak," by J. T. Rothrock with figures of the tree and of abnormal fruits.[1] The tree which bore abnormal fruits was observed first by Mr. Wm. H. Groninger a few minutes walk from the railroad station of Warble, Juniata Co., Pennsylvania; it was about 40 feet tall and the trunk was severely injured on one side and therefore could not be considered healthy. The amount of abnormal fruit varied greatly in different years; in 1895, when there was a phenomenal drought, the abnormal fruit formed about fifty percent, while in the following year with a more favorable summer the fruit was practically normal. The fruit figured agreed with the fruit described by A. A. Crozier.

The fruits of the "Wm. H. Cramer Walnut" show considerable variation; they vary from subglobose to obovoid and ellipsoid and measure 4–5 cm. in length. They are divided by a distinct line of demarcation into a lower and upper part. The lower cup-shaped part covers the fruit about ½ to ⅔ of its length and its surface is like that of the normal Black Walnut (fig. a and b); the upper part is smooth and shows more or less clearly

four vertical somewhat depressed lines of division running down from the four small calyx-lobes at the apex. In one of the six fruits before me the lower part is not cup-shaped but separated into two oval lobes extending to about the middle of the fruit (fig. c). In two of the fruits an oblong body adnate to the cup-shaped part is present extending from base to about the middle or less and slightly spreading at the apex. The nut itself agrees in the sculptured wall and in the inner structure with that of typical *Juglans nigra*, but it is usually smaller and somewhat irregular in shape and in its inner structure.

No analogous cases seem to have been observed in other species of *Juglans*. Neither Masters in his "Vegetable teratology," nor Penzig in his "Pflanzen-Teratologie" mentions similar cases, and also Kronfeld who dealt exhaustively with the teratology of *Juglans regia*[2] does not describe among the abnormal fruit of that species any comparable with the one here discussed.

There is certainly no foundation to the belief that the tree which pro-

[1] In Pennsylvania—Department of Agriculture—Division of forestry—Preliminary Report of the Commissioner of forestry for 1896, p. 41–43 (p. 405–407), 3 pl. (1897).
[2] In Bot. Jahrb. XII. 280–304, pl. 4, 5 (1888).

duces these abnormal nuts is a hybrid; it is, as bark, branches with their lamellate pith, winter-buds and leaves show, a true *Juglans nigra*. Also the theory that the abnormal fruits are due to the direct influence of the pollen of Carya on the flower of Juglans need hardly to be considered in this case, since the abnormality is restricted to the prophylls and to some extent to the perianth but does not extend to ovary itself which would be the first part of the flower influenced by the foreign pollen. The abnormality, however, is easily explained by the unequal and incomplete development of those parts of the flower which develop into the husk due possibly among other causes to insufficient nourishment as suggested by Rothrock. The ovary of the flower of Juglans is surrounded by a perianth consisting of four connate sepals and this again by the two bractlets or prophylls which are connate into a cupula; both these parts are adnate to each other and to the ovary and developing normally and equally form the husk. Now in our case for some reason the outer layer formed by the prophylls stops in its development at an early period and covers the fruit only partly, while the perianth which has a smooth surface continues to develop with the ovary which forms finally the nut, and outgrows the cupula formed by the prophylls which shows the rough surface of the normal husk; the bract which supports the flower can usually be seen extending from the base of the cupula as an oblong body adnate to the cupula about ⅓ or nearly ½ as long as the fruit (fig. b) and more or less free at the very apex. Sometimes the prophylls are more or less distinct and form a two-lobed cupula as described by A. A. Crozier (fig. c). The four parts of the perianth can be easily distinguished on the upper smooth part of the fruit and also the four calyx-lobes at the apex. That the husk consists of two layers can also be seen on the normal fruit, for at the apex the outer layer which is formed by the prophylls leaves a small opening in which can be seen the inner smooth layer with the minute calyx-lobes.

We have to conclude, therefore, that the abnormal development of these fruits is due to the retarded growths of the bracts which form the outer layer of the husk and is caused either by insufficient nourishment or some other influence during or soon after the flowering time. Observation of the flowers of this tree during different stages of their development would probably lead to a clearer understanding of the cause of this abnormality.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM.[1]

Abies balsamea Mill. f. **angustata,** forma nova.

A typo recedit foliis minoribus 6–14 mm. longis valde congestis, et ramis ramulisque valde abbreviatis et confertis comam densam angustissime pyramidalem formantibus.

[1] Continued from vol. VII. p. 244.

MAINE: Sherman Point, near Camden, *Robert Ancill*, January 1, 1928, also a photograph taken in 1927 and preserved in the photograph collection of the Arboretum.

This handsome form differs from the type in its narrowly pyramidal habit; it forms a dense column gradually narrowed toward the apex with close-set whorls of much shortened branches; the branchlets are also very short and crowded and densely clothed with short ascending leaves which measure only ¼ to slightly over ½ in. in length. The original tree is about 15 m. (50 ft.) tall and 3.5 m. through at the base; it stands fairly isolated surrounded by rather low deciduous trees. Scions have been received at the Arboretum for propagation and have been grafted on stock of *A. balsamea*.

Abies Fraseri Poir. f. **prostrata,** forma nova.

A typo recedit habitu depresso tabulaeformi ramis horizontaliter patentibus.

Cultivated at the Arnold Arboretum under no. 18131 received in 1925 from Wyman's Framingham Nurseries. Specimens in herbarium coll. Nov. 18, 1926.

This form may be considered a parallel form to *A. balsamea* var. *hudsonia* Sarg. It forms a low depressed bush with flattened top and wide-spreading branches. The leaves do not differ from those of typical *A. Fraseri*, and by their broader stomatic bands with 8–12 lines of stomata in each band, this form is easily distinguished from *A. balsamea* var. *hudsonia*. The largest plants in Wyman's Framingham Nurseries, Framingham, Mass., where this form was first observed about twenty-five years ago among seedlings of *A. Fraseri* received from a French nursery, are about 0.75 m. high and 1.75 cm. in diameter.

Hamamelis vernalis Sarg. f. **carnea,** forma nova.

A typo recedit petalis et sepalis intus pallide carneis, foliis subtus praesertim ad nervos dense tomentellis vel subtomentosis ut in f. *tomentella*.

Cultivated at the Arnold Arboretum under no. 18886. Specimens in herbarium: September 6, 1918, April 3, 1920 and March 16, 1927, *Alfred Rehder*.

This new form stands out in spring distinct from the other shrubs of this species on account of its red flowers; the other five plants of this species including f. *tomentella* Rehd. have the petals pale yellow or only slightly red toward the base. The plant we consider typical f. *tomentella* has pure yellow petals and the inside of the sepals slightly tinged red. The flowers of *H. vernalis* and its forms are very fragrant and on sunny and warm days fill the air for quite a distance with a delicious perfume.

Aesculus parviflora Walt. f. **serotina,** forma nova.

A typo recedit circiter 15 ad 20 diebus tardius florendo et foliis subtus sparse pubescentibus vel glabrescentibus et manifestius glaucescentibus.

Cultivated: Arnold Arboretum, under no. 12514 (raised from seed collected in 1919 by T. G. Harbison near Birmingham in Alabama). Specimens in herbarium: August 8, 1925; Durand-Eastman Park, Rochester, N. Y., August 3, 1922 (spikes 55 cm. long); Hort. Hodenpyl, Locust Valley, Long Island, N. Y., August 23, 1927 (nearly past blooming).

This form has attracted our attention since 1924 on account of its flowers appearing so much later than the common form; it blooms here in the first half of August while the typical form flowers about the middle of July. It further differs in the slight pubescence and the more glaucous color of the under side of the leaves, while all the other specimens in this herbarium, spontaneous and cultivated, have the under side of the leaves covered by a rather dense and soft grayish pubescence except in two spontaneous specimens collected by T. G. Harbison near Birmingham, Alabama, which agree with the cultivated specimens described above and are probably identical, as the seed from which this late flowering form was raised came from Birmingham; Harbison's flowering specimen was collected on June 23, but the blooming time of the species in a locality so far south does not permit comparison with the time of flowering in the north. This new form prolongs considerably the flowering season of *Aesculus parviflora* which is one of our most conspicuous summer-blooming shrubs and it is therefore a welcome addition to our late flowering shrubs of which we have not too many.

Stewartia koreana Nakai in sched. apud Rehder in Jour. Arnold Arb. VII. 242 (1926).

Descriptioni adde: Flores albi, 7–7.5 cm. diam.; pedicelli in axillis foliorum inferiorum, 1.5 cm. longi, glabri, satis robusti; bractea exterior triangulari-ovata, acuta, 4 mm. longa, fere glabra interior suborbicularis, mucronulata, 5–7 mm. lata, extus minute pubescentia, ciliata; sepala 5, suborbicularia, circiter 1 cm. longa, denticulata denticulis aristatis, extus dense sericea, ciliata; petala 6, patentia, circiter 3.5 cm. longa, exteriora leviter concava, medio virescentia, exteriora fere plena candida, omnia margine undulato-crenulata, extus margine excepto dense sericea; stamina indistincte pentadelphia, filamentis albidis; ovarium longe et satis dense pilosa; styli 5, rubescentes, quarta parte superiore excepta connati, staminibus paullo breviores.

When the description of this new species was published in the autumn of 1926 no flowering material was available, but since then the plants introduced from Korea by Mr. Wilson flowered at the end of July last year and the description given in 1926 can now be supplemented by the description of the flowers based on a specimen collected on July 27, 1927, from a plant cultivated in the Arnold Arboretum under no. 11440; this plant was raised from seed of Wilson's no. 9596. The flower does not differ much from that of *S. pseudocamellia* Maxim. except that it is somewhat larger and flatter, not cup-shaped and therefore more conspicuous and showy.

NOTES

Illustrations of Chinese plants. Under the title "Icones plantarum sinicarum" the first fascicle of a work containing illustrations of Chinese plants is issued by the Department of botany of the National Southeastern University at Nanking.[1] It is edited by H. H. Hu and W. Y. Chun and dedicated to Charles Sprague Sargent, the late director of the Arnold Arboretum. The fifty plants described and figured are, with the exception of the three last numbers, all woody plants. The clear and well printed text consists of descriptions in English and Chinese with citations of literature and synonymy, notes on the distribution and habitat, on prominent characters and the economic uses if any. The large folio plates represent faithful drawings of flowering or fruiting branches or both in natural size with analytical figures. Most of the plants figured are well known species, but the following are figured here apparently for the first time: *Torreya Jackii* Chun, *Alnus Jackii* Hu, *Fortunearia sinensis* Rehd. & Wils., *Halesia Macgregorii* Chun, *Symplocos Chunii* Merr., *Lilium cathayanum* Wils. and *Zephyranthes Tsoui* Hu, the last named published here as a new species. The publication is highly creditable to its authors and we sincerely hope that other issues will follow soon and, if we may express a wish, will be devoted chiefly to Chinese plants not yet or only inadequately figured.

It may not be amiss to state here that the authors of the three first modern botanical works, of which this is one, written and published by Chinese botanists received their training at Harvard University and chiefly at the Arnold Arboretum, the two other publications "Catalogue of trees and shrubs of China," by H. H. Chung, and "Chinese economic trees," by W. Y. Chun having been prepared almost wholly at this Arboretum.—A. R.

Trees and Shrubs at Westonbirt.[2] Under this title the Arnold Arboretum recently received a sumptuous catalogue of the plants growing in the arboretum of the late Sir George Holford at Westonbirt, Gloucestershire, England. The volume is printed on most excellent paper and contains sixty-six collotype plates. It is gotten up in exquisite taste, does justice to its subject and is a credit to its compiler, Mr. A. B. Jackson, and to all concerned.

From the preface we learn that "for nearly a century tree planting has gone on at Westonbirt almost without interruption, and the skill and enthusiasm of two generations have achieved such a result that the visitor may wander over five hundred acres of arboretum and woodland and find at every few steps a new tree to admire."

[1] Icones plantarum sinicarum. Edited by Hsen-Hsu Hu and Woon-Young Chun. Department of Botany, College of Agriculture, Southeastern University, Nanking, China. 50 pp. 50 pl. F. Commercial Press, Ltd., Shanghai, China, 1927.

[2] Catalogue of the Trees & Shrubs in the Collection of The Late Lieut-Col. Sir George Lindsay Holford, K.C.V.O., C.I.E., C.B.E., Compiled by A. Bruce Jackson, A.L.S., 4°. VII. 205 pp. 66pt.

The Westonbirt Arboretum contains a very complete collection of Silver Firs. One of the most successful is *Abies grandis* Lindl., native of northwest America. As showing the extraordinary rapidity of growth of this species we are told that "a tree moved into a sheltered position less than forty years ago is now 106 feet high by 7 feet 9 inches in girth of trunk." There are also handsome specimens of *A. Lowiana* Murr. native of the Pacific slope. An illustration shows of one of these trees, 77 feet tall by 7 feet in girth of trunk and branches flat on the ground; another is mentioned as being 91 feet tall with a trunk 8 feet 5 inches in girth. The tallest Silver Fir in the Arboretum is a specimen of *Abies pectinata* D.C., which is 106 feet tall with a trunk 10 feet 7 inches in girth. Mention may also be made of a good specimen of the Algerian *A. numidica* De Lanney, which is 49 feet 2 inches tall and 4 feet 2 inches in girth of trunk.

The European Yew (*Taxus baccata* L.) is one of the features of Westonbirt and we are told that "Sir George Holford's father with admirable foresight put a girdle of this Yew around the arboretum with such skill that each specimen group of trees and shrubs now stands against a perfect background." The arboretum is particularly rich in the trees and shrubs of North America and of China and Japan. Maples are favorites and we note that no fewer than seventy-two species and varieties are listed in the catalogue. Among them two specimens of the Sugar Maple (*Acer saccharum* Marxh.) respectively 74 and 60 feet tall, are probably the finest in England. The Sugar Maple is extremely rare in the British Isles, where, for some reason or another, it does not flourish.

Another group well represented is Oaks, of which forty-three species and varieties are enumerated. We note a tree of the American White Oak (*Quercus alba* L.) 30 feet tall and again probably the finest example of a tree, very rare in British gardens.

It is sad to know that Sir George Holford did not live to see the completion of this catalogue on which he labored so diligently. His loss to dendrology is great, and those who knew Westonbirt and its courteous owner will deeply miss the presence of a gallant English gentleman.—E. H. W.

The Library.—Of the volumes accessioned during the three months November 15, 1927–February 15, 1928, the most interesting from the point of view of the collector is a volume of Thomas Nuttall's "Original drawings, botanical subjects". The plates are the originals of those in his "North American sylva," but differ slightly from the published ones, as in the case of mountain ash where the fruit cluster is much diminished, while in others the position of details and color are changed. A few of the plates bear the names of French, Butler, Long, West, and Gamble as artists which may indicate that Nuttall had some help; his manuscript notes indicating changes, probably for the engraver, do not in all cases seem to have been carried out. The type-written sheet accompanying the plates reads:—"Thomas Nuttall naturalist, born Settle Yorkshire,

England 1786. He traveled extensively throughout America, even to the Pacific Coast, became Professor of Natural History in Harvard 1822, and curator of the Botanical Gardens 1828, returned to England in 1842 and died in St. Helen's, Lancashire 1859. He contributed articles to many periodicals and published several books on Birds, Botany and American Travel. This case holds over 50 of his Original Drawings of Botanical Subjects mostly Western Specimens with notations in his handwriting, nearly all hand colored. Elias Durand said of him 'no other explorer of the Botany of North America has personally made more discoveries, no writer on American Plants except perhaps Professor Asa Gray has described more Genera and Species'."

Another important addition is R. B. Hough's "American woods, a collection of actual specimens" in 13 volumes containing 987 wood specimens showing the beautiful and varying colors and structure of 325 different woods, in almost transparent sections, transverse, radial and tangential. A fourteenth volume is in preparation.

A little book of eight pages is "Vegetabilium cum animalibus comparatio. Upsaliae. 1737". Privately printed in facsimile by B. D. Jackson, with bibliographical note, "the author being the famous Lars Rôberg (1664–1742); it is noteworthy for an early citation of the first edition of the 'Systema Naturae', published at Leyden in December, 1735, nearly two years before".

"Chase fruit and flowers in natural colors" published by Chase Brothers Company of Rochester, and gift of the publishers is unique in the group of nursery catalogues, its exquisitely colored plates resembling very closely those published by the New York Agricultural experiment station, to whom they acknowledge indebtedness for much assistance.

"Boskoop, in its historical development as a centre of nurseries," an oblong large octavo, with colored plates, is another nursery catalogue on a magnificent scale.

Among other accessions are:—E. Silva Tarouca, "Unsere freiland stauden," 1927; V. A. Rybin, "Über anatomische merkmale im fruchtbau verschiedener apfelsorten," 1925, and E. L. Wolf, "Coniferous trees and shrubs in regions of the Soviet Republic in Europe and Asia," 1925. (Both works in Russian and gifts of the authors); A. B. Jackson, "Catalogue of the trees and shrubs in the collection of the late Lieut-Col. Sir George Lindsay Holford," 1927; W. D. Prior, "Roses and their culture," 1892; Mary V. Walcott, "North American wild flowers," vol. 3, 1925 (Gift of Mrs. L. A. Frothingham); J. Dravnieka, "Anglu-latvju vardnica" [English-Latvian dictionary], 1924; Eleanour S. Rohde, "Garden-craft in the Bible, and other essays," 1927; Takenoshin Nakai; "Flora sylvatica koreana," pt. xvi, 1927; E. H. M. Cox, "Farrer's last journey to Upper Burma, 1919–20," 1926; G. C. Druce, "The flora of Buckinghamshire," 1926; "*Revue de botanique appliquée & d'agriculture coloniale*," 1921–26; M. Büsgen and E. Münch, "Bau und leben unserer waldbäume," 1927;

D. J. Browne, "The trees of America, native and foreign," 1857 (Gift of Mr. Samuel Henshaw); J. V. Suringar, "Contributions à l'étude des espèces du genre Melocactus des Indes Néerlandaises Occidentales," 1901 (Gift of the author); Kôki Masui, "A study of ectotrophic Mycorrhiza," 1926, and "The compound Mycorrhiza of Quercus," 1926 (Gifts of the author); "*American gardening*," vol. 18–25, 1897–1904, and "*Gardener's magazine*," vol. 34–40, 42–50, 1891–97, 1899–1907 (Gifts of Bussey Institution); Vicary Gibbs, "Taxaceae at Aldenham and Kew," 1926 (Gift of the author); E. P. Phillips, "Genera of South African flowering plants," 1926; H. H. Hu, and W. Y. Chun, "Icones plantarum sinicarum," fasc. i, 1927, an important work of especial interest as the result of work done at the Arboretum and dedicated to Professor C. S. Sargent. (Gift of the authors); and "Union list of serials in the libraries of the United States and Canada," edited by Winifred Gregory, an imposing and invaluable work of reference.—E. M. T.

MALUS TRANSITORIA Schneider
Tree 7 meters tall, on the bank of the Tao ho at Choni ku, Kansu

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME IX JULY, 1928 NUMBERS 2 & 3

ENUMERATION OF THE LIGNEOUS PLANTS COLLECTED BY J. F. ROCK ON THE ARNOLD ARBORETUM EXPEDITION TO NORTHWESTERN CHINA AND NORTHEASTERN TIBET[1]

ALFRED REHDER AND ERNEST H. WILSON

Plates 12 and 13

ULMACEAE

Determined by A. REHDER

Ulmus pumila Linnaeus, Spec. 226 (1753).—Planchon in De Candolle, Prodr. XVII. 159 (1873).—Schneider in Sargent, Pl. Wilson. III. 242 (1916), with full citation of literature and synonyms.—Chun, Chin. Econ. Trees, 108, t. 40 (1923).

SOUTHWESTERN KANSU. Tao River Basin: beyond Pi kou, along river, alt. 900 m., no. 12089, April 1925 (tree 6 m.).

NORTHWESTERN KANSU: Richthofen range and adjacent region: rocky gorge, opposite He yo tung, Liyüanku, no. 13324, Nov. 1925 (tree 18–24 m. tall, with large trunk, spreading crown and ascending branches; common at foot of Nanshan).

Celtis Bungeana, Blume, Mus. Bot. Lugd.-Bat. II. 71 (1852).—Planchon in De Candolle, Prodr. XVII. 171 (1873).—Schneider in Sargent, Pl. Wilson. III. 269 (1916), with full citation of literature and synonyms.

CENTRAL KANSU. Lien hoa shan: alt. 2750 m., no. 13503, Oct. 1925 (tree 18–24 m. tall, trunk 90 cm. diam.; fruit black).

Zelkova sinica Schneider in Sargent, Pl. Wilson. III. 286 (1916).—Rehder in Jour. Arnold Arb. IV. 172 (1923).

SOUTHERN KANSU: beyond Pi kou on banks of Wen hsien ho, no. 12078, April 1925 (shrub 1.20 m. tall).

MORACEAE

Determined by A. REHDER

Ficus Baileyi Hutchinson in Bailey, Gent. Herb. I. 19, fig. 4 B, C (1920).

NORTHEASTERN YUNNAN: near Laoyatan, alt. 900 m., no. 12006, Jan. 1925 (pendent shrub).

[1] Continued from p. 27.

URTICACEAE

Determined by A. REHDER

Debregeasia longifolia Weddell in De Candolle, Prodr. XVI. pt. I. 235[24] (1869).—Schneider in Sargent Pl. Wilson. III. 313 (1916), with full citation of literature and synonyms.

WESTERN SZECHUAN: gorge along the Fukiang, north of Kiang yu, alt. 1200 m., no. 12022, March 1925 (shrub 1.2 m.).

From typical *D. longifolia* this specimen differs in the slight appressed pubescence of the branchlets and in the leaves being glabrescent above and in this respect resembles *D. edulis* Wedd. from Japan.

LORANTHACEAE

Determined by A. REHDER

Loranthus europaeus Jacquin, Enum. Stirp. Vindob. 230, t. 3 (1762).—Beck in Reichenbach, Icon. Fl. Germ. XXIV. 4, t. 142 (1900).—Rehder in Jour. Arnold Arb. IV. 178 (1923).

SOUTHWESTERN KANSU. Lower Tebbu country: in Mayaku, alt. 2300 m., no. 14750, Sept. 5, 1926.

Though this species has a wide distribution, it seems to be very rare in central and eastern Asia.

POLYGONACEAE

Determined by A. REHDER

Polygonum Auberti L. Henry in Rev. Hort. 1907, 82, fig. 23, 24.—Schneider in Sargent, Pl. Wilson. III. 457 (1917).

CENTRAL KANSU: en route to Lien hoa shan, alt. 2750 m., no. 12757, July 14–20, 1925 (woody climber; flowers cream-colored).

This species had not been collected in Kansu before. It was first collected in 1899 by the French missionary Georges Aubert near Tachien lu and introduced by him into cultivation and was collected again at the same locality by E. H. Wilson in 1908.

CHENOPODIACEAE

Determined by A. REHDER

Eurotia ceratoides C. A. Meyer apud Ledebour, Fl. Alt. IV. 239 (1833).—Moquin-Tandon in De Candolle, Prodr. XIII. pt. II. 120 (1849).—Beck in Reichenbach, Icon. Fl. Germ. XXIV. 148, t. 273 (1900–1909).

EASTERN TIBET. Grasslands between Labrang and Yellow River: on loess banks between Kongwar and Kachiassu, alt. 2750 m., no. 14545, August 5, 1926 (flowers greyish pink). Kokonor Region: rocky dry slopes between Bamba and Tankar, alt. 3050 m., no. 13389, Sept. 1925 (shrub 60–90 cm.); dry gulch in Peitatung valley, below Peitatung, alt. 2900 m., no. 13703, Oct. 1925 (shrub).

RANUNCULACEAE

Determined by A. REHDER

Clematis lasiandra Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 213 (1876); in Mél. Biol. IX. 586 (1876).—Rehder & Wilson in Sargent, Pl. Wilson. I. 323 (1913).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2300 m., nos. 14683 and 14707, Sept. 1 and 3, 1926 (climber over shrubs and trees; flowers purple).

Clematis aethusifolia Turczaninow in Bull. Soc. Nat. Moscou, v. 181 (1832).—Rehder in Jour. Arnold Arb. IV. 190 (1923).

SOUTHWESTERN KANSU. Tao River basin: among limestone rocks back of Choni, alt. 2600 m., no. 12867, July 1925 (flowers whitish); Kadjaku valley, among scrub along road, no. 13141, July 1925 (climber woody at base; flowers yellowish). Lower Tebbu country: gravelly rocky banks of Peshwekiang, alt. 2050 m., no. 14557, Aug. 30, 1926 (climber; flowers greenish yellow;) loess slopes, Wantsang ku, alt. 2150 m., no. 15008, Sept.–Oct. 1926 (climber; fruits white).

Clematis macropetala Ledebour, Icon. Pl. Fl. Ross. 5, t. 11 (1829).—Rehder in Jour. Arnold Arb. IV. 192 (1923).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, south of Choni, in forests, alt. 2750 m., no. 12560, June 1925 (flowers rich lavender purple); in crevices of limestone walls along Tao river between Tatzuto and Lupassu, west of Choni, alt. 2550 m., no. 12524 June 1925 (flowers bluish purple).

Clematis gracilifolia Rehder & Wilson in Sargent, Pl. Wilson. I. 331 (1913).

SOUTHWESTERN KANSU. Tao River basin: Choni, alt. 2600 m., no. 12164, June 1925 (climbing over shrubs; flowers white with pinkish tinge); Taoho watershed, Choni, alt. 2750 m., no. 12294, June 1925 (climber of bushes in scrub forest, usually associated with Berberis); Minshan range, valley of Kadjaku beyond Tatsuto, alt. 3000 m., no. 12428, June 1925 (woody climber; flowers purplish white); Tatsuto, Kadjaku, alt. 2600 m., no. 12469, June 1925 (festooning shrubs; flowers white, purplish beneath).

The specimen under no. 12164 has much larger leaves than the typical form, the lateral leaflets being up to 2, the terminal up to 3 cm. long, and the flowers are up to 4 cm. in diameter, also no. 12428 has flowers of the same size but small leaflets like those of the typical form.

Clematis brevipes Rehder, sp. nov.

Frutex scandens ramis subteretibus sulcatis glabris, junioribus initio satis dense adpresse albido-villosis; gemmae perulis exterioribus adpresse pubescentibus costa carinata glabrescente excepta, interioribus villosis. Folia pinnata, plus minusve cirrhosa, pedunculo 4–5 cm. longo incluso

circiter 10 cm. vel ultra longa, bijuga, initio praesertim ad petiolum et rachin laxe villosa, mox glabrescentia; foliola triangulari-ovata, circiter 3–4.5 cm. longa, petiolulo 5–10 mm. longo, trilobata lobis abrupte acutis, terminali acuminato, integris vel lateralibus extus dente uno instructis et medio saepissime dentibus duobus praedito, maturitate glabra. Flores in axillis foliorum inferiorum ramulorum lateralium solitarii, par infimum in axillis bractearum basalium, 3.5–4 lati, flavido-albi, simul cum foliis; pedunculi erecti, 1.5–2.5 cm. longi, uniflori, laxe villosi, infra medium vel ad basin bracteis duobus lanceolatis 3–4 mm. longis praediti; sepala 4, patentia, ovalia, 1.5–2 cm. longa et 12–15 mm. lata, apice rotundata, tenuia, extus parce villosula, non marginata; stamina subaequalia, dimidiam partem sepalorum circiter aequantia, filamentis linearibus apicem versus attenuatis medio ad 1 mm. latis glabris quam antherae lineari-oblongae 2 mm. longae circiter quater longioribus; carpella staminibus paullo longiora, stylo plumoso, ovariis dense sericeo-villosis. Fructus maturi desiderantur.

SOUTHERN KANSU: between Kaichow and Minchow, no. 12075, April 1925 (climber; flowers cream-colored).

This new species is similar to *C. Fargesii* Franch. which differs, however, in its glabrous achenes, in the bipinnate leaves and in the usually 3-flowered long-stalked cymes borne in the axils of the middle or upper leaves. The presence of flowers in the axils of the basal bracts indicate some affinity to the group *Montanae*, which has the flowers in axillary clusters on branches of the previous season; in its leaves the new species resembles closely *C. gracilifolia* Rehd. & Wils., a member of this group, except that the leaves of the latter are much smaller.

Clematis Fargesii Franchet in Jour. de Bot. VIII. 273 (1894).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 523 (1903); Contrib. Fl. As. Or. I. 8 (1905).

SOUTHWESTERN KANSU. Tao River basin: in forest of Spruce hills, west of Choni, alt. 3000 m., no. 12886 July 1925 (flowers white); grassy slopes of Maerhku valley and in Spruce forests, alt. 3000 m., no. 12948, July 1925 (woody climber covering Willow bushes; flowers large, white); Maerhku, east Minshan, among shrubs in Picea forest, alt. 2900 m., no. 13624, Sept.–Oct. 1925 (woody climber.)

Clematis hastata Finet & Gagnepain in Bull. Soc. Bot. France, L. 52 t. 16 (1903); Contrib. Fl. As. Or. I. 12, t. 16 (1905).

WESTERN SZECHUAN: near Ching chuan, along Fu kiang River, no. 12037, April 1925 (woody climber; flowers white).

This species was first collected by Farges in eastern Szechuan near "Tchen-kéou" and is known to me only from the original description and figure. Rock's specimen which was collected in southern central Szechuan agrees well with the description and the figure except that the sepals are oblong rather than lanceolate and rounded at apex and the filaments about twice as long as the anthers, but this difference may be due to the fact that in Farges' specimen the flowers were just opening, while Rock's specimen is almost out of bloom with only a few sepals and a few stamens still clinging to the heads of the young fruits.

Clematis Armandi Franchet in Nouv. Arch. Mus. Paris, sér. 2, VIII. 184, t. 2 (Pl. David. II. 2) (1885).—Sprague in Bot. Mag. CXL. t. 8587 (1914).

WESTERN SZECHUAN: beyond Kiang yu, north Szechuan no. 12009, March 1925 (woody climber over shrubs on rocky slopes).

Clematis fruticosa Turczaninow in Bull. Soc. Nat. Moscou, v. 180 (1832).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 537 (1903); Contrib. Fl. As. Or. I. 22 (1905).

Clematis fruticosa α. viridis Turczaninow in Bull. Soc. Nat. Moscou, v. 180 (1832).

Clematis fruticosa β. lobata Maximowicz, Enum. Pl. Mongol. 3 (1889).

SOUTHWESTERN KANSU. Lower Tebbu country: gravelly banks and slopes of Peshwekiang, alt. 2300 m., no. 14566, August 29, 1926 (erect shrub 60–90 cm.; flowers dark yellow, grayish outside, drooping); loess slopes in valley of Chulungapu, alt. 2450 m., no. 15007, Sept.–Oct. 1926 (shrub about 1 m.; fruit golden yellow).

Clematis fruticosa var. **β. canescens** Turczaninow in Bull. Soc. Nat. Moscou, v. 180 (1832).

Clematis fruticosa Maximowicz, Enum. Pl. Mongol. 2 (1889), sensu str.

NORTHWESTERN KANSU: northern slopes of Richthofen range in dry rocky gorge, near entrance and in Liyüanku, en route to Kanlungssu, no. 13322, Nov. 1925 (erect shrub 60–90 cm.).

Rock's specimens of no. 13322 are leafless or nearly so, but a few partly broken leaves show that it belongs to the form with entire leaves which Maximowicz considered the type of the species. Turczaninow, however, when distinguishing two forms of his new species places the form with dentate leaves under α and that with entire leaves under β, thus making the former the type of the species.

Clematis nannophylla Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 305 (1877); in Mél. Biol. IX. 707 (1887); Fl. Tangut. 2, t. 1, figs. 1–9 (1889).

CENTRAL KANSU. Yellow River basin: sandstone cliffs and loess banks, barren ravines, between Tao shan and Lanchow, alt. 1830 m., no. 13231, Aug. 1925 (small shrub 30–50 cm.; flowers yellow); loess ravines near Lanchow, alt. 1525 m., no. 13242, August 1925 (shrub 60–90 cm.; flowers yellow).

In the specimens under no. 13242 the branchlets are 3–5-flowered, not 1-flowered as originally described by Maximowicz and the leaves partly resemble those of *C. fruticosa* Turcz. except that they are very much smaller, while in no. 13231 the branchlets are 1–3-flowered and the leaves partly approach those of var. *foliolosa* Maxim.

Clematis brevicaudata De Candolle, Syst. I. 138 (1818).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 533 (1903); Contrib. Fl. As. Or. I. 18 (1905).

SOUTHWESTERN KANSU. Tao River basin: in forests of Kadjaku and Tao valley, alt. 2750 m., no. 13137, July 1925 (woody climber;

flowers dark cream-colored to yellow). Lower Tebbu country: Peshwekiang valley, alt. 2300 m., no. 14569, Aug. 29, 1926 (climber over shrubs; flowers cream-colored). Upper Tebbu country; Yiwaku, along stream, Drakana, alt. 2750 m., 14632, August 22, 1926 (flowers yellowish).

CENTRAL KANSU. Lien hoa shan: lower slopes, alt. 2750 m., no. 13614, Sept.–Oct. 1925 (woody climber; flowers white).

NORTHWESTERN KANSU. Richthofen range and adjacent region: at foot of Loyui shan, near Sincheng, alt. 2750 m., no. 13308, Oct. 1925 (woody climber over Berberis bushes).

Clematis Gouriana Roxb. var. **Finetii** Rehder & Wilson in Sargent, Pl. Wilson. I. 339 (1913).

SOUTHWESTERN KANSU. Lower Tebbu country: dry valley slopes of Peshwekiang near Wantsang monastery, alt. 2000 m., no. 14733 Sept. 2, 1926 (climber over Berberis).

Neither the species nor its var. *Finetii* had been recorded from Kansu before.

Clematis glauca Willd. var. **akebioides** Rehd. & Wils. f. **phaeantha** Rehder in Jour. Arnold Arb. I. 195 (1920).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, in Willow bushes, alt. 2750 m., no. 12964, July 25, 1925 (climber; flowers purplish brown).

CENTRAL KANSU: en route to Lien hoa shan, along stream banks, alt. 2750 m., no. 12756, July 14–20, 1925 (flowers purple and yellow).

Clematis tangutica Korsh. var. **obtusiuscula** Rehder & Wilson in Sargent, Pl. Wilson. I. 343 (1913).—Chittenden in Jour. Roy. Hort. Soc. XLVII. 193, fig. 49 (1922).

CENTRAL KANSU. Lien hoa shan: lower slopes, alt. 2750 m., no. 13615, Sept.–Oct. 1925 (woody climber; fruiting heads 7.5 cm. in diameter).

EASTERN TIBET. Radja and Yellow River gorges: climbing over rocks on banks of Yellow River near Radja, alt. 3050 m., no. 14037, May 28, 1926 (flowers yellow); back of Radja, alt. 3050 m., no. 14124, June 1926 (climber over Lonicera bushes and rocks). Kokonor Lake: alt. 3350–3650 m., no. 13277, Sept. 1925 (erect shrub 60–90 cm., not prostrate; fruiting heads pinkish purple).

The erect shrubby habit of Rock's no. 13277 from Kokonor Lake is apparently caused by the fact that the stems are dying partly back during the severe winter at that high altitude but the leaves still retain their cirrhose habit.

LARDIZABALACEAE

Determined by A. REHDER

Akebia quinata Decaisne in Arch. Mus. Paris, I. 195, t. 13a (1839).—Siebold & Zuccarini, Fl. Jap. I. 145, t. 77 (1841).—Rehder & Wilson in Sargent, Pl. Wilson. I. 347 (1913), with full citation of literature and synonyms.

WESTERN SZECHUAN: gorge of Fukiang River, in company with no. 12021, no. 12024, March 1925 (woody climber forming dense masses over rocks and shrubs; flowers dark red).

The species does not seem to have been recorded from Szechuan before. The leaves of Rock's Szechuan plant are persistent and bear occasionally 6–8 leaflets instead of the normal 5; usually they are deciduous or half-evergreen with only a few persisting occasionally until the following spring.

Akebia trifoliata Koidzumi in Tokyo Bot. Mag. XXXIX. 310 (1925).

Clematis trifoliata Thunberg in Trans. Linn. Soc. II. 337 (1794).

Akebia lobata Decaisne in Arch. Mus. Paris, I. 196, t. 13b (1839).—Hooker f. in Bot. Mag. CXXII. t. 7485 (1896).

WESTERN SZECHUAN: mountains south of Ching chuan, alt. 1500 m., no. 12028, March 1925 (woody climber, flowers dark red).

BERBERIDACEAE

Determined by J. T. P. BYHOUWER

Berberis Soulieana Schneider in Bull. Herb. Boiss, sér. 2, v. 449 (1905); in Sargent, Pl. Wilson. I. 361 (1913); III. 437 (1917); in Oesterr. Bot. Zeitschr. LXVII. 137 (1918).—Rehder in Jour. Arnold Arb. v. 138 (1924).

Berberis stenophylla Hance in Jour. Bot. XX. 257 (1882).—Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 44 (1905).—Non Lindley.

Berberis Wallichiana Hemsley in Jour. Linn. Soc. XXIII. 32 (1886).—Maximowicz in Act. Hort. Petrop. XI. 42 (1890).—Diels in Bot. Jahrb. XXIX. 341 (1900), quoad specimen coll. a Piasezki.—Non De Candolle.

Berberis levis Schneider in Bull. Herb. Boissier, sér. 2, VIII. 198 (1908), quoad specimina e Shensi et synonyma citata.—Non Franchet.

WESTERN SZECHUAN: north of Kiang-yu on banks of Fu Kiang, alt. 800 m., no. 12010, March 1925 (shrub 1.5–1.8 m.).

Berberis diaphana Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 309 (1876); in Mél. Biol. IX. 712 (1877); Fl. Tangut. 32, t. 8, fig. 1–7 (1889); in Act. Hort. Petrop. XI. 42 (1890).—Hemsley in Jour. Linn. Soc. XXIII. 31 (1886).—Kanitz in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 681 (1898).—Schneider in Bull. Herb. Boissier, sér. 2, v. 398 (1905); VIII. 195 (1908).—Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 44 (1905)—Rehder in Sargent, Trees & Shrubs, II. 19, t. 109 (1907); in Jour. Arnold Arb. v. 139 (1924).

SOUTHWESTERN KANSU. Tao River basin: Tayüku, east Tebbu land, alt. 3000 m., no. 13525, Oct. 1925 (shrub 1.2–1.8 m.; fruit pale yellow to red); mountains near Adjüan, east Tebbu land, alt. 3200 m., no. 13529, Oct. 1925; Kadjaku, west Tebbu land, in Picea forest, alt. 2900 m., no. 13574, Oct. 1925 (shrub 1.2–1.5 m.; fruit red, single, turbinate); ridges west of Adjüan, alt. 3000 m., no. 12634, July 6–10, 1925 (shrub 1.2–1.5 m.; flowers yellow).

CENTRAL KANSU: Lien hoa shan: alt. 2900 m., no. 13474, Oct. 1925 (shrub 1.5–1.8 m., globose in appearance).

EASTERN TIBET. Radja and Yellow River gorges: outskirts of Spruce forest on slopes of mountain south of Yellow River, facing northward towards Radja, alt. 3200 m., no. 14108, June 10, 1926 (shrub 1.2–1.5 m., spines straw color, long; flowers yellow, single); conglomerate gorges back of Radja, alt. 3200 m., no. 14115, June 10, 1926 (shrub 1.8–2.4 m.). Alpine region between Radja & Jupar range: near Radja among conglomerates, alt. 3200 m.,

no. 14100, June 6, 1926 (shrub 1.2 m.; flowers single yellow). Kokonor Region: Koko gorge, no. 13263, Sept. 1925 (shrub 1.5–2.4 m., spines large; fruit yellow and red and asymmetrical at apex & base); Koko gorge, no. 13272, Sept. 1925 (shrub 1.5–2.4 m., spines thick; fruits oval, single); Lalaku gorge, alt. 3400 m., no. 13273, Sept. 1925 (shrub 1.2–1.8 m.; fruits single, on long pedicels).

Of this species good material had been collected in Kansu by R. C. Ching, collector of the Wulsin expedition (nos. 432, 556 and 961).

Berberis parvifolia Sprague in Kew Bull. Misc. Inform. 1908, p. 445.—Schneider in Sargent, Pl. Wilson. III. 436 (1917); in Oesterr. Bot. Zeitschr. LXVII. 296 (1918).—Rehder in Jour. Arnold Arb. v. 139 (1924).

SOUTHWESTERN KANSU: Tao River basin: Poyüku, alt. 2900 m., no. 13530, Oct. 1925 (shrub 0.9–1.2 m.); embankments of Tao between Choni and Poyüku, no. 13744, Dec. 1925 (shrub 0.3 m.; fruits red); Maerhku valley, Choni district, alt. 2800 m., no. 13564, Sept.–Oct. 1925 (shrub 0.9–1.2 m.; fruit red, in axillary, short racemes); on rocky slopes of Maerhku valley, alt. 2700 m., no. 12956, July 25, 1925 (shrub 0.6 m.; flowers yellow); along river, near Choni, alt. 2600 m., no. 12797, June–July 1925 (shrub 0.6 m.; flowers yellow); valley back of Choni, en route to new city, no. 13745, Dec. 1925 (shrub 0.3–0.6 m.); in dry scrub, arid valley north of Choni, no. 14911, Oct. 13, 1926 (fruit single or in short cymes of eight, brilliant red and semi-transparent when ripe).

This species had been collected in Kansu by Purdom (see Rehder l.c.) and R. C. Ching (Wulsin expedition, no. 845).

Berberis Caroli Schneider in Bull. Herb. Boissier sér. 2, v. 459 (1905).

Berberis integerrima var. *stenophylla* Maximowicz, Fl. Tangut. 29 (1889); in Act. Hort. Petrop. XI. 41 (1890).

EASTERN TIBET. Ba valley: in dry arid loess ravines of lower valley, alt. 2850 m., no. 14362, July 1926 (shrub 2.4 m.; flowers yellow).

NORTHWESTERN KANSU. Richthofen range and adjacent region: Liyüanku, no. 13314, Nov. 1925 (shrub 1.2–1.5 m., with rambling drooping branches; fruits pale whitish pink).

These two specimens are intermediate between *Berberis Caroli* Schneid. and *Berberis Vernae* Schneid., but in the characters are nearer to *Berberis Caroli* Schneid.: inflorescence 15–20-flowered, pedicels 3–5 mm., fruiting pedicels 5–7 mm., fruits oblong, to 7 mm. long.

Berberis Vernae Schneider in Sargent Pl. Wilson. I. 372 (1913); in Möller's Deutsch. Gärtn.-Zeit. XXXV. 82, fig. (1917); in Oesterr. Bot. Zeitschr. LXVII. 218 (1918).

Berberis integerrima var. *stenophylla* Maximowicz, Fl. Tangut. 29 (1889), ex parte.

Berberis Caroli var. *hoanghensis* Schneider in Bull. Herb. Boissier, sér. 2, v. 459 (1905).

SOUTHWESTERN KANSU. Tao River basin: valley, Choni, in scrub forest, alt. 2600 m., no. 12271, June 1925 (shrub 1.2–1.5 m. tall; flowers small, in drooping racemes); Choni, alt. 2600 m., no. 14888,

Aug.–Sept. 1926 (shrub 3 m., forming large round clumps; fruit red, in short racemes); on loess bluffs at Laliku, alt. 2700 m., no. 14915, Oct. 20, 1926 (shrub 3 m., forming dense thickets; fruit globose, scarlet, in drooping racemes); Tatsuto, Kadjaku, alt. 2700 m., no. 13557, Oct. 1925 (shrub 1.5–1.8 m.; fruits ovoid, in short racemes, brilliantly red). Lower Tebbu country: Pezhu, banks of Peshwekiang, no. 14943, Oct. 1926 (shrub 1.2–1.8 m., forming clumps, branches slender, drooping; fruit red, in drooping racemes); undergrowth in groves of Juniperus, Populus, at Pezhu, Peshwekiang, alt. 2150 m., no. 14563, Aug. 1926 (shrub 1.8–2.4 m., long drooping branches; fruit brick red).

Western Kansu: between Hsining and Tankar, alt. 2700 m., no. 13256, Sept. 10, 1925 (shrub 0.9–1.2 m.; fruit tomato-red); foot of Loyni shan, near Sin cheng, north-east of Tankar, no. 13289, Oct. 1925 (shrub 1.5–1.8 m.; fruit in drooping racemes, red, transparent, juicy).

Northwestern Kansu. Richthofen range and adjacent region: Liyüanku, no. 13315, Nov. 1925 (shrub 1.5 m.; fruit red, in drooping racemes).

Berberis Silva-Taroucana Schneider in Sargent, Pl. Wilson. I. 370 (1913).—Hesse in Mitt. Deutsch. Dendr. Ges. XXII. 266 (1914).

Southwestern Kansu. Tao River basin: slopes of Laliku, on loess bluff overlooking river, alt. 2700 m., no. 14913, Oct. 19, 1926 (shrub 1.2 m.; fruit scarlet, in short sessile racemes); Adjüan, Taku, east Tebbu country, alt. 3000 m., no. 13522, Oct. 1925 (shrub 1.2–1.5 m.; fruits red); Tebbu country south of Minshan range, alt. 2950 m., no. 12473, June 1925 (shrub 1.5–1.8 m.; young leaves purple; flowers yellowish-red).

Berberis Silva-Taroucana was until now only known from western Szechuan; the material from Kansu differs from the type specimen only in the somewhat lighter branches.

Berberis Mouillacana Schneider in Sargent Pl. Wilson. I. 371 (1913).

Descriptioni adde: Inflorescentiae laxe racemosae, 1.5–2.5 cm. longae pedunculo nudo 4–10 mm. incluso, 2–9-florae, glabrae; flores flavi vel extus rubescentes, satis parvi (circiter 5–9 mm. diam.); pedicelli 3–6 mm. longi, basi bracteis acuminatis 1 mm. longis instructi; sepala interiora late ovata; petala sepalis interioribus aequilonga, obovata, glandulis oblongis instructa; stamina normalia; ovaria ovulis 2 sessilibus instructa.

Southwestern Kansu. Tao River basin: Maerhku, Minshan, alt. 2700 m., no. 14898, Aug.–Sept. 1926 (shrub 1.2–1.8 m.; fruit in small raceme, pedicels several times as long as peduncle); beyond Tatsuto in Spruce forest, alt. 2600 m., no. 12443, June 1925 (shrub 1.5–1.8 m. spines red, long; flowers yellow, tinged red); on loess hills, back of Choni, en route to Taochow, alt. 2500 m., no. 13202, Aug. 1925 (shrub 1.2 m.; fruit reddish, glaucous); river valley, among shrub of Berberis, Lonicera etc., on grassy slopes, alt. 2650 m., no. 12303, June 1925 (shrub 1.2 m.; leaves bright green; flowers yellow).

Probably the two following specimens also belong to *Berberis Mouillacana;* they differ, however, from the other material in having mostly narrower, oblong to oblanceolate leaves, shorter-peduncled, often nearly sessile umbel-like racemes and slightly longer pedicels (6–8 mm.).

SOUTHWESTERN KANSU. Tao River basin: northern bank between Choni and Kadjaku, alt. 2600 m., no. 12458, June 1925 (shrub 1.2–1.5 m.; flowers yellow, on slender red pedicels); Minshan range, valley of Kadjaku beyond Tatsuto, alt. 3000 m., no. 12429, June 1925 (shrub 1.2–1.8 m.; flowers pale yellow).

This species was only known from western Szechuan; the material from Kansu has leaves with grayish-pruinose under surface, like part of the original material.

Berberis Boschanii Schneider in Sargent, Pl. Wilson. I. 369 (1913). Descriptioni adde: Folia margine integra vel supra medium dentibus brevibus 1–6 instructa. Inflorescentiae racemosae, pedunculatae pedunculis 7–10 mm. longis, 5–15-florae, glabrae, 1.5–2.5 cm. longae; flores flavae, parvae (circiter 4–7 mm. diam.); pedicelli 5–7 mm. longi, basi bracteis minutis 0.5–1 mm. longis instructi; sepala interiora late ovata, petala obovata, sepalis aequilongis, glandulis 2 normaliter instructa; stamina apice paullo apiculata, petalis breviora; ovaria ovulis 2 subsessilibus instructa.

SOUTHWESTERN KANSU. Upper Tebbu country: southern slopes of Minshan, alt. 2900–3200 m., no. 12513, June 1925 (shrub 1.2–1.5 m.).

NORTHWESTERN KANSU. Richthofen range and adjacent region: in Hung shui kou, on rocky slopes, north slopes of Richthofen range, east end, alt. 2850–2950 m., no. 13300, Oct. 1925 (shrub 0.9–1.2 m.; fruit dull waxy red); Liyüanku, no. 13316, Nov. 1925 (fruit red).

EASTERN TIBET. Radja and Yellow River gorges: alt. 3000 m., no. 13948, May 26, 1926 (shrub 1.2–1.5 m.); rocky slopes back of Radja, alt. 3300 m., no. 13920, May 20, 1926 (shrub 1.2 m.); along streambed and outskirts of Spruce forests in Dachso canyon, north of Radja, alt. 3200 m., nos. 14073 and 14079, June 2, 1926 (shrub 1.2–1.5 m.; flowers yellow). Kokonor Region: mt. of Hankar, Kokonor border, alt. 2850 m., no. 13274, Sept. 1925 (shrub 0.9–1.2 m.; fruit red, transparent); among limestone rocks, below Kettenika, east Kokonor, alt. 3000 m., no. 13366, Sept. 1925 (shrub 0.9 m.; fruit red); Koko gorge, no. 13261, Sept. 1925 (shrub 1.2–2.4 m.).

This species had been collected in Kansu by R. C. Ching, who accompanied the Wulsin Expedition (nos. 86 and 773).

Berberis dasystachya Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 308 (1877); in Mél. Biol. IX. 711 (1877); Fl. Tangut. 30, t. 5, fig. 1–7 (1889); in Act. Hort. Petrop. XI. 41 (1890).—Hemsley in Jour. Linn. Soc. XXIII. 3 (1886).—Kanitz in Szechenyi, Wiss. Ergeb. Reise

Ostas. II. 681 (1898).—Bretschneider, Hist. Eur. Bot. Discov. China, 971 (1898).—Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 43 (1905).—Schneider in Sargent Pl. Wilson. III. 442 (1917); in Oesterr. Bot. Zeitschr. LXVII. 287 (1918).

Berberis heteropoda var. *oblonga* Maximowicz in Act. Hort. Petrop. XI. 41 (1890).—Non Regel.

? Berberis dolichobotrys Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 41 (1905).

Berberis vulgaris var. *dasystachya* Voss in Putlitz & Meyer, Land-Lex. v. 709 (1913).

SOUTHWESTERN KANSU. Tao River basin: along streams of Tao river watershed, outskirts of Pine forest, no. 12207, June 1925 (shrub 1.2–1.5 m.; leaves pale green; flowers in racemes, yellow); alt. 2700 m., no. 13514, Oct. 1925 (shrub 2.1–2.4 m.; fruits crimson); river bank, Choni, alt. 2550 m., no. 12885, July 1925 (shrub 1.8–2.4 m.; flowers yellow); Tatsuto, Kadjaku valley in Pine and Picea forest, alt. 2750 m., no. 13561, Sept.–Oct. 1925 (shrub 1.8–3.0 m.; fruit red, in long drooping racemes); Kadjaku valley, outskirts of Pine forests, alt. 2600 m., no. 12465, June 1925 (shrub 3.0–3.6 m., very spiny; flowers in long drooping racemes, bright yellow); valley of Shiaoku, en route to Tebbu land, Mt. Lissedzadza, alt. 3000 m., no. 12808, July 1925 (shrub 1.2–1.5 m.). Lower Tebbu country: forests of Wantsang valley, alt. 2550 m., no. 14680, Sept. 1, 1926 (shrub 1.8–2.4 m.; leaf thin, dark green; fruit oblong, truncate). Upper Tebbu country: near Tongwa, southern Minshan, no. 12504, June 1925 (shrub 1.4–1.8 m.; flowers in drooping racemes).

WESTERN KANSU: summit ridges of Komang ssu, northeast of Tankar, alt. 3200 m., no. 13291, Oct. 1925 (resembles 13290 which see under *B. kansuensis*).

EASTERN TIBET. Kokonor Region: Koko gorge, no. 13262, Sept. 1925 (shrub 1.5–1.8 m.; leaf pale yellow; fruit elliptic, in erect racemes).

Berberis dasystachya Maxim. had not been found previously in Eastern Tibet.

Berberis brachypoda Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 308 (1877); in Mél. Biol. IX. 711 (1877); Fl. Tangut. 30, t. 7, fig. 8–13 (1889).—Hemsley in Jour. Linn. Soc. XXIII. 31 (1886).—Bretschneider, Hist. Eur. Bot. Disc. China, 995 (1898).—Schneider in Bull. Herb. Boissier, sér. 2, VIII. 262 (1908); in Oesterr. Bot. Zeitschr. LVII. 285 (1918).—Rehder in Jour. Arnold Arb. v. 142 (1924).

SOUTHWESTERN KANSU. Tao River basin: along river, east of Choni, alt. 2400 m., no. 12796, June–July 1925 (shrub 1.2–1.5 m., flowers in drooping spikes; leaves dull green); loess hills, alt. 2700 m., no. 14936, Oct. 20, 1926 (shrub 3.0–4.5 m., branches straight erect; fruit red, in hairy drooping racemes); west of Choni, in open outskirts of forests, alt. 2550–2700 m., no. 12181, June 1925 (shrub 1.2–1.5 m. with long stiff branches; drooping inflorescences); Poyuku, alt. 2700 m., no. 13545,

Sept.–Oct. 1925 (shrub 1.5–1.8 m.; leaves coriaceous; fruits small, globose, in short racemes). Lower Tebbu country: Wantsang ku forests, alt. 2550 m., no. 15029, Sept.–Oct. 1926 (shrub 1.2 m.; fruit red, in drooping racemes).

Berberis kansuensis Schneider in Oesterr. Bot. Zeitschr. LXVII. 288 (1918).

Berberis dasystachya Rehder in Jour. Arnold Arb. v. 142 (1924) pro parte, quoad W. Purdom no. 1014, 1910.—Non Maximowicz.

Descriptioni adde: Inflorescentiae fructiferae 4–7 cm. longae. Fructus rubri ("crimson" fide Rock), leviter pruinosi, ovato-elliptici, circiter 6–8: 3–5 mm. magni, stigmatibus sessilibus; semina 1–2.

SOUTHWESTERN KANSU. Tao River basin: Tatsuto to Kadjaku, alt. 2800 m., in forests, no. 13528, Oct. 1925 (shrub 2.1–2.4 m.; fruit crimson); Maerhku, Minshan, alt. 2700 m., no. 14899, Aug.–Sept. 1926 (shrub 3.0 m.; fruit in long racemes, brilliant red with pruinose hue; Tayüka, east Tebbu country, alt. 3000 m., no. 13526, Oct. 1925 (shrub 1.8–3.0 m.); south of Minshan range in Tebbu country, alt. 2900 m., no. 12482, June 1925 (shrub 1.2–1.8 m.; flowers yellow, in drooping racemes). Lower Tebbu country: forests of Wantsang valley, alt. 2400 m., no. 14723, Sept. 3, 1926 (shrub 3.6–4.5 m., with long drooping branches; fruit in racemes, dull red); mountains back of Wantsang ssu, alt. 2850 m., no. 14804, Sept. 9, 1926 (shrub 1.5–1.8 m.; fruit red, in drooping racemes); Mayaku near Nyipa, alt. 2100 m., no. 14786, Sept. 9, 1926 (shrub 1.5–1.8 m.; leaf glaucous; fruit reddish yellow, in drooping racemes). Upper Tebbu country: southern shopes of Minshan, alt. 2900–3150 m., no. 12511, June 1925 (shrub 1.2–1.8 m., young stem red; flowers yellow).

WESTERN KANSU: Komang ssu: alt. 2950 m., no. 13290, Oct. 1925 (shrub 4.5 m., with long whip-like branches; fruit red, in drooping racemes); alt. 2950 m., no. 13292, Oct. 1925 (resembles 13290, but leaves oblong instead of orbicular; fruit pale red).

LAURACEAE

Determined by A. REHDER

Benzoin umbellatum Rehder in Jour. Arnold Arb. I. 146 (1919).

Lindera umbellata Thunberg, Fl. Jap., 145, t. 21 (1784).—Shirasawa, Icon. Ess. For. Jap. II. t. 18, fig. 16–33 (1908).

SOUTHWESTERN KANSU. Lower Tebbu country: forests in lower Wantsang valley, alt. 2125 m., no. 14729, Sept. 3, 1926 (tree 6 m.; bark, leaves etc. fragrant).

Benzoin strychnifolium var. **Hemsleyanum** (Diels) Rehder in Jour. Arnold Arb. I. 145 (1919).

WESTERN SZECHUAN: on mountains of Ching chuan, alt. 1825 m., no. 12039, April 1925 (tree 4.5 m., bushy crown; flowers yellow).

Litsea cubeba Persoon, Syn. II. 4 (1807).

Litsea citrata Blume, Bijdr. 565 (1825).

WESTERN SZECHUAN: mountains of Ching chuan, no. 12038, April 1925 (tree 4.5 m.; flowers yellow).

Litsea sericea Hooker f., Fl. Brit. Ind. v. 156 (1886).—Rehder in Jour. Arnold Arb. 1. 143 (1919).

WESTERN SZECHUAN: north of Kiang yu; gorge along the Fu kiang, alt. 1200 m., no. 12021, March 1925 (tree 3–4 m.; flowers yellow).

SAXIFRAGACEAE

Determined by A. REHDER

Philadelphus pekinensis var. **kansuensis** Rehder, var. nov.

Philadelphus sericanthus Rehder in Jour. Arnold Arb. v. 153 (1924), quoad specimen e Kansu.—Non Koehne.

A typo recedit praecipue calycibus extus et pedicellis strigoso-villosis et a var. *dasycalyx* foliis supra adpresse scabrido-pilosis subtus ad costam nervosque, sparsius in facie strigoso-pilosis et petiolis strigoso-villosis.—Frutex 1.5–3-metralis; ramuli annotini cortice cinereo-fusco vel rubro-fusco horizontaliter fisso et mox solubili. Folia oblongo-ovata vel elliptico-ovato ad ovato-lanceolata, 3–5 cm. vel interdum ad 7 cm. longa, acuminata, supra laete viridia, sparse scabrido-pilosa, interdum glabrescentia, subtus pallida, ad costam et nervos densius in facie sparsius vel interdum tantum ad costam et nervos sparse strigoso-pilosa; petioli strigoso-villosi. Racemi 5–7-flori, rhachi initio sparse villosa; flores 2–2.5 diam.; pedicelli 3–6 mm. longi, villoso-strigosi ut calycis tubus et sepala ovata acuminulata extus; petala ovalia; stylus staminibus paullo brevior apice quarta vel tertia parte divisus, stigmatibus angustis brevibus.

SOUTHWESTERN KANSU. Tao River basin; forests of Choni, along banks of streams, alt. 2900 m., no. 12587, July 1925 (shrub 1.5–3 m. tall; flowers white, leaves pale beneath; type); valley of Toyüku, alt. 2600 m., no. 12821, July 1925 (shrub 2–2.5 m.; flowers white, fragrant); banks of Tao, alt. 2600 m., no. 12870, July 1925 (shrub 1.5–2.5 m.; leaves greyish beneath; flowers white fragrant); outskirts of forests, Tao valley, alt. 2600 m., no. 12873, July 1925 (shrub 1.75–2 m.; leaves small; flowers numerous); in Spruce forest, west bank of Tao valley, alt. 3000 m., no. 12883, July 1925 (shrub 3 m.; flowers white, fragrant); Tatsuto, Kadjaku valley, Tebbu land, alt. 2800 m., no. 13603, Sept.–Oct. 1925 (shrub 2–3 m.); outskirts of Picea forest, Poyuku, alt. 2750 m., no. 13659, Oct. 1925 (shrub 2–2.5 m.); Poyuku, valley, outskirts of Picea forest, north Minshan, alt. 2850 m., no. 13687, Sept.–Oct. 1925 (shrub 2–3 m.); outskirts of forest, with Junipers in Choni ku, alt. 2700 m., no. 14926, Oct. 20, 1926 (shrub 3–4.5 m., branches erect). Lower Tebbu country: forests of Wantsang valley, alt. 2450 m., no. 14684, Sept. 1, 1926 (shrub 2–3 m.; leaf small, pale); outskirts of Abies forests, back of Wantsang ssu, alt. 2850 m., no. 14813, Sept. (?) 1926 (flowers white, fragrant); on dry arid slopes with Oaks in Mayaku near Nyipa village, alt. 2250 m., no. 14791, Sept. 8, 1926 (shrub 3–5 m.); dense forest of Wantsang, alt. 2750 m., no. 14852, Sept.

12, 1926 (tree 5–6 m., leaf pale green above, greyish green beneath); Pezhu valley, alt. 2850 m., no. 14948, Oct. 1926 (shrub 4.5 m.; leaf whitish blue beneath); mountains of Wantsang, valley of Chulungapu, alt. 2450 m., no. 15046, Sept.–Oct. 1926 (shrub 4.5; leaf glaucous beneath); Mayaku near Nyiba, alt. 2250 m., no. 15076, Sept.–Oct. 1926 (shrub 1.5–2 m.; leaf pubescent). Upper Tebbu country: in Spruce forests of Drakana, alt. 3050 m., no. 13102, July–Aug. 1925 (shrub 2–2.5 m.).

CENTRAL KANSU. Lien hoa shan: forests of Spruces and Birches, alt. 3050 m., no. 12749, July 14–20, 1925 (shrub 1.5–2 m.; leaves glaucous beneath; flowers white fragrant).

Here belong also the following specimens from KANSU: Hsia Mo K'ou, near Lichen, alt. 2000–2300 m., *R. C. Ching*, Wulsin Exped. no. 325, July 7–8, 1923; Toul Ping, near Lichen, alt. 2150–2950 m., *R. C. Ching*, Wulsin Exped. no. 393, July 7–9, 1923; Tai H'wang K'ou, near Lichen; alt. 2200–2600 m., *R. C. Ching*, Wulsin Exped. no. 440, July 9, 1923; near Pingfan, alt. 2350–2800 m., *R. C. Ching*, Wulsin Exped. no. 484, July 12–20, 1923; Choni district, alt. 2750 m., *Wm. Purdom*, no. 1021, in 1910.

This Mock-Orange which seems to be quite common in Kansu, and is there apparently the only representative of the genus, differs markedly from typical *P. pekinensis* in the pubescent calyx and the more or less pubescent leaves and I would have considered it a distinct species, though it agrees in all other characters and in general appearance with typical *P. pekinensis*, if it were not connected with the type by the var. *dasycalyx* Rehd. which has quite glabrous leaves but a pubescent calyx. The pubescence of the leaves is very variable and is sometimes only sparingly present on the veins beneath; the pubescence of the calyx also varies, but in a lesser degree. In their rather dense pubescence Rock's no. 14926 and Ching's 325, 393 and 484 are similar to the type except that in Ching's nos. 325 and 485 the upper surface is more densely scabrid than in the type. Most specimens are strigose only on the veins, while some as nos. 12870, 13102, 14791, 14813, 14948 and 15046 are almost glabrous, but the base of the leaves and the petioles are always pubescent; a few as no. 12749 and to a lesser degree no. 12883 are fairly densely strigose-pubescent above, though only sparingly strigose on the veins beneath. Nos. 13603, 13659 and 13687 are fruiting specimens without leaves. Some vigorous shoots of no. 14948 have leaves up to 13 cm. long and to 8 cm. wide and a few of the racemes have 9 flowers, but the weaker branches do not differ from the other specimens. The bark of all the specimens is exfoliating in large thin flakes and varies from greyish brown to red-brown.

Deutzia albida Batalin in Act. Hort. Petrop. XIII. 97 (1893).—Rehder in Sargent, Pl. Wilson. I. 21 (1913).

SOUTHWESTERN KANSU: Lower Tebbu country: dry arid

slopes of Nyibaku, in Oak forests, alt. 2250 m., no. 14747, Sept. 5, 1926 (shrub 3–4 m.); dry arid slopes of Mayaku near Nyipa village, alt. 2250 m., no. 14790, Sept. 8, 1926 (shrub 3–4.5 m.).

Hydrangea Bretschneideri Dippel, Handb. Laubholzk. III. 320 (1893).—Schneider, Ill. Handb. Laubholzk. I. 390, fig. 250 h-l, 251 a-b (1905).—Rehder in Sargent, Pl. Wilson. I. 38 (1913).

SOUTHWESTERN KANSU. Tao River basin: mountains of Choni, outskirts of forests, alt. 2900 m., no. 12586, July 1925 (shrub or small tree 4.5 m.; bracts creamy-yellowish with slightly pinkish tinge); in forests of Tao valley, alt. 2600 m., no. 12876, July 1925 (shrub 2–3 m.; bracts creamy-white); between Yaraku, Yarugomba and Lupassu, very common, alt. 2750 m., no. 13174, Aug. 1925 (shrub 2–3 m.; bracts white when flowers open, pink later); Tatsuto, Kadjaku valley in Picea forest, alt. 2800–3000 m., no. 13602, Sept.–Oct. 1925 (shrub 1.5–2 m.; flowers creamy white to pinkish); Maerhku valley, in outskirts of deciduous forests, alt. 2750 m., no. 13604, Sept.–Oct. 1925 (shrub 3–4.5 m.; flowers white, bracts turning); Poyuku, alt. 2900 m., no. 13671, Oct.–Nov. 1925 (shrub 2–3 m.; bracts cream-colored, turning pink on maturity of fruit). Lower Tebbu country: dense forests at Wantsang valley, alt. 2700 m., no. 14858, Sept. 12, 1926 (tree 6 m.; floral bracts cream-colored with purplish tinge); dense forests of Totipana, Sambaku, alt. 3000 m., no. 14884, Sept. 16, 1926 (tree 6 m.; bracts purple); forests of Ngongo, alt. 2600 m., no. 14976, Sept.–Oct. 1926 (shrub 4.5 m.).

Hydrangea Bretschneideri var. glabrescens Rehder in Mitt. Deutsch. Dendr. Ges. XXI. 186 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: dense forests of Wantsang, alt. 2250 m., no. 14670, Aug. 31, 1926 (tree 6 m.; floral bracts cream-colored); in mixed forests of Mayaku, alt. 2750 m., no. 14761, Sept. 5, 1926 (tree 5–6 m.; floral bracts deep purple above, green beneath); Wantsang ku, alt. 2750 m., no. 15005, Sept.–Oct. 1926 (shrub 3 m.; bracts purplish); forests of Wantsang, alt. 2750 m.; no. 15039, Sept.–Oct. 1926 (shrub 4.5 m.; bracts pinkish).

This variety had not yet been recorded from Kansu, while the type had been collected before by Wm. Purdom and R. C. Ching (Wulsin Exped. nos. 336, 835).

Hydrangea longipes Franchet in Nouv. Arch. Mus. Paris, sér. 2, VIII. 228 (Pl. David. II. 45) (1885).—Rehder in Sargent, Pl. Wilson. I. 33, (1913).

SOUTHWESTERN KANSU. Lower Tebbu country: in forest of Wantsang valley, alt. 2450–2600 m., nos. 14679 and 14847, Sept. 1 and 12, 1926 (shrub 1–1.5 m.; floral bracts greenish or yellowish white); dense forests between Hera Sambaku and Dayaya gorge, alt. 3050 m., no. 14782, Sept. 8, 1926 (shrub 1–1.5 m.; bracts pure white); dense

forests of Wantsang ku, alt. 2750 m., no. 15016, Sept.–Oct. 1926 (shrub 1.5 m.; bracts pure white).

This species had not yet been recorded from Kansu. Of no. 14782 there is a photograph in the Arboretum collection of photographs showing the habit of a flowering shrub.

Decumaria sinensis Oliver in Hooker's Icon. XVIII. t. 1741 (1888).

WESTERN SZECHUAN: near Ching chuan, along stream, among rocks, no. 12042, April 1925 (shrub 0.75–1 m.; flowers green).

Ribes moupinense Franch var. **tripartitum** Janczewski in Mém. Soc. Phys. Hist. Nat. Genève, XXXV. 300 (Monog. Groseill.) (1907).

SOUTHWESTERN KANSU. Lower Tebbu country: on shaded limestone cliffs, upper Wantsang valley, alt. 2550 m., no. 14704, Sept. 3, 1926 (shrub 1.5 m.; fruit purplish black, in drooping racemes): Pezhu valley in Picea and Abies forests, alt. 2900 m., no. 14947, Oct. 1926 (shrub 1.5 m.; fruit black, in long racemes).

Ribes Meyeri Maximowicz in Mél. Biol. IX. 323 (1873); in Bull. Acad. Sci. St. Pétersb. XIX. 260 (1874).—Janczewski in Mém. Soc. Phys. Hist. Nat. Genève, XXXV. 297, fig. 34 (Monog. Groseill.) (1909); in Bull. Acad. Sci. Cracovie Sci. Nat. 1913, p. 724, fig. 6 (1913).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, Spruce forest, alt. 2750–3050 m., nos. 12200 and 12201, June 1925 (shrub 2–2.5 m.; flowers greenish or yellowish green, in pendent racemes); Maerhku valley, Choni, outskirts of Spruce forests, alt. 2750 m., no. 12335, June 1925 (shrub 1.5–2.5 m.; flowers greenish red, in small racemes); Maerhku, alt. 2750 m., no. 13536, Oct. 1925 (shrub 1.5–2 m.; fruit black); Maerhku valley, east Tebbu land, no. 13586, Sept.–Oct. 1925 (shrub 1.5–2 m.; fruit red, in short racemes); in Spruce forests of Tebbu country, alt. 3000 m., no. 12474, June 1925 (shrub 2–2.5 m.; with long rambling branches; flowers yellow, in drooping racemes); in Spruce forest, west bank of Tao valley, alt. 3000 m., no. 12888, July 1925 (shrub 2.5 m.); Kwang kei shan, west Tebbu land, alt. 3650 m., no. 13579, Sept.–Oct. 1925 (shrub 1.5 m., fruit black in short racemes). Lower Tebbu country: upper Mayaku, alt. 3000 m., no. 14878, Sept. 16, 1926 (shrub 2–3 m.; fruit black, in short racemes). Upper Tebbu country: near Tongwa, south of Minshan, in Spruce forest, no. 12519, June 1925 (shrub 2.5 m., with straggling branches; flowers reddish yellow).

EASTERN TIBET. Radja and Yellow River gorges: rocky slopes back of Radja gomba, alt. 3300 m., no. 13922, May 20, 1926 (shrub 1.5 m.; flowers red); valley of Nyavruch, north of Radja, lateral valley, along rocky stream bed, no. 13935, May 27, 1926 (shrub 1.5 m.; flowers reddish); northern slopes of river valley, mountains opposite Radja, alt. 3200 m., no. 14000, May 27, 1926 (shrub 2–2.5 m., flowers whitish green); near mouth of Dachso canyon, in Birch and Spruce forests, alt. 3100–3050 m., nos. 14057 and 14059, June 1–2, 1926 (shrub 1.5–2.5

m.; flowers whitish green or reddish purple). Ba valley: gravelly slopes, alt. 3200 m., no. 14265, June 1926 (shrub 1.5 m.). Kokonor Region: among rocks in Koko ho gorge, alt. 3200 m., no. 13381, Sept. 1925 (shrub 1.5 m.; fruit black).

This seems to be a very variable species; half of the specimens have the leaves finely villous beneath, while the others have glabrous or nearly glabrous leaves; this character is neither correlated with the color of the flowers which varies from whitish green to reddish purple, nor with certain localities. The fruit is black, only of no. 13586 the color is given as red, but the berries seem to be partly immature and appear to be dark red to nearly black in the dried state. No. 12888 differs from the other specimens in the distinctly stalked fruit, the pedicels being up to 2 mm. long. The species has not yet been recorded from Kansu and Tibet.

Ribes Vilmorini Janczewski in Bull. Acad. Sci. Cracovie Cl. Sci. Nat. 1906, p. 290 (Spec. Gen. Ribes, III. 11) (1906); in Mém. Soc. Phys. Hist. Nat. Genève, XXXV. 462, fig. 167, 168 (1909).

Southwestern Kansu: Lower Tebbu country: forests of Wantsang valley, steep rocky slopes, alt. 2600 m., no. 14681, Sept. 1, 1926 (shrub 1.5 m.); dense forests of Wantsang, alt. 2750 m., no. 14853, Sept. 12, 1926 (shrub 1.5–2 m.; fruit black); forests of Abies in upper Mayaku, alt. 3000 m., nos. 14873 and 14877, Sept. 16, 1926 (shrub 2–3 m.; fruit black). Upper Tebbu country: shade of Spruce forests among boulders, southern slopes of Minshan, alt. 2925 m., no. 12534, June 1925 (shrub 0.5 m.).

Eastern Tibet. Grasslands between Labrang and Yellow River: in Serchen valley along stream beds, no. 13916, May 15, 1926 (shrub 1.5 m.). Radja and Yellow River gorges: rocky slopes back of Radja gomba, alt. 3300 m., no. 13923, May 20, 1926 (shrub 1–1.5 m.; flowers green); with Willows on rocky and grassy slopes above Yellow River gorge, alt. 3300 m., no. 13942, May 27, 1926 (shrub 1.5 m., flowers green); mountains southwest of Yellow River en route to Ngolok country, alt. 3450 m., no. 13954, May 24, 1926 (shrub 1.5 m.; flowers green).

The specimens cited above agree with the original description in the short racemes and the green flowers and in the black fruit, but the leaves are larger, decidedly longer than broad with the lobes mostly acuminate or at least acute; the leaves agree, however, with those of Wilson's nos. 913 and 4503 from southwestern Szechuan determined by Janczewski as *R. Vilmorini*.

Ribes glaciale Wallich in Roxburgh, Fl. Ind. II. 514 (1824).—Janczewski in Mém. Soc. Phys. Hist. Nat. Genève, XXXV. 467, fig. 173 (Monog. Groseill.) (1907); in Bull. Acad. Sci. Cracovie Sci. Nat. 1913, p. 736, fig. 12 (*β minus* Jancz.) (1913).

SOUTHWESTERN KANSU. Tao River basin: Choni, in valleys, alt. 2650 m., no. 12290, June 1925 (shrub 1.5–2 m.; flowers blackish red); Maerhku valley, Choni, outskirts of Spruce forests, alt. 2750, no. 12336, June 1925 (shrub 1.5 m.). Upper Tebbu country: in crevices of limestone walls, southern slopes of Minshan, alt. 3450 m., no. 12528, June 1925 (flowers reddish brown); in Spruce and Willow forests below Shimen, alt. 3200 m., no. 13056, July–Aug. 1925 (shrub 2 m., with long spreading whip-like branches); forests below outer Shimen, Tsalaku valley, alt. 3350 m., no. 13069, July–Aug. 1925 (shrub 1.5 with ascending branches).

WESTERN SZECHUAN: above Ching chuan mountains, along stream, alt. 1825 m., no. 12046, April 1925 (shrub 1.5 m.).

The specimens enumerated above belong apparently to Janczewski's var. *minus* (l. c.).

Ribes Giraldii Janczewski in Bull. Acad. Sci. Cracovie, Cl. Sci. Nat. 1906, 289 (Spec. Gen. Ribes, III. 10) (1906); in Mém. Soc. Phys. Hist. Nat. Genève, XXXV. 455, fig. 163 (Monog. Groseill.) (1907).

SOUTHWESTERN KANSU: Tao River basin: valley near Choni, alt. 2600 m., no. 12274, June 1925 (shrub 0.5–1 m.; flowers greenish, in short racemes). Lower Tebbu country: Pezhu valley, alt. 2750 m., no. 14953, Oct. 1926 (stout spiny shrub; fruit red).

CENTRAL KANSU. Lien ho shan: alt. 2750 m., no. 13505, Oct. 1925 (shrub 1.5 m., spiny; fruit red).

The specimen from central Kansu has the fruits very sparingly glandular or nearly glabrous, also the leaves are less pubescent than in the typical form and thus the specimen seems to form a transition to *R. pulchellum* Turcz.

Ribes stenocarpum Maximowicz in Bull. Acad. Sci. St. Pétersb. XXVI. 475 (1881); in Mél. Biol. XI. 228 (1881).—Janczewski in Mém. Soc. Phys. Hist. Nat. Genève XXXV. 374, fig. 101 (Monog. Groseill.) (1907).

Grossularia stenocarpa Berger in N. Y. Agric. Exper. Sta. Geneva Tech. Bull. CIX. 108 (Taxon. Rev. Curr. Gooseb.) (1924).

SOUTHWESTERN KANSU. Tao River basin: Tao ho watershed, Choni, in valleys, often forming hedges around fields, very common, alt. 2600–2750 m., no. 12295, June 1925 (spiny shrub 1.5 m.; flowers greenish); Kadjaku valley near Tatsuto, in forests of Malus, Pyrus, Betula, with Berberis etc., alt. 2700 m., no. 13128, Aug. 1925 (shrub 2.5 m.; fruit greenish yellow); Choni, common in valleys leading from Tao River to the Minshan, alt. 2550 m., no. 13197, Aug. 1925 (shrub 1.5–2.5 m.; fruit greenish yellow). Lower Tebbu country: forests of Wantsang valley, in dense jungle of Picea, Abies, Acer, etc., alt. 2750 m., no. 14851, Sept. 18, 1926 (fruit yellow).

EASTERN TIBET. Radja and Yellow River gorges: rocky slopes back of Radja, alt. 3350 m., no. 13924, May 20, 1926 (globose shrub, 1.5 m., branching from base).

Ribes spec.

EASTERN TIBET. Jupar Range: Jupar valley along stream bed, alt. 3200 m., no. 14288, June 1926 (shrub 1.5–2 m.).

This is apparently related to *R. Vilmorini* Jancz.; it has small glabrous leaves not exceeding 2 cm. in length and about as broad, with 3–5 short nearly rounded lobes, and immature subsessile fruits usually three crowded on a very short rachis not exceeding 5 mm.

ROSACEAE

Determined by A. REHDER[1]

Spiraea gemmata Zabel, Strauch. Spir. 23 (1893).—Schneider, Ill. Handb. Laubholzk. I. 466, fig. 489 h, 290 f-g (1905).—Rehder in Sargent, Pl. Wilson. I. 411 (1913).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, alt. 2800 m., no. 13594, Sept.–Oct. 1925 (shrub 1.5 m.).

Spiraea alpina Pallas, Fl. Ross. I. 35, t. 20 (1784).—Maximowicz in Act. Hort. Petrop. VI. 182 (Adnot. Spir.) (1879).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, Spruce forest, alt. 3350 m., no. 12199, June 1925 (shrub 0.5–1 m.; flowers [in bud] apparently dark red; leaves deep green); in forest and outskirts along stream of Shiao ku, beyond Adjüan, alt. 2900 m., no. 12810, July 1925 (shrub 1–1.25 m., with spreading branches; flowers creamy white); Kadjaku, west Tebbu, in forest of Spruce and deciduous trees, alt. 3050 m., no. 13689, Sept.–Oct. 1925 (shrub 1–1.25 m., with horizontal branches).

EASTERN TIBET. Radja and Yellow River gorges: northern slopes of river valley, mountains opposite Radja, alt. 3200 m., no. 13999, May 27, 1926 (shrub 1 m.; flowers creamy white); among rocks on banks of Yellow River south of Radja, alt. 3050 m., no. 14113, June 10, 1926 (shrub 1 m.; flowers white).

Spiraea media Schmidt var. **sericea** Maximowicz in Act. Hort. Petrop. VI. 189 (Adnot. Spir.) (1879).

WESTERN SZECHUAN: mountain south of Ching chuan beyond Kiang yu, in gorge of Fu Kiang, no. 12054, March 1925 (shrub about 1 m.; flowers white).

This variety has not yet been recorded from Szechuan. The specimen does not look typical; the umbels are nearly sessile with a cluster of small bract-like leaves at the base and the flowers are rather small.

Spiraea Blumei G. Don var. **microphylla** Rehder, var. nov.

A typo recedit praecipue foliis multo minoribus 6–9 mm. longis distincte 3-nerviis minute crenato-serratis, crasse papyraceis, umbellis parvis, fructibus tantum 3–7.—Frutex metralis, dense ramosus, ramulis brevibus teretibus, glaber; gemmae ovoideae, pauciperulatae, glabrescentes. Folia late ovalia, 6–9 mm. longa, crasse papyracea, apice rotundata, rarius acutiscula, basi rotundata vel late cuneata, supra

[1] Crataegus, Cotoneaster, Rosa and Rubus by E. H. WILSON.

medium vel tantum in triente superiore inaequaliter crenato-serrata, basi trinervia, glabra, supra coeruleo-viridia, subtus cinereo-viridia; petioli circiter 1 mm. longi, rubescentes. Umbelli simplices in apice ramulorum 1–1.5 cm. longorum foliis pluribus instructorum; fructus 3–7; pedicelli circiter 5 mm. longi; calyx hypanthio late cupulari vel fere plano, sepalis triangularibus reflexis; follicula erecta, glaberrima, leviter pruinosa, stylo paullo sub apice inserto ascendente.

SOUTHWESTERN KANSU. Lower Tebbu country: arid slopes in limestone gorge, Peshwekiang, no. 14689, Sept. 1, 1926 (shrub 1–1.25 m.; leaf greyish green).

This Spiraea is apparently a depauperate form of *S. Blumei* with much smaller rather finely crenate-serrate distinctly 3-nerved leaves of firm texture and with a smaller inflorescence.

Spiraea canescens var. **glaucophylla** Franchet, Pl. Delavay. 200 (1889).

SOUTHWESTERN KANSU. Tao River basin: southern bank, Choni, no. 12266, June 1925 (shrub 1.5 m.; flowers cream-colored); south of Minshan in Spruce forests of Tebbu land, alt. 3000 m., no. 12454, June 1925 (shrub 1 m.; flowers white); Tatsuto and lower slopes of Minshan range, alt. 2600 m., no. 12464, June 1925 (shrub with horizontally spreading branches; flowers white).

This Spiraea has not yet been recorded from Kansu, and it is somewhat doubtful whether the specimens cited here belong to this variety, as they differ in the glabrous inflorescence, which is simple or nearly simple with the lower pedicels bearing mostly a leafy bract, as is the case in the type of var. *sulphurea* Batal.

Spiraea uratensis Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 259 (Pl. David. I. 107) (1883).

SOUTHWESTERN KANSU. Lower Tebbu country: on banks of Peshwekiang, arid gorge above Wantsang lamasery, alt. 2075 m., no. 14799, Sept. 5, 1926 (shrub 1.5–2.5 m.); mountains of Wantsang, valley of Chulungapu, alt. 2125 m., no. 15049, Sept.–Oct. 1926 (shrub 2–2.5 m.).

Of this species I have neither seen the type nor any specimens from the type region, but the specimens which are in fruit seem to agree well with the description, though the flowering branchlets are generally shorter than described by Franchet; the carpels appear glabrous but remnants of pubescence can be seen occasionally along the ventral suture and on the basal part.

Spiraea Wilsonii Duthie in Hort. Veitch. 379 (1906).—Bean in Bot. Mag. CXXXVII. t. 8399 (1911).

SOUTHWESTERN KANSU. Lower Tebbu country: outskirts of forests of Ngongo, alt. 2600 m., no. 14982, Sept.–Oct. 1926 (shrub 1.5 m.).

Rhododendron rufum Batalin
Shrub 4.5 m. tall, on slopes of Mt. Kwang ke, Minshan range, Kansu

Spiraea longigemmis Maximowicz in Act. Hort. Petrop. VI. 205 (Adnot. Spir.) (1879).—Sargent in Gard. & For. VII. 344, fig. 56 (1894).—De Wildeman in Hort. Thenens. v. 131, t. 192 (1906).

SOUTHWESTERN KANSU. Tao River basin: Choni, forests of Spruce and Willows, alt. 2750–3050 m., no. 12573, July 1925 (shrub 1.5–2.5 m.; flowers cream-colored); outskirts of Spruce forest; Shiaoku valley, alt. 2900 m., no. 12843, July 1925 (shrub 1.5–2 m.; flowers creamy white); valley opposite Choni, grassy slopes, alt. 2600 m., no. 12856, July 1925 (shrub 1.5 m.; flowers cream-colored); banks of Tao River, west of Choni, alt. 2600 m., no. 12861, July 1925 (shrub 2–2.5 m.; flowers creamy white); Maerhku, north Minshan, in Spruce forest; alt. 3050 m., no. 13690, Sept.–Oct. 1925 (shrub 2.5–3 m.). Upper Tebbu country: in Spruce forest below Shimen, alt. 3200 m., no. 13057, July–Aug. 1925 (shrub 1–1.5 m.; flowers creamy white).

Only two of the specimens, nos. 12861 and 13057 represent the typical form with glabrous leaves and glabrous or glabrescent follicles, while the other specimens have more or less pubescent leaves and pubescent follicles, and thus approach *S. Rosthornii* Pritz., but the serration of the leaves is simple or slightly double, not deeply incised or lobulate as in *S. Rosthornii*. Possibly *S. Rosthornii* represents only a variety of *S. longigemmis*.

Sibiraea laevigata Maxim. var. **angustata** Rehder in Sargent, Pl. Wilson. I. 455 (1913).

SOUTHWESTERN KANSU. Tao River basin: Choni, in valleys, alt. 2600 m., no. 12288, June 1925 (shrub 1.5–2 m., flowers white); common on outskirts of Spruce forests, Shiaoku valley, alt. 2900 m., no. 12841, July 1925 (shrub 1.5 m.; flowers cream-colored); Maerhku valley, alt. 2800 m., no. 13595, Sept.–Oct. 1925 (shrub 1.5–2.5 m.; flowers creamy white).

EASTERN TIBET. Radja and Yellow River gorges: Lungmar valley, southeast of Radja, with Willows and Rhododendrons, alt. 3050 m., no. 14011, May 1926 (shrub 1.5 m.; flowers whitish); in stream bed and with Birches in Dachso canyon, north of Radja, alt. 3200 m., no. 14080, June 2, 1926 (shrub 1.5 m.; flowers white). Jupar Range: slopes of valley and along stream bed, alt. 3200 m., no. 14314, June 1926 (shrub 1.5 m.; flowers cream colored).

Two of the specimens, nos. 12841 and 14080, differ from typical var. *angustata* in having a glabrous inflorescence like the type of the species, but they are easily distinguished from typical *S. laevigata* and its var. *croatica* Schneid. by the narrow-lanceolate pointed leaves. Also a plant grown in this Arboretum under no. 7267 and raised from seed collected by E. H. Wilson in 1903 near Sungpan, western Szechuan, has a glabrous inflorescence, while the herbarium specimens collected by him have a pubescent inflorescence.

Sorbaria arborea Schneid. var. **glabrata** Rehder in Sargent, Pl. Wilson. I. 48 (1911).

SOUTHWESTERN KANSU. Tao River basin: cliffs of river valley, alt. 2750 m., no. 12878, July 1925 (shrub 1.5–2.5 m. with drooping branches; flowers white of unpleasant odor); common on banks of valleys, Kadjaku, alt. 2750 m., no. 13143, July 1925 (shrub 1.5 m., flowers cream-colored); outskirts of Picea forests, Tatsuto, Kadjaku, alt. 2750–2900 m., no. 13670, Sept.–Oct. 1925 (shrub 1.5–2 m., branching from base; flowers cream-colored).

The specimens cited above differ like Purdom's no. 1018 from Minchow from the typical form in the leaflets having only 8–12 rarely up to 14 pairs of lateral veins.

Exochorda Giraldii Hesse in Mitt. Deutsch. Dendr. Ges. XVII. 191, 219 (1908); XVIII. 295, fig. (1909); in Fedde, Rep. Spec. Nov. VIII. 347 (1910).—Rehder in Mitt. Deutsch. Dendr. Ges. XXIII. 257 (1914).

SOUTHWESTERN KANSU. Lower Tebbu country: on dry rocky arid slopes of Peshwekiang valley near Tsaoshi and in the gorges, alt. 2000 m., no. 14739, Sept. 2, 1926 (tree 6 m.); drier forests of Tsaoshiku and Mayaku, alt. 2750 m., no. 14996, Sept.–Oct. 1926 (tree 4.5–7.5 m.); dry slopes of Mayaku and Nyiba ku, alt. 2450–2600 m., no. 15059, Sept.–Oct. 1926 (tree 4.5–5.5 m.; bark smooth yellowish flesh-color; leaves dull green; capsule brown).

Crataegus (determined by E. H. WILSON).

Crataegus kansuensis Wilson, sp. nov.

Crataegus Oxyacantha Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 810 (Pl. Enum. 22) (1891); in Szechenyi, Wiss. Ergeb. Reis. Ostas. II. 699 (1898).—Not Linnaeus.

Crataegus sanguinea Sargent, Pl. Wilson. I. 180 (1912).—Not Pallas.

Crataegus Wattiana Rehder in Jour. Arnold Arb. V. 180 (1924).—Not Hemsley & Lace.

Frutex vel arbor parva 2.5–8 m. alta; ramuli glabri, rubro-brunnei, nitidi, spinis validis 1–2 cm. longis armati; gemmae subglobosae, rubro-brunneae, nitidae. Folia late ovata, 3–9 (pleraque 4–7) cm. longa et 2–8 (pleraque 3–6) cm. lata, acuta, basi truncata, interdum abrupte cuneata, plus minusve pinnato-lobata, grosse dentata vel interdum duplicato-dentata dentibus triangularibus patentibus glanduloso-mucronulatis, supra intense viridia, subtus pallida, initio supra ad venas pilis paucis cinereis et subtus in axillis nervorum barbata, maturitate glabra; petioli graciles, 1–4 cm. longi, saepe leviter marginata, interdum glandulis paucis breviter stipitatis instructi; stipulae caducae, in turionibus interdum persistentes, foliaceae, ovatae, 0.5–1 cm. longae, dentatae dentibus acutis glanduloso-mucronatis. Inflorescentia corymbosa, glabra, floribus 8–15 vel pluribus albis, bracteis bracteolisque deciduis glandulosis; pedicelli filiformes, bracteolati; calycis dentes ovato-triangulares, 2–3 mm. longi, acuminati; petala suborbicularia, 3–4 mm.

longa et 3–3.5 mm. lata; stamina 15–20, filamentis subulatis, antheris ut videtur albidis; styli 2–3, recti, glabri, stigmate capitato; ovarium in apice villosum. Fructus subglobosus, 8–10 mm. diam., ruber, vestigiis calycis et filamentorum coronatus; pyrenae dorso sulcatae, ventre exsculptae.

SOUTHWESTERN KANSU. Tao River basin: northwest of Choni, forests, no. 12166, June 1925 (tree 6 m. tall; flowers white to cream colored; type); loess plain with Poplars and Pears, alt. 2588 m., no. 14917, Oct. 20, 1926 (tree 4.5–6 m. tall; fruiting co-type); in valleys, alt. 2588 m., no. 14908, Sept. 10, 1926 (tree 3 m. tall); mountains of Toyüku, alt. 2588 m., no. 12921, July 1925 (tree 7.5 m. tall). Lower Tebbu country: Pezhu, banks of Chulungapu, nos. 14939, 14956, Oct. 1926 (tree 4.5–6 m. tall). Upper Tebbu country: southern slopes of lower Yiwaku near Tsaruku, alt. 2374 m., no. 14579, Aug. 28, 1926 (tree 4.5–6 m. tall).

CENTRAL KANSU. Lien hoa shan: Shanshen Miao, alt. 2983 m., nos. 13223, 13500 and 13501, Aug. and Oct. 1925 (tree 2.5–4.5 m. tall).

The following specimen in this herbarium but not collected by Mr. Rock belong to this new species: WESTERN KANSU: Peling Mountains, *Wm. Purdom*, no. 1134, 1910. KANSU: vicinity of Lanchow, alt. 2000–2050 m., *R. C. Ching*, Wulsin Exped. no. 244, June 28–July 4, 1924; vicinity of Lichen, alt. 1750–2050 m., *R. C. Ching*, Wulsin Exped., no. 366, July 4–8, 1923; between Choni and Lanchow, alt. 2600–3000 m., *R. C. Ching*, Wulsin Exped. no. 1030, September 19–21, 1923; Lian hwa shan Mountains, southwest of Ti tao chow, alt. 3000–3300 m., *R. C. Ching*, Wulsin Exped. no. 1017, September 20, 21, 1923. WESTERN SZECHUAN: north of Tachien-lu, alt. 3000 m., *E. H. Wilson*, no. 2987, July 9, 1908. SHENSI: Mt. Kin-tan-san, *J. Giraldi*, July 14, 1897; Thin-kio-tsuen, *J. Giraldi*, September 25, 1897; Lao-y-san, *J. Giraldi*, 1897, Lungchow, Li-kia-po, alt. 1400 m., *J. Hers*, no. 2383, 1924; Huashan, alt. 1000 m., *J. Hers*, no. 3059, October 31, 1924. SHANSI: Suiyuan territory, Saratsi, Wu-ta-chao lamasery, alt. 1000–1500 m., *J. Hers*, no. 2929, September 15, 1924; Wu-chai-hsien, Ta-nan-kow, alt. 2000–3000 m., *Tchuang Kieh*, Herb. J. Hers, no. 2019, September 7, 1922; Nan-yang-shan, alt. 1500–2800 m., *J. Hers*, no. 2725, September 22–30, 1923; Ming-lou, alt. 650 m., *C. T. Ren*, Herb. Univ. Nanking no. 6120, August 1923. NORTHWEST CHIHLI: Siao-wu-tai-shan, Tieh-ling-sze, alt. 1300 m., *J. Hers*, no. 2118, October 7, 1922.

This new species is characterized by its broadly ovate, more or less pinnately lobed leaves, glabrous at maturity except for a tuft of villose hairs in the axils of the veins on the under surface, with truncate, rarely abruptly cuneate base, and short, mucronate, glandular teeth, by its glabrous inflorescence, deciduous sepals, persistent filaments, villose summit of the ovary, and by its soft pulpy, bright red to orange-colored fruit. The closely related *C. Wattiana* Hemsl. & Lace differs in having more sharply incised leaves, acuminate, even aristate, teeth, no venulous tufts of hairs, larger flowers, persistent calyx teeth, deciduous filaments and the summit of the ovary glabrous. The other related species, *C. sanguinea* Pallas, has longer spines, leaves more or less pubescent and almost invariably cuneate at the base and smaller fruit. The three species agree in having a soft pulpy fruit. Each occupies its own

geographical area. *C. Wattiana* Hemsl. & Lace would appear to be confined to the heart of Asia ranging from Beluchistan in the south to the Altai Mountains in the north. *C. sanguinea* Pallas is confined to northeastern Asia with its southern limits in Manchuria. Our new species is found widespread in northern China from northwestern Chihli through Shansi and Shensi to the western limits of Kansu with its southwest limits north of Tachien-lu in western Szechuan.

Photographs of a tree and of fruiting branches accompanied Rock's no. 14917.

From the material in this herbarium this new Crataegus would appear to have been first collected in Shensi in 1887 by J. Giraldi and erroneously identified as *C. pinnatifida* Bunge. In 1908 Wilson found it north of Tachien-lu and his specimen was doubtfully referred to *C. sanguinea* Pallas. In 1910 W. Purdom collected it on the Peling Mountains in western Kansu. In 1922 J. Hers collected it in northwest Chihli, in several districts of western Shansi and also in Shensi. In 1923 R. C. Ching on the F. R. Wulsin Expedition collected it in several places in Kansu. The specimen collected in Kansu by Count Szechenyi and by Kanitz wrongly referred to *C. oxyacantha* L. undoubtedly belongs to our new species which appears to be the only Crataegus native of extreme northwestern China.

Crataegus kansuensis f. aurantiaca Wilson, forma nova.

A typo recedit fructu aurantiaco.

SOUTHWESTERN KANSU. Lower Tebbu country: Peshwekiang gorge, alt. 2069 m., nos. 14552 (type) and 14802, Aug. 30, Sept. 5, 1926 (tree 4.5–6 m. tall; fruit reddish yellow).

This variety differs from the type only in having orange-yellow fruit, a character apparently common to its related species.

Cotoneaster (determined by E. H. WILSON).

Cotoneaster multiflora Bunge in Ledebour, Fl. Alt. II. 220 (1830).—Ledebour, Ic. Fl. Ross. III. 22, t. 274 (1831).—Schneider, Ill. Handb. Laubholzk. I. 755, fig. 424 c, m–n (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 170 (1912).—Bean, Trees & Shrubs, Brit. Isles, I. 413, fig. (1914).—Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).—Rehder in Jour. Arnold Arb. V. 177 (1924).

Cotoneaster reflexa Carrière in Rev. Hort. 1870–71, 520 (1871).—André in Rev. Hort. 1892, 327, fig. 100.

Cotoneaster vulgaris var. *glabrata* Hort. ex Kew Hand-list Trees & Shrubs, I. 213 (1894), as a synonym.

SOUTHWESTERN KANSU. Tao River basin: without special locality, alt. 2708 m., nos. 13517, 14905, Sept.–Oct. 1926 (shrub 3 m. high; leaves coriaceous, pale beneath; fruits in cymes, red); west of Choni, banks of river, alt. 2588 m., no. 12187, June 1925 (shrub 4.5 m. high, flowers white); Taoho watershed, Choni, 3048 m., no. 12296,

June 1925 (shrub 1.3–1.8 m. high; flower buds pinkish white); Minshan range, Tatsuto scrub forest, no. 12433, June 1925 (shrub 1.8–2.5 m. high; flowers pinkish-white); Maerhku, Minshan, alt. 2743 m., no. 14897, Aug.–Sept. 1926 (shrub 1.3–1.8 m. high; fruits red, globose, on slender pedicels, in cymes); on loess banks at Laliku, no. 14914, Oct. 1926 (tree 4.5 m. tall; fruits crimson-carmine). Lower Tebbu country: banks of stream, Peshwekiang gorge, alt. 2069 m., no. 14801, Sept. 1926 (shrub 2.5–3 m. high, branches spreading horizontally, fruits red); Wantsang ku, alt. 2134 m., no. 15027, Sept.–Oct. 1926 (shrub 1.5 m. high; fruits red, in racemes). Upper Tebbu country: Drotsuku valley, beyond Tsaruku, gravelly slopes, Peshwekiang, no. 14577, Aug. 1926 (shrub 1.3–1.8 m. high, branches spreading, drooping; fruits dark red).

Western Kansu: between Tangar and Machuan, on loess banks, alt. 2893 m., no. 13395, Oct. 1925 (shrub 1–1.3 m. high; fruits red); Komang ssu Spruce forest, alt. 2983 m., no. 13296, Oct. 1925 (shrub 1.5–1.8 m. high; fruits red, in poor cymes).

Eastern Tibet. Radja and Yellow River gorges: grassy slopes, among boulders in Yellow River valley, east of Radja, alt. 3048 m., nos. 14016 and 14138, May and June 1926 (shrub 1.3–1.8 m. high; flowers white). Ba valley: gravelly slopes, alt. 3198 m., no. 14268, June 1926 (shrub 1.6 m.; flowers white); Jupar Range: along stream bed of Jupar valley, alt. 3198 m., nos. 14291 and 14292, June 1926 (shrub 1.3–2.5 m. high; flowers white).

Cotoneaster multiflora var. **calocarpa** Rehder & Wilson in Sargent, Pl. Wilson, I. 170 (1912).—Rehder in Jour. Arnold Arb. v. 178 (1924).

Southwestern Kansu. Lower Tebbu country: forests of Chingolo, above Pezhu, no. 14992, Sept.–Oct. 1926 (shrub 3 m. high; fruits red, globose, in racemes).

Central Kansu. Lienhoashan: Shanshen Miao, alt. 2743 m., nos. 13480 and 13493, Oct. 1925 (shrub 1.5–3.6 m. high; leaves dull, leaf ribs red; fruits brilliant deep red).

Cotoneaster racemiflora var. **soongorica** Schneider, Ill. Handb. Laubholzk. I. 754, fig. 424i (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 168 (1912).—Rehder in Jour. Arnold Arb. v. 177 (1924).

Cotoneaster Nummularia Trautvetter in Bull. Soc. Nat. Moscou, XXXIII. pt. I. 531 (Enum. Pl. Songor. Schrenk.) (1860).

Cotoneaster nummularia var. *soongoricum* [sic] Regel & Herder in Bull. Soc. Nat. Moscou, XXXIX. pt. II. 58 (Pl. Semenov. no. 381) (1866).

Cotoneaster Fontanesii var. *soongorica* Regel in Act. Hort. Petrop. II. 313 (1873).

Southwestern Kansu. Tao River basin: valley of Toyuku below Adjüan, alt. 3588 m., no. 12823, July 1925 (shrub 1.5–1.8 m. high, conspicuously grey-white; leaves grey-green; flowers many, white); valley beyond Toyu, en route to Toyuku, alt. 2893 m., no. 12826, July 1925 (shrub 1.3–1.5 m. high, greyish green); Maerhku to Poyüku, Choni

district, alt. 2743 m., no. 13523, Oct. 1925 (shrub 1.5–1.8 m. high; leaves dark green; fruits red).

Cotoneaster adpressa Bois in Vilmorin & Bois, Frut. Vilmorin. 116, fig. (1904); in Fedde, Rep. Spec. Nov. III. 226 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 155 (1912).—Rehder in Jour. Arnold Arb. v. 175 (1924).

Cotoneaster horizontalis var. *adpressa* Schneider, Ill. Handb. Laubholzk. I. 744, figs. 418 k-m, 419 e′ (1906).

SOUTHWESTERN KANSU. Tao River basin: east of Choni, on banks of river, alt. 2528 m., no. 12204, June 1925 (spreading shrub, 0.3 m. high, flowers red); beyond Taochow, new city, on grassy slopes, alt. 3048 m., no. 13203, August 1925 (prostrate shrub; fruits red); Shiaoku, road to Tsarekika, east Tebbu, no. 13535, Oct. 1925 (shrub 0.3 m. high, fruits red). Lower Tebbu country: valley of Somba near Hera, banks at Ngongo, alt. 2588–2893 m., nos. 14766 and 14972, Sept.–Oct. 1926 (prostrate shrub; fruits red, globose, subsessile).

CENTRAL KANSU. Lien hoa shan: high mountains, among rocks, alt. 3198–3498 m., no. 13475, Oct. 1925 (prostrate shrub; fruit red).

EASTERN TIBET. Grasslands between Labrang and Yellow River: on rocks in Gochen valley, gorge south of Kzangar and south of Radja, alt. 3198 m., no. 13908, May 14, 1926 (prostrate shrub; flowers rose). Radja and Yellow River gorges: on rocks, alt. 3198 m., no. 14116, June 10, 1926 (prostrate shrub).

Cotoneaster horizontalis Decaisne in Fl. des Serres, XXII. 168 (1877).—André in Rev. Hort. 1885, 136, fig. 25–25; 1889, 348, fig. 89–90. t.—Schneider, Ill. Handb. Laubholzk. I. 744, fig. 418 g–i, 419 e (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 154 (1912).—Rehder in Jour. Arnold Arb. v. 175 (1924).

Cotoneaster acuminata var. *prostrata* Dippel, Handb. Laubholzk. III. 414 (1893).—Not Hooker f.

Cotoneaster Davidiana, Hort. ex Kew Hand-list Trees and Shrubs I. 213 (1894), as a synon.

Cotoneaster microphylla Diels in Bot. Jahrb. XXIX. 386 (1901), in part.—Not Wallich.

CENTRAL KANSU. Lien hoa shan: high mountains, among rocks, alt. 3198–3498 m., nos. 12698 and 13478, July and Oct. 1925 (prostrate shrub; fruits red).

Cotoneaster Zabeli Schneider, Ill. Handb. Laubholzk. I. 749, fig. 420 f–h (1906); in Fedde, Rep. Nov. Sp. III. 220 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 166 (1913).—Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).—Rehder in Jour. Arnold Arb. v. 175 (1924).

Cotoneaster vulgaris Pritzel in Bot. Jahrb. XXIX. 385 (1900).—Not Lindley.

Cotoneaster racemiflora var. *Veitchii* Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).—Not Rehder & Wilson.

SOUTHWESTERN KANSU. Lower Tebbu country: along

stream in Wantsang valley, no. 14829, Sept. 1926 (shrub 1.8–3 m. high, branches long, spreading; fruits red).

Cotoneaster nitens Rehder & Wilson in Sargent, Pl. Wilson. I. 156 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: on rocks back of Wantsang ssu, alt. 2438 m., no. 14806, Sept. 1926 (prostrate shrub; fruits red); forests of Ngongo, alt. 2438 m., no. 14981, Sept.–Oct. 1926 (shrub 1.8–3 m. high, branches, slender, rambling; leaf thickly tomentose, grey beneath; fruit carmine, on short slender pedicels).

Cotoneaster obscura var. **cornifolia** Rehder & Wilson in Sargent, Pl. Wilson. I. 162 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: outskirts of Wantsang valley, no. 14834, Sept. 1926 (shrub 3–4.5 m. high, branches long, whip-like; fruits black).

Cotoneaster acutifolia Turczaninow in Bull. Soc. Nat. Moscou, v. 190 (1832).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 471 (Ind. Fl. Pekin.) (1859).—Rehder & Wilson in Sargent, Pl. Wilson. I. 158 (1912).—Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).—Rehder in Jour. Arnold Arb. v. 176 (1924).

Cotoneaster acutifolia var. *pekinensis* Koehne, Deutsche Dendr. 158 (1893).

Cotoneaster moupinensis F. N. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXVII. 59, no. 36739 (1916).—Not Franchet.

Cotoneaster acutifolia var. *villosula* Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).—Not Rehder & Wilson.

SOUTHWESTERN KANSU. Tao River basin: Tayuku, east Tebbu land, alt. 2893–3048 m., no. 13548, Sept.–Oct. 1925 (shrub 1.5–1.8 m. high; fruits black, on short pedicels).

WESTERN KANSU: in Spruce forests of Komang ssu, alt. 3013 m., no. 13294, Oct. 1925 (shrub 1.8–3 m. high; fruits black, single).

EASTERN TIBET. Radja and Yellow River gorges: near mouth of Dachso canyon, north of Radja, in Birch and Spruce forest, alt. 3108 m., no. 14060, June 1926 (shrub 1.3–1.5 m. high; flowers pink).

Cotoneaster acutifolia var. **villosula** Rehder & Wilson in Sargent, Pl. Wilson. I. 158 (1912).—Rehder in Jour. Arnold Arb. v. 176 (1924).

SOUTHEASTERN KANSU. Tao River basin: banks of Tao river, east of Choni, no. 12210, June 1925 (small tree 2.5–3 m. high; flowers white). Lower Tebbu country: Wantsang forests, alt. 2284–2438 m., nos. 14713 and 14724, Sept. 1926 (shrub 1.5–3 m. high, branches horizontal; fruits purplish black, in pairs).

Cotoneaster tenuipes Rehder & Wilson in Sargent, Pl. Wilson. I. 171 (1912).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao River,

east of Choni, no. 12209, June 1925 (shrub 1.3–1.5 m. high; flowers white).

EASTERN TIBET. Radja and Yellow River gorges: among boulders in Yellow River valley, near Radja, alt. 3048 m., no. 14139, June 1926 (shrub 1.8 m. high; flowers pink). Jupar Range: gravelly rocky bluffs overlooking Yellow River, west of mouth of Jupar valley, alt. 3198, no. 14320, June 1926 (shrub 1–1.3 m. high; flowers white). Kokonor Region: rocky slopes of Koko gorge, no. 13269, Sept. 1925 (shrub 1.5–1.8 m. high, branching from the base; fruits black).

Cotoneaster lucida Schlechtendal in Linnaea, XXVII. 541 (1855).—Schneider, Ill. Handb. Laubholzk. I. 750, fig. 421 c, 423 a–c, (1906).—Bean, Trees, Shrubs Brit. Isles, I. 412 (1914).—Rehder, Man. Cult. Trees Shrubs, 357 (1927).

Cotoneaster acutifolia Lindley in Ledebour, Fl. Ross., II. 92 (1844).—Gartenwelt, V. 245, fig. p. 247 (1901).—Not Turczaninow.

Cotoneaster nigra var. *acutifolia* Wenzig in Linnaea, XXXVIII. 183 (1874).

SOUTHWESTERN KANSU. Lower Tebbu country: forests between Pezhu and Ngongo, alt. 2893 m., no. 14980, Sept.–Oct. 1926 (shrub 1.8–3 m. high; fruits black, in pairs at ends of twigs).

Pyracantha crenulata Roemer in Fam. Nat. Syn. III. 220 (1847).—Schneider, Ill. Handb. Laubholzk. I. 761, fig. 430 c-d, 431 g-h (1906).

Crataegus crenulata Roxburgh, Fl. Ind. II. 509 (1832).—Lindley in Bot. Reg. XXX. t. 52 (1844).

NORTHEASTERN YUNNAN: near Laoyatan, alt. 1525 m., no. 12007, Jan. 1925 (shrub 1.5 m.; berries scarlet).

Sorbus thianschanica Ruprecht in Mém. Acad. Sci. St. Pétersb. sér. 7, XIV. 46 (Sert. Tiansch.) (1869).—Schneider, Ill. Handb. Laubholzk. I. 668, fig. 366 c–d, 367 d (1906).

Pyrus thianschanica Franchet in Ann. Sci. Nat. sér. 6, XVI. 287 (1883), "*P. tianschanica.*"—Regel in Gartenfl. XL. 7, fig. 4 (1891).—Hooker f. in Bot. Mag. CXXVII. t. 7755 (1901).

WESTERN KANSU: top of ridge in Spruce forest, Komang ssu, northeast of Tankar, alt. 3150 m., no. 13286, Oct. 1925 (tree 4.5 m.; fruit red).

NORTHWESTERN KANSU. Richthofen range and adjacent region: Kanglung ssu road in gorge which leads up to pass from Liyüanku, no. 13318, Nov. 1925 (tree 4.5 m.; fruit red).

EASTERN TIBET. Radja and Yellow River gorges: in Spruce forest, southwest of Yellow River, opposite Radja, alt. 3350 m., no. 13958, May 24, 1926 (tree 4.5–5.5 m.; flowers white); banks of river, south of Radja, alt. 3050 m., no. 13998, May 27, 1926 (tree 4.5 m.; petioles and rachis red; flowers white); north of Radja, alt. 3200 m., no. 14030, May 28, 1926 (tree 4.5 m.); at camp, near mouth of stream bed of Dachso canyon, north of Radja, alt. 3100 m., no. 14062, May 29, 1926 (tree 4.5–6 m.; flowers white). Jupar Range: in valley with Spruces and Willows, alt. 3200 m., no. 14282, June 26, 1926 (tree 4.5 m.; flowers white); in Spruce forest of Jupar valley, alt. 3500 m., no. 14321.

June 1926 (tree 7.5 m.; flowers white to pink). Kokonor Region: Koko gorge, no. 13267, Sept. 1925 (tree 4.5–6 m., with wide-spreading branches; fruit brilliant red); Lalaku, below Kokonor pass, alt. 3000 m., no. 13372, Sept. 1925 (shrub 2 m.; fruit red).

This species had not yet been recorded from eastern Tibet and Kansu. The young leaves and the inflorescences of almost all specimens are quite glabrous or show only occasionally a few scattered hairs except the fruiting specimen no. 13267 which has the petiole and rachis and the base of the midrib on the under side of the leaflets sparingly villous. In the fruiting specimens, no. 13318 and less so in no. 13372, the carpels are more or less exserted, in some fruits more than one-half. Two flowering trees of *S. tianschanica* are shown in a photograph of the vegetation in the lower part of Dachso canyon taken on June 1, 1926.

Sorbus tapashana Schneider in Bull. Herb. Boissier sér. 2, VI. 313 (1906); Ill. Handb. Laubholzk. I. 672, fig. 369 b (1906).—Koehne in Sargent, Pl. Wilson. I. 482 (1913).

Southwestern Kansu. Tao River basin: mountains, alt. 3350 m., no. 12198, June 1925 (tree 4.5–6 m.; leaves dark green; flowers white); Minshan range, Mt. Kuang ke, alt. 3350 m., no. 12394, June 1925 (shrub 1.5–2.5 m.); mountains of Maerhku valley, alt. 3050 m., no. 12555, June 1925 (tree 4.5–6 m.; flowers white, in large open cymes); ridges back of Adjüan, with Birch, Rhododendron and Spruce, alt. 3200–3750 m., no. 12654, July 5, 1925 (tree 4.5–5.5 m.; flowers white); forests of Shiao ku, with Spruce, Larix, etc., alt. 3050 m., no. 12813, July 1925 (tree 5.5 m.); along road, in Spruce and Rhododendron forest from Kuang ke to Tebbu land, alt. 3500 m., no. 13189, August 1925 (tree 4.5–5.5 m.; fruit red); Tsarekika to Taku, alt. 3200–3350 m., no. 13532, Oct. 1925 (tree 7.5 m.; leaves bright green; fruit brilliant red); Drakana, Tebbu country, alt. 3200–3350 m., no. 13566, Sept.–Oct. 1925 (shrub or tree 6 m.; fruit globose red). Lower Tebbu country: with Abies and Rhododendron scrub, alt. 3450 m., no. 14769, Sept. 6, 1926 (tree or shrub 1.5–2 m.; branches stout; fruit red). Upper Tebbu country: in Abies forest with Rhododendron, at foot of Shimen, alt. 3500 m., no. 13075, July–Aug. 1925 (tree 4.5–5.5 m.); among limestone boulders, in gorge leading to Drakana, southern slopes of Minshan, alt. 3350 m., no. 14637, Aug. 25, 1926 (tree 4.5 m.; fruit red).

The specimens cited above seem to agree well with the description of *S. tapashana* of which I have seen no specimens, though the serration of the leaflets is usually somewhat coarser than shown in Schneider's figure. From the closely related *S. Rehderiana* Koehne it differs chiefly in the broader more pubescent and grayish leaflets, with more numerous teeth, in the scarcely winged rachis, in the larger inflorescence and in the red fruits. *Sorbus tapashana* had not been recorded before from Kansu.

Sorbus hupehensis Schneid. var. **aperta** Schneider in Bot. Gaz. LXIII. 403 (1917).

Sorbus aperta Koehne in Sargent, Pl. Wilson. I. 465 (1913).

SOUTHWESTERN KANSU. Lower Tebbu country: dense forests of Wantsang, alt. 2225 m., no. 14672, Aug. 31, 1926 (tree 9 m., trunk black; fruit white, in large red panicles); forests of Chingolo above Pezhu, alt. 2600 m., no. 14990, Sept.–Oct. 1926 (tree 12–15 m., trunk 60 cm. diam.; fruit white, in ample panicles); forests of Wantsang ku, alt. 2450 m., no. 15024, Sept.–Oct. 1926 (tree 10–12 m., trunk black 60 cm. diam.; fruit white).

CENTRAL KANSU. Lien hoa shan: Shanshen Miao, alt. 2750 m., no. 13479, Oct. 1925 (tree 10–12 m., trunk 30 cm. diam.; fruit white).

Sorbus Prattii Koehne in Sargent, Pl. Wilson. I. 468 (1913).

SOUTHWESTERN KANSU. Tao River basin: Maerhku river valley, alt. 3200 m., no. 13540, Sept.–Oct. 1925 (tree 7.5 m.; fruit white and deep pink); Maerhku valley, alt. 2900 m., no. 14902, Aug.–Sept. 1926 (tree 4.5–5.5 m., trunk 30 cm. diam.; fruit large, white with pinkish tint); Tatsuto, Kadjaku valley, west Tebbu land, alt. 2800 m., no. 13563, Sept.–Oct. 1925 (shrub or tree 2–3 m. tall; fruit white, size of pea); with Picea and Abies in Choni ku, alt. 3050 m., no. 14919, Oct. 19, 1926 (tree 4.5 m., with long straight ascending branches; fruit white).

CENTRAL KANSU. Lien hoa shan: alt. 3050 m., no. 13494, Oct. 1925 (shrub 3–4.5 m.; fruit white).

This species has not yet been recorded from Kansu. Two of the specimens, nos. 13540 and 14919 are leafless and it is therefore somewhat doubtful whether they belong to this species.

Sorbus Koehneana Schneider in Bull. Herb. Boissier, sér. 2, VI. 316 (1906); Ill. Handb. Laubholzk I. 681, fig. 3740 (1906).—Koehne in Sargent, Pl. Wilson. I. 471 (1913).

SOUTHWESTERN KANSU. Tao River basin: Choni, alt. 2600 m., no. 12163, June 1925 (small tree or shrub, 3 m.); valley of Laliku, in Spruce forests, alt. 3050 m., no. 12863, July 1925 (tree 4–5 m.; flowers white); between Yaruku, Yaru gomba and Lupassu, alt. 2750 m., no. 13171, Aug. 1925 (shrub or small tree with few ascending branches); Adjüan mountain, east Tebbu land, alt. 3050 m., no. 13524, Oct. 1925 (shrub 2.5–3 m.; fruit white); Tatsuto, Kadjaku valley, west Tebbu land, alt. 2900 m., no. 13589, Sept.–Oct. 1925 (shrub 1.5–2 m.; leaflets silvery white beneath; fruit white). Lower Tebbu country: Wantsang ku forests, alt. 2700 m., no. 15025, Sept.–Oct. 1926 (shrub 1.5–2.5 m.; fruit white); outskirts of Birch forests and Spruces along banks of streams, Wantsang valley, alt. 2150–2450 m., no. 14699, Sept. 3, 1926 (tree 4.5 m., oftener shrub; fruit white); banks of stream, Tsao shi valley, alt. 2150 m., no. 14741, Sept. 2, 1926 (shrub or small tree; fruit white); forests between Pezhu and Ngongo, alt. 2900 m., no. 14987, Sept.–Oct. 1926 (tree 4.5–6 m.; fruit white). Upper Tebbu country:

along streams, alt. 3375 m., no. 12497, June 1925 (tree 3.5–4.5 m.; flowers white).

CENTRAL KANSU: Lien hoa shan: on slopes, alt. 3050 m., no. 12699, July 1925 (shrub 1.5–2.5 m.); along grassy slopes with Spruces, alt. 3050 m., no. 12763, July 14–20, 1925 (shrub 3–3.5 m.; leaves dull green; flowers white); alt. 2750 m., no. 13477, Oct. 1925 (shrub or small tree 3–3.5 m.; fruit white).

WESTERN KANSU: mountains of Komang ssu, mossy Spruce forests, northeast of Tankar, alt. 3050 m., no. 13287, Oct. 1925 (small tree 3.5–4.5 m.; fruit white).

EASTERN TIBET. Kokonor region: Koko gorge, along stream, no. 13268, Sept. 1925 (shrub 1.5–2.5 m., much branched; fruit pure white).

Pyrus ussuriensis Maxim. var. **ovoidea** Rehder in Jour. Arnold Arb. II. 60 (1920).

Pyrus ovoidea Rehder in Proc. Am. Acad. L. 228 (Syn. Chin. Pyrus) (1915).—Bailey in Stand. Cycl. Hort. v. 2869, fig. 3278 (1916).

CENTRAL KANSU. Lien hoa shan: Shansen Miao, alt. 2750 m., no. 13499, Oct. 1925 (tree 9–12 m.; leaves dark green; fruit greenish yellow).

This Pear has not yet been recorded from Kansu nor with certainty from western China generally. The single fruit with Rock's specimens is about 2.5 cm. long, apparently obovoid, with persistent calyx, greenish yellow and borne on a stiff stalk 5 cm. long.

Pyrus pashia Hamilton apud D. Don, Prodr. Fl. Nepal. 236 (1825).—Decaisne, Jard. Fruit. I. 328, t. 7 (1872).—Collett, Fl. Siml. 169, fig. 47 (1902).—Rehder in Proc. Am. Acad. L. 238 (Syn. Chin. Pyrus) (1915).

SOUTHWESTERN KANSU. Tao River basin: Choni, forests of Tao valley, west of Tao River, alt. 2900 m., no. 12131, May 1925 (tree 6–12 m.; flowers white, margin of petals red); Choni district, alt. 2600 m., no. 13558, Sept.–Oct. 1925 (tree 9–12 m.; leaves red, on red petioles; fruit yellowish red); banks of river at Choni, alt. 2600 m., no. 14924, Oct. 20, 1926 (tree 12 m., trunk 30–60 cm. diam., blackish; fruit red and yellow, on stout peduncles); Tayaku, east Tebbu land, alt. 2900 m., no. 13549, Sept.–Oct. 1925 (tree 4.5–6 m.; leaves dark green, petioles red; fruit yellow, 2.5 cm. across). Lower Tebbu country: Peshwekiang, beyond Ngongo, alt. 2200 m., no. 14565, Aug. 29, 1926 (tree 7–9 m.; with round crown, trunk 30 cm. diam., with blackish furrowed bark; fruit greenish yellow); banks of Peshwekiang, alt. 2000 m., no. 14807, Sept. 1926 (tree 7–9 m., trunk 30–60 cm. diam.; fruit yellow, globose); banks of Peshwekiang near Wangtsang ssu, no. 14816, Sept. 1926 (tree 4.5–6 m.; fruit yellowish red, 2.5 cm. diam.); Peshwekiang gorge, near Wangtsang gomba, no. 14826, Sept. 1926 (tree 9 m.; flowers white; fruit yellowish red, 2.5 cm. diam.); mountain back of Wantsang,

valley of Chulungapu, alt. 2600 m., no. 15043, Sept.–Oct. 1926 (tree 9–11 m., bark blackish, deeply furrowed; fruit red); below Nyipa, along Mayaku stream, alt. 2300 m., no. 15054, Sept.–Oct. 1926 (tree 15 m., trunk 60 cm. diam.). Upper Tebbu country: below Pasheteuga, Drotsuku, alt. 2300 m., no. 15090, Oct. 1926 (tree 4.5–6 m.; leaves dark glossy green; fruit brilliant red).

CENTRAL KANSU. Lien hoa shan: along banks of streams, alt. 2750 m., no. 12751, July 14–20, 1925 (tree 9 m.; fruit red); Shan shen Miao, alt. 2900 m., no. 13496, Oct. 1925 (tree 6–9 m.; fruit globose, 2.5 cm. diam.).

Most of the fruits of the specimens cited above are globose and measure 2–3 cm. in diameter, but no. 13558 has distinctly pear-shaped fruit; the calyx is persistent. The young leaves and inflorescence of no. 12131 are quite glabrous except the inner surface of the sepals, while in no. 14826 the pedicels and the outside of the calyx are slightly villous. From *P. pashia* var. *kumaoni* Stapf which also has a glabrous inflorescence these specimens differ in the triangular-lanceolate acuminate calyx-lobes. Probably the plant of northwestern China constitutes a distinct geographical variety.

Malus baccata Borkhausen, Handb. Forstbot. II. 1280 (1803).—Rehder in Sargent, Pl. Wilson. II. 291 (1915).

Pyrus baccata Linnaeus, Mant. 75 (1767).—Regel in Gartenfl. XI. 202, t. 364, fig. 1–5 (1862).

CENTRAL KANSU. Lien hoa shan: in meadows along stream of Ha kou valley, alt. 2750 m., no. 12781, July 1925 (tree 9–11 m.; leaves dull dark green above, paler beneath); common only on northern slopes, alt. 2750 m., nos. 13218 and 13220, August 1925 (shrub or small tree 3–6 m.; fruit red); slopes of Mt. Hako, alt. 2750 m., no. 13498, Oct. 1925 (shrub or small tree 4.5–6 m.; leaves bright green; fruit bright red); Shanshen Miao, alt. 2900 m., no. 13502, Oct. 1925 (tree 9–12 m.; leaves pale beneath, red-veined; fruit red).

Malus Halliana Koehne, Gatt. Pom. 27 (1890).—Rehder in Sargent, Trees & Shrubs, I. 35, t. 18 (1902); in Sargent, Pl. Wilson. II. 285 (1915).

WESTERN SZECHUAN: south of Ching chuan, growing along rocky river bank, alt. 1200 m., no. 12026, March 1925 (tree 7–9 m.; flowers rich pink).

The locality given by Rock and the fact that all the flowers have only five petals would indicate that the plant is growing wild; the flowers are large, 3 to nearly 4 cm. in diameter, and have only 3 styles.

Malus transitoria Schneider, Ill. Handb. Laubholzk. I. 726 (1906); in Fedde, Rep. Spec. Nov. III. 178 (1906).—Rehder in Sargent, Pl. Wilson. II. 295 (1915).—Hughes in Kew Bull. Misc. Inform. 1920, p. 207, fig. A.

Pyrus transitoria Batal. in Act. Hort. Petrop. XIII. 95 (1893).

SOUTHWESTERN KANSU. Tao River basin: west of Choni, banks of river, alt. 2600 m., no. 12188, June 1925 (shrub or tree 4.5–6 m.; flowers white); river valley, Choni district, alt. 2600 m., no. 13539,

Sept.–Oct. 1925 (tree 6 m.; fruit yellow and red); near Choni, alt. 2750 m., no. 14910, Sept. 10, 1926 (shrub or tree to 6 m., spineless; fruit red or yellow); Choni ku, banks of river; alt. 2600 m., no. 14922, Oct. 20, 1926 (tree 6–7 m., trunk 60 cm. diam.; fruit small red and yellow).

Of no. 14922 there are photographs in the Arboretum collection under nos. 11346 (see plate 12), 11347, and 11348 showing the habit of flowering trees and the bark which differs from that of the following species in the ridges being broken into small thick scales, not into continuous somewhat flaky ridges as in *M. toringoides*.

Malus toringoides Hughes in Kew Bull. Misc. Inform. 1920, p. 205, fig. B.—Stapf in Bot. Mag. CXLVIII. t. 8948 (1923).

Malus transitoria var. *toringoides* Rehder in Sargent, Pl. Wilson. II. 286 (1915).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao River, east of Choni, alt. 2550 m., no. 12215, June 1925 (tree 7.5 m.; flowers white); outskirts of Pine forest at Tatsuto, Kadjaku valley, no. 12478, June 1925 (tree 10 m.; flowers white); outskirts of Pine forests, Kadjaku valley, alt. 2650 m., no. 12483, June 1925 (tree 18–24 m., with ascending branches; flowers white); near camp beyond Tatsuto Kadjaku valley, nos. 13132 and 13133, July 1925 (tree 8 and 15 m.; flowers white; see photographs M—10842 and 10871); Kadjaku valley, en route to Tebbu land, alt. 2800 m., nos. 13543 and 13544, Sept.–Oct. 1925 (tree 8–21 m.; leaves small; fruit oval, yellow or yellowish red; same trees as nos. 13132 and 13133); alt. 2750, no. 13559, Sept.–Oct. 1925 (tree 4.5–7 m.; fruit oval, red); Poyuku, alt. 2900 m., no. 13565, Oct. 1925 (tree 4.5–6 m.; leaves 3-lobed glabrous; fruit oval, yellowish red); along river bank, alt. 2750, no. 13568, Oct. 1925 (tree 4.5–6 m.; leaves shallow-trilobed; fruit oval yellowish red; banks of river at Choni, alt. 2600 m., no. 14923, Oct. 20, 1926 (tree 12 m., trunk 30–60 cm. diam., bark longitudinally furrowed, greyish drab color; fruit cherry red; see photographs M—11342–11344). Lower Tebbu country: Mayaku along stream near Zehga, alt. 2450 m., no. 15074, Sept.–Oct. 1926 (shrub or tree 3–4.5 m.; fruit yellow and scarlet, on red pedicels).

The leaves of this species are extremely variable in shape and to a lesser degree in size. No. 15074 from the lower Tebbu country matches almost exactly the type specimen, Wilson's no. 1285 from Tachien lu, with narrow partly undivided and partly lobed leaves; no. 14923 is similar but the leaves are of thinner texture and all are undivided or only slightly lobulate and so are the flowering specimens, nos. 12483 and 13132 which further differ in the leaves being generally broader, more ovate in shape and often with rounded or nearly rounded base, closely resembling those of the American *M. fusca* (Raf.) Schneid. The other specimens have deeply lobed leaves with rather broad lobes, the leaves being about 3 cm. long in no. 13559 and mostly 4–6 cm. long in nos. 12215, 12478 and 13133. The nos. 13543, 13544, 13565 and 13568 have no leaves, but the first two numbers are according to the collector

from the same trees as nos. 13132 and 13133 which are from the same locality and of which one has the leaves not lobed and the other deeply lobed. Though the specimens with undivided or mostly undivided leaves appear to be quite distinct from those with deeply lobed leaves, their close connection is shown by the fact that the plants growing in this Arboretum and raised from seed of Wilson's no. 1285 have deeply lobed leaves much like those of Rock's no. 13559 but generally more elongated, while the leaves of Wilson's no. 1285 are mostly undivided or only slightly lobed like Rock's no. 14923. The photographs represent the habit of flowering trees and groves of trees (nos. M—10842, 10871 and 11341) and the bark (nos. M—11342, 11343 and 11344).

Malus kansuensis × toringoides, hybr. nov.

SOUTHWESTERN KANSU. Tao River basin: near Choni ku, no. 14925, Oct. 20, 1926 (tree 6–7.5 m., with spreading crown; fruit pale yellow with reddish tinge; see photograph under M—11345).

This specimen is exactly intermediate between the supposed parents which both occur in the region where this number was collected, as shown by no. 14918 of *M. kansuensis* and no. 14923 of *M. toringoides*, which were collected together with no. 14925 on the same day near Choni. From *M. kansuensis* the leaves differ in the less close and fine and not distinctly setose-acuminate serration, in the obsolete net of veinlets beneath, in the deeper lobing with a more elongated middle lobe and in the presence of a few undivided leaves with cuneate base; the fruits are not or very sparingly punctulate. From *M. toringoides* the leaves differ in being generally 3-lobed with broader and shorter lateral lobes and in the closer serration and the fruits in having mostly a few dots and a few grit-cells. The photograph represents a flowering tree with the trunk dividing near the base into several stems.

Malus kansuensis Schneider in Fedde, Rep. Spec. Nov. III. 178 (1906).—Rehder in Sargent, Pl. Wilson. II. 286 (1915); Man. Cult. Trees Shrubs, 397 (1927).

Pyrus kansuensis Batalin in Act. Hort. Petrop. XIII. 94 (1893).

Eriolobus kansuensis Schneider, Ill. Handb. Laubholzk I. 726, fig. 403 d-d^1, 404 d-e (1906).

SOUTHWESTERN KANSU. Tao River basin: at Toyü, alt. 2450 m., no. 12897, July 1925 (tree 3–4 m.); between Yaruku, Yaru gomba and Lupassu, alt. 2750 m., no. 13172, August 1925 (shrub or tree 4.5 m.); bank of stream in Choni ku, alt. 2900 m., no. 14918, Oct. 20, 1926 (tree 4.5–6, with erect branches; leaves dark glossy green above, gray velvety-tomentose beneath; fruit dull red); in Yierh ku alt. 2900 m., no. 14938 (tree 4.5 m., with erect branches). Lower Tebbu country: dense forests of Wantsang valley, alt. 2125–2200 m., no. 14663, Aug. 31, 1926 (tree 4.5 m.; trunk with black smooth bark; fruit yellow and red).

CENTRAL KANSU. Lien hoa shan: forest of Spruces and Birches, alt. 3050 m., no. 12748, July 14–20, 1925 (tree 4.5–6 m.; flowers

white); Shanshen Miao, alt. 2900 m., no. 13497, Oct. 1925 (tree 6–7 m.; leaves woolly beneath; fruit red).

Kerria japonica De Candolle in Trans. Linn. Soc. XII. 157 (1817); Prodr. II. 541 (1825).—Siebold & Zuccarini, Fl. Jap. I. 183, t. 98, 99, fig. i, iii (1841).

SOUTHERN KANSU: between Motzuping and Pikou, on grassy slopes and banks, alt. 1400 m., no. 12067, April 1925 (shrub 0.5–0.75 m.; flowers deep yellow).

Rubus (determined by E. H. WILSON).

Rubus xanthocarpus Bureau & Franchet in Jour. de Bot. v. 46 (1891).—Regel in Gartenfl. XLI. 108 (1892).—Bretschneider, Hist. Eur. Bot. Discov. China, 1028 (1898).—Focke in Bibl. Bot. LXXII. 29 (Spec. Rub.) (1910); in Sargent, Pl. Wilson. I. 49 (1911).—Rehder in Jour. Arnold Arb. v. 194 (1924).

CENTRAL KANSU. Lien hoa shan: meadows along stream of Ha kou valley, alt. 2743 m., no. 12775, July 14–20, 1925 (flowers white).

Rubus corchorifolius Linnaeus fil., Suppl. 263 (1781).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 261 (Pl. David. I. 109) (1883).—Focke in Bibl. Bot. LXXII. 131 (Spec. Rub.) (1911); in Sargent, Pl. Wilson. I. 51 (1911).—Bailey, Gent. Herb. I. 30 (1920).—Rehder in Jour. Arnold Arb. v. 194 (1924).

WESTERN SZECHUAN: north of Kiang yu, on rocky cliffs along the Fu Kiang River, no. 12032, March 1925 (shrub 1 m. high; flowers white); without precise locality, no. 12025, March 1925 (shrub 1–1.3 m. high; flowers white).

Rubus amabilis Focke in Bot. Jahrb. XXXVI. beibl. LXXXII. 53 (1905); in Bibl. Bot. LXXII. 163, fig. 70 (Spec. Rub.) (1911); in Sargent, Pl. Wilson, I. 52 (1911).—Rehder in Jour. Arnold Arb. v. 195 (1924).

SOUTHWESTERN KANSU. Tao River basin: beyond Tatsuto in Spruce forest, alt. 2618 m., no. 12442, June 1925 (shrub 1.3 m. high, flowers white); wooded slopes of Maerhku valley, south of Choni, Tao watershed, alt. 2983 m., no. 12554, June 1925 (flowers white); in valley of Toyüku, alt. 2588 m., no. 12809, July 1925 (scandent shrub 1.5–1.8 m. high; flowers white); Poyuku, alt. 2833–3048 m., no. 13581, Sept.–Oct. 1925 (shrub 1 m. high); gulches of Minshan, near Choni, alt. 2743 m., no. 14895, Aug.–Sept. 1926 (shrub 1–1.3 m. high).

Rubus pileatus Focke in Hooker's Icon. XX. in textu sub t. 1952, p. 3 (1891); in Bot. Jahrb. XXXVI. beibl. LXXXII. 53 (1905); in Bibl. Bot. LXXII. 167 (Spec. Rub.) (1911).—Rehder in Jour. Arnold Arb. v. 195 (1924).

SOUTHWESTERN KANSU. Tao River basin: mountains of Choni, outskirts of Birch and Spruce forest, alt. 2743 m., no. 12578, July 1925 (shrub 1 m. high; flowers white); slopes of Maerhku valley, alt. 3048 m., no. 12951, July 25, 1925 (woody climber); in Larix forest of Tsarekika, east Tebbu, alt. 3198 m., no. 13546, Sept.–Oct. 1925 (shrub 1–1.3 m. high). Lower Tebbu country: along Wantsang

stream, alt. 2438 m., no. 14701, Sept. 3, 1926 (shrub 1.8 m. high); forests of Ngongo, alt. 2743 m., no. 14979, Sept.–Oct. 1926 (rambling shrub).

Rubus idaeus var. **strigosus** Maximowicz in Bull. Acad. Sci. St. Pétersb. XVII. 161 (1872); in Mél. Biol. VIII. 394 (1872).—Palibin in Act. Hort. Petrop. XIV. 116 (1895).—Rehder in Jour. Arnold Arb. v. 199 (1924).

SOUTHWESTERN KANSU. Tao River basin: Kwang kei shan, along stream, alt. 3348 m., no. 13553, Oct. 1925 (shrub 0.3 m. high).

WESTERN KANSU: mossy Spruce forest of Komang ssu, alt. 3048 m., no. 13285, Oct. 1925 (shrub 0.3 m. high).

Potentilla fruticosa L. var. **parvifolia** Wolf in Bibl. Bot. XVI. 58 (Monog. Potent.) (1908).—Rehder & Wilson in Sargent, Pl. Wilson. II. 304 (1915).

Potentilla parvifolia Fischer apud Lehmann, Nov. Stirp. Pugill. III. 6 (1831).

SOUTHWESTERN KANSU. Tao River basin: west of Choni, rocky slopes, alt. 2700 m., no. 12173, June 1925 (shrub 1–1.25 or less; flowers deep yellow); dry slopes between Choni and Kadjaku ferry, alt. 2625 m., no. 12460, June 1925 (shrub 1 m.; flowers yellow); in Willow and Birch forest, west bank of river, alt. 2900 m., no. 12881, July 1925 (flowers small, deep golden yellow); Maerhku, northern Minshan, alt. 3000 m., no. 13672, Oct. 1925 (shrub 0.75–1 m.; flowers deep yellow). Upper Tebbu country: alpine meadows, summit of Kwang kei, alt. 3815 m., no. 13096, Aug. 3, 1925 (shrub 30 cm.; flowers rich golden yellow).

CENTRAL KANSU. Lien hoa shan: among scrub and forests, alt. 3050 m., no. 12746, July 14–20, 1925 (shrub 1 m.; flowers yellow).

EASTERN TIBET. Radja and Yellow River gorges: Lungmar valley, 15 li south of east Radja, alt. 3350 m., no. 14005, May 1926 (shrub 1.25 m.; flowers yellow); Deyang valley, east of Radja, alt. 3050 m., no. 14140, June 1926 (shrub 0.60–1 m.; flowers yellow). Ba valley: gravelly slopes, alt. 3200 m., no. 14264, June 1926 (shrub 1–1.75 m.; flowers yellow). Jupar Range: on rocky slopes and cliffs of schist in upper Jupar valley, alt. 3650 m., no. 14348, June 1926 (shrub 1–1.25 m.; flowers yellow). Kokonor Region: below pass, Lalaku, alt. 3050 m., no. 13357, Sept. 1925 (shrub 0.60–1 m.; flowers yellow); head of Koko gorge, alt. 3650 m., no. 13370, Sept. 1925 (flowers yellow); sand dunes northeast Kokonor shores, alt. 3300–3500 m., no. 13391, Sept. 1925 (shrub 0.60–1 m.).

Wolf describes this variety as having 7 leaflets, but many of the specimens cited above have leaves with only 5 leaflets, as nos. 12460, 12881, 13096, 13370, 13672 and 14384, while nos. 12173, 12746 and 1357 have 5–7 leaflets and like those of the preceding numbers rather sparingly pubescent; nos. 13391, 14005, 14140 and 14264 all from eastern

Tibet, have prevailingly 7 rather densely silky-pubescent leaflets not exceeding 5 mm. in length.

Potentilla fruticosa var. **Purdomii** Rehder in Jour. Arnold Arb. III. 209 (1922); Man. Cult. Trees Shrubs 423 (1927).

SOUTHWESTERN KANSU. Tao River basin: summit of Mt. Lissedzadza, along stream, alt. 3650 m., no. 12599, July 1925 (shrub 0.6–1 m.; flowers lemon yellow); among rocks, mountains west of Adjüan, alt. 3050 m., no. 12805, July 1925 (shrub 1–1.25 m.; flowers cream-colored).

This variety is nearest to var. *parvifolia* Wolf and chiefly distinguished by its pale yellow flowers and by its 5 leaflets being generally broader, 7–10 mm. long and glaucescent and glabrous beneath except the silky midrib. It was originally described from cultivated plants raised from seed collected by Wm. Purdom in northern China; it has not been recorded before from Kansu.

Potentilla fruticosa L. var. **Veitchii** Bean, Trees & Shrubs Brit. Isles, II. 223, fig. (1914).—Rehder & Wilson in Sargent, Pl. Wilson. II. 303 (1915).

Potentilla Veitchii Wilson in Gard. Chron. ser. 3, L. 102 (1911).
Potentilla davurica var. *Veitchii* Jesson in Bot. Mag. CXLI. t. 8637 (1915).

EASTERN TIBET. Jupar Range: in stream bed of valley with Willows, alt. 3200 m., no. 14281, June 26, 1926 (shrub 1–1.25 m.; flowers white). Radja and Yellow River gorges; mountains opposite Radja, alt. 3350 m., no. 14164, June 1926 (shrub 1.25 m.; flowers white). Ba valley: gravelly slopes, alt. 3200 m., no. 14263, June, 1926 (shrub 1.5 m.; flowers white). Kokonor Region: rocky cliffs in valley of Chunku ho, alt. 3050 m., no. 13369, Sept. 1925.

Potentilla fruticosa L. var. **dahurica** Seringe in De Candolle, Prodr. II. 579 (1825).—Rehder in Jour. Arnold Arb. V. 201 (1924), as "var. *davurica* Lehmann"; Man. Cult. Trees Shrubs, 423 (1927).

Potentilla davurica Nestler, Monog. Potent. 31, 1bis fig. B (1916).—Poiret, Encycl. Math. Bot. Suppl. IV. 541 (1816).—Wolf in Bibl. Bot. XVI. 60 (Monog. Potent.) (1908).
Potentilla fruticosa β. Lehmann, Monog. Potent. 32 (1820).
Potentilla glabra Laddiges, Bot. Cab. X. t. 944 (1826).

SOUTHWESTERN KANSU. Tao River basin: Choni, southern banks, no. 12267, June 1925 (shrub 0.6–1 m.; flowers white); along banks of stream, Kadjaku, alt. 2700 m., no. 12453, June 1925 (shrub 0.3–6 m.; flowers large, white); summit of Mt. Lissedzadza, eastern end of Minshan range, along brook near camp, alt. 3650 m., no. 12594, July 1925 (flowers white); along streams on rocks and cliffs, near Adjüan, alt. 3050 m., no. 12641 (shrub 1 m.; flowers white); Maerhku, northern Minshan, alt. 2750–3050 m., no. 13673, Sept.–Oct. 1925 (shrub 1–1.25 m.; flowers white).

The varietal combination is often credited to Lehmann who, however, called it *P. davurica* β with *P. davurica* Nestler as synonym. The com-

bination was apparently first made by Seringe who changed the spelling of the name to "dahurica."

Potentilla biflora Willdenow herb. apud Schlechtendal in Mag. Ges. Naturf. Freunde Berlin, VII. 297 (1816).—Lehmann, Monog. Potent. 30, 192, t. 20 (1820).—Rydberg in Mem. Dept. Bot. Columbia Univ. II. 83, t. 33, fig. 6–9 (1898).—Wolf in Bibl. Bot. XVI. 70 (1908).

SOUTHWESTERN KANSU. Upper Tebbu country: trail to Kuang ke, west of Shimen, Minshan range, on limestone boulders, alt. 3950, no. 13006, July–Aug. 1925 (forming large cushions; flowers rich yellow).

This is a low form with one-flowered branchlets 1.5–2 cm. long and except at the apex nearly glabrous leaflets. The species has apparently not yet been recorded from northern China.

Potentilla Salesoviana Stephan in Mém. Soc. Nat. Moscou, II. 6, t. 3 (1809).—Wolf in Bibl. Bot. XVI. 74 (1908), "P. Salesowiana."

Potentilla Salesovii Stephan apud Willdenow, Enum. Hort. Berol. 552 (1809).—Lehmann Monog. Potent. 35, t. 1 (1820).

Comarum Salesowianum Ascherson & Graebner, Syn. Mitteleur. Fl. VI. 663 (1904).

NORTHWESTERN KANSU. Richthofen Range and adjacent region: slopes of the Pientuku gorge, eastern end of the Kanchow Nanshan, no. 13321, Nov. 1925 (shrub 1–1.25 m.).

EASTERN TIBET. Jupar Range: in stream bed of valley, with Willows, alt. 3200 m., no. 14280, June 26, 1926 (shrub 1–1.25 m.; flowers large white).

This species has not yet been recorded from Kansu nor from any other province of northern China.

Rosa (determined by E. H. WILSON).

Rosa chinensis f. spontanea Rehder & Wilson in Sargent, Pl. Wilson. II. 320 (1915).

Rosa indica Hemsley in Jour. Linn. Soc. XXIII. 249 (1887), in part.—Focke in Bot. Jahrb. XXIX. 405 (1900).—Henry in Gard. Chron. ser. 3, XXXI. 438, fig. 170 (1902).—Not Linnaeus, nor Loureiro.

SOUTHERN KANSU: beyond Pikow on banks of Wen hsien ho, no. 12077, April 1925 (flowers deep red).

A very interesting discovery and the first record of this Rose growing in Kansu.

Rosa sertata Rolfe in Bot. Mag. CXXXIX. t. 8473 (1913).—Osborn in Gard. Chron. ser. 3, LIV. 166, fig. 63 (1913).—Willmott, Gen. Rosa, II. 493 (1914).—Bean, Trees & Shrubs Brit. Isl. II. 443 (1914).—Rehder & Wilson in Sargent, Pl. Wilson. II. 327 (1915).

Rosa Webbiana Vilmorin & Bois, Frut. Vilmorin. 93 (1904).—Not Wallich.

Rosa macrophylla f. gracilis Focke in Not. Bot. Gard. Edinburgh, VII. 69 (1911), as to no. 4442.

SOUTHWESTERN KANSU. Lower Tebbu country: Wantsang

valley, in Spruce and Birch forest, alt. 2438 m., no. 14696, Sept. 3, 1926 (shrub 1.3 m. high; fruit red).

Rosa Biondii Crépin in Bull. Soc. Bot. Ital. 1897, 233.—Rehder in Jour. Arnold Arb. v. 207 (1924).

SOUTHWESTERN KANSU. Tao River basin: valley of Poyü, alt. 2743 m., no. 12793, June–July 1925 (shrub 1.3–1.5 m. high; flowers white). Upper Tebbu country: in Willow and Spruce forest below Shimen, alt. 3198 m., no. 13055, July–August 1925 (shrub 1.3 m. high; flowers white to cream color); forests below outer Shimen, Tsaluku valley, alt. 3348 m., no. 13068, July–August 1925 (shrub 1.5 m. high).

CENTRAL KANSU. Lien hoa shan: Spruce forest, alt. 2983–3048 m., no. 12730, July 14–20, 1925 (shrub 1.3 m. high; flowers white tinged cream).

Rosa bella Rehder & Wilson in Sargent, Pl. Wilson. II. 341 (1915).—Rehder in Jour. Arnold Arb. v. 206 (1924).

? *Rosa macrophylla hypoleuca* Franchet in Nouv. Arch. Mus. Paris, ser. 2, v. 267 (Pl. David. I. 115) (1883).

Rosa sp. F. N. Meyer in U. S. Dept. Agric. Invent. Seeds Pl. Imp. XXXVII. 75, no. 36857, 36858 (1916).

Rosa Sweginzowii Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 26 (1922).—Not Koehne.

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, southeast of Choni, alt. 3048 m., no. 12553, June 1925 (shrub 1.3–1.5 m. high; flowers rich carmine).

WESTERN KANSU: Komang ssu, alt. 2983 m., no. 13293, Oct. 1925 (shrub 1.3 m. high; fruit red).

EASTERN TIBET. Kokonor Region: Koko gorge, no. 13265, Sept. 1925 (shrub 1.5 m. high; fruit scarlet). Radja and Yellow River gorges: valley of Yellow River gorges, north of Radja, alt. 3198 m., no. 14035, May 28, 1926 (shrub 1.3–1.5 m. high); south of Yellow River, facing north towards Radja, alt. 3198 m., no. 14110, June 10, 1926 (shrub 1.5–1.8 m. high; flowers deep red). Ba valley: gravelly slopes, alt. 3198 m., no. 14267, June 1926 (shrub 1.8–2.5 m. high, flowers rich red).

Rosa Sweginzowii Koehne in Fedde, Rep. Spec. Nov. VIII. 22 (1910).—Rehder & Wilson in Sargent, Pl. Wilson. II. 324 (1915).—Rehder in Jour. Arnold Arb. v. 207 (1924).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao, Choni, alt. 2588–3013 m., nos. 12869, 12884 and 14927, July, Oct. 1926 (shrub, 1.3–3 m. high; flowers pink, rose-red); banks of Toyuku, below Adjüan, alt. 2743 m., no. 12824, July 1925 (shrub 1.5–2.5 m. high; flowers pale pink); gulches of northern Minshan, alt. 2893 m., no. 14896, Aug.–Sept. 1926 (shrub 1.3–1.8 m. high); Maerhku valley, alt. 2743–2893 m., nos. 14903 and 14907, Aug.–Sept. 1926 (shrub 1.5–4.5 m. high); Kadjaku, west Tebbu, alt. 2893 m., nos. 13570 and 13573, Oct.

1925 (shrub 1.3–2.5 m. high). Lower Tebbu country: in Abies forest along streams, Totipana, southern Minshan, Sambaku, alt. 2743 m., no. 14882, Sept. 1926 (shrub 3–4.5 m. high; flowers white); forests between Pezhu and Ngongo, alt. 2438 m., no. 14988, Sept.–Oct. 1926 (shrub 1.8–3 m. high).

EASTERN TIBET. Kokonor Region: Koko gorge, nos. 13264 and 13266, Sept. 1926 (shrub 1.3–2.5 m. high).

Rosa Davidii Crépin in Bull. Soc. Bot. Belg. XIII. 253 (Prim. Ros. Monog. 260) (1874).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 270 (Pl. David. I. 118) (1883).—Rehder & Wilson in Sargent, Pl. Wilson. II. 322 (1915).—Rehder in Jour. Arnold Arb. v. 205 (1924).

CENTRAL KANSU. Lien hoa shan: Shanshen Miao, alt. 2893 m., no. 13495, Oct. 1925 (shrub 1.3–1.5 m. high).

Rosa Willmottiae Hemsley in Kew Bull. Misc. Inform. 1907, 317; in Bot. Mag. CXXXIV. t. 8186 (1908).—Willmott, Gen. Rosa, I. 195, t. (1911).—Rehder & Wilson in Sargent, Pl. Wilson. II. 329 (1915).

SOUTHWESTERN KANSU. Tao River basin: Choni district, dry scrub, no. 14912, Oct. 1926 (shrub 1.3–1.5 m. high); Maerhku, Choni, alt. 2588 m., no. 14892, Aug.–Sept. 1926 (shrub 1.8–2.5 m. high); Tatsuto, Kadjaku valley, west Tebbu, alt. 2803 m., no. 13591, Sept.–Oct. 1925 (shrub 1.3–1.5 m. high). Lower Tebbu country: Pezhu, Peshwekiang, alt. 2194 m., no. 14944, Oct. 1926 (shrub 1.5 m. high).

EASTERN TIBET. Kokonor Region: forest on Mt. Ngiu sin shan, Babo, alt. 2893 m., no. 13299, Oct. 1925 (shrub 1–1.3 m. high).

Rosa omeiensis Rolfe in Bot. Mag. CXXXVIII. t. 8471 (1912).—Bean, Trees & Shrubs Brit. Isles, II. 438 (1914).—Rehder & Wilson in Sargent, Pl. Wilson. II. 331 (1915).—Rehder in Jour. Arnold Arb. v. 210 (1924).

Rosa sericea Crépin in Bull. Soc. Bot. Belg. XIV. 151 (1875), as to Przewalski's specimen; XXV. Compt. Rend. 9 (1886); in Bull. Soc. Bot. Ital. 1897, 234.—Diels in Not. Bot. Gard. Edinburgh, VII. 238 (Pl. Chin. Forrest.) (1912).—Not Lindley.

Rosa sericea, f. *glabrescens* Franchet, Pl. Delavay. 220 (1890).

Rosa sericea, f. *intermedia* Franchet, l. c. (1890).

Rosa sericea, f. *denudata* Franchet, l. c. (1890).

Rosa sericea, f. *inermis eglandulosa* Focke in Not. Bot. Gard. Edinburgh, v. 69 (Pl. Chin. Forrest.) (1911).

Rosa sericea, f. *aculeata eglandulosa* Focke, l. c. 70 (1911).

Rosa Sorbus Léveillé in Fedde, Rep. Spec. Nov. XIII. 338 (1914).

SOUTHWESTERN KANSU. Tao River basin: Choni district, alt. 2528 m., nos. 12177, 12211, 12461 and 13547, June, Sept.–Oct. 1925 (shrub 1.3–1.8 m. high, stem red; flowers white); west bank of Tao valley, alt. 2743–2983, nos. 12889 and 13575, July, Sept.–Oct. 1925 (shrub 0.6–1.3 m. high); forests of Shiaoku, along brooks, alt. 3048 m., no. 12807, July 1925 (shrub 3–6–4.5 m. high); Poyüku, in river valley, no. 13537, Oct. 1925; south of Minshan, below Shimen, alt. 3048 m., no. 12485, June 1925 (shrub 1–1.5 m. high; flowers white); Maerhku,

alt. 2743 m., no. 14900, Aug.–Sept. 1926 (shrub 1.5–2.5 m. high); Tatsuto, Kadjaku valley, west Tebbu, alt. 2893 m., no. 13590, Sept.–Oct. 1925 (shrub 1.3 m. high). Upper Tebbu country: forests below outer Shimen, Tsaluku valley, alt. 3228–3348 m., nos. 13070, 13103, July–Aug. 1925 (shrub 1.5–2.5 m. high).

Eastern Tibet. Kokonor Region: Koko gorge, no. 13271, Sept. 1925 (shrub 1–1.8 m. high).

Rosa xanthina Lindley, Monog. Ros. 132 (1820).—Hemsley in Jour. Linn. Soc. xxiii. 254 (1887).—Bretschneider, Hist. Eur. Bot. Discov. China, 861 (1898).—F. N. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. xiii. 170, no. 21620 (1908).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 342 (1915).—Hers in Jour. N. China Branch R. As. Soc. liii. 115 (1922); Liste Ess. Lign. Honan, 26 (1922).—Rehder in Jour. Arnold Arb. v. 208 (1924).

Rosa pimpinellifolia Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. ii. 100 (Enum. Pl. Chin. Bor. 26) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. ix. 471 (Ind. Fl. Pekin.) (1859).—Hemsley in Jour. Linn. Soc. xxiii. 253 (1887).—Bretschneider, Hist. Eur. Bot. Discov. China, 333 (1898).—Not Linneaus.

Rosa sp. F. N. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. xii. 37, no. 17469 (1907).

Rosa xanthinoides Nakai in Tokyo Bot. Mag. xxxii. 218 (1918); in Fl. Sylv. Kor. vii. 33, t. 6 (1918).

Southwestern Kansu. Tao River basin: west of Choni, banks of river, alt. 2588 m., no. 12186, June 1925 (shrub 1.3 m. high; flowers yellow).

Maddenia hypoleuca Koehne in Pl. Wilson. i. 56 (1911).

Southwestern Kansu. Tao River basin: mountains of Choni, west of Tao ho, outskirts of Picea forest, alt. 3050 m., no. 12148, May 1925 (shrub 2.5–3 m.); Choni, in forest among Spruces, alt. 2750–3050 m., no. 12577, July 1925 (tree 4.5 m.). Upper Tebbu Country: Spruce forest, among boulders, southern slopes of Minshan, alt. 2950 m., no. 12531, June 1925 (small tree or shrub 2.5–3 m.).

This species has been collected in Kansu before by Wm. Purdom near Minchow and by R. C. Ching (Wulsin Exped. no. 391) at Hsia mo k'ou near Lichen.

Prunus salicina Lindley in Trans. Hort. Soc. vii. 239 (1830).—Koehne in Sargent, Pl. Wilson i. 580 (1913).

Prunus triflora Roxburgh, Hort. Bengal. 38 (1814), nom. nud.; Fl. Ind. ed. 2, ii. 501 (1832), sphalm. "trifolia."—Nakai, Fl. Sylv. Kor. v. 42, t. 26 (1916).

Southwestern Kansu. Tao River basin: Choni, valley of Tao ho, nos. 12112, 12121, May, 1925 (shrub 2–2.5 m. or tree 4.5 m., with round crown and short branching trunk; flowers whitish pink or white); Poyüku, alt. 2900 m., no. 13527, Oct. 1925 (tree 3–4.5 m.; leaves pale beneath; fruit edible); in Birch and Picea forest, with Rosa, Salix Cotoneaster etc., alt. 2750–2900 m., no. 14909, Sept. 10, 1926

(shrub or tree 3–4.5 m.). Lower Tebbu country: wild on banks of Peshwekiang, alt. 2300 m., no. 14570, Aug. 29, 1926 (tree 4.5 m.; fruit yellow, sweet, edible).

WESTERN SZECHUAN: north of Kiang yu, rocky cliffs along Fu Kiang, no. 12030, March 1925 (shrub 1.75 m.; flowers pink); along Fu Kiang river, among rocks, alt. 1200 m., no. 12035 (shrub 1.25 m.).

This species had not been recorded from Kansu before.

Prunus Persica Batsch, Beytr. Entwick. Gesch. Naturr. 30 (1801).—Rehder in Jour. Arnold Arb. v. 213 (1924).

WESTERN SZECHUAN: mountain south of Ching chuan beyond Kiang, in gorge of Fu Kiang, no. 12055, March 1925 (shrub 1 m.; flowers deep reddish pink).

Prunus Armeniaca Linnaeus, Spec. 474 (1753).—Koehne in Sargent, Pl. Wilson. I. 278 (1912).—Beck in Reichenbach, Icon. Fl. Germ. XXV. pt. II. 5, t. 85 (1913).

Armeniaca vulgaris Lamarck, Encycl. Méth. I. 2 (1780).

EASTERN TIBET. Radja and Yellow River gorges: Radja lamasery, cultivated, alt. 3050 m., no. 13926, May 20, 1926 (tree 7.5 m.; flowers whitish pink).

Prunus tangutica Koehne in Sargent, Pl. Wilson. I. 276 (1912).—Rehder in Jour. Arnold Arb. v. 215 (1924).

Amygdalus communus var. *tangutica* Batalin in Act. Hort. Petrop. XII. 163 (1892).

Amygdalus tangutica Korshinsky in Bull. Acad. Sci. St. Pétersb. sér. 5, XIV. 94 (1901).

Prunus dehiscens Koehne in Sargent, Pl. Wilson. I. 271 (1912).—Rehder & Wilson in Sargent, Pl. Wilson. III. 432 (1917).—Rehder in Jour. Arnold Arb. III. 24 (1921).—Anon. in Gard. Chron. ser. 3, LXXVII. 200, fig. (1925).

SOUTHWESTERN KANSU. Tao River basin: over the rocky hillsides of Choni, wild shrub, no. 12095, May 1925 (flowers with pale reddish tinge); mountains of Choni, alt. 2750 m., no. 12143, May, 1925 (shrub 1.75–2 m.; flowers pale pink); Choni district on dry banks, alt. 2600 m., no. 13555, Sept.–Oct. 1925 (spiny compact shrub 2–2.5 m.); dry loess slopes, alt. 2600 m., no. 14889, Aug.–Sept. 1926 (thorny shrub, stem black; fruit dry, velvety).

The additional material cited above has convinced me of the already suspected identity of *P. tangutica* and *P. dehiscens*. The size of the leaves, which after the flowers of *P. dehiscens* had become known, constituted the chief distinguishing character, cannot be considered any longer a constant character with the material now before me. Typical *P. dehiscens* from Szechuan has leaves 1–3 cm. long, R. C. Ching's specimen from Tao chow, Kansu, (Wulsin Exped. no. 831) has leaves 2–3 cm. long, Rock's no. 14889 has them 2–4 and Rock's no. 13555 3–5.5 cm. long and up to 1.4 cm. broad, which agrees with the measurements given by Batalin for *P. tangutica*. The fruits of Rock's nos. 13555 and 14889 are distinctly dehiscent, a character which did not show in Potanin's specimens, upon which Batalin based his description, as his fruits were not mature.

Prunus tomentosa Thunberg, Fl. Jap. 203 (1784).—Siebold & Zuccarini, Fl. Jap. I. 51, t. 22 (1837).—Koehne in Sargent, Pl. Wilson. I. 268 (1912).—Rehder in Jour. Arnold Arb. v. 217 (1924).

SOUTHERN KANSU: mountain of Motzuping, no. 12061, April 1925 (shrub 1–1.75 m.; flowers white).

SOUTHWESTERN KANSU. Tao River basin: mountain of Choni, alt. 2600 m., no. 12096, May 1925 (shrub 1.50–2.50 m.; flowers white); mountain of Choni, alt. 2750 m., no. 12113, May 1925 (flowers pinkish white); Choni, valley of the Tao ho, alt. 2700 m., nos. 12108 and 12122, May 1925 (shrub 1.75–2 m.; flowers pink); west of Choni, open scrub and forests, alt. 2700 m., no. 12175, June 1925 (shrub 1.75–2 m.).

Prunus stipulacea Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIX. 97 (1883); in Mél. Biol. XI. 689 (1883).—Koehne in Sargent, Pl. Wilson. I. 258 (1912).

SOUTHWESTERN KANSU. Tao River basin: mountains of Choni, in forests and on banks of streams, alt. 3050, no. 12116, May 1925 (shrub 2–2.5 m.; flowers pink); Choni, forests west of Tao ho, no. 12124, May 1925 (shrub 1–2 m.; flowers pink); mountains of Choni west of Tao River, in Picea forest, alt. 3200 m., no. 12127, May 1925 (shrub 1 m.); Choni, river valley, no. 12262, June 1925 (shrub or small tree 3–3.5 m.; flowers pink); Maerhku valley, Choni, outskirts of Spruce forest, alt. 2750 m., no. 12334, June 1925 (tree 3.5–4.5 m.; flowers pink); banks of river and forests, alt. 2600–2750 m., no. 12872, July 1925 (shrub 1.75 m., branching from base; leaves dull green; fruit ovoid-oblong, red). Lower Tebbu country: in Abies and Rhododendron forests, Sambaku, alt. 3200 m., no. 14767, Sept. 7, 1926 (shrub or small tree, 4.5 m.; foliage pale green; fruit single, red). Upper Tebbu country: in crevices of limestone walls, southern slopes of Minshan, alt. 3500 m., no. 12527, June 1925 (small tree 3–4 m.; flowers pale pink); in valleys with Willow and Birches, alt. 3350 m., no. 13108, July–Aug. 1925 (shrub 2–2.5 m.; fruit rich red); trail from Kwang kei, alt. 3350 m., no. 13113, Aug. 1925 (shrub 2–3 m.; fruit red).

This species is endemic to Kansu. The specimens from Tebbu land have rather small stipules and small mostly ovate to elliptic leaves, that from Lower Tebbu country generally 3–5 cm., those from Upper Tebbu country 2–3.5 cm. long, and thus resemble the following species.

Prunus setulosa Batalin in Act. Hort. Petrop. XII. 165 (1892); in Gartenfl. XLII. 330 (1892).—Koehne in Sargent, Pl. Wilson. I. 257 (1912).

SOUTHWESTERN KANSU. Tao River basin; alt. 2600 m., no. 12263, June 1925 (shrub 1–1.5 m.; flowers purplish-red); outskirts of forests in river valley, alt. 2600–3000 m., no. 12298, June 1925 (shrub or small tree, 4.5 m.; flowers in pairs, pink); Minshan range, Kadjaku, beyond Tatsuto, alt. 2750 m., no. 12432, June 1925 (shrub or small tree 3–4.5 m.; flowers pink).

This species also is endemic to Kansu. The leaves resemble those of the small leaved *P. stipulacea* but the serrations are broader and less acuminate and the petioles are shorter; the bark of the older branchlets partly separates into large thin flakes.

Prunus pseudocerasus Lindley in Trans. Hort. Soc. Lond. VI. 90 (1826).—Wilson, Cherries Jap. 3 (1916).

Prunus paniculata Edwards in Bot. Reg. X. t. 800 (1824).—Non Thunberg.

SOUTHERN KANSU: mountain of Motzuping and Pikou along streams, no. 12072, April 1925 (tree or shrub 1–1.5 m.; flowers white).

Prunus spec.

WESTERN SZECHUAN: mountain of Ching chuan, alt. 1500 m., no. 12052, April 1925 (small tree 3 m.; flowers white).

This specimen resembles in the characters of its flowers and inflorescence *P. pseudocerasus*, but the involucre is caducous and the mature branchlets are slender, yellowish gray and more or less short-pilose; the very young unfolding leaves are densely pubescent on the veins and midrib beneath and on the petiole, but glabrous above. It may be related to *P. hirtifolia* Koehne of which the flowers are unknown, but branchlets and leaves of that species are more densely pubescent.

Prunus Padus Linnaeus, Spec. 473 (1753).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIX. 108 (1883); in Mél. Biol. XI. 705 (1883).—Beck in Reichenbach, Icon. Fl. Germ. XXV. 5, t. 95 (1913).

SOUTHWESTERN KANSU. Tao River basin: mountains of Choni, in forests and on banks of streams, alt. 3050 m., no. 12117, May 1925 (shrub 2–2.5 m.); banks of Tao River, east of Choni, alt. 2550 m., no. 12213, June 1925 (shrub or small tree; flowers white); southern bank, Choni, no. 12264, June 1925 (shrub 1.25–3 m.; flowers white); along bank of Tao ho, alt. 2550 m., no. 12306, June 1925 (tree 4.5–6 m.; flowers white, in showy racemes); Tatsuto forests along Kadjaku stream, alt. 2700 m., nos. 12452 and 12468, June 1925 (shrub 3 m. or less, or tree 7 m.; flowers white); Maerhku valley, alt. 2750 m., no. 13577, Sept.–Oct. 1925 (shrub 3–4.5 m.; fruit black); near Choni, no. 14893, Aug.–Sept. 1926 (shrub or small tree with drooping branches; fruit black).

The specimens above are apparently referable to var. *commutata* Dippel (Handb. Laubholzk. III. 647 [1893]), differing from the type chiefly in the smaller leaves mostly broad-cuneate at base and light green beneath.

Prunus pubigera Koehne var. **Prattii** Koehne in Sargent, Pl. Wilson. I. 68 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: dense forests of Wantsang valley, alt. 2700 m., no. 14857, Sept. 12, 1926 (tree 7–10 m.; leaf gray beneath; fruit yellowish when mature); dense forest, with Abies at Totipana, Sambaku, alt. 2750–3000 m., no. 14883, Sept. 15, 1926 (tree 7–9 m., trunk reddish; leaf dull green above; fruit orange to brownish red).

Prinsepia uniflora Batalin in Act. Hort. Petrop. XII. 167 (1892); in Gartenfl. XLII. 331 (1892).—Rehder in Sargent, Pl. Wilson. I. 345 (1915).—F. N. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent Seeds Pl. Imp. XLI. 28, t. 3, 4 (1917).

SOUTHERN KANSU: valley of Motzuping, no. 12065, April 1925 (shrub 1–1.3 m.; flowers white to cream-colored).

SOUTHWESTERN KANSU: Lower Tebbu country: Pezhu valley, on loess slopes, no. 14957, Oct. 1926. Upper Tebbu country: banks of the Peshwekiang between Tsaraku and Pezhu, alt. 2450 m., no. 14564, Aug. 30, 1926 (shrub 1.75–2 m., with drooping branches; fruit single, wine-red).

CENTRAL KANSU. Lien hoa shan: below Lien hoa shan, along sandy banks of stream, alt. 2450 m., no. 13504, Oct. 1925 (spiny shrub, 1.75–2 m.; leaves pale green; fruit red juicy, edible); Tao River valley, below Titao, no. 13225, Aug. 1925 (spiny shrub, 1.25 m.; fruit scarlet, edible).

Prinsepia utilis Royle, Ill. Bot. Himal. 206, t. 38, fig. 1 (1839).—Hooker f., Fl. Brit. Ind. II. 323 (1879).—Rehder in Sargent, P. Wilson. II. 345 (1915).

NORTHEASTERN YUNNAN: near Laitoupu, dry rocky slopes, alt. 2550 m., no. 12004, Dec. 1924 (spiny shrub).

LEGUMINOSAE

Determined by CLARENCE E. KOBUSKI

Cercis chinensis Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 95 (Enum. Pl. Chin. Bor. 21) (1833); Planchon in Fl. des Serres, VIII. 269, t. 849 (1852–53).

WESTERN SZECHUAN: on road to Ching chuan, alt. 1525 m., no. 12041, Apr. 1925 (tree 6.5–9 m. tall; flowers white).

Indigofera Bungeana Walpers in Linnaea, XIII. 525 (1839).—Craib in Not. Bot. Gard. Edinb. VIII. 69 (1913).

SOUTHWESTERN KANSU. Lower Tebbu country: Mayaku above Nyipa, on shale slopes, alt. 2375 m., no. 15056, Sept.–Oct. 1926 (shrub 1 m. high).

Indigofera Bungeana Walp. f. **spinescens** Kobuski, forma nova.

A typo recedit habitu humili ad 0.3 m. alto, intricato-ramosissimo, ramis congestis brevibus spinescentibus, foliolis 2.5–7 mm. longis et 2–3 mm. latis crassioribus subtus et ad marginem densius pubescentibus.

SOUTHWESTERN KANSU. Lower Tebbu country: on slate and shale embankments of Peshwekiang near Wantsang, alt. 1950 m., no. 14743, Sept. 5, 1926 (cushion plant, stiff low shrub; flowers pink).

This form, on account of its low growing, rather gnarled and spiny habit, would hardly on appearances be associated with the taller, more graceful shrub *I. Bungeana* Walp. However, the flower and fruit characters are practically identical with the typical form of the species and one must conclude on a study of the material that this specimen is probably only an ecological form.

Caragana brevifolia Komarov in Act. Hort. Petrop. XXIX. 211, t. 17 (1909).

EASTERN TIBET. Kokonor Region: in rocky ravines of east Kokonor below Kettenika, alt. 3050 m., no. 13367, Sept. 1925 (shrub 1 m. high forming dense masses); grassy hillsides of Koko gorge near Bamba, northeast of Kokonor, alt. 2890–3050 m., nos. 13280 and 13343, Sept. 1925 (shrub 0.5–1.3 m. high, branches suberect; leaflets dark green; flowers yellow). Radja and Yellow River gorges: among rocks of Lungmar valley, southeast of Radja, alt. 3300 m., no. 14012, May 1926 (shrub 0.5–1 m. high; flowers dark yellow); along stream bed and outskirts of Spruce forest in Dachso canyon north of Radja, alt. 3200 m., no. 14075, June 2, 1926 (shrub 1 m. high). Jupar Range: open grassy slopes of valley north of range, alt. 3200 m., no. 14278, June 26, 1926 (shrub 1 m. high; flowers yellow).

SOUTHWESTERN KANSU. Tao River basin: Kadjaku valley, west Tebbu land, alt. 2800 m., no. 13562, Sept.–Oct. 1925 (shrub 1 m. high; flowers yellow); upper Chabaku valley in shade of Junipers, alt. 3050 m., no. 13192, Aug. 1925 (shrub with pendent branches).

Along with these numbers should be cited the Purdom specimen no. 1052, collected in Minchow, Western Kansu in 1910. This number was formerly cited in Jour. Arnold Arb. VII. 166 (1926) as *C. pygmaea* DC. var. *acicularis* Komarov.

Caragana frutex K. Koch, Dendrol. I. 48 (1869).—Koehne, Deutsch. Dendrol. 339 (1893).—Komarov in Act. Hort. Petrop. XXIX. 224 (1909).
Caragana frutescens DC. Prodr. II. 268 (1825).—Sweet, Brit. Fl. Garden III. t. 227 (1827).

CENTRAL KANSU: along stream banks and beyond New City, en route to Lien hoa shan, alt. 2590 m., nos. 12759 and 13495A, July and Oct. 1925 (shrub 1.5–2.5 m. high; flowers yellow).

Caragana densa Komarov in Act. Hort. Petrop. XXIX. 258, t. 7 (1909).

SOUTHWESTERN KANSU. Lower Tebbu country: in shade in mixed Mayaku forests along Mayaku stream, alt. 2590–2740 m., nos. 14760 and 15061, Sept.–Oct. 1926 (shrub 2–2.5 m. high, branches long, semi-erect, spines weak; flowers yellow); forests of Ngongo, no. 14973, Sept.–Oct. 1926 (shrub 1.5 m. high; flowers yellow). Tao River basin: Choni, alt. 2590 m., no. 12551, June 1925 (shrub 1.5–2 m. high; flowers yellow). Upper Tebbu country: among rocks, in Hsiaoku, northeast of Adjüan, east Tebbu country, alt. 3200 m., no. 13638, Sept.–Oct. 1925 (shrub 1.5 m. high; flowers yellow).

Caragana Maximoviczіana Komarov in Act. Hort. Petrop. XXIX. 269, t. 11, fig. B (1909).

SOUTHWESTERN KANSU. Upper Tebbu country: south of Minshan, along stream near Tongwa, no. 12507, June 1925 (armed shrub 0.5–1 m. high; flowers yellow). Tao River basin: river

valley among rocks, alt. 2590 m., no. 13538, Sept.–Oct. 1925 (shrub 1.5–2 m. high; flowers yellow); river banks near Choni, alt. 2530 m., no. 12205, June 1925 (shrub 1–1.5 m. high; flowers yellow).

EASTERN TIBET. Radja and Yellow River gorges: among boulders, alt. 3050 m., no. 13947, May 20, 1926 (shrub 1–1.5 m. high; flowers yellow).

Caragana Roborovskyi Komarov in Act. Hort. Petrop. XXIX. 280, t. 8, fig. B (1909).

EASTERN TIBET. Jupar Range: gravelly rocky bluffs overlooking Yellow river, west of mouth of Jupar Valley, alt. 3200 m., no. 14318, June 1926 (shrub .3–.7 m. high).

The specimen cited above lacks flowers but agrees with the original description of Komarov's species in all respects except for leaf length. The approximate leaf length is 5 mm. or one-half that given by Komarov. Incidentally the legumes, which were lacking in the Roborovsky specimen, are present in the Rock specimen. They are approximately 2.5 cm. long, quite attenuated at the apex and about as villous as the calyx.

Caragana tibetica Komarov in Act. Hort. Petrop. XXIX. 282, t. 10 (1909).—Rehder in Jour. Arnold Arb. VII. 166, 1926.

EASTERN TIBET. Jupar Range: gravelly rocky bluffs overlooking Yellow river, west of mouth of Jupar valley, alt. 3200 m., no. 14319, June 1926 (tussock forming plant; flowers yellow).

An excellent photograph of this specimen showing its low growing habit accompanied the collection.

Caragana jubata Poiret, Encycl. Méth. Suppl. II. 89 (1911).—Regel in Gartenfl. X. 231, t. 331 (1861).—Komarov in Act. Hort. Petrop. XXIX. 287 (1909).

SOUTHEASTERN KANSU. Tao River basin: Drakana in Kwang kei, alt. 3050 m., no. 13567, Sept.–Oct. 1925 (single, woody, erect stem, 3–4.5 m. high; flowers large, rich pink); Darakana, Tebbu country, alt. 3300 m., no. 13541, Oct. 1925 (thick-stemmed, spiny shrub 1 m. high, spreading; flowers pink); alpine meadows, west of Adjüan, alt. 3650 m., no. 12635, July 6–10, 1925 (shrub 1 m. high); Taku mountains, west of Adjüan, east Tebbu land, alt. 3300 m., no. 13533, Oct. 1925 (spiny spreading shrub; flowers pink); with Abies at head of Laliku, alt. 3050–3300 m., no. 14933, Oct. 19, 1926 (unbranched shrub, 1.3–2 m. high; flowers pink); grassy slopes of Minshan range, Kadjaku, no. 12425, June 1925 (woody plant 3–3.5 m. high, forming long cylindrically shaped trees without lateral branches). Upper Tebbu country: southern slopes of Minshan (only), alt. 3230 m., no. 12517, June 1925 (spreading rambling shrub; flowers purplish red).

EASTERN TIBET. Kokonor Region: grassy hillsides of Koko gorge near Bamba, northeast of Kokonor, alt. 2890–3020 m., no. 13342, Sept. 1925 (stiff, stout, spreading stems). Radja and Yellow

River gorges: grassy slopes of Lungmar pass, southeast of Radja, alt. 3650 m., no. 14013, May 1926 (prostrate shrub; flowers pink); alpine meadows between upper Dachso valley and mouth of Wajo valley, alt. 4100 m., no. 14090, June 4, 1926 (prostrate shrub; flowers pink). Jupar Range: rocky slopes and cliffs of schist in upper Jupar valley, alt. 3650 m., no. 14341, June 1926 (stem up to 3 m. high; flowers pink). Amnyi Machen range (west of Yellow River): alpine meadows of Druggu, alt. 4250 m., no. 14427, July 1926 (prostrate shrub; flowers pale pink).

Excellent photographs of nos. 12425, 12635, 14341 and 14933 were sent along with the collection and show both habit and parts of the plants in greater detail. The prostrate form of *C. jubata* of the grassy alpine slopes is perhaps represented by nos. 14013, 14090 and 14427. These numbers also possess smaller leaves. The remaining numbers represent the erect, robust habit of growth usually associated with this species. A more glabrescent form is represented by numbers 13342 and 13533. In these last mentioned numbers, however, the specimens are already in fruit and may not represent any unusual feature.

Caragana sp.

Southwestern Kansu. Lower Tebbu country: along stream in upper Mayaku forests, alt. 2740 m., nos. 14765 and 15062, Sept.–Oct. 1926 (shrub 1–2.5 m. high, branched); on rocks and shady banks upper forests of Wantsang, alt. 2560 m., no. 14698, Sept. 3, 1926 (shrub 2–3 m. high; flowers yellow); gorges of Ngongo, alt. 2890 m., no. 14965, Oct. 1926 (shrub 1.5–2.5 m. high, tortuously branched).

These flowerless specimens represent either the species *C. conferta* Benth. or a species closely related. Since the flowers are lacking and there seems to be no outstanding and distinctive characters present one hardly feels justified in describing it as new.

Astragalus sp.

Eastern Tibet. Kokonor Region: sandy desert surrounding northeastern shore of Kokonor, alt. 3200 m., no. 13382, Sept. 1925 (shrub less than 0.3 m. high, spiny, globose).

On account of the absence of both inflorescence and fruit it is quite impossible to determine the above number any further than to genus.

Hedysarum multijugum Maximowicz in Mél. Biol. XI. 212 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 464 (1882).—Regel in Gartenfl. XXXII. 193, t. 1122 (1883).

Central Kansu. Lien hoa shan: loessy bank of Tao river below Titao, also Yellow river and Hsinging river valley, alt. 1830 m., no. 13226, Aug. 1926 (flowers rich carmine, turning purple on drying).

Lespedeza formosa Koehne, Deutsch. Dendrol. 343 (1893).—Schindler in Bot. Jahrb. XLIX. 580 (1913); in Sargent, Pl. Wilson. II. 107 (1914).

SOUTHWESTERN KANSU. Lower Tebbu country: on dry slate and shale slopes of Mayaku along trail in Oak forest, alt. 2375 m., no. 14792, Sept. 8, 1926 (about 1 m. high; flowers purple).

Lespedeza floribunda Bunge in Mém. Kazan. Univ. IV. [114?] (Pl. Mongh.-Chin. 13) (1835); Schindler in Bot. Jahrb. XLIX. 597 (1919); in Sargent, Pl. Wilson. II. 105 (1914); in Bot. Centralbl. Beih. XXXVII. pt. II. 142 (1919).

SOUTHWESTERN KANSU. Lower Tebbu country: on dry arid shale slopes of Peshwekiang below Wantsang, no. 14744, Sept. 5, 1926 (flowers deep lavender purple).

Campylotropis Giraldii Schindler in Fedde, Rep. Spec. Nov. IX. 518 (1911); XI. 340 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2135 m., no. 14732, Sept. 1926 (shrub 2–2.5 m. high; flowers rich pink); banks of stream and outskirts of forests, alt. 2135 m., no. 14652, Aug. 31, 1926 (shrub 3–4 m. high; flowers pinkish purple).

ZYGOPHYLLACEAE

Determined by A. REHDER

Zygophyllum xanthoxylum Maximowicz, Fl. Tangut. 103 (1889).—Engler in Engler & Prantl, Nat. Pflanzenfam. abt. 3, IV. 81 (1890).

Sarcozygium xanthoxylum Bunge in Linnaea, XVII. 8, t. 1 (1843).

CENTRAL KANSU. Yellow River basin: between Taosha and Lanchow, alt. 1825 m., no. 13238, Aug. 1925 (shrub 1 m.; leaves fleshy; fruit papery, yellow).

NORTHWESTERN KANSU. Richthofen Range and adjacent region: arid gorge of Liyüanku, no. 13320 a, Nov. 1925 (fruit 3-winged, white).

No. 13320 a consists of fruit only; the branches under no. 13320 belong to the following species.

Nitraria Schoberi Linnaeus, Spec. ed. 2, 638 (1762).—Maximowicz, Fl. Tangut. 102 (1889).—Engler in Engler & Prantl, Nat. Pflanzenfam. abt. 3, IV. 91, fig. 59 A–G (1890).

CENTRAL KANSU. Yellow River basin: loess canyons and ravines beyond Taosha, alt. 1725 m., no. 13240, August 1925 (shrub with pendent spiny branches, globose in outline; fruit transparent, scarlet); between Taosha and Lanchow, alt. 1825 m., no. 13237, August 1925 (spiny shrub 0.75–1 m., branches whitish; flowers whitish).

NORTHWESTERN KANSU. Richthofen Range and adjacent region: arid gorge of Liyüanku, no. 13320, Nov. 1925 (shrub 1 m., pale, spiny).

EASTERN TIBET. Ba valley: in dry arid loess region in lower Ba valley, alt. 2850 m., no. 14355, July 1926 (spiny shrub, prostrate or 1–1.25 m. high; flowers white).

RUTACEAE

Determined by A. Rehder

Zanthoxylum setosum Hemsley in Jour. Linn. Soc. XXIII. 107 (1886).—Rehder & Wilson in Sargent, Pl. Wilson. II. 124 (1914).

SOUTHWESTERN KANSU. Lower Tebbu country: outskirts of forests of Wantsang valley, alt. 2125–2250 m., nos. 14661 and 14827, Aug. 31 and Sept. 1926 (shrub with stiff spreading branches or tree to 4.5 m.; fruit bright red, seeds shining black).

The specimens cited above differ from typical *Z. setosum* in the less copious pubescence; in both specimens the leaflets number 5–7 and are glabrous, but the petioles and the rachis of the leaf, the inflorescence and the branchlets are short-pilose, more minutely so and with the rachis of the leaf glabrescent in no. 14827. The related *Z. simulans* Hance (*Z. Bungei* Planch.) differs chiefly in its glabrousness, in the 7–11 larger leaflets and *Z. Piasezkii* Maxim in the 7–15 much smaller leaflets and in its glabrousness.

SIMAROUBACEAE

Determined by A. REHDER

Ailanthus altissima (Mill.) Swingle in Jour. Wash. Acad. Sci. VI. 495 (1916).

Ailanthus glandulosa Desfontaines in Mém. Acad. Sci. Paris, 1786, 265, t. 8.—L'Héritier, Stirp. Nov. 179, t. 84 (1791).

SOUTHWESTERN KANSU. Lower Tebbu country: slopes of gorges of Peshwekiang, alt. 1900 m., no. 14691, Sept. 1, 1926 (tree 7 m.; leaf glossy dark green above, pale beneath; fruit red at maturity); slopes of upper Nyibaku, alt. 2300 m., no. 14748 (tree 7–10 m.); slopes of Mayaku and Nyibaku, central spur, alt. 2450 m., no. 15060, Sept.–Oct. 1926 (tree 4.5–6 m.; panicle 30 cm. long).

CENTRAL KANSU. Yellow River basin: hilly loess country west of Lanchow near Hsincheng, no. 13243, Aug. 1925 (tree 7–12 m.; trunk 30–60 cm. diam., bark brown-gray, longitudinally furrowed).

ANACARDIACEAE

Determined by A. REHDER

Pistacia chinensis Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 89 (Enum. Pl. Chin. Bor. 15) (1833).—Rehder & Wilson in Sargent, Pl. Wilson. II. 173 (1914).—Chun, Chinese Econ. Trees, 216, fig. 78 (1922).

SOUTHWESTERN KANSU. Lower Tebbu country: dry arid banks of Peshwekiang, alt. 2000 m., no. 14798, Sept. 9, 1926 (tree 7–10 m.; leaf dark green above, pale beneath; fruit red, in large clusters).

AQUIFOLIACEAE

Determined by A. REHDER

Ilex malabarica Beddome, Fl. Sylv. I. t. 143 (1869).—Hooker f., Fl. Brit. Ind. I. 600 (1875).—Loesener in Nov. Act. Leop.-Carol. Acad. LXXVIII. 235 (Monog. Aquifol.) (1901).

NORTHEASTERN YUNNAN: Laitoupu, mountainous slopes, alt. 2450 m., no. 12003, Dec. 1924 (tree 6 m. with round bushy crown; leaves glossy dark green; berries crimson).

The specimen agrees with the figure given by Beddome and with Loesener's description, but the fruits are in fascicles of 2–5, not solitary; in this respect it agrees with Henry's 12595a which is apparently identical with Henry's 12595, the type number of Loesener's var. *sinica* (in Nov. Act. Leop.-Carol. Acad. LXXXIX. no. 1, p. 281 [Monog. Aquifol. II] [1908]), which has often 2 to 3 flowers in one fascicle on the branchlets of the previous season. It differs, however, from var. *sinica* in the leaves having the petiole and the midrib beneath glabrous; the petioles are 5–10 mm. long.

CELASTRACEAE

Determined by A. REHDER

Evonymus alata Reg. var. **aperta** Loesener in Sargent, Pl. Wilson. I. 494 (1913).—Rehder in Jour. Arnold Arb. VII. 202 (1926).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Ngongo, alt. 2750 m., no. 14978, Sept.–Oct. 1926 (shrub 1.75–2 m., branches round; seed black, aril orange). Upper Tebbu country: southern slopes of Minshan, along bank of mountain stream, alt. 3250 m., no. 12498, June 1925 (shrub with long rambling branches; flowers reddish brown).

I have referred the flowering specimen to this variety as it is not known that any other form of *E. alata* occurs in Kansu.

Evonymus phellomana Loesener in Bot. Jahrb. XXIX. 444, t. 5, fig. D, E (1900); XXX. 463 (1902).—Rehder in Jour. Arnold Arb. VII. 203 (1926).

SOUTHWESTERN KANSU. Tao River basin: valley of Tayüku, alt. 2600 m., no. 12626, July 6–10, 1925 (flowers greenish white); banks of Tayüku, southeast of Choni, alt. 2600 m., no. 12822, July 1925 (shrub 1.75–2.5 m., stem quadrangular; flowers greenish white); Maerhku, Choni district, alt. 2750 m., no. 13508, Oct. 1925 (weak shrub, 2–2.5 m., branches quadrangular, winged; fruit pink, seeds red); Tayüku, east Tebbu country, alt. 2900 m., no. 13521, Oct. 1925 (branches winged; fruit red, seeds black). Lower Tebbu country: exposed slopes, with Cotoneaster, Pyrus, etc., in Tayüku valley, eastern Minshan, alt. 2750 m., no. 14872, Sept. 19, 1926 (shrub 3–4.5 m.; leaf dull pale green); Mayaku and Nyiba ku divide, alt. 2450 m., no. 15072, Sept.–Oct. 1926 (seeds pale red).

Evonymus nanoides Loesener & Rehder in Sargent, Pl. Wilson. I. 492 (1913).—Rehder in Jour. Arnold Arb. VI. 203 (1926).

SOUTHWESTERN KANSU. Tao River basin: west of Choni, open scrub, alt. 2700 m., no. 12174, June 1925 (shrub 0.6–1 m.; flowers

green); Choni district, alt. 2600 m., no. 13554, Sept.–Oct. 1925 (shrub 0.6–1 m.; fruit capsular, aril red). Lower Tebbu country: slate banks and slopes of Mayaku beyond pass, on ridge between Nyiba and Maya, no. 14749, Sept. 5, 1926 (a prostrate stiff shrub; fruit yellow and red); Pezhu valley, alt. 2750 m., no. 14955 (shrub 0.6 m., stems angular, branches short; fruit globose, red, seeds single).

CENTRAL KANSU. En route to Lien hoa shan: from Choni via Tao chow, on grassy slopes and among scrub, alt. 2750 m., no. 12670, July 1925 (shrub 1–1.25 m.; fruit red).

Evonymus Przewalskii Maximowicz in Mél. Biol. XI. 194 (1881); in Bull. Acad. Sci. St. Pétersb. XXIX. 451 (1882); Fl. Tangut. 108 (1889).—Loesener in Bot. Jahrb. XXX. 464 (1902).

SOUTHWESTERN KANSU. Tao River basin: forests of Shiaoku beyond Adjüan, alt. 3050 m., no. 12820, July 1925 (scandent shrub 1.75–2.5 m. with quadrangular branches; flowers dark reddish black); Tayüka, east Tebbu land, Tsarekika, alt. 3200 m., no. 13587, Sept.–Oct. 1925 (shrub 0.6–1 m.; fruit greenish yellow, aril yellow).

NORTHWESTERN KANSU. Richthofen range and adjacent region: among scrub of Willows, Berberis and Potentilla, Kommangssu, alt. 2900 m., no. 13311, Oct. 1925 (shrub 1–1.25 m.; fruit pinkish red).

Evonymus Giraldii Loes. var. **ciliata** Loesener in Bot. Jahrb. XXIX. 443 (1900); XXX. 465 (1902).

SOUTHWESTERN KANSU. Tao River basin: between Yaruku, Yarugomba and Lupassu, steep forested southern banks, alt. 2750 m., no. 13173, Aug. 1925 (shrub 2.5 m.); Tatsuto to Kadjaku, Picea forest, alt. 2900 m., no. 13569, Sept.–Oct. 1905 (shrub 1–1.25 m.; fruit red, aril red). Lower Tebbu country: mixed forest along Mayaku stream in shade, alt. 2750 m., no. 14759, Sept. 6, 1926 (shrub 1–1.5 m., with erect slender straggling branches); forests of Wantsang valley, alt. 2600 m., no. 14843, Sept. 12, 1926 (shrub 2–3 m., with slender drooping branches; seeds black, enclosed in red aril).

The specimens cited above I have referred on account of the decidedly ciliate leaves to var. *ciliata* Loes., but the leaves are mostly elliptic-lanceolate or ovate-lanceolate, narrower than described by Loesener. The fruits agree with those of the following variety.

Evonymus Giraldii var. **angustialata** Loesener in Bot. Jahrb. XXXVI. beibl. LXXXII. 72 (1905).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, among Willow scrub and Berberis, no. 12961, July 25, 1925 (shrub 1–1.25 m.). Lower Tebbu country: outskirts of forests, Wantsang valley, alt. 2300 m., no. 14695, Sept. 3, 1926 (shrub 1.75–2 m.; leaf pale green; fruit greenish pink, red at maturity).

CENTRAL KANSU. Lien hoa shan: with Spruces at 3050 m., alt., no. 12747, July 14–20, 1925 (tree 2.5–3 m.).

ACERACEAE

Determined by A. REHDER

Acer pictum Thunb. var. **parviflorum** Schneider, Ill. Handb. Laubholzk. II. 225 (1907).—Nakai, Fl. Sylv. Kor. I. 18, t. 12 (1915).—Rehder in Jour. Arnold Arb. VII. 216 (1926).—Chun, Chin. Econ. Trees, 227, fig. 82 (1922).

Acer pictum var. *Mono* Franchet in Nouv. Arch. Mus. Paris sér. 2, V. 229 (Pl. David. I. 77) (1883).—Engler, Pflanzenr. IV.-163, p. 47 (1902).—Rehder in Sargent, Trees & Shrubs I. 177 (1905).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2200 m., no. 14666, Aug. 31, 1926 (tree 7–12 m.; petioles red; fruit erect on the pedicels); Tsao hi forests, alt. 2300 m., no. 14738, Sept. 2, 1926 (tree 12–15 m.; leaf pale beneath; fruit on erect peduncle); Tsaoshiku forests, alt. 2750 m., no. 15000, Sept.–Oct. 1926 (tree 12–15 m.; trunk over 60 cm. diam.); forests of Tsaoshiku, alt. 2600 m., no. 15098, Sept. 1926 (tree 15–18 m.; fruit in short raceme).

Acer ginnala Maximowicz in Bull. Phys.-Math. Acad. Sci. St. Pétersb. XV. 126 (1857); in Mél. Biol. II. 415 (1857).—Pax in Engler, Pflanzenr. IV.-163, p. 12 (1902).—Rehder in Sargent, Trees & Shrubs, I. 179 (1905); in Jour. Arnold Arb. VII. 220 (1926).—Nakai, Fl. Sylv. Kor. I. 8, t. 2 (1915).

CENTRAL KANSU. Lien hoa shan: along banks of Ha kou stream, alt. 2750 m., no. 12783, July 1925 (tree 12–15 m., trunk 90 cm. diam.; leaf dark glossy green above, paler beneath).

Acer caudatum Wall. var. **multiserratum** Rehder in Sargent, Trees & Shrubs, I. 163, t. 82, fig. 11 (1905).

Acer erosum Pax in Hooker's Icon. XIX, sub tab. 1897 (Oct. 1889).—in Engler, Pflanzenr. IV.-163, p. 69 (1902).

Acer multiserratum Maximowicz in Act. Hort. Petrop. XI. 107 (Nov. 1889).—Pax in Engler, Pflanzenr. IV.-163, p. 21 (1902).

Acer ukurunduense var. *multiserratum* Schneider, Ill. Handb. Laubholzk. II. 199, fig. 131 d (1907).

SOUTHWESTERN KANSU. Tao River basin: slopes of Maerhku valley, alt. 3050 m., no. 12957, July 25, 1925 (tree 4.5–6 m.; trunk 30 cm. diam.; petioles red; flowers [young fruits] pale lavender pink); Maerhku valley, Minshan range, alt. 2750 m., no. 13607, Sept.–Oct. 1925 (tree 7–9 m.). Lower Tebbu country: upper forest of Wantsang, with Picea and red Birches, alt. 2425 m., no. 14702, Sept. 3, 1926 (tree 15–18 m.; trunk 30–60 cm. diam.; petiole red; fruit in drooping racemes); dense forests of Wantsang, banks of stream, alt. 2400 m., no. 14727, Sept. 3, 1926 (tree 12–15 m.; trunk 60 cm. diam.; fruit pale green); dense Abies forest en route to Dayaya limestone canyon, alt. 3050 m., no. 14785, Sept. 8, 1926 (tree 10 m.; petioles red; fruit on erect racemes);

forest of Wantsang ku, alt. 2750 m., no. 15010, Sept.–Oct. 1926 (tree 15–18 m.; leaf brilliant carmine, racemes 15 cm. long, densely packed with small fruits); forests of Wantsang, alt. 2600–2750 m., no. 15040, Sept.–Oct. 1926 (tree 13–15 m.; trunk 60 cm. diam.).

Acer Davidi Franchet in Nouv. Arch. Mus. Paris, sér. 2, VIII. 212 (Pl. David. II. 30) (1884).—Rehder in Sargent, Trees & Shrubs, I. 167, t. 83 (1905).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang ku, alt. 2125–2450 m., nos. 14660 and 15033, Aug. 31 and Sept.–Oct. 1926 (tree 7.5–9 m.; fruit pale green, finally straw colored).

Acer Grosseri Pax in Engler, Pflanzenr. IV.-162, p. 80 (1902).—Rehder in Sargent, Trees & Shrubs, I. 181 (1905); in Jour. Arnold Arb. VII. 222 (1926).

SOUTHWESTERN KANSU. Lower Tebbu country: Mayaku, near Zhega, alt. 2300–2550 m., no. 15053, Sept.–Oct. 1926 (tree 7.5–10.5 m.).

Possibly this species is only a form of *A. Davidi* Franch. with which it seems connected by intermediate forms.

Acer Maximowiczii Pax in Hooker's Icon. XIX. sub t. 1897 (Oct. 1889); in Engler, Pflanzenr. IV.-163, p. 70 (1902).

Acer urophyllum Maximowicz in Act. Hort. Petrop. XI. 105 (Nov. 1889).—Rehder in Sargent, Trees & Shrubs I. 169, t. 84 (1905).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2300–2600 m., nos. 14682, 14703, 14706 and 14730, Sept. 1 and 3, 1926 (tree 7–12 m., trunk 30 cm. diam., with drooping branches (no. 14703); leaves dark green above, pale beneath, petioles red; fruit in drooping racemes pale green to pink); Tsaoshi ku, alt. 2225 m., no. 14735, Sept. 2, 1926 (tree 7–9 m.; leaves dark green; fruit pale green); dense Abies forest en route to Dayaya, limestone canyon, alt. 3050 m., no. 14784, Sept. 8, 1926 (tree 6 m., with long descending branches; leaf petiole and fruit pale green); in mixed forests below Abies on slopes back of Wantsang ssu, alt. 2750 m., no. 14814, Sept. 1926 (tree 7–9 m.); dense forests of Wantsang valley, alt. 2600 m., no. 14855, Sept. 12, 1926 (tree 13–15 m., trunk 30–60 cm. diam.); Pezhu valley, alt. 2750 m., no. 14946, Oct. 1926 (tree 12 m.; trunk 60 cm. diam.); forests of Tsaoshiku, alt. 2600 m., no. 14998, Sept.–Oct. 1926 (tree 10–12 m.; trunk 30 cm. diam.); Wantsang forests, alt. 2600–2750 m., no. 15031, Sept.–Oct. 1926 (tree 7–9 m.); forests of Wantsang ku, alt. 2750 m., no. 15041, Sept.–Oct. 1926 (tree 7–9 m.); mountain of Wantsang, valley of Chulungapu, alt. 2750 m., no. 15047, Sept.–Oct. 1926 (tree 6–7 m.).

CENTRAL KANSU. Lien hoa shan: in forests of Shanshen Miao, no. 13488, Oct. 1925 (shrub or tree 4.5–6 m.; fruits in drooping racemes).

Acer tetramerum Pax var. **betulifolium** Rehder in Sargent, Pl. Wilson. I. 95 (1911).

Acer betulifolium Maximowicz in Act. Hort. Petrop. IX. 108 (1889).

SOUTHWESTERN KANSU. Tao River basin: in Picea forests, beyond Kadjaku near Lupassu, alt. 2750 m., no. 13166, Aug. 1925 (tree 4.5 m.; petioles and stems red); Tatsuto to Kadjaku, Picea forests, alt. 2750 m., no. 13542, Sept.–Oct. 1925 (tree 4.5 m.; fruits red). Lower Tebbu country: along Wantsang stream, dense forests, alt. 2125–2200 m., no. 14656, August 31, 1926 (tree 7 m.; stems and petioles red; leaf dull above, glossy beneath; fruit pink); forests of Wantsang, alt. 2125–2200 m., no. 14665, Aug. 31, 1926 (tree 4.5–6 m.; leaf dark green; stem red; fruit pinkish); Lower Wantsang valley, alt. 2125 m., no. 14830, Sept. 1926 (tree 12 m.; fruit pink); Pezhu valley, alt. 2900 m., no. 14949, Oct. 1926 (tree 9 m., trunk 30 cm. diam.; fruit in racemes); forests of Ngongo to Pezhu, alt. 2750 m., no. 14984, Sept.–Oct. 1926 (tree 11 m.); valley of Tsaoshiku, alt. 2750 m., no. 14997, Sept.–Oct. 1926 (tree 11 m.; trunk 30 cm. diam.; fruit in drooping racemes); forests of Wantsang, alt. 2450, no. 15032, Sept.–Oct. 1926 (tree 9 m.; fruit in drooping racemes); Mayaku near Zhega, alt. 2600 m., no. 15051, Sept.–Oct. 1926 (tree 3–4.5 m.).

CENTRAL KANSU. Lien hoa shan: Shanshen Miao, alt. 2900 m., no. 13489, Oct. 1925 (small tree or shrub 3 m.; fruit in drooping racemes).

SAPINDACEAE

Determined by A. REHDER

Koelreuteria paniculata Laxmann in Nov. Comm. Acad. Sci. Petrop. XVI. 561 (1772).—Ker in Bot. Reg. IV. t. 330 (1818).

SOUTHWESTERN KANSU. Lower Tebbu country: gravelly slopes of Peshwekiang gorge, alt. 2100 m., no. 14553, Aug. 30, 1926 (tree 4.5–5.5 m. with spreading branches; the bladder-like fruit greenish red); dry slopes of Nyibaku, largest tree observed, alt. 2300 m., no. 14796, Sept. 9, 1926 (tree 12 m., trunk 30–60 cm. diam., bark longitudinally furrowed, dark brownish black); drier region, banks of Chulungapu, tallest trees at Nyiba, no. 14994, Sept.–Oct. 1926 (tree 12 m.; trunk 60 cm. diam., bark brownish black, deeply longitudinally furrowed).

SABIACEAE

Determined by A. REHDER

Sabia Ritchieae Rehder & Wilson in Sargent, Pl. Wilson. II. 195 (1916).

SOUTHERN KANSU: between Kaichow and Minchow, along river bank of Wutu ho, no. 12074, April 1925 (straggling shrub 1–1.5 m.; flowers purplish).

Meliosma cuneifolia Franchet in Nouv. Arch Mus. Paris, sér. 2, VIII. 211 (Pl. David. II. 29) (1886).—Hutchinson in Bot. Mag. CXXXVII. t. 8357 (1911).

SOUTHWESTERN KANSU. Lower Tebbu country: dense forests of Wantsang, alt. 2125–2200 m., no. 14667, Aug. 31, 1926 (tree 6 m.; with ascending branches; leaf dark dull green above, paler and glossy beneath).

RHAMNACEAE

Determined by A. REHDER

Berchemia pycnantha Schneider in Sargent, Pl. Wilson. II. 215 (1914).

SOUTHEASTERN KANSU. Lower Tebbu country: lower part of Wantsang valley, in forests, alt. 2125 m., no. 14711, Sept. 3, 1926 (shrub 2.5–3 m.).

This species has not yet been recorded from Kansu.

Sageretia theezans Brongniart in Ann. Sci. Nat. x. 360 (Mém. Fam. Rhamn. 53) (1826).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, IV. no. XI. 20 (Rhamn. As. Or.) (1866).—Nakai, Fl. Sylv. Kor. IX. 35, t. 15a (1920).

SOUTHWESTERN KANSU. Lower Tebbu country: in groves of Junipers and Oaks at Pezhu and on banks of Peshwekiang, alt. 2170 m., no. 14560, Aug. 30, 1926 (shrub 3 m., with long whip-like drooping branches); arid slopes in limestone gorge, Peshwekiang, no. 14688, Sept. 1, 1926 (shrub with stiff spreading branches; leaf glossy; flowers cream-color); Pezhu, bank of Chulungapu, alt. 2200 m., no. 14958, Oct. 1926 (shrub 3–4.5 m., with rambling branches; fruit globose, black).

Rhamnus leptophylla Schneider in Notizbl. Bot. Gart. Berlin, 1908, p. 77; Ill. Handb. Laubholzk. II. 285, fig. 196v–w, 198e–h (1909); in Sargent, Pl. Wilson. II. 239 (1914).

SOUTHWESTERN KANSU. Tao River basin: northwest of Choni, in scrub forest, alt. 2600 m., no. 12167, June, 1925 (shrub 2–3 m., with stiff gnarled branches); west of Choni between Tatsuto and Lupassu, alt. 2625 m., no. 12445, June 1925 (shrub 2–3 m., with stiff gnarled branches; flowers green). Lower Tebbu country: forests of Wantsang, no. 14712, Sept. 3, 1926 (shrub 2–2.5 m., with spreading branches; mature fruit purplish black); arid slopes of Mayaku, alt. 2300 m., no. 14795, Sept. 9, 1926 (spiny tree 4.5–5.5 m., with long erect stiff branches; ripe fruit black); Mayaku north of Chulungapu valley, alt. 2600 m., no. 15050, Sept.–Oct. 1926 (shrub 2.5–3 m., spiny; fruit black, single or in threes). Upper Tebbu country: undergrowth in Oak and Juniper forests at Pezhu, alt. 2150 m., no. 14581, Aug. 28, 1926 (stiff shrub with horizontal branches; fruit globose, black).

Numbers 14581, 14712 and 14795 have the leaves slightly pubescent above and thus form a transition to the following variety. This species is apparently one of the most common species in China and very variable in the shape of its leaves. It had been collected before in Kansu by R. C. Ching (Wulsin, Exped. nos. 345, 829, and 1031).

Rhamnus leptophylla var. **scabrella** Rehder, var. nov.

A typo recedit foliis minoribus obovatis vel ellipticis supra scabrido-pilosiusculis subtus praecipue ad costam et petiolos satis dense breviter pilosis.—Frutex spinosus 1.5–3 m. altus, ramulis junioribus brevissime pilosulis, foliis 2–3, rarius 4 cm. longis.

SOUTHWESTERN KANSU. Tao River basin: northwest of Choni, alt. 2600, no. 12168, June 1925 (shrub 2–3 m.; type); in Picea forest beyond Kadjaku near Lupassu, alt. 2750 m., no. 13170, Aug. 1925 (shrub 2–2.5 m.; fruit [immature] red when mature); Poyuku, no. 13608, Sept.–Oct. 1925 (spiny shrub 0.5–2 m.; fruit black).

EASTERN TIBET. Kokonor region: along banks at foot of Loyni, near Sin cheng, no. 13297, Oct. 1925 (shrub 0.75–2.5 m.; fruit globose, black).

Here belong also the following specimens: KANSU: Ti Taon sse, near Pingfang, alt. 2350–3250 m., *R. C. Ching*, Wulsin Exped. no. 559, July 20, 1923.—HUPEH: north and south of Ichang, alt. 300–1200 m., *E. H. Wilson*, no. 421, June 5, 1907; (bush 0.5–2 m.; flowers yellowish); Fang Hsien, alt. 1800–2100 m., *E. H. Wilson*, no. 618, Nov. 1907; western Hupeh, alt. 2100 m., *W. Y. Chun*, no. 4190, Sept. 3, 1922.—HONAN: Sunghsien, San kuan miao, alt. 1200 m., *J. Hers*, no. 510, May 24, 1919.—CHEKIANG: Tihtai shan, Tihtai, alt. 200 m., *R. C. Ching*, no. 1358, May 4, 1924 (shrub 2.5 m.; flowers greenish).—HUNAN: in monte Yün shan, prope urbem Wukang, alt. 850–1300 m., *H. Handel-Mazzetti*, no. 12042, June 6, 1918 (shrub 1.5 m.).

This variety differs from the typical form chiefly in the somewhat scabrid short pilose pubescence of the upper side of the leaves and in the short minute pilose pubescence of the midrib beneath and of the petioles. The var. *milensis* Schneid. which is also pubescent differs chiefly in the larger leaves scarcely scabrid above, in the slenderer elongated branches and the tree-like habit. The somewhat similar *R. rugulosa* Hemsl. is readily distinguished by the deeply impressed veins above and the dense and soft pubescence of the under side of the leaves.

VITACEAE

Determined by A. REHDER

Ampelopsis aconitifolia Bge. var. **palmiloba** Rehder in Mitt. Deutsch. Dendr. Ges. XXI. 190 (1912); Man. Cult. Trees Shrubs 608 (1927).

Ampelopsis palmiloba Carrière in Rev. Hort. 1867, p. 451, fig. 40.

Ampelopsis aconitifolia var. *typica* Koehne, Deutsch. Dendr. 400 (1893).

CENTRAL KANSU. Yellow River basin: rocky gorge of Hsining river beyond Hsiang tang, alt. 2450 m., no. 13244, Aug. 1925 (woody climber; fruit red).

None of the leaves of this number are undivided; many are 5-parted and occasionally the middle leaflet has the sinus of one or both of the lower lobes extending to the midrib but mostly the leaflets are more or less rhombic in outline and only coarsely toothed or lobulate; the primary and secondary veins beneath are rather densely hirsute with some scattered hairs on the veinlets.

TILIACEAE

Determined by A. REHDER

Tilia chinensis Maximowicz in Act. Hort. Petrop. XI. 83 (1890).
Tilia Baroniana Diels in Bot. Jahrb. XXIX. 468 (1900).—V. Engler, Monog. Tilia, 132 (1909).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2125–2200 m., no. 14657, Aug. 31, 1926 (tree 12 m.; leaf dull green above, paler beneath); forests of Wantsang, alt. 2450 m., no. 14720, Sept. 3, 1926 (tree 12 m.; trunk grayish green; leaf dull green papery); Wantsang forests, alt. 2750 m., no. 15034, Sept.–Oct. 1926 (tree 10–12 m.); Wantsang ku, alt. 2750 m., no. 15042, Sept.–Oct. 1926 (tree 9–12 m.); grassy slopes and in dense forest of Wantsang valley, alt. 2600 m., no. 14821, Sept. 11, 1926 (tree 10–12 m.); forests of Tsaoshi, alt. 2300 m., no. 14737, Sept. 2, 1926 (tree 12 m.); forest of Tsaoshi ku, alt. 2600–2750 m., nos. 14999 and 15001, Sept.-Oct. 1926 (tree 12–15 m.); Mayaku, alt. 2600–2750 m., nos. 15052 and 15069, Sept.–Oct. 1926; mixed forests of upper Mayaku, alt. 2750 m., no. 14763, Sept. 5, 1926 (tree 7–9 m.; branches drooping; leaf dark green, petioles red).

CENTRAL KANSU. Lien hoa shan: alt. 2900 m., no. 13217, Aug. 1925 (tree 7 m.; leaf gray beneath, dull); northern slopes of Shanshen Miao, alt. 2750–2850 m., nos. 13484 and 13486, Oct. 1925 (tree 6–10 m.; leaves pale beneath).

The pubescence on the under side of the leaves shows some variation; in most specimens the stellate tomentum is very thin and loose; in some specimens as in nos. 13217, 14657 and 14763 the leaves have the tendency to become glabrescent, while in nos. 14821 and 15042 the tomentum is fairly dense but yet easily detachable.

MALVACEAE

Determined by A. REHDER

Abutilon sinense Oliver in Hooker's Icon. XVIII. t. 1750 (1888).
WESTERN SZECHUAN: south of Takwan, cliffs of Takwan River gorge, on rocky sandstone, alt. 900 m., no. 12008, March 1925 (shrub; flowers yellow).

DILLENIACEAE

Determined by A. REHDER

Actinidia tetramera Maximowicz in Act. Hort. Petrop. XI. 35 (1889).—Finet & Gagnepain in Bull. Soc. Bot. France, LII. Mém. IV. 21 (1905); Contrib. Fl. As. Or. II. 21 (1907).—Dunn in Jour. Linn. Soc. XXXIX. 404 (1911).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang valley, alt. 2450 m., no. 14728, Sept. 3, 1926 (huge woody climber, on Maple; leaves dark green, glossy; fruit green, striped darker green); forest of Wantsang ku, alt. 2450 m., no. 15026, Sept.–Oct. 1926 (liana 15 m. high, hanging over trees in dense masses; fruit brown, fleshy).

Clematoclethra integrifolia Maximowicz in Act. Hort. Petrop. XI. 38 (1889).—Komarov in Act. Hort. Petrop. XXIX. 90 (1908).

SOUTHWESTERN KANSU. Lower Tebbu country: in mixed forests of Mayaku, alt. 2750 m., no. 14762, Sept. 5, 1926 (woody climber; leaf grayish blue beneath; fruit purplish black); upper Wantsang valley; alt. 2825 m., no. 14844, Sept. 12, 1926 (covering trees and bushes; leaf grayish blue beneath, petioles red); dense forests between Pezhu and Ngongo, alt. 2750 m., no. 14985, Sept.–Oct. 1926 (large liana densely covering trees up to 18 m. height; fruit black).

CENTRAL KANSU. Lien hoa shan: along grassy slopes with Spruces, alt. 3050 m., no. 12762, July 14–20, 1925 (4.5–6 m. high; flowers white); northern slopes, no. 13224, Aug. 1925 (woody climber on Pear trees; fruit purplish black).

All the specimens have the leaves ciliate with fine setae which occasionally are partly, rarely entirely, wanting on some leaves.

Clematoclethra lasioclada Maximowicz in Act. Hort. Petrop. XI. 38 (1889).—Komarov in Act. Hort. Petrop. XXIX. 95 (1908).

SOUTHWESTERN KANSU. Lower Tebbu country: along Wantsang stream, alt. 2125–2200 m., no. 14659, Aug. 31, 1926 (vine or shrub with long rambling branches; leaf pale, beneath, petiole red at base; fruit dark purple): Wantsang valley, alt. 2450 m., no. 14710, Sept. 3, 1926 (huge woody climber covering Maple and Linden trees, trunk 8–10 cm. diam.); forests of Wantsang, alt. 2450 m., no. 14725, Sept. 1926 (woody climber festooning Maples and Linden trees; petioles dull red; fruit purplish red); forests of Wantsang ku, alt. 2600 m., no. 15015, Oct. 1926 (large liana climbing 15–18 m. high over trees; fruit black); forests of Tsaoshi valley, alt. 2325 m., no. 14742, Sept. 2, 1926 (woody climber); Pezhuku forests with Picea, alt. 2900 m., no. 14945, Oct. 1926 (liana climbing 12–18 m. high over trees); forests of Ngongo, no. 14970, Sept.–Oct. 1926 (climber 12–18 m. high; fruit black with reddish tinge).

CENTRAL KANSU. Lien hoa shan: Shanshen Miao, alt. 3050 m., no. 13490, Oct. 1925 (woody climber; fruit black).

The specimens which are all in fruit are quite glabrous except small axillary tufts of hairs on the under side of the leaves. In nos. 14742 and 14945 the peduncles are one-flowered, though distinctly bracted, but in their leaves and other characters they agree exactly with nos. 14725 and 15015.

MYRICACEAE

Determined by A. REHDER

Hololachne songarica Ehrenberg in Linnaea, II. 273 (1827).—Ledebour, Icon. Pl. Ross. v. 14, t. 443 (1834) "soongarica."—Niedenzu in Engler & Prantl, Nat. Pflanzenfam. abt. 3, VI. 293, fig. 133 J–P (1895).

Tamarix songarica Pallas in Act. Nov. Acad. Sci. Petrop. X. Math. 374, t. 10 (1797).

CENTRAL KANSU. Yellow River basin: loess plateaus and stream beds below Lanchow and north to Hsining, alt. 1825 m., no. 13235, Aug. 1925 (shrub 0.5 m.).

The genus Hololachne had not been recorded from China before.

Myricaria dahurica Ehrenberg in Linnaea, II. 278 (1827).—De Candolle, Prodr. III. 98 (1828).

Myricaria germanica var. *squamosa* (Desv.) Maximowicz, Fl. Tangut. 96 (1889); Enum. Pl. Mongol. 112 (1889).

SOUTHWESTERN KANSU. Tao River basin: Choni, along Tao ho, alt. 2600 m., no. 12150, May 1925 (shrub 1.75–2 m.; flowers pinkish purple).

EASTERN TIBET. Radja and Yellow River gorges: in stream bed of Dachso canyon, north of Radja, alt. 3100 m., no. 14058, June 1–2, 1926.

Myricaria alopecuroides Schrenk apud Fischer & Meyer, Enum. Pl. Nov. 65 (1841).—Ledebour, Fl. Ross. II. 131 (1844).

Myricaria germanica var. *alopecuroides* Maximowicz, Fl. Tangut 96 (1889); Enum. Pl. Mongol. 112 (1889).

SOUTHWESTERN KANSU. Upper Tebbu country: Yiwa ku, along stream, Drakana, alt. 2750 m., no. 14630, Aug. 22, 1926.

THYMELAEACEAE

Determined by A. REHDER

Wikstroemia chamaedaphne Meisner in De Candolle, Prodr. XIV. 547 (1857).—Rehder in Sargent, Pl. Wilson. II. 536 (1916).

SOUTHWESTERN KANSU. Lower Tebbu country: in gravel, Peshwekiang, alt. 2125 m., no. 14559, Aug. 30, 1926, (leaf dull green: flowers rich yellow); dry shale slopes of Wantsang and Chulungapu, alt. 2000 m., no. 15006, Sept.–Oct. 1926 (shrub 0.75–1 m.; leaf vivid green; flowers yellow fragrant).

Daphne genkwa Siebold. & Zuccarini, Fl. Jap. I. 137, t. 75 (1840).—Meisner in De Candolle, Prodr. XIV. 531 (1857).—Rehder in Sargent, Pl. Wilson. II. 538 (1916).

WESTERN SZECHUAN: north of Mienchow, on grassy slopes among Pine trees, no 12012, March 1925 (shrub 30–60 m.; flowers lavender-pink, fragrant); south of Mienchow, northern Szechuan, along grassy dry banks, no. 12013, March 1925 (shrub 30 cm.; flowers pale); around Teyang, northern Szechuan, no. 12014 (shrub 30–60 cm.; flowers pinkish purple).

Daphne Giraldii Nitsche, Beitr. Kenntn. Daphne, 7 (1907).—Rehder in Sargent, Pl. Wilson. II. 545 (1916).

SOUTHWESTERN KANSU. Tao River basin: slopes of mountains in Maerhku valley, southeast of Choni, alt. 3050 m., no. 12552, June 1925 (shrub 1–1.25 m.; flowers orange-yellow, fragrant); Maerhku, Choni district, alt. 2750 m., no. 13510, Sept. 1925 (fruit red); forests of Choni, along streams, alt. 2750–3050 m., no. 12581, July 1925 (shrub 0.75–1 m.; flowers yellow); at Toyü, in patches, alt. 2300 m., no. 12898, July 1925 (shrub 0.75–1 m.).

Daphne tangutica Maximowicz in Mél. Biol. XI. 309 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 531 (1882).—Rehder in Sargent, Pl. Wilson. II. 545 (1916).

Daphne Wilsonii Rehder, in Sargent, Pl. Wilson. II. 540 (1916).

SOUTHWESTERN KANSU. Tao River basin: Maerhku valley, open scrub, among Willows, alt. 2900 m., no. 12339, June 1925 (shrub 50 cm.; flowers white); outskirts of forests in Maerhku valley, alt. 2750–3050 m., no. 12344, June 1925 (shrub 0.75–1 m.; flowers pinkish purple); Maerhku, Choni, alt. 2925 m., no. 14894, Aug.–Sept. 1926 (shrub 30–60 cm.; fruit red); Minshan range, valley of Kadjaku beyond Tatsuto, alt. 3050 m., no. 12427, June 1925 (globose bush 30–60 cm.; flowers white); mountains of Tsarekika, east Tebbu land; alt. 3200 m., no. 13531, Oct. 1925 (shrub 60 cm.; flowers pale pink; fruit red); Kwang ke shan, west Tebbu land, alt. 3050 m., no. 13572, Sept.–Oct. 1925 (shrub 60 cm.; leaves fleshy; flowers white; fruit red). Upper Tebbu country: shade of Spruce forest, southern slopes of Minshan, alt. 2925 m., no. 12533, June 1925 (shrub 60 cm.; flowers rich purple).

WESTERN SZECHUAN: mountain south of Ching chuan, alt. 1825 m., no. 12044, April 1925 (shrub 1 m.; flowers purplish red).

With ample material before me consisting of more than 20 specimens from Kansu, western Szechuan and western Hupeh I am unable to separate specifically *Daphne Wilsonii* from *D. tangutica;* the former seems to have generally larger and broader leaves, larger flowers, often more flowers in an inflorescence and occasionally as in Wilson's no. 2947 from Hupeh and in Rock's no. 12044 from Szechuan additional axillary inflorescences below the terminal one. The pubescence of the mature branchlets is apparently more copious in *D. Wilsonii*, but it is never wanting entirely in the Kansu specimens: the leaves vary from acutish as occasionally in *D. Wilsonii* to obtuse and to emarginate which is the rule in *D. tangutica*. That the color of the flowers varies from white to violet or purple had been already stated by Maximowicz.

Two fragments received from Léveillé under the name of *Daphne Bodinieri* certainly belong here; one of them is without locality and the other marked "Yunnan." In his "Flora of Kouy Tchéou," p. 417, Léveillé transfers *D. Bodinieri* to *Wikstroemia* as *W. Bodinieri;* of the type specimens there are fragments in this herbarium which show that the flowering specimen is not a *Wikstroemia* but an *Apocynacea* probably near *Melodinus;* the fruit, however, is not an *Apocynacea*.

ELAEAGNACEAE

Determined by A. REHDER

Hippophae rhamnoides Linnaeus, Spec. 1023 (1753).—Schlechtendal in De Candolle, Prodr. XIV. 607 (1857).—Reichenbach, Icon. Fl. Germ. XI. 12, tab. 549, no. 1165 (1849).—Hemsley in Bot. Mag. CXXXI. tab. 8016 (1905).—Servettaz in Bot. Centralbl. Beih. XXV. 2, 5 (1909).

SOUTHWESTERN KANSU. Tao River basin: banks of Tao river, alt. 2550 m., no. 12208, June 1925 (shrub 1.75–2 m.); Maerhku valley, alt. 2900 m., no. 13571, Oct. 1925 (spiny shrub 3–4.5 m.; leaves green above, silvery beneath; fruit orange, globose). Lower Tebbu country: forest of Chingolo above Pezhu, alt. 2750 m., no. 14991, Sept.–Oct. 1926 (tree 3–4.5 m.; fruit deep red).

EASTERN TIBET. Kokonor region: Koko gorge, no. 13270, Sept. 1925 (spiny tree 4.5–6 m., trunk 30 cm. diam.; leaves silvery drab beneath; fruit globose, yellow); mountains of Lalaku, alt. 3500 m., no. 13275, Sept. 19, 1925 (shrub or bush, used as medicine for stomach ache).

A good photograph of a tree accompanied no. 13270 from the Koko gorge.

Elaeagnus angustifolia Linnaeus, Spec. 176 (1753).—Reichenbach, Icon. Fl. Germ. XI. 12, t. 549, no. 1166 (1849).

Elaeagnus hortensis M. B. *a. angustifolia* Schlechtendal in De Candolle, Prodr. XIV. 609 (1857).—Servettaz in Bot. Centralbl. Beih. XXV. pt. II. 34, fig. 7, 1–10 (1909).

NORTHWESTERN KANSU. Richthofen range and adjacent region: planted and wild on Kanchow plain, foot of Nanshan, alt. 1825 m., no. 13319, Nov. 1925 (tree 6–9 m.; leaves glaucous silvery; fruit edible).

Hedera nepalensis K. Koch var. **sinensis** Rehder in Jour. Arnold Arb. IV. 250 (1923).

Hedera himalaica var. *sinensis* Tobler, Gatt. Hedera, 79, fig. 39–42 (1912).

Hedera himalaica Harms & Rehder in Sargent, Pl. Wilson. II. 555 (1916), excl. syn. nonnull.—Non Tobler.

SOUTHERN KANSU: mountains of Motzuping, no. 12063, April 1925 (climbing shrub).

The genus Hedera has not been recorded from Kansu before.

Acanthopanax leucorrhizus Harms in Engler & Prantl, Nat. Pflanzenfam. III. abt. VII. 49 (1897); in Bot. Jahrb. XXIX. 488 (1900).—Bean in Bot. Mag. CXLI. t. 8607 (1915).—Harms in Mitteil. Deutsch. Dendr. Ges. XXVII. 9 (1918).

Eleutherococcus leucorrhizus Oliv. in Hooker's Icon. XVIII. sub t. 1711 (1887).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2225–2450 m., no. 14669 and 14721 Aug. 31 and Sept. 3, 1926 (tree 4.5–6 m., branches drooping; leaves dull dark green above, pale beneath; fruit black, in umbels on drooping peduncles); forest of Wantsang ku, alt. 2450 m., no. 15023, Sept.–Oct. 1926 (shrub 3–4.5 m. fruit black, in drooping umbels; flowers white).

CENTRAL KANSU. Lien hoa shan: limestone range, alt. 2900 m., no. 13665, Oct. 1925 (shrub 1.75 m.).

This species seems to have not been collected in Kansu before.

Acanthopanax Giraldii Harms in Bot. Jahrb. XXXVI. beibl. LXXXII. 80 (1905); in Mitteil. Deutsch. Dendr. Ges. XXVII. 19, t. 3, fig. A–H (1918).

SOUTHWESTERN KANSU. Tao River basin: forests of Shiao ku, beyond Adjüan, alt. 3050 m., no. 12845, July 1925 (spiny shrub 1-1.25 m.; flowers greenish); Shiao ku, en route to Tsarekika, east Tebbu, alt. 3200 m., no. 13534, Oct. 1925 (spiny shrub, 1.5–2 m.; fruit black). Lower Tebbu country: forest of upper Mayaku, alt. 2750 m., no. 14764, Sept. 5, 1926 (shrub or small tree, 4.5–7 m., covered with soft spines throughout; leaves dark green, glossy); forests back of Wantsang gomba, alt. 2750 m., no. 14811, Sept. 1926 (shrub 1.75–2 m., covered with small spines); forests of Dayayaku, southern slopes of Minshan, alt. 3050 m., no. 14866, Sept. 17, 1926 (shrub 2–3 m., stems densely covered with soft spines; fruit black); forests of Ngongo, with Picea etc., alt. 2750 m., no. 14983, Sept.–Oct. 1926 (shrub 3–4.5 m., densely spiny; fruit black).

CENTRAL KANSU. Lien hoa shan: forest of mountain, alt. 3050 m., no. 12695, July 1925 (shrub 2 m., spiny on young shoots; flowers white with greenish tinge); alt. 2925 m., no. 13491, Oct. 1925 (shrub 2–2.5 m., spiny; fruit black).

This species had been collected in Kansu before by R. C. Ching (Wulsin Exp. no. 887).

Acanthopanax Giraldii var. **pilosulus** Rehder, var. nov.

A typo recedit ramulis subinermibus vel sparse setuloso-aculeolatis, foliolis angustioribus lanceolatis vel oblanceolatis et minute subsimpliciter serrulatis vel rhombico-lanceolatis et distinctius duplicato-serrulatis, supra sparse scabrido-pilosulis, subtus praesertim ad costam et in facie sparsius breviter villoso-pilosis.—Frutex 1–1.75 m. altus; foliola fere semper 5, 2–6 cm. longa et 5–12 mm. lata (in typo), vel 2.5–4.5 cm. longa et 8–15 mm. lata; pedunculi glabri, 0.5–2 cm. longi, rarius fere nulli; styli 5, infra medium vel fere ad basin divisi.

SOUTHWESTERN KANSU. Upper Tebbu country: in Willow scrub, with Birches, along streams, alt. 3350 m., no. 13106, July–Aug. 1925 (shrub 1.75 m., with red spines; type). Tao River basin: west of Adjüan, eastern Minshan range in Birch and Spruce forests, alt. 3050 m., no. 12657, July 5, 1925 (shrub 1 m.).

The type of this new variety with its nearly unarmed stems, narrower and pubescent leaflets looks quite distinct from typical *A. Giraldii*. In its nearly unarmed stems it resembles var. *inermis* Harms & Rehd., but it differs from it as from the typical form in its much narrower pubescent and finely, nearly simply serrulate leaflets. The co-type no. 12657 with its broader doubly serrulate leaflets forms a transition toward var. *inermis* from which it differs, however, in the pubescent leaflets.

Acanthopanax stenophyllus Harms f. **angustissimus** Rehder, forma nova.

A typo recedit foliolis fere linearibus 3–5 mm. latis minute serrulatis.—Frutex 0.75–2.5 m. altus, ramulis ad nodos aculeis setiformibus erectis paucis armatis.

SOUTHEASTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2300 m., no. 14850, Sept. 12, 1926 (shrub 1.75–2.75 m.; fruit globose, purple).

On account of its long linear leaflets this form looks very distinct, but in all other characters it agrees with the typical form, which is known apparently only from Shensi.

Aralia chinensis L. var. **nuda** Nakai in Jour. Arnold Arb. v. 32, 242 (1924).

Aralia chinensis var. *glabrescens* Harms & Rehder in Sargent, Pl. Wilson, II, 567 (1911).—Non Schneider.

SOUTHWESTERN KANSU. Lower Tebbu country: dense forests of Wantsang, alt. 2225 m., no. 14673, Sept. 1926 (tree 9 m.; fruit bluish black); Wantsang valley, undergrowth in Birch and Maple forest, alt. 2450 m., no. 14825, Sept. 1926 (tree 4.5 m.). Upper Tebbu country: Yiwa ku valley, forested slopes, alt. 2750 m., no. 14572, Aug. 28, 1926 (tree 3 m., trunk spiny, branches spreading; leaves gray beneath; flowers yellow); Yiwaku, south of Drakana, alt. 2600, no. 15085, Oct. 1926 (tree 4.5–6 m.; inflorescence several feet long; flowers rich yellow; fruit black.

CENTRAL KANSU. Lien hoa shan: scrub forest, northern slopes, above Shanshen Miao, alt. 2900 m., no. 13215, Aug. 1925 (tree 4–4.5 m., with few spreading branches; flowers yellowish); Shanshen Miao, alt. 2750 m., no. 13481, Oct. 1925 (shrub 3 m.; fruit purplish black).

Neither this variety nor typical *A. chinensis* seems to have been collected in Kansu before.

CORNACEAE

Determined by A. REHDER

Cornus macrophylla Wallich in Roxburgh, Fl. Ind. 1. 433 (1820).—Brandis, Forest Fl. Brit. Ind. 252, t. 32 (1874).—Hemsley in Bot. Mag. CXXXV. t. 8261 (1909).—Wangerin in Engler, Pflanzenr. IV-229, p. 71 (1910).

Cornus brachypoda C. A. Meyer in Ann. Sci. Nat. sér. 3, IV. 74 (1845).—Rehder in Sargent, Trees & Shrubs I. 81, t. 41 (1903).—Wangerin in Engler, Pflanzenr. IV.-229, p. 64 (1910).

SOUTHWESTERN KANSU. Tao River basin: in Picea forests, beyond Kadjaku, near Lupassu, alt. 2750 m., no. 13167, Aug. 1925 (tree 4.5–6 m.; leaves grayish beneath). Lower Tebbu country: forests of Wantsang valley, alt. 2200 m., no. 14662, Aug. 31, 1926 (shrub or tree with horizontal branches; leaves dull green; panicle red, fruit dull bluish black); along stream of Mayaku, alt. 2125 m., no. 14787, Sept. 9, 1926 (tree 4.5–6 m.; leaves bluish gray beneath; panicles red); forests of Ngongo, alt. 2600 m., no. 14968, Sept.–Oct. 1926 (tree 7 m.; leaf gray beneath; fruit bluish black).

CENTRAL KANSU. Lien hoa shan: along grassy slopes with Spruces, alt. 3050 m., no. 12761, July 14–20, 1925 (shrub or tree 3–6 m.;

leaves gray-glaucous beneath; flowers cream-colored); Shanshen Miao, alt. 2750 m., no. 13483, Oct. 1925 (tree 6–7.5 m.; leaves pale beneath; fruit purple).

This species had been collected in Kansu before by Wm. Purdom. Rock's no. 14662 from lower Tebbu country differs from the usual form in the slight villous and fulvous pubescence of the petioles and the lower part of the midrib on the under side of the rather small leaves which measure only 3–5.5 cm. in length.

ERICACEAE

Determined by E. H. Wilson

Rhododendron anthopogonoides Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 350 (1877); in Mél. Biol. IX. 772 (1877).—Hemsley in Jour. Linn. Soc. XXVI. 19 (1889).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 820 (Pl. Enum. 33) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. II. 710 (1898).—Millais, Rhodod. 114 (1917).

Southwestern Kansu. Tao River basin: ridges west of Adjüan, alt. 3048–3498 m., nos. 12194 and 12651, June and July 1925 (shrub 0.6–1.3 m. high; flowers white; leaves aromatic, odor of Eucalyptus); grassy slopes, Mt. Lissedzadza, alt. 3650 m., no. 12627, July 6–10, 1925 (shrub 1.3–1.5 m. high; flowers greenish white; leaves aromatic); Mt. Kwang ke, west Tebbu land, alt. 3498 m., no. 13597, Sept.-Oct. 1925 (shrub 1.5 m. high; flower tubular, white; leaf pubescent beneath, very aromatic). Upper Tebbu country: Maerhku, alt. 3048 m., no. 13636, Sept.–Oct. 1925 (shrub 1.5 m. high; flowers white, tubular; leaves aromatic).

Central Kansu. Lien hoa shan: in Rhododendron, Spruce and scrub forest, alt. 3048–3198 m., nos. 12723 and 13610, July and Oct. 1925 (shrub 1–1.5 m. high; flowers greenish white, tubular; leaves very aromatic).

Eastern Tibet. Kokonor Region: Koko gorge, alt. 3348 m., no. 13279, Sept. 1925 (shrub 1.3–1.5 m. high; flowers whitish pink, tubular; leaves bronze-colored, aromatic).

Rhododendron thymifolium Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 351 (1877); in Mél. Biol. IX. 773 (1877).—Hemsley in Jour. Linn. Soc. XXVI. 31 (1889).—Millais, Rhodod. 254 (1917).

Southwestern Kansu. Tao River basin: Minshan range, Mt. Kwang ke, alpine meadows, alt. 3198–3800 m., nos. 12368, 12370, 12411 and 13598, June and Sept.–Oct. 1925 (shrub 0.3–1 m. high; flowers pale lavender, bluish purple).

Northwestern Kansu. Richthofen Range and adjacent region: Tapanshan, northeastern slopes near Peitatung, alt. 3650 m., no. 13303, Oct. 1925 (shrub 0.6–1 m. high; flowers blue; leaf yellowish beneath).

EASTERN TIBET. Grasslands between Labrang and Yellow River: rocky moist slopes at Borlung ngongma, south of Kecbach nira pass, alt. 3698 m., no. 13904, May 7, 1926 (shrub 1–1.3 m. high; leaf very aromatic).

The minute oval to elliptic-obovate leaves densely crowded with grey lepidote scales, which show on the underside as an intense grey felt, the usually solitary (rarely 2 or 3 together) flowers with short tube, spreading corolla lobes and prominent stamens overtopping the stigma, readily distinguish this pleasing little alpine species among its very numerous brethren.

Rhododendron capitatum Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 351 (1877); in Mél. Biol. IX. 773 (1877).—Hemsley in Jour. Linn. Soc. XXVI. 21 (1889).—Kanitz in Szechenyi, Keletazs, Utján. Tudom. Ered. II. 820 (Pl. Enum. 33) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. II. 710 (1898).—Millais, Rhodod. 136 (1917).

SOUTHWESTERN KANSU. Tao River basin: south of Choni, toward Tebbu land, alt. 3048 m., nos. 12191 and 12471, June 1925 (shrub 0.6–1 m. high; flowers bluish-purple); Minshan range, meadows of Mt. Kwang ke, alt. 3048–3800 m., nos. 12371, 13600, 13605 and 13596, Sept.–Oct. 1925 (shrub 0.6–1.4 m. high; flowers large, deep lavender to blue); Minshan range, meadows of Kadjaku, alt. 3048–3353 m., nos. 12376, 13674 and 13688, June, Sept.–Oct. 1925 (shrub 0.3–1 m. high; flowers bluish purple); west of Adjüan, east Tebbu land, alpine meadows, 3198–3650 m., nos. 12647 and 13622, July and Sept.–Oct. 1925 (shrub 1–1.3 m. high; flowers lavender-purple). Upper Tebbu country: southern slopes of Minshan, alpine meadows, alt. 3128 m., no. 12518, June 1925 (shrub 1 m. high; flowers deep purplish red); Maerhku east Tebbu land, alt. 3350 m., no. 13634, Oct. 1925 (shrub 1 m. high; flowers bluish purple); Drakana, covering steep mountain slopes like heather, alt. 3350 m., no. 13635, Sept.–Oct. 1925 (shrub 0.6–1 m. high; flowers bluish purple).

CENTRAL KANSU. Lien hoa shan: in alpine meadows, between Taochow and Titao, alt. 3403 m., nos. 12731 and 13611, July 14–20, Oct. 1925 (shrub 0.3–1 m. high; flowers purplish-blue).

EASTERN TIBET. Grasslands between Labrang and Yellow River: rocky moist slopes at Borlung ngongma, south of Kecbach nira pass, alt. 3689 m., nos. 13904A and 13905, May 7, 1926 (shrub 1 m. high). Radja and Yellow River gorges: grassy slopes above Spruce forest, southwest of Yellow River, opposite Radja, alt. 3650 m., nos. 13956 and 14101, May 24 and June 10, 1926 (shrub 0.6–1 m. high; flowers purplish blue); rocky and grassy slopes above Picea forest, northern slopes of Yellow River, southwest of Radja, alt. 3650 m., no. 13968, May 25, 1926 (shrub 1 m. high); Lungmar pass, 15 li south of East Radja, alt. 3350 m., no. 14006, May 1926 (shrub 1 m. high; flowers purplish lavender); alpine meadows in masses

with Willows, between Howa and Arh'tsa canyon, north of Radja, alt. 3403 m., no. 14041, May 31, 1926 (shrub 1 m. high; flowers pale purple); grassy alpine slopes, Mochur nira pass, alt. 3640 m., no. 14045, May 31, 1926 (shrub 1-1.3 m. high).

It is possible, though I do not think probable, that some of the fruiting specimens, such as no. 13596, may represent another closely related species. In this very difficult group of alpine Rhododendrons it is impossible to diagnose species unless complete material is present. The boreal character of the upland flora of Kansu is well shown by the paucity of Rhododendron species.

A photograph of a flowering shrub accompanied no. 12647 from near Adjüan, east Tebbu land.

Rhododendron micranthum Turczaninow in Bull. Soc. Nat. Moscou, x. no. vii. 155, (1837); xxi. pt. ii, 502 (Fl. Baical. Dahur.) (1848).—De Candolle, Prodr. vii. 727 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. xvi. no. 9, 18, t. 4, figs. 1–10 (Rhod. As. Or.) (1870).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, vi. 77 (Pl. David. i. 197) (1883).—Hemsley in Jour. Linn. Soc. xxvi. 27 (1889).—Komarov in Act. Hort. Petrop. xxv. 205 (Fl. Mandsh. iii.) (1907).—Chip in Bot. Mag. cxxxiv. t. 8198 (1908).—Schneider, Ill. Handb. Laubholzk. ii. 475, figs. 315 p–q, 316g (1909).—Hemsley & Wilson in Kew Bull. Misc. Inform. 1910, p. 117.—Pampanini in Nuov. Giorn. Bot. Ital. n. ser. xvii. 683 (1910).—Rehder & Wilson in Sargent, Pl. Wilson. i. 513 (1913).—Bean, Trees & Shrubs Brit. Isl. ii. 368 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2938 (1916).—Millais, Rhodod. 210 (1917).—Nakai, Fl. Sylv. Kor. pt. viii. 30, t. 7 (1919).—Osborn in Garden, lxxxiv. 270, fig. (1920).—Wilson in Jour. Arnold Arb. iv. 42 (1923).

Rhododendron Rosthornii Diels in Bot. Jahrb. xxix. 509 (1900).
Rhododendron Pritzelianum Diels, l. c. 510.

Southwestern Kansu. Lower Tebbu country: gravelly slopes of Peshwekiang gorge, alt. 2069 m., no. 14554, Aug. 30, 1926 (shrub 1.3 m. high); dry gorges of Chulungapu, near Wantsang, alt. 2134 m., no. 15004, Sept.–Oct. 1926 (shrub 1.5–1.8 m. high; flowers white, in dense racemes).

This species is widespread, being found from the mountains of northern Korea westward through southern Manchuria and the northern provinces of China to Kansu with its southern limits in Hupeh and western Szechuan.

Rhododendron Rockii Wilson, sp. nov.

Frutex vel arbor 4–6-metralis, cortice pallide cinereo; ramuli juniores pallide cinereo-lepidoti. Folia congesta, oblongo-lanceolata ad oblongo-oblanceolata, 6–12 (pleraque 8–10) cm. longa et 1–2 (pleraque 1.5–2) cm. lata, breviter acuminata, basi attenuata vel cuneata, supra intense viridia, leviter reticulata, subtus dense tomento brevi cinereo-fusco

floccoso tomentum album crustaceum obtegente vestita, costa supra impressa subtus elevata, nervis secondariis patentibus leviter ascendentibus supra impressis; petioli robusti, 0.8–1.8 cm. longi, supra canaliculati. Flores 6–12, umbellato-racemosi; pedicelli satis graciles, 1–1.5 cm. longi, tomento brevi crispo floccoso pallido vel rufo-cinereo vestiti; calyx glabrescens, annularis, dentibus 5 triangularibus minutis; corolla pallide rosea, punctata, infundibuliformi-campanulata, 3–4 cm. longa, 4–5 cm. lata, intus ad basin puberula, 5-loba, lobis rotundatis interdum truncatis vel emarginatis, 1–1.5 cm. longis et 1.5–2 cm. latis; stamina 9–10, filamentis inaequalibus rectis compressis infra medium puberulis, antheris oblongis fuscis; pistillum stamina superans, ovario conico 5 mm. longo sulcato dense tomento cinereo vel pallide cinereo-brunneo obtecto, stylo fere recto basi leviter villoso sursum incrassato, stigmate capitato. Fructus non visus.

SOUTHERN KANSU: slopes, beyond Szechuan border, rain forest, alt. 2009 m., nos. 12064 (type), 12081 and 12083, April 1, 1925.

This handsome new species is characterized by its narrow leaves clothed with short, grey-brown floccose tomentum arising above a white crustaceous indumentum, by its relatively large flowers with villous pedicels, puberulous filaments and ovary clothed with grey-brown floccose tomentum. It is most closely related to *R. adenopodum* Franch. of western Hupeh and northeastern Szechuan, which has much broader leaves, a white floccose tomentum clothing a dun-colored crustaceous indumentum, pedicels and ovary clothed with stalked glandular hairs and a relatively large membranous calyx. From the collector's notes this new species appears to be confined to the Kansu-Szechuan boundary, where a moist climate prevails.

Rhododendron Przewalskii Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 350 (1877); in Mél. Biol. IX. 771 (1877).—Hemsley in Jour. Linn. Soc. XXVI. 29 (1889).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 820 (Pl. Enum. 34) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. II. 711 (1898).—Bean in Flora & Sylva, III. 164 (1905); in Kew Bull. Misc. Inform. 1914, p. 385; Trees, Shrubs, Brit. Isles, II. 373 (1914), excluding reference to Wilson's introduction.

SOUTHWESTERN KANSU. Tao River basin: Minshan range, Mt. Kwang ke, alt. 3348 m., no. 12399, June 1925 (shrub 1.8–2.5 m. high; flowers white); Minshan range, valley of Kadjaku, alt. 3198–3650 m., nos. 12415, 12373, 12417, 12397 and 12365, June 1925 (shrub 1.5–3 m. high; flowers white); same locality, alt. 3198 m., no. 12419, June 1925 (shrub 1.8–2.5 m. high; flowers pink); west of Taoho mountains, alt. 3348 m., no. 12154, May 1925 (shrub 1.5–1.8 m. high); below Mt. Kwang ke, Drakana, among limestone rocks, Abies forest, alt. 3198 m., nos. 13679 and 13681, Sept.–Oct. 1925 (shrub 1–1.8 m. high); Drakana, beyond Kwang ke shan, west Tebbu land, alt. 3198–3498 m., no. 13686, Sept. 1925 (shrub 1.5 m. high); Kadjaku valley, below Mt.

Kwang Kei, Tebbu land, open alpine regions, alt. 3498–3650 m., nos. 12364, 13694 and 13695, June, Sept.–Oct. 1925 (shrub 1–4.5 m. high; flowers white); Maerhku valley, N. Minshan, spruce forest, 3048–3348 m., nos. 12189 and 13676, June and Sept.–Oct. 1925 (shrub 1–1.5 m. high; flowers white, spotted purplish); west of Adjüan, eastern Minshan, alt. 3348 m., no. 12652, July 5, 1925 (shrub 1.3–1.5 m. high; flowers white); west of Adjüan, east Tebbu land, alt. 3198–3348 m., nos. 13677 and 13685, Sept.–Oct. and Oct.–Nov. 1925 (shrub 1.3–1.5 m. high). Lower Tebbu country: on summit of spur dividing Maya ku from Sambaku, alt. 3438 m., no. 14770, Sept. 6, 1926 (shrub 1–1.3 m. high; flowers white). Upper Tebbu country: at foot of Shimen, alt. 3348–4100 m., nos. 13047 and 13052, July–Aug. 1925 (shrub 1.5–1.8 m. high); Mt. Kwang ke, alt. 3650–3800 m., no. 13629, Sept.–Oct. 1925 (shrub 1.3–1.5 m. high; flowers white).

Central Kansu. Lien hoa shan: among limestone rocks, alt. 3348 m., no. 13612, Sept.–Oct. 1925 (shrub 1–1.3 m. high); between Taochow and Titao, alt. 3348 m., no. 12672, July 1925 (shrub 1–1.3 m. high; flowers white, pinkish tinge).

Northwestern Kansu. Richthofen range and adjacent region: Tapanshan, northeastern slopes near Peitatung, alt. 3650 m., no. 13302, Oct. 1925 (shrub 1.3–1.8 m. high).

Eastern Tibet. Kokonor Region: lateral gorge of Koko gorge, alt. 3348 m., no. 13278, Sept. 1925 (shrub 1.5–2.5 m. high; flowers whitish pink; fruits greenish). Grasslands between Labrang and Yellow River: rocky moist slopes at Borlung ngongma, south of Kecbach nira pass, alt. 3689 m., no. 13906, May 7, 1926 (shrub 0.6–1 m. high; flower probably white).

This Rhododendron would appear to be widespread on the mountains of Kansu and the adjacent region of eastern Tibet and to be confined thereto. The collector remarks that here and there he found this Rhododendron growing on limestone rocks. The rich green upper surface of its leaves and the yellow petiole give it a distinct appearance. The pubescence on the under surface of the leaves presents a remarkable range of variation in quantity. On some specimens the leaves are totally devoid of indumentum on the under surface; in others some leaves are perfectly glabrous, others partially glabrous; others are densely covered with a short felted grey or brownish gray tomentum. In some this tomentum is confined more or less to near the midrib. The umbellate corymbose inflorescence is compact, rounded and often contains as many as twenty flowers. The corolla is bell-shaped and the flower is everywhere glabrous except on the lower half of the filaments, which are somewhat villose.

After examining the large suite of specimens collected by Mr. Rock I am of the opinion that *R. kialense* Franch. is a distinct, if critical, species closely related to *R. Przewalskii* Maxim. The specimens collected in western Szechuan and by Rehder & Wilson (in Sargent, Pl.

Wilson. I. 534 (1913)) referred to *R. Przewalskii* belong to *R. kialense*. From the description (Rhodod. ser. 2, 167 (1924)) I think that *R. kansuense* Millais is probably identical with *R. Przewalskii* Maxim.

Rhododendron rufum Batalin in Act. Hort. Petrop. XI. 490 (1891).—Millais, Rhodod. 237 (1917).

SOUTHWESTERN KANSU. Tao River basin: Choni, west of Taoho mountains, alt. 3348 m., nos. 12152, 12153 and 12156, May 1925 (shrub 2.5–4.5 m. high; flowers white, purplish pink tinge); lateral valley of Taoho, south of Choni, alt. 3048–3348 m., nos. 12230, 12322, 12231 and 12234, June 1925 (shrub 1.5–2.5 m. high; flowers pale pink or white, pinkish tinge, spotted purple); Choni, Taoho watershed, alt. 3048 m., nos. 12232 and 12233, June 1925 (shrub 1.3–4.5 m. high; flowers white, purplish pink stripes); Kadjaku, alt. 3198–3348 m., nos. 13696 and 13697 Sept.–Oct. 1925 (shrub 4.5 m. high; flowers pinkish with deep purple spots); Minshan range, Mt. Kwang ke, alt. 3348–3498 m., nos. 12366, 12374, 12380, 12395, 12398, 12400, 12418 and 12422, June 1925 (shrub 1.5–4.5 m. high; flowers white, spotted crimson, pinkish purple); mountains of Maerhku gorge, Choni territory, alt. 3228 m., nos. 12331, 12332 and 12333, June 1925 (shrub 1.5–4.5 m. high; flowers white to pinkish lavender, spotted purplish); Maerhku valley, N. Minshan, alt. 2893–3348 m., nos. 12190, 12324, 12325, 12326, 12328, 12330, 12343, 13649, 13650, 13682, 13683, 13691, 13692 and 13693, June and Sept.-Oct. 1925 (shrub 1.3–5.5 m. high; flowers white, pinkish purple); Mt. Kwang ke, alt. 3498–3650 m., nos. 12367, 12369, 13599 and 13601, June and Sept.–Oct. 1925 (shrub 1.3–4.5 m. high; flowers white-pink to purplish); below Mt. Kwang ke, Drakana, among limestone rocks, alt. 3498 m. no. 13680, Sept.–Oct. 1925 (shrub 2.5–3.6 m. high; flowers pinkish); forest at Laliku, alt. 3348–3650 m., no. 14928, Oct. 20, 1926 (shrub 3–4.5 m. high); Hsiaoku, below Mt. Lissedzadza, east Tebbu land, alt. 3198–3348 m., no. 13684, Oct. 1925 (shrub 1.8–2.5 m. high); west of Adjüan, east Tebbu land, alt. 3198 m., no. 13678, Sept.–Oct. 1925 (shrub 1.5–2.5 m. high). Lower Tebbu country: Wantsang valley, alt. 3048–3198 m., nos. 14836 and 15014, Sept. and Sept.–Oct. 1926 (shrub 3–4.5 m. high). Upper Tebbu country: Mt. Kwang ke, alt. 3498 m., nos. 13628, 13630, Sept.–Oct. 1925 (shrub 1.8–6 m. high, flowers deep pink, spotted purple); Maerhku, east Tebbu land, alt. 3198 m., nos. 13640 and 13643, Sept.–Oct. 1925 (shrub 1.3–1.5 m. high; flowers white, purplish pink); Kadjaku valley, west Tebbu land, alt. 3198 m., no. 13645, Sept.–Oct. 1925 (shrub 1.3–2.5 m. high; flowers pink); mountains of Adjüan, east Tebbu land, alt. 3198–3348 m., no. 13647, Sept.–Oct. 1925 (shrub 1.3–1.8 m. high; flowers pinkish white, spotted purple).

CENTRAL KANSU. Lien hoa shan: between Taochow and Titao, alt. 3048–3498 m., nos. 12677, 12728 and 13613, July and Sept. 1925 (shrub 1.5–4.5 m. high; flowers probably pink).

The leaves of this common Kansu species are usually broadest above the middle but vary in shape from oblong-obovate to elliptic-oblong, sometimes elliptic; the base is rounded or slightly auricled; the lamina varies in length from 4–16 cm. and in width from 2–8 cm. The upper surface is glabrous, finely reticulate, with impressed midrib. The under surface is densely clothed with a floccose tomentum; on young leaves it is at first greyish or brownish grey, but it soon becomes ferruginous or red-brown. The inflorescence is compact and rounded and often contains as many as twenty flowers. The pedicels are more or less grey, floccose-tomentose. The corolla is white or pinkish and spotted, and the filaments vary from subglabrous to densely villose in the lower half. The style is always glabrous except at the very base; the ovary is tomentose. The undescribed fruit is cylindric, often slightly curved, 2–2.5 cm. long and 0.5–0.8 cm. broad with slightly undulate valves, glabrescent, usually more or less sparsely clothed with grey to rufous brown, curled, floccose tomentum.

Photographs of large flowering shrubs accompanied no. 12422 from Mt. Kwang ke, Tebbu land (see plate 13).

In describing our *Rhododendron Weldianum* (in Sargent, Pl. Wilson. I. 532 [1913]) my colleague, Alfred Rehder, and myself point out its close relationship with *R. rufum* Batalin. I am now of the opinion that my no. 4250 collected near Sungpang ting is really referable to Batalin's species. *R. Weldianum* Rehd. & Wils. would appear to be a critical species characterized mainly by the much more persistent red-brown tomentum on the fruit. The material, however, is poor. It is native of a region somewhat removed from Kansu and fortunately is in cultivation, so when it blooms proper comparisons can be made. From the description I strongly suspect that *R. Wallaceanum* Millais (Rhodod. ser. 2, 259 (1924)) is referable to *R. rufum* Batal.

R. rufum was first discovered in extreme northwestern Szechuan in the valley of the River Ksernzo in August, 1895, by the Russian traveller, G. N. Potanin. It would appear to have been first discovered in Kansu by William Purdom (nos. 1077 and 1078) when collecting for the Arnold Arboretum in 1911. He found it south of Minchow growing at an altitude of 8000–9000 feet above sea level.

Arctous ruber Nakai in Tokyo Bot. Mag. XXXVIII. 40 (1924); Trees and Shrubs Jap., I. 156, fig. 90 (1922); ed. 2, 216 (1927).

Arctous alpinus var. *ruber* Rehder & Wilson in Sargent, Pl. Wilson. I. 556 (1913).—Nakai, Fl. Sylv. Kor. VIII. 49, fig. 19 (1919).

Arctostaphylos rubra Fernald in Rhodora, XVI. 32 (1914).

SOUTHWESTERN KANSU. Tao River basin: Minshan range, Mt. Kwang ke, 3650–3800 m., nos. 12382 and 13609, June and Sept.–Oct. 1925 (flowers yellow; fruits red, large). Upper Tebbu country: covering limestone boulders and in crevices at foot of main Shimen, alt. 3650 m., no. 13081, July–Aug. 1925 (prostrate shrub; fruits brick red).

In Kansu as in northwestern Szechuan this plant appears to be confined to calcareous soils.

MYRSINACEAE

Determined by A. REHDER

Myrsine semiserrata Wallich in Roxburgh, Fl. Ind. II. 293 (1824); Tent. Fl. Nepal. 34, t. 24 (1824–26).—Mez in Engler, Pflanzenr. IV.-236, p. 339 (1902).

WESTERN SZECHUAN: south of Ching chuan on rocky slopes, alt. about 1200 m., no. 12019, March 1925.

Most of the leaves of Rock's specimen are entire, only few are slightly toothed with not more than one to four teeth on each side.

Myrsine africana Linnaeus, Spec. 196 (1753).—Mez in Engler, Pflanzenr. IV.-236, p. 340 (1902).

WESTERN SZECHUAN: north of Kiang yu, northern Szechuan, on banks of Fu Kiang among rocks no. 12011, March 1925 (shrub 0.3–0.6 m.; flowers red).

PLUMBAGINACEAE

Determined by A. REHDER

Limonium aureum Hill, Veget. Syst. XII. 37,* ind., t. 37, fig. 4 (icon mala) (1773).[1]—Kuntze, Rev. Gen. II. 395 (1891).

Statice aurea Linnaeus, Spec. 396 (1753).—Reichenbach, Iconog. Pl. II. 86, t. 195, fig. 336 (1824).—Boissier in De Candolle, Prodr. XII. 641 (1848).

CENTRAL KANSU Yellow River Basin: loess ravines below Lanchow, beyond Taosha, alt. 1825 m., no. 13239, Aug. 1925 (shrub 30 cm.; flowers yellow).

The specimen differs from *L. aureum* in its rather dense stellate or fasciculate pubescence, while according to the description and the only meagre specimen I saw (ex Herb. Bunge) the plant is only tuberculate. The plant is larger, much more copiously branched and more floriferous than the figure in Reichenbach's Iconographia.

SYMPLOCACEAE

Determined by A. REHDER

Symplocos Wilsonii Brand in Fedde Rep. Spec. Nov. III. 216 (1906).

SOUTHERN KANSU: on border of Szechuan and Kansu before reaching Motzuping, alt. 1825 m., no. 12058, April 1–2, 1925 (tree 3–4.5 m.; flowers yellowish green); between Motzuping and Pikou, alt. 1825 m., no. 12060, April 2, 1925 (tree 4.5 m.; flowers yellow).

No species of Symplocos had been recorded from Kansu before and this species reaches only the extreme southern border of that province.

OLEACEAE

Determined by A. REHDER

Fraxinus platypoda Oliver in Hooker's Icon. XX. t. 1929 (1890).—Lingelsheim in Engler, Pflanzenr. IV.-243, pt. I–II. 39, fig. 11c (1920).

[1] The species appears on p. 37* under the generic heading *Limonium* as *Statice aurea*, but in the index it is listed as "*Limonium aurea*."

SOUTHWESTERN KANSU. Lower Tebbu country: in mixed forest of Wantsang Valley, alt. 2300–2450 m., no. 14832, Sept. 1926 (tree 15–24 m.).

This species had not been recorded before from Kansu.

Forsythia Giraldiana Lingelsheim in Jahresber. Schles. Ges. Vaterl. Cult. II. Abt. Zool.-Bot. Sect. 1908, p. 1; in Engler, Pflanzenr. IV.-243, pt. I–II. 110, fig. 11 (1920).

Forsythia Giraldii Pampanini in Nuov. Giorn. Bot. Ital. n. ser. XVII. 688 (1910).

SOUTHERN KANSU: valley north of Tan chang, no. 12057, April 14, 1925 (shrub 1.25 m.; flowers yellow).

From the type of *F. Giraldiana* Rock's specimen differs in the smaller fruits which are only about 1 cm. long, but it agrees in the nearly terete branchlets and in the epidermis of the two-year-old branchlets separating in thin hyaline flakes. The flowers which have not yet been described are very similar to those of *F. viridissima* Lindl. with sepals about half as long as the corolla-tube and rather narrow corolla-lobes. The species had not been recorded from Kansu before.

Forsythia suspensa Vahl, Enum. Pl. I. 39 (1804).—Siebold & Zuccarini, Fl. Jap. I. 12, t. 3 (1835).

WESTERN SZECHUAN: south of Ching chuan, on rocky, grass covered slopes, alt. 1200 m., no. 12020, March 1925 (shrub 1.5 m.; flowers pendent, satin-yellow).

Syringa microphylla Diels in Bot. Jahrb. XXIX. 531 (1900).—Lingelsheim in Engler, Pflanzenr. IV.-243, pt. I–II. 86, fig. 5 (1920).

SOUTHWESTERN KANSU. Tao River basin: lamasery of Choni, alt. 2600 m., no. 12203, June 1925 (shrub 2–2.5 m.; flowers lavender); Choni lamasery, upper Yamen, alt. 2600 m., no. 13698, September, 1925 (tree 4.5–6 m.; flowers pink, not fragrant).

Rock's specimens are apparently from cultivated plants.

Syringa Potanini Schneider in Fedde Rep. Spec. Nov. IX. 80 (1910);—Ill. Handb. Laubholzk. II. 777, fig. 487l-m, 488s-u (1911); in Sargent, Pl. Wilson. I. 297 (1912).

SOUTHWESTERN KANSU. Lower Tebbu country: arid slopes of Mayaku, alt. 2300 m., no. 14793, Sept. 8, 1926 (shrub 3–4.5 m., with long flexible rambling branches).

I refer Rock's no. 14793 with some hesitation to *S. Potanini* since its leaves are nearly glabrous except the puberulous impressed midrib above and the pilose midrib beneath, also the veinlets are very sparingly pilose and the petioles are short-pilose. In the dense pubescence of the branchlets, the inflorescence, calyx and winter-buds and in its general habit and the shape of the leaves which are up to 7 cm. long it agrees with *S. Potanini* Schneider. Potanin collected this species near Tanchang southeast of Minchow while Rock's specimen comes from where the Mayaku joins the Peshwekiang, a point approximately 50 miles distant from Tanchang.

Syringa oblata Lindl. var. **Giraldii** Rehder in Jour. Arnold Arb. VII. 34 (1926).

Syringa Giraldi Lemoine, Cat. no. 157, p. 35 (1904); no. 160, p. 30 (1905).—Bellair in Rev. Hort. 1909, p. 335, fig. 135–137.

Syringa affinis var. *Giraldi* Schneider, Ill. Handb. Laubholzk. II. 774 (1911).

SOUTHWESTERN KANSU. Tao River basin: Choni, lamasery alt. 2600 m., no. 12158, June 1925 (shrub 4.5 m., spreading; flowers rich lavender). Lower Tebbu country: dry open scrub in Wantsang valley, also in dry gorges of Peshwekiang, alt. 2000 m., no. 14685, Sept. 1, 1926 (tree 3 m.; leaf thick, coriaceous); arid slopes of Peshwekiang, alt. 2000 m., no. 14687, Sept. 1, 1926 (shrub 2–3 m.; trunk black; leaf dark green); dry gorges of Chulungapu below Wantsang, alt. 1825–2000 m., no. 15036, Sept.–Oct. 1926 (tree 4.5 m.); dry shale slopes of Mayaku, below Nyipa, alt. 2450 m., nos. 15058 and 15063, Sept.–Oct. 1926 (tree 15 m.).

This variety had been collected before in Kansu by R. C. Ching, (Wulsin Exped. no. 51). Rock's no. 14687 differs in its small ellipsoid scarcely acuminate fruit about 8 mm. long and 5 mm. across.

Syringa oblata Lindl. var. **affinis** Lingelsheim in Engler, Pflanzenr. IV.-243, pt. I–II. 88 (1920).

Syringa affinis L. Henry in Jour. Soc. Hort. France, sér. 4, II. 731, (Monog. Hort. Lilas Ligustrina) (1901); in Rev. Hort. 1908, p. 301, fig. 112.

SOUTHWESTERN KANSU. Tao River basin: Choni, lamasery, alt. 2600 m., no. 12159, June 1925 (shrub 4.5 m., spreading; flowers white).

This is apparently a white-flowered form of the preceding variety and is known only as a cultivated plant.

Syringa pekinensis Ruprecht in Bull. Phys.-Math. Acad. St. Pétersb. XV. 371 (1857).—Decaisne in Nouv. Arch. Mus. Hist. Nat. Paris, sér. 2, II. 43 t. 2 (Monog. Syringa) (1879).

Syringa amurensis var. *pekinensis* Maximowicz in Mém. Div. Sav. St. Pétersb. IX. 194 (1859).—Lingelsheim in Engler, Pflanzenr. IV.-243, pt. I–II. 94 fig. 7A (1920).

SOUTHWESTERN KANSU. Tao River basin: Shanshen Miao, alt. 2900 m., no. 13507, Oct. 1925 (tree 4.5–6 m., leaves pale, whitish beneath). Lower Tebbu country: Mayaku, alt. 2300 m., no. 14751, Sept. 5, 1926 (shrub 3–4.5 m.); Mayaku, alt. 2450 m., no. 15070, Sept.–Oct. 1926 (tree 4.5 m.).

CENTRAL KANSU. Lien hoa shan: en route to Lien hoa shan, along stream banks, alt. 2750 m., no. 12760, July 14–20, 1925 (tree 4.5 m.; flowers cream-colored, fragrant); tributary bank of Tao, north of Titao, en route to Lanchow, alt. 1300 m., no. 13227, Aug. 1925 (tree 4.5 m.); slopes, alt. 2750, no. 13506, Oct. 1925 (tree 4.5–6 m.: flowers white).

With no. 15070 is a branch about 1.5 cm. in diameter which shows the brown bark separating in thin flakes rolling back. The form usually

cultivated has close brown bark marked by prominent horizontal lenticels, but trees raised from seed collected by Purdom in northern China and received without precise locality have the bark even more markedly exfoliating with larger and thinner papery flakes very much like that of the River Birch (*Betula nigra* L.).

Jasminum humile Linnaeus, Spec. 7 (1753).—Ker in Bot. Reg. v. t. 350 (1819).—De Candolle, Prodr. VIII. 313 (1844).—Rehder in Sargent, Pl. Wilson. II. 614 (1916).

SOUTHWESTERN KANSU. Lower Tebbu country: out-skirts of forests along stream in Wantsang valley, alt. 2125–2250 m., no. 14653, Aug. 31, 1926 (shrub about 1.5 m.); dry arid slopes with Oaks in Nyibaku, alt. 2100 m., no. 14797, Sept. 9, 1926 (shrub about 1.5 m.; flowers rich yellow); gorge of Chulungapu, dry slopes with Koelreuteria, alt. 2000 m., no. 15035, Sept.–Oct. 1926 (shrub about 1.5 m.; flowers yellow; fruit black).

The calyx-teeth of the specimens cited above are longer and slenderer than in typical *J. humile*, but otherwise Rock's specimens do not differ. No species of Jasminum seems to have been recorded from Kansu before.

LOGANIACEAE

Determined by A. REHDER

Buddleia albiflora Hemsley in Jour. Linn. Soc. XXVI. 118 (Ind. Fl. Sin.) (1889).—Schneider, Ill. Handb. Laubholzk. II. 845, fig. 430d (1912).

Buddleia Hemsleyana Koehne in Gartenfl. LII. 170 (1903).

SOUTHWESTERN KANSU. Lower Tebbu country: along banks of stream, Wantsang forest, alt. 2125 m., no. 14675, Sept. 1, 1926 (shrub 1.5–2 m.); in Abies forests and in small clearings, alt. 3050 m., no. 14773, Sept. 7, 1926 (plant 0.6–1 m.; flowers lavender); grassy slopes of lateral valleys in Wantsang valley, alt. 2750 m., no. 14819 (shrub 1.75–2 m.); open grassy slopes of Wantsang ku, alt. 2900 m., no. 15012, Oct. 1926 (shrub 2–3 m.); Mayaku near Zhega, alt. 2600 m., no. 15071, Sept.–Oct. 1926 (plant about 1.5 m.).

This species does not seem to have been recorded from Kansu before.

Buddleia officinalis Maximowicz in Bull. Acad. Sci. St. Pétersb. XXVI. 496 (1880); in Mél. Biol. X. 675 (1880).—C. H. Wright in Bot. Mag. CXXXVII. t. 8401 (1911).

WESTERN SZECHUAN: mountains of Ching chuan, along banks of streams and hillsides, no. 12051, April 1925 (shrub 1.75–2 m.; flowers pinkish lavender).

Buddleia nana W. W. Smith in Not. Bot. Gard. Edinb. VIII. 126 (1913).

WESTERN SZECHUAN: north of Kiang yu near Kao chuan pa and dry rocky cliff of Fu kiang, no. 12017, March 1925 (pendent shrub; flowers pale lavender, very handsome); same locality and date, no. 12018 (flowers white); north of Kiang yu, rocky cliffs along Fu kiang, nos. 12029 and 12031, March 1925 (shrub 0.6–7 m.; flowers pale lavender); below Ching chuan, on rocky banks, no. 12034, March 1925 (bush 0.6–1 m.; flowers pale lavender).

The specimens differ according to the descriptions from typical *B. nana* in the larger corolla lobes which measure about 5 mm. in diam., but I think they are referable to this species rather than to *B. brachystachya* Diels which has the leaves

glabrate above and still smaller corolla-lobes. No. 12018 is said to have white flowers, but in the dried specimens they look exactly like those of no. 12017; these two specimens have small often obtusish leaves, white-tomentose beneath and occasionally with a few minute teeth, while the leaves of nos. 12029 and 12031 are larger, up to 4.5 cm. long, mostly acutish and the tomentum is slightly fulvous. Of *B. brachystachya* I have seen no specimen, and of *B. nana* only Forrest's no. 13645 received under this name from Edinburgh.

Buddleia alternifolia Maximowicz in Bull. Acad. Sci. St. Pétersb. XXVI. 494 (1880); in Mél. Biol. x. 67 (1880).—Stapf in Bot. Mag. CLI. t. 9085 (1926).

CENTRAL KANSU. Lien hoa shan: en route to Lien hoa shan, along stream banks, alt. 2750 m., no. 12754, July 14–20, 1925 (shrub 2–2.25 m.; flowers purplish red, fragrant; leaves whitish beneath); lower slopes, alt. 2750–3050 m., no. 13617, Sept.–Oct. 1925 (shrub about 1.5 m.; leaves white beneath; flowers purple).

ASCLEPIADACEAE

Determined by A. REHDER

Periploca calophylla Falconer in Proc. Linn. Soc. I. 115 (1842); in Ann. Mag. Nat. Hist. VIII. 449 (1842).—Hooker f., Fl. Brit. Ind. IV. 12 (1883).

Streptocaulon calophyllum Wight, Contrib. Bot. Ind. 65 (1834); Ill. Ind. Bot. II. 230, t. 182, fig. 1 (1850).

SOUTHERN KANSU: beyond Pikou on bank of Wen hsien ho, no. 12080, April 1925 (climber, forming clumps over shrubs, 1–1.6 m.; flowers green).

WESTERN SZECHUAN: along the Fu kiang, on rocky cliffs and grassy banks, no. 12036, April 1925 (woody climber; flowers green).

The genus Periploca has apparently not yet been recorded from Kansu.

VERBENACEAE

Determined by A. REHDER

Caryopteris incana Miquel in Ann. Mus. Bot. Lugd.-Bat. II. 97 (1866); Prol. Fl. Jap. 29 (1866).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXXI. 87 (1866); Mél. Biol. XII. 523 (1886).

Caryopteris Mastacanthus Schauer in De Candolle, Prodr. XI. 625 (1847).—Hooker f. in Bot. Mag. CIII. t. 6799 (1885).

SOUTHWESTERN KANSU. Tao River basin: along stream between Taochow and Kan ku, on loess slopes, alt. 2450 m., no. 13208, Aug. 1925 (often a shrub 0.6–1 m.; flowers blue; common in Tao and Yellow River valley).

CENTRAL KANSU. Lien hoa shan: along stream of Ha kou, alt. 2750 m., no. 12765, July 14–20, 1925 (bush 0.25–50 m.; flowers lavender).

This species had been collected before by Wm. Purdom in the Lao chow district.

LABIATAE

Determined by A. REHDER

Plectranthus discolor Dunn in Not. Bot. Gard. Edinb. VIII. 155 (1913); VI. 140 (1915).—Rehder in Sargent, Pl. Wilson. III. 384 (1916).

SOUTHWESTERN KANSU. Lower Tebbu country: on rocky cliffs of Peshwekiang valley, alt. 2100 m., no. 14558, Aug. 30, 1926 (shrub 0.75–1 m.; flowers pinkish lavender).

This species had been collected previously in Kansu (J. Hers no. 2432).

SOLANACEAE

Determined by A. REHDER

Lycium chinense Miller, Gard. Dict. ed 8, no. 5 (1768).—Watson, Dendr. Brit. I. 8, t. 8(1825).—Dunal in De Candolle, Prodr. XIII. pt. I. 510 (1852).

SOUTHWESTERN KANSU. Tao River basin: west of Choni banks of river, alt. 2600–2750 m., no. 12185, June 1925 (shrub about 1.5 m.; flowers red); along streams between Tao chow and Kan ku, alt. 2525 m., no. 13211, Aug. 1925 (shrub 1.25 m.; flowers bluish lavender); Choni district, alt. 2750 m., no. 13560, Sept.–Oct. 1925 (spiny shrub about 2.5 m.; flowers purple; fruit brick-red). Lower Tebbu country: banks of Chulungapu, Wantsang, alt. 2000 m., no. 15094, Sept. 1926 (shrub 0.75–1 m.).

WESTERN KANSU: in dry gorge between Hsining and Tankar, alt. 2750 m., no. 13257, Sept. 10, 1925 (shrub 0.75–1 m.; fruit tomato-red).

The leaves of most of Rock's specimens are rather narrow, lanceolate to linear-lanceolate, sometimes as in no. 13560 only 5 mm. wide by 3 cm. length or 5.5 cm. by 8 mm. The species had been collected before in Kansu by R. C. Ching (Wulsin Exped. no. 208).

CAPRIFOLIACEAE

Determined by A. REHDER

Viburnum fragrans Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 107 (Enum. Pl. Chin. Bor. 30) (1833).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXVI. 485 (1880); in Mél. Biol. X. 659 (1880).—Farrer, On the Eaves of the World, I. 94, 96, pl. (1917).—[Bowles] in Gard. Chron. ser. 3, LXIX. 109, fig. 48 (1921).

SOUTHWESTERN KANSU. Tao River basin: Taochow, alt. 2750 m., nos. 12141, 12142 and 12144, May 1925 (shrub 3–4.5 m.; flowers pale pink [no. 12141], deep pink [no. 12142] or white [no. 12144], fragrant).

Rock's specimens were collected in the city of Taochow apparently from cultivated plants. The species which is frequently cultivated all over northern China was found wild by Farrer south of Shiho in southern Kansu.

Viburnum erubescens Wall. var. **gracilipes** Rehder in Sargent, Pl. Wilson. I. 107 (1911).

SOUTHWESTERN KANSU. Tao River basin: Lamasery of Choni, alt. 2600 m., no. 12962, July 25, 1925 (tree 7 m. tall; fruits blackish purple).

Rock's specimen differs from typical var. *gracilipes* in the glabrous narrow-elliptic or obovate-elliptic leaves, gradually narrowed into the slender petiole which is up to 3 cm. long, and in the short panicles. It looks like a distinct form, but without a revision of the several varieties described of this apparently very variable and widely distributed species I hesitate to add a new one.

Viburnum Veitchii C. H. Wright in Gard. Chron. ser. 3, XXXIII. 257 (1903).—Rehder in Sargent, Trees & Shrubs II. 110 (1908); Man. Cult. Trees Shrubs, 801 (1927).

SOUTHWESTERN KANSU. Tao River basin: Choni, in scrub forest, outskirts of Spruce forest, alt. 2750 m., no. 12275, June 1925 (shrub 1.25 m.; flowers white).

This species had been collected before by Wm. Purdom in the Minchow district.

Viburnum buddleifolium C. H. Wright in Gard. Chron. ser. 3, XXXIII. 257 (1903).—Rehder in Sargent, Trees & Shrubs II. 110 (1908); Man. Cult. Trees Shrubs, 801 (1927).—Schneider, Ill. Handb. Laubholzk. II. 659, fig. 419i (1909).

SOUTHERN KANSU: between Motzuping and Pikou, on grassy slopes and banks, no. 12068, April 1925 (shrub 1 m.); between Pikou and Kaichow, no. 12076, April 1925 (shrub 1 m.; flowers white).

Rock's no. 12076 has somewhat broader leaves, generally oblong-ovate or occasionally ovate, but otherwise the specimen agrees with typical *V. buddleifolium*. The species had not yet been recorded from Kansu, where it occurs apparently only in the warm valleys of the extreme southeastern border.

Viburnum glomeratum Maximowicz in Bull. Acad. Sci. St. Pétersb. XXVI. 483 (1880); in Mél. Biol. X. 656 (1880).—Rehder in Sargent, Trees & Shrubs II. 110 (1908).

SOUTHWESTERN KANSU. Tao River Basin: Choni, outskirts of forests, with Berberis, Lonicera etc., alt. 2600 m., no. 12165, June 1925 (shrub 1.25 m.; flowers white); Minshan range grassy banks of Kadjaku, alt. 2750 m., no. 12435, June 1925 (straggling branching shrub, 1.25–2 m.; flowers cream-colored); in Picea forests beyond Kadjaku near Lupassu, alt. 2750 m., no. 13168, August 1925 (shrub 1.75–2 m.; fruit reddish black); Tatsuto, en route to Lupassu, alt. 2750 m., no. 13518, Sept.–Oct. 1925 (shrub 2–2.75 m.; fruit black). Lower Tebbu country: Pezhu gulch, alt. 2600 m., no. 14986, Sept.–Oct. 1926 (shrub 4.5 m.; leaf dark green above, gray woolly beneath); outskirts of dry forests in Mayaku, alt. 2450 m., no. 15096, Sept. 1926 (shrub 2–2.75 m.). Upper Tebbu country: along stream of Yiwaku, Drakana, alt. 2750 m., no. 14633, Aug. 1926 (shrub 1.75–2 m.; fruit black).

Viburnum glomeratum var. **Rockii** Rehder, var. nov.

A typo recedit foliis minoribus elliptico-ovatis vel ovalibus 2–3 cm. longis et 1.3–2.2 cm. latis, rarius orbiculari-ovalibus, obtusis vel obtusiusculis, basi rotundatis vel late cuneatis, remote et saepe obsolete denticulatis, supra maturitate fere glabris vel sparse asperato-stellato-pilosis, subtus stellato-tomentosis, venis utrinque 3–5 ascendentibus et leviter arcuatis ut venulae in dentes excurrentibus, petiolis 3–5 mm. longis stellato-pubescentibus, fructu minore circiter 7 mm. longo, putamine minus compresso.

SOUTHWESTERN KANSU. Lower Tebbu country: outskirts of Wantsang ku forests, alt. 2300 m., no. 15003 (type), Sept.–Oct. 1926 (shrub 1.75–2 m.; fruit glossy black); outskirts of forests along stream in Wantsang valley ,alt. 2125–2225 m., no. 14654, Aug. 31, 1926 (stiff shrub; fruit reddish black when ripe).

This new variety differs chiefly in the much smaller usually obtuse or rounded leaves with only 3–5 pairs of veins. In size and shape the leaves resemble somewhat those of *V. mongolicum* Rehder, but they differ in the dense stellate tomentum of the under side and in the veins ending directly into the teeth. No. 14654 differs somewhat from the type in the broader generally oval leaves usually rounded at apex with the veins less distinctly impressed above and in the more compressed stone.

Viburnum mongolicum Rehder in Sargent, Trees & Shrubs II. 111 (1908); Man. Cult. Trees Shrubs, 802 (1927).

Lonicera mongolica Pallas, Reise Russ. Reich. III. 721 (1771), excl. synon. Gmelin; Fl. Ross. I. 59, t. 38 (Lonicera dauurica) (1784).

Viburnum davuricum Pallas, Fl. Ross. II. 30 (1788).—Herder in Bull. Soc. Nat. Moscow, XXXVII. pt. 1, 200, t. 1, fig. 2 (1864).

SOUTHWESTERN KANSU. Tao River basin: Choni among rocks on banks of Tao ho river, alt. 2600 m., no. 12161, June 1925 (shrub 1.25 m., with spreading branches; flowers pale green); Tatsuto toward Lupassu, in outskirts of forest with Berberis, alt. 2675 m., no. 12463, June 1925 (shrub 1–1.75 m.; flowers green); between Tatsuto and Lupassu on banks and spreading over boulders, alt. 2625 m., no. 12480, June 1925 (shrub with rambling branches; flowers green); Poyüku, alt. 2750 m., no. 13515, Oct. 1925 (shrub 1.75 m.; leaves pale beneath; fruit black).

Viburnum betulifolium Batalin in Act. Hort. Petrop. XIII. 371 (1894).—Rehder in Sargent, Trees & Shrubs II. 99, 116, t. 147 (1908); Man. Cult. Trees Shrubs, 807 (1927).—Bean in Bot. Mag. CXLII. t. 8672 (1916).

Viburnum lobophyllum Graebner in Bot. Jahrb. XXIX. 589 (1901).—Rehder in Sargent, Trees & Shrubs. II. 101, 116, t. 148 (1908); Man. Cult. Trees Shrubs, 807 (1927).

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Wantsang, alt. 2125–2225 m., no. 14664, Aug. 31, 1926 (shrub 2–3 m.; fruit globose, red); outskirts of forests in Wantsang valley, alt.

2125 m., no. 14828, Sept. 1926 (tree 3–4.5 m.; fruit pale red); dense forests of Wantsang valley, alt. 2600 m., no. 14845, Sept. 12, 1926 (tree 5–6 m., leaf dark green); forests of Wantsang ku, alt. 2600–2900, nos. 15011 and 15013, Oct. 1926 (shrub 3–4.5 m.; fruit globose, red or pale red, in drooping panicles); in shade in forests of Wantsang, alt. 2600 m., no. 15028, Sept.–Oct. 1926 (shrub 3–4.5 m.; fruit in ample drooping panicles).

CENTRAL KANSU. Lien hoa shan: alt. 2900 m., nos. 13213 and 13473, Aug. and Oct. 1925 (shrub 1.75–2 m. or tree 4.5 m.; fruit red or pale red); central part of mountain, alt. 2750 m., no. 13221, Aug. 1925 (shrub 1.75–2 m.; fruit pale red); in forests, alt. 3000 m., no. 13476, Oct. 1925 (shrub 3 m.; fruit bright red).

With a large series of specimens before me I have been unable to find any constant characters to distinguish *V. lobophyllum* Graebn. from *V. betulifolium* Batal., as species or even as varieties. The length of the peduncle, width of the corymb and size and shape of the leaves are very variable. Some specimens, nos. 14664, 14828 and 15011, differ somewhat in their distinctly ovate leaves, always rounded or subcordate at the base, not exceeding 5 cm. in length, less coarsely serrate and of somewhat firmer texture; also the stipules are less developed, usually small or wanting entirely.

Viburnum betulifolium f. **aurantiacum** Rehder, forma nova.

A typo recedit fructu aurantiaco.—Frutex 3–4.5 m. altus, foliis plerisque late ovatis 5–7.5 cm. longis, pedunculis 1–2.5 cm. longis, corymbis 5–7.5 cm. diam.

SOUTHWESTERN KANSU. Lower Tebbu country: forests of Ngongo, west of Chulungapu, no. 14971 (type), Sept.–Oct. 1926 (shrub 2.75–4.5 m.; fruit orange, in drooping panicles); forest of Wantsang, alt. 2125–2225 m., no. 14658, Aug. 31, 1926 (shrub 2.75–3 m.; fruit yellowish red, juicy, acid, edible, in large drooping clusters).

This form differs from the type in its orange fruit and under no. 14658 the collector states that it is juicy, acid and edible; probably the yellow fruit is less bitter and astringent than the red one.

Viburnum Sargenti Koehne var. **calvescens** Rehder in Mitt. Deutsch. Dendr. Ges. XII. 125 (1903); in Sargent, Trees & Shrubs, II. 116 (1908); Man. Cult. Trees Shrubs, 810 (1927).

CENTRAL KANSU. Lien hoa shan: northern slopes, alt. 2750 m., no. 13219, Aug. 1925 (shrub or small tree 3–4 m.; fruit bright red); Shanshen Miao, alt. 2750–2900 m., nos. 13485 and 13492, Oct. 1925 (handsome shrub 3–4.5 m.; fruit orange).

The color of the fruit of nos. 13485 and 13492 is stated to be orange, while that of 13219 which is immature is said to be bright red. The color of typical *V. Sargenti* is scarlet, but there is a form with yellow fruit distinguished as f. *flavum* Rehd.

Abelia brachystemon (Diels) Herb. Edinb. in sched.
Linnaea brachystemon Diels in Not. Bot. Gard. Edinb. v. 178 (1912).

SOUTHWESTERN KANSU. Upper Tebbu country: southern slopes of Minshan, along banks of mountain streams, alt. 3250 m., nos. 12502 and 12505, June 1925 (shrub 2–3 m., with straight ridged stem and rambling branches); along bank of stream back of Drakana, alt. 3050 m., no. 14587, Aug. 1926 (shrub 1.75–2.75 m.; with brittle rambling branches).

I refer with some hesitation the numbers cited above which bear only very young flower-buds or immature fruits to *A. brachystemon* described originally from the Li kiang range in Yunnan, but they agree well in their inflorescence, sepals and leaves with that species of which I have an isotype before me except that the leaves are narrower, linear-lanceolate in nos. 12502 and 12505 and about 2–5 cm. long and 3–8 mm. wide, distinctly ciliate and very sparingly pilose above, and in no. 14587 somewhat broader and pilose along the midrib and on the veins beneath. The light brownish gray bark of the stems of which pieces about 2 cm. in diameter accompany no. 12502 is very remarkable; it is divided by deeply incised longitudinal grooves into 6 rounded corky ridges 3–4 mm. high. This peculiar structure is well developed apparently only on vigorous shoots; the lateral branches up to 3 years of age are perfectly terete, but on branches 4 or perhaps sometimes only 3 years old the six grooves though rather shallow can be distinguished and they are present in Forrest's no. 2155, the type number of *A. brachystemon*. In the closely related *A. Zanderi* (Graebn.) Rehd. of which there are growing in this Arboretum shrubs up to 2 m. tall the bark of the stems is only shallowly and more irregularly fissured into longitudinal ridges.

Lonicera syringantha Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIV. 49 (1877); in Mél. Biol. X. 77 (1877).—Wolf in Gartenfl. XLI. 564, fig. 115, 116 (1892).—Rehder in Rep. Missouri Bot. Gard. XIV. 46 (Syn. Gen. Lonicera) (1903); in Schneider, Ill. Handb. Laubholzk. II. 685, fig. 736m., 437g (1911); Man. Cult. Trees Shrubs, 822 (1927).—C. H. Wright in Bot. Mag. CXXX. t. 7989 (1904).

SOUTHWESTERN KANSU. Tao River basin: along Tao River and its tributaries, Choni, alt. 2600 m., no. 12236, June 1925 (shrub 1–1.75 m.; flowers lavender, fragrant); on banks of river, no. 12270, June 1925 (shrub 1–1.25 m.; flowers pinkish purple, fragrant); grassy banks of river, no. 12279, June 1925 (shrub 0.75–1 m.; flowers pinkish); Choni, no. 12283, June 1925 (shrub 0.75 m.; leaves smaller; flowers lavender pink); Tao ho watershed, Choni, in river valley, on scrub-covered hillsides, alt. 2625 m., no. 12297, June 1925 (shrub 1–1.5 m.; flowers pinkish lavender, fragrant); beyond Adjüan, forest of Shiao ku, no. 12804, July 1925 (shrub 1–1.75 m.; flowers pink, erect on horizontal branches); slopes of Maerhku valley, in Willow and Spruce forests, alt. 3050 m., no. 12949, July 1925 (shrub 1–1.25 m.; leaves glaucous beneath;

flowers pale pink, fragrant); in meadows between Choni and Kadjaku, very common, alt. 2600 m., no. 13176, Aug. 1925 (fruit tomato-red); Tayaku, east Tebbu land, alt. 2900 m., no. 13550, Oct. 1925 (shrub 1–1.75 m.; fruit brick red to scarlet).

CENTRAL KANSU: en route to Lien hoa shan, from Choni via Taochow, on grassy slopes, no. 12669, July 1925 (shrub 1 m.; fruit orange).

EASTERN TIBET. Radja and Yellow River gorges: among rocks and on grassy slopes, northern bank of Yellow River at Radja, alt. 3050 m., no. 14014, May 1926 (shrub 1.25–1.75 m.; flowers pinkish lavender, fragrant); along stream bed and outskirts of Spruce forest in Dachso canyon, north of Radja, alt. 3200 m., no. 14074, June 2, 1926 (shrub 1.25 m.; flowers pinkish). Jupar Range: gravelly slopes, with Willows, alt. 3200 m., no. 14289, June 1926 (shrub 1.75–2 m.; flowers pink). Kokonor region: along stream bed, Koko gorge, no. 13276, Sept. 1925 (shrub 1.75–2 m.; fruit scarlet); rocky bluffs along streams of gorge; north barrier range of Kokonor, no. 13298, Oct. 1925 (shrub 1–1.25 m.; fruit in sessile clusters, ovoid, red); below Kokonor pass, Lalaku, alt. 3050 m., no. 13365, Sept. 1925 (shrub 0.75–1 m.; fruit red).

Some specimens as nos. 12283, 12804, 13176, 13298, 13365, 13550 and 14074 approach in their smaller and narrower leaves, smaller sessile or nearly sessile flowers and fruits var. *minor* Maxim. (l.c.), but they are of upright habit, usually 1 m. or more tall, and not depressed.

Lonicera thibetica Bureau & Franchet, Jour. de Bot. v. 48 (1891).—Rehder in Sargent, Trees & Shrubs I. 89, t. 45 (1903); in Rep. Missouri Bot. Gard. XIV. 45 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 684, fig. 436h–i, 437 e (1911); Man. Cult. Trees Shrubs, 822 (1927).

SOUTHWESTERN KANSU. Tao River basin: summit of Mt. Lissedzadza, with Caragana, Rhododendron etc., alt. 3800 m., nos. 12595 and 12598, July 1925 (prostrate shrub; leaves pale; flowers purplish pink, slightly fragrant); Kuang ke shan, alt 3800 m., no. 13583, Sept.–Oct. 1925 (prostrate shrub, 30 cm. high; fruit orange); among boulders on Mt. Kuangke, alt. 3650 m., no. 14639, Aug. 25, 1926 (prostrate shrub; fruit red).

EASTERN TIBET. Radja and Yellow River gorges: high pass of Relung nira, alt. 3900 m., no. 14052, May 31, 1926 (prostrate shrub; flowers pink, very fragrant). Alpine region between Radja and Jupar range: alpine meadows of Wajo la, alt. 4350 m., no. 14156, June 1926 (prostrate shrub). Jupar valley: alt. 3650 m., no. 14342, June 1926, (prostrate or tussock forming shrub; flowers pinkish lavender, fragrant).

In no. 13583 the leaves toward the end of the branchlets are glabrescent or even glabrous; in no. 14639 the upper leaves and the upper part of the branchlets are quite glabrous, while the lower part of the branchlets is

only rather thinly pubescent and there is only a scattered woolly pubescence on the under side of the lower leaves. Thus the latter number seems to form a transition to *L. syringantha* Maxim.; its leaves are larger and broader than in typical *L. thibetica* and resemble in shape those of *L. syringantha* var. *Wolfii* Rehd.

Lonicera szechuanica Batalin in Act. Hort. Petrop. XIV. 172 (1895).—Rehder in Rep. Missouri Bot. Gard. XIV. 59, pl. 8 (Syn. Gen. Lonicera) (1903); in Schneider, Ill. Handb. Laubholzk. II. 690, fig. 439 h-i, 440 g (1911).

SOUTHWESTERN KANSU. Tao River basin: Kadjaku valley near Tatzuto in forests of Malus, Pyrus, Betula with Berberis etc., alt. 2700 m., no. 13130, Aug. 1925 (shrub about 1.5 m.; branching horizontally); Kadjaku valley, west Tebbu land, no. 13592, Sept.–Oct. 1925 (shrub 1–1.25 m.; fruit pale orange, on short peduncles). Lower Tebbu country: in Abies forest, bank of Wantsang gomba, alt. 3050 m., no. 14810, Sept. 1926 (shrub 1.75–2 m., branches spreading horizontally; fruit globose, red). Upper Tebbu country: Tebbu road, alt. 3350 m., no. 13112, Aug. 1925 (shrub about 1.5 m., branches horizontal; fruit red).

Lonicera tangutica Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIV. 41 (1877); in Mél. Biol. X. 75 (1877).—Wolf in Gartenfl. XL. 580, fig. 104, 105 (1891).—Rehder in Rep. Missouri Bot. Gard. XIV. 59 (Syn. Gen. Lonicera) (1903); in Schneider, Ill. Handb. Laubholzk. II. 690, fig. 439 m-o, 440 i (1911); Man. Cult. Trees Shrubs, 823 (1927).

SOUTHEASTERN KANSU. Tao River basin: west of Choni, in alpine meadows, no. 12349, June 1925 (shrub about 1.5 m.; flowers pale pink to white); common in Spruce forests, alt. 2625–3050 m., no. 12466, June 1925 (shrub 1.5 m., branches horizontally spreading; flowers pinkish white, drooping). Lower Tebbu country: forests of Wantsang, alt. 2450 m., no. 14708, Sept. 3, 1926 (shrub 1.75–2 m.; fruit red, on long drooping pedicels); forests of Abies in upper Mayaku, alt. 3000 m., no. 14874, Sept. 16, 1926 (shrub 2–3 m.; fruit globose, deep carmine to blackish red, on slender pedicels). Upper Tebbu country: Spruce forest, among boulders, southern slopes of Minshan, alt. 2925 m., no. 12532, June 1925 (shrub 1.25–2 m., with horizontally spreading branches; flowers pale yellow-pink).

Lonicera tangutica var. **glabra** Batalin in Act. Hort. Petrop. XIV. 171 (1895).

SOUTHWESTERN KANSU. Tao River basin: near camp beyond Tatzuto, Kadjaku valley, no. 13134, July 1925 (shrub 1.5 m.; flowers long, tubular, whitish pink); Maerhku valley, alt. 2900 m., no. 13580, Sept.–Oct. 1925 (shrub 1.25 m.; fruit globose, red, on slender peduncles). Upper Tebbu country: in limestone gorge and along stream, Drakana, alt. 3350 m., no. 14596, Aug. 1926 (shrub 2–2.75 m.; fruit red on long pedicels).

This variety which I had previously referred to *L. szechuanica* Batal. differs from it chiefly in its slender pedicels as long as or exceeding the leaves and in the longer generally oblong-ovate leaves. Nos. 13134 and 13580 have the leaves sparingly ciliate, but glabrous on the upper surface.

Lonicera aemulans Rehder in Rep. Missouri Bot. Gard. XIV. 59, t. 2, fig. 10, 11 (Syn. Gen. Lonic.) (1903).

SOUTHWESTERN KANSU. Tao River basin: Choni, in valley, alt. 2600 m., no. 12289, June 1925 (shrub 1–1.25 m.; flowers purplish [in bud]); Tao ho watershed, Choni, outskirts of forests, alt. 2750 m., no. 12291, June 1925 (shrub 1 m.; flowers greenish in bud); along Tao ho river bank, alt. 2600 m., no. 12299, June 1925 (shrub 1.5 m.; flowers rich yellow).

The corolla is somewhat longer than in the type specimen, up to 18 mm. long, and the bractlets are usually slightly leafy.

Lonicera saccata Rehder in Sargent, Trees & Shrubs I. 39, t. 20 (1902); in Rep. Missouri Bot. Gard. XIV. 60 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 690, fig. 439 p-r, 440 k (1911); Man. Cult. Trees Shrubs, 823 (1927).

SOUTHWESTERN KANSU. Lower Tebbu country: dense Abies forest, alt. 3050 m., no. 14783, Sept. 8, 1926 (shrub 1.75–2 m., branches horizontal; fruit globose, red, on long drooping peduncles).

The pubescence on the under side of the leaves is mostly confined to the middle, toward the margin the leaves are glabrescent.

Lonicera microphylla Willdenow apud Roemer & Schultes, Syst. Veg. V. 258 (1819).—Ledebour, Ic. Pl. Fl. Ross. III. 8, t. 213 (1831).—Rehder in Rep. Missouri Bot. Gard. XIV. 61 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 691, fig. 440 l, 441 a–c (1911); Man. Cult. Trees Shrubs, 824 (1927).

SOUTHWESTERN KANSU. Tao River basin: northern bank, between Choni and Kadjaku, alt. 2625 m., no. 12457, June 1925 (shrub 1.25–2 m.; flowers yellow).

EASTERN TIBET. Ba valley: gravelly slopes, alt. 3200 m., no. 14266, June 1926 (globose shrub, 1.75–2.75 m.; flowers small, yellow). Radja and Yellow River gorges: among rocks in dry ravines near Radja, alt. 3200 m., no. 13938, May 27, 1926 (shrub with globose crown; flowers pale yellow); near Radja, alt. 3050, no. 13949, May 26, 1926 (shrub 1.5 m.; flowers yellow); rocky bluffs above Dachso canyon, north of Radja, alt. 3350 m., no. 14061, June 1, 1926 (compact globose shrub 1.5 m.); three days north of Radja, alt. 3350 m., June 3, 1926 (shrub 1.25 m.).

Lonicera coerulea L. var. **edulis** Regel, Russk. Dendr. 144 (1873).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIV. 48 (1877); in Mél.

Biol. x. 75 (1877).—Rehder in Rep. Missouri Bot. Gard. xiv. 72 (Syn. Gen. Lonic.) (1903); Man. Cult. Trees Shrubs, 825 (1927).

Lonicera coerulea γ Turczaninow in Bull. Soc. Nat. Moscou, xviii. 306 (1845).—Herder in Bull. Soc. Nat. Moscou, xxvii. pt. I. 205, t. 3, fig. 1–2a (1864).

Southwestern Kansu. Tao River basin: Minshan range, alpine meadow of Kadjaku, alt. 3200 m., no. 12372, June 1925 (shrub 1–1.25 m.; flowers yellowish green); opposite Choni, alt. 2750 m., no. 12893, July 1925 (shrub 2.75–3 m.; with scandent branches; fruits horn-shaped, pruinose); Maerhku, alt. 2750–3050 m., nos. 12955 and 13551, July 25 and Oct. 1925 (shrub 1.75–4.5 m., bark shaggy cinnamon-brown; fruit spindle- or cornucopiae-shaped, pruinose, edible).

This variety had been collected before in Kansu on the Tao River by Wm. Purdom (no. 500).

Lonicera Ferdinandi Franchet in Nouv. Arch. Mus. Paris, sér. 2, vi. 31, t. 12, fig. A (Pl. David. i. 151) (1884).—Rehder in Rep. Missouri Bot. Gard. xiv. 78 (Syn. Gen. Lonic.) (1903); in Schneider, Handb. Ill. Laubholzk. ii. 696, fig. 444a (1911); Man. Cult. Trees Shrubs, 826 (1927).

Southwestern Kansu. Tao River basin: on rocky slopes, western banks of river, below Choni, on road to Poyü, alt. 2450 m., no. 12800, June–July 1925 (shrub 1–1.25 m.; flowers yellow); Tatsuto, Lupassu, alt. 2750 m., no. 13519, Sept.–Oct. 1925 (shrub 1.75–2.75 m., branches horizontal; fruit red); near Maerhku, alt. 2600 m., no. 14906, Sept. 10, 1926 (shrub or small tree 3–4.5 m.; fruit red). Lower Tebbu country: arid slopes of Niayaku, with Oaks, etc., near Nyipa, alt. 2300 m., no. 14794, Sept. 9, 1926 (tree with long shaggy pale brown bark, branches bending gracefully; leaf dark green); Pezhu gulch, dry slopes, alt. 2750 m., nos. 14954 and 14960, Oct. 1926 (shrub 3–5.5 m.; bark black; fruit crimson or scarlet, globose); dry shale slopes of Mayaku, alt. 2450 m., no. 15078, Sept.–Oct. 1926 (tree 4.5–5.5 m., bark black, shaggy; fruit globose, red). Upper Tebbu country: gravelly slopes of Drotsuku valley, Peshwekiang, below Tsaruku, no. 14580, Aug. 28, 1926 (shrub 1.75–2 m.).

This is apparently a variable species. In the specimens from the Tao River basin the branchlets are more or less setose, but the corolla of the only flowering specimen (no. 12800) lacks the reflexed setae of the typical form; the branchlets of the specimens from the lower Tebbu country are pubescent, but not setose, while in that from the upper Tebbu country they are rather densely pilose. The specimens are more or less intermediate between the type and var. *leycesterioides* (Graebn.) Zabel which has nearly glabrous and rather slender branchlets.

Lonicera Standishii Carr. var. **lancifolia** Rehder in Rep. Missouri Bot. Gard. xiv. 82 (Syn. Gen. Lonic.) (1903) as forma; in Schneider, Ill. Handb. Laubholzk. ii. 698, fig. 444e (1911); Man. Cult. Trees Shrubs, 826 (1927).

Lonicera pseudoproterantha Pampanini in Nuov. Giorn. Bot. Ital. n. ser. xvii. 723, fig. 18 (1910).—Morel in Rev. Hort. 1916, p. 24, fig. 5.

Western Szechuan: Mountains of Ching chuan, alt. 1850 m., no. 12049, April 1925 (shrub 1–1.25 m.; flowers pinkish).

Lonicera hispida Pallas apud Roemer & Schultes, Syst. Veg. v. 258 (1819).—Ledebour, Icon. Pl. Fl. Ross III. 7, t. 212 (1831).—Rehder in Rep. Missouri Bot. Gard. XIV. 93 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 700, fig. 445 i-m, 446 d (1911); Man. Cult. Trees Shrubs, 827 (1927).

SOUTHWESTERN KANSU. Tao River basin: slopes of river watershed, among Willows, alt. 3050 m., no. 12193, June 1925 (shrub 0.30–1 m.; flowers pale lemon-yellow); Tao ho watershed, Choni, outskirts of Spruce forests, or in meadows among Willows up to 3050 m., no. 12292, June 1925 (shrub 0.30–1.25 m.; flowers yellow); along Tao River in scrub, alt. 2600 m. and higher, no. 12310, June 1925 (shrub about 1.5 m.; flowers yellow): Minshan range, valley of Kadjaku, beyond Tatsuto, alt. 3050 m., no. 12425, June 1925 (shrub about 1.5 m.; flowers yellow); in Spruce forest of Tebbu country, alt. 3000 m., no. 12475, June 1925 (shrub 0.5–1 m.; flowers yellow); mountains west of Adjüan, in shady places under Birches and Willows, alt. 3350 m., no. 12631, July 6–10, 1925 (shrub 0.5–1 m.; flowers pale yellow); forest around Choni, alt. 2600–2750 m., no. 12890, July 1925 (shrub 1.75–2 m.; fruit orange-red to brick-red); Maerhku valley, east Tebbu land, alt. 2750 m., no. 13584, Sept.–Oct. 1925 (shrub about 1 m.; leaves coriaceous; fruit pyriform, orange). Upper Tebbu country: trail to Kuang kei, alt. 3700 m., no. 13090, July–Aug. 1925 (shrub 0.5 m.; flowers pale yellow); Tebbu road from Mt. Kuang kei, alt. 3350 m., no. 13107, July–Aug. 1925 (shrub 1–1.25 m.; fruit orange-red); alt. 3350, no. 13114, Aug. 1925 (shrub about 1.5 m.; fruit deep orange).

CENTRAL KANSU. Lien hoa shan: scrub forests, alt. 2900 m., no. 12681, July 14–20, 1925 (shrub 0.5–1 m.; fruit yellow).

EASTERN TIBET: Radja and Yellow River gorges: Lungmar pass, 15 li south of East Radja, alt. 3350 m., no. 14007, May 1926 (shrub 1–1.25 m.; flowers yellow); near mouth of Dachso canyon, north of Radja, in Birch and Spruce forest, alt. 3100 m., no. 14056, June 1–2, 1926 (shrub 1 m.); flowers pale yellow); along stream bed and outskirts of Spruce forests in Dachso canyon, north of Radja, alt. 3200 m., no. 14076, June 2, 1926 (shrub 1.25 m.; flowers yellow). Jupar Range: upper Jupar valley, on rocky slope, alt. 3650 m., no. 14293, June 1926 (shrub about 1.5 m.; flowers yellow); banks of upper Jupar stream, alt. 3650 m., no. 14351, June 1926 (shrub 3–4.5 m.).

The specimens show some variation in the pubescence of the leaves and branchlets and in the size of the flowers; those from the upper Tebbu country have the leaves glabrous above and the branchlets either quite glabrous as in nos. 13107 and 13114 or slightly setose as in no. 13090, and more or less bloomy, as are the bracts and peduncles, while the other specimens have the leaves setose above and setose branchlets.

Lonicera infundibulum Franch. var. **Rockii** Rehder, var. nov.

A typo recedit praecique ovariis et sepalis satis dense pilosis et sparse glandulosis et bracteis extus pubescentibus.

WESTERN SZECHUAN: mountains of Ching chuan, forests along stream, alt. 1825 m., no. 12050, April 1925 (shrub 1.25 m.; flowers white with pinkish tinge).

According to the material before me which consists of flowering branches with very young scarcely half-grown leaves Rock's specimen seems to differ from typical *L. infundibulum* Franch. (*L. praecox* Ktze., not K. Koch) only in the pubescent ovary, calyx and bracts. The style is glabrous, while in the type of *L. praecox* it is pilose below the middle; nothing is said of the pubescence of the style by Franchet.

Lonicera heteroloba Batalin in Act. Hort. Petrop. XII. 174 (1892).—Rehder in Rep. Missouri Bot. Gard. XIV. 109, t. 15 (Syn. Gen. Lonic.) (1903).

SOUTHWESTERN KANSU. Tao River basin: Choni, outskirts of forest, alt. 2600 m., no. 12162, June 1925 (shrub 1.75–2 m.; flowers deep red, pendent); along river bank, alt. 2600 m., no. 12300, June 1925 (shrub 2–2.75 m.; flowers dark red); Minshan range; shady places among Willows at Tatsuto, alt. 2750 m., no. 12437, June 1925 (shrub 2–2.75 m.; flowers deep red, drooping); Kadjaku valley, near Tatsuto, in forests of Malus, Pyrus, Betula, with Berberis, alt. 2700 m., nos. 12467, 13129 and 13585, June, Aug. and Sept.–Oct. 1925 (shrub 1.75–3 m.; flowers dark red; fruit dark red, globose, on long peduncles); Maerhku, Choni district, no. 13509, Oct. 1925 (shrub 1.75–2.75 m.; fruit red); Mt. Kuang ke in scrub and meadows, alt. 3650 m., no. 13556, Sept.–Oct. 1925 (shrub 2–2.75 m.; leaves pale; fruit globose, orange on slender peduncles); Poyuku, near Choni, alt. 2750 m., no. 14890, Aug.–Sept. 1926 (shrub 2–2.75 m.; fruit globose, red, on erect peduncles).

CENTRAL KANSU. Lien hoa shan: along stream in Ha kou valley, alt. 2900 m., no. 12792 (shrub 1.25–2 m.).

In no. 13129 some of the lower leaves have a few rounded lobes near the base, while in the other specimens the leaves are quite entire or occasionally slightly sinuate. Nos. 12792 and 13556 differ in their smaller and narrower glabrescent leaves from the typical form and resemble somewhat *L. heterophylla* var. *Karelini* (Bge.) Rehd.; the leaves are lanceolate or narrow-lanceolate, 2.5–5 cm. long and 6–12 mm. broad, ciliate, sparingly pilose above and glabrous beneath. The specimens represent apparently a very distinct form, but without flowers their relationship remains doubtful.

Lonicera nervosa Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIV. 39 (1877); in Mél. Biol. X. 62 (1877).—Rehder in Rep. Missouri Bot. Gard. XIV. 121, t. 16 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 714, fig. 452 m-o, 453 b (1911); Man. Cult. Trees Shrubs, 831 (1927).

SOUTHWESTERN KANSU. Tao River basin: Choni, forests of Spruce and Willows, alt. 2750–3050 m., no. 12571, July 1925 (shrub about 1.5 m., branches horizontal; flowers upright, pink); valley of Hsiao ku, outskirts of Willow and Birch forest, alt. 2925 m., no. 12638, July 6–10, 1925 (shrub 1–1.25 m.; flowers pink); Maerhku valley, Picea

forest, alt. 2800 m., no. 13582, Sept.–Oct. 1925 (shrub 1.75 m.; fruit globose, black). Lower Tebbu country: dense forest, between Hera and limestone gorge Dayaya, alt. 3050 m., no. 14781, Sept. 8, 1926 (shrub 2–2.75 m.; leaf dark green; fruit bluish black); forests of Abies in upper Mayaku, alt. 3000 m., no. 14876, Sept. 16, 1926 (shrub 1.25–3 m., branches horizontal; fruit black, on erect short pedicels); forests of Ngongo, alt. 3050 m., no. 14977, Sept.–Oct. 1926 (shrub 1.75–2.75 m.; fruit globose, black). Upper Tebbu country: along stream bed, Drakana, alt. 3050 m., no. 14593, Aug. 1926 (shrub about 1.5 m.; fruit black).

Western Kansu: forests of Komang ssu, alt. 3050 m., no. 13288, Oct. 1925 (shrub 1–1.25 m.; fruit globose, black).

Lonicera chrysantha Turcz. var. **longipes** Maximowicz in Bull. Acad. Sci. St. Pétersb. xxiv. 44 (1877); in Mél. Biol. x. 68 (1877).—Rehder in Rep. Missouri Bot. Gard. xiv. 140 (Syn. Gen. Lonic.) (1903).

Southwestern Kansu. Tao River basin: Tao River valley, alt. 2600–2750 m., no. 12348, June 1925 (shrub about 1.5 m.; flowers green [in bud]); Choni, forests of Spruce and Willows, alt. 2750–3050 m., no. 12572, July 1925 (shrub about 1.5 m.; flowers yellow); banks of Tao River, near Choni, alt. 2500–2700 m., nos. 12858, 13512 and 13516, July, Sept. and Oct. 1925 (shrub 1.25–2.75 m.; flowers-orange yellow; fruit red); in Picea forests beyond Kadjaku, near Lupassu, alt. 2750 m., no. 13169, Aug. 1925 (shrub 1.75–2 m.; fruit red); Kadjaku valley, near Tatsuto, outskirts of Pine forest and in forests of Malus, Pyrus, Betula, with Berberis etc., alt. 2700–2800 m., nos. 12479, 13131, 13520 and 13578, June, July and Sept.–Oct. 1925 (shrub 1.75–2.75 m.; leaves dark; flowers on long drooping pedicels; fruit globose, red). Lower Tebbu country: forests of Wantsang valley, alt. 2250–2325 m., nos. 14674 and 14717, Sept. 1 and 3, 1926 (shrub 2–3 m., with horizontally spreading branches; fruit red); Wantsang ku, alt. 2600 m., no. 15022, Sept.–Oct. 1926 (shrub 1.75–2 m., with flat spreading branches; fruit red); along stream at Tsaoshi ku, alt. 2225 m., no. 14736, Sept. 2, 1926 (fruit on long erect peduncles, red); forests of Chingolo, above Pezhu, alt. 2600 m., no. 14993, Sept.–Oct. 1926 (shrub 1.75–2 m.; fruit yellowish red, on long erect peduncles).

Lonicera deflexicalyx Batalin in Act. Hort. Petrop. xii. 173 (1892).—Rehder in Rep. Missouri Bot. Gard. xiv. 142 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. ii. 724, fig. 455 l–m, 456 o-q, (1911); Man. Cult. Trees Shrubs, 835 (1927).—Hutchinson in Bot. Mag. cxl. t. 8536 (1914).

Southwestern Kansu. Tao River basin: Tatsuto, Kadjaku, west Tebbu land, alt. 2800 m., no. 13576, Sept.–Oct. 1925 (shrub 1.75 m.; fruit orange); Maerhku valley, east Tebbu, alt. 2900 m., no. 13588, Sept.–Oct. 1925 (shrub 1–1.75 m.; fruit orange, globose); Maerhku,

Choni, alt. 2700 m., no. 14891, Aug.–Sept., 1926 (shrub 1.75–2 m., with long horizontal branches; fruit red, globose). Lower Tebbu country: along stream bed, in forests of Tsaoshi valley, below Wantsang valley, alt. 2125 m., no. 14734, Sept. 2, 1926 (shrub 1.25 m., with spreading branches; fruit red). Upper Tebbu country: forests below outer Shimen, Tsaluku valley, alt. 3350 m., no. 13072, July–Aug. 1925 (shrub 2–2.75 m., with long scandent branches); along brook back of Drakana, Lassun gomba, alt. 3050 m., no. 14583, Aug. 1926 (shrub 1.75 m., with spreading branches; fruit tomato-red).

All the specimens cited above differ from typical *L. deflexicalyx* in the less pubescent leaves which are only pilose along the midrib and often sparingly so on the veins, and thus approach the following species. The species had been collected before in the Choni and Minchow districts, Kansu, by Wm. Purdom (nos. 1089 and 1090).

Lonicera trichosantha Bureau & Franchet in Jour. de Bot. v. 48 (1891).—Rehder in Rep. Missouri Bot. Gard. XIV. 142, t. 20 (Syn. Gen. Lonic.) (1903); in Schneider, Ill. Handb. Laubholzk. II. 724, fig. 456 r–s, 457 a–b (1911); Man. Cult. Trees Shrubs, 835 (1927).

Lonicera ovalis Batalin in Act. Hort. Petrop. XIV. 170 (1895).

Southwestern Kansu. Tao River basin: west of Choni, between Tatsuto and Lupassu, alt. 2625 m., no. 12444, June 1925 (shrub 1–1.25 m. with horizontally spreading branches; flowers yellow); forests of Shiao ku, en route to Lissedzadza, Minshan, alt. 3000 m., no. 12814, July 1925 (shrub 1.25 m.; flowers sulphur-yellow, erect on horizontal branches); high grassy mountain beyond Tao chow, alt. 3050 m., no. 13206, Aug. 1925 (shrub 1–1.25 m., with spreading branches). Upper Tebbu country: forests below outer Shimen, Tsalaku valley, alt. 3350 m., no. 13071, July–Aug. 1925 (shrub about 1.5 m., with twining scandent branches; flowers yellowish).

This species had been collected before in Kansu by R. C. Ching (Wulsin Exped. no. 754).

(To be continued)

FOUR NEW LIGNEOUS PLANTS FROM KWANGTUNG

WOON YOUNG CHUN

Quercus Hui, sp. nov.[1]

Tree to 5 m. tall, trunk to 28 cm. in diameter; bark gray, smooth; young branchlets densely yellowish or fulvous-tomentose, slender, terete, becoming glabrous, grayish black and the second and third year roughened by numerous small raised lenticels. Leaves distinctly petiolate, thin, membranous, densely whitish floccose-tomentose on the under surface at the time of unfolding, quickly glabrous excepting the base of the midrib which is densely yellowish tomentose, spathulate-cuneate or oblanceolate, usually broadest above the middle, obtuse or broadly acute at apex, narrowed at base into the petiole, margin revolute, with 3 or 4 obscure crenate-apiculate teeth on each side near the apex, upper surface lustrous pale green, glabrous, with indistinct midrib and lateral veins, lower surface whitish or gray-green, with the midrib and lateral veins distinctly elevated; with 6–8 pairs of lateral veins, diverging at an angle of about 45 degrees, joined by obscure transverse veinlets; petiole densely yellowish tomentose, about 1 cm. long; stipules linear-lanceolate, dorsally pilose, glabrous inside, about 4 mm. long. Young fruit densely tawny-tomentose, sessile, paired, terminating a densely tomentose peduncle to 8 mm. long, ovoid; styles 4, erect, glabrous or puberulous towards the base, stigma capitate, 3 mm. long. Mature fruits solitary, glabrous, dark brown, depressed-globose, 2 cm. in diameter, 1.5 cm. high, apex with a thick conical umbo about 4 mm. high, truncate at base, with a flattened circular hilum; involucre patelliform, to 4 mm. high, embracing only the base of the nut, densely yellowish tomentose, the scales wholly connate into 4 or 5 concentric zones with entire margins.

KWANGTUNG: North River region, road from Cheng-kou to Pan lin tsze, in mixed woods, *W. Y. Chun*, no. 5868, Dec. 24, 1927.—Specimens in the Sun Yatsen University, Canton and Nanking, and in the Arnold Arboretum.

[1] **Quercus Hui,** sp. nov.

Arbor ad 5 m. alta, trunco ad 28 cm. diam., cortice cinereo laevi; ramuli juveniles dense luteo- vel fulvo-tomentosi, tenues, teretes, glabrescentes, cinereo-nigri et secundo et tertio anno lenticellis multis parvis elevatis asperati. Folia distincte petiolata, tenuia, membranacea, subtus initio dense albido-floccoso-tomentosa, basi costae dense luteo-tomentosâ exceptâ mox glabra, spathulato-cuneata vel oblanceolata, pleraque supra medium latissima, apice obtusa vel late acuta, basi in petiolum attenuata, margine revoluta, ad apicem utrinque 3 vel 4 dentibus obsoletis crenato-apiculatis instructa, supra lucida, pallide viridia, glabra, costa et venis lateralibus indistinctis, subtus albida vel cinereo-viridia, costa et venis lateralibus distincte elevatis, utrinque venis 6–8 sub angulo 45° divergentibus, venulis obsoletis transversis conjunctis; petioli dense luteo-tomentosi, circiter 4 mm. longi; stipulae linearilanceolatae, dorso pilosae, ventre glabrae. Fructus juveniles ovoidei, dense fulvo-tomentosi, sessiles, bini pedunculo ad 8 mm. longo dense fulvo-tomentoso suffulti; styli 4, erecti, glabri vel versus basin puberuli, stigmate capitato 3 mm. longo. Fructus maturus solitarius, glaber, intense brunneus, depresso-globosus, 2 cm. diam., 1.5 cm. longus, apice umbone crasso conico circiter 4 mm. longo instructus, basi truncatus, hilo circulari applanato; cupula patelliformis, ad 4 mm. alta, dense luteo-tomentosa, squamis in 4 vel 5 lamellas concentricas margine integras connatis, tantum basin glandis amplectens.

Allied to *Q. Championi* Bentham, differing in the thinner leaves tomentose only along the base of the midrib beneath and in the larger depressed-globose acorn.

Named in compliment to my colleague Dr. H. H. Hu.

Mahonia Shenii, sp. nov.[1]

Shrub to 1–2 m. high, wholly glabrous; bark of stem dull yellowish gray, irregularly longitudinally fissured and ridged; branchlets smooth, subterete or obscurely angular, greenish brown to greenish gray-brown, sparsely shallowly fissured, lustrous. Leaves to 40 cm. long, with 1–2 pairs of leaflets, the basal pair not much smaller than the upper pair, the terminal leaflet somewhat larger; leaflets from 4–6 cm. apart, sessile, coriaceous, upper surface deep green, dull to sublustrous, lower surface much paler, whitish or yellow-green, lustrous, gradually short-acuminate or abruptly acuminate at apex, mucronate, acute at base, entire, strongly thickened, 3–5-nerved, midrib slender, slightly elevated on both surfaces, reticulations sparse, slightly distinct on the upper surface only, obscure to obsolete beneath; terminal leaflet elliptic to oblong-elliptic, symmetrical at base, 13–15 cm. long, about 6 cm. wide; lateral leaflets elliptic to ovate-lanceolate, slightly oblique at base, 8–13 cm. long, 3–5 cm. wide. Flowers not seen. Infructescences 6–8 from the axils of scarious broadly lanceolate to linear-lanceolate acuminate lustrous greenish brown bracts 1–2 cm. long; racemes about 10 cm. long, somewhat densely fruited in the upper half; pedicels 3–4 mm. long, slender, recurved; bractlets minute, ovate, obtuse or acute, concave, about 1 mm. long; fruit 1-seeded, depressed-globose, 6–7 mm. across, blackish blue, glaucous, crowned by a discoid sessile stigma; seeds obliquely oblong-ovoid, about 5 mm. high, greenish brown.

KWANGTUNG: North River region, about 20 li N. W. of Cheng-kou on the road to Pan ling tsze, west slope of shaded ravine, *W. Y. Chun*, no. 5850, Dec. 24, 1927.—Specimens in the Arnold Arboretum and Sun Yatsen University, Canton.

Mahonia Shenii is easily distinguished from all other species of the genus by its entire leaflets.

[1] **Mahonia Shenii**, sp. nov.

Frutex ad 1–2 m. altus, totus glaber, cortice luteo-cinereo irregulariter longitudinaliter fisso; ramuli laeves, subteretes vel obsolete angulati, viridi-brunnei ad viridi-cinereo-brunnei, lucidi, parce leviterque fissi. Folia ad 40 cm. longa, 1–2-juga, foliolis inferioribus quam superiora vix minora, terminali paullo majore; foliola sessilia, 4–6 cm. distantia, coriacea, supra intense viridia, opaca ad sublucida, subtus multo pallidiora, albida vel luteo-viridia, lucida, apice gradatim breviter acuminata vel subito acuminata, mucronata, basi acuta, margine integra, manifeste incrassata, 3–5-nervia, costa tenui utrinque leviter elevata, tantum supra leviter reticulata, subtus obsolete reticulata; foliolum terminale ellipticum ad oblongo-ellipticum, basi symmetricum, 13–15 cm. longum et circiter 6 cm. latum; foliola lateralia elliptica vel ovato-elliptica, basi leviter obliqua, 8–13 cm. longa et 3–5 cm. lata. Flores non visi. Infructescentiae 6–8 in axillis bractearum scariosarum late lanceolatarum vel lineari-lanceolatarum acuminatarum lucidarum viridi-brunnearum 1–2 cm. longarum; racemi circiter 10 cm. longi, supra medium plus minusve dense fructiferi; pedicelli 3–4 mm. longi, tenues, recurvati; bracteolae minutae, ovatae, obtusae vel acutae, concavae, circiter 1 mm. longae; bacca 1-sperma, depresso-globosa, 6–7 mm. diam., nigro-caerulea, glauca, stigmatate discoideo sessili coronata; semina oblique oblongo-ovoidea, circiter 5 mm. longa, viridi-brunnea.

The species is dedicated to Professor P. F. Shen, M. F. (Yale), Dean of the College of Agriculture, Sun Yatsen University, Canton, through whose interest the North River expedition was made possible.

Eurya Weissiae, sp. nov.[1]

Shrub to 3 m. high; bark yellowish gray, sublustrous; flowering branchlets stoutish, terete, densely hirsute with brownish or fuscous long-spreading hairs, older branchlets puberulous or subglabrous, gray or gray-brown. Leaves distichous, crowded, shortly but distinctly petiolate, sub-amplexicaul, coriaceous, oblong or elliptic-oblong, 4–6 cm. long, 1.5–3 cm. wide, biauriculate at base and in the fresh state more or less clasping the branchlet, with unequal rounded lobes, abruptly short-acuminate with an obtusish acumen, revolute, crenately glandular-denticulate from base to apex, upper surface dull green, glabrous when mature, with the midrib, veins and veinlets impressed, lower surface bright yellow green, scattered-hirsutulous and minutely punctulate or at length glabrous, the midrib strongly elevated, the lateral veins loosely but distinctly reticulate; lateral veins numerous, slender, horizontally spreading, anastomosing; petiole 2–3 mm. long, pubescent. Flowers dioecious, small, 2–3 in the axils of the leaves, more or less concealed by the leaf bases, creamy-white, shortly pedicellate; pedicels about 1 mm. long, pubescent, bibracteolate at apex; bractlets elliptic, obtuse or acute. Staminate flowers urceolate, 5 mm. long, 3 mm. wide; sepals 2 mm. long, oblong, obtuse or acute, the 3 outer ones larger, purplish, hirsute, the 2 inner ones thinner, obscurely puberulous; petals connate at base, closely imbricate, erect, narrowly oblong, rounded and slightly reflexed at apex; stamens 10, glabrous, 4 mm. long, filaments 3 times longer than the anthers; anthers apiculate; pistillode glabrous, ovoid, slightly angular, contracted at base; style short, subulate; pistillate flowers about 4 mm. high and 5 mm. across, corolla more spreading or the petals more strongly reflexed; ovary glabrous, about 4 mm. high,

[1] **Eurya Weissiae,** sp. nov.

Frutex ad 3 m. altus, cortice luteo-griseo sublucido; ramuli floriferi robusti, teretes, dense pilis brunneis vel fuscis longe patentibus hirsuti, vetustiores puberuli vel subglabri, cinerei vel cinereo-brunnei. Folia disticha, congesta, breviter sed distincte petiolata, subamplexicaulia, coriacea, oblonga vel elliptico-oblonga, 4–6 cm. longa, 1.5–3 cm. lata, basi biauriculata et in vivo plus minusve ramulos amplectentia, lobis basalibus inaequalibus rotundis, subito breviter acuminata acumine obtuso, margine revoluta, e basi ad apicem glanduloso-crenato-denticulata, supra opace viridia, sub maturitate glabra, costa et venis venulisque impressis, subtus clare luteo-viridia, sparse hirsutula et minute punctulata vel demum glabrescentia, costa manifeste elevata, venis laxe sed distincte reticulatis, venis secundariis multis tenuibus, horizontaliter patentibus anastomosantibus; petioli 2–3 mm. longi, pubescentes. Flores dioeci, parvi, 2–3 axillares, plus minusve foliorum basibus obtecti, luteo-albi, breviter pedicellata; pedicelli circiter 1 mm. longi, pubescentes, apice bibracteolati; bracteolae ellipticae, obtusae vel acutae, flores masculi urceolati, 5 mm. longi, 3 mm. lati; sepala 2 mm. longa, oblonga, obtusa vel acuta, 3 exteriores maiora purpurascentia, hirsuta, 2 interna tenuiora, obsolete puberula; petala basi connata, arcte imbricata, erecta, anguste oblonga, apice rotundata et leviter reflexa; stamina 10, glabra, 4 mm. longa, filamentis quam antherae apiculatae triplo longioribus; pistillodium glabrum, ovale, leviter angulare, basi contractum; stylo brevi subulato; flores feminei circiter 4 mm. longi et 5 mm. lati; corolla-magis patens vel petala magis reflexa; ovarium glabrum, circiter 4 mm. longum, cylindricum, sensim in stylum robustum circiter 1 mm. longum attenuatum; stigmata 3, rarius 4, patentia. Fructus (immaturus) globosus, lucidus, niger, apice apiculatus.

cylindric, gradually narrowed into a stoutish style about 1 mm. long; stigmas 3, rarely 4, spreading. Fruit (immature) globose, lustrous, black, apiculate at apex.

KWANGTUNG: North River region, Chang tung hang, Dec. 18, 1927, *W. Y. Chun*, no. 5791 (♀); Pan ling tsze, Dec. 25, 1927, no. 5791a (♂).—Specimens in the Sun Yatsen University, Canton and Nanking, and in the Arnold Arboretum.

Allied to *E. obliquifolia* Hemsley and *E. glandulosa* Merrill, differing from both in the semi-amplexicaul leaves; from the former also in the smaller, abruptly short-acuminate leaves and smaller flowers with only 10 stamens; from the latter in the unequally biauriculate base of the leaves.

This species is dedicated to Mrs. Weiss of the Berliner Mission, Shaochow fu, in appreciation of the courtesies extended to me while at the mission.

Tutcheria Greeniae, sp. nov.[1]

Densely branched shrub to 3 m. high; bark gray brown; branchlets glabrous, terete, pale tawny, changing to gray-brown, finally to dark purple, finely striate. Leaves scattered, petiolate, coriaceous, oblong-lanceolate to obovate-lanceolate, obtusely acuminate at apex, cuneate at base, decurrent into the petiole, glabrous, dull yellowish green above, paler beneath, irregularly crenate-denticulate at the margin, midrib impressed above, elevated beneath; lateral veins 10–12, slender, anastomosing, loosely and somewhat obscurely reticulate, 6–13 cm. long, 3–4 cm. wide; petiole stout, flattened above, about 1 cm. long. Flowers not seen. Capsule solitary, subterminal on a slender peduncle 1.2–1.5 cm. long, elongated-ovoid, acute at apex, 3 cm. long, 2 cm. across, densely grayish silky-puberulous, dehiscent from the base upwards into 3 thinly coriaceous valves; central column slender, 3-angled, broadly clavate, to 3 cm. long and 8 mm. wide in the upper dilated part, attenuate from the middle to the base into a peduncle-like base; basal bracts suborbicular, obtuse at apex, truncate at base, to 9 mm. high and 12 mm. wide, densely puberulous outside, glabrous inside; seeds pale chestnut-brown, lustrous, to 1.5 cm. long.

KWANGTUNG: North River region, Pan lin tsze, in open woods, Dec.

[1] **Tutcheria Greeniae**, sp. nov.

Frutex dense ramosus ad 3 m. altus, cortice cinereo-brunneo; ramuli glabri, teretes, pallide fulvi, deinde cinereo-brunnei, demum intense purpurei, minute striati. Folia sparsa, petiolata, coriacea, oblongo-lanceolata vel obovato-lanceolata, 6–13 cm. longa et 3–4 cm. lata, obtuse acuminata, basi cuneata et in petiolum decurrentia, glabra, supra opace luteo-viridia, subtus pallidiora, irregulariter crenato-denticulata, costa supra impressa subtus elevata, venis lateralibus 10–12 tenuibus anastomosantibus, laxe vel plus minusve obsolete reticulata; petioli crassi, supra plani, circiter 1 cm. longi. Flores non visi. Capsula solitaria, subterminalis, pedunculo tenui 1.2–1.5 cm. longo suffulta, elongato-ovoidea, apice acuta, 3 cm. longa et 2 cm. lata, dense cinereo-sericeo-puberula, valvis 3 tenuiter coriaceis dehiscens; columna centralis 3-angularis, late clavata, ad 3 cm. longa, in parte dilatata superiore 8 mm. lata, e medio in basin stipitatam attenuata; bracteae basales suborbiculares, apice obtusae, basi truncatae, ad 9 mm. longae et 12 mm. latae, extus dense puberulae, intus glabrae; semina pallide castaneo-brunnea lucida, ad 1.5 cm. longa.

25, 1927, *W. Y. Chun*, no. 5937.—Specimens in the Sun Yatsen University, Canton, and in the Arnold Arboretum.

Allied to *T. spectabilis* Dunn, differing in its smaller leaves, much smaller fruit on longer slenderer peduncles with thinner, coriaceous not woody valves, and in the slender, differently shaped central column.

The genus Tutcheria has a peculiarly close association with the Hongkong Botanical Garden, and I therefore take especial pleasure in naming this new species after Mrs. H. Green, the wife of the present Superintendent.

SINOJACKIA, A NEW GENUS OF STYRACACEAE FROM SOUTHEASTERN CHINA

H. H. Hu

Sinojackia, gen. nov.

Arbor stellato-pilosa. Folia alterna, membranacea, calloso-serrulata, exstipulata. Flores albi, in cymos axillares dispositi, saepius penduli, rarius patentes; calycis tubus turbinatus, ovario ad medium adnatus, lobis 6–7, interdum 5, brevibus distinctis; corolla late campanulata vel subrotata, segmentis 6–7, interdum 5, basi brevissime connatis imbricatis stellato-puberulis; stamina 12–14, interdum 10, prope basin corollae 1-seriatim affixa, filamentis stellato-villosis, inferne plus minus connatis basi complanatis superne attenuatis liberis, antheris oblongis, loculis linearibus parallelis omnino adnatis stellato-puberulis, rima longitudinaliter dehiscentibus, connectivis viridibus; ovarium partim inferum, 3–4-loculare, glabrum; stylus elongatus, subulatus, stigmate terminali vix dilatato obscure 3-lobo, lobis papillosis; ovula in quoque loculo 2-seriata, 8, erecta. Fructus ligneus, indehiscens, exocarpio crasso, suberoso interdum transverse fisso, endocarpio ligneo tenui indurato. Semina abortu solitaria, oblongo-linearia, testa crustacea, albumine carnoso.

Genus novum Melliodendro Handel-Mazzetti ovario semiinfero, fructu ligneo indehiscente affine, sed floribus in cymos axillares dispositis, ovulis in quoque loculo 2-seriatis bene distincta.

This new genus is named in honor of Professor J. G. Jack of the Arnold Arboretum of Harvard University, whose knowledge of Chinese botany, and his zeal and enthusiasm in helping Chinese students in their studies will leave a permanent influence in their work.

Sinojackia xylocarpa, sp. nov.

Arbor 6-metralis, trunco ambitu 1.5 m., ramis erecto-patulis. Folia membranacea, obovata, breviter acuminata, basi cuneata vel subrotundata, obsolete calloso-serrulata, supra glabra, subtus costâ mediâ obsolete stellato-pubescente exclusâ glabra, 3–7, saepius 6 cm. longa et 2–4, saepius 3.5 cm. lata; petioli 5 mm. longa, stellato-pilosi. Cymae axillares, 3–5-florae; flores late campanulati vel subrotati, ad 2.5 cm.

diam.; pedicelli penduli, stellato-pilosi, articulati, ad 3 cm. longi; calycis tubus turbinatus, extus stellato-pilosus, dentes triangulares, acuti, extus stellato-pilosi, intus hirtelli; corollae segmenta oblongo-elliptica, obtusa, 12 mm. longa, 6 mm. lata, extus dense stellato-pilosula, intus adpresse stellato- et simpliciter pilosula; stamina 12–14, interdum 10, filamentis inferne dilatatis et complanatis, superne attenuatis, stellato- et simpliciter pilosa, 4 mm. longi, cum connectivo viridi continua; antherae oblongae, luteae, obtusae, dense pilosae, pilis stellatis conspersae, 4 mm. longi; ovarium oblongo-ellipticum, glabrum, 6 mm. longum, 3–4-locularae; stylus subulatus, 8 mm. longus, stigmate terminali obscure 3-lobo, lobis minute papillosis; ovula in quoque loculo 2-seriata, 8, erecta, saepius pro parte abortiva. Fructus ligneus, indehiscens, apex late conicus, ceterum obovoideus, cinereo-brunneus, verrucosus, apice acuto 7 mm. longo incluso 1.9 cm. longus, 1.3 cm. diam., exocarpio suberoso, saepius irregulariter transverse fisso 3.5 mm. crasso, endocarpio ligneo 1.5 mm. crasso; semina in quoque fructu solitaria, oblongo-linearia, 1 cm. longa, testa castaneo-brunnea coriacea, albumine carnoso.

KIANGSU: Nanking, in woods, *R. C. Ching*, no. 3458, Sept. 25, 1927, *Y. L. Keng*, no. 1376, April 22, 1928 (type).

The discovery of a new genus in an open country as Nanking, within a few miles of the metropolis, is a rare occurrence. Only one small tree has been located so far. In late April the tree is loaded with showy pendulous white flowers. At first glance it looks more like a rosaceous tree than a *Styrax*, but when the flowers are examined in detail, its affinity is at once revealed. Its inferior ovary and indehiscent wingless fruit exclude it from such genera as *Styrax*, *Pterostyrax*, *Halesia* or *Alniphyllum*, and I can only suggest its affinity to Handel-Mazzetti's *Melliodendron*, from which it differs in several characters. That the exocarp of the old fruit is irregularly transversely fissured is also an interesting character not known in other genera of this family.

NOTES ON CHINESE BERBERIS

J. T. P. BYHOUWER

While identifying the Berberis specimens collected by J. F. Rock in Northern China, and comparing it with the material in the herbarium of Arnold Arboretum, I found among the indetermined material two new species and a new variety. The diagnoses of these Berberis will be found below, followed by a list of those species, of which the geographic distribution has become more completely known since the publication of C. Schneider's Weitere Beiträge zur Kenntnis der chinesischen Arten der Gattung Berberis (in Oesterr. Bot. Zeitschr. LXVI. 315–326 [1916], LXVII. 15–32, 135–146, 213–228, 284–300 [1918]) and A. Rehder's Enumeration of the ligneous plants of Northern China, Berberidaceae (in Jour. Arnold Arb. v. 138–144 [1924]).

Berberis reticulata, spec. nov.

Frutex ad 2-metralis; ramuli annotini et biennes purpurascentes, glabri, angulati, vetustiores cinereo-brunnescentes; internodia 1.5–4 cm. longa; spinae pleraeque simplices, parvae, ad 9 mm. longae. Folia ad 6 fasciculata, spathulato-obovata, tenuia, apice obtusa vel rotundata, mucronulata, basim versus in petiolum 2–12 mm. longum decurrentia, margine anguste aequaliter spinoso-dentata, spinis 1 mm. longis, supra viridia, subtus cinerea, utrinque distincte reticulata, petiolis inclusis 2.0 : 0.9–4.0 : 1.6–5.6 : 2.1 cm. magna. Inflorescentiae breviter corymboso-racemosae, ad 8-florae, 1.4–2.0 cm. longae, glabrae; pedicelli 4–7 mm. longi, basi bracteis acuminatis 1 mm. longis suffulti; flores flavi, extus rubescentes, satis magni (circiter 11 mm. diam.), sepala interna late obovata, 7 mm. longa, petalis obovatis apice emarginatis basi nectariis ovalibus instructis majora; stamina normalia; ovaria ovulis 2 sessilibus instructa. Fructus ovales, rubri, leviter pruinosi, ad 11 : 8 mm. magni, stigmatibus sessilibus coronati.

NORTHERN CHINA: without precise locality, Wm. Purdom, no. 644 (seeds only); plants raised from this seed cultivated in the Arnold Arboretum under no. 20081. Specimens examined: *A. Rehder* May 11 and 21, 1927 (type), May 15, 1918, May 16, 1919, May 15, 1922, Sept. 14, 1922, *L. V. Schmitt*, Sept. 23, 1926.

This species seems to be related to *Berberis Silva-Taroucana* Schneider and *B. Mouillacana* Schneider of the section Tschonoskyanae, and *Berberis Boschanii* Schneider and *B. Lecomtei* Schneider of the section Sinenses. The leaf-texture and the rather big fruits resemble those of species of the former, the short inflorescence, the small spines and the red-tinged flowers suggest the latter section, in which it could best be placed. It differs from all species mentioned in the corymbose inflorescense, the larger flowers and the strongly reticulate leaf.

Berberis Cavaleriei var. **pruinosa**, var. nov.

Berberis sp. Rehder in Jour. Arnold Arb. VIII. 108 (1927).

A typo recedit foliis subtus albescentibus, pruinosis.—Ramuli flavi, angulati; spinae trifidae, flavescentes, mediae ad 2.5 cm. longae. Folia tenuiter coriacea, oblonga, 3 : 1 ad 5 : 1.4 cm. magna, apice acuta, basi cuneata in petiolum ad 3 mm. longum attenuata, margine distanter spinuloso-serrata (dentibus 0.5–1 mm. longis 1–3 pro 1 cm.), superne viridia, subnitentia, supra albopruinosa, utrinque laxe nervata. Inflorescentiae fasciculatae, 6–12-florae. Fructus pruinosi, stylo brevi excluso 7 mm. longi et 4 mm. crassi, semina 2; pedicelli 14–18 mm. longi.

SOUTHERN ANHWEI: Chang gon shan, Wu yuan, thickets in ravine, *R. C. Ching*, no. 3248 (type), Aug. 17, 1925 (shrub 1 m. tall, leaves evergreen, dull shining green, fruit greenish, pendulous).

This variety seems to be the extreme eastern form of the widely distributed species.

Berberis densifolia, spec. nov.

Frutex 0.3–1.2 m. altus; ramuli juniores geniculati, sulcato-angulati, flavi, vetustiores flavescenti-cinerascentes; internodia 1–2(–4) cm. longa; spinae tripartitae, flavae, mediae ad 1.3 cm. longae. Folia ad 6 fasciculata, crasse coriacea, cuneata vel oblanceolata, apice sensim acuta, mucronata, basi sensim in petiolum 1–2 mm. longum attenuata, margine saepe revoluta, versus apicem dentibus 1–3 munita, minora 1 cm. longa, 5–6 mm. lata, majora 3 cm. longa, 7–10 mm. lata, supra viridia, subtus albo-pruinosa vel in sicco ferruginea, indistincte laxe reticulata. Flores nondum vidi. Fructus ad 3 fasciculati, ovales, circiter 7–9 : 6 mm. magni, stylo brevi coronati, atrocoerulei; pedicelli ad 7 mm. longi; semina 3.

Formosa: Prov. Nanto: Mount Kiraishui, alt. 3500–3600 m., *E. H. Wilson*, no. 10074 (type), Mar. 6, 1918 (bush 0.3–1.2 m., fruit blue-black).

The nearest relatives among the Chinese species appear to be *Berberis triacanthophora* Fedde, which has, however, reddish-brown, round twigs and much longer flower-stalks and *B. replicata* W. W. Smith, which differs in having round twigs, longer flower-stalks and smaller fruits.

The other Formosan species can all be easily distinguished: *Berberis aristato-serrulata* Hayata by the finely serrulated leaf-margin, *Berberis Kawakamii* Hayata by the larger, more strongly reticulate and non-pruinose leaves and the 10–15-flowered inflorescenses with longer pedicels, *Berberis brevisepala* Hayata by the uniovulate ovaries, the red twigs and the larger and wider leaves, *Berberis mingetsensis* Hayata by the very large, strongly reticulate leaves.

Berberis densifolia Wilson no. 10074 has been distributed as *Berberis Kawakamii* Hayata.

Berberis Cavaleriei Léveillé in Fedde Rep. Spec. Nov. IX. 454 (1911).—Schneider in Oesterr. Bot. Zeitschr. LXVII. 140 (1918).

Berberis Griffithiana Léveillé Fl. Kouy-Tcheou. 48 (1914).—Non Schneider.

The type-specimens were collected in Kweichow by *J. Cavalerie* (no. 3209), it has now been found also in Chekiang (*R. C. Ching*, Plants of Chekiang, no. 2336), Hunan (*Handel-Mazetti*, no. 438, inter urbes Linling and Sinning, alt. 200–500 m. and no. 552, ad minas Hsikwang-schan prope urbem Hsinhwa, in fruticetis, alt. 600–800 m.) and the variety *pruinosa* Byhouwer in Anhwei (*R. C. Ching*, no. 3248).

Berberis Kawakamii Hayata in Jour. Coll. Sci. Tokyo XXX. Art. I. 24 (1911); Icon. Pl. Formos. I. 40, t. 9 (1911); l. c. III. 4 (1914).—Kanehira, Formos. Trees 32, fig. (1917).—Schneider in Oesterr. Bot. Zeitschr. LXVII. 140 (1918).

The original material was found by T. Kawakami on Mt. Morrison, alt. 2700 m.; among E. H. Wilson's specimens three are from the same province (no. 9720, Arisan, prov. Kagi, alt. 2333–2933 m., no. 10910, Arisan to Mt. Morrison, prov. Kagi, alt. 2666–3666 m., and no. 10952,

Arisan to Mt. Morrison, alt. 3666 m.), and one from province Nanto (no. 10060, from Nanto to Noko via Musha, alt. 2666–3166 m.).

Berberis silvicola Schneider in Sargent Pl. Wils. III. 438 (1917).

The type-material was found by E. H. Wilson in western Hupeh (no. 2879); it appears to grow also in Yunnan (G. Forrest, no. 18195), so probably it is still to be found in Szechuan or Kweichow.

Berberis diaphana Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 309 (1876); in Mél. Biol. IX. 712 (1877); Fl. Tangut. 32, t. 8, fig. 1–7 (1889); in Act. Hort. Petrop. XI. 42 (1890).—Hemsley in Jour. Linn. Soc. XXIII. 31 (1886).—Schneider in Bull. Herb. Boiss. sér. 2, v. 398 (1905); VIII. 195 (1908); in Oesterr. Bot. Zeitschr. LXVI. 321 (1916).—Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 44 (1905).—Rehder in Sargent, Trees & Shrubs, II. 19, t. 109 (1907); in Jour. Arnold Arb. v. 139 (1924).

Berberis yunnanensis Hutchinson in Bot. Mag. CXXXIV. t. 8284 (1908).—Non Franchet.

Discovered in Kansu by N. Przewalski, this species has been collected in the same province by *G. N. Potanin*, *R. C. Ching* (Wulsin Expedition no. 432, 556, 961) and *J. F. Rock* (no. 12634, 13474, 13525, 13529, 13574). In Shensi it was found by *G. Giraldi* (Fedde l.c.), in Szechuan by *Farges* (Eastern Szechuan, Tchen-keou-tin, 1893) and *E. H. Wilson* (Western Szechuan, no. 930, 4190, 2865, 4170). Recent material shows that the range of the species extends further south-west and west; it has been found by *Handel-Mazetti* in northwestern Yunnan (no. 8117, ad confines tibeticas sub jugo Dokerla, 28° 15′, in regionis frigide temperatae abieto-salicetis, alt. 3800–4150 m.) and by *J. F. Rock* in eastern Tibet (no. 13263, 13272, 13273, 14100, 14108, 14115).

Berberis aemulans Schneider in Sargent, Pl. Wils. III. 434 (1917); in Oesterr. Bot. Zeitschr. LXVI. 321 (1916).

Berberis diaphana Schneider in Sargent, Pl. Wils. I. 353 (1913), ex parte.—Non Maximowicz.

The type-locality for this species is western Szechuan, Wa-shan (*E. H. Wilson*, no. 930), other material collected by E. H. Wilson comes from the same province (no. 3145, 4190, Sungpan). It appears to grow also in northwestern Yunnan, as shown by the following specimens of *G. Forrest;* no. 19521, margins of pine forests on the Mekong-Salwin divide, lat. 27° 54′, long. 98° 50′, alt. 3000–3300 m. and no. 20295, Mekong-Salwin divide, Sie-la, lat. 28°, long. 98° 40′, alt. 4000–4300 m.

Berberis Faxoniana Schneider in Oesterr. Bot. Zeitschr. LXVI. 325 (1916).

About the geographic distribution of this species nothing was known, as Schneider described it from material grown in Arnold Arboretum and perhaps introduced from Vilmorin's nurseries. The numbers 13829, 16554 and 18992 of the Plantae Forrestianae from Yunnan appear to be

Berberis Faxoniana, but the labels do not give any clue in which part of Yunnan this material has been collected.

Berberis Wilsonae var. **subcaulialata** Schneider in Oesterr. Bot. Zeitschr. LXVII. 298 (1918).

Berberis subcaulialata Schneider in Fedde Rep. Spec. Nov. VI. 267 (1909); in Sargent, Pl. Wils. I. 369 (1913).—Hesse in Mitt. Deutsch. Dendr. Ges. XXII. 266 (1914).—Bean in Gard. LXXXV. 501, fig. (1921).

Berberis Coryi Veitch, New Hardy Pl. W. China, 7 (1913).

This variety was first collected by E. H. Wilson in western Szechuan (no. 1267), but it is found also in western Yunnan, as shown by the specimens of *E. E. Maire* (no. 67, coteaux arides, rocailleux derrière Tong-tchouan, alt. 2990 m., no. 179, collines arides, rocailleuses de Pokio, alt. 2990 m.) and *G. Forrest* (no. 18516, Yunnan, no. 20179, side valleys on the mountains N. E. of Atuntze, lat. 28° 35′ N., long. 99° 10′ E., alt. 3300–3600 m., N. W. Yunnan, and no. 20378, ravines on the Mekong-Yangtze divide, lat. 27° 36′ N., long. 99° 10′ E., alt. 3600 m., N. W. Yunnan.

Berberis aggregata var. **Prattii** Schneider in Sargent, Pl. Wils. III. 443 (1917); in Oesterr. Bot. Zeitschr. LXVII. 296 (1918).

Berberis polyantha Hemsley in Jour. Linn. Soc. Bot. XXIX. 302 (1892), quoad specim. Prattii no. 80.

Berberis Prattii Schneider in Sargent, Pl. Wils. I. 376 (1913).—Sprague in Bot. Mag. CXI. t. 8549 (1914).

Berberis integerrima Hort. Veitch, pro parte, ex Schneider l. c. (1918), pro synon.—Non Bunge.

Berberis Geraldii Veitch, New Hardy Pl. W. China 7 (1913), nomen.

Berberis brevipaniculata Bean, Trees and Shrubs I. 236 (1914).—Non Schneider.

The range of this species appears to extend from western Szechuan, where it was discovered (*E. H. Wilson*, no. 1261 type, 1050 A, 1073, 1300, 4173) into northwestern Yunnan (*G. Forrest*, no. 20292, on Dokerla, Mekong-Salwin divide, lat. 28° 20′ N., long. 98° 40′ E., alt. 3600 m.).

Berberis Caroli Schneider in Bull. Herb. Boiss. sér. 2. v. 459 (1905).

Berberis integerrima var. *stenophylla* Maximowicz, Fl. Tangut. 29 (1889). Non *Berberis stenophylla* Lindley, nec Hance.

Berberis integerrima Maximowicz Enum. Pl. Mongol. 33 (1889), quoad specim. ex Ordos.

As mentioned in the enumeration of the Berberis of the Rock collection, two specimens, no. 13314 from northwestern Kansu and no. 14362 from eastern Tibet seem to belong to *Berberis Caroli* rather than to the closely related *Berberis Vernae* Schneider. This means a much wider range for *B. Caroli* which was discovered by *G. N. Potanin* in Ordos (southern Mongolia, 1884), and since then no typical material has been found.

Berberis Silva-Taroucana Schneider in Sargent, Pl. Wils. I. 370 (1913); in Oesterr. Bot. Zeitschr. LXVII. 217 (1918).—Hesse in Mitt. Deutsch. Dendr. Ges. XXII. 266 (1914).

The type-specimen of this species is *E. H. Wilson's* no. 2860, from

Chiu ting shan, western Szechuan; other material from the same province constitutes the nos.: 955, 1012, 1012A, 1059, 2857, 2858, 2861, 2863A, 2867, 3151A, 4153, 4288, 4726. The area in which the species occurs appears to be much larger, as shown by Wilson's no. 645, collected in western Hupeh, and *J. F. Rock's* nos. 12473, 13522 and 14913 from southwestern Kansu.

Berberis Mouillacana Schneider in Sargent, Pl. Wils. I. 371 (1913); in Oesterr. Bot. Zeitschr. LXVII. 217 (1918).

Berberis Mouillacana was known only from western Szechuan, in the specimens: *E. H. Wilson* no. 1039 (type), 1041, 1283, 4123. The specimens collected by *J. F. Rock* demonstrate its occurence in southwestern Kansu, north of the original area (*J. F. Rock*, nos. 12303, ?12429, 12443, ?12458, 13202, 14898).

Berberis Boschanii Schneider in Sargent, Pl. Wils. I. 369 (1913); in Oesterr. Bot. Zeitschr. LXVII. 225 (1918).

This is another case of a Berberis, discovered in western Szechuan (*E. H. Wilson*, no. 1166, type, 3156), which appears to extend northward into Kansu (*R. C. Ching*, Wulsin Expedition, no. 86 and 773, southwestern Kansu; *J. F. Rock*, no. 12513, southwestern Kansu and no. 13300 and 13316, northwestern Kansu) and into eastern Tibet (*J. F. Rock*, no. 13261, 13274, 13366, 13920, 13948, 14073, 14079).

Berberis Lecomtei Schneider in Sargent, Pl. Wils. I. 373 (1913); in Oesterr. Bot. Zeitschr. LXVII. 225 (1918).

? *Berberis heteropoda* Franchet in Bull. Soc. Bot. France, XXXIII. 386 (1896).—Non Schrenck.

Berberis sinensis var. *typica* Franchet, Pl. Delav. 35 (1889).—Non Poiret.

Berberis Thunbergii var. *glabra* Franchet, l. c. 35 (1889).—Schneider in Bull. Herb. Boiss. sér. 2. VIII. 204 (1908).

Berberis pallens Diels in Not. Bot. Gard. Edinb. VII. 342 (1912).—Non Franchet.

This species was known to occur in Yunnan, the type-material was collected in that province by Delavay (no. 1047), later more specimens were found by *Delavay* (no. 2247 and specimens from Kou toui and Li-chiang range) and by *G. Forrest* (nos. 17143, 20621, 20802, 2271 and 2343). Schneider described two specimens from southern Szechuan (nos. 1503 and 1536), found by himself in 1914, as probably belonging to *B. Lecomtei*. A confirmation of the occurrence in this province is given by no. 22395 of *G. Forrest:* side valleys of the mountains southeast of Mu-li, lat. 27° 50′ N., long. 101° E., alt. 3300–3600 m., southwestern Szechuan.

Berberis dasystachya Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIII. 308 (1877); in Mél. Biol. IX. 711 (1877); Fl. Tangut. 30, t. 5, fig. 1–7 (1889); in Act. Hort. Petrop. XI. 41 (1890).—Hemsley in Jour. Linn. Soc. XXIII. 3 (1886).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 794 (Pl. Enum. 5) (1891); in Szechenyi, Wiss. Ergebn.

Reise Ostas. II. 681 (1898).—Bretschneider, Hist. Eur. Bot. Disc. China, 971 (1898).—Schneider in Bull. Herb. Boiss. sér. 2, v. 664 (1905); VIII. 262 (1908); in Sargent, Pl. Wilson III. 442 (1917); in Oesterr. Bot. Zeitschr. LXVII. 287 (1918).—Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 43 (1905).—Rehder in Jour. Arnold Arb. v. 142 (1924).

Berberis heteropoda var. *oblonga* Maximowicz in Act. Hort. Petrop. XI. 41 (1890).—Non Regel.

? *Berberis dolichobotrys* Fedde in Bot. Jahrb. XXXVI. beibl. LXXXII. 41 (1905).

Berberis vulgaris var. *dasystachya* Voss in Putlitz & Meyer, Landlexicon v. 709 (1913).

Originally described from material collected by N. Przewalski in Kansu, the species was found in that province by all subsequent collectors: *G. N. Potanin* (see Schneider, l. c. 1905), *L. Loczy* (see Kanitz, l. c.), *W. Purdom* (no. 1014), and *J. F. Rock* (no. 12207, 12465, 12504, 12808, 12885, 13291, 13514, 13561, 14680). Meanwhile it had been discovered in several adjacent provinces: in Hupeh by *A. Henry* (no. 6816), *E. H. Wilson* (no. 307), and *W. Y. Chun* (no. 3910, 4219), in Szechuan by *Von Rosthorn* (no. 962), *Farges* (see Schneider, l. c. 1918) and *E. H. Wilson* (no. 4203), in Shensi by *G. Giraldi* (no. 51, see Fedde l. c.). So it was to be expected also in eastern Tibet, especially in the Kokonor region, between western Szechuan and northwestern Kansu, where it has now been found by *J. F. Rock* (no. 13262).

TWO NEW GENERA AND NEW COMBINATIONS OF RUTACEAE-AURANTIEAE FROM PAPUA

(REVISIO AURANTIACEARUM II)

TYÔZABURÔ TANAKA

Echinocitrus,[1] gen. nov.

Flores mediocres, axillares, solitarii; calyx cupulatus, basi attenuatus, punctatus, lobis 5 ovato-deltoideis glabris; petala 5, imbricata, oblongo-obovata, basi plus minusve attenuata, punctata; stamina 10, filamentis filiformibus liberis, antheris linearibus obtusis; ovarium lageniforme, stipitatum, glabrum, apice in stylum attenuatum, stylo staminibus paulo longiore. Bacca obovoidea, frequenter basi elongata, punctata, laevissima, corticosa, 5-locularis; pulpa vesiculari nulla, succo exiguo; semina biseriata, reniformia, compressa.—Frutex ramosissimus, ramis patentibus saepissime pendulis, spinosissimis, spinis geminatis, puberulis. Folia alterna, ovato-rhomboidea, obsolete punctata, nervis utrinque vix prominulis, breviter petiolata.

Genus Triphasiae affine, floribus pentameris longe pedicellatis, foliis simplicibus irregulariter crenulatis, fructibus obovoideis magnitudine cerasi.

Species unica, *Paramignya Brassii* C. T. White.

[1] From the Greek, ἐχῖνος, hedgehog, and *Citrus*.

Echinocitrus Brassii, comb. nov.

Paramignya Brassii C. T. White in Jour. Arnold Arb. VII. 231 (1926).

This exceedingly spiny Papuan species of the Citrus tribe was only once collected by L. J. Brass in Rigo, British New-Guinea, and the specimens are deposited in the Arnold Arboretum. It is very unlike *Paramignya*, which is a vine with solitary curved spines and large elliptic leaves having somewhat motile petioles, but the present species is closely allied to *Triphasia* in its puberulent, somewhat zigzag branches armed with paired sharp spines, in the thin leaves without prominent reticulation, solitary flowers with cupulate calyx and slender petals, free filiform filaments and linear anthers, stalked ovary narrowed into a long style, and in the few-celled bright-colored berry without pulp-vesicles. It is, however, distinct from *Triphasia* primarily in having 5-merous flowers, while both species of *Triphasia* (*T. trifolia* and *T. grandifolia*) have always 3-merous flowers. This species is far more spiny than *Triphasia*, especially at the juvenile stage, and the fruit is very much larger and mostly pointed at the base, not at the apex, the segments containing distinctly biseriate seeds. The leaves are crenate, not entire, and the pedicel of the fruit is very much elongated: calyx-lobes are distinct and ovoid-deltoid, not so broad and flat-triangular as in *Triphasia*. The calyx lacks pubescence but is only minutely ciliate on the margin. The appearance of the fruit is very much like an oval kumquat (*Fortunella margarita* Swingle), but it lacks pulp-vesicles.

Species of true *Paramignya* do not occur in Malay Archipelago, except *P. andamanica* (King) Tanaka which was once collected in Sumatra and Sumbawa.

Monanthocitrus,[1] gen. nov.

Flores majores vel minores, solitarii, axillares, breviter pedicellati; calyx cupulato-scutellatus, 5-lobatus, lobis triangularibus subpatentibus glabris; petala 5, imbricata, oblongo-ovata vel lanceolata, punctata; stamina libera, filamentis 8–10 tenuibus, antheris oblongis; ovarium globosum vel substipitato-obovoideum, disco annulari vel subpentagono, stylo crasso vel elongato, stigmate subpentagono. Bacca globosa vel obovata, 5-locularis, cum pulpa vesiculari.—Frutex, ramis teretibus gracilibus, spinis 2 in foliorum axillis. Folia oblongo-lanceolata, subintegra vel crenulato-subdentata, breviter petiolata.

Genus Wenzeliae affine, foliis acuminato-caudatis, nervis subtus et supra magis prominentibus, distinctissime anguste reticulatis; ramis spinosis, spinis geminatis acutissimis.

Species typica, *Citrus cornuta* Lauterbach.

Monanthocitrus cornuta, comb. nov.

Citrus cornuta Lauterbach in Lorentz, Nova Guinea, VIII. 292 (1910).

Type specimen: Rijks Herbarium, Leiden (*Versteeg* no. 1551).

The specific name was derived from an abnormal fruit which bore 5

[1] From Greek, μονάνθος, one-flowered, and *Citrus*.

persistent styles. Later material (Rümer no. 633) deposited in the Leiden Herbarium has normal fruits with one stylar point, and was later referred to by Lauterbach in a supplementary note (l. c. 825 [1912]). The flowering specimen deposited in the herbarium at Berlin-Dahlem shows that the species is far removed from the genus *Citrus* and much more closely related to the genus *Wenzelia*, first described from the Philippines.

Wenzelia is characterized by solitary axillary flowers with slender pedicel, 5 petals, 5 calyx-lobes and 10 stamens. The leaves of *Wenzelia* are large, with obscure reticulation and are borne on slender branchlets unarmed or rarely armed with single spines in the axils. The type of *Monanthocitrus* in its essential characters approaches very much *W. brevipes* Merr., but in appearance it is closer to *Citrus inodora* Bail., having distinctly reticulated leaves, paired sharp spines at each node and short-pedicelled roundish fruits resembling a lime (*Citrus aurantifolia* Swingle). The ovary of *Monanthocitrus* contains only 2 ovules in each locule, while *Wenzelia* contains 6.

Monanthocitrus grandiflora, comb. nov.

Citrus grandiflora Lauterbach l. c. 292.

This species is closely allied to the former, but it has very large petals measuring about 35 mm. in length, while those of the former only attain to 5 mm. A sterile specimen deposited in Leiden Herbarium sufficiently shows its proper systematic position and relation to the former species, although the only flowering material (in Buitenzorg) has not been examined at this time.

Wenzelia dolichophylla, comb. nov.

Citrus dolichophylla Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 377 (1901).

Type specimen: Herbarium of Botanisches Museum, Berlin-Dahlem. (Lauterbach no. 3108).

This species differs from the type of the genus (*Wenzelia brevipes* Merrill in Philip. Jour. Sci. x. Bot., 272 [1915]) in the narrower leaves with the lateral veins diverging at about right angles. The solitary axillary flower has a slender pedicel gradually merging into an almost funnel-shaped small calyx, the limb of which remains in cupular form until fruiting time. In the case of *Monanthocitrus cornuta*, the calyx spreads open in the fruiting stage with its lobes recurved at the end. The fruit of this species is ellipsoid, very thin-skinned, and entirely lacks pulp-vesicles.

Wenzelia paludosa, comb. nov.

Citrus paludosa Lauterbach in Bot. Jahrb. LV. 263 (1918).

Type specimen: Herbarium of Botanisches Museum, Berlin-Dahlem. (Ledermann no. 7173).

This species has occasionally simple spines at the node, while the two other species are entirely unarmed. The leaves are still narrower than

those of the former species, and the texture is much thinner with equally obsolete reticulation. It also has a similar funnel-shaped calyx with narrow not spreading lobes. The fruit is ovoid, narrowed at the base and distinctly acuminate at the apex, containing about six seeds in each locule. The lateral veins of the leaf spread at a rather acute angle, and are sometimes irregularly branching as in *W. brevipes*.

The three species of Wenzelia can be easily distinguished as follows:

Leaves oblong, lateral veins at more or less acute angles, subcoriaceous: fruits obovoid with round apex and narrowed base.....*W. brevipes*.
Leaves lanceolate.
Leaves subcoriaceous, lateral veins nearly at right angles to the midrib: fruit ellipsoid with the ends nearly rounded.....*W. dolichophylla*.
Leaves almost chartaceous, lateral veins at somewhat acute angles: fruit ovoid, with pointed ends.....*W. paludosa*.

The last species alone has pubescence on calyx, pedicel, style and the upper part of ovary, while the others are glabrous.

The relationship of the genera *Microcitrus*, *Echinocitrus*, *Monanthocitrus*, *Wenzelia* and the new yet unnamed genus representing *Citrus inodora* Bailey, is not very clear, since the present herbarium material is still very scanty. It is, however, apparent that in the floral characters *Wenzelia* is most closely related to *Echinocitrus* and *Triphasia*, as is shown by the stalked, 5-celled ovary with less developed disk, large stigma continuous into the style, 10 filaments of equal length, with oblong anthers, and thin-skinned fruits without pulp-vesicles and containing (except in *Triphasia*) biseriate seeds. In the texture of the leaf and particularly in the inconspicuous reticulation *W. paludosa* approaches very much the genera above mentioned, but the genus already lost the primitive paired thorns, as they still exist in *Monanthocitrus* and *C. inodora*. The genus *Monanthocitrus* would appear to be a close ally of *Wenzelia* if its fruit lacked pulp-vesicles. The presence or absence of pulp-vesicles, not mentioned by the authors of *C. dolichophylla* and *C. paludosa*, is however of great importance in judging their exact relationship with *Microcitrus*, which has small leaves with distinct venation, somewhat terete branches armed with simple spines, minute, distinctly stalked fruits with a very small number of segments and globose pulp-vesicles. Only *Citrus inodora* Bailey, or, as it has been called, *Microcitrus inodora* Swingle in Jour. Wash. Acad. Sci. v. 577 (1915), is very near to *Monanthocitrus*, in its distinct venation of the large leaf, paired thorns, and in the comparatively large, short-stalked solitary fruits. Bailey (in Bot. Bellenden-Ker Exped. 34 [1889]) unfortunately failed to mention the presence of pulp-vesicle in *C. inodora*, but on account of the numerous stamens amounting to about 30 it seems to be a species of a higher position. If it lacks pulp-vesicles, its relation will be similar to that between *Atalantia* and *Oxanthera*, the former having 10 filaments and pulp-vesicles, and the latter having more than 10 stamens and larger fruit without pulp-vesicles. To make the relationship of the different genera clearer the following chart may be helpful.

Unifoliolate group
- Main group with paniculate inflorescence — *Atalantia, Oxanthera,* etc.
- Group with solitary flowers
  - (reticulation conspicuous)
    - *Monanthocitrus* (paired thorns)
    - *Citrus inodora* (paired thorns)
    - *Microcitrus,* etc. (single thorn)
  - (reticulation inconspicuous) — *Wenzelia* (single thorn)
    - *Echinocitrus* (paired thorns)
    - *Triphasia* (paired thorns, leaves sometimes trifoliolate)
- Pinnate-leaved group — *Hesperethusa, Citriopsis, Poncirus, Citrus,* etc.

Atalantia disticha (Blanco) Merr. var. **paniculata,** comb. nov.

Atalantia paniculata Warburg in Bot. Jahrb. XIII. 340 (1891).
Atalantia maritima Merrill in Philip. Jour. Sci. IX. Bot. 295 (1914).

Type specimen: Herbarium of Botanisches Museum, Berlin-Dahlem. (Warburg from Ceram-laut, no. 20123).

In its general characters this variety agrees with the Philippine *A. disticha,* but the leaves are larger, less crowded, and the reticulation much less close; the inflorescence is a more wide-spreading compound panicle. This variety is common in Java, Key, Sumbawa, Timor, north Borneo, extending to Mindanao, Negros, Panay, etc. It never occurs in Luzon.

Clausena Harmandiana Pierre ex Guill. var. **papuana,** comb. nov.

Clausena papuana Lauterbach in Bot. Jahrb. LV. 260 (1918).
Clausena hirta Ridley in Jour. Fed. Malay. Stat. Mus. X. pt. 2, 85 (1920).

Type specimen: Herbarium of Botanisches Museum, Berlin-Dahlem (Schlechter no. 18476).

Pierre's *Glycosmis Harmandiana* (Fl. Forest. IV. fasc. 18, following pl. 285, 1893), based upon Harmand's specimen from Cochinchina (no. 3875) is similar to the specimen collected by Leschenault in Java, and both are correctly transferred to *Clausena* by Guillaumin (*in* Lecomte's Not. Syst. I. 219 [1910]), although Thorel's material from Laos, considered to belong to the same species represents partly an entirely different new species (*C. Guillauminii* Tanaka in sched.). The typical *C. Harmandiana* has pentamerous flowers, two rows of large oil-cell dots on the surface of the ovary, a rather contracted style, and a less hairy rachis bearing only about 5 to 7 leaflets. The present variety has a somewhat elongated style and ovary, and the whole plant is hairy. The ovary seems to have three rows of enlarged oil glands, but close examination will show that it has only two rows, having a wide but slightly elevated naked space between the rows. The flowers of the Papuan specimens are almost always tetramerous, with a few pentamerous flowers mixed in. It has a long rachis with more pairs of leaflets than the type of the species. The form described from Peninsular Sima as *C. hirta,* is almost identical with the present variety, except that it has nearly constantly 5-merous flowers.

TAIHOKU IMPERIAL UNIVERSITY
TAIWAN, JAPAN

Podocarpus falcata R. Br.
Tree in Natal, 24 meters tall, the trunk 3 meters in girth

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME IX NOVEMBER, 1928 NUMBER 4

PODOCARPUS FALCATA R. BR.

ERNEST H. WILSON

Plate 14

South Africa is not well supplied with indigenous species of softwood timber trees, several species of *Podocarpus* and of *Widdringtonia* representing the entire group. The Widdringtonias, called Cedars, occur in isolated areas; a few of them are plentiful but such that are do not grow to a large size, the exception being *W. Whytei* Rendle, indigenous on the Shire Highlands and adjacent regions of Central Africa. Several species of *Podocarpus*, however, are plentiful in regions where a good rainfall is enjoyed and among them *P. falcata* R. Br., the Yellow-wood or Geelhout of the Dutch, takes high rank as a timber tree. I am familiar with it in the splendid forests of the Knysna district, in the Tzitzikamma forests to the eastward and in the rain forests of Natal. It is reported from other parts of South Africa and would appear to me to be little, if at all, different from *P. gracilior* Pilger, a common tree in the forests of Kenya beyond Nairobi and which has been also reported from Abyssinia.

In Natal I saw fine trees of *P. falcata* R. Br., but they did not compare favorably in height and magnitude of trunk with those common in Knysna and Tzitzikamma. In these forests, which are dense with thick, almost impenetrable undergrowth, this tree rears itself high above the other vegetation, its dome-shaped or rounded crown over-shadowing that of any other tree. From the distance, where a view over the forests may be had, the tops of this *Podocarpus* stand out sentinel-like. The trunk varies in girth from 10 to 25 feet, is cylindrical, of even thickness for a great height, and usually clear of branches from 50 to 100 feet. The tallest tree I saw was 141 feet high and had a trunk 21 feet in girth. This was near Storms River in the Tzitzikamma. The largest specimen, however, was at Deepwall in the crown forest of Knysna. This tree was well over 100 feet high, the bole 24½ feet in girth, straight and without a branch for 62 feet. Conservator of Forests, P. J. Darmehl, who was with me, estimated this tree to contain 2,300 cubic feet of lumber.

The straightness of the trunk, its even thickness and freedom of branches mark it as an exceedingly valuable tree from the lumberman's point of view. The crown is relatively small, rounded or flattened, made up of a few thick branches and many smaller ones. Usually above where branch-

ing commences the tree is useless for timber. The bark is chocolate-brown and flakes off in relatively thick, irregular pieces leaving behind deeply impressed scars. In youth the bark is smooth and gray on the exterior. The tree is plentifully provided with narrow, lance-shaped, rich green leaves and the fruit is globose, plum-like, orange-brown, somewhat bloomy when ripe and about ½ an inch in diameter. The wood is light, yellowish white, close grained, elastic, free from knots and not resinous. It saws easily, planes to a smooth surface and takes nails well. It is not durable for external work where exposed to the weather but for furniture, paneling, flooring, joinery, pattern making and interior construction generally it is a most useful and valuable wood. When air-dried planks have a tendency to warp but kiln-seasoning gives excellent results.

The species belongs to the Nagi section of the genus. It is a light demanding tree and flourishes best in cool rich forest soils. It enjoys the wind protection afforded by lesser trees and when out in the open or when fully exposed to the wind it is less tall and inclined to have an irregular, even scrawny, crown.

A superior wood is that of *P. latifolia* R. Br., the Real Yellow-wood or Regte Geelhout of the Dutch, which grows in forests along with *P. falcata* R. Br. The Real Yellow-wood has fibrous bark and belongs to the section of the genus that has the fruit seated on a very pronounced arillode and of which the Japanese *P. macrophylla* D. Don. is a known example. This is not so large neither is it so handsome a tree as *P. falcata* R. Br., but its wood is, perhaps, superior to that of any other African species.

TWO NEW BAMBOOS FROM NEW GUINEA

AIMÉE CAMUS

Schizostachyum Brassii, n. sp.

Culmi 3–4.5 cm. alti, fistulosi, glabri, recurvati. Foliorum lamina lanceolata, basi rotundata, apice setaceo-acuminata acumine scabro, pallida, glabra, basi puberula, 15–40 cm. longa, 4.5–5.8 cm. lata, margine scabra, superne scabrido-ciliata, nervis permultis parallelis bene striata, venulis transversis tessellata; petiolus crassus, 4–6 mm. longus; vagina striata, superne truncata, ore ciliato-setosa; ligula truncata, ciliata. Panicula depauperata, elongata, foliata; rami puberuli; bracteae ovatae, mucronatae; spiculae angustae, lineari-fusiformes, subteretes, 15 mm. longae, uniflorae; rachilla supra glumam floriferam producta et glumam sterilem cum palea procreans; glumae steriles 3, prima 4–6 mm. longa, ovato-lanceolata, mucronata vel subaristata, 7–9-nervia, margine pilosa; secunda 5–8 mm. longa, ovato-lanceolata, mucronata, subaristata, 7–9-nervia, superne pilosula, margine pilosa; tertia 8–9 mm. longa, ovato-lanceolata, subaristata, 7-nervia; gluma fertilis expansa ovata, mucronata, subaristata, 8 mm. longa, glabra, superne pilosa, 9–11-nervia; palea oblonga, 7–8 mm. longa,

truncatula, breviter bidentula; lodiculae lanceolatae, margine ciliatae; stamina 6, filamentis conjunctis sed cito separandis; antherae lineares, 2.5–3 mm. longae, luteolae, apice subacutae, glabrae; ovarium glabrum, stylo longo; stigmata 3, plumosa. Fructus elongatus, superne attenuatus, pilosus; flos superior: gluma ovata, mucronata, 7–8 mm. longa, margine ciliata, 5-nervia; palea 3–5 mm. longa, oblonga, subcarinata, apice bidentata, ciliata.

NEW GUINEA: Ihu, Vailala River, *L. J. Brass*, no. 1105, March 4, 1926. This species is called BE-ERO by the natives.

The fertile flower is surmounted by a sterile flower situated at the end of an articulation of the rhachilla which is 2 mm. long, slender, glabrous, slightly dilated and ciliate at the apex. Above this flower at the end of a very short articulation of the rhachilla appears sometimes a second shorter and more rudimentary sterile flower.

Though the filaments in a young state have a tendency to unite, this species recedes from the genus *Neohouzeaua* by the presence of one or two upper sterile flowers and of a rudiment of a keel in the palea of the fertile flower and thus approaches *S. Blumei* Nees, the type species of the genus *Schizostachyum*. The tendency toward a union of the very young filaments is also found in *S. Hallieri* Gamble. By this character and by the ciliate apex of the sheaths with the setae about 6 mm. long *S. Brassii* approaches *S. Hallieri* but differs in the arrangement of the inflorescence, in the less congested spikelets, the shorter bracts, in the sterile and fertile glumes distinctly hairy on the margins and with a longer mucro, in the truncate and bidentate palea of the fertile flower and finally in the leaves being more rounded at the base. From *S. Blumei* it differs in the yellow anthers, in the arrangement of the inflorescence, the less hairy glumes with a shorter mucro. In its leaves *S. Brassii* somewhat recalls *S. latifolium* Gamble, but differs in its very loose inflorescence, which is a much-branched panicle, in the scarcely bidentate palea of the fertile flower and in the glabrous anthers. It resembles *S. chilianthum* Kurz in the slightly 2-keeled palea and in the presence of an upper sterile flower, but differs in the arrangement of the inflorescence, in the ciliate glumes and in the not bicuspidate palea.

Bambusa Brassii, n. sp.

Frutex scandens; culmi glabri, fistulosi. Foliorum lamina subelliptica, basi attenuata, petiolata, apice acuminata, 22–25 cm. longa, 5–6 cm. lata, glabra, versus apicem scabra, margine scaberula, nervis parallelis multis striata; petiolus 4–5 mm. longus; vagina glabra, striata; ligula truncata, glabra. Inflorescentia elongata, spicularum fasciculi alternantes satis distantes, densi, sed parvi; spiculae glabrae, 0.8–1 cm. longae, 3–4-florae; glumae steriles ovato-acutae, plurinerviae; glumae fertiles ovato-acutae, mucronatae, inferiores 5–5.2 mm. longae, glabrae, apice puberulae, 11-nerviae; palea glumam subaequans, ad carinas inflexa, dorso inter carinas parum concava, superne puberula; lodiculae ovatae vel oblongae, hyalinae;

stamina 6, libera; antherae 1.8–2 mm. longae, luteae, glabrae, apice mucronatae; ovarium oblongum, basi attenuatum, superne pilosum; stylus pilosus. Fructus?

NEW GUINEA: foothill forests, Borabere, alt. 360 m., *L. J. Brass*, no. 715, Nov. 30, 1925.

This species is called LINOO by the natives.

In the arrangement of its inflorescence this species recalls *B. Griffithiana* Munro, but differs in the more numerous flowers of the spikelets, in the mucronulate anthers, elongated style, the hairy apex of the ovary and finally in its sheaths and ligulae being glabrous at least in the fully developed leaves. It also resembles *B. Thorelii* G. Camus in the arrangement of the inflorescence, but the leaves are much larger, have 9–10 pairs of secondary veins with numerous intermediary veins, and are somewhat tessellate.

SOME NONDESCRIPT PIPERS FROM NEW GUINEA.

WILLIAM TRELEASE

THE following species form part of a collection of woody plants made in New Guinea in 1926–27 by Mr. L. J. Brass for the Arnold Arboretum. Ninety-three species of Pipers have been recorded for New Guinea and the adjacent Bismarck Archipelago and the eleven here described bring the number up to 104. It is not impossible that one or another of these may have been reported heretofore under the name of a non-endemic species; but as I have not seen these collections I am unable to indicate synonymy for any of the present list, though they cannot be reconciled with the characters on which such species rests.

The favorable location of New Guinea, with a diversified area of some 200,000 square miles (twice that of the West Indies and nearly equaling that of Central America) makes it probable that a much larger number of Piperaceae (*Piper* 104; *Peperomia* 22; *Macropiper* 2) may be expected than is now known; and except for the few that have been cultivated, they may be expected to be endemic.

Piper (Eupiper) arbuscula, n. sp.

An essentially glabrous compact small tree, 10–12 ft. tall; flowering internodes slender and somewhat elongated; leaves round-ovate, abruptly sharp-acuminate, slightly obliquely cordate, 12–14 × 15–16 cm., multiple-nerved, with about 6 lateral nerves from the base and the midrib with 2 alternate branches from its lower fifth, papery, minutely dark-punctulate beneath; petiole 15–20 mm. long, approximately equaling the open sinus, exceptionally somewhat hirtellous, not winged; pistillate spikes opposite the leaves, curved, 4 × 60 mm., closely flowered; peduncle 5 mm. long, bracts round-peltate; berries orange, ovoid, pointed; stigmas 3, small, sessile.

TYPE LOCALITY: young forest, U-uma river, *L. J. Brass*, no. 1449, May 18, 1926. — Called Boni.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **Brassii,** n. sp.

A slender nodose glabrous liana, drying dark; flowering internodes 2 × 20–35 mm.; leaves lanceolate, lance-oblong, or the lower lance-ovate, attenuate, acute-based, 3 or 3.5–4.5 × 10–12 cm., palmately 5-nerved, the nerves impressed above and salient beneath with numerous ascending cross-veins, chartaceous and glossy; petiole about 5 mm. long, neither channelled nor winged; spikes opposite the leaves, slender and long (becoming 2 × 200 mm.) densely flowered; peduncle 20–30 mm. long; bracts round-peltate; fruit unknown.

TYPE LOCALITY: Iawarere, at 350 m. alt., in the foothill forest, *L. J. Brass,* no. 683, Nov. 24, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **corylistachyopse,** n. sp.

A climbing shrub; flowering internodes thick (5 mm.) and short, dingy-velvety; leaves oblong, sharp-acuminate, rounded at base or minutely cordulate, with one side barely perceptibly shorter, 4.5–7 × 14–19 cm., pinnately nerved from below about the middle, the nerves 5 or 6 × 2 gradually congested downwards, drying dull and papery, dingy-velvety beneath; petiole 10 + 1 mm. long, velvety, channelled, sheathing below; pistillate spikes opposite the leaves, 5 × 20-30 mm., densely flowered; peduncle stout, recurving, 10–15 mm. long; bracts round-peltate; ovary sessile; stigmas 3, linear, sessile.

TYPE LOCALITY: rain-forest, Sogeri, at 450 m. alt., *L. J. Brass,* no. 655, Nov. 17, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **flavifructum,** n. sp.

A somewhat nodose fleshy scandent or straggling shrub; leaves broadly ovate, acuminate, shallowly (or the lower moderately deeply) cordate, slightly oblique, 7 × 13–11 × 16 cm., multiple-nerved from the basal 10 or 15 mm., the 7 nerves sparsely hirtellous beneath, dark green, drying thin; petioles 10 or on the lower leaves 30 mm. long, channelled but not winged, somewhat puberulent; pistillate spikes opposite the leaves, in fruit 20 × 50 mm., loosely flowered; peduncle about 20 mm. long, at most locally and obscurely puberulent; bracts round-peltate; berries yellow, pyriform, stipitate for an equal length, glabrous; stigmas 3, sessile, short.

TYPE LOCALITY: swampy rain-forest on the Domara River, *L. J. Brass,* no. 1644, June 4, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **fragrans,** n. sp.

A somewhat succulent nodose glabrous shrub, decumbent, and rooting from some nodes; flowering internodes rather slender and short (2 × 15–25 mm.), finely striate; leaves ovate, acuminate, round-based, 4.5 × 8–5.5 ×

11 cm., sub-pinnately nerved with 3 pairs of strong nerves from the lower fourth and a fainter pair from the upper fourth, drying thin; petiole about 5 mm. long, channelled but not winged; spikes opposite the leaves, as yet 1.5 × 40 mm.; peduncle 5 mm. long; bracts round-peltate; flowers said to be very sweet-scented.

TYPE LOCALITY: Iawarere, at 550 m. alt., *L. J. Brass*, no. 701, Nov. 25, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **Melula,** n. sp.

A high-climbing somewhat nodose glabrous shrub; flowering internodes moderately slender and elongated; leaves inequilaterally round-ovate; abruptly very short-acuminate, rounded at base, 6 × 9–11 × 12 cm., septuplinerved from within the lowest 10 mm., the midrib with a single upcurved branch one-fourth from the apex, drying thin-papery; petiole 10–15 mm. long, channelled, sheathing toward the base or the longer up to the middle; spikes opposite the leaves, as yet 2–3 × 60 mm., closely flowered, green; peduncle slender, 5 mm. long; bracts round-peltate.

TYPE LOCALITY: rain-forest, Hewa, Vaitata River, *L. J. Brass*, no. 1130, March 13, 1926. — Called Melula.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **morianum,** n. sp.

A large glabrous nodose succulent climbing shrub; flowering internodes moderately slender and short; leaves elongated-ovate and obscurely cordulate above, broadly ovate and very shallowly cordate below, acuminate, slightly inequilateral, 5 × 11, 7 × 15, or 11 × 17 cm., palmately 5- or 7-nerved, chartaceous; petiole 10 mm. long, openly grooved, sheathing toward the base; spikes opposite the leaves (young) scarcely 2 × 40 mm., closely flowered, in fruit said to be long and red; peduncle slender, 20 mm. long; bracts round-peltate.

TYPE LOCALITY: rain-forest, lower Mori River, *L. J. Brass*, no. 1562, May 28, 1926. — Called Boidiboro.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **pavimentifolium,** n. sp.

A low-climbing somewhat fleshy shrub; flowering internodes 5 × 100–150 mm., harsh, subvillous; leaves lance-elliptic, sub-acuminately pointed, the slightly inequilateral cordulate base equally contracted, 10–11 × 25 cm., pinnately about 11-nerved from the lower third, the nerves and cross-veins impressed above and very salient beneath, hard, stiffly hirtous beneath; petiole 10 mm. long, harshly subvillous, channelled, sheathing only at base; pistillate spikes opposite the leaves, 5 × 60 mm., densely flowered, peduncle 10 mm. long, sparsely hirsute; bracts round-peltate; berries immersed in the rachis, globose; reddish-yellow; stigmas about 3, sessile, broad.

TYPE LOCALITY: rain forest on the Murua River, at 100 m. alt., *L. J. Brass*, no. 1338, March 29, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **pullibaccum,** n. sp.

A weak zig-zag softly pubescent undershrub; flowering internodes moderately slender and short, villous; leaves ovate, acuminate, obliquely cordate, 6 × 10–10 × 16 cm., submultiple-nerved from the lower third, the nerves 4 or 5 × 2, somewhat transiently short-pubescent above with hirtellous nerves, crisply subvillous beneath, drying thin; petiole about 10 mm. long, about equaling the sinus, sheathing for some distance above the base; pistillate spikes in fruit about 10 × 100 mm., closely flowered; peduncle slender, 15 mm. long, villous; bracts round-peltate; berries brown, ellipsoid, narrowed at base rather than stipitate; stigmas 3, linear, recurved, small.

TYPE LOCALITY: edge of rain-forest, Vaitata River, *L. J. Brass*, no. 966, Feb. 13, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **rhizocaule,** n. sp.

A large glabrous climbing shrub, abundantly rooting from the nodes; internodes rather thick and elongated, angular and striate, concolorously verruculose; leaves round-ovate, abruptly and obtusely short-acuminate, 14 × 16–19 × 30 cm., round-based, the minutely cordulate margin sometimes connate across the petiole, multiple-nerved, with 6 nearly based lateral nerves and the midrib 2-branched one-third above the base, drying rather thin and cellular-pale-punctulate beneath; petiole 10–15 cm. long, winged toward the base; fruit said to be red.

TYPE LOCALITY: rain-forrest at Kira, Vaitata river, *L. J. Brass*, no. 1115, March 9, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) **rhodocarpum,** n. sp.

A sparsely hirtellous nodose rambling shrub; flowering internodes moderately slender and elongated, sparingly hirtellous; leaves elliptic or subovate-elliptic, acuminate, obtuse or subacute at base, 7.5–13 × 15–22 cm., submultiple-nerved from the lower half or third, the nerves about 3×2, at most slightly hirtellous beneath, drying thin; petiole 10–20 mm. long, transiently velvety, scarcely channelled or sheathing; pistillate spikes opposite the leaves, in fruit 10 × 35 mm., very closely flowered; peduncle 10 mm. long, hirtellous; bracts round-peltate, concave and crisped; berries bright red, with a stout style; stigmas 2.

TYPE LOCALITY: rain-forest on the U-uma river, at 150 m. alt., *L. J. Brass*, no. 1427, May 14, 1926. — Called O-o-o.

DISTRIBUTION: New Guinea.

Piper (Eupiper) viridibaccum, n. sp.

A slender nodose climbing shrub; flowering internodes rather short, crisp-pubescent in lines; leaves oblanceolate-subobovate, sharply acuminate, the narrowed base somewhat inequilaterally cordate, 6–8 × 15–17 cm., submultiple-nerved from the lower fourth, the larger nerves 4 × 2, drying thin, the nerves finely crisp-pubescent beneath; petiole about 5 mm. long, shorter than the auricles, crisp-pubescent, scarcely sheathing; pistillate spikes opposite the leaves, 4–5 × 30 mm., densely flowered; peduncle filiform, 80 mm. long, glabrous; bracts round-peltate; berries green, suboblong, mucronately contracted; stigmas 2.

TYPE LOCALITY: rain-forest, Mowabula, *L. J. Brass*, no. 1370, May 10, 1926.

DISTRIBUTION: New Guinea.

ADDITIONS TO THE KNOWLEDGE OF CHINESE TREES, I

WOON-YOUNG CHUN

Castanopsis Greenii, sp. nov.

Arbor 18-metralis, cortice fusco vel cinereo, in lamellas irregulares oblongas detergentes fisso; ramuli graciles, glabri, teretes, viridi-brunnei, vetustiores nigricantes; gemmae obtusae, perulis fuscis extus adpresse pilosis. Folia persistentia, coriacea, graciliter petiolata, integra, glabra, lanceolata vel elliptico-lanceolata, breviter acuminata, apice obtusa vel acutiuscula, basi subinaequilateralia, breviter cuneata, in petiolum breviter decurrentia, 5–10 (-15) cm. longa, 1.5–3.5 (–5) cm. lata, supra laete viridia, subtus opaca, pallida, obsolete reticulata, costa supra plana, subtus elevata, nervis lateralibus utrinsecus 8–10, sub angulo circiter 30° a costa divergentibus utrinque vix prominulis ante marginem anastomosantibus; petioli graciles, supra plani, glabri, 1.5–2.5 cm. longi. Amenta mascula ad basin innovationum pluria, ascendentia, ad 7 cm. longa, rachi tenuissima pilosula; flores 2–3-fasciculati; stamina 12, perianthio 5-fido circiter 2-plo longiora; ovarii rudimentum pilosum. Spicae femineae masculis fere dimidia breviores, 2–4 cm. longae, puberulae, in superiore ramuli novelli parte solitariae, in axillis foliorum juvenilium; flores pauci, sparsi, alterni. Fructus globosi, in valvas 4 aequales dehiscentes, solitarii vel bini; involucra aculeis fasciculatis acicularibus gracilibus subulatis, fere rectis brunneis densissime echinata; valvae extus cinereae, pilosulae, intus densissime sericeo-villosae, circiter 5 mm. crassae; glans solitaria, depresso-globosa, dense puberula.

Tree about 18 m. high with umbrageous, densely foliaged crown about 20 m. across. Bark of trunk dark or pale gray, peeling off in irregularly oblong somewhat fibrous thick plates, the inner bark cinnamon-red. Branchlets 3–4 mm. in diameter, glabrous, terete, brownish green, sublustrous, minutely grayish lenticellate, becoming dark brownish black the

second year, finally changing to dull black. Stipules linear, purplish, caducous. Leaves persistent, coriaceous, slender-petioled, wholly glabrous, entire with translucent margin, lanceolate or elliptic-lanceolate, apex attenuate into an acutish or acuminate point, base subinequilateral, shortly cuneate, slightly decurrent down the petiole, 5–10 (–15) cm. long, 1.5–3.5 (–5) cm. wide, upper surface light green, lustrous, with flattened midrib, lower surface paler green, opaque and with the midrib distinctly elevated, finely but obscurely reticulated, drying grayish yellow, lateral veins 8–12, diverging at an angle of about 30 degrees from the midrib, slender and disappearing towards the margin on upper surface, slightly more distinct and confluent towards the margin beneath; petiole slender, flattened above, glabrous, 1.5–3.5 cm. long. Inflorescence from terminal and subterminal buds, spicate, ascending, the pistillate above the staminate in a pseudopanicle on a more or less purplish-red branchlet terminated by young leaves. Staminate spikes many, creamy white, to about 7 cm. long, rachis and perianth minutely puberulous; flowers in clusters of 2–3 separated by short intervals; stamens 12, slightly more than 2 times longer than the calyx; calyx 5-fid, the lobes broadly ovate, obtuse; rudimentary ovary villous; pistillate spikes solitary; flowers few, solitary, scattered; stigmas 4, linear, erect, silky-pilosulous, especially towards the base. Fruit dehiscent into 4 regular valves, solitary or 2 together, globose, about 6 cm. across before dehiscence, and about 8 cm. across when open, chestnut-brown, densely echinate with slender subulate spines branching from a common base, the peduncles densely grayish pilosulous, valves woody, about 5 mm. thick, densely silky-villous inside; nuts solitary, depressed-globose, densely tawny-tomentose, apex umbonate, base with large pale convex rugulose hilum, about 2 cm. in diameter and 1.8 cm. high.

HONGKONG: New Territory, Sha Tin, top of wooded slope back of Lek Yun village, *W. Y. Chun*, no. 4966, March 24, 1927; from the same tree, no. 4966a, June 22, 1927, no. 4966b, December 2, 1927.—Specimens in Hongkong Herbarium, Herbarium of Sun Yat Sen University, Canton, and in the Arnold Arboretum.

Easily distinguished from all known Chinese species of Castanopsis by the lanceolate or elliptic-lanceolate, entire, long-petiolate leaves, glabrous and concolorous on both surfaces, and by the large globose, densely echinate fruit splitting open into 4 regular valves when mature and containing a solitary seed.

This species is dedicated to Mr. H. Green, Superintendent of the Botanical and Forestry Department, Hongkong, in appreciation of his courtesy in extending to me every facility for study in the Hongkong Herbarium.

Lithocarpus elaeagnifolia (Seemen), comb. nov.

Quercus elaeagnifolia Seemen in Bot. Jahrb. XXIII. beibl. LVII. 51 (1897).—Merrill in Lingnam Sci. Jour. v. 60 (1927)

Additional description:

Fruit on a spike to 10 cm. long, rarely 3 together on a stout rachis,

approximated, connate at their bases, ovoid to subglobose; cup wholly enclosing the nut, bur-like, thin, fragile, puberulous outside, silky-hirsutulous inside, the scales about 10-seriate, sparse, bases confluent, apices free, divergent, triangular-subulate, terminated by a hooked, incurved prickle, the apical scales abruptly smaller, lanceolate, closely appressed; acorn ovoid, about 18 mm. high, about as broad, chestnut-brown, apex flattened and shortly umbonate, basal scar convex, large, pale-colored, rugose.

HAINAN.

KWANGTUNG: North River Region, Tai Ping, *W. Y. Chun*, no. 5665, Dec. 11, 1927.

Lithocarpus silvicolarum (Hance), comb. nov.

Quercus silvicolarum Hance in Jour. Bot. XXII. 229 (1884).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

Additional description:

Tree to 30 m. high, trunk 100 cm. in diameter; branchlets angled, sulcate, fuscous, puberulous, lenticellate. Leaves long-petiolate, subcoriaceous, glabrous, entire, elliptic to elliptic-oblong, caudate-acuminate, base obliquely obtuse, decurrent down the petiole, upper surface light green, sublustrous, lower surface whitish green, becoming brownish when dry, midrib flattened above, elevated on the lower surface, lateral veins 8–11 pairs, slender, diverging at an angle of about 45 degrees, ascending-curving, indistinct and with transverse veinlets above, slightly elevated and joined by transverse veinlets beneath, 7–14 cm. long, 2.5–5 cm. wide; petiole flattened above, base dilated, 2–2.8 cm. long.

HAINAN.

Lithocarpus synbalanos (Hance), comb. nov.

Quercus synbalanos Hance in Jour. Bot. XXII. 328 (1884).—Dunn & Tutcher in Kew Bull. Misc. Inform. x. 253 (1912).

Additional description:

Fruiting spike about 10 cm. long; mature fruits usually 2–3, bases connate, depressed globose; cup scales about 10-seriate, ovate-triangular, mucronate, thick, fuscous-tomentose, the uppermost scales incurved; acorn densely tawny-tomentose, top convex, apiculate.

HONGKONG: Happy Valley, *C. Ford*, July, 1880; Wong-nei-chong, *C. Ford*, April, 1881 and May, 1882. New Territory: Tai Mo Shan, May 1886. Lantao Island, *A. B. Westland*, Aug. 1888; *W. Y. Chun*, no. 4766, April 1917.

KWANGTUNG: Wan Shiu Shan, *H. Fenzel*, June, 1927.

Lithocarpus naiadarum (Hance), comb. nov.

Quercus naiadarum Hance in Jour. Bot. XXII. 227 (1884).—Skan in Jour. Linn. Soc. XXVI. 519 (1899).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

HAINAN: *W. Y. Chun*, no. 999, Dec. 1919.

Lithocarpus litseifolia (Hance), comb. nov.

Quercus litseifolia Hance in Jour. Bot. XXII. 228 (1884).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

HAINAN.

Lithocarpus variolosa (Franchet), comb. nov.

Quercus variolosa Franchet in Jour. de Bot. XIII. 156 (1899).—Skan in Jour. Linn. Soc. XXVI. 222 (1899).

YUNNAN: *R. P. Delavay*, nos. 1144, 3531, 3544, 4229, 4480.

Lithocarpus truncata (King) Rehder & Wilson in Sargent, Pl. Wilson. I. 123 (1919)

Quercus truncata King in Hooker f., Fl. Brit. Ind. v. 618 (1888).
Quercus cathayana Seemen in Fedde, Rep. Sp. Nov. III. 53 (1906).
Lithocarpus cathayana (Seemen) Rehder in Jour. Arnold Arb. I. 123 (1919).

YUNNAN: *A. Henry*, no. 12, 330b (type of *Q. cathayana* Seemen).

I have seen the type of *Quercus cathayana* Seemen in the Hongkong Herbarium and have no hesitation in calling attention to its identity with King's species from India.

Quercus Blakei Skan var. **Vanioti** (Léveillé), comb. nov.

Quercus Vanioti Léveillé in Fedde, Rep. Sp. Nov. XII. 364 (1913).

Differs from *Quercus Blakei* only in the grayish tomentose under surface of the leaves.

KWEICHOW: Pin Fa, J. Cavalerie, no. 3264, April 1908.

Litsea wushanica Chun, nom. nov.

Litsea gracilepis Hemsley in Jour. Linn. Soc. XXVI. 387 (1891), non Hooker f. Fl. Brit. Ind. v. 157 (1886) from Malacca.

HUPEH: Nanto and mountains to northward, *A. Henry*, no. 2999.
SZECHUAN: north Wushan, *A. Henry*, nos. 7113, 7114.

A BOTANICAL TRIP THROUGH THE CHISOS MOUNTAINS OF TEXAS

ERNEST J. PALMER

THE Rio Grande del Norte, to use the full Mexican name of the river that forms the boundary between Texas and the republic to the south, in the more than nine hundred miles of its course from El Paso to the Gulf of Mexico has in general a direction from northwest to southeast, but in addition to innumerable small windings and turns, it describes two great arcs, the convex side of the first of which is to the south and the other to the north. If a line were drawn, as a bowstring, across the first or more western of these from the northwest corner of Presidio County, Texas, to the point where the river again turns from northeast to east in Brewster County, the territory enclosed would embrace the greater part of these two great counties, or more than 4500 square miles, an area more than half as large as that of the state of Massachusetts. This region is known in Texas as the "Big Bend Country." It is for the most part an arid rocky plain, diversified by several distinct groups of mountains. There are no streams of much importance except the river that forms the southern boundary, for, although several of the smaller streams marked on the map have well defined courses, they lack, at least at most seasons, one of the elements

which in most parts of the country is considered essential for a river—namely water. Beyond the vicinity of the railway that runs along the northern border the country is but sparsely inhabited, and except some small settlements along the river and in the vicinity of the mines there are only a few isolated ranches widely scattered over the area. It is doubtful, indeed, whether anywhere else in the United States there remains a region so remote from civilization or the beaten tracks of travel as that occupied by some of the ranches along the river. What this isolation must have been before the days of roads and automobiles can be inferred to some degree from the fact that even now a trip to and from the railroad and market requires three or four days, while to drive stock over the same distance is a matter of weeks. Feed must often be carried and water is a difficult problem on such journeys. Aside from some mining enterprises and a few cotton farms along the upper part of the river where irrigation is possible, stock raising is the only important industry and cattle, sheep and goats almost the only products. All supplies not furnished directly by this industry must be brought in over the desert from the railway in trucks or wagons.

Several isolated ranges of mountains occur in the Big Bend, all of them outliers of the great Cordilleran system, of which the Christmas, Rosillos, Chinati and Chisos groups are most important. The Chisos Mountains, on the southeastern side of the area and close to the Rio Grande, are the most remote and distinct geographically, and they are also amongst the most rugged and diverse and hence most interesting of the Texas mountains as a biotic region.

Since early in the last century when the first American and European travelers and traders began to explore this part of the Rio Grande valley accounts of the strange flora and fauna have appeared, and yet it remains today as a region but partially explored and a rich mine that returns to every new investigator a wealth of interesting facts and new discoveries.

The most important early exploration and publication dealing with the botany of the region was that of the Boundary Survey that marked the line between Mexico and the newly acquired territory of the United States after the Mexican war. In the second volume of the Report of Major Emory's Expedition, published in 1859, Dr. C. C. Parry, who accompanied the expedition along this part of the river, gives an interesting sketch of the flora and of its geographical and ecological distribution, which appears as an introduction to the botanical part of the report. The explorations of that expedition were, however, necessarily limited to a narrow strip along the river in the vicinity of the military camps. Even to a much later date and until comparatively recent years independent investigations in the region were attended with much danger and hardship, not only from the adverse physical conditions of a desert country infested by venomous reptiles and other menaces, but also from the presence or potential danger of savage Indians or bandits, who have found safe retreats in its fastnesses from which to carry on their depredations on both sides of the river.

It is not surprising, therefore, that the more remote parts of the region, and especially of the mountains, should still be comparatively unknown. But with the building of roads and the advent of the automobile and with more peaceful conditions prevailing along the border at present, better opportunities and a greater degree of safety are afforded, although the traveler who would enter the region must expect still to encounter sufficient hardship and difficulty to at least add zest to his undertaking.

Amongst those who have added to the botanical knowledge of this part of the Rio Grande valley since the time of the Boundary Survey should be mentioned Mr. G. C. Nealley, who in 1887 to 1889 made collections along the border and besides rediscovering many of the rare plants of the earlier surveys added a number of new ones to the record. More recently, expeditions of the University of Texas, under the direction of Dr. B. C. Tharp, have entered the region and done some more thorough exploring in the mountains.

It was with anticipations of interesting adventure and the hope of no less interesting results botanically that I made preparations in the spring of 1928 for a brief trip into this remote part of the country.

Through correspondence with the University of Texas I had become acquainted with Mr. Leo T. Murray, then Superintendent of Schools at Ft. Davis, and he had agreed to accompany me on the trip. In this I was most fortunate, since Mr. Murray had previously been in parts of the Chisos Mountains and had a general acquaintance with the people and with conditions in the region.

On May 21st, having fitted up a little Ford car belonging to Mr. Murray, we set out from Alpine, well supplied with provisions, camp outfit, collecting supplies, and above all with water jugs and canteens, for the journey. The road between Alpine and Marathon is very good and we covered the distance of 60 miles in about an hour and a half. Here we procured a fresh supply of gasoline and oil and took leave of civilization, for this was the last point where we expected to get supplies for some time. However, we were somewhat reassured to hear that there was a little store at Glen Spring, where we might be able to supply emergency needs.

South of Marathon the road for some miles passes through a broken and interesting country. Outcrops of white novaculite on some of the hills contrast strikingly with the brown of the plains or the verdure of the trees and shrubs that grow in the protection of the ridges. We did not stop here, however, but pushed on to Garden Spring, where we made our first halt for lunch.

The spring, which is the source of a small stream, issues from the clay banks and produces a bit of verdure and a tiny bog as it spreads out over the flat plain. Here a number of Cottonwood and Willow trees were growing. Some of the Cottonwoods (*Populus arizonica* var. *Jonesii*) were of large size and here, as about many of the other springs in this region, they serve as conspicuous land marks in an almost treeless land.

The Willow (*Salix Goodingii*) is usually also found where there is permanent moisture. Just beyond the influence of the spring the xerophytic flora held sway. *Lippia ligustrina*, *Acacia constricta* and *Mimosa biuncifera* were growing along the banks, and a little farther out *Fouquieria splendens* and various species of *Yucca* and *Opuntia* were conspicuous features of the desert landscape.

About twelve miles farther on we stopped again for a hasty inspection of the flora along a little rocky ravine that traversed the plain. Here we found the curious little Wax-plant (*Euphorbia antisyphilitica*,) from the thickly coated stems of which a wax used in the manufacture of candles and soap is obtained. The naked gray stems, erect and usually unbranched, form low mounds. The plants in the center of the groups which we observed here were about six decimeters tall, gradually diminishing in height towards the outside. A little shrub three or four decimeters tall growing on the dry banks was conspicuous on account of its purple plumose heads of flowers. This proved to be *Coldenia Greggii*, a plant of the *Boraginaceae*. Two other species, *C. conferta* and *C. tomentosa*, both of which are prostrate and barely woody, were growing near. *Mozinna sessiliflora* was in fruit, and *Leucophyllum frutescens* was just coming into bloom.

For many miles we were traveling over a flat dry country, with mountains seen in the distance on either side. The gravelly or white calcareous surface was usually destitute of any vestige of grass or herb but supported a scattered vegetation of shrubs and Cactus. Over wide areas in the more sterile parts the Creosote (*Covillea tridentata*) and the Tar-bush (*Flourensia cernua*) held undisputed sway, almost to the exclusion of all others. Both are strongly aromatic and ill-smelling, which perhaps accounts for their immunity from browsing animals, including even the not very fastidious goat. Along ravines and on the rocky and more uneven ground the flora was more varied. Here Mesquite bushes and various species of *Acacia*, *Mimosa*, *Yucca*, *Agave* and *Leucophyllum* were conspicuous, with the smaller forms of *Cacti* growing amongst and beneath them, and thus occupying in this strange flora the place of flowering herbs and grass in more favored regions. Several low or prostrate Opuntias were growing here, one of which (*Opuntia Schottii*?) sometimes covered several square meters with its creeping branches of small cylindric and remarkably thorny joints, forming a sort of turf, such as Dante might have pictured for the Infernal Regions. Tufts of Mamillarias and the deeply ridged heads of *Echinocactus horizonthalonius*, half buried in the dry earth and armed with stellate clusters of curved thorns of nail-like strength, were scattered here and there. But most abundant and conspicuous of all were the mounds of *Echinocereus mojavensis*, with their hundreds of closely crowded stems thickly beset with slender spreading white spines. Some of these groups were more than a meter in diameter and the tallest joints occupying the center were three or four decimeters in length. Some of the colonies were in bloom and the magenta-pink flowers were very showy.

The road through this section was good and although there was much of interest that we would have liked to have examined, time was pressing and we pushed on for some distance before stopping to examine and photograph an unusual *Yucca* that attracted our attention. The plants, which were growing in some abundance in a depression and along a small rocky stream, had simple or rarely branching stems one to two meters in height and thickly clothed with the reflexed dead gray leaves. This was surmounted by a dense crown, six or seven decimeters in diameter, of narrow rigid glaucous leaves, from the center of which sprung the slender stem and simple panicle of flowers, which together occupied about a third of the entire height of the plant. The leaves were much narrower and more crowded than in any of the other species of *Yucca* found here, and the plants had a very distinct and handsome appearance. This proved to be *Yucca rostrata*, a Mexican species not previously known as a native plant on this side of the Rio Grande, although Dr. Trelease reported seeing it planted along the Southern Pacific railway.

Towards evening we reached Tornillo Creek where we made camp for the night. The creek was flowing, perhaps as a result of recent rain, or it may be perennial here.

After pitching the tent and making other preparations for the night, I went down to the creek for water, but although the water was clear it was scarcely potable. As I was returning a coyote ran across the creek a little way below me, but before Murray could locate him with his gun he disappeared in the chaparral and ravines.

After breakfast the next morning we set out to explore the locality. *Acacia tortuosa* was abundant near the camp and the banks of the stream were lined in places with a growth of *Pluchea sericea*, a slender shrub one to two meters tall with pink or lavender flowers, and resembling somewhat in its habit of growth the Sand Bar Willow along northern streams. On low ground along the stream were some large trees of *Salix Goodingii*, and the Mesquite and Screw Bean (*Prosopis juliflora* and *P. pubescens*) were common in somewhat dryer ground. *Opuntia Engelmannii*, *O. arborescens*, *O. leptocaulis*, *Acacia biuncifera* and several other spiny shrubs formed impenetrable thickets in places, and large patches of *Opuntia Schottii* occupied open spaces. *Acacia occidentalis*, growing on the rocky slopes, had both flowers and young fruit. On the way back we killed a small rattlesnake, which was only about three decimeters in length and of a gray or stone color faintly mottled with brown, and not easily distinguishable from the similarly colored rocks and soil of the plain.

About nine o'clock we were again on our way southward. After going a few miles we stopped along another creek, or perhaps a branch of the one we had camped by; and here the Desert Willow (*Chilopsis linearis*) was in full bloom on the gravel bars, and near-by some tall shrubs of *Leucophyllum frutescens* were also loaded with a profusion of large pink blossoms, delicately marked with brown, purple and white blotches within the pubescent

corollas. A tall Composite shrub, with yellow flowers, somewhat resembling those of a *Coreopsis*, was also conspicuous. Some of the plants were fully two meters in height. Upon examination I found that it was *Gymnolomia tenuifolia*, although I have never seen it growing so tall elsewhere.

By noon we had reached a point opposite the Chisos Mountains, of which we had been getting glimpses for some distance back. Here the main group was in plain view but no details could be discerned, and the fantastic outlines of domes, peaks and spires outlined against the clear sky, as seen in the distance across the plains, presented a very curious scene. The silhouette was sharp and clear but only of a slightly deeper shade of blue than that of the sky itself, and indeed it looked more like the painted scene of some enchanted castle upon a painted background than the solid reality of granite peaks and cliffs interspersed with canyons and wooded valleys, that we knew it to be. The impression of unreality that the scene conveyed seemed to offer a significant explanation of the Indian name, which is said to signify "Ghost Mountains." At least, as the fancy struck me, I hoped that the name was not based upon a more vulgar superstition.

The day had grown very hot but there was no shade in sight, so we stopped by the roadside and had a hasty lunch with warm water from our canteens. Above the road on our left a rocky hillside was covered with Sotol (*Dasylirion texanum*), Lechuguilla (*Agave lecheguilla*) and other desert plants. So thickly was the ground covered with the spiny leaves of these plants that it was with difficulty we could pick our way amongst them when we went over to make photographs.

A little farther on we met a party of three horsemen returning from the river. They appeared to be stockmen or officers, but although they seemed familiar with the country they could give us little information about the localities in the mountains that we were seeking. They directed us, however, to a ranch some miles farther on and back from the main road.

The highway up to this point had been very good, being one of those constructed by the United States government to facilitate the movement of troops and supplies during the border troubles several years ago. We now turned off this road to make our way to the ranch and towards the mountains. Our first objective was Boot Spring, which we knew lay in one of the canyons back of the peaks in front of us. The reports we received at the ranch concerning the road to this locality were not very definite nor encouraging. The lady who answered our inquiries directed us to a road through the pastures which, she said, led to the foot of the mountains, where a lower camp used by the stockmen was located; there was no water there, but a trail led to a spring at the upper camp; and from that point another trail had been blazed across the mountains by a mining prospector, which, if we could find and follow it, would take us to the locality we were seeking.

The road we found ourselves on after entering the pasture was but dimly

marked and with branches leading off in various directions. Following some recent wagon tracks on one of these we started across the gradually ascending rocky plain towards the base of the mountains. The road rapidly became worse and the grade steeper and we made but slow progress. The tracks we were trying to follow proved to be a poor guide, as the driver had apparently gotten off the road and been forced to turn back more than once. Presently no sign of a road remained, or the way that had evidently once been followed had been washed out by floods from the mountains, and after going a little way in one direction we would find further progress barred by deep ditches or a surface overgrown with thorny shrubs and Cactus and too rocky to be followed. After spending several hours in this sort of travel we could get no farther, but we had now reached a point near the foot-hills of the mountains. Leaving the car here and taking with us our presses, kodaks, blankets and a small supply of provisions and water, we set out on foot to follow the road, which led up a small dry creek. This soon brought us to the stock pens of the lower camp, to which we had been directed. These were deserted, but a little farther up the canyon and nestling at the foot of the mountain was a little shack, without windows and apparently without any sort of furniture. Two young Mexican girls seemed to be the only occupants present. They seemed alarmed at our appearance, and as they did not speak or understand English, they could give us no information as to the direction of Boot Spring, but in response to our inquiries about "agua" they pointed towards the mountains.

In following the road along the side of the rocky creek we had noted the appearance of several new plants not found in the lower plain. Gregg's Ash (*Fraxinus Greggii*) was abundant on the dry banks and *Quercus Vaseyana* a little lower down. In more protected situations the Wild Cherry (*Prunus virens*) was growing and *Leucaena retusa* was in bloom in several places.

Above the camp the trail became steeper and as we were rather heavily loaded we found the going somewhat difficult. Some distance up the canyon we came upon two Mexicans, who were engaged in cutting Cedar trees, and later we met a third coming down the steep trail on a mule, which was also dragging a heavy load of Cedar poles. The muleteer seemed somewhat more intelligent that the others, but none of them could give us any information about localities in the mountains.

The flora at this level began to take on quite a different aspect, and we stopped to investigate and collect. Some of the interesting woody plants were *Juniperus pachyphlaea, Morus microphylla, Garrya Lindheimeri, Fraxinus cuspidata, Lonicera albiflora* var. *dumosa* and *Acer grandidentatum*. The Maple was rather abundant locally along the bed of the stream and under protecting bluffs. It is a small tree, or sometimes shrubby, with pale bark and crooked trunks and branches. The largest specimens seen here were six or seven meters tall. There was no fruit on any of them, but it is evidently the form described by Wooton and Standley as *Acer brach-*

ypterum, and although the leaves vary greatly and some of them look quite different from those of typical *Acer grandidentatum* in other localities, it is doubtful whether the two are specifically distinct.

In a rocky basin a little farther up the mountain side there was a large colony of Poison Ivy (*Rhus biternata*). The deeply-cut leaves of this species give it a distinct and handsome appearance. Some of the plants here were growing as upright shrubs or trailing over the rocks, while others were climbing to a height of several meters in the trees. The Wild Grape (*Vitis arizonica*) was also common here, and near by we saw the first specimens of the Cypress (*Cupressus arizonica*), which was one of the special objects of our search. The few trees seen here were of moderate size and we were unable to get fruiting specimens.

One of our chief concerns was to find water, and after searching several branches of the canyon without success we at last located the spring. A tiny streamlet was trickling from a mossy bank, and from this the water was led by an iron pipe to the concrete tank below, which furnished water for stock.

Selecting a level spot a few hundred meters above the spring we spread our blankets on a bed of leaves and Cedar boughs, and after getting supper and sitting for sometime by a huge camp fire we turned in to rest, but not until after we had enjoyed a cool bath at the stock tank. The next morning when we went down to the spring we found a large rattlesnake freshly killed, no doubt by some of the Mexicans, almost on the spot where we had disrobed in the dark on the previous night.

The Wild Cherry was common about the spring, some of the trees being 15 or 16 meters tall. On a moist bank below, a leguminous shrub, *Eysenhardtia amorphoides*, was growing, and with it a species of Dogbane, just coming into bloom. This resembled *Apocynum androsaemifolium* of the Eastern States, but proved to be *A. convallarium*. Near by I also collected *Asclepias elata* and several other herbaceous plants. The curious little Composite shrub, *Carpochaete Bigelovii* was common on rocky banks a little higher up.

After breakfast we repacked and set out to climb the mountain that rose ahead of us. There was no visible trail except for short distances where the Mexicans had dragged down Cedar logs. Some of these were so steep that it seemed impossible that even a mule could have gotten down them, had their hoof prints not been there as visible proof.

On the open slopes and ridges between the canyons many of the plants of the plains reasserted themselves and the only trees were a few scattered and stunted specimens of the Piñon (*Pinus cembroides* var. *edulis*) and of the Alligator Juniper (*Juniperus pachyphlaea*). The Gray Oak (*Quercus grisea*) was usually a low shrub, and such xerophytic species as *Cercocarpus paucidentatus*, *Mimosa biuncifera*, *Rhus trilobata*, *Condalia obovata*, *Adolphia infesta* and *Opuntia leptocaulis* were common, with Yuccas, Agaves, Nolina and Sotol scattered amongst them. Some of the Aloes or

Century-plants (*Agave applanata*) were sending up flowering stalks to a height of five or six meters, and the slender stems of the Sotol were nearly as tall. The Bear-grass (*Nolina erumpens*) was occasionally found on rocky banks and ledges, growing in large clumps with branching stems and spikes of flowers scarcely exserted beyond the protection of the rigid leaves, which were six to eight decimeters long, about a centimeter in width and with edges of almost knife-like sharpness. At this height we also began to see specimens of *Juniperus flaccida*, which is a beautiful tree with slightly pendulous branches and yellow-green drooping foliage.

When we had climbed to a considerable height and stood an top of the first ridge we were able to make a general survey of the surrounding country. Several high mountains lay ahead of us to the south and east, one of which we thought might be Mt. Emory, and another far to the right, Lost Mine Peak, but we were unable to make out from the map our exact location. Below, in the opposite direction lay the rocky plain over which we had traveled on the previous day. This was diversified by many low hills, but not a trace of civilization or human habitation could be seen. Far over the plain we could see the mountains of Mexico beyond the Rio Grande, blue and hazy on the horizon.

As this part of the mountains was as unfamiliar to Murray as to myself we decided that it would be imprudent to set out without a guide, and with our small supply of provisions and water to run the risk of getting lost in the labyrinth of canyons. Accordingly we returned to the car which we reached a little after noon.

After getting lunch and taking care of the plant collections we set out again over the difficult terrain we had traversed the day before. But this time the downgrade and our previous experience of the road proved such an advantage that we had little difficulty in getting over it and regaining the highway. There we turned south and proceeded to the settlement at Glen Spring. We found one or two white families and a number of Mexicans living there, but the place had a most dreary aspect. All of the buildings were of adobe and there was scarcely a sign of shade or vegetation to vary the grim monotony. The store proved to be a very small affair, but we were glad to be able to fill up our gasoline tank, paying forty cents per gallon for the fuel, and also to secure a few other needed supplies. At the time of the troubles with Mexico a few years ago this place was raided and robbed and several of the inhabitants were killed, by marauders from across the river. Many of the ranches in the Big Bend suffered similar depredation during the same time.

Turning back from this point we decided to go around the main group of the Chisos Mountains and to approach them from the north side. After leaving the highway we had to follow such roads as had been made through the great "pastures" for the accommodation of the few ranchers, but these we found fairly passable, although difficult to follow, and we made good time with few stops.

The vegetation was similar to that on the other side of the mountains, most of the country being without trees and with very few traces of grass or herbaceous plants, but with a scattered growth of Creosote, *Leucophyllum*, *Ephedra*, Cactus and other desert shrubs. *Koeberlinia spinosa*, sometimes called the Crown of Thorns, was frequent in places. This is usually a shrub, the naked green branches of which, thickly studded with stout thorns, form an impenetrable mass. Prairie rats and other rodents often select its base as a secure place in which to build their communal homes of earth, sticks and rubbish, and it also furnishes a favorite hiding place for rattlesnakes. Rarely it becomes a small tree; one specimen that I saw here being six or seven meters in height. Along a little dry creek bed I saw the common Misletoe of the region (*Phoradendron Engelmannii*) growing on *Acacia Roemeriana* and *Celtis laevigata* as well as on the Mesquite, which is its commonest host. The Indian Blanket (*Castilleja lanata*) was also collected near the same spot, and it was almost the only herbaceous plant seen in bloom.

Some time after dark we arrived at an abandoned adobe house, on a ranch that was familiar ground to my companion. The two-roomed structure had a dirt floor, and the door and most of the windows were out. Our flash-lights revealed an old rusty stove without pipe, a pair of deer antlers, some feed and other supplies, including a lot of material for bee hives and part of a box of dynamite. The place did not look exactly inviting, but as a shower came up, we decided to camp inside, and accordingly we proceeded to get supper on the old stove and to spread our blankets on the floor. The chief danger was from rattlesnakes, that are likely to be found in such places, but we looked about carefully with the flash-lights and found no trace of them, nor were we molested during the night.

The next morning we had a chance to look about and explore the immediate vicinity of the ranch. We were now approaching the mountains, which were in plain view, and the rocky plain was diversified with numerous mesas and rocky ridges. A small spring issued in a ravine near the ranch house, and some Willows and Cottonwoods were growing along this and about the pond that had been constructed close by. These appeared to be of the same species which we had seen and recorded before, but this was the first place on the trip where I had seen the Button-bush (*Cephalanthus occidentalis*), which was growing with them.

There were abundant signs of Indian occupancy about some of the mesas. At one of these where we made a hasty inspection, we found remains of rough masonry walls, showing evidence of fire. These probably represented house sites. There were also a number of pot-holes cut in the rocks, some of them having a depth of five or six decimeters and a capacity of two or three gallons. Their antiquity was indicated by the fact that the slow force of erosion had served to break down some of the ledges in which they had been cut and to overturn them. The ground on

all sides was strewn with fragments of flint, chalcedony and porphyry that had been used in making arrows and other stone implements.

Turning towards the mountains after leaving this desolate camp, we followed a rather bad road to the mouth of Oak Canyon, as it is marked on the topographic map. The ranch located here had the best improvements and surroundings of any we had seen in this part of the country. The house was of frame construction and with abundant shade, being situated in a grove of *Quercus Emoryi*. Water was piped from a spring some distance up the canyon, and the same source served to irrigate a little garden and some fruit trees, which were growing under the protection of the canyon wall. We found no one about the place, so taking our packs and collecting outfit and leaving the car there, we set out up the canyon towards the mountains. Emory's Oak, Hackberry, Walnut (*Juglans rupestris*), the Mexican Mulberry and other trees were growing along the banks of the stream, and vines of the Arizona Grape were climbing in some of them. The Maidenhair Fern (*Adiantum Capillus-Veneris*) was growing on wet banks along the brook, and its delicate green fronds contrasted strangely with the dry tufts of rock Ferns, such as *Cheilanthes Eatoni*, *Notholaena bonariensis* and *Pellaea Wrightiana*, which were growing along the dry ledges a little higher up.

The ascent soon became steep and difficult as the path wound up the mountain side. Near the top the Resurrection Moss (*Selaginella lepidophylla*) was common in the clefts of the rocky cliffs. As there had been no recent rain the plants were all dry and the fronds closely coiled into tufts or balls, which suggested the significance of the name Bird's-nest Moss, by which it is also sometimes known.

At one point near the top I descried a tall shrub that looked unfamiliar to me, and climbing down to it with some difficulty, I found it to be an interesting member of the Rose family, *Vauquelinia angustifolia*, a Mexican species that does not seem to have been recorded previously from this side of the Rio Grande.

We had probably ascended more than a thousand meters since leaving the ranch, and now we began a steep descent into the canyon. When we reached the bottom we found a little water running in the creek and an abundance of shade, both of which were very gratifying after the long hot climb. So we stopped here to have lunch before going farther.

At places where the canyon widened a little there was a considerable growth of both trees and shrubs. The commonest arborescent species were *Juniperus pachyphlaea*, *Quercus Emoryi*, *Q. grisea*, *Q. texana* var. *chisosensis*, *Celtis reticulata*, *Morus microphylla* and *Prunus virens*. Along the canyon walls I found the little shrub, *Bouvardia triphylla*, in bloom, its clusters of bright scarlet flowers making it a conspicuous object. *Vauquelinia angustifolia* was also growing here, some of the bushes being in bloom and others with old fruit. Along the rocky bed of the creek *Fallugia paradoxa* was in bloom, and on the low banks was a shrub with brilliant

red flowers, which I found to be *Anisacanthus insignis*, of the *Acanthaceae* family.

Following up the canyon for some distance we came out upon a broad open space at the foot of the higher mountains, which surround it on three sides. This is named Green Gulch on the map, but it is generally known as the Basin. There is a scattered growth of trees and shrubs here, in which the usual species of Oak, Piñon and three species of Juniper (*Juniperus flaccida*, *J. monosperma* and *J. pachyphlaea*) are most conspicuous, with Yuccas, Agaves, Nolina, Sotol, Cat-claws and other xerophytic shrubs occupying the more open and dry situations. All of the Junipers grow to a large size here and it was the only place where we found the beautiful *Juniperus flaccida* common.

After climbing one of the lower mountains, where we obtained a good view of the surrounding country, we returned through the deeper part of the canyon, this time following it down to the end, or at least as far as we could go. Below the place where we had entered we found *Pentstemon Havardi* and several other herbaceous plants in bloom. *Eysenhardtia amorphoides* was growing as a small tree six or seven meters tall, and *Clematis Simsii* was trailing along moist rocky banks. The canyon here became very narrow, and from the point where we stood there was a precipitous drop of perhaps a hundred meters or more to a lower level. The ranch from which we had started lay not more than a mile down the canyon below us, but the reason why the long detour and climb we had made to reach our present situation were necessary was now very plain. There was little or no water falling over the cliff at the time of our visit, but after a heavy rainfall it must be a rather impressive sight.

A passing shower that came up just as we reached the car gave proof that shelter is sometimes desirable even in this arid country. As there was still no one to be seen about the place we drove on some miles to the next ranch, at which Mr. Murray had stayed on a previous trip. As we drove up here we were met by a Mexican boy, who proved to be the only person about the place. However, accepting the hospitable customs of the country we went in and proceeded to make ourselves at home. The ranch house was typical of the better class of such structures in this part of the country. It consisted of two large rooms and a small kitchen and screened porch, the walls being of adobe or mud blocks and roofed with cedar poles and thatch, the whole covered thickly with adobe mud. The rough hewn or round timbers showed on the inside, but the place was not without some home-like comforts and it possessed a distinctive attractiveness peculiar to the region and to its surroundings. There was plenty of shade about the place, and water was supplied by a large open well. A large tree of *Salix taxifolia* in the yard had been transplanted, we were told, from a locality close by. The Mexican boy, Emanuel, prepared supper for us, but as he could speak no English our conversation with him was rather limited. After supper and the luxury of baths in a tub by the well we enjoyed a good night's sleep on the porch.

Early the next morning we were astir and after a hasty breakfast were soon on the way. A few miles out we stopped to inquire directions from some Mexican goat shearers who were encamped at a corral. They pointed out the road to Blue Creek and assured us that it was a "camino real" and practicable for automobiles, an optimism that our subsequent experience only partially confirmed. Our conversation was carried on partly by gestures, in which most of them were quite eloquent. There was a considerable number of men, women and children here, and the conditions under which they were living were to say the least extremely primitive. No shelter was apparent except the sheds which they shared with the goats. The green hides and the meat of some of the animals that had been slaughtered for food were hanging about and attracting great swarms of flies; and the odor from these added to the other aromas of the camp furnished a real incentive to hasten us on our way.

For some miles the road skirted the foot-hills, with some of the Chisos peaks in plain view. An intrusive dike across the plain could be traced for miles with the eye; in places it stood out as a perpendicular wall several meters in height. At one place a deer ran across the road over the open hills. It was the first we had seen, although they are said to be plentiful in the mountains.

When we reached Blue Creek we found it to be quite dry and the whole country had a parched appearance, although there was evidence of rain having fallen not long before. Near the head of the canyon there is supposed to be a small spring which we were particularly anxious to find so as to insure our water supply. However, a sharp lookout failed to discover it or any added trace of verdure that would indicate its presence. As the canyon was rapidly getting narrower and the road rougher and steeper we made slow progress and at last could go no further with the car; and so leaving it by the roadside we prepared our packs to continue the journey on foot.

Just then I descried a burro, with a little wooden saddle, such as is sometimes used by the Mexican peones, grazing in the chaparral, and on approaching we found that it had a mate similarly accoutred, and soon we saw the riders. An old man with an unusual abundance of white hair and whiskers and a little girl about eight or nine years old were the oddly assorted pair. They were having breakfast of black bread and water, and seemed to be traveling with no other outfit than a small tin canteen and a bundle or two not much larger than their water supply. The old man was evidently somewhat disconcerted by our appearance, but he appeared to be good natured and was very voluble in his Spanish, and interspersed his oration with frequent peals of laughter. We could make out little of what he said, but he was very positive in his negatives when we asked about water. A bundle of the green stalks of the Maguay (*Agave applanata*), freshly cut, was lying on the ground, and in answer to our questions he admitted that he was getting it to make "pouche" or mezcal, and it was perhaps

some natural uncertainty as to which of the conflicting views regarding his industry, both prevalent on this side of the river, we were likely to take, that accounted for his uneasiness.

Amused but not much wiser after this encounter we again set out up the trail to try to discover Boot Spring. We had not gone far when we met a Mexican riding a mule and driving two others loaded with packs, and a little behind him two young American geologists, also riding mules, who were returning from a reconnaisance in the mountains. It was a relief to meet someone again who could speak English and give us some definite information. We learned from them that they had camped at Boot Spring two nights previously, although not knowing the name of it; and they gave us directions about the trails over the mountains, estimating the distance to the spring at about eight miles. With this information we set out in better spirits.

A little farther up we found *Fraxinus Greggii* abundant growing with *Porlieria angustifolia*, *Ungnadia speciosa*, *Forestiera neo-mexicana* and various other shrubs.

After following the steep and winding trail for several miles we came out into a pretty little mountain valley, called Laguna. The elevation here was about 2000 meters and the valley was perhaps not more than a quarter of a mile in length and about half as wide. A few groups of Piñon and Juniper were scattered about and there were some small groves of the Gray and Texas Oak along the margins; but most of the area was open and covered with tall grass, which was now all dry. After rains water evidently stands for sometime on the flat or depressed surface, which accounts for the somewhat marshy appearance of the tufted grass. The ruins of a small log cabin here was the only sign of civilization we had seen in the mountains. We learned that it had been built some years before and occupied by a man and his wife, who had kept a herd of cattle in the mountains. There seemed to be no permanent water supply near, which perhaps accounted for the abandonment of the place. Under some of the Oak trees near the cabin *Mahonia haematocarpa* (*Berberis haematocarpa* Wooton) was growing, some of the plants being in bloom.

Mt. Emory, the highest peak of the Chisos group (2400 meters or 7835 ft. high) lay just to the east of us and we skirted along its base for some distance, but we did not attempt to climb to the highest point, as we were anxious to reach the spring before nightfall. The slope we were traveling was well wooded and had more the appearance of a forest than anything we had seen in these mountains. *Quercus texana* var. *chisosensis* and *Q. grisea* were the commonest trees, with occasional Junipers, Madronas (*Arbutus texana*) and Wild Cherries. At the highest point of the pass there was an indication of a more boreal flora in the presence of such woody plants as *Rubus trivialis*, *Celastrus scandens* and *Symphoricarpos oreophilus*. A little lower down we came out upon a level strip of ground bordering a small creek, and here we were rejoiced to see the grove of Cypress trees for which we had been searching so long.

This tree (*Cupressus arizonica*) appears to be very local in the Chisos Mountains, although there are many trees of all sizes here. It is the only locality where it has been found in Texas and it is far removed from the other nearest stations in Arizona and Chihuahua.

Some of the trees here are quite large, the largest being probably over 20 meters (65 to 70 ft.) in height and with a trunk diameter of over a meter. The conical crowns are rather open, and the straight clear trunks are clothed with reddish-brown, comparatively smooth and slightly fibrous bark. In the younger specimens the crown is often slender-pyramidal and the branches slightly drooping. The leaves are eglandular and the fruit differs somewhat from that of typical specimens from other localities, being distinctly smaller and with longer and sharper horn-like bosses. In this respect it seems to be intermediate between *Cupressus arizonica* and *C. lusitanica*, some of the cones resembling those of the latter more closely than they do those of the species to which it has been referred. Further study may prove this to be a distinct variety, but I hesitate to consider it such without having a chance to compare material from a number of the trees, with this idea in mind.

Several of the Cypress trees were growing along the bed and banks of the little creek, below the terrace. One very large one was almost overhanging the spring, which we found here, and there were a number of small seedlings along the gravel bars. The spring was nothing but a stagnant pool of black water at the dry season of our visit, but although it did not look very inviting we drank of it and refilled our canteens, since water is too scarce and too important a consideration in this region for one to be over fastidious in its use. *Rhamnus Purshiana* was growing just below the spring and the Maple, Wild Cherry and Wild Grape were abundant. *Apocynum cannabinum* was also growing on the gravel bars, and I found *Asplenium resiliens* in clefts of the porphyritic rocks overhanging the spring.

As we were but poorly provided for spending the night here and were in a hurry to proceed, we decided to cut our investigations short and try to make our way back to the car. By taking a shorter cut through another pass we succeeded in doing this before nightfall, and as there were no advantages for a camp where we were we drove several miles down the canyon before stopping, some time after dark. Here we were on level ground, but we had no water except what we had brought with us, and wood was also scarce. However, we managed to make a fire from dry sticks of the Creosote-bush, and this served for making coffee as well as giving a cheerful light.

Early the next morning we were on our way down the canyon of Blue Creek; and we were now leaving the main group of the Chisos Mountains and turning towards Castellan, on the Rio Grande. The rest of the way was as unfamiliar to Murray as to myself, but the road, if it might be called such, followed the bed of the creek, and as the latter ran in the right direction we surmised that we might continue down it for the entire distance.

There was no distinct roadway except in places, the tracks of the last traveler, who may have passed over it weeks before, having been obliterated by subsequent rain; and we had to pick our way cautiously amongst the various channels and rocks.

The descent rapidly became steeper as we proceeded and the going worse. We congratulated ourselves that we were traveling with the grade, as it seemed impossible that a car could be made to go in the opposite direction. We were not without misgivings, however, as the idea occurred to us that we were burning our bridges behind us and had no definite information as to whether we were on the right way or where we were likely to come out.

As Murray drove I went ahead to pick out the way and remove rocks or fill in holes and sometimes to cut down obstructing shrubs. After several miles of such going we could distinguish no more trace of the road, and at last we came to a place where a dike of igneous rock lay across the creek bed, forming a sheer wall and a descent of several feet, quite impassible for any sort of a vehicle.

The situation was not a cheerful one. Our water supply was low; the sun was well up towards the zenith and scorching hot; there was an unsurmountable bluff on each side of us as well as the drop in front; and behind us lay the miles of loose rocky slope we had just come down with so much difficulty. Besides this we were in an almost uninhabited desert country, with our gasoline supply running low and no chance to replenish it or to secure help perhaps in a day's journey, even if we had known in which direction to seek it.

Under the circumstances we decided to camp where we were. So we made coffee and had lunch, after which I worked over my plant collections under the protection of an overhanging bluff, there being no other shade. Before I had finished this task the sun had gotten around to a point where it reached me and the heat was almost unsupportable.

However, the place was not without botanical interest, and the instinct of the scientist prevailing I made a hasty exploration. Along the low rocky bluffs *Tecoma stans* var. *angustifolia* was conspicuous with its clear yellow trumpet-like blossoms. A curious vine of the Malphigaceae, *Janusia gracilis*, and an Asclepiad, *Philibertia linearis*, were climbing over bushes, both of them being in flower. *Krameria glandulosa* was also growing along the rocky banks, and several herbaceous and shrubby plants were in bloom along the gravelly creek bed. A shrubby *Menodora*, with bright yellow flowers, was collected here, which may be an undescribed species.

Slight as the chance of getting back over the way we had come seemed to be it appeared to offer the only possibility. So we turned the car about, repacked it, and under the spur of necessity made a start. Fortunately we found a little pool of black water at the foot of the rocky barrier in the creek bed, and from this we filled the radiator and all the vessels we had.

Running all of the time in low gear and picking our way amongst rocks and shrubs and in places literally building a road as we went, we made slow progress. Over particularly bad places I would push, adding such power as I could to that of the overheated engine. Every few rods we had to stop to cool the motor, as the water in the radiator would be boiling and when the cap was removed it shot up like a geyser. The temperature in the close canyon aggravated this, as it was probably above one hundred degrees, Fahrenheit, in the shade, and there wasn't any shade. There were short stretches of gravel over which it was possible to make more speed, but we were probably not able to average more than two miles an hour. After an hour or so of this we had used up so much of the water, including part of our drinking supply, that I went back to the water hole with buckets to replenish it. To add to our difficulties we discovered that when the car was on a steep incline it was losing gasoline from a leaking valve that we could not tighten. A little way beyond the place where we stopped for me to make the trip back for water we discovered a stock tank, fed by a tiny spring, which we had not noticed on the way down. From this we were able to secure a better supply of water than we had had for two or three days. A few miles farther on we were rejoiced to see a road leading up from the creek valley to the higher plain, which was evidently the one we should have taken but had overlooked in coming down. But our troubles were not yet over. The hill was steep and about an eighth of a mile in length, and the way up was more like a ravine than a road, having a surface of loose rocks and gullies washed out by the floods of many years. Murray made several attempts at it but with the hot engine and heavy load was unable to reach the top, and each time had to back down and take a new run. Finally we decided that the only chance lay in completely unloading the car, which we did, and at last succeeded in getting it to the top. Then we proceeded to carry the heavy bundles of plants, collecting supplies, camp outfit and other things up the steep slope and reload them on the car.

It is hard to realize the relief we felt on finding ourselves out of this difficulty and once more on a comparatively level and passable road. There was still two hours or more of daylight, and we stopped a few miles farther on to explore some curious eroded pinnacles, known as the Chimneys. There was not much of botanical interest here except several sorts of Cactus, including a low-growing *Opuntia* with long black spines. The Indians had evidently used the place for a camp, the overhanging ledges of some of the mesas furnishing the only shade to be had on the treeless plain. Portions of the cliffs were covered with crude figures of men and monsters, mingled with more conventional designs, incised in the soft limestone. At another point we found the picture of a horse painted in shades of ochre, and displaying rather more skill than is usual in Indian art.

Some distance beyond the Chimneys we descried the welcome sight of a group of Cottonwood trees to the left of the road. In this part of the

country Cottonwoods and Willows are a certain sign of the presence of water; and we hastened to reach them and make camp for the night. It proved to be the best spring we had found on the trip, and the small clear stream that was issuing from a clay and gravel bank not only furnished us with a supply for our canteens and other camp needs, but we were also able to use one of the deep pools some distance below for a bath tub, a luxury that went far towards compensating for the hardships of the day. The only serious drawback that we found at this camp was the swarms of ants that invaded it. But we were not in a humor to be critical about little things; so we did not regard them too seriously, nor even the visit of a snake of a harmless species, that came to investigate our dinner table.

The Cottonwoods about the spring were of the same species that we had seen elsewhere, and there was little else in the way of tree growth. On the higher ground close along the stream thickets of Mesquite and several of the other spiny shrubs of the region occurred, but there was nothing worthy of note. The herbaceous growth about the spring was very sparse, the most conspicuous plant being *Samolus ebracteatus*. A little farther down on the rocky plain the Screw-bean (*Prosopis pubescens*) was growing, and under it the tiny little shrub, *Ruellia Parryi*, and an herbaceous Crucifer, *Dithyraea Wislizeni*, were blooming.

Somewhat reluctantly leaving this camp we set out the next morning for Castellan, which we reached about nine o'clock on Sunday morning. This little settlement was formerly called St. Helena, and during the border troubles a considerable body of troops was stationed here. The remains of barracks and stables are still to be seen and one of the more substantial adobe buildings erected at that time is now occupied by the general store, where a considerable stock of merchandise is carried to supply the scattered ranchers and the Mexicans from both sides of the river. The store was open and doing a brisk business and we were able to fill up our gasoline tank and make other purchases. During our strenuous experience of the previous day neither of us had dared to investigate the fuel supply, but we were not surprised now to find that scarcely an inch of gasoline remained in the tank.

As we planned to visit the Grand Canyon some miles away over a rather bad road, we unloaded our heavier packages at the store. The road led through the valley and over low hills, most of the country being bare or with a scanty growth of Mesquite and Cactus. Close along the river banks there were sometimes a few Cottonwoods or Willows or patches of *Baccharis glutinosa*, but generally there was little or no tree growth even there.

The canyon is rather impressive where we entered it at the south end. The almost perpendicular cliffs rise on either side to a height of 600 meters or more, and they are much higher in parts of the canyon. The river makes a sharp turn as it breaks through the rocky barrier and flows along the foot of the cliff, which is on the Mexican side. In the opposite direc-

tion the high bluffs extend for a long distance along a little creek, which perhaps occupies a former bed of the river. The canyon, which is several miles in length, has been cut through the massive beds of the Edwards limestone, a formation of the Comanchean series. In places it is very narrow and the walls are often perpendicular or overhanging. At places great detached masses that have fallen from above are piled up at the base of the cliffs or stand out in the channel of the river, and the swift flowing stream dashes against them in its impetuous course. There was scarcely any woody growth in the canyon except a few of the common shrubs of the plains on the higher benchs. This is perhaps due to the destructive force of the great floods that must sweep through it when the river is high. We were only able to penetrate it for about half a mile before we found further passage blocked by the swift current impinging against the foot of the bare cliff.

After lunch we took a swim in the river and then drove several miles to another locality, which has been the subject of some controversy. It is generally known as the Petrified Forest, and the proposition has been made to set it aside as a state park. There is evidence of former volcanic activity here on all sides. The most conspicuous object is a small mountain, the walls of which are in places stained and streaked with colors almost as brilliant as those of a Navajo blanket. In striking contrast to this a light chalk-like deposit forms the truncate summit of the peak. The lower slopes are covered with lava, and the whole hill has the appearance of a volcanic crater, which after becoming extinct may have had a small lake in the center in which the light-colored stratified material was deposited.

On the slopes of a somewhat lower hill nearby are the peculiar formations that have given rise to the theory of a petrified forest. Several of the supposed tree trunks lie prostrate, one of which has a length of several hundred feet and a diameter of perhaps thirty feet. Another that is standing upright appeared to be thirty or forty feet tall, and there are "stumps" of several others. The silicious material of which these columns are composed has a coarse fibrous structure and a somewhat ligneous appearance. However, they are probably of purely mechanical origin, and may have been cores of mineral matter forced up through chimneys in the old volcanic floor, which having later been removed by erosion left the harder material standing out in relief. Whatever its geologic history the locality is a most interesting one. Chalcedony, agates and other silicious minerals are abundant and there is evidence of copper in the green stains of some of the rocks.

On returning to the store at Castellan we met a representative of the State Agricultural Experiment Service. There is a station here where an investigation of the native Malvaceous plants is being made at present, to ascertain whether any of them act as hosts to the pink boll worm, which is a serious menace to the cotton crop in southern Texas. Pressure of time and other plans forced us to decline an invitation for a longer stay at the station, and we hastened on towards Terlinguas.

The village of Terlinguas, occupied by the Mexican workers in the quicksilver mines, was a most curious and interesting sight, and we had to rub our eyes to convince ourselves that we were not amongst the natives of some primitive foreign clime. The low flat-topped huts, composed mostly of upright poles, mud and thatch, are scattered about promiscuously among the pens of goats and burrows, which useful domestic animals seem almost as numerous as the progeny of the dusky human inhabitants.

That night we camped on Terlinguas Creek, about ten miles from the village, where a little water, unfit for drinking purposes, was found. There were some Cottonwood trees of the usual variety near the creek, and we at first planned to pitch our tent under these, but swarms of little red ants that infested the place drove us away. After trying several places we at length spread our tarpaulin and blankets in an open space that seemed to be comparatively free from the pests, but no sooner were we located than they seemed to spring up from the dust, and we had little peace from them through the night.

We planned to reach Alpine the next day and the roads being good it was an easy drive of only a few hours. The country through which we were passing was comparatively level but with low hills and ridges at intervals and several groups of mountains visible in the distance. We climbed a high bluff along one of the streams to a rock shelter once occupied by the Indians. In the dry rubbish strewn over the floor we succeeded in uncovering fragments of rope and basketware made from leaves of Nolina and the fiber of the Maguay. We also found several cobs of the primitive corn raised by the Indians. These were not more than six or seven centimeters in length, and they showed evidence of having had five or six rows of grains.

Along the rocky wall just below the cave several shrubs were growing, amongst which were *Cowania ericaefolia* and *Buddleia marrubiifolia*, both of which were in bloom.

A little farther on we found *Acacia occidentalis* and *A. Schottii* growing as low shrubs along rocky hillsides. The curious little Star Cactus, *Ariocarpus fissuratus*, was also growing here, the plants being almost buried in the dry calcareous soil. Shark teeth and other fossils collected on an eroded hillside near here indicated that the formation was of Upper Cretaceous age.

We arrived at Alpine shortly after noon, our car loaded to capacity with the spoils of the trip, which while representing only a small part of the flora of the Chisos Mountains and of the Big Bend, embraced at least most of the woody plants, including a number that are rare and little known.

The geographical position of the Chisos Mountains and of the Big Bend area in which they lie is one of the factors which contribute toward making the country one of the most peculiar and interesting botanical regions in the United States. For while it does not extend so far south by three degrees of latitude as does the extremity of the lower valley near Browns-

ville, it nevertheless is the most southern part of western Texas and of the entire arid southwestern part of the country, and the salient which it occupies in the bend of the river carries it deep into adjacent Mexican territory on three sides, with its extremity almost as far south as the middle of Lower California. The extreme aridity of the climate, the average annual rainfall being in most parts less than fifteen inches, and the great diversity of soil and geological formation, as well as the considerable range in elevation are of course dominant factors in accounting for the varied and unusual flora. Due to the sparsity of settlement and the impossibility of agricultural improvement over nearly all of the area it remains almost entirely in a state of nature, a condition that is not likely to be changed materially for a long while, at least under any conditions that we can foresee at present. The Chisos Mountains, situated as they are near the southern extremity of the area and close to the river that forms the international boundary, are widely separated by great stretches of desert from any region of similar topography. The higher peaks of the mountains here rise from 1000 to 1800 meters above the surrounding plains, and this difference in elevation, together with the protection afforded by the deep canyons and the somewhat greater amount of moisture received in the form of showers and mist from passing clouds which they intercept, furnishes favorable habitats to many plants not found elsewhere in the United States, and to others that are known only from stations hundreds of miles away.

It is not surprising, therefore, that every expedition and all collectors who have gone into this region have been rewarded by new and interesting discoveries, and it is reasonably certain that more thorough and systematic exploration would result in many others. The inaccessibility of the region and the considerable difficulties still to be encountered in traveling through it, some of which are indicated in this narrative, make it improbable that the flora will be known in complete detail for many years to come.

LEAVES FROM A COLLECTOR'S NOTE BOOK

ERNEST J. PALMER

Page, Okla., April 14th, 1928.

While coming down the steep slopes of Rich Mountain this morning I found several shrubby specimens of *Cotinus americanus* in a rocky ravine, 75 or 80 meters above the creek valley.

This rare and interesting tree was originally discovered by Thomas Nuttall on a bluff of Grand River, or as it is now called the Neosho River, thirty or forty miles above its confluence with the Arkansas. Since that time it has turned up in a number of isolated localities in the Ozark region of Missouri and Arkansas, as well as in northern Alabama and western Texas, but so far as I know it had not been collected again in Oklahoma.

Nuttall's station is north of the Arkansas River and about 100 miles from here.

In the Ozark region the Smoke-tree seems to be limited to rocky bluffs and hills along the valleys of the Arkansas and White Rivers. It is most abundant and of the largest size on the dolomite bluffs and adjacent bald knobs along White River, where it sometimes becomes a tree ten meters or more in height and with a trunk diameter of over three decimeters. In the Arkansas River valley it grows along high sandstone bluffs, with a west or south exposure, where it was first found several years ago near Van Buren by Mr. G. M. Brown.

Houston, Texas, April 15th.

This morning I accompanied Mr. Edward Teas to his nurseries in Conroe County. The plantations are located in a clearing of typical piney woods, as it is known in this section. The soil is a fine sandy loam rather rich in humus when first cleared. The principal forest growth is Old Field Pine (*Pinus taeda*) interspersed with a large variety of deciduous trees and shrubs.

After we had inspected some of the interesting collection of trees in the nursery and admired the brilliant display of Verbenas, Bluebonnets and other bedded plants, Mr. Teas conducted us through the woods to a little bayou, where last year he discovered the Choke Cherry (*Aronia arbutifolia* f. *macrophylla*). We found several of these shrubs growing along the banks, the plants being already out of bloom but with young fruit.

This is the third station so far found in Texas for the southern form of this typically eastern American genus, and it considerably extends the westward range. The other stations are near Bland Lake, San Augustine County, where the type of the large-leaved form was found, the plants there attaining a height of from five to seven meters and being somewhat arborescent; and along the borders of a sandy bog, in the suburbs of Texarkana, just within the state line.

Sanderson, Texas, April 25th.

On several previous trips to and from western Texas I have looked eagerly down into the deep canyon of the Pecos River, where the Southern Pacific Railroad crosses it on the high bridge. The bridge is more than 330 feet above the river, and with the canyon forms one of the principal scenic features of the rather monotonous and dreary stretch of arid plain and desert between Del Rio and Alpine.

Leaving most of my outfit at Sanderson I boarded a local train yesterday morning and got off at the flag stop, known as Viaduct, on the west side of the river, where we arrived shortly after noon. My entire equipment consisted of plant press, kodak and a little knapsack, containing a light lunch and a few indispensible collecting supplies; and as the country is but sparsely inhabited and without any accommodations for travelers, I felt a slight thrill of adventure in thus plunging into the unknown. This historic

river was formerly supposed to mark the last boundary of civilization, and "the law west of the Pecos" was the law of the gun, the strong arm and Judge Lynch.

The river at this point has excavated a deep narrow canyon in the Edwards limestone, a heavily-bedded formation of the Comanchean series. The canyon walls are in most places almost perpendicular, rising to a height of from 80 to 100 meters above the bed of the river, and I went some distance below the bridge looking for a ravine or place where it would be possible to descend to the lower level. Not finding this I went back for nearly a mile along the railway, following a side canyon, before I found a place to get down into it.

The country was extremely dry and no herbaceous vegetation was apparent on the rocky plains above the canyon. The most conspicuous plants were Yuccas and Opuntias of several species, Gregg's Ash (*Fraxinus Greggii*) and the curious Candlewood or Ocotillo of the Mexicans (*Fouquieria splendens*) with its straight simple branches, two or three meters high, surmounted by a tuft of brilliant scarlet flowers, suggesting, I suppose, the popular name from a fancied resemblance to the flame of a candle. Along rocky ledges bordering the cliffs the Resurrection-plants (*Selaginella lepidophylla*) were very abundant, and there were dry tufts of several ferns, but with no sign of recent growth.

Descending with some difficulty into the canyon, which at this point was 50 or 60 feet deep, a striking change in the vegetation was apparent. There was no water in the canyon and scarcely any herbaceous growth, but a variety of trees and shrubs were flourishing, many of them being in flower or fruit. Amongst the most conspicuous were *Quercus annulata*, *Q. Vaseyana*, *Celtis reticulata*, *C. laevigata* var. *texana*, *Acacia Roemeriana*, *A. Berlandieri*, *Sophora secundiflora*, *Leucaena retusa*, *Ungnadia speciosa*, *Rhus virens*, *Forestiera neomexicana* and *Cercis reniformis*. *Lucaena* and the two species of *Acacia* bore a profusion of flowers and were hosts to many insects. The broad leaves of the Texas Red-bud (*Cercis reniformis*) were a striking contrast to the small or dissected foliage of most of the other plants, but it was by no means common. The Mexican Buckeye (*Ungnadia speciosa*) and several of the other trees and shrubs were also in bloom.

Huge detached masses and boulders of the limestone were piled up in the canyon, in places almost obstructing passage, and there were evidences in the form of drift left high on the walls and trees of the great floods that have rushed through it in times of torrential rain. *Karwinskia Humboldtiana* was abundant near the river and here also I found *Prunus minutiflora*.

Proceeding into the main canyon I passed under the high bridge and began making my way down the bank of the river, which is here lined with a dense growth of small trees and chaparral shrubs, rendering progress in places anything but easy. *Salix nigra* var. *Lindheimeri* and *Baccharis glutinosa* were abundant near the normal water line and also great clumps

of the cane-like grass, *Arundo Donax*, and the smooth-barked shrub or tree, *Nicotiana glauca*. The two last mentioned are both introduced plants, the former coming from the Old World and the latter from South America. This curious arborescent representative of the Tobacco family is thoroughly established and is abundant along the lower courses of the Pecos, the Rio Grande and other streams of southwestern Texas.

On the higher banks and talus slopes between the river and the canyon walls the shrubby growth is often dense but it varies in character according to the amount of exposure or the protection afforded. A zone of typical chaparral occupies the intermediate ground in many places. This is quite similar in composition and appearance to the growth found along the coastal plain to the south and east, but the conditions here are too arid for it to become established beyond the protected canyon. Amongst the commonest shrubs of this formation are *Celtis pallida*, *Colubrina texensis*, *Condalia obtusifolia*, *Porlieria angustifolia* and several species of *Acacia* and *Mimosa*. Farther up, on somewhat exposed rocky slopes and ledges, this association gives place to a more xerophytic one, in which *Ephedra antisyphilitica*, *Mozinna sessilifolia*, a curious little Euphorbiaceous shrub locally known as Leatherwood, the Candlewood and several species of *Opuntia* and *Yucca* are most common. Near the base of the high cliffs, that afford a measure of protection from the scorching sun, are found the Wild China-tree or Soapberry (*Sapindus Drummondii*), the Mexican Buckeye (*Ungnadia speciosa*), the evergreen Sumach (*Rhus virens*) and the Cat Brier (*Smilax Bona-nox*). In one of the small ravines below the canyon wall I also found an abundant growth of a scandent species of Poison Ivy (*Toxicodendron biternatum* Greene), which was climbing to a height of several meters on the face of the limestone cliff and into small trees and shrubs. The deeply-cut foliage of this plant gives it a distinctive and handsome appearance. I remember having found it also, several years ago, in the canyon of Devil's River. Along the base of the bluff a little lower down a woody *Cardiospermum* was growing, but it was not yet in flower.

As the day was hot and I had not come upon a spring I was at last constrained to try the river water, which was clear and flowing, but one taste of this sufficed, as it was extremely brackish and bitter.

Before leaving Sanderson, and also from a chance acquaintance on the train, I had made inquiry and been told that there was a white family living in a ranch house near the highway bridge, some miles below the railway, and I had hoped to find lodging there for the night. Towards evening I came in sight of the bridge and little house, and here I found an old Mexican cooking supper over a camp fire. He spoke fairly good English and in answer to my inquiries he told me that the house was vacant except for some highway workers who were camping there, and with whom he was working. He gave me to understand that he was in charge of the place and said that I might stay there for the night if I wished, and he also

invited me to have supper. Seeing no alternative except sleeping out in the canyon, where, aside from the discomfort, there might have been some danger from snakes or scorpions, I readily accepted his hospitality. The meal consisted of a stew of bacon, onions and chili pepper, very hot according to the Mexican taste, with black coffee and a sort of bread in the form of cakes or thin loaves baked in a covered skillet over the camp fire. During the meal an old white man and his son joined us and a number of other Mexicans came up and camped at a little distance. To my further inquiries about lodgings the "Americano" did not at first seem as responsive or hospitably inclined as was my Mexican host, and I could not determine which of them was really in charge of the camp. The old man seemed rather suspiciously curious about my business and reason for appearing there, which perhaps was not altogether unnatural. The Mexican, however, did not seem to share this suspicion but appeared to regard it as quite natural that I should be collecting plants, and he looked over my specimens with interest, telling me the Mexican names of most of them. It is a curious fact that the ignorant American usually seems less inclined to take an interest in nature and is not so well informed regarding natural objects and places of interest in his locality as are the men of more primitive races.

After supper cigarettes and conversation soon put us on good terms, and they assigned me the best accomodations they had—an old wire cot without bedding in a screened porch of the little house. The two white men occupied an adjoining room, sleeping on the floor, and the Mexican found quarters elsewhere. I slept with a feeling of perfect security, inspired by my knowledge of the country and the people, although not with the greatest comfort. At the earliest sign of daylight we were up and soon had breakfast, consisting again of black coffee and bread with the addition of "frijoles," cooked in the Mexican fashion. Taking leave of my friends of the camp I started to walk down to the Rio Grande, which they told me was less than a mile below. As an illustration of the hospitable customs of the country, I was unable to persuade either the white men or the Mexican to accept any compensation for my lodging and meals.

Below the bridge the valley begins to widen and several additional species of trees and shrubs appear. The chaparral occupied the higher portions, and in the deeper alluvial ground *Fraxinus Berlandieriana, Prosopis juliflora, Salix nigra* var. *Lindheimeri* and a shrubby form of the Sand Bar Willow (*Salix longifolia* var. *angustissima*) were growing.

One of the most striking plants of the chaparral is the Soap-bush, as it is known in southern Texas (*Porlieria angustifolia*), of the Lignum-vitae family (*Zygophyllaceae*). This was quite common in dryer situations, sometimes growing as a low shrub with stout crooked branches spreading near the ground, apparently due to a sort of pruning of the young growth by grazing animals; elsewhere it attained a height of four or five meters with numerous stout and erect stems. Some of the bushes had a profusion of the deep violet flowers and some half developed seed pods.

The mouth of the canyon is several hundred yards in width and is bounded by bold promontories that continue as a line of high bluffs along the American side of the Rio Grande. The locality is much frequented by fishermen and campers, although none were there at the time of my visit, and there were signs of a lively international trade, in the form of broken and empty bottles scattered in great quantities through the chaparral. The Mexican side of the river was low and covered in places with thickets of Willows, *Baccharis glutinosa*, *Arundo Donax* and similar growth. My friends of the road camp had warned me that there had recently been some shooting across the river, and I was somewhat wary of exposing myself there, although there probably was really little danger except to such as were engaged in contraband traffic or the excesses that grow out of it.

Going back along the east bank of the Pecos I decided to cross the river some distance above the highway bridge. This I easily accomplished by removing my boots and wading across at a shallow point, the water being nowhere more than knee deep. With some difficulty I climbed the bluffs and came out upon the highway and the dry rocky plain that it traverses. Here I took several photographs of the desert flora, of which Yuccas, Opuntias and the Candle Bush were conspicuous features. A little farther on I was overtaken by a party of fishermen, whom I had encountered in going down the river on the previous day, and I rode with them to the little station of Shumla where we enjoyed the luxury of cold drinks and lunch.

Having three or four hours to wait here for the train I spent it in exploring another deep little canyon leading down to the Rio Grande, which is less than a mile from the station. This was in all respects similar to the one I had first entered on the previous day, but it added several woody plants not seen in the former. *Bumelia texana* was growing here as a shrub less than two meters high, and all of the plants were badly infested by some insect that caused a swelling of the young branchlets where eggs were deposited. In the protection of the high perpendicular bluffs that formed the canyon walls some of the shrubs attained the dimensions of trees, although shrubby in form. Specimens of *Quercus Vaseyana* were noted fully ten meters in height and with trunks three decimeters in diameter. *Leucaena retusa* grew to a height of eight or nine meters and *Ungnadia speciosa*, *Sophora secundiflora* and *Porlieria angustifolia* were fully six meters high. *Smilax Bona-nox* and *Vitis Longii* were climbing in trees and shrubs close to the canyon walls and *Porophyllum scoparium* was growing in clefts of the limestone.

Uvalde, Texas, April 30th.

This flourishing little city, one of the prettiest and most attractive in southwestern Texas, is situated near the head of the Leana River, a tributary of the Frio. It is only a small intermittent stream here, with a few water holes at intervals along its course, some of which are fed by springs that seep through the clay or gravel banks. The Nueces River

flows a few miles to the west, and although it also is often dry in part of its course, it is one of the most important rivers in this part of the state.

Today I followed the Leana for several miles below the town. A considerable tract has been set aside for a park, and this is largely in a state of nature except for the clearing away of undergrowth and the opening of roads. Live Oak and Pecan are the principal trees, with some Mesquite, Hackberry and Cedar Elm (*Ulmus crassifolia*) in the more open parts.

For some distance down the river the banks are low, with occasional bluffs only a few meters in height, cut through the soft conglomerate of the Uvalde formation, a diluvial deposit of comparatively recent geologic age. Beyond the meandering rocky bed of the stream alluvial flood plains have scarcely begun to develop. Close to the river I examined some rather large trees of *Celtis laevigata* var. *texana* and *Morus rubra*. Live Oaks overhung the banks in most places, often festooned with Grape vines (*Vitis Berlandieri*), and *Rhus Toxicodendron* and *R. rhomboidea* are common shrubs. Usually the Pecan is the most abundant tree, and it often attains a height of 15 or 20 meters. Along wet banks and the margins of water holes there are some fine beds of the Maidenhair and Shield ferns (*Adiantum Capillus-Veneris* and *Dryopteris patens*) and two species of Water Pimpernel (*Samolus floribundus* and *S. ebracteatus*). A little distance back from the stream the semi-arid vegetation holds sway, with a variety of spiny shrubs and small trees. Yuccas, Cacti, Mesquite and the Huajilla (pronounced Waheyah) are common, the last often being the dominant plant in rocky ground. It is said to furnish excellent forage for sheep and goats, and I was told by ranchmen that they attribute the superior quality of the mohair produced here to the abundance of this shrub. The fragrant flowers of this species of Acacia (*A. Berlandieri*) are also of great value to the apiarists, who have developed an industry of considerable local importance.

May 1st.

Chalk Bluff, about 14 miles northwest of Uvalde, is one of the largest bluffs in this vicinity and probably along the whole course of the Nueces River. There is no settlement or village at this point, but a club house is located near for the accomodation of campers and fishermen. The river here has cut through the horizontal beds of Comanchean limestone, which are exposed in the bluff, rising to a maximum height of perhaps more than 300 feet (100 meters) above the stream, and extending along it for nearly a quarter of a mile. The exposure is mainly towards the east. On the opposite side the strata have been broken down and removed, perhaps owing to a difference in composition due to faulting.

I had made two visits to this locality several years ago, and on the first occasion found a large Cottonwood tree, which was later taken by Professor Sargent as the type of a new species, *Populus Palmeri*. The principal object of my present visit was to try to rediscover this tree and secure additional specimens of the leaves and a sample of the wood.

Leaving Uvalde on the motor bus I arrived about two o'clock in the afternoon at a point on the highway opposite the bluff and about two miles distant from it. Making my way across the rocky plain I crossed the river, which although running swiftly was shallow and easily fordable at this point near the north end of the bluff. A number of aquatic plants were growing in a spring that issued from the gravel here, and a little lower down and along the margin of the river I found the shrubby Willow, *Salix longipes* var. *venulosa*. Below the bluff and protected by it from the scorching rays of the afternoon sun there is a narrow strip of rocky talus, usually bare near the river but with some accumulation of soil and humus higher up. This is occupied by a rather dense growth of trees and shrubs as well as many herbaceous plants, several of which are very local and out of their usual range here. Pecan and the Texas Oak (*Quercus texana*) were amongst the commonest trees, with Black Willow (*Salix nigra* var. *Lindheimeri*) growing close to the river and *Celtis reticulata* in more exposed places. The Wafer Ash (*Ptelea trifoliata* var. *mollis*) and the Spice Bush (*Benzoin aestivale*) were abundant and both were in fruit. *Rubus trivialis* was growing amongst the rocks and *Clematis Simsii* and *Vitis Berlandieri* were climbing over rocks and bushes. In clefts of the rock near the base of the cliff I found a beautiful scarlet-flowered sage (*Salvia Roemeriana*) and the little tufted shrub of the Composite family, *Laphamia Lindheimeri*.

After some search and as I was almost ready to give up the quest I saw in the distance, in the valley and beyond the south end of the bluff, a large tree standing well above the surrounding growth. From its appearance I felt sure that it was a Cottonwood and upon making my way to it I found that it was the tree I was looking for. It is growing in moist alluvial ground near a spring, just below a little bluff on the east side of the river. This tree appears to be the only one of its kind in the vicinity, but it is conspicuous for size amongst the large Pecan trees and other species that surround it. I found some difficulty in reaching the lowest branches, but finally succeeded in getting a few leaves and a small specimen of wood.

May 2nd.

When I was in Uvalde about ten years ago Mr. F. Getsendener, then the editor of a local newspaper, told me of a very large Cottonwood tree he had seen on the Nueces River a few miles from Uvalde. As trees of the genus *Populus* appear to be so rare in this vicinity I was anxious to see it, thinking it might prove to be the same as the interesting tree found at Chalk Bluff. Mr. Getsendener at that time kindly took me over to the river where he thought the tree was growing and we spent nearly half a day in searching for it, but without success. A few days ago I again met this gentleman in the Post Office here and he at once recognized me and told me that he had been waiting for a chance for these many years to make good in showing me that Cottonwood tree. Accordingly, this morning he took me over to the river in his car and after going as far as the road would permit we left it

near a ranch house and struck out down the river. The stream winds about in a tortuous course, often dividing its channel along the rocky flood plain, flanked by low banks or bluffs, beyond which is the narrow valley, open in places but elsewhere dissected with ravines and with a more or less dense growth of shrubs and trees. The going is often difficult and it is particularly hard to keep directions. Live Oak, Pecan and Hackberry are amongst the commonest forest trees, with occasional specimens or clumps of Elm (*Ulmus crassifolia*), Mulberry, Soapberry (*Sapindus Drummondii*) and Ash (*Fraxinus Berlandieriana*) and several other species. The Riverbank Walnut (*Juglans rupestris*), the Desert Willow (*Chilopsis linearis*) and the Southwestern variety of the Sycamore (*Platanus occidentalis* var. *glabrata*) are characteristic species along the rocky flood plain of the present channel of the river.

After we had tramped several miles and my guide was beginning to feel discouraged we at last saw the tree we were in search of close beside the river. It was a very fine large specimen and I was quite willing to accept Mr. Getsendener's opinion, that it was the largest tree in Uvalde county. The trunk, which was somewhat flattened, was more than seven feet (two meters) in diameter, and while we did not have a chance to measure the height, I estimated that it must have exceeded one hundred feet (thirty to thirty-five meters).

On an examination of the specimens, however, I cannot see that they have the distinctive characters on which *Populus Palmeri* was based and it probably must be referred to the common and widely distributed Cottonwood of the eastern United States, *Populus balsamifera* var. *virginiana*. This species has not been known before from so far south-west in Texas.

Carrizo Springs, Texas, May 3d.

A torrential rain fell in this section yesterday and last night, and I was advised at Uvalde to take the train rather than conveyance over the highways, which was likely to be interrupted by washouts or high water. I was the only passenger on the coach of the mixed train that runs between Uvalde and Crystal City, and the conductor told me that they often made the trip without any passengers, so successful is the competition of motor busses and private cars along the recently improved roads.

The train traveled slowly enough for me to get a very fair view of the country through which we passed and of its vegetation. For several miles the country was comparatively level and covered with a sparse growth of Mesquite trees and various shrubs, amongst which were *Yucca Treculeana, Celtis pallida, Ephedra trifurca?, Acacia Wrightii, Mimosa borealis, Opuntia leptocaulis, O. Engelmannii, Condalia obovata, Colubrina texensis, Cercidium texanum* and *Lycium Berlandieri*. Where the surface was a little more rocky, *Acacia Berlandieri* was common. In the intervals between the widely scattered trees and tufts of spiny shrubs the ground was white and bare and with scarcely a trace of grass or other herbaceous vegeta-

tion. Such are the typical "pastures" of this part of Texas. However, after the heavy rain a rapid transformation will take place; grass will begin to spring up in the protection of the shrubs and Rain Lilies (*Cooperia Drummondii*) and a variety of other showy flowering plants will appear.

About twelve miles southwest of Uvalde we crossed the Nueces River, close to the boundary of Zavalla County. In the vicinity of the stream and along the low rocky bluffs a marked change in the character of the flora was noticeable, both in the size and variety of trees and shrubs. Pecan, Hackberry and Black Willow were as usual the commonest trees, with *Cephalanthus occidentalis* and *Baccharis glutinosa* growing abundantly along the margins of the stream. *Platanus occidentalis* var. *glabrata* and *Juglans rupestris* were growing along gravel bars of the river. On a little bluff just beyond the bridge I noticed some tall plants of *Leucophyllum* covered with a profusion of large pink flowers. This may have been *L. frutescens*, but the flowers appeared to be larger than those seen elsewhere.

As we approached Crystal City the air became redolent with the odor of onions, this being the height of the shipping season. Fields of onions, trucks and wagons loaded with onions, and many cars in the process of loading, in addition to the heaps of decaying onions dumped along the railway impressed, both upon the eye and olfactory nerves of the traveler, the importance of the industry here. The onions, principally varieties of the White Bermuda sort, are grown in fields, by aid of irrigation from artesian wells. Many hundreds of cars are shipped from this point and Carrizo Springs during the season.

May 4th.

This morning I followed the small stream, Carrizo Creek, which lies just east of the town and runs in a southwesterly direction, for several miles. Most of the land in this vicinity is of a fine deep sand, although some of the higher areas are calcareous and support a xerophytic flora of the chaparral character. A curious little relative of the Mesquite, *Prosopis cinerascens*, was growing along the railway, probably introduced from farther south. *Parkinsonia aculeata* was common in sandy fields along the creek and quite conspicuous with its abundance of yellow flowers. In open places there were acres covered with *Argemone intermedia*, or a closely related species, but with flowers varying on different plants from white through various shades of pink and rose to the deepest wine-color. The Live Oak was also common in the sands and, in places that have not been disturbed by cultivation or too close grazing, there was a rich herbaceous vegetation of peculiar plants. I photographed a large specimen of *Salix nigra* var. *Lindheimeri* along the creek and higher up *Sapindus Drummondii* and *Bumelia lanuginosa* var. *albicans* are abundant. The *Bumelia* looks very distinct from the typical form, which is common farther east, in its narrow leaves, silvery and sericeous on the under surface. In coming up the creek I dug from the sand a large mammoth tooth, which was rather badly decayed.

This afternoon I collected on the higher ground just south of the town and bordering the creek. The difference in the flora of the two areas is quite marked. The surface here is rocky with clay or gumbo soil, eroding rapidly into ravines on the slopes along the creek. Mesquite is quite abundant and is the only thing that might be called a tree. Yuccas and Opuntias are conspicuous features and there are many of the smaller Cacti, such as *Echinocereus* and *Mamillaria*, growing under the chaparral which, in places, is dense and impenetrable. Some of the characteristic species are *Rhus microphylla*, *R. trilobata*, *Cercidium floridum*, *Acacia Greggii*, *A. Wrightii*, *Condalia obovata*, *C. lycioides* and *Forestiera angustifolia*. A curious little Agave (*A. maculosa*) was in bloom in rocky places and I secured a photograph of it and of several other things.

San Antonio, Texas, May 9th.

In coming up on the railway from Carrizo Springs a few days ago, we passed through some sandy country near the boundary of Frio and Medino Counties where an interesting flora with Oaks and Hickories attracted my attention. With the purpose of exploring this locality I went down on the Laredo motor-bus this morning and got off at the little town of Moore, in northern Frio County. From this place I followed the railroad to Divine, Medino County, collecting on both sides as I went.

Quercus marilandica, *Q. stellata*, *Q. virginiana*, *Carya Buckleyi* and *Xanthoxylum Clava-Herculis* var. *fruticosum* are common arborescent species, and *Lantana Camara* and *Bernhardia myricaefolia* are growing as undershrubs. The Hickory has a somewhat different appearance from that of the species as it grows farther east, due to the fact that here the branches extend nearly to the ground. I remember finding the same tree near Fredericksburg, Gillespie County, several years ago. Both localities are very near the 99th meridian, and this appears to be about the western limit of its range.

Along the railway enclosure, where grazing is restricted and the woody plants have been cleared away, there is an abundant growth of herbaceous plants and grasses, one of the most conspicuoous species being *Phlox tenuis*. Along the banks of a little stream, on ground that is flooded after rains and remains muddy for some time, I found *Marsilia macropoda* growing very luxuriantly.

Blanco, Texas, May 11th.

The village of Blanco, situated near the head of the Blanco River, in the county of the same name, is one of the oldest settlements in this part of Texas, and it has been but slightly touched by modern progress, being more than twenty miles from the nearest railroad and somewhat off the more frequented routes of travel. The mail is received from San Marcos, and I secured a passage today on the truck that renders this service to the town and also to the few rural patrons of the Post Office Department along the road. Between San Marcos and Fischer's Store, a post office and general

mercantile establishment in Comal County, the road winds through some interesting and picturesque country and over a high limestone ridge, known as the Devil's Back-bone. From the top of this ridge one can look down on either side into deep gorges several hundred feet deep, where there is an abundant growth of small trees and shrubs. *Juniperus mexicana* is abundant on the hills, and *Quercus texana* is the commonest deciduous tree. *Quercus annulata, Cercis reniformis* and *Bumelia monticola* are also conspicuous. *Mahonia Swaseyi* was first found by Buckley not far from here, and I collected it here also several years ago; I saw a few specimens of this rare species along the road today, with an abundance of pink fruit.

After securing lodging and getting lunch at the small hotel at Blanco I started out and followed the river down for about four miles. The river is barely flowing at this dry season and one could cross it almost anywhere without difficulty. Some of the interesting trees and shrubs seen along this part of the river are *Salix longipes* var. *venulosa, Ulmus americana, U. fulva, U. crassifolia, Celtis laevigata* var. *texana, Morus rubra, M. microphylla, Mahonia trifoliata, Crataegus Traceyi, Prunus mexicana, P. Reverchoni, P. serotina, Acacia Wrightii, Mimosa Lindheimeri, Eysenhardtia amorphoides, Sophora affinis, Dalea frutescens, Ptelea trifoliata, Rhus virens, R. rhomboidea, R. copallina* var. *lanceolata, Ilex decidua, Ungnadia speciosa, Aesculus discolor* var. *flavescens, Malus ioensis* var. *texana, Ceanothus ovatus, Condalia obovata, Garrya Lindheimeri, Cornus asperifolia, Arbutus texana, Diospyros texana, Fraxinus texensis, Forestiera pubescens, Callicarpa americana, Lonicera albiflora* and *Eupatorium ageratifolium.* This by no means complete list shows a curious mingling of species from the eastern or Carolinian and southwestern, Sonoran, floras.

May 12th.

Having a few hours this morning before starting back for San Marcos I went up the river for a distance of about three miles. In addition to many of the things mentioned yesterday I collected *Vitis monticola,* which was in full bloom and was climbing to a considerable height in trees. About a mile above the town I found a group of several large trees of *Populus balsamifera* var. *virginiana. Mimosa borealis* was abundant, growing as a low spreading shrub, some of the plants being in full bloom and others covered with immature fruit, probably representing a response to two rains occurring a few weeks apart.

Low bluffs occur at intervals on either side of the river; these are seldom more than eight or ten meters high and of no great length, the soft limestone strata breaking down rather rapidly under erosional agencies. There are many well preserved fossils in some of the beds and in the clay partings between them, which seem to belong to the Fredericksburg group of the Comanchean series; sometimes this is overlaid with a conglomerate deposit. These bluffs afford a habitat for a variety of woody as well as herbaceous plants, many of which are found only in their protection. Two species of Linden (*Tilia caroliniana* and *T. floridana*) are amongst the

most interesting trees of such situations, and curiously they occur usually, if not always, along bluffs of the north side of the river, or those with a south exposure. As the river usually flows at the immediate foot of the bluff, a possible explanation is that a greater amount of evaporation in such situations tends to keep the air moist and more than offsets the direct heat. *Prunus Reverchoni, Rhus rhomboidea, Ungnadia speciosa, Garrya Lindheimeri* and *Sambucus canadensis* also grow in the protection of the bluffs, and where there is considerable moisture or seepage water from ledges, *Rubus trivialis* is likely to be found and often a luxuriant growth of Maidenhair Fern (*Adiantum Capillus-Veneris*).

One of the highest cliffs is known as Red Bluff and it was at this point that I turned back. This bluff is quite heavily wooded and there are some deep pools of water along its base. Several Linden trees were seen on the steep rocky slopes and here also *Prunus serotina* var. *eximia* and *Ulmus fulva* were growing, with *Cornus asperifolia* and *Sambucus* near the base. On the opposite side along the margins of a deep pool were several trees of the bald Cypress (*Taxodium distichum*), another southeastern species and usually an inhabitant of swamps, which seems strangely out of place in this semi-arid region.

Big Spring, Texas, May 17th.

Heavy rains fell last night and this morning while we were on the train coming over from Sweetwater. This must have reached almost the proportions of a "cloud-burst" here, as such torrents are known in this section. When we arrived at the station it was still raining sharply and the tracks, platform and all of the surrounding low grounds were flooded.

The rain having abated this afternoon, I started west on the railway to reach the outskirts of the town, thinking that the dryest way. However, I had not calculated on the extent of the flood and I had to go two or three miles before I could find a place to cross the small river that was racing down the ditches that paralleled the embankment. Finally, wading water knee-deep and making my way across a muddy flat for some distance, I managed to reach higher ground. The railway and the lower part of the town occupy a creek valley and all of this was flooded. To the west, at the point where I left the valley, there is a dry sandy plain gradually rising to a bold escarpment about a mile beyond.

Red sandy soil with considerable gravel, and probably impregnated with gypsum, as it appears to belong to the Permian formations, covers the surface of the plain. It is occupied by a shrubby flora, rather dense in places, and elsewhere with wide bare spaces in which a few herbaceous perennials struggle to maintain an existence. Characteristic shrubs are *Juniperus Pinchotii, Ephedra antisyphilitica, Mahonia trifoliata, Prosopis juliflora, Atriplex canescens, Mimosa fragrans, Covillea tridentata, Condalea obovata, Koeberlinia spinosa, Microrhamnus ericoides, Rhus microphylla* and *Opuntia leptocaulis*. *Juniperus Pinchotii* grows here as a shrub seldom more than four or five meters high. It has much the habit of *Juniperus*

monosperma, but can readily be distinguished from that species by its stouter branchlets and generally stiffer habit, even in the absence of the large copper-colored fruit. The Creosote Bush (*Covillea*) has a monopoly of some of the more sterile and flat portions but with it sometimes grows *Koeberlinia spinosa*, presenting a very curious appearance with its green naked thorny branches.

There had probably been some rain shortly before the present heavy fall, since many of the shrubs were in flower and the little yellow-flowered Rain Lily, *Atamosco texana*, *Cassia pumilio* and a few other herbaceous plants were in bloom.

On the limestone hills there was an almost complete change in the character of the flora. A shrubby growth of *Quercus Mohriana* occupied the steep slopes and ledges and base of the cliffs; *Celtis laevigata*, *Xanthoxylum Clava-Herculis* var. *fruticosum*, *Rhus trilobata*, *Ungnadia speciosa* and *Bumelia monticola* also grew here.

There is a driveway to the top of this plateau or mesa, which overlooks the town, and from which an excellent view of the latter and of the surrounding country may be had. Following this, I came down to the railroad again on the east side of the town and after wading more mud and water came out again on low calcareous hills and a mile or two farther east got into an area of deep loose sands with quite another type of vegetation.

Quercus Havardi was very common here, growing in clumps or thickets, and usually as a slender shrub one to rarely two meters in height. It appeared very distinct from *Quercus Mohriana* of the limestone hills, but along the contact of the two formations there were some very puzzling forms, that suggested either hybridization or the possibility that the two extremes might be ecological responses to the different environment. *Artemisia filifolia* was also common in the sands, and a little shrubby Pentstemon (*P. ambiguus*) was in full bloom. The latter had a profusion of pale lavender blooms and was one of the most conspicuous and showy plants I have seen in this region. Amongst herbaceous species *Dithyraea Wislizeni* was very abundant, and *Houstonia humifusa*, *Anogra albicaulis*, *Monarda clinopodioides* and *Hymenopappus corymbosus* were conspicuous. *Yucca constricta* was in full bloom and I made photographs of this and of several of the other plants.

Pecos, Texas, May 18th.

After exploring the Pecos River along the last few miles of its course and its junction with the Rio Grande, I was anxious to see it farther up and learn how the flora at this point compares with that of the lower canyons. The contrast is certainly striking but so far as the flora is concerned it is also disappointing. The surrounding country is all rather level and the surface is sandy and the soil strongly gypsous and saline. In consequence it is extremely sterile and in many spots absolutely devoid of plant life. A few stunted Mesquite bushes are the only ligneous plants over wide areas. Both the glabrous and pubescent varieties were noted. The soil appears

generally to be too poor even for Cactus, although a few discouraged looking specimens of Opuntias and a small *Echinocereus* were seen. In a few places *Lippia lanceolata* and *Lepidium alyssoides* were blooming bravely and plants of *Statice Limonium* were coming up. Along the banks of the river, however, one tree is abundant and conspicuous and serves to relieve the dreary monotony with its bright green foliage, This is *Tamarix gallica*, the Salt Cedar, a native of the Mediterranean region, which has been introduced and thoroughly established in this part of Texas. It lines the low banks of the river here for miles and appears to flourish everywhere along ditches and ponds or wherever there is a little moisture.

The list of woody plants here is a very short one; besides those just mentioned I saw a few specimens of *Condalia obovata* and *Lycium Torreyi*, and *Allenrolfea occidentalis* was locally abundant in flats and depressions.

NOTES

The Arnold Arboretum during the Fiscal year ended June 30, 1928.

The Arboretum.—In Massachusetts the winter of 1927-28 will be remembered for its mildness and absence of heavy snowfalls and while ground covering plants suffered on this account the trees and shrubs in general were uninjured. During the autumn of 1927 and the spring and early summer of 1928 good rains fell and the Arboretum shows the benefit of two successive favorable years. It is many years since the plants have been so well favored. The Lilacs, which were severely pruned in the spring of 1927, made great growth and many of them flowered quite freely this year. The trusses of flowers were remarkably large but no increase in the size of the individual blossom was noticeable. This is rather curious since one would have expected increased size in the flower as well as in the flower truss and in the leaf itself. The Japanese Cherries at the Forest Hills Gate flowered as freely as usual, while the double flowering sorts on Bussey Hill were finer than they have ever been before. There is a difference of more than a fortnight in the flowering season of these two groups which adds greatly to their value in gardens. The collection of double flowering varieties on Bussey Hill is grafted on understocks of the Sargent Cherry (*Prunus serrulata sachalinensis*) and the trees clearly demonstrate the value of this species as an understock for the Japanese Cherries. The Crabapples, more especially the collection at the foot of Peters Hill, bore abundant blossoms and for the first time in the Arboretum the two plants of *Malus theifera* and two plants of *Malus toringoides* flowered freely. Heretofore, one of the plants in each case has enjoyed an off season. There was very little blossom on the Kalmias this year but the Hybrid Rhododendrons were better than usual. They wintered fairly well after having made a good growth the previous season.

The winter was marked by a very low snowfall and this had a disastrous effect on the dwarf evergreen plants familiarly called groundcovers. In

most of them the foliage was severely browned and not a few plants were killed outright. Heather (*Calluna vulgaris*) suffered badly in this respect and new plantations had to be made in the Shrub Garden. The Davidia on Bussey Hill bore a few blossoms for the first time. The bracts, however, were imperfect and gave but a poor idea of the real beauty of this tree. At Newport, Rhode Island, where the climate enjoys the influence of the gulf stream, the Davidia flowered amazingly this year.

In recent years the important work in the Arnold Arboretum has been finding proper space for the different collections so that the individuals might develop into worthy specimens. Last autumn rearrangement of the Azalea group on Bussey Hill and the spreading out of the many Chinese plants was undertaken. Near the Administration Building a planting of Crabapples and groups of the new Chinese Conifers were carried out. In a year or two this should make a very pleasing feature at the Jamaica Plains Entrance.

An important event of the year was the building of a new propagating house and pits and establishing a new nursery on the Bussey property. The Arboretum now has a model propagating plant and attached to the propagating house is a small pathological laboratory.

During the year 3964 plants (including grafts and cuttings) and 1518 packets of seeds were distributed in the United States, Cuba, Great Britain, Germany, Poland, Holland, Sweden, France, Canada, Nova Scotia, Russia, New Zealand, Australia, India and Czechoslovakia.

There have been received 4460 plants (including grafts and cuttings) and 419 packets of seeds from the United States, Cuba, Great Britain, France, Japan, Sweden, Canada, New Zealand, India, Germany, Greece, Holland, Denmark, and Manchuria.

Visitors to the Arboretum were more numerous than usual. On June 7, 1928 a delegation of ladies representing the Philadelphia Horticultural Society made a two day's pilgrimage. Artists, photographers and plant lovers in general visit the Arboretum in increasing numbers every year. The newly established bus service over the Parkway doubtless brings many additional visitors. Some 796 persons registered at the Administration Building. Among these were visitors from such foreign countries as Great Britain, Formosa, Japan, Holland, Denmark, China, Germany, Panama, South Africa, Palestine, Philippine Islands, Federated Malay States, Poland, France and Hungary. — E. H. W.

The Herbarium.—The Herbarium now contains 297,018 sheets, 11,196 sheets having been added during the time from July 1, 1927 to June 30, 1928. Among accessions approximately 1,850 plants came from North America, 1,600 from Europe and western Asia, 3,050 from China, about 650 from southern Asia and Malaysia, 850 from Australasia and 750 from tropical Africa. Among the more important single collections received may be mentioned 1,627 plants collected by J. F. Rock in northwestern China and northeastern Tibet; 1,465 plants from the United States

National Herbarium collected primarily by P. C. Standley in Central America; 589 plants added from the collection made by D. H. Linder in tropical Africa; 568 plants collected by J. G. Jack in Cuba; 1,384 plants received through the National Southeastern University at Nanking; 454 plants collected by E. J. Palmer in southwestern United States; 510 plants of Australasia collected by L. J. Brass; 346 plants of Greece collected by J. Mattfeld and 747 plants from Europe and western Asia received from J. Bornmüller.

There have been distributed from the Herbarium 11,863 specimens among thirty-nine institutions in the United States, Canada, Europe, Asia Australia and Africa. This is one of the largest distributions in the history of the institution.

Botanical exploration has been carried on in different parts of the world during the year. The most important expeditions are those to the New Hebrides and to Madagascar. The first named islands whose vegetation is still incompletely known are now being explored by Mr. S. F. Kajewski who left Australia at the end of January; this expedition is financed jointly by the Arnold Arboretum and the California Botanic Garden. At the, beginning of June, Dr. H. Humbert, who already has made important contributions to the knowledge of the flora of Madagascar, started for this island accompanied by Dr. Charles T. Swingle to collect for the Arnold Arboretum and the U. S. Department of Agriculture. At the end of April Mr. Fang of the National Southeastern University of Nanking went to Kweichou and the adjoining regions of Szechuan on a collecting tour subsidized by the Arnold Arboretum. In Cuba Assistant Professor J. G. Jack continued the botanical exploration of the region near the Harvard Tropical Garden at Soledad during the months of February to June; for about six weeks, in February and March, he was joined by Mr. A. Rehder. Mr. J. E. Palmer started on his collecting tour in April and went first to Arkansas and eastern Oklahoma and then to various localities in southern Texas; in the Davis Mountains he supplemented the extensive collections he made there in the autumn of 1926. He also visited the Chisos Mountains and returned to the Arnold Arboretum beginning of July (see p. 153–187 for an account of these trips). In June Dr. C. E. Kobuski accompanied by Dr. J. T. P. Byhouwer made a short collecting trip to New Jersey and Pennsylvania. In Australia Mr. C. T. White continued his exploration of the Queensland flora in which the Arboretum participated. Early in September 1927 Dr. J. Mattfeld returned from his botanical tour to Bulgaria and European Turkey which was mentioned already in last year's report.— A. R.

The Library.—During the year the Library has added 590 bound volumes, 380 pamphlets and 558 photographs including 305 taken by Mr. J. F. Rock in northwestern China and northeastern Tibet, 75 taken by Dr. Mattfeld in Greece and 50 from the Rochester park department, making a total of bound volumes 37,736, pamphlets 8,939 and photographs 13,915,

together with about 250 unbound volumes. Of the 350 periodicals, bulletins and reports coming from all parts of the world 178 are received from botanic gardens, universities and other institutions, and societies in exchange for the *Journal* and the *Bulletin* of the Arboretum, and 25 by gift. About 100 books and reprints have also come from Russia and Lettland in exchange for Arboretum publications and herbarium specimens.

Over 1200 cards have been inserted in the catalogue of books, 600 cards in the catalogue of photographs, 550 cards for plates representing type specimens, and 2500 cards in the "Card-index of new genera, species and varieties of North and South American plants" published by the Gray Herbarium. In the manuscript "Index of illustrations and of new genera, species and varieties of ligneous plants since 1915," prepared at the Arboretum, 3778 cards were inserted bringing the total to 79,773. This Index is unique and makes available all references to new ligneous plants to date, exclusive of those published in floras.

The count of books bound is about 500 and of titles catalogued 900.

Though not a lending library over 100 books have gone out, chiefly as inter-library loans.

The number of inquiries coming to the Library has greatly increased during the year and ranges from requests for lists of books on certain subjects to verified references, photostat copies and the "best book" for a given purpose.

Mention of the more interesting accessions during the period from October 1926 to October 1927 will be found in the *Journal* for October 1927, and from that period to February 15, 1928 in the *Journal* for March, 1928. Among the works added since that date are:

WOCHENSCHRIFT für gärtnerei und pflanzenkunde. Jahrg. 1–11, 1858–1868.

The LINDLEY library. Catalogue of books, pamphlets, manuscripts and drawings. 1927.—Gift of the Royal horticultural society.

PECHEY, John. The compleat herbal of physical plants. Containing all such English and foreign herbs, shrubs and trees, as are used in physick and surgery. And to the virtues of those that are now in use is added one receipt, or more, of some learned physician. By John Pechey, of the College of Physicians, in London. Printed for Henry Bonavicke, at the Red Lyon in St. Paul's Churchyard. 1694.

WILSON, E. H. More aristocrats of the garden. 1928.—Gift of the author.

FYSON, P. F. Madras flowers. 1912–14.—Gift of Dr. Lemon Uhl.

MASSART, Jean. Esquisse de la géographie botanique [With annexe]. 2. vol. Bruxelles. 1910.

REVUE bretonne de botanique pure et appliquée. 1920–27.

ZEITSCHRIFT für gartenbau; organ der Baltischen gartenbauvereine. Vol. 1–7, 9. Reval 1904–12.—Gift of Dr. Karlis Starcs. Only known copy in the United States.

REVUE horticole de l'Algérie. Vol. 17–31. 1913–27.

SIMMONDS, J. H. Trees from other lands for shelter and timber in New Zealand. Eucalypts. 1927. 104 plates.

NEDERLANDSCHE kruidkundig archief. 1904–08, 1910–26.

[ZABEL, Hermann. Catalogue of the botanic garden of the Forest academy of Münden, Germany.] N. P. [1869–1912?] MS.

REVUE des eaux et forêts. Vol. 62–64. 1924–26.

PECORI, Raffaello. La cultura dell'Olivo in Italia. 1891.

KEW—Royal botanic gardens. Handlist of rock garden plants. 1925.
Handlist of hardy monocotyledons. 1925.
Handlist of herbaceous plants. 1925.
Handlist of tender monocotyledons. 1915.
Official guide to museums of economic botany. 1927.
Popular official guide. 1928.
Official guide to the North gallery. 1914.
Illustrated guide. 1927.
The wild fauna and flora. 1906.
Selected papers. iii. Rubber. 1906.—Gifts of Dr. Arthur W. Hill.

MIYOSHI, Manabu. Japanese cherries. 3 vol. Text and 2 vol. of plates.

VALLOT, J. Essai sur la flore du pavé de Paris. 1884.

NORTH, Marianne. Further recollections of a happy life. 1893.

HEAD, George. Forest scenes and incidents. 1829.

BATSCH, A. I. G. C. Beyträge und entwürfe zur pragmatischen geschichte der drey natur-reiche nach ihren verwandtschaften. Gewächsreich. Theil. 1. 1801. Photographs of pp. 19, 29 & 30 from copy in Universitäts Bibliothek at Jena.

PRINCE, William. [Nursery catalogues.] Photostat copies of two broadsides in possession of the New York agricultural experiment station at Geneva. They were printed in New York, the first reads "To be sosd (sic) by William Prince at Flushing-Landing 1771," and offers among other plants "English Cherries, Plumbs, Nectarines, Rasberries, Evergreen Trees and Shrubs, Timber Trees and Flowering Shrubs." The second was issued in 1790, with the addition of Roses.

[FRÖLICH, Karl. Die alpenpflanzen der Schweiz. Lief. 1–10. Teufen. 1853–55.] 62 colored plates. No more published. Rare.

A supplement to the Catalogue of the Library of the Arnold Arboretum will be published during the coming year.—E. M. T.

Staff of the Arnold Arboretum, 1928–29

OAKES AMES, A.M., Professor of Botany, Supervisor
ERNEST HENRY WILSON, A.M., Keeper
JOHN GEORGE JACK, Assistant Professor of Dendrology
ALFRED REHDER, A.M., Curator of the Herbarium
JOSEPH HORACE FAULL, Ph.D., Professor of Forest Pathology
KARL SAX, Ph.D., Associate Professor of Cytology
ERNEST JESSE PALMER, Collector & Assistant in the Herbarium
CLARENCE EMMEREN KOBUSKI, Ph.D., Assistant in the Herbarium
ETHELYN MARIA TUCKER, Librarian
KATHARINE TEASDALE ANDERSON, Business Secretary
ELIZABETH DEAN BENNETT, A.B., Assistant in the Library
LOUIS VICTOR SCHMITT, Superintendent
WILLIAM HENRY JUDD, Propagator

ERRATA

Page 25, line 19 from below *for* var. Rockii *read* var. **Rockii**
" 29, between line 4 and 5 from below insert ALFRED REHDER
" 78, line 21 for *communus* read *communis*

INDEX

Synonyms are printed in *italics;* new names in **bold-face** type.

JOURNAL

OF THE

ARNOLD ARBORETUM

EDITED BY

ALFRED REHDER

AND

ERNEST H. WILSON

VOLUME X

PRINTED FOR THE ARNOLD ARBORETUM BY THE
INTELLIGENCER PRINTING COMPANY
LANCASTER, PA.
1929

DATES OF ISSUE

No. 1. (pp. 1–68, pl. 15) issued March 20, 1929.
No. 2. (pp. 69–136, pl. 16, 17) issued April 22, 1929.
No. 3. (pp. 137–196, pl. 18) issued August 7, 1929.
No. 4. (pp. 197–299) issued November 12, 1929.

TABLE OF CONTENTS

WIDDRINGTONIA JUNIPEROIDES Endl.
Cedarbergen, altitude 1300 m., near Clanwilliam, South Africa.

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME X JANUARY, 1929 NUMBER 1

WIDDRINGTONIA JUNIPEROIDES ENDL.

ERNEST H. WILSON

Plate 15

Widdringtonia is the African analogue of the northern genus Cupressus and the two genera closely resemble one another in their vegetative parts and in the character and odor of their timber. Some six species of Widdringtonia have been recognized and with one exception all have a very limited geographical distribution.

The subject of this note is confined to the Cedarberg Mountains near Clanwilliam and about 180 miles north of Cape Town. It is commonly known as the Clanwilliam Cedar and gives its name to the mountain range, the Cedarbergen, on which it grows. These mountains are from 4,800 to 6,336 feet high, composed mainly of Table Mountain sandstone and shale band, and are worn into bold cliffs, either bare or clothed with a scrub growth of shrubs and herbs in which coarse grasses are prominent. Between elevations of from 3,000 to 5,000 feet above sea-level, this Widdringtonia is strewn over an area of about 30 miles either singly or in thin groves. It grows in the rocky crevices and among the boulders, and often stands out in the face of the sheer cliffs. It is doubtful if this tree ever formed real forests and in all probability always grew either scattered or in small groves just as it does today.

Accompanied by the Conservator of Forests, Mr. C. R. Ross, I made a special journey in March 1922 from Cape Town to the Cedarbergen for the purpose of studying and photographing this tree, and the one thing that astonished me, over and above everything else, was that the tree could flourish under such stark conditions. At one time it was quite common on this mountain range but axe and fire, especially fire, have reduced its number to a comparative few hundreds. Young plants are springing up everywhere among the rocks and if fires be kept out the species is safe.

When exploring this part of South Africa, Sir James Alexander remarks that a Cedar tree which was cut down in 1836 was 36 ft. in girth of trunk and out of its giant arms a thousand feet of plank was sawn. No such enormous trees exist today. The largest tree I saw, measured and noted down, was 40 ft. tall with a trunk 13 ft. in girth at breast height.

The crown of the Clanwilliam Cedar is more or less flattened and irregular in outline and made up of many massive horizontally spreading

or slightly ascending branches. The branchlets are terete and on very old trees numerous toward the extremity of the branches which gives a tufted appearance to the crown from a short distance. On the young shoots the bark is brownish purple; later it becomes fissured and broken into small blackish gray, rectangular flakes which show a vinous purple color beneath. As a rule the trees branch from near the ground and the trunks and main branches clothed with tessellated bark are beautiful. On young saplings the branches are erect or erect-spreading and in its early years this tree is columnar in outline. As it grows older, stout lateral branches are thrust out more or less horizontally and develop into a flattened crown. The leaves are opposite, decussate, and dimorphic. On young plants they are lance-shaped but on adults scale-like. The resemblance of this particular species in its youth to *Juniperus chinensis* L. is remarkable.

The fruits are crowded around the shoots, mark the base of a season's growth and take two years to ripen. The woody capsule at maturity is blackish purple, almost an inch square, warted without and more or less coated with resin.

The timber of the Clanwilliam Cedar is perhaps the most valuable of any African softwood tree but is now so rare that it is of little or no commercial importance. The wood is oily and inflammable, white or slightly yellowish, well figured, fragrant and saws and planes well. It is easily carved and eminently suitable for furniture and cabinet-making. It has a strong Cedar-like odor agreeable to the nostrils. A church in Clanwilliam has pews, doors and the altar front made out of this wood. In the ground it is almost everlasting, a quality which it shares with the wood of most Cupressus and Juniperus.

From the branches and cones of the tree a yellowish transparent resin is exuded which is used locally in the form of fumigations as a cure for gout and rheumatism and also in the compounding of plasters and the preparation of varnish.

The Cedarbergen, where this Widdringtonia finds its home, enjoys a light winter rainfall, the annual precipitation never exceeding 15 inches. Frost and snow occur during the winter and the small ponds and ditches of still water are often frozen over. The climate is indeed extreme, the summers being very hot and dry and the winters wet and miserably cold. This Widdringtonia is found between 3,000 and 5,000 ft. and reaches its optimum round about 4000 ft. It keeps to the upper-middle parts of the range and does not live long under cultivation in the lower valleys. It is indeed a very isolated species, demanding peculiar ecological conditions not easily found elsewhere.

The Clanwilliam Cedar was one of the first of the Cape trees to be grown in England. Philip Miller in his "Dictionary" records raising plants from seed he had received, some of which were killed in open ground in the winter of 1756. Being tender in north temperate regions, it is doubtful if this tree is now in cultivation.

A FUNGUS DISEASE OF CONIFERS RELATED TO THE SNOW COVER

J. H. Faull

Until towards the close of the last century the vast forests of America seemed to be sufficient for all demands that might be made on them for all time. Fear that such might not be the case was first aroused by obtruding evidence of rapid depletion of the White Pine. This found expression in active propaganda for replacement by planting. But a resultant planting campaign scarcely began when it received an unforeseen check through the announcement about 1910 that a potentially dangerous blister rust had been imported in nursery stock and had been widely distributed. In consequence of the thorough establishment of that unwelcome pest even the most optimistic nowadays agree that the restoration of some of our White Pine forests at least will involve arduous, vigilant and expensive effort.

When the supply of White Pine waned we turned to less valuable woods such as Spruce and Fir. As the years have gone by the demand for them has steadily mounted because continually additional uses have been found for them—as for the manufacture of paper and viscose. Consumption has proceeded at an accelerated pace, so that in turn their early exhaustion is no idle threat. To forestall an eventuality that would be so disastrous to the welfare of great industries, to communities directly dependent on them, and to the public in general, it has been for some time apparent that measures of economy and replenishment must be devised and practised. Planting, better management, and closer utilization have been proposed as means affording a solution, and beginnings have been made along these lines. But once again, in certain regions there has loomed up an imminent frustration of planting policies because of the appearance of an unexpected disease.

This disease has been one of the subjects of my researches during the last two years, and the purpose of this paper is to present an account of its nature, cause, origin and control. It may properly be named "Phacidium blight of conifers."

My attention was first called to Phacidium blight during the summer of 1923 in a large spruce nursery whose output runs into the millions of trees each year, though I afterwards knew that that was not my first contact with it. I had long known it on Fir, though not its cause, and have since found it in various parts of the northeastern United States and eastern Canada on Fir, the Spruces, and occasionally on Pines and Arbor-vitae. Its attack is *en masse* on leaves of all ages, but only on those needles that lie below the snow cover. Its virulence is so severe that few Fir or Spruce trees once involved escape destruction unless their leaders are well above the surface of the snow.

The affected parts are a soft and more or less glaucous brown color. In closely planted nursery beds it occurs in subcircular patches up to two feet

or more in diameter, or in strips where the plants are in fully separated lines. As for older trees, masses of branches on one side or all within certain horizontal planes are browned; and if they have suffered in previous years the newly browned foliage is contiguous to old more or less completely defoliated branches, or to those that are covered with withered and whitened needles. Leaves of all ages are equally liable to attack. Diseased needles of White Pine drop during the first summer, those of Fir and Arborvitae carry through the following winter, while those of the Spruces likewise commonly adhere throughout the winter unless too much subjected to drought or wind or other disturbing agencies.

The disease as first seen by me in the nursery was on two and three-year old beds of White Spruce. The latter had suffered the year before and were mostly a complete loss. But they, like the former, were said to have entered their first winter perfectly green. The brown needles showed submerged black dots, evidently incipient fungus fruits, but there was no evidence at that time to show that the fungus might not be purely secondary. The blight, whatever its cause might be, had not spread subsequently to the uncovering of the beds through the melting of the snow a few months previously.

The losses and expansions of invasion in the springs of 1924, 1925 and 1926 were reported to be continually mounting at a rapid rate, and those of 1926 were so enormous that the future of the nursery was jeopardized. The problem was then actively taken up, and during 1927 visits were made in the spring just as the snow was leaving, again in midsummer, and finally towards the end of the fall. At my suggestion, Mr. G. G. Cosens, a resident forester, marked the limits of a number of spots in the beds and staked individual diseased trees here and there in the transplant lines in the fall of 1926, so that in the following spring we might have definite information as to whether or not there was a spread from these foci.

To the symptoms just recorded, may be added the appearance of subepidermal disk-like apothecia in the fall on needles browned the preceding spring. These are exposed by the irregular dehiscence of the overlying epidermis, and from them there is spore-discharge in mild, damp weather until winter sets in. There has also been noted an almost constant occurrence of black microsclerotia on the affected needles in the spring. Likewise, observation at the right moment in the spring reveals a more or less evident covering of white mycelia on the browned foliage just as the snow melts away.

Cause

After becoming familiar with the symptoms, the next step was to determine the cause. In view of the time at which the disease manifested itself it was natural to suspect winter injury. But with knowledge of the continuous aggravation of the malady throughout a period of years, such an explanation was not convincing. Since the grass and the low-lying vegetation everywhere in that region, as well as the brown spots, are cover-

ed with a white cobwebby gauze as the snow disappears, it was suggested that this might furnish a clue. But the molds on the grass were found to consist of the mycelia of a few species of fungi that apparently were purely saprophytic. Several experiments and observations, however, have demonstrated beyond question that the disease is infectious and contagious and that it is due to a fungus. These are as follows:

1. The mesophyll of the browned needles from the first is occupied by intercellular hyaline hyphae and cultures show that it is always the same fungus.

2. The spread of the disease from spring to spring is to contiguous foliage.

3. Wherever the needles of adjacent susceptible conifers come into contact with diseased foliage they, too, are likely to be browned.

4. From the preliminary markings made in the fall of 1926 in nursery beds and transplant lines there was an extensive spread showing in the spring of 1927.

5. From the reported history of the disease in two nurseries, one in Quebec and the other in New England, we know with reasonable certainty that it began in both at recognized limited points, and its spread from them has been disturbingly noted.

6. Experimental plots were staked out in nursery beds, transplant lines and plantations—about 30 acres in all—during the season of 1927, and the diseased spots and trees were marked. In all cases a spread was revealed in the spring of 1928. The lateral spread in the nursery plots affords a striking illustration. The areas diseased in ten 2-year old beds of White Spruce in 1927 ranged from 3% to 40% in extent, with an average of 18.4%; in the spring of 1928 the range was from 12% to 85%, with an average of 47.2%.

7. Net bags of diseased Spruce needles were hung in the crowns of healthy Spruces in a disease-free plantation in November, 1927, just at the onset of winter, all below the snow line (12 experiments). In the spring of 1928, as the snow fell away, these bags were seen to be the centres of subspherical masses of brown foliage a foot to two feet in diameter, and nowhere else in the plantation did the disease develop.

8. Mr. G. D. Darker similarly suspended bags of diseased Balsam Fir in Balsam Fir, Hemlock, and White Pine trees in the fall of 1927. Browning showed in the adjacent foliage and not elsewhere in the spring of 1928.

A study of the fungus proves that it a species of *Phacidium*. Morphologically the ascospores are in general like those of *Phacidium infestans* but there are certain features in connection with the fructifications, the mycelial cultures, and the pathogenicity that deter me from deciding finally whether or not the form on Spruce may be varietally different, and whether or not the forms on Spruce and Fir may always be varietally the same. So far as can be learned from the literature and through correspondence,

P. infestans is known only on *Pinus sylvestris* in Europe. The only record in America is by Weir, who found a parasitic *Phacidium* on certain western species of *Abies* and on Douglas Fir which he called *P. infestans* var. *Abietis*.

All of the means of dissemination have likewise not yet been cleared up. It seems obvious that primary infection is by means of discharged ascospores in the fall. These germinate readily without a resting period. It is of course possible that some of them may carry through the winter and cause infection in early spring. It also seems likely that the microsclerotia referred to above are a phase of the fungus and that they may cause infection. It is certain that a very important cause of infection is the mycelium in the browned needles. During the latter part of the following winter, for a few weeks before the snow departs, this mycelium grows out under the snow over to adjacent foliage and enters dormant healthy needles. Foliage in contact with browned branches has been dug up in late winter and at that time these phenomena were beginning to show. The temperature in the crust-covered air pockets around branches or small trees varied from 36 to 43° F. on bright sunny days during the period of thaws. Mycelial spread was also seen to advantage in the thawing season in beds covered over by a low platform of boards.

Control

The question of control was naturally uppermost in mind from the first, and every new acquisition of knowledge regarding the cause of the disease and the behavior of the pathogen was treasured for its possible bearing on an efficient method of control. The European literature had nothing to offer on this matter for it was acknowledged by European pathologists that no effective means had been devised for combating *P. infestans*.

Acting on general principles it seemed advisable to practice thorough sanitation in the nursery so far as possible. Hence as a first measure badly diseased beds were treated with a strong lime-sulphur spray and turned under with the plow. Then an extensive program of spraying experimentation was projected. For this purpose thirty-seven beds of White Spruce and nine plots of 2-1 (2 years in nursery beds, 1 year in transplant lines) transplants were reserved. The latter measured 10,000 square feet each, with about 40,000 young trees in each plot. These experiments consisted of sprayings with lime-sulphur (dormant) of various strengths, part in late spring and part in the fall up until the first snows fell; in some the browned plants were first eradicated, in others they were not disturbed. A few plots were not treated, but left as controls. The results have been highly gratifying. Removal of the diseased stock before spraying proved to be of no value. Spraying in the spring was likewise of no effect. On the other hand spraying in the late fall with lime-sulphur gave perfect control. One very interesting result noted was that browned, unpulled spots, not only showed no spread after fall spraying, but some of the appar-

ently dead plants revived to the extent of unfolding meagre new foliage in the following spring.

Having discovered the ascosporic fructifications in the fall of 1927, and knowing of the mycelial habit of spread, it was surmised that if spraying were of any avail the fall would be the proper time to make the application. So the beds throughout the nursery not reserved for experiment were treated to a dormant lime-sulphur spray. The nursery uncovered in the spring of 1928 without a blemish and continued so for the rest of the season. For the first time in years the nursery was free from the Phacidium blight.

In attempting to control the blight on the plantations several procedures are being followed. For planting, only positively healthy stocks are used, and such plants are first sprayed or dipped in lime-sulphur. In some of the established plantations the diseased stock was pulled by hand and carried in sacks to canvas-lined wagons, removed and burned. The full value of this latter measure cannot be fully appraised for another year or two, but success is anticipated. It is possible that thorough fall spraying of diseased trees in the plantations might be successful and practicable; if so a large proportion of affected trees would be conserved; an experiment of this type has been projected.

At the suggestion of Mr. Ellwood Wilson, diseased branches were removed from a number of six or eight-year-old trees in the fall of 1927 and burned. Some of these trees showed a little browning in the spring of 1928, but several came through clean.

The cost of fall spraying in the nursery and of removal of diseased plants from the plantations is trifling.

Distribution and origin of Phacidium blight

It is obvious that a knowledge of the origin of such a disease is of great importance in relation to many questions, such as the possibility of attack in any nursery, the effect on natural regeneration if it be native, and on the advisability of quarantine and embargo.

I have long been familiar with this disease on Balsam Fir, and have found it everywhere in the snow laden parts of Ontario and Quebec and in several of the northeastern States. But I was not so certain of its occurrence on native Spruce. In order to determine this matter I made journeys into the Spruce forests of Gaspé, Quebec, and Maine in September and November of 1928, and was rewarded by finding it in both places on White, Red, and to a lesser extent on Black Spruce, in regions where it was plainly native. A review of collections made previously and subsequently at various locations in the east, adds to the evidence that it is widely distributed on Spruce in eastern Canada and in the northeastern States. It is a safe conclusion that Phacidium blight of conifers is native to America. Under such circumstances the sane procedure is not to to employ embargo or quarantine except in the case of wilfully neglected nurseries, but to be ever on the alert and to adopt control measures wherever it shows itself.

Summary and conclusions

1. Phacidium blight of conifers is a disease favored by a covering of snow that persists throughout the winter. In Europe it (Schneeschütte) attacks *Pinus sylvestris* and is said to be caused by *Phacidium infestans*. In America various conifers are attacked; the Firs and various Spruces are especially susceptible; it is caused by a form or forms very similar to if not identical with *P. infestans*.

2. An extensive contagious spread takes place under the snow in late winter and early spring and there is none throughout the summer.

3. Any nursery or plantation in a snow laden area is liable to attack, and especially so if it be located in a forested district.

4. It is a disease that is potentially capable of rapid spread and great losses.

5. Being native there is more or less of a balance as between host and parasite under natural conditions. It is conceivable, however, that in many areas the natural regeneration of such a susceptible host as White Spruce may be seriously affected by it. So far no studies have been made on this point.

6. It has been found that it can be easily and cheaply controlled.

7. A reforestation planting policy in snow laden areas is liable to failure unless Phacidium blight be controlled.

Throughout the course of this investigation I have received generous support and invaluable co-operation from many quarters; due acknowledgments will be made in a detailed paper to be published in the near future.

THE LIGNEOUS FLORA OF THE DAVIS MOUNTAINS, TEXAS

Ernest J. Palmer

Far out towards the southwestern corner of the great state of Texas, but still some two hundred miles east of El Paso, the rugged peaks and ridges of the Davis Mountains rise rather abruptly from the surrounding high plains. Owing to the isolation of those outlying groups of the Rocky Mountains which occupy the generally arid region of western Texas they offer an extremely interesting field for the study of peculiar phases of the flora and fauna. And the Davis group, because of the higher altitude and the precipitous character of some of the mountains and other ecological factors to be mentioned later, seems to constitute one of the most distinct sub-regions biologically to be found in the state.

The Davis Mountains lie entirely within the limits of Jeff Davis County, a large area separated politically several years ago from Presidio County. The area of the county is 2263 square miles and the population according to the last census was only 1445. The number of inhabitants is somewhat, though not materially larger at present. Nearly half of the people live in the two principal towns of Ft. Davis and Valentine, the remainder be-

ing widely scattered over the great ranches that occupy nearly all of the county.

The elevation of Ft. Davis, which lies at the foot of the mountains and in the valley of Limpia Creek, is about 1600 meters (5200 ft.) above sea level.

Just west of the town lies the old military fort, established in 1854 by Jefferson Davis while Secretary of War in the cabinet of President Pierce. This was built as one of the line of frontier forts to afford protection to the traders and early settlers against the hostile Indians. The Apaches who roamed over this part of the Southwest were one of the most war-like and troublesome of all of the tribes, and they continued to be a menace and source of trouble until comparatively recent times. A regiment of cavalry was stationed here for many years and the fort was finally abandoned as a military post in 1891. The buildings, which were nearly all constructed of adobe blocks, are now only a picturesque group of ruins in various stages of dilapidation. Some of the officer's houses and the cottages of the non-commissioned officers are still practically intact, while the old hospital and barracks are rapidly disintegrating and only the outlines of some of the other buildings can now be traced.

Most of the buildings of the modern town are also of adobe, but some of them have been covered with stucco, and the court-house and a few of the more pretentious business buildings are constructed of native stone. Alpine, Marfa, and Valentine, each more than 20 miles distant, are the nearest railroad points, and until recently the town had remained quite isolated and primitive, serving only as a supply point for the ranchers in addition to being the seat of the county government. But since the construction of automobile roads in the last few years the place has begun to attract many summer tourists. The distinctive character of the village, with its flavor of the old Southwest, its cool nights, clear skies and dry crisp air and the opportunities it affords for excursions into the mountain fastnesses and for seeing something of the rapidly disappearing ranch life, which has persisted here more typically than in most parts of the West, serve well to repay those who have the enterprise to turn aside from the beaten tracks of travel to enjoy the hospitality of this little mountain town.

Limpia Creek, which has its rise in the higher mountains, flows by the town and furnishes the water supply. Several strong perennial springs emerge in the canyon a little distance above the old fort, and the water from these is also used for irrigating small tracts in the valley, most of which are devoted to apple orchards. Some fine apples are raised here, and since the area is far removed from any other where they are grown at present, the industry is generally a profitable one.

The low hills and plains in the vicinity of the town are mostly devoid of woody growth, with the exception of a few Mesquite bushes, Cacti, Yuccas and other semi-desert shrubs. Along rocky ravines and in the protection of cliffs and canyons in the foot-hills many other plants appear

and the flora is more varied and richer especially in woody species. This diversity increases more rapidly and the different plant zones become more distinctly marked as the higher altitudes in the mountains are reached. Many of the species are quite local, their ability to survive depending upon peculiar conditions of protection, moisture and shade. Near the town and the old fort some very large Cottonwood trees (*Populus Wislizeni* and *P. McDougalii*) are growing, which are said to have been planted shortly after the establishment of the military post. Small groves of the same species are found at intervals for some miles down the valley of the Limpia, giving a pleasing touch of shade and vendure to the otherwise bare landscape.

The Davis Mountains consist of numerous peaks and ridges, some of them isolated and separated from each other by broad canyons and valleys or stretches of open plain, and others closely aggregated into irregular groups rather than into definite ranges, and divided only by deep narrow canyons or gorges with high cliffs and bold naked promontories, often difficult to reach and impossible to scale.

The rocks forming these mountains are all igneous and owe their origin to a great upthrust of intrusive material during one of the mountain-forming periods subsequent to the Lower Cretaceous. The formations consist of rhyolites, syenites, trachytes and similar crystaline rocks, with beds of lava indicating later volcanic activity in many places. Lava flows are conspicuous in the immediate vicinity of old Ft. Davis, and where also noted on the west slope of Mt. Livermore and on the Fowlkes ranch, near the head of the Big Aguja Canyon, and at several places in the lower part of Limpia Canyon. In some places false bedding planes and systems of horizontal fissures give to the porphyritic rocks the appearance of stratification. Near the head of Madera Canyon, at an altitude of approximately 2100 meters, the trail crosses a low ridge on which a deposit of thinly-bedded sandstone with dendrite markings is exposed. I was unable to determine what the geological position of this formation is or its relation to the igneous rocks.

On the extreme northern flank of the mountains some beds of limestone of the Comanchean series are found, which are the only extensive deposits of sedimentary rocks in the region, and these seem to have had some influence upon the flora. The appearance of the Chinquapin Oak (*Quercus Muhlenbergii*) in the Little Aguja and the lower part of the Madera Canyons and elsewhere in that part of the mountains is doubtless due to the influence of the limestones, although some of the trees are growing some distance beyond the limits of these deposits at present.

The soils resulting from the decomposition of the igneous rocks are generally acid in varying degrees, and this is one of the factors determining the character of the flora over most of the region. It is rather curious, however, that only one Ericaceous plant (*Arbutus texana*) is found, members of this family not having generally adapted themselves to xerophytic conditions.

In some of the protected canyons, and especially under the high cliffs about Mt. Livermore, the soil has been considerably enriched by humus. This appears to be one of the factors that account for the survival in such places of a number of mesophitic plants of distinctly northern origin, that will be described later.

The soil in the open valleys and on the slopes and hillsides is usually very porous and intermingled with rock fragments and gravel. And on the steeper slopes the naked igneous rocks that cover most of the surface, being poorly adapted for absorbing or retaining moisture, cause a rapid run-off after rains, thus soon rendering the surface dry and sterile and capable of supporting only the more xerophytic forms of plant life. Only at a few places where springs issue following systems of fissures or faults, or where water flowing over impermeable rocks in some of the stream beds emerges from the gravel to form pools, is the water supply sufficiently abundant or permanent to enable many moisture-loving species to maintain themselves.

Rainfall over the whole region is light, the average annual amount being about 20 inches. Most of the precipitation occurs in the form of local showers and torrents, covering very limited areas. These occur most frequently during the summer and autumn months. Due to the local character of the rainfall the amount received by any given area is quite uncertain, and there is much variation in different years. Temperatures several degrees below freezing point and sometimes as low as zero Fahrenheit, or even below, occur in the winter months. Light snows sometimes fall during the winter and early spring months, and sleet and hail are common forms of precipitation during the latter season.

The following tables of weather data are taken from the figures of the United States Weather Bureau for Ft. Davis, where records of precipitation by months have been kept from 1855 to 1920, several years being omitted and the data for some years being incomplete. In the first column the average for the 45 years reported is shown by months, with the total annual average, and in the second column the figures are for the nine years from 1912 to 1920, for which the record was complete. The figures are in inches and fractions of inches.

	Average precipitation by months for 45 years, between 1855 and 1920	For 9 years, 1912 to 1920
Jan.	0.53	0.54
Feb.	0.44	0.23
March	0.37	0.34
April	0.55	0.64
May	1.13	1.65
June	1.95	2.19
July	3.24	2.78
Aug.	3.60	4.10
Sept.	2.90	3.04
Oct.	1.28	1.19
Nov.	0.64	0.92
Dec.	0.54	0.47
Mean annual for period	17.17	22.6

The variation from year to year as shown by the figures is very great. In 1871 the annual total was only 6.78, while in 1881 it was 27.54. Correspondingly great variations occurred during some months. Thus in July, 1875, the total precipitation shown is 15.36, while for the same month in 1903 it is only 0.15, and in February, one of the dryest months, the variation is from 0 in a number of years to 3.54 in 1877. In the winter and early spring frequently no precipitation occurs for several consecutive months, and in the dry year of 1871 there was only a trace from January to June inclusive.

Temperature figures show equally great variations. Records are in degrees Fahrenheit, those for the highest and lowest thermometer readings covering a period of 16 years, those for the mean minima and maxima 5 years, and for the averages 13 years.

	Highest records	Lowest records	Mean maximums	Mean minimums	Averages
Jan.	77	−3	58.6	28.9	43.8
Feb.	85	3	60.7	31.3	48.6
March	87	15	68.3	38.7	55.0
April	95	24	76.2	46.6	62.5
May	101	38	83.5	53.3	70.3
June	111	42	87.6	60.8	74.9
July	110	47	86.0	61.3	75.1
Aug.	100	47	86.4	60.8	73.9
Sept.	94	37	80.7	55.5	68.6
Oct.	90	22	73.6	46.6	61.0
Nov.	82	6	65.1	36.6	51.3
Dec.	80	1	56.1	29.0	45.2

Frost data over a period of 29 years shows the earliest date for a killing frost in autumn as Oct. 1st, and the latest date in spring as May 2nd, while the average for the period was Oct. 15th and April 2nd, respectively.

No definite weather data is available for the higher mountains, but it is certain that lower temperatures occur and that considerably more precipitation is received at the higher altitudes than in the plains. The interception of moisture-laden clouds floating at low elevations by the lofty mountains probably results in several inches of additional rainfall, and the evaporation of this is considerably retarded in the deep shaded canyons.

The factors, therefore, that appear to limit the distribution of species and to have determined the character of the flora as it has developed in different parts of the region are moisture, as received in the form of rainfall or as it is present in springs and perennial streams; protection afforded by bluffs and canyons against the hot dry winds of the plains; altitude, as it effects rainfall and temperature; and the physiographic and geologic history of the region. The last factor, while necessarily an uncertain one and one that can be approached only hypothetically, is nevertheless probably one of the most important, and it is certainly one of the most interesting; since under changing conditions of geography and climate successive waves of flora have advanced and retreated and species

have been introduced and exterminated, resulting in the present character and distribution of the flora, which is doubtless only a stage in the slow process of transition. The plants that constitute the present flora of the region have been drawn from various sources at different times. The xerophytic phase which occupies the lower and more open portions and by far the greatest part of the area belongs to the Sonoran province and was probably the last to invade the Davis Mountains region. Other associations found in the canyons of the higher mountains, about springs and under the bluffs of a few of the highest peaks are of more ancient origin and are relics from a time when more equable climatic conditions prevailed.

Beginning with the comparatively level rocky plains about Ft. Davis and on other sides of the mountains, which lie at altitudes of from 1200 to 1500 meters, several rather distinct zones of plant life may be distinguished, which become more restricted in area but better marked as the higher altitudes of the mountains are reached.

A flora consisting largely of grasses and herbs, in which species of *Bouteloua* and *Aristida* predominate, is found in the most open situations. Amongst common herbaceous species found here are *Polygala pubera, Phlox nana, Malvastrum coccineum, Sida neo-mexicana, Eryngium Wrightii, Cassia Roemeriana, Evolvulus linifolius, Solanum elaeagnifolium, Physalis hederaefolia, Monarda clinopodioides, Houstonia rubra, Helianthus ciliaris* and *Vernonia tenuifolia.* Mesquite bushes (*Prosopis juliflora* var. *velutina*), Yuccas (*Yucca constricta*), *Condalia obtusifolia, Opuntia imbricata, O. Engelmannii* and *Senecio Riddellii* are amongst the commoner shrubs. Some of these become more abundant along ravines or in broken rocky ground, where many other species also appear, and there is a gradual transition from this association to the richer and more varied flora of the foot-hills and lower canyons. Particularly characteristic plants along the dry arroyos and open rocky ground are *Koeberlinia spinosa, Microrhamnus ericoides, Riddellia arachnoidea, Datura fastuosa* and *Xanthium spinosum.*

Rock ferns are abundant along cliffs and about the bases of the large erosion boulders of porphyritic rocks scattered about in the lower canyons and foot-hills. Fourteen species, mostly of *Pellaea, Notholaena* and *Cheilanthes,* were collected in one canyon within a half mile of Ft. Davis. *Woodsia mexicana, Bommeria hispida, Asplenium resiliens* and the rare little *Polypodium thyssanolepis* are also found here. The list of herbaceous flowering plants is long, but few of the species are common in any one locality, most of them being restricted to certain spots favored by peculiar conditions. Amongst plants found here that seem characteristic are *Andropogon scoparius, Aristolochia brevipes, Boerhaavia gypsophiloides, Linum australe, L. Lewisii, Acalypha Lindheimeri, Mentzelia oligosperma, Nicotiana trigonophylla* and *Siphonoglossa pilosella.* Many small trees and shrubs grow under the protection of the low bluffs and close along

canyon walls. Emory's Oak (*Quercus Emoryi*) and the narrow-leafed form of the Texas Red Oak (*Q. texana* var. *chisosensis*) are often common in such places, and with them grow the Mexican Mulberry (*Morus microphylla*), Hackberry (*Celtis reticulata*), *Sophora secundiflora*, *Ungnadia speciosa*, *Rhus virens*, *R. trilobata* and *Croton fruticulosus*. In somewhat more open situations the shrubby Juniper (*Juniperus monosperma*) is sometimes found, with such xerophytic shrubs as *Nolina texana*, *Dasylirion texanum*, *Yucca constricta*, *Ephedra trifurca*, *Metastelma plumosa* and *Bouvardia triphylla*. *Acacia tortuosa*, *Mimosa biuncifera*, *Mahonia trifoliata*, *Clematis Drummondii* and small groves of Emory's Oak often grow in open ground at the mouth of the canyons, and *Juglans rupestris* along the banks and beds of the dry streams. *Tecoma stans* var. *angustifolia* is common along rocky ledges. It is a shrub 6 to 8 decimeters tall, with a profusion of large trumpet-like flowers of a clear yellow color, which make it one of the most conspicuous and handsome plants during its long flowering period. Equally characteristic although less common are *Abutilon lignosum*, *Phlox Stansburyi*, *Croton suaveolens*, *Buddleia scordioides*, *Cissus incisa* var. *Andrewsii*, *Menodora longiflora*, *M. hispida*, *Brickellia californica*, *Baccharis californica*, *Eupatorium ageratifolium* and *Trixis angustifolia*. In more protected situations amongst the rocks and deep ravines *Philadelphus argyrocalyx*, *Fendlera rupicola* var. *falcata* and *Garrya Lindheimeri* are sometimes found, although they are more characteristic of higher altitudes. In some of the larger canyons where water remains for some time after rains various other trees and shrubs as well as herbaceous plants are sometimes found that usually grow only at higher levels, and a few species are most abundant here or are restricted to such places. Amongst the latter is the Maple (*Acer grandidentatum* var. *brachypterum*) and the Red Haw (*Crataegus Traceyi*). The former appears to be limited to these lower canyons while the *Crataegus* is most common here but is found up to levels of about 2000 meters. This tree is interesting as being the only representative of the large genus *Crataegus* so far found in the mountains of western Texas. It is a small thorny tree, often growing in groups or small groves. The largest specimens become 6 or 7 meters tall. At the lower levels the trees bloom early in April or perhaps even in March, depending on the season, but in the upper canyons I found it flowering as late as June 7th, in 1928. Amongst the other trees and shrubs found associated with the Maple and Red Haw are the Wild Cherry (*Prunus virens*), the Arizona Grape (*Vitis arizonica*), *Lippia ligustrina* and *Fraxinus texensis*.

Where the water supply is more abundant and permanent many other species begin to appear. In fact moisture everywhere appears to be the most important consideration and all evidence seems to indicate that many of the plants now restricted to the higher watered canyons, which will be described later, have been forced to retreat to such places to find protection and moisture.

In Limpia canyon, about a mile above the old fort, where the springs issuing from the gravel furnish perennial moisture for some distance, a very different association of plants is found. Although this locality is on about the average level of the plains many of the species growing here are found elsewhere only at considerably higher elevations in the mountain canyons. Many of the plants are limited strictly to the gravel bars of the creek or a narrow strip along its banks and they persist only as far as the influence of the water extends.

Typical trees and shrubs growing about the springs are *Populus Wislizeni*, *P. Macdougalii*, *Salix lasiolepis*, *S. Goodingi*, *S. longifolia* var. *angustissima*, *Juglans rupestris*, *Fallugia paradoxa*, *Fraxinus texensis*, *F. pubescens*, *Chilopsis linearis* and *Baccharis glutinosa*. Amongst the many herbaceous plants growing at this locality are *Cyperus esculentus*, *C. Fendlerianus*, *Lemna valdiviana*, *Tradescantia scopulorum*, *Commelina crispa*, *Froelichia gracilis*, *Radicula nasturtium-aquaticum*, *Sisymbrium diffusum*, *Euphorbia adenoptera*, *Polanisia uniglandulosa*, *Martynia fragrans*, *Epilobium Fendleri*, *Gaura parviflora*, *Salvia angustifolia* var. *glabra*, *Mimulus glabratus*, *Mecardonia peduncularis*, *Convolvulus incanus*, *Lobelia fenestralis* and *Pectis angustifolia*.

At an altitude of about 1700 meters (5500 ft.) the Piñon or Nut Pine (*Pinus cembroides* var. *edulis*) and the Alligator-bark Juniper (*Juniperus pachyphloea*) begin to appear on the slopes and tops of hills and both become commoner at higher altitudes, persisting nearly to the tops of the highest mountains. Sometimes in the Juniper-Piñon association the curious Century Plant (*Agave applanata*) is found, sending up its flowering stalks to a height of five or six meters. The plants are said to take from 15 to 25 years to arrive at blooming size, and after once flowering the plant dies, reproducing itself by offsets. The Mexican name by which it is generally known in western Texas is Maguay, and an intoxicating liquor is made from the green stalks. Other woody species commonly found on the hills here are *Quercus grisea*, *Cercocarpus paucidentatus*, *Dalea formosa* and *Adolphia infesta*. *Phoradendron Coryae* and *P. juniperinum* are common parasites, the former growing usually on Mesquite and Oaks, and the latter on the Juniper. The flora of the canyons at this elevation is not greatly different from that found at the lowest levels in the region. Certain other plants, however, begin gradually to appear and others to become more abundant. The most conspicuous addition to the forest trees is the Western Yellow Pine, locally called Long-leaf Pine (*Pinus ponderosa*). At an altitude of about 1800 meters the first specimens are found in the open canyons and it becomes increasingly abundant as the higher levels, sometimes becoming dominant or growing in pure stands over small areas in the canyons and appearing on the steep open slopes of the mountains towards their summits. It is a fine tree, sometimes 25 meters or more in height and with a clear trunk for a third or half of the distance. The bark on younger specimens is usually

rough and deeply ridged, while on the larger trees it is divided into broad, flat plates. Some of the trees are infested with a parasitic shrub related to the Mistletoes, *Arceuthobium vaginatum*. Sometimes this is so abundant as to obviously injure or even to kill the trees.

At about the same level or a little lower such shrubs as *Ptelea polyadenia*, *Ceanothus Fendleri*, *Rhus copallina* var. *lanceolata*, *Forestiera pubescens*, *F. neo-mexicana* and *Lonicera albiflora* var. *dumosa* appear in the canyons, while *Quercus texana* var. *chisosensis*, *Prunus virens*, *Vitis arizonica* and *Arbutus texana* become frequent and often conspicuous members of the forest flora. *Sapindus Drummondii* is also sometimes found along bluffs, but it does not appear to be very abundant anywhere in the region. Along the gravel bars and beds of the streams the two Walnuts of the region (*Juglans rupestris* and *J. major*) are usually found, and the little Rosaceous shrub, *Fallugia paradoxa*, is common in such places. *Juniperus pachyphloea* and *Quercus Emoryi* also frequently grow along the rocky flood-plains and the latter attains its largest size (about 15 meters tall) in such places. If the water supply is rather more abundant some of the Willows and species of Ash may be present, and *Baccharis glutinosa* is frequent along the gravel bars or margins of pools. On the dry rocky slopes of the hills the Mountain Mahogany (*Cercocarpus paucidentatus*), and such low shrubs as *Eriogonum Wrightii*, *E. tenellum*, *Dalea frutescens*, *Opuntia polyacantha*, *Adolphia infesta* and *Carpochaete Bigelovii* are typical and common. Ferns continue to be abundant along the canyon walls, and in addition to the species found at the lower levels, *Pellaea cordata*, *Cheilanthes castanea* and *Woodsia Plummerae* become characteristic, and more rarely *Pellaea atropurpurea* and *Cheilanthes alabamensis* are found. Amongst the other characteristic or conspicuous herbaceous plants along the mountain streams are *Panicum plenum*, *Cyperus Rusbyi*, *Treleasea brevifolia*, *Aquilegia chrysantha*, *A. longissima*, *Thelepodium Wrightii*, *T. linearifolium*, *Hosackia Wrightii*, *Astragalus giganteus*, *Hartmannia rosea*, *Lithospermum multiflorum*, *Geranium atropurpureum*, *Asclepias perennis*, *Hedeoma plicata*, *Pentstemon Torreyi*, *Cosmos parviflora*, *Bahia Bigelovii* and *Senecio Greggii*, to mention only a few. The tiny shrub, *Laphamia rupestris*, the succulent little *Sedum Wrightii*, the scarlet-flowered *Salvia Roemeriana*, and the scarcely less brilliant Indian Pink (*Silene laciniata*) are often found in the crevices of the canyon walls, the last species at least becoming commoner towards the tops of the mountains. On more open slopes such plants as *Amaranthus Pringlei*, *Mirabilis Wrightiana*, *Castilleja Lindheimeri*, *Cologania angustifolia*, *Artemisia mexicana*, *Picradenia longifolia* and *Gymnolomia multiflora* were noted. *Dichondra repens* is a common creeping plant on dry shaded banks, and a curious fungus-like parasite of the Broom-rape family, *Chonopholis mexicana*, is often abundant on the roots of Oak trees. *Quercus hypoleuca* begins to appear in the canyons in the upper part of this association, although it becomes common only at higher altitudes where it is sometimes a dominant species.

In the upper part of the Limpia, Madera and other canyons leading up to Mt. Livermore a marked change in the character of the flora becomes apparent at an altitude of approximately 2200 meters. Many of the species of the lower zone persist but such conspicuous trees and shrubs as *Pinus flexilis* var. *reflexa*, *Quercus novomexicana*, *Q. undulata*, *Holodiscus dumosus*, *Rhamnus fasciculata*, *Symphoricarpos oreophilus* and *Rosa Demareei* first begin to appear, and *Quercus hypoleuca* and *Rhamnus Purshiana* become conspicuous members of the plant association.

The White Pine (*Pinus flexilis* var. *reflexa*) is one of the largest and handsomest trees found in the Davis Mountains. It has a very different appearance from that of typical *Pinus flexilis* as it grows in other parts of the Rocky Mountains, and I am not sure that it should not be regarded as a distinct species. Some of the specimens seen in the canyons here must have been nearly 30 meters (90 to 100 ft.) tall. The trunks are straight and tall and the habit of growth is usually quite symmetrical. On the young trees the crown is slender-pyramidal, with whorls of branches at regular intervals. The larger specimens usually have a clear column-like trunk surmounted by a depressed conical head of rather short branches, the lower ones being somewhat pendulous. The bark is of a brownish color, rather deeply fissured and divided into large oblong plates. The bluish-green foliage has a beautiful plumose appearance, due to the long slender needles, 5 to 9 centimeters long, produced in fascicles of 4 or 5. The cones, which are pendulous, are cylindrical or narrowly conical, with truncate base and gradually tapering to the apex. They are usually 15 to 20 centimeters in length.

Pinus ponderosa and *Juniperus pachyphloea* are also common here and both attain a large size. In open situations the Juniper develops a low round crown of stout branches on the older trees. The short trunk is sometimes nearly a meter in diameter and the spread of the branches equals or exceeds the height of 18 to 20 meters attained by the largest specimens.

Quercus hypoleuca is often shrubby, forming dense thickets in some of the canyons and on rocky slopes. In more protected situations it becomes a tree up to about 14 meters tall. The leathery, lanceolate leaves, dark green above and white felty beneath, are evergreen and make it one of the most distinct looking of all the Oaks. *Quercus novomexicana* is also usually shrubby, growing in thickets in the canyons or on the open rocky slopes and along the base of bluffs at the highest altitudes. Occasionally single specimens occur that become small trees. *Quercus undulata*, which is much less common and found only towards the top of this zone and near the summits of the highest mountains, somewhat resembles the last species, but has narrower, less deeply lobed leaves, and it is usually a tree.

Holodiscus dumosus, growing on rubble and rocky banks towards the heads of canyons and ravines, is a conspicuous shrub in the flowering

season, which is in June or July, with its diffuse panicles of small white flowers. *Symphoricarpos oreophilus* is a slender shrub, often pendulous or trailing over banks, especially about springs, or growing amongst rubble in the deep canyons. The small trumpet-shaped flowers, nearly a centimeter in length, are borne profusely in short racemes, and are of a pale pink or lavender color. It is almost equally attractive when in fruit, with an abundance of inflated white berries, usually a centimeter or less in diameter. It becomes even more abundant at the higher altitudes and is one of the commonest shrubs in the Summit Formation, as will be mentioned later. The Wild Rose and *Rhamnus fasciculata* are also more abundant towards the summits of the mountains. This species of *Rhamnus* usually grows along the base of bluffs, although it is sometimes found on the rocky banks of streams and on rubble-covered slopes at the higher altitudes. It is a much-branched shrub two or three meters tall, with rather small ovate-lanceolate leaves. *Rhamnus Purshiana*, which usually grows about springs or on moist banks, is a tree-like shrub with large broadly-elliptic feather-veined leaves. *Salix lasiolepis*, *Garrya Lindheimeri* and *Forestiera neo-mexicana* are also often common here.

Amongst herbaceous plants characteristic of this association, or at least commonest at the elevations where it occurs, are *Pteridium aquilinum* var. *pubescens*, *Muhlenbergia montana*, *Bromus Porteri*, *Epicampes leptoura*, *Spiranthes minutiflora*, *Acroanthes montana*, *Lathyrus graminifolius*, *Desmodium Grahami*, *D. neo-mexicana*, *Oxalis monticola* ?, *Euphorbia chamaesula*, *Oenothera Hookeri*, *Pseudocymopterus montanus*, *Campanula rotundifolia*, *Phacelia crenulata*, *Heterospermum pinnatum*, *Solidago Bigelovii* and *Senecio integerrimus*.

Growing in clefts of the porphyritic rocks along cliffs and canyon walls are *Polypodium erythrolepis*, *Draba petrophila*, *Heuchera rubescens*, *Echinocereus Rosei*, *E. polyacanthus* and *Ferocactus hamatocanthus*. The Fern was seen only at one place near the head of Limpia Canyon. The other plants mentioned are often abundant and are found up to the highest cliffs of the mountains. *Echinocereus Rosei* is sometimes very conspicuous with its bright scarlet flowers that remain open only during the night or at least when protected from direct sunlight by shadows, or in cloudy weather. The ribbed, cylindric stems grow in dense caespitose clusters, often springing from clefts on the almost naked faces or ledges of the cliffs. *Ferocactus hamatacanthus* is much less common and seeks more protected situations. The deeply-ridged stem joints with long hooked thorns on elevated bosses grow in small groups or sometimes singly and attain a diameter of three or four decimeters in the older specimens. The flowers are of a clear lemon-yellow color, six to eight centimeters in diameter when expanded, which occurs only after sun-down or in deep shade.

Climbing up the steep grade towards the heads of the canyons as they

converge at the base of Mt. Livermore, and with indications of similar conditions about a few of the other higher peaks, a sudden and striking change in the flora is encountered. Here, at an altitude of about 2250 meters, accumulation of talus covers the steep slopes at the base of the perpendicular cliffs, which rise to a height of two or three hundred meters in places along the north and west sides of the peak. The loose material consists of blocks of all sizes up to two or three meters in diameter. Much of this is covered with moss and lichens, and in places considerable deposits of soil and humus have accumulated in depressions. Over part of the surface a dense growth of shrubs and small trees is found, the character of which indicates that a considerable amount of moisture must be received. The high cliffs above also furnish protection from the hot dry winds and from direct sunlight for a considerable part of the day.

The most conspicuous and largest tree is the western variety of the Trembling Aspen (*Populus tremuloides* var. *aurea*), of which there is a grove running up into an angle of the cliff on the north side of the mountain and following a ravine or draw down the talus slope for about a hundred meters. The largest trees are close to the foot of the cliff, where two or three attain a height of sixteen meters or more. Farther down the plants become smaller, gradually diminishing in size, and with the area they occupy narrowing, until the thin outer ranks are reduced to straggling shrubs only a meter or two in height. A large proportion of dead or partially dead plants indicates that the struggle they have to maintain in getting over periods of drought and other adverse conditions is rather severe and that a slight change for the worse might turn the scale against them.

The woody species found here, several of which are strictly limited to this narrow zone, while others occur slightly farther down the slopes and canyons, as has been mentioned previously, are:

Populus tremuloides var. *aurea*
Quercus novomexicana
Quercus undulata
Quercus hypoleuca
Philadelphus argyrocalyx
Philadelphus argenteus
Fendlera rupicola
Fendlera rupicola var. *falcata*
Ribes leptanthum
Holodiscus dumosus
Prunus virens
Prunus virginiana var. *melanocarpa*
Rosa Demareei
Rhamnus fasciculata
Garrya Lindheimeri
Vitis arizonica
Parthenocissus vitacea
Parthenocissus quinquefolia
Forestiera neo-mexicana
Sambucus coerulea
Symphoricarpos oreophilus

Along the foot of the high cliffs with north and east exposures the Male Fern (*Dryopteris filix-mas*) is very luxuriant in places, some of the fronds being eight or ten decimeters long. A few of the other characteristic herbaceous plants noted in this association are *Asplenium Tricho-*

manes, Selaginella mutica, Smilacina sp.?, *Allium cernuum, Urtica Breweri?, Thalictrum Wrightii, Draba petrophila, Heuchera rubescens, Corydalis* sp.?, *Aralia biuncifera, Erigeron Bigelovii* and *Chrysopsis hispida. Asplenium Trichomanes* is apparently rather rare, growing in deep shaded clefts along the cliffs, and the *Selaginella, Draba, Heuchera* and the two Composites are found in similar but somewhat more exposed situations and are more abundant. The other species were collected on the moist shady talus, to which they appear to be limited. The list represents only a small percent of the herbaceous flora at such places. At the same or higher altitudes on exposed slopes were found such plants as *Eriogonum Jamesii, Erysimum asperum, Androsace glandulosum, Sedum Wrightii, Phaseolus macropoides, Castilleja sessiliflora* and *Echinocereus viridiflorus.*

On the west side of Mt. Livermore, at about the same altitude, and under a cliff considerably higher than those on the north, a second grove of the Aspen with many of the peculiar associated plants was found. The area covered by this colony is greater and the number of plants composing it larger than at the other locality. The conditions at the two places are similar except for the greater exposure to the afternoon sun on the west side, but the thriftier appearance of the plants here, although none of them attain so large a size as the maximum trees under the north bluffs, indicates that this factor must be more than compensated for by other advantages. From the base of the cliff, which can scarcely be less than 300 meters in height, the Aspen has worked down two or three folds or ravines in the talus for a hundred meters or more and over the separating ridges and slope for a part of that distance, the plants gradually diminishing in size, as at the other station, towards the outer edge of the colony. The cliff here forms an open arc of a circle with the exposure slightly north of west. At the time of my visit, on June 4th, 1928, the early afternoon sun was beating down on the slope with intense fervor, and it seemed most astonishing that the *Populus* and some of the other species should be able to maintain themselves in such a position. The probable explanation is that a greater amount of moisture is actually received here than on the north side, due to the height and favorable location of the cliffs for intercepting saturated clouds and to the shade that they afford, except for a few hours near mid-day, which tends to produce and conserve a cool moist condition.

The *Ribes* and *Sambucus* and a few of the herbaceous plants so abundant on the north side were not seen here, while others, such as *Garrya* and *Rhamnus*, seemed to be thriftier and more abundant. Most of the other plants, except *Rosa Demareei*, were common to both places. This pretty little Rose, which was not seen under the north cliffs, although it occurs lower down in the canyons, was growing abundantly under the shade of the Aspens. Some of the plants here were over a meter tall, with stout prickly stems. The small pink flowers, which were in full

bloom, looked very striking and attractive in this peculiar setting. *Vitis arizonica*, *Parthenocissus vitacea* and the *Symphoricarpos* were also trailing over and amongst the rocks, growing with the Rose under the Aspens, but they persisted also beyond the shaded area, where they flourished even more abundantly, with the Choke Cherry, *Rhamnus*, *Forestiera* and other shrubs. A little farther out, and obviously just beyond the protecting influence of the cliff, a xerophytic flora of *Nolina*, *Dasylirion*, *Yucca*, *Opuntia*, *Adolphia* and similar plants had full possession of the slope

Near the top of Sawtooth Mountain, which lies several miles northwest of Livermore and rises to a height of 2350 meters (7748 ft.), the occurrence of several plants of this association in a deep protected cove at the head of a canyon indicates a former colony or an approach to the conditions that have made possible the persistence of this flora about the higher peak. The Aspen was not seen, although the inference is strong that it may have formerly been present with the other plants, such as *Quercus novomexicana*, *Prunus virginiana* var. *melanocarpa*, *Ribes leptanthum*, *Parthenocissus quinquefolia*, *Rhamnus fasciculata*, *Fendlera rupicola*, *Sambucus coerulea*, *Symphoricarpos oreophilus*, *Dryopteris filix-mas*, *Allium cernuum*, *Smilacina* sp.?, *Aralia biuncifera* and several others that were growing here.

Since some of the plants both of the Transition and Canadian zones, the Upper Canyon and Summit Floras as here described, or species closely allied to them are widely distributed through the Rocky Mountains, and are clearly of northern origin; and since some of them reappear in the mountains to the south and far into the interior of Mexico, the inference seems obvious that the isolated colonies found in these outlying mountain groups, like the Davis Mountains, are relics of a widely distributed flora that once held sway more or less continuously throughout western North America. Climatic conditions that favored such a flora, suggestive of that now occupying the region about the Great Lakes and the central and southern provinces of Canada, must have been very different to those that prevail in the Southwest at present.

This sketch of the flora of the Davis Mountains and the annotated list of the woody species that follows is based upon observations and collections made during three brief visits in 1926 and 1928. The time at my disposal and the difficulties of travel and transportation in this rugged region made it impossible to explore more than a small part of it, and since every section visited and almost every canyon entered furnished surprises and additions to the list of plants, it is highly probable that other species growing within the limits of the area were not seen, and that further exploration might add materially to it.

While a number of botanists have visited the Davis Mountains region at various times and made more or less extensive collections of plants, no systematic exploration has so far been undertaken, nor has any general account of the flora appeared.

The earliest botanical information in regard to the region resulted from the explorations of Charles Wright, who in 1849 accompanied a military expedition from San Antonio to El Paso, which passed by the present site of Ft. Davis; and it appears that he must have gone some distance up the Limpia Canyon, since some of the plants in his collection are found only at the higher altitudes there. The plants of Wright's collection, including a number from our region, were described by Dr. Asa Gray under the title "Plantae Wrightianae."

Dr. Valery Havard, a surgeon of the United States Army, was in western Texas and visited the Davis Mountains region in 1881 to 1883, making valuable collections and notes on some of the conspicuous plants. A brief account of the country through which he passed and of the flora was written by him and published in Washington in 1885.

In 1887 to 1889 Mr. G. C. Nealley made collections of plants for the United States Department of Agriculture, mainly along the route followed by the United States and Mexican Boundary Survey about 40 years previously, and he appears to have visited the Davis Mountains region and collected in the Limpia Canyon.

Professors S. M. Tracey and F. S. Earle passed through the region between Toyahvale and Ft. Davis in the summer of 1902, making collections of Cacti and other plants. The type material of *Crataegus Traceyi* Ashe was collected by them in the northern part of the mountains on this trip.

Amongst other botanists who have made collections of plants in the region are Mr. D. M. Andrews, of Boulder, Colorado, who spent some time in the vicinity of Ft. Davis in the summer of 1913; Dr. B. C. Tharp, of the University of Texas, who has visited the region several times during the past few years with parties of botanical students, and Mr. W. W. Eggleston, of the Bureau of Plant Industry, Washington, who has investigated the poisonous plants of the area and made some general collections.

On my first trip to the Davis Mountains, in June, 1926, I was accompanied by Professor Delzie Demaree, of the University of Arkansas. We established our camp along the Limpia Canyon, on the Frank Jones ranch, at an altitude of about 1900 meters (6200 ft.). From this place we explored the main canyon and several smaller ones leading up towards Mt. Livermore. We spent one night near the top of the Mountain and climbed to the summit, exploring the cliffs on the east and south sides.

Mt. Livermore is not only the highest peak of the Davis group but it is the heart of the roughest and wildest part of the region. On the topographic sheets published by the United States Geological Survey this mountain is called "Baldy Peak," a name that is not recognized by the inhabitants of the region and which seems to have been coined by the surveyors who mapped the area. This has been responsible for considerable confusion on later maps, both names appearing in some

cases and giving the impression of two distinct peaks of equal altitude. Similar liberties seem to have been taken with some other well-established local names with no happier results either as to clarity or euphony. The summit of Mt. Livermore is occupied by a cone or ridge of almost naked rock rising about one hundred meters above the next lower stage. The summit is precipitous for most of its circumference and can be scaled with difficulty only on one side. A fine view of the surrounding mountains and canyons can be had from the top on a clear day. A few straggling shrubs of *Fendlera rupicola* and *Cercocarpus paucidentatus*, a Cactus (*Echinocereus viridiflorus*), and a sparse growth of grasses and xerophytic herbs manage to maintain themselves amongst the dry rocks at the very summit. Around the base of the cone a shrubby growth of *Quercus novomexicana*, *Prunus virens*, *Vitis arizonica* and a few other species is rather dense in places. Over more open spaces at this second level a shrubby form of *Quercus grisea*, with very small elliptic-lanceolate leaves, is the dominant plant. Some of the plants are less than a meter tall and spread over much wider areas with a dense growth of foliage and branches.

On this trip we spent six days in the mountains and in the vicinity of Ft. Davis, following the Limpia down all of the way from our mountain camp to the town on our return. The weather was fine during our stay, although rather dry, and we made a large collection of plants, the flora generally being in good condition.

A second trip in coöperation with the Botanical Department of the University of Texas was made in the autumn of the same year, my companion being Mr. A. H. Berkman, then a graduate student at the University. Fortune was not so favorable to us in some respects on this trip. We encountered bad roads and tire trouble on the way from Austin to Ft. Davis, and were delayed at the latter place by a heavy rain. On our way out to the mountains, in trying to follow the poorly-marked winding roads through the ranches, we were overtaken by darkness and torrents of rain and were compelled to wait for daylight before extracting our car from the deeply-rutted roadway where it had stalled in the mud.

The following morning we established our camp at the Rock-pile Ranch, near Sawtooth Mountain, and spent the next two days in exploring the vicinity. On October 5th, having gone as far as we could with the car, we left it in a valley and set out on foot with collecting outfit, blankets and other supplies, to make our way over the mountains to Livermore peak, which I was anxious to explore from the north side. The direct distance was only a few miles, but the nature of the country greatly increased this and made traveling with loads quite difficult in places. The first night we slept by a mountain stream, the murmuring of which, mingled with the rustling of the Pines above us, the distant cry of the Whip-poor-wills and other forest sounds made pleasant music, and our camp fire of cedar logs, casting strange shadows beyond the little circle

of light, added to the charm of the scene as well as to our comfort through the chilly night. The next morning, however, a light rain began falling, which became heavier as we proceeded, and the temperature fell rapidly. Leaving our blankets and as much of our other loads as we could dispense with under a dry ledge of rock, we continued climbing and accumulating a large collection of plants as we went. Some distance below Mt. Livermore we struck into the upper part of Madera Canyon, which we followed to the foot of the mountain. Coming out under the high cliffs on the north side of the peak we spent some hours of difficult climbing through the wet shrubs and over slippery rocks in an unsuccessful attempt to find a place where we could scale them and reach the top. Although thoroughly soaked and chilled we kept on collecting as many interesting things as we could lay hands on, but towards the end of the afternoon a heavy blanket of fog and cloud settled down over the mountain so that it became impossible to distinguish any distant landmarks or to see more than a few meters ahead. Making our way as best we could back down the mountain side we managed after some difficulty to locate our blankets and other things and began seeking for a dry cave or ledge under which to spend the night, as it was evident that we would not be able to get back to the car. We crossed a rocky ridge into another deep canyon, where finding ourselves completely at fault as to direction, and darkness coming on, we were forced to stop for the night. It was at this point, just as the light was failing, that I found the interesting little Orchid, *Acroanthes montana*, growing amongst the humus and Oak leaves.

After much delay we managed to get a fire started by splitting dry wood from the heart of a Cedar log, and the rain fortunately slacking a few hours later we were able to dry our clothes to some extent by it. The ground and rocks, however, were soaking wet and we got little sleep as we crouched over the camp fire and kept it going waiting for the daylight. The mournful cries of a pair of bob-cats that kept circling our camp in the trees, evidently attracted by the camp fire, added nothing to the inducements for sleep.

The next morning Berkman climbed to the top of a high hill to try to locate Sawtooth or other landmarks and determine our location and directions. But the clouds still lying low on the mountain tops he was unsuccessful in this.

In the meantime I explored the canyon in the vicinity of our camp. *Juglans major* was growing along the bed of the mountain stream, some of the trees being eight or ten meters in height and with abundant fruit. *Forestiera pubescens* and *Mahonia haematocarpa* were growing on the steep rocky banks. The last seems to be rather a rare shrub in these mountains. One of the specimens seen some distance farther down this canyon was between four and five meters tall and with stems a decimeter or more in diameter, making it one of the largest of the Barberries.

Fearing to get lost in the mountains we decided to follow this canyon

out to the plains, in the hope that it might lead us somewhere in the direction of our car or camp. The Wild Cherry (*Prunus virens*) and the Wild Grape were common in the canyon and both were loaded with fruit. The black bears, of which there were abundant signs everywhere, although they kept pretty well out of sight, had broken down the lower branches of the trees and the vines in many places to get at the fruit.

Our provisions had been exhausted the previous evening and we set out without breakfast, and the heavy rain-soaked loads we were carrying proved very troublesome in rough places. Towards noon we reached the open country a few miles from our car and after regaining the latter we were soon at camp, where we prepared and did ample justice to our first real meal in forty-eight hours, the menu including a few mushrooms (*Agaricus* sp.?) which I found growing in the pastures.

In the spring of 1928 I planned another trip into the Davis Mountains. Arriving at Alpine on April 20th, I was met by Mr. Leo T. Murray, then Superintendent of Schools at Ft. Davis, who drove me over to that little mountain town. I learned there that the season was very backward and dry and that recent severe frosts had killed back such vegetation as had put out in the vicinity of the town, and subsequent investigation proved that most of the vegetation in the mountains was still quite dormant.

The following morning we set out for the mountains, stopping first at the Fowlkes ranch, some fifteen or twenty miles from Ft. Davis, where the Little and Big Aguja Canyons begin within a few hundred meters of each other.

About the spring at the head of the Big Aguja *Salix lasiolepis* was growing, the trees having staminate flowers at this time, although the leaves showed evidence of frost. *Rhus copallina* var. *lanceolata* growing nearby was still dormant. Going a mile or so down the canyon we found little evidence of new growth on trees and shrubs and even less in herbaceous plants. *Quercus hypoleuca* was common and conspicuous with its evergreen coriaceous leaves, and the Madrona (*Arbutus texana*), which also retains its leaves through the winter, had already bloomed. A little farther down the Maple (*Acer grandidentatum* var. *brachypterum*) was abundant. This species, as it grows here, is a shrub or small tree attaining a maximum height of six or seven meters, with short, usually crooked stems and branches and pale smooth bark. The leaves had put out evidently some weeks previously, probably following showers and a period of warm weather. Some of the trees also had half-grown fruit, but leaves and samaras had in most places been severely nipped by recent frosts. *Crataegus Traceyi* was also abundant here, some of the plants being in bloom.

In returning up the canyon we caught sight of a group of small Plum bushes growing along the rocky banks of the stream. This appears to represent a new and distinct species, which is described at another place

in this paper as *Prunus Murrayana*, for Mr. Leo T. Murray, who was with me when it was discovered. Subsequently I found what appears to be the same species growing in a little dry canyon near Ft. Davis, the plants at the latter station being without flowers or fruit.

Crossing over to the Madera Canyon, we followed a mountain road past the Fischer ranch to a point several miles below Livermore Peak, and as far as we could proceed with the car. The last few miles of the way was steep and difficult and little more than a trail, and as night was coming on we made camp in the canyon, where the temperature fell nearly to the freezing point before morning. The next morning we set out on foot up the canyon towards Mt. Livermore. There was little in condition to collect except the Conifers and other evergreen trees and shrubs. *Pinus ponderosa* was common a little way above our camp, and some of the trees were badly infested with the parasite, *Arceuthobium vaginatum*, which was both in flower and fruit. Another Mistletoe, *Phoradendron juniperinum*, was also common on the large Juniper (*Juniperus pachyphloea*).

A cold misty rain began to fall in the canyon and we could see from the more open places that the top of the mountain was enveloped in a heavy fall of sleet. As the sun came out later the trees and shrubs encased in ice at the higher altitudes shone out with striking brilliancy, but when we finally reached the top shortly after noon it was rapidly melting and the ice was falling thickly in the strong wind.

Realizing that it would be useless to spend much time in the mountains under these conditions, we returned to Ft. Davis and I spent some weeks collecting in other parts of Texas before returning to this region at the beginning of June.

At this time Mr. Murray and I again went up the Madera Canyon, and by carefully picking our road amongst rocks and other obstacles we managed to reach a point with the car more than a mile above our former camp. Carrying the tent, supplies and outfit a piece at a time up the steep trail for half a mile farther I selected a camp site at a beautiful spot on a flat bench between the creek and a rocky bluff. The place was well shaded and abundantly supplied with wood, and the base of the cliff furnished a ready-made fireplace and kitchen shelves. The most serious disadvantage was the scarcity of water. A little muddy pool in the bed of the creek, much frequented by cattle and wild animals, was the only ready source of supply. This was so stagnant and vile that it was scarcely fit to use even for washing purposes. However, a light shower came on before I had my tent set up and more rain that fell during the night helped to solve the water problem temporarily, for in the morning I found water caught in the hollows of the rocks, which furnished me a supply for about two days.

After helping to set up the tent my companion, who had to return to Alpine, left me and I managed to get most of my things under shelter

before dark. I knew that there was a spring somewhere up the canyon, but when I had a chance to reconnoiter the following day I found that it was nearly three miles up to it over a steep and rugged trail. But this being the nearest source of supply after the rain water was exhausted I was obliged to make the journey to it with my canteens each day.

Early in the morning I was on the trail towards Mt. Livermore. In the month since my last visit there had been some progress in the development of the vegetation, but since only light rains had fallen and the weather had generally remained cool, things were still surprisingly backward, and except in the more sheltered parts of the canyons many trees and shrubs were as dormant as in winter.

The spring, which is located near the head of the canyon and not far below the foot of the mountain, was now reduced to a tiny trickle, and as it required nearly a quarter of an hour to fill a quart canteen the process of obtaining the precious fluid was somewhat tedious. *Rhamnus Purshiana, Salix lasiolepis, Symphoricarpos oreophilus, Quercus novomexicana* and some fine large trees of *Pinus flexilis* var. *reflexa* were growing about the spring, but most of the herbaceous plants which are abundant in more favorable seasons had now succumbed to drought and browsing animals. The spring is much frequented by wild animals as well as by the cattle, as was attested by the numerous fresh tracks of bear, deer and various smaller sorts. Frequently in coming up the trail I caught glimpses of both the large Mule Deer and the smaller Whitetail or Flag-tail species, and once or twice I saw Bruin or his spouse scurrying to cover. The spring is also a favorite rendezvous for many kinds of birds, some of which, including a species of mountain Pigeon, apparently nest in the vicinity. Rattlesnakes are rather abundant here and throughout the mountains, and one has to be on the lookout for them everywhere. On my first trip up this canyon I killed two, one of them being a large specimen of the common Mountain Blacktail species and the other a slender stone-colored snake with dark bands and very small rattles.

A little way below the spring *Ceanothus Fendleri* was in bloom along the rocky creek bed, and *Rosa Demareei*, growing on a sometimes moist bank, was also flowering. Climbing up the steep slope to near the foot of the cliffs I found *Sambucus coerulea* in full bloom. Some of the plants were four or five meters in height and quite tree-like, with trunks more than a decimeter in diameter. On some of them the narrow leaflets were deeply serrate or almost laciniate, perhaps representing a distinct form. *Philadelphus argyrocalyx* and *Fendlera rupicola* var. *falcata* were also in bloom and the Choke Cherry was setting young fruit, but the Gooseberry was not yet in flower. Owing to the dry season there was little in the way of herbaceous growth except a species of *Stellaria* and a *Corydalis*, growing amongst the rubble, and several flowering plants and ferns in clefts along the bluffs. The Male Fern was also conspicuous in places but had made little new growth. A light shower came up about

noon, mingled with some fine hail, and as the vegetation became wet a large species of snail with thin striped shell began to emerge from the bases of the ferns and from under the mossy rocks and beds of *Selaginella*.

On another trip I crossed the mountains some distance northwest of Livermore and after a circuitous climb over the high ridges came out into a deep canyon between that peak and Sawtooth Mountain. *Rhamnus fasciculata* was abundant along some of the cliffs and I also came upon *Quercus undulata* near the top of a high bluff. A large Juniper tree in one of the canyons looked very puzzling. The top of this tree had been broken down in a storm and only a few of the lower branches were alive. From these I secured specimens of the leaves and fruit which clearly showed it to be the common species of the mountains, *Juniperus pachyphloea*, although the bark of the trunk, which was nearly a meter in diameter, was rather smooth and shreddy and not at all like the usual rough checkered bark of this tree. I saw a few other trees with similar though not quite such smooth bark at other localities. In descending into the canyon I found *Garrya Lindheimeri* and *Forestiera neo-mexicana* abundant in some of the deep ravines, and at one place *Mahonia haematocarpa* was in bloom, the flowers being of a bright yellow color.

Working my way back towards the south side of Livermore I came to the head of a deep canyon which is scarcely indicated on the topographic map. This ran towards the east and descended rapidly between high walls, forming a narrow gorge. I followed it down for about a mile, at which point *Fraxinus texensis*, *Juglans major* and *Vitis arizonica* began to appear. I believe that this is the same canyon that Demaree and I explored for some distance from the other direction two years previously, and in the lower end of which we found *Quercus reticulata* and the Bittersweet (*Celastrus scandens*).

As time did not permit me to follow this interesting canyon farther on this trip, I returned along the south side of the mountain to the western end, where with much difficulty I climbed up the steep slope to the base of the high cliff and found the grove of Trembling Aspen, which has been described in another place.

A few days later I crossed over the divide into the head of Limpia Canyon, which I followed down to a point below our first camp on the Jones ranch. Not finding anyone about the little ranch house I spent the night in the canyon by a camp fire. Conditions were much drier in the canyon at this time than we had found them in 1926. None of the springs were flowing and all water had disappeared at the higher levels and only at two or three places did I come upon water holes where I could replenish my supply. On dry open slopes some of the trees and shrubs still showed no sign of putting out new foliage, and herbaceous plants were very little in evidence except at a few spots. *Erysimum asperum* was in bloom along dry ledges near the top of the mountain and farther down in the canyon *Aquilegia chrysantha*, *Hartmannia rosea*,

Senecio Greggii and a few others were in flower. Below the altitude of about 2000 meters *Mimosa biuncifera, Ceanothus Fendleri* and *Rhus copallina* var. *lanceolata* began to appear in the more open parts of the canyon. A little lower down *Astragalus giganteus* was in bloom on the gravel bars. On my way back up the steep trail I stopped to look for the little Orchid, *Spiranthes minutiflora*, that we had found on the previous trip growing in a bit of boggy ground about a spring, but the place was now quite dry and no signs of the rare plants were to be found. Well up towards the top of the mountain, on a slope where water evidently seeps out in rainy seasons, a few flowering stalks of the Coral Root Orchid (*Corallorrhiza maculata*) had persisted from the previous year but the new growth had not started. Not far below along a low porphyritic bluff of the canyon I found an abundant growth of a curious little fern, *Polypodium erythrolepis*, a Mexican species recently described by Weatherby, and which does not appear to have been found previously in the United States. This was growing with *Selaginella Sheldoni*. The coriaceous fronds are ovate-lanceolate and entire with obtuse or rounded apices.

After returning to Ft. Davis and spending a day collecting in the foothills there I made a hasty trip to the Little Aguja Canyon. We followed the Toyahvale road down the Limpia Canyon for some miles, and then made our way over the pasture roads through the McCutcheon ranch to the mouth of the Little Aguja. The altitude here is considerably lower than in the other parts of the region that I had visited, being under 1400 meters in the plain. A xerophytic flora of Cacti, Yuccas, Sotol, Creosote-bush (*Covillea tridentata*) and the Tar-bush (*Flourensia cernua*) occupied the flat sterile land at the foot of the hills. The supply of water issuing from the canyons was used in a small way for irrigation on the ranch, and some small fields of Maize and forage crops were in cultivation. We managed to get our car up the canyon for several miles, but the last part of the road was rough and difficult. When we could go no farther I left the driver and car at a small abandoned house near a water hole and proceeded on foot. As the canyon narrowed and the walls became higher the flora rapidly became more varied and interesting. *Quercus Muhlenbergii* was growing just below the first water hole and it became abundant a few miles farther up. *Acer grandidentatum* var. *brachylerum* was found under the bluffs and along the rocky creek bed. Several of the other Oaks were also seen, *Quercus grisea* and *Q. Emoryi* growing in the more open places and *Q. texana* var. *chisosensis* and *Q. hypoleuca* occupying ground closer to the creek or in the protection of bluffs, and *Prunus virens* and *Crataegus Traceyi* were frequently growing with them. There was more water here than in any of the other canyons I had explored. In many places the creek was flowing and there was a succession of water-holes for several miles. In some of these fish were very abundant and they could be seen clearly disporting amongst the

rocks through the limpid water. As usual in such places *Salix lasiolepis*, *Juglans rupestris* and *Fraxinus texensis* were growing about the pools, as well as many species of grasses, sedges and herbaceous plants. A large Cottonwood tree (*Populus Wislizeni*) was growing near a slender needle-like pinnacle of porphyry, perhaps 20 or 25 meters tall, which has doubtless suggested the Spanish name of the canyon. *Garrya Wrightii*, also growing near here on the cliffs and rocks, was a species I had not collected before. Along a wet bank there was a rank growth of the Virginia creeper (*Parthenocissus quinquefolia*) and Wild Grape, with Columbine, Water Pimpernel (*Samolus floribundus*), *Ludvigia palustris* and other hydrophytic plants along the margin of the pool at the base, and grasses and a variety of mesophytic herbs higher up. In a wet season the vegetation must be rather rank at this place. The little Poison Ivy (*Rhus Rydbergii*) was found close-by on a low rocky bank. Towards the head of the canyon a few specimens of *Pinus ponderosa* began to appear and the Piñon was seen at several places. The altitude, however, seems to be too low for *Pinus flexilis* var. *reflexa* or any of the characteristic species of the Summit Formation found about Mt. Livermore.

Most of the woody plants found in the other canyons except those restricted to the highest altitude were noted in the Little Aguja, although it is unnecessary to give the entire list, and the discovery here of several species not found elsewhere in the mountains indicates that this part of the region may offer the most promising field for further investigation.

The literature in regard to the botany and natural history of the Davis Mountains region seems to be rather meager, although references to it are found in a number of more general treatises. Some of these, a list of which is given at the end of this paper, I have had occasion to consult and have availed myself freely of the information which they contain.

I must here acknowledge my indebtedness to my traveling companions on the various trips, whose energy and courage were in large measure responsible for what was accomplished. I also wish to express my gratitude to the authorities of the Morton Arboretum for coöperation with the Arnold Arboretum in promoting these trips, and to the botanists of the University of Texas for their interest and assistance in the work. Many of the citizens of Ft. Davis and the ranchers in the country visited also showed in many ways their intelligent interest in promoting scientific work in the region, and I am under obligations to them for courtesies and hospitality. It would scarcely be fair in this connection not to mention the fine survival of pioneer hospitality, which still prevails on many of the great ranches, where the stranger is welcomed and extended every courtesy at their command.

Specimens of some of the plants have been submitted to botanists who have made special studies of difficult groups, and I wish to thank all of them for their assistance. Amongst these I would specially mention Professor A. S. Hitchcock and Mrs. Agnes Chase, of the Bureau of Plant

Industry, Washington, who have identified or passed on most of the Grasses; Dr. S. F. Blake, of the same bureau, who has examined some of the Composites; Dr. William R. Maxon, of the National Museum, and Mr. C. A. Weatherby, of the Gray Herbarium, for assistance on the Ferns, and Dr. Francis W. Pennell, of the Academy of Natural Sciences, Philadelphia, who has examined and determined some of the *Scrophulariacea*.

Specimens of all of the ligneous plants of the following list are deposited in the herbarium of the Arnold Arboretum and in that of the Morton Arboretum. Specimens of many of the woody as well as of the herbaceous species will also be found in the herbaria of the Missouri Botanical Garden, the New York Botanical Garden, the University of Texas, and other institutions.

LIGNEOUS PLANTS OF THE DAVIS MOUNTAINS

PINACEAE

Pinus ponderosa Dougl. In mountain canyons from an altitude of approximately 1800 meters and on mountain slopes from about 2000 meters to the summits. This tree sometimes grows in pure stands over small areas or as a co-dominant species with *Juniperus pachyphloea*. It is one of the most valuable timber trees of the region.

Pinus cembroides var. *edulis* (Engelm.) Voss. The Piñon is a small tree attaining a maximum height of about 12 or 15 meters as it grows in the Davis Mountains. It is found in open canyons and on mountains from about 1700 meters to the highest altitudes. On dry and sterile mountain tops plants a meter or less in height are sometimes loaded with cones. The wood of this species is of little value and few of the seeds mature in the cones.

Pinus flexilis var. *reflexa* Engelm. This tree is found only in the higher canyons and on slopes near the summits of the mountains, usually above an altitude of 2200 meters. It is a beautiful symmetrical tree attaining a maximum height of about 30 meters. The wood is valuable for lumber but it is too rare and inaccessible in this region to be of much commercial importance.

Juniperus pachyphloea Torr. The Alligator Juniper grows in open canyons and on mountain sides above an altitude of about 1700 meters. The wood is used for posts and other purposes.

Juniperus monosperma Engelm. This species is comparatively rare in the region, where it grows in the foot-hills and on the lower mountain slopes. It is usually shrubby and of no economic importance.

GNETACEAE

Ephedra trifurca Torr. This curious shrub, with its green stems and whorled leafless branchlets, is frequent in dry rocky ground in the plains and foot-hills and sometimes on the lower mountain slopes.

LILIACEAE

Nolina texana Wats. This low shrub, known in the Southwest as Bear Grass, is found in the foot-hills and along dry rocky cliffs of the lower mountains.

Dasylirion texanum Scheele. The Sotol is found on rocky plains and hillsides at the lower altitudes. In the Davis Mountains region it is nowhere common enough to be of economic importance as a forage plant, as it is in some other sections.

Yucca elata Engelm. This species is found only in the plains and foot-hills. The plants are seldom over two or three meters tall at this altitude.

Yucca constricta Buckley. This low species is often abundant in open rocky ground in the plains and foot-hills. It is sometimes nearly acaulescent and resembles closely *Yucca glauca* of the western plains.

Yucca macrocarpa (Engelm.) Coville. This is the commonest Yucca of the region, growing in open rocky ground on the plains and lower slopes of the mountains. It seldom grows to a height of more than two or three meters here.

SALICACEAE

Salix lasiolepis Benth. Grows along streams and about springs in the mountain canyons up to altitudes of 2200 meters. This is the most abundant Willow in the region and the only species found at the higher altitudes. It is usually a shrub with a maximum height of five or six meters. The bark is smooth and the branches are of a yellow-green color.

Salix taxifolia H.B.K. Found along streams and in open canyons at the lower altitudes and up to about 1700 meters. This species sometimes becomes a tree 12 to 15 meters in height. It is easily recognized by its small leaves and by the rough, deeply ridged bark on the trunks of old trees.

Salix Goodingii Ball. This species is growing along Limpia Creek, near Ft. Davis, where it may have been planted, and it was also seen in the Little Aguja Canyon. It sometimes becomes a large tree with dark rough bark, and it seems to be closely related to *Salix nigra*, the common Black Willow of wide distribution.

Salix longifolia var. *angustissima* Anders. This variety of the Sandbar Willow was found growing along the creek near Ft. Davis, where it may have been introduced.

Populus tremuloides var. *aurea* (Tiedst.) Daniels. The Trembling Aspen is limited in the Davis Mountains, so far as known, to two small groves under the high cliffs near the top of Mt. Livermore. It is a small tree, the largest specimens attaining a height of 14 or 15 meters.

Populus Wislizeni Sarg. This species is common along the Limpia, near Ft. Davis, and it was also noted at the lower levels in some of the other canyons. Although the trees about the old fort and the town are said to have been planted it is probably native in the region.

Populus Macdougalii Rose. Trees that appear to belong to this species, which was previously known to range from Arizona to California, are growing with the last along Limpia Creek.

JUGLANDACEAE

Juglans rupestris Engelm. This small-fruited Walnut is common along the rocky flood-plains of streams and in their vicinity from the lowest levels to about 1900 meters. It is often shrubby but becomes a tree up to 7 or 8 meters tall.

Juglans major (Torr.) Heller. This species grows with the last, but is more common at the higher altitudes up to about 2000 meters. It is usually a tree, with a maximum height of 10 or 12 meters, and may be distinguished from *Juglans rupestris* by its larger fruit and the broader and less numerous leaflets.

GARRYACEAE

Garrya Lindheimeri Torr. A slender shrub rarely two meters in height. It is found along rocky bluffs and in deep canyons from the altitude of Ft. Davis to that of the highest mountains.

Garrya Wrightii Torr. This species was collected only in the Little Aguja Canyon, where it was growing on rocks and cliffs, but it probably occurs at other places in the mountains.

FAGACEAE

Quercus grisea Liebm. The Gray Oak is one of the commonest species of the Davis Mountains region, and it is found growing from the plains to the tops of the highest mountains. It is extremely variable in its foliage and habit of growth. At the lower levels it becomes a tree, with a wide flat crown, sometimes 10 or 12 meters tall. A dwarf form occurs on the high mountains, which often forms dense thickets, and in which the plants are sometimes a meter or less in height. The wood of the larger trees is used for fuel.

Quercus novomexicana (DC.) Rydb. This species is found only above an altitude of approximately 2100 meters in the canyons and at one or two hundred meters higher along cliffs of the mountains up to the highest levels.

Quercus Muhlenbergii Engelm. The Chinquapin Oak seems to be confined to the northern part of the region. It is rather abundant in the upper part of the Little Aguja Canyon, and I have also seen specimens collected near the mouth of Madera Canyon and on Mt. Gomez.

Quercus undulata Torr. A species found only at the higher altitudes of 2200 meters and above, where it grows sparingly in canyons and on rocky mountain slopes. In foliage and general appearance this species somewhat resembles the last, but it becomes a larger tree, sometimes up to 18 or 20 meters in height.

Quercus reticulata H.B.K. This appears to be a rare tree in the Davis

Mountains region, having been noted only in one small, deep canyon a little to the east of Mt. Livermore

Quercus hypoleuca Engelm. Growing in the canyons in the area about Mt. Livermore at altitudes above approximately 1700 meters and at somewhat lower levels in the Little Aguja Canyon. In protected situations it sometimes becomes a small tree up to 12 or 14 meters tall, but it is more commonly a shrub only two or three meters in height.

Quercus Emoryi Torr. This is perhaps the commonest Oak found at the lower altitudes and up to approximately 2100 meters in open canyons. It sometimes becomes a tree, with symmetrical round crown, and a maximum height of about 15 meters. The wood is tough and durable and is used for fuel and posts.

Quercus texana Buckley. The typical form of the Texas Red Oak is comparatively rare in this region. A few specimens were seen in the lower canyons where it grows with the variety next mentioned.

Quercus texana var. *chisosensis*[1] Sarg. This form is common in all of the lower canyons, but it does not seem to be present above 2000 or 2100 meters elevation. It is a small tree with a maximum height of about 16 meters. The leaves in the variety are narrower than in the typical form but they are extremely variable on different trees.

Quercus texana var. *stellipila*[1] Sarg. In the type specimens of this variety, the leaves are rather broad and with short obtuse lobes, but forms with similar pubescence but the narrow leaves of var. *chisosensis* were found which should perhaps be referred to it.

Quercus inconstans, nov. hyb. (*Quercus Emoryi* × *hypoleuca*). What appears to be a hybrid between these two species was collected in a deep rocky canyon a little east of Mt. Livermore. The leaves have a pale felty pubescence on the under surface similar to that of *Q. hypoleuca*, but it is thinner and rather easily rubbed off. In form and texture the leaves are also intermediate between the two supposed parents, both of which were growing near the hybrid. Collections were made from two plants growing some distance apart. My numbers referred to this hybrid are 30934 and 30935.

ULMACEAE

Celtis reticulata Torr. This is the commonest species of Hackberry in the region, and it is rather frequent along rocky streams in the canyons of the foot-hills and lower mountains, becoming rarer at the higher altitudes. In the canyons it sometimes becomes a tree with a maximum height of 12 or 14 meters, but in drier situations it is usually shrubby.

Celtis laevigata var. *texana* (Scheele) Sarg. This form is sometimes found along rocky bluffs and banks in the canyons at the lower and middle altitudes.

[1] In the original description of this variety (Sargent in Bot. Gaz. LXV. 423 [1918]) the name was spelled *chesosensis*, which is an obvious error that should be corrected; also var. *stellapilla* Sarg. (l. c. 424) should be corrected to *stellipila*.

Celtis laevigata var. *brevipes* (Wats.) Sarg. A usually shrubby form, growing in similar situations to the last.

MORACEAE

Morus microphylla Buckley. The Mexican Mulberry is found only in the lower canyons and foot-hills, where it is usually shrubby.

LORANTHACEAE

Phoradendron Coryae Trel. This seems to be the commonest Mistletoe of the region, growing on a variety of host plants, including most of the Oaks, *Acacia* and *Prosopis*. Trees of *Quercus grisea* and the Mesquite are often badly infested and in some cases are eventually killed by it.

Phoradendron Engelmannii Trel. This species somewhat resembles the last and grows on the same hosts. It can generally be distinguished by its smaller fruit and smaller, roundish leaves.

Phoradendron juniperinum Engelm. This species is often abundant on *Juniperus pachyphloea*.

Arceuthobium vaginatum (H.B.K.) Eichl. Parasitic on *Pinus ponderosa*, and apparently commonest at the lowest altitudes at which that species occurs.

POLYGONACEAE

Eriogonum tenellum Torr. On rocky ledges and slopes of the foot-hills and lower mountains.

Eriogonum Jamesii Benth. This species grows in similar situations to the last, but is usually found at higher altitudes.

Eriogonum Wrightii Torr. This species is found on dry rocky slopes and bluffs at the lower and middle altitudes.

PHYTOLACCACEAE

Rivina humilis L. In rocky ravines and canyons at the lower altitudes.

BERBERIDACEAE

Mahonia trifoliata (Moric.) Fedde. This shrub, known by the Mexican name of Algerita, is found only in the plains and foot-hills and is rather uncommon.

Mahonia haematocarpa (Wooton) Fedde. This species appears to be comparatively rare in the region and was seen only in some of the higher canyons above the altitude of 2000 meters.

RANUNCULACEAE

Clematis Drummondii Torr. & Gray. A slightly woody vine, climbing or trailing over shrubs and rocks, found only in the foot-hills and lower canyons.

Clematis reticulata Walt. This species is found in the canyons along the banks of streams. It is a climbing vine, and is less common than the last.

SAXIFRAGACEAE

Philadelphus argenteus Rydb. A shrub one to three meters tall, found in the canyons and on rocky banks at all elevations, but most abundant on the high mountains.

Philadelphus argyrocalyx Wooton. A shrub somewhat resembling the last species in habit and growing in similar situations.

Fendlera rupicola Gray. A shrub found along rocky banks and bluffs in the canyons, but most common near the summits of the mountains.

Fendlera rupicola var. *falcata* (Thurber) Rehder. This variety is quite similar to the last except in the narrower and sometimes falcate leaves. It grows in similar situations to the typical form and is much commoner.

Fendlera Wrightii Gray. This species was seen only in the Little Aguja Canyon, where it was growing on rocky ledges along the canyon walls.

Ribes leptanthum Gray. This Gooseberry is one of the plants restricted to the highest altitudes and is characteristic of the Summit Formation. It was seen only on Sawtooth and Livermore Mountains.

ROSACEAE

Holdiscus dumosus (Nutt.) Heller. A diffuse shrub locally common at the heads of ravines and canyons and on rocky banks at altitudes of about 2100 meters and above.

Fallugia paradoxa (Don) Endl. This slender shrub is often abundant along the beds and banks of rocky streams, from the plains to about 2100 meters.

Cercocarpus paucidentatus (Wats.) Britton. The Mountain Mahogany is a common shrub on open slopes and ledges, especially at the higher altitudes.

Crataegus Traceyi Ashe. This species of Red Haw, the only one seen in the Davis Mountains, is common in many of the canyons especially at the lower altitudes and up to about 2000 meters. It is often shrubby but sometimes becomes a tree up to 6 or 7 meters tall. Specimens from the Edwards Plateau, which undoubtedly belong to the same species, were described by Professor Sargent under the name of *Crataegus montivaga*, which must be regarded as a synonym.

Rosa Demareei, sp. nov.[1] Stems 6–12 dm. tall, reddish-brown and often glaucous or pruinose, usually hispid with straight, slender, broad-based spines 5–10 mm. long. Stipules narrow, adnate to the petioles, the free portions lanceolate and erect, those of the 1–3-foliate bracts subtending

[1] **Rosa Demareei,** sp. nov. Frutex erectus; caules 6–12 dm. alti, rubro-brunnescentes, saepe pruinosi, aculeis rectis tenuibus (5–10 mm. longis) basi dilatatis hispidi; ramuli graciles, infra stipulas armati. Stipulae petiolo adnatae, angustae, auriculis lanceolatis erectis, integrae vel glanduloso-serratae, eae foliorum infra flores latiores; folia 5–9, plerumque 7, obovata, apice rotundata, basi acuta, grosse-serrata, 5–25 mm. longa, 4–15 mm. lata, superne saturate viridia et leviter pilosa, subtus pallidiora et magis pubescentia; petioli rachesque pubescentia, armata. Flores solitarii vel raro 2–3 corymbosi, 4–5 cm. lati; petala obovata, rubicunda, apice emarginata; pedicelli glabri; hypanthium glabrum; sepala angusta, integra, caudato-appendiculata, 1.5–2 cm. longa, interne et ad marginem lanata, externe valde glanduloso-hispida; styli circiter 12–14. Fructus maturus non visus.

the flowers much broader; leaflets 5–9, usually 7, obovate, narrowed or cuneate at the base, rounded at the apex, 5–25 mm. long, 4–15 mm. broad, coarsely and simply serrate, thin but firm at maturity, bright green and sparsely pilose above, distinctly paler and more copiously pubescent beneath; petioles and rachis densely pubescent and usually armed with weak prickles. Flowers solitary or rarely two or three together, 4–5 cm. in diameter; petals obovate or obcordate, 1.5–2 cm. long, bright pink; pedicels and hypanthium glabrous; sepals narrowly lanceolate, dilated at apex, 1.5–2 cm. long, usually with entire margins, densely pubescent within and glandular-hispid on outer surface; styles about 12–14. Mature fruit not seen.

This distinct and handsome little Rose was found in several places in the higher parts of the Davis Mountains. In the Upper Limpia and Madera Canyons it was growing on moist banks and about springs. But it was most abundant on talus slopes below the high northwest-facing bluffs of Mt. Livermore at an altitude of about 2300 meters, where it was growing under the shade of the Trembling Aspen (*Populus tremuloides* var. *aurea*) and associated with other somewhat boreal plants.

The specific name is for Professor Delzie Demaree, who was with me when it was first seen. The type specimen is my number 34351, below high west-facing cliffs of Mt. Livermore, June 4, 1928. Other collections are number 30785, upper Limpia Canyon, June 11, 1926; 34385, same locality, June 6, 1928; and 34322, upper Madera Canyon, June 3, 1928.

Although the mature fruit is unknown this species, judging by the small number of the styles, appears to belong to the *Gymnocarpae* group, and it is probably most nearly related to *Rosa gymnocarpa* Nutt. However, it differs markedly from that species in its obovate, simply serrate leaflets with shorter petioles, in the character of the sepals, the enlarged-based spines, and especially in the broad stipules and modified bracts subtending the flowers. This last character appears to be quite constant and serves to distinguish our plant from related species.

Prunus virens (Wooton & Standley) Shreve. This handsome species of Wild Cherry is common in many places in the canyons and is most abundant at the higher altitudes. It becomes a tree with a maximum height of 14 or 15 meters. The fruit, which is sometimes borne in great profusion, is sweet and juicy and is eagerly eaten by bears and other wild animals.

Prunus virginiana var. *melanocarpa* (A. Nels.) Sarg. This variety of the Choke Cherry is a shrub usually less than 1.5 meters tall. It was seen only near the tops of the highest mountains, where it is a characteristic plant of the Summit Formation, growing on rocky slopes and talus under the high bluffs.

Prunus virginiana var. **pumicea** (Wooton & Standley), comb. nov. This variety grows in similar situations to the last, which it resembles in habit. It is *Padus pumicea* of Wooton & Standley.

Prunus Murrayana, sp. nov.[1] Shrub 1–2 meters tall, or probably becoming larger in protected situations, intricately branched or sometimes growing with erect stems and few ascending branches. Branchlets slender, rarely spiny, greenish-brown and densely pubescent the first season, becoming gray and glabrous or retaining some of the pubescence the second season. Stipules linear 6–10 mm. long, glandular-serrate. Leaves ovate to ovate-lanceolate, 3–5 cm. long, 1.5–2.5 cm. wide, rounded at the base, acute or acuminate at apex, finely and evenly serrate with shallow, obtuse teeth (12–14 to the cm.), thin but firm at maturity, scabrate above and pilose-pubescent beneath with short stiff hairs; petioles 5–10 mm. long, densely pubescent, eglandular. Flowers in simple 1–5-flowered umbels, on slender, 8–12 mm. long, densely pubescent pedicels, 8–12 mm. in diameter when fully expanded; petals obovate, short-clawed, 4–5 mm. long, exceeding the short stamens; calyx pubescent, the oblong-lanceolate lobes obtuse, glabrous within and densely hispid-pubescent on the outer surface. The mature fruit is unknown.

This plant, which was the only Wild Plum seen in the Davis Mountains region, was found growing on steep rocky banks of a stream, near the head of the Big Aguja Canyon. It was also found in a little dry canyon off the Limpia Canyon, near Ft. Davis. The plants at the first station were in flower, while those collected at the latter place show only the mature leaves.

Although I have not seen the fruit, this species is so distinct in the character of its inflorescence and in the pubescence from any of the other Plums with which I am acquainted that I venture to describe it as new. It is perhaps most closely related to *Prunus rivularis* Scheele, which it resembles in habit of growth, but from which it is well distinguished by the characters mentioned in the above description. My collection numbers are 33424, near head of Big Aguja Canyon, April 21, 1928 (type), and 34562, near Ft. Davis, June 13, 1928.

LEGUMINOSAE

Acacia Wrightii Benth. Plains and foot-hills and on the lower mountain slopes, mostly below 1700 meters. A shrub or rarely becoming a small tree in the Davis Mountains.

Acacia constricta Benth. This species is confined to the plains and foot-hills, where it becomes a small tree up to 6 or 7 meters tall.

Acacia angustissima (Mill.) Kuntze. Open rocky ground at the lower altitudes. Suffruticose or barely woody at the base.

[1] **Prunus Murrayana,** sp. nov. Frutex erectus, ut videtur 1–2 m. altus; rami ascendentes, intricati, nigrescentes, glabri; ramuli graciliores raro spinescentes, annotini viridi-brunnescentes, pubescentes, biennes vetustioresque cinerascentes, glabri vel leviter pubescentes. Stipulae lineares, glanduloso-serratae; folia ovato-lanceolata vel anguste ovata, basi rotunda, apice acuta vel acuminata, tenuiter serrata, matura papyracea, superne scabrida, subtus breviter pilosa; petioli 5–10 mm. longi, pubescentes, eglandulosi. Flores parvi, 8–12 mm. diam. in umbellis 1–5-floris; pedicelli graciles, 8–12 mm. longi, dense pubescentes; petala obovata, 4–5 mm. longa, apice rotundata, basi attenuatis, staminibus longiores; calyx campanulatus, pubescens; sepala ovato-oblonga, margine glanduloso-serrata, apice obtusa, interne glabra, externe hispido-pubescentes. Fructus ignotus.

Acacia angustissima var. *hirta* (Nutt.) Robinson. More common than the typical form and growing in similar situations.

Leucaena retusa Benth. Found only in the foot-hills and lower canyons. A small tree with showy yellow flowers.

Mimosa biuncifera Benth. Plains and foot-hills and in open canyons up to altitude of about 2000 meters. A very spiny shrub, and apparently the only species of Cat's-claw in the Davis Mountains.

Prosopis juliflora var. *velutina* (Wooton) Sarg. The Mesquite is usually shrubby, rarely becoming a small tree up to about 6 meters tall, as it grows in this region.

Caesalpinia Gilliesii (Hook.) Wall. Escaped from cultivation and thoroughly establishes in and about Ft. Davis. This showy flowering shrub, sometimes called Bird of Paradise, is a native of South America.

Dalea formosa (Gray) Vail. Dry rocky ground at the lower altitudes. A low shrub, seldom over 3 decimeters tall.

Dalea frutescens Gray. Rocky ground along streams and on slopes of low hills.

Sophora secundiflora (Cav.) DC. Rocky canyons and hillsides, plains and foot-hills.

Krameria glandulosa Rose. Rocky open ground at the lower altitudes.

ZYGOPHYLLACEAE

Covillea tridentata (Cav.) Vail. The Creosote Bush was seen only in the plains near the mouth of Little Aguja Canyon.

RUTACEAE

Ptelea polyadenia Greene. Often common along banks of canyons above an altitude of 1700 meters.

SIMAROUBACEAE

Koeberlinia spinosa Zucc. This remarkably spiny shrub, known as The Crown of Thorns, is found only in the plains and foot-hills, where it sometimes attains a height of 3 or 4 meters.

EUPHORBIACEAE

Croton fruticulosus Torr. A rather common shrub in rocky canyons and ravines of the plains and foot-hills.

Croton suaveolens Torr. Rocky open ground, foot-hills near Ft. Davis.

ANACARDIACEAE

Rhus copallina var. *lanceolata* Gray. Grows in canyons up to about 2000 meters A tree-like shrub sometimes 3 to 4 meters tall.

Rhus virens Lindl. Found only at the lower altitudes, on plains and in canyons.

Rhus trilobata Nutt. A very common shrub in rocky ground from the plains almost to the highest levels.

Rhus Rydbergii Small. Moist banks in the lower canyons.

Rhus microphylla Engelm. A shrub found only on the plains and in the lower foot-hills and canyons.

CELASTRACEAE

Celastrus scandens L. This widely distributed species of Bittersweet was seen in the Madera Canyon and in a short canyon a little to the east of Mt. Livermore.

ACERACEAE

Acer grandidentatum var. **brachypterum** (Wooton & Standley), comb. nov. The Maple appears to be confined to the lower canyons in the Davis Mountains. It is a shrub or small tree with crooked stems and branches. The foliage and fruit are quite variable and although in extreme forms it looks quite distinct it probably cannot be kept separate by any constant good characters from *A. grandidentatum*, and it is perhaps best to consider *A. brachypterum* Wooton & Standley, as a variety of that species.

SAPINDACEAE

Sapindus Drummondii Hook. & Arn. The Soap-berry or Wild China is a small tree found in the lower canyons and up to altitudes of about 1800 meters.

Ungnadia speciosa Endl. This tall shrub, called Mexican or Spanish Buckey, grows along rocky streams and bluffs in the lower canyons.

RHAMNACEAE

Rhamnus Purshiana DC. This species grows in the upper canyons from about 1700 to the highest altitudes. It is a shrub 2–3 meters tall. The drug Cascara Sagrada is obtained from the bark.

Rhamnus fasciculata Greene. A species found only in the higher canyons and along bluffs near the tops of the mountains from about 2000 meters to the highest altitudes. This is a shrub 2–3 meters tall. It differs somewhat in the shape of the leaves and in the character of the pubescence from Greene's description and from plants collected in New Mexico, and I was at first inclined to regard it as a distinct species. But the differences do not appear to be constant or important enough to distinguish it from this species.

Condalia obovata Hook. This is a common shrub in the plains and foot-hills, but it is not found at the higher levels.

Microrhamnus ericoides Gray. A low, very spiny shrub growing in rocky ground in the plains and foot-hills.

Ceanothus Fendleri Gray. Grows along streams and in rocky open ground in the canyons at elevations between 1900 and 2100 meters. It is a spiny shrub about a meter tall, with heads of pinkish blossoms.

Adolphia infesta Meisn. This is a low, spreading, spiny shrub, often very common on dry slopes from altitudes of 1700 to 2100 meters.

VITACEAE

Vitis arizonica Engelm. This is the only species of Grape seen in the region, and there is considerable variation in the shape of the leaves in different plants. It is often common in the canyons, especially at the higher altitudes. The fruit is small but sweet and it is greedily eaten by the bears.

Parthenocissus vitacea Hitchc. This species of the Virginia Creeper was seen only at the higher elevations where it grows in deep rocky canyons and under bluffs.

Parthenocissus quinquefolia (L.) Planch. This species is apparently less common than the last, and grows in similar situation and perhaps at lower levels. It was seen on Sawtooth Mountain and in the Little Aguja canyon.

Cissus incisa var. **Andrewsii,** var. nov.[1] In this variety the leaves differ from the typical form in being usually if not always simple or one-foliate, broadly ovate in outline, 3–8 cm. long and about as broad, usually deeply three-lobed and the lobes coarsely toothed with obtuse apiculate pointed teeth, and open-cordate at the base. The inflorescence is umbellate and apparently somewhat smaller than in the typical form. Further study and better material may prove this to be a distinct species, but for the present it is perhaps best to treat it as a variety.

The plant was seen growing in a dry rocky ravine off the Limpia Canyon, near Ft. Davis and in the Little Aguja Canyon. The specimen which I am taking as the type was collected by *D. M. Andrews*, no. 17, Ft. Davis, Aug. 21, 1913. Other collections referred to this variety are *D. M. Andrews*, no. 41, Ft. Davis, Aug. 23, 1913; *Geo. L. Fischer*, no. 82, Devil's River, Texas, July 14, 1927; *E. J. Palmer*, no. 34475, Ft. Davis, June 11, 1928, and no. 34517, Little Aguja Canyon, June 12, 1928, all in the herbarium of the Arnold Arboretum; and *F. Lindheimer*, nos. 497 and 719, New Braunfels, Texas, Aug., 1850, in the Gray Herbarium.

MALVACEAE

Abutilon lignosum (Cav.) Don. This is a frutescent shrub about one meter tall, found growing in dry rocky ravines and canyons near Ft. Davis.

CACTACEAE

Opuntia imbricata (Haw.) DC. Very common on rocky plains and foot-hills and up to altitudes of about 1800 meters. Grows as a stout shrub sometimes 2 to 3 meters in height.

Opuntia Kleiniae DC. Grows in rocky plains and in open canyons at the lower altitudes.

Opuntia leptocaulis DC. Found in similar situations to the last but nowhere common.

[1] **Cissus incisa** var. **Andrewsii,** var. nov. A typo recedit foliis simplicibus plerumque profunde-trilobatis basi cordatis grosse dentatis.

Opuntia polyacantha Haw. Often common in rocky open ground, especially at the higher altitudes.

Opuntia strigil Engelm. Amongst rocks, upper part of Limpia Canyon.

Opuntia Engelmannii Salm. A common species in dry rocky open ground, especially at the lower levels.

Opuntia macrocentra ? Engelm. What appears to be this species was collected near Ft. Davis. There are probably several other species of *Opuntia* growing in the region that were not collected or identified.

Echinocactus horizonthalonius Engelm. Dry plains near Ft. Davis and doubtless elsewhere in the region.

Ferocactus hamatocanthus (Muhlenpfordt) Rose. Shelves and crevices of rocks in the upper canyons and higher mountains.

Echinomastus intertextus (Engelm.) Britton & Rose. Amongst rocks; often common on the higher mountains.

Echinocereus viridiflorus Engelm. A common species amongst rocks at the higher altitudes.

Echinocereus Rosei Wooton & Standley. Ledges and crevices of rocks. Often common at the higher altitudes and very showy when in bloom, with a profusion of scarlet flowers.

Echinocereus Reichenbachii (Terscheck) Haage. Rocky open ground in the mountains.

Echinocereus polyacanthus Engelm. In crevices of rocks in the mountains.

Echinocereus dubius Engelm. Amongst rocks in the lower canyons, near Ft. Davis.

Neomammillaria Pottsii (Scheer) Britton & Rose. Along rocky ledges, especially at the higher altitudes.

The list of *Cacti* is probably far from complete, as I did not have facilities for collecting many species that were seen on the different trips.

ERICACEAE

Arbutus texana Buckley. This interesting tree, known in the region by the Mexican name of Madroña, is found in the canyons from the lowest levels up to about 2000 meters. It is sometimes shrubby but maximum specimens attain a height of 8 or 10 meters.

OLEACEAE

Fraxinus texensis (Gray) Sarg. This is the commonest species of Ash in the Davis Mountains, and it is found in watered canyons from the foot-hills up to an altitude of about 2200 meters. It is a small tree with a maximum height of about 10 meters.

Fraxinus velutina Torr. This species also grows in the watered canyons but it was not noticed at the lower levels.

Fraxinus velutina var. *glabra* Rehder. The glabrous form of this species is found growing with the typical one, and is apparently about as common.

Forestiera pubescens Nutt. This shrub grows on rocky banks in the canyons and is rather frequent, especially at the higher altitudes.

Forestiera neo-mexicana Gray. This species grows in similar situations to the last and is perhaps commoner at the lower levels.

Menodora hispida, sp. nov.[1] A low frutescent plant, about 3 decimeters tall, from a stout woody base. Leaves small, narrowly oblong, 5–10 mm. long, 2–4 mm. wide, strongly revolute, firm and subcoriaceous, punctate, with sparse but harsh hispid pubescence, scabrate above. Calyx campanulate, deeply cleft into about 9 linear lobes, 12–15 mm. long, ciliate and exceeding the capsule. Capsules about 1 cm. high. Flowers not seen.

Collected in dry rocky ground, just above Limpia Canyon, near Ft. Davis. Type specimen is my number 32112, Oct. 8, 1926.

Menodora longiflora Gray. This is a slender shrub sometimes 6 dm. tall. It is found in dry rocky ground in the foot-hills and lower parts of the canyons.

LOGANIACEAE

Buddleia scordioides H.B.K. A low shrub found on rocky slopes and ledges at the lower altitudes.

APOCYNACEAE

Macrosiphonia brachysiphon (Torr.) Gray. This is a small shrub about 2 or 3 dm. tall, with showy white flowers. It grows in rocky ground at the lower altitudes.

ASCLEPIADACEAE

Metastelma plumosa Small & Alexander. A slender woody vine, often common on dry rocky ledges at lower and middle altitudes.

Philiberta crispa Hemsl. A slender vine with woody base and somewhat woody stems. Found along rocky streams in the canyons.

POLEMONIACEAE

Phlox Stansburyi (Torr.) Heller. A slender plant with woody stems and a stout ligneous base. It was collected in the foot-hills near Ft. Davis.

VERBENACEAE

Lippia ligustrina (Lag.) Britton. This species is a tall shrub up to 3 or 4 meters in height. It is found in the moister situations in the canyons mostly at the lower levels. The small white spicate flowers are very fragrant and furnish a valuable bee food. The foliage is also eaten by stock.

Lippia Wrightii Gray. A low spreading shrub, found on rocky ledges, mostly at the higher altitudes.

[1] **Menodora hispida,** sp. nov. Frutex parvus vel suffrutex erectus, ad 3 dm. altus; rami graciles, striato-angulati, hispidi. Folia satis crasse chartacea, angusto-oblonga, apice apiculata, 5–10 mm. longa, 3–4 mm. lata, revoluta, hispido-pubescentia, supra scabrida. Calyx campanulatus, profunde incisus, lobis plerumque 9 linearibus ciliatis 12–15 mm. longis. Capsulae circiter 1 cm. longae. Flores non visae.

BIGNONIACEAE

Chilopsis linearis (Cav.) Sweet. The Desert Willow grows along the rocky flood-plains of streams and is often common at the lower levels and up to about 1800 meters altitude.

Tecoma stans var. *angustifolia* Rehder. This beautiful shrub is often abundant on rocky banks in the foot-hills and lower canyons. The profusion of large trumpet-like yellow blossoms make it very conspicuous during the long flowering season.

RUBIACEAE

Bouvardia triphylla Salisb. A very showy little shrub with a profusion of scarlet blossoms. It grows on dry rocky ledges at all altitudes.

CAPRIFOLIACEAE

Lonicera albiflora var. *dumosa* (Gray) Rehder. This bushy Honeysuckle is often common on rocky banks of the canyons, especially at the higher altitudes.

Symphoricarpos oreophilus Gray. Found only at the higher altitudes above approximately 2100 meters, where it grows on banks and rubble. The rather large pinkish flowers are borne in great profusion and are followed by an abundance of white berries. The plant trails or inclines over banks and grows in great luxuriance in certain favorable localities.

Sambucus coerulea Raf. This species of Elderberry is very restricted in its occurrence in the Davis Mountains, being found only at a few places at the highest altitudes, where it is a characteristic plant of the Summit Formation. Under the high cliffs on the north side of Mt. Livermore it sometimes is quite tree-like, attaining a height of 4–5 meters and having stems 12–14 cm. in diameter. There is considerable variation in the leaves, one form with narrow deeply incised leaflets appearing rather distinct.

Sambucus coerulea var. *arizonica* Sarg. This variety, in which the leaflets are broader and usually only three to five in number, was seen only in cultivation in yards at Ft. Davis, where it becomes a small tree. The plants had been brought in from somewhere in the mountains, and it should be looked for at the higher altitudes.

COMPOSITAE

Eupatorium ageratifolium DC. A low shrub found in rocky ground in the lower canyons.

Carpochaete Bigelovii Gray. On rocky banks and walls of canyons, and common at altitudes of 1700 to 2000 meters.

Brickellia Wrightii Gray. Grows on rocky banks and slopes in the lower canyons and foot-hills.

Brickellia baccharidea Gray. This species grows on rocky bluffs and banks and is found up to 2000 or 2100 meters altitude.

Brickellia laciniata Gray. On dry rocky slopes and ledges in the canyons and on mountain slopes.

Brickellia californica Torr. & Gray. This species was found in rocky ground in the foot-hills.

Flourensia cernua D.C. This shrub, usually called Tar-bush, was seen in the Davis Mountains region only an sterile plains near the mouth of Little Aguja Canyon.

Gymnosperma corymbosa DC. Common in rocky open ground, in the canyons and on mountain slopes, especially at the lower altitudes.

Baccharis Wrightii Gray. A low shrub growing in rocky ground in the canyons and foot-hills.

Baccharis texana Gray. Along rocky streams in the canyons, at the lower altitudes.

Baccharis Bigelovii Gray. Rocky banks and canyon walls.

Baccharis californica Torr. & Gray. Foot-hills and lower canyons.

Trixis angustifolia DC. Foot-hills and lower canyons.

Trixis californica Kellogg. In rocky ground, foot-hills, near Ft. Davis.

Laphamia rupestris Gray. Often common in clefts and crevices of rocks and along cliffs, at all altitudes.

Artemisia filifolia Torr. Rocky flood plains of streams, lower canyons.

Senecio filifolius Nutt. Dry rocky ground, foot-hills, plains and mountain slopes, except at the highest altitudes.

Senecio Riddellii Torr. & Gray. Grows in similar situations to the last species, and often very common.

LITERATURE CONSULTED

Bailey, Vernon. Biological Survey of Texas. Washington, 1905. (U. S. Dept. Agric., N. Am. Fauna, no. 25).

Bray, Wm. L. Distribution and Adaptation of the Vegetation of Texas. Austin, 1906. (Bull. Univ. of Texas, no. 82.)

Coulter, John M. Botany of Western Texas. Washington, 1891–94. (Contrib. U. S. Nat. Herb. II.)

Day, P. C. Summary of the Climatic Data of the U. S., Western Texas nd Southern New Mexico. Washington, 1920?. Reprint of sec. 2. U. S. Dept. Agric., Weather Bureau.

Gray, Asa. Plantae Wrightianae Texano-Neo-Mexicanae. Pt. 1. Washington, 1852. (Smithsonian Contrib. to Knowledge, 3.)

Havard, V. Report on the Flora of Western and Southern Texas. Washington, 1886. (Proc. U. S. Nat. Mus., VIII, no. 29.)

Parry, C. C., Jno. Torrey, and Geo. Engelmann, (in Rept. U. S. Mex. Boundary Survey, Botany, III. Washington, 1859.)

Standley, Paul C. Trees & Shrubs of Mexico. Washington, 1920–26. (Contrib. U. S. Nat. Herb., xxiii.)

Udden, J. A., C. L. Baker, and Emil Bose. Review of the Geology of Texas. Austin, 1916. (Bull. Univ. of Texas, no. 44.)

PROPOSED AMENDMENTS TO THE INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE

ALFRED REHDER

Since the publication of the International rules of botanical nomenclature adopted by the International Botanical Congress at Vienna in 1905 I have tried to follow them and the amendments adopted by the Congress held in 1910 in Brussels, but in several instances the rules seemed to allow of different interpretations, while in others the results of their strict application did not seem altogether satisfactory and conducive to the greatest possible stability in nomenclature. I have already in two articles[1] pointed out some of the doubtful cases and suggested modifications and now I wish to present in more definite form certain amendments which I consider desirable. In these propositions no changes of principles are involved, they only consist of extensions or modifications of the adopted rules, some caused by the application of the type method and some by a clearer distinction between taxonomic and nomenclatural validity.

ARTICLE 12

Art. 12. Finally if circumstances require us to distinguish a greater number of intermediate groups, it is easy, by putting the syllable *sub* before the name of a group, to form subdivisions of that group. In this way subfamily (*subfamilia*) designates a group between a family and a tribe, subtribe (*subtribus*) a group between a tribe and a genus, etc. The arrangement of subordinate groups may thus be carried, for wild plants only, to twenty-two degrees, in the following order: Regnum vegetabile. Divisio. Subdiviso. Classis. Subclassis. Ordo. Subordo. Familia. Subfamilia. Tribus. Subtribus. Genus. Subgenus. Sectio. Subsectio. Species. Subspecies. Varietas. Subvarietas. Forma. Forma Specialis. Individuum.

If this list of groups is insufficient it can be augmented by the intercalation of supplementary groups, so long as these do not introduce confusion or error.

Example: *Series* and *Subseries* are groups which can be intercalated between subsection and species.

PROPOSED CHANGE

Art. 12. Finally if circumstances require us to distinguish a greater number of intermediate groups, it is easy by putting the syllable *sub* before the name of a group to form subdivisions of that group: in this way subfamily (*subfamilia*) designates a group between a family and a tribe, subtribe (*subtribus*) a group between a tribe and genus, etc. The arrangement of subordinate groups may thus be carried to twenty-five degrees in the following order: Regnum vegetable. Divisio. Subdivisio. Classis. Subclassis. Ordo. Sub-

[1] Jour. Arnold Arb. I. 44 (1919) and VIII. 58 (1927); also in Jour. Bot. LIX. 289 (1921).

ordo. Familia. Subfamilia. Tribus. Subtribus. Genus. Subgenus. Sectio. Subsectio. Series. Subseries. Species. Subspecies. Varietas. Subvarietas. Forma. Forma specialis. Lusus. Individuum.

If this list of groups is insufficient it can be augmented by the intercalation of supplementary groups, so long as these do not introduce confusion or error.

Example: *Grex* which can be intercalated between subgenus and sectio; *proles* (or *stirps*) which can be intercalated between subspecies and varietas; *clon* between forma and individuum.

Article 20

Art. 20. However, to avoid disadvantageous changes in the nomenclature of genera by the strict application of the rules of nomenclature, and especially of the principle of priority in starting from the dates given in art. 19, the rules provide a list of names which must be retained in all cases. These names are by preference those which have come into general use in the fifty years following their publication, or which have been used in monographs and important floristic works up to the year 1890.

ADD AFTER THE FIRST PARAGRAPH:

Similarly, to avoid changes in the names of well known species which would be displaced by the strict application of the principle of priority or which have been variously interpreted because they include different elements without clear indication of the typical form or because their original description contains some erroneous statement, a list of binomials is provided with indication on which part of the original description or synonymy the name should be based or in which restricted sense it should be used. The list of these names forms an appendix to the Rules of Nomenclature.

Recommendation VI

ADD TO THIS RECOMMENDATION:

VI.

d) Avoid in coördinated subdivisions of a genus the use of names in the form of a noun together with those in the form of a plural adjective; the former should be used chiefly for subgenera, sections and subsections, the latter for series and subseries.

Article 28

Art. 28. Names of subspecies and varieties are formed like specific names and follow them in order, beginning with those of the highest rank. The same holds for subvarieties, forms, and slight or transient modifications of wild plants which receive a name or numbers or letters to facilitate their arrangement. Use of a binary nomenclature for subdivisions of species is not admissible.

PROPOSED CHANGE

Art. 28. Names of subspecies and varieties are formed like specific names and follow them in order, beginning with those of the highest grade. The same holds for subvarieties, forms, and slight or transient modifications which receive a name or numbers or letters to facilitate their arrangement. Use of binary nomenclature for subdivisions of species is not admissible.

All subdivisions of a species are of the same nomenclatural rank, the subordinate groups being considered different grades of the same rank.

ARTICLE 29

Art. 29. Two subspecies of the same species cannot have the same name. A given name can only be used once for a variety of a given species, even when dealing with varieties which are classed under different subspecies. The same holds for subvarieties and forms.

On the other hand the same name may be employed for subdivisions of different species, and the subdivisions of any one species may bear the same name as other species.

PROPOSED CHANGE

Art. 29. Two subspecies of the same species cannot have the same name, a given name can only be used once for a variety of a given species even when dealing with varieties which are classed under different subspecies. The same holds for subvarieties and forms; in short, the same name can be used only once for a subdivision of a given species except when the name is used for a subordinate subdivision based on the same type.

On the other hand the same name may be employed for subdivisions of different species and the subdivision of any one species may bear the same name as other species.

Additional examples:—*Andropogon Sorghum* subsp. *halepensis* var. *halepensis* Hackel,—two subdivisions bearing the same name, but representing subordinate grades based on the same type, namely on *A. halepensis* Brot. and being thus synonymous except that the name of the lower subdivision is used in a restricted sense.

RECOMMENDATION XV

AFTER RECOMMENDATION XV^{bis} ADD:

XV^{ter} Avoid giving to the typical variety of a subspecies or the typical form of a variety, in short to the type of any subdivision of a species a new name. Use the same name or a customary title like typicus, genuinus, originarius. Examples: *Andropogon caricosus* subsp. *mollissimus* var. *mollissimus* Hackel; *Arthraxon ciliaris* Beauv. subsp. *Langsdorffi* var. *genuinus* Hackel.

Article 31

ADD AS A FOURTH PARAGRAPH:

Asexual hybrids (graft-hybrids, chimeras, etc.) are treated like the sexual hybrids; they receive, even if between the same species as a sexual hybrid, a different specific epithet with the sign + before the name and in the formula the parent species are connected by the sign +.

Article 32

Art. 32. Intergeneric hybrids (between species of different genera) or presumably such, are also designated by a formula, and, when it seems useful or necessary, by a name.

The formula consists of the names of the two parents, in alphabetical order.

The hybrid is associated with the one of the two genera which precedes the other in alphabetical order. The name is preceded by the sign ×.

PROPOSED CHANGE

Art. 32. Intergeneric hybrids (between species of different genera) or presumably such, are also designated by a formula, and, when it seems useful or necessary, by a name.

The formula consists of the names of the two parents, in alphabetical order.

The name consists of a new generic name usually formed by a combination of the names of the parent genera, and a specific epithet.

Asexual hybrids between two genera are classed under the same generic name as the sexual hybrids, but a graft-hybrid between the same species as a sexual hybrid is distinguished by a different specific epithet and in the formula the names of the two parent species are connected by the sign +.

Examples: *Odontioda Boltonii* = *Cochlioda Noezliana* × *Odontoglossum Vuylstekeae.*—*Pyronia* (*Cydonia* × *Pyrus*) with a sexual and an asexual hybrid: × *P. Veitchii* Guillaum. = *Cydonia oblonga* × *Pyrus communis*, and + *P. Danielii* (Hans Winkl.) Rehd. = *Cydonia oblonga* + *Pyrus communis.*

Article 34

Art. 34. When there is reason to distinguish the different forms of a hybrid (pleomorphic hybrids, combinations between different forms of collective species, etc.) the subdivisions are classed under the hybrid like the subdivisions of species under a species.

PROPOSED CHANGE

Art. 34. When there is reason to distinguish the different forms of a hybrid (pleomorphic hybrids, combinations between different forms of collective species, etc.) the subdivisions are classed under the binomial of the hybrid like the subdivisions of a species under a species.

ARTICLE 42

ADD AS A SECOND PARAGRAPH

If desirable or necessary to abbreviate these citations the name of the publishing author as the more important must be retained.

Additional examples: "*Gesnera Donklarii* Hort. apud Hook. may be shortened to *Gesnera Donklarii* Hook."

RECOMMENDATION XXV

ADD AFTER RECOMMENDATION XXV^{ter}

XXV^{quat}. In citing a name published as a synonym the words "as a synonym" or "pro synon." should be added to the citation. If it is a manuscript name the word "ex" should preferably be used to connect the names of the original author and the author publishing it as a synonym and "apud" if the name published is a valid name. The preposition "in" should be reserved for such cases when the publishing author publishes a description contributed by the author of the name. (*Myrtus serratus* Koenig ex Steudel, Nomencl. 321 (1821), an unpublished name cited as a synonym of *Eugenia laurina* Willd. by Steudel, Nomencl. 321 [1821]; *Stewartia koreana* Nakai apud Rehder, a manuscript name of Nakai's published with a description by Rehder in Jour. Arnold Arb. IX. 31 [1828]; *Viburnum ternatum* Rehder in Sargent, a species described by Rehder and the description published by Sargent, Trees & Shrubs, II. 37, t. 117 [1907]).

ARTICLE 45

When a genus is divided into two or more genera, the name must be kept and given to one of the principal divisions. If the genus contains a section or some other division which, judging by its name or its species, is the type or the origin of the group, the name is reserved for that part of it. If there is no such section or subdivision, but one of the parts detached contains a great many more species than the others, the name is reserved for that part of it.

PROPOSED CHANGE

Art. 45. When a genus is divided into two or more genera the name must be kept and given to the division containing the species which is either designated as the type or is evidently the type of the genus. If there is no such species, the author who effects the first division chooses and his choice cannot be modified provided that the part to which he gives the name contains one or more of the species upon which the genus was originally based.

In cases where opinions differ as to the correct interpretation of this rule or where the strict application would result in the change of the name of an important genus, the name should be placed on the list of Nomina generica conservanda with the indication which

species is to be considered the type or standard species of the genus.

Article 47

Art. 47. When a species or subdivision of a species is divided into two or more groups of the same nature, if one of the two forms was distinguished or described earlier than the other, the name is retained for that form.

Examples: Genista horrida DC. Fl. Franc. IV. 500 was divided by Spach (in Ann. Sci. Nat. ser. 3, II., 253 [1844] into three species: G. horrida DC., G. Boissieri Spach and G. Webbii Spach; the name F. horrida was rightly kept for the earliest described form, that described and figured by Vahl and Gilibert.—Several species (Primula cashmiriana Munro, P. erosa Wall.) have been separated from Primula denticulata Sm. (Exot. Bot. II, 109, tab. 114), but the name P. denticulata has been rightly kept for the form which Smith described and figured under this name.

Proposed change

Art. 47. When a species or subdivision of a species is divided into two or more groups of the same nature, the name is retained for that group to which the type or the type specimen belongs.

Example: *Genista horrida* DC., Fl. Franc. IV. 500 was divided by Spach into three species: *G. horrida* DC., *G. Boissieri* Spach and *G. Webbii* Spach: the name *G. horrida* was rightly kept for the form based on *Spartium horridum* Vahl.—*Philadelphus subcanus* Koehne was separated in 1904 (in Mitt. Deutsch. Dendr. Ges. XIII. 83) from *P. incanus* Koehne (in Gartenfl. XLV. 562, 1896), but the name was rightly kept for the majority of specimens cited upon which the description was based and which must be considered as representing the type of *P. incanus*.

Article 48

Art. 48. When a subgenus or section or species is moved into another genus, when a variety or other division of a species is moved into another species, retaining there the same rank, the original name of the subgenus or section, the first specific epithet, or the original name of the division of the species must be retained or must be re-established, unless, in the new position there exists one of the obstacles indicated in the articles of section 7.

Proposed change

Art. 48. When a subdivision of a genus or a species is moved into another genus, or when a subdivision of a species is moved into another species, the original name of the subdivision of the genus, the first specific epithet, or the original name of the subdivision of the species must be retained or must be re-established, unless in the new position there exists one of the obstacles indicated in the articles of section 7.

The name of a species or of a subdivision of a species applied, when transferred to another genus or species, erroneously in its new position to a different plant, stands for the plant upon which it was originally based.

Additional example: Var. *macrobotrys* Lavallé, Arb. Segrez. 65 (1871) of *Wistara sinensis* when transferred as a forma to *W. floribunda* retains its name *W. floribunda* f. *macrobotrys* Rehd. & Wils. in Sargent, Pl. Wilson. II. 513 (1916).—*Tsuga Mertensiana* whose specific epithet was taken by Carrière from *Pinus Mertensiana* Bong. and published with a description of another *Tsuga*, namely *T. heterophylla* (Raf.) Sarg., must be maintained as the correct name of the tree described by Bongard which was called *T. Hookeriana* by Carrière. To avoid any possible doubt of the meaning of the name, it should be quoted as *T. Mertensiana* Carr. sensu Sarg. or *T. Mertensiana* Sarg., while *T. Mertensiana* Carr. (quoad descriptionem) becomes a synonym of *T. heterophylla* Sarg.

Article 50

Art. 50. No one is authorized to reject, change or modify a name (or combination of names) because it is badly chosen, or disagreeable, or another is preferable or better known, or because of the existence of an earlier homonym which is universally regarded as non-valid, or for any other motive either contestable or of little import. (See also art. 57.)

Proposed change

Art. 50. No one is authorized to reject, change or modify a name (or combination of names) because it is badly chosen or disagreeable, or another is preferable or better known, or because of the existence of an earlier homonym which is non-valid, or for any other motive either contestable or of little import. (See also art. 56 and 57.)

Article 51

Art. 51. Everyone should refuse to admit a name in the following cases:

3. When it is based on a monstrosity.

4. When the group which it designates embraces elements altogether incoherent, or when it becomes a permanent source of confusion or error.

Proposed change

Art. 51. Everyone should refuse to admit a name in the following cases:

3. When it is the name of a species placed in a genus which has no affinity whatever to the genus to which the species actually belongs.

4. When the group which it designates embraces elements altogether incoherent or when it becomes a permanent source of confusion or error. A list of names to be abandoned for these reasons is appended to the Rules of Nomenclature (Nomina specifica rejicienda).

Article 53

Art. 53. When a subgenus, a section or a subsection, passes as such into another genus, the name must be changed if there is already, in that genus, a valid group of the same rank, under the same name.

When a species is moved from one genus into another, its specific epithet must be changed if it is already borne by a valid species of that genus. Similarly when a subspecies, a variety, or some other subdivision of a species is placed under another species, its name must be changed if borne already by a valid form of like rank in that species.

PROPOSED CHANGE

Art. 53. When a subdivision of a genus passes into another genus, when a species is moved from one genus into another or when a subdivision of a species is placed under another species, its name must be changed, if there exists already a valid homonym in the new position.

ARTICLE 55

Art. 55. Specific names must also be rejected in the following special cases:

ADD TO THIS ARTICLE

3°. When they occur in a work in which binomial nomenclature is not recognized.

Add to the Examples: 3°. *Alnus vulgaris* Hill, Brit. Herbal, 510 (1756) was not proposed as a binomial, as it occurs in a work in which binomial nomenclature was not adopted.

ARTICLE 58

Art. 58. The rules of botanical nomenclature can only be modified by competent persons at an International Congress convened for the express purpose.

PROPOSED ADDITION

The permanent Committee on Nomenclature shall have the power to render in doubtful cases binding decisions regarding interpretations of the Rules of Nomenclature; it also shall have the power of adding new names to the list of Nomina conservanda and of Nomina rejicienda. The findings and decisions of the Committee will be published regularly in a botanical periodical. The Committee may have the power to fill seats which have become vacant and if considered necessary, to add new members to its body.

EXPLANATIONS AND REMARKS TO THE AMENDMENTS PROPOSED ABOVE

ARTICLE 12

It seems desirable to augment the enumeration of subordinate groups by such frequently used terms as series and subseries for groups to be intercalated between subsectio and species and lusus for a group between forma and individuum. The term series has been quite generally employed in this sense, though occasionally it has been used in a different sense, e. g. by

Pax & Hoffmann who apply this term to groups between subtribus and genus (see Engler, Pflanzenr. IV. 147[IV]. 10). As all plants wild and cultivated are objects of botanical classification, there seems to be no need to restrict the arrangement of subordinate groups to wild plants and the words "for wild plants only" may be as well omitted. If in special cases an additional group for cultivated plants should be needed, the second paragraph of art. 12 permits the intercalation of supplementary groups.

The term *grex* may serve as the name for a group to be intercalated between subgenus and sectio as done by Koehne (in Engler, Pflanzenr. IV. 216; see p. 83), though Pax and Irmscher (see Engler, Pflanzenr. IV. 117[1], 6), use it instead of *series*, but as we have *series* as the customary term for this group, *grex* is better used in Koehne's sense. For a group between subspecies and varietas *proles* may be used as done by Rouy (Fl. de France, see X. 3), and *clon* (Greek κλων, twig, shoot)[1] for a group between forma and individuum. Another term is needed for a group between subtribe and genus for which perhaps *cohors* or *turma* could be employed.

Article 20

The preservation of the names of certain well known, economically and horticulturally important species, names which by strict application of the rules of nomenclature would be changed, is as important as the preservation of well known generic names and in fact even more so than that of many of these names which scarcely figure in the literature of applied botany and whose removal from the list of conserved names would hardly be felt outside of strictly taxonomic literature, while the transfer to other species of such names like *Quercus rubra* and *Populus balsamifera* which have stood for more than 150 years for plants treated in innumerable botanical, forestal, horticultural and other economic publications is causing much confusion and great inconvenience to workers in many fields. For these reasons it seems advisable to have a list compiled and published of important and well known names which should be preserved in the sense in which they have been used extensively over a long period, in some cases for more than 150 years, or which have been interpreted differently by different botanists and should be tied down to a definite type. The fixation, even if more or less arbitrary, of names of varying interpretation, will be of great advantage. Much time and energy will be saved, if one is not forced every time one has to use a doubtful name which one has not yet carefully examined to study its history and synonymy in order to find out which of the divergent opinions should be considered correct.

Such names are for instance the following:—

Quercus rubra Linnaeus (Spec. pl. II. 996. 1753) should be based on the citation "Quercus foliorum sinubus obtusis .... Hort. Cliff. 448" and applied in the sense of Du Roi (Observ. Bot. 35. 1771), Michaux (Hist.

[1]See Webber in Science, n. s., XVIII. 501-503 (1903) and Stout in Jour. N. Y. Bot. Gard. XXX. 35 (1929).

Chênes Am. no. 20, t. 35, 36. 1801) and Sargent (Silva N. Am. VIII. 125, t. 409, 410. 1895). Syn.: *Quercus borealis* var. *maxima* Ashe.—The name *Quercus rubra* has stood for more than 150 years for the well known American Red Oak, one of the most important species of the American Oaks and extensively planted in this country and in Europe. It was not until 1915 that attention was drawn to the fact by C. S. Sargent (in Rhodora, XVII. 39) that the literature cited in the first place by Linnaeus and serving as the base for his description refers to the species later described by Michaux as *Q. falcata*, and the name *Q. rubra* was therefore transferred to that species, while the *Q. rubra* of Duroi and of all later authors became *Q. borealis* Michx. or *Q. borealis* var. *maxima* (Marsh.) Ashe. Considering the fact that the name *Q. rubra* was based at least partly on the common Red Oak, it seems permissible and even advisable to declare this citation the type of his species and conserve the name for the well known "Red Oak." Another alternative would be to consider the name as becoming a permanent source of confusion and to abandon it altogether in accordance with art. 51, 4. and to use instead *Q. falcata* Michx. for the first part and *Q. borealis* Michx. for the second part of Linnaeus' citations.

Populus balsamifera Linnaeus (Spec. Pl. II. 1034. 1753) should be based on the citation "Populus foliis cordatis crenatis basi nudis petiolis teretibus Wach. ultr. 294" and applied in the sense of Duroi (Harbk. Baumz. II. 143. 1772), Michaux (Hist. Arb. Am. III. 306, t. 13, fig. 1. 1813) and Sargent (Silva N. Am. IX. 167, t. 490. 1896). Syn.: *P. tacamahaca* Mill.—This case is very similar to the preceding, the name *P. balsamifera* having been used for more than 150 years for the Balsam Poplar, i. e. in the sense indicated above; it was not until 1919 when Farwell (in Rhodora, XXI. 101) drew attention to the fact that the type of the species should be the plant known as *P. deltoidea* Marsh. and transferred the name to that species. If abandoned as a source of confusion, it would be replaced by *P. tacamahaca* Mill. and *P. deltoidea* Marsh.

Prunus virginiana Linnaeus (Spec. Pl. I. 473. 1753) quoad specimen in Herb. Linn. et exclud. synon. omnibus; sensu Willdenow, Berlin. Baumz. 238, t. 5, fig. 1 (1796) et Spec. Pl. II. pt. II. 985 (1799), Sargent, Silv. N. Am. IV. 41, t. 158 (1892). Syn.: *P. nana* Duroi, Harbk. Baumz. II. 194, t. 4 (1772). This has been the prevailing interpretation of the name since about the middle of last century and a shifting of this name to the Black Cherry (*P. serotina* Ehrh.) to which most of the synonyms cited by Linnaeus belong would cause much confusion, since both species are economically important (see Fernald in Rhodora, XVIII. 141 [1916], also MacKenzie in Rhodora, XXX. 234 [1929]).

Azalea calendulacea Michaux (Fl. Bor. Am. I. 151. 1803) should be based on his var. β. *crocea* (l. c.) and applied in the sense of Rehder (in Wilson & Rehder Monog. Azaleas, 127. 1921).—Michaux's description of the species was based chiefly on the plant called by him var. β. *crocea* and not on his var. α. *flammea* which is identical with *Rhododendron speciosum;*

also the specific name shows that he intended the name for the generally orange-colored var. *crocea* and not for the scarlet var. *flammea*. If in this case var. α should be considered the type of the species, as it is customary, the name would have to be transferred from the plant for which it has stood for more than 100 years to the rare and little known *R. speciosum* (Willd.) Sweet.

Magnolia denudata Desrousseaux (in Lamarck Encycl. Meth. Bot. III. 675 [1791]) should be based on *Mokkwuren fl. albo* Kaempfer Amoen. v. 845 (1912) and on *Mokkwuren* 1. of Banks Icon. Kaempfer t. 43 (excl. descript.) (1791) and applied in the sense of Rehder & Wilson (in Sargent, Pl. Wilson. I. 399. [1913]). Synon.: *M. conspicua* Salisb., *M. Yulan* Desf. —In 1905 Schneider (Ill. Handb. Laubholzk I. 330) had taken up *M. denudata* Desrouss. as the oldest name for *M. purpurea* Curtis relying apparently chiefly on the color of the flower as given in Desrousseaux's description who had erroneously attributed red flowers to his *M. denudata* (see Rehder & Wilson, l. c. 401). In this interpretation Schneider is followed by Valckenier Suringar (in Mededeel. Rijks Herb. Leiden 56, p. 25. 1928). In this case an erroneous statement in the original description has caused different interpretations by different authors and the interchange of the two names, *M. denudata* and *M. liliflora* Desrouss.

In the cases mentioned above it has been possible to tie the name with more or less certainty to a definite part or citation of the original description and thus to conserve the original name. There are, however, cases, in which the original name includes two or more species variously interpreted by different authors; such names should according to article 51, 4 of the Rules be abandoned and will be dealt with under that article.

Other binomials which should be typified are: *Achras zapota* L., *Cleyera japonica* Thbg. (quoad flores).

Recommendation VI. d.

It does not seem logical to use nouns and adjectives in the plural form for coördinate subdivisions of a genus, though this had been done in *Primula* by Pax & Knuth (in Engler Pflanzenr. IV. 237, pp. 19, 45, 130. [1905]) where sect. 1 is called *Sinenses* and sect. 7 is called *Carolinella* and subsect. 1 of sect. *Auricula* is called *Euauricula* while subsect. 2 appears as *Brevibracteatae* and subsect. 3 again as a noun, *Arthritica;* thus both forms of names appear in the higher as well as the lower subdivision which makes the nomenclature rather confusing and not in agreement with the general custom. About ten years later in his monograph of *Saxifraga* (in Engler, Pflanzenr. IV. 117[I].) he uses nouns uniformly for the higher subdivisions and adjectives in plural form for the lower subdivisions. These two forms of names belong clearly to two different categories: the names in the form of nouns correspond to generic names and in many cases have been such before or they may become generic names if the group is elevated to generic rank; the names in adjectival form are usually derived from

names of species by putting these in plural form and can never become generic names or compete in any way with generic names. Therefore if a subgenus or section with a name in the form of a noun is changed to a series and in this new position the other coördinated groups have adjectival names, it should also receive a name in adjectival form, while the old name will become a synonym, or if the reverse of these changes takes place the adjectival name must be changed to a noun. The names of subgenera and of sections should be always nouns, also those of subsections except if the term is used in the place of series; the names of series and subseries should be adjectives. If the name of a species upon which a name of a series in adjectival form is based, is a proper name in the genetive, the specific name should be changed to an adjective in the plural form, e. g. a series based on *Crataegus Douglasii* should take the name Ser. *Douglasianae*.

Article 28

Though the majority of botanists who follow the International Rules consider all these categories as of different rank, there is apparently no definite statement to that effect in the Rules, neither in articles 10 to 13 in which the arrangement of subordinate groups of the plant kingdom is carried to 21 degrees nor in article 49 which deals with changes of rank and where nothing is said of the change of one subdivision of a species to another subdivision, but only the change of a species to a subdivision of a species or vice versa is mentioned. One source of the opinion that the different subordinate subdivisions of a species are of different rank may be the English translation of the Rules which employs the term rank for the term "dégré" as used in the original French text in article 12 and 28 and also for "rang hiérarchique" as used in article 29. Some authors apparently consider the different subordinate subdivisions below the species as one nomenclatorial class and take the oldest name, whether published as a variety or form, but cite the change from a lower to a higher subdivision or vice versa as a new combination; e. g. Pampanini in proposing as new the combination *Gentiana verna* var. *magellanica*,[1] takes the oldest combination *G. verna* f. *magellanica* Ronniger (1916) and not *G. verna* var. *Tenoreana* Vaccari (1917) or var. *vexans* Fiori (1926), though he should have accepted var. *Tenoreana* as the oldest name published as a variety, if he had considered forma and varietas as constituting different ranks. A similar opinion was voiced by botanists of Harvard University in their proposed amendments to the Paris Code[2]: "Subspecies, varieties and forms are not sharply definable or mutually exclusive categories, it is therefore better that, although their separate rank is maintained for classificatory purposes their names should be regarded as forming a single nomenclatorial class." There is also to be considered that the term varietas as used by one author may correspond to the subspecies of another author, or as used by a cer-

[1] In Bull. Soc. Bot. Ital. 1926, p. 42.
[2] Propos. Chang. Lois Nomencl. Bot. p. 18 (1904).

tain author it may correspond to the term forma of another, or speaking generally the same term may mean different things with different authors, and different terms as used by different authors may mean the same thing. Furthermore in many instances the names of subdivisions are preceded by letters or numerals only and it is by no means always certain for which grade they stand; this leaves too much play for varying individual interpretations and causes uncertainty.

If the subordinate subdivisions are considered as of different rank, the same group may have different names in accordance with the fact whether it is considered a varietas or a forma; e. g. *Spiraea tomentosa* [var.] *alba* Weston (1770) as a forma will have to be called *S. tomentosa* f. *albiflora* Blake, but if all subdivisions constitute one rank the name will be *alba* whether the combination is called *S. tomentosa* var. *alba* or *S. tomentosa* f. *alba* or *S. tomentosa alba*. (See also remarks under Art. 53.)

Article 29

The wording of the Art. 29 as it stands does not exclude the possibility, that the same name may be employed for two groups of different rank. If e. g. two species are united of which one contains a var. *pubescens* and the other a forma *pubescens*, there is nothing in the rules to prevent both names, since they are of different rank, from becoming valid names which would result in two different subdivisions bearing the same name. This, however, is against Art. 51. 2 which reads "Everyone should refuse to admit a name in the following cases: 2° When it duplicates the name of .... a subdivision of the same species." It also is contrary to Recommendation XXIX. 3° which says: "retain the original epithet, unless this results.... in two subdivisions of the same name in the same species." Therefore we must conclude that the correct interpretation of the Rules is to consider the subdivisions of a species as of a single nomenclatural class.

From the fact that a name can be used only once for a subdivision of a given species it follows that by the addition of one name to the binomial any subdivision is clearly designated or in other words that a trinomial is quite sufficient for the designation of any form of a polymorphous species. Only in exact citation and when it is desirable to give the exact taxonomic position the intercalated subdivisions should be quoted. E. g. *Lythrum Salicaria* var. *intermedium* subvar. *gracilius* f. *glabrum* Koehne gives the exact taxonomic position of the plant according to the author of the name, but as *Lythrum Salicaria* f. *glabrum* the plant is clearly and unmistakably designated. There is no reason in employing seven names as in *Saxifraga aizoon* subsp. *euaizoon* var. *typica* subvar. *brevifolia* f. *multicaulis* subf. *surculosa* Engler & Irmscher, if with only three names, *Saxifraga Aizoon* subf. *surculosa* or *S. Aizoon surculosa*, one can clearly designate the plant. The omission of intercalated subdivisions does, of course, not apply to terms like *typicus, normalis, genuinus*, etc., which are not names, but only titles and stand for the preceding superordinate group in a restricted sense.

Recommendation XV^ter

Names like *Prunus glandulosa* var. *glabra* f. *Sieboldiana* subf. *rosea* Koehne are not to be recommended, since they all represent the type of the species and are different names for one and the same group; they only indicate a gradually narrower conception of this group.

Article 31

Since by botanists, e. g. Hans Winkler, Camus, Daniel and others, who have studied and described graft-hybrids and chimeras names have been given to these plants, there does not seem to be any reason why these names should not be recognized and treated like those of sexual hybrids. Any botanist who disapproves of such names, is at liberty to use the formula instead.

Article 32

It does not seem advisable to associate specific names of intergeneric hybrids with one of the two genera, since they do not agree in their characters with either one of the parent genera and therefore should not be placed there without a change in the characters of the genus in question. Furthermore it does not seem logical to allow specific names for hybrids between species, while prohibiting the giving of names to hybrids between genera, and this no doubt is the reason why a considerable number of botanists, as Camus, Guillaumin, Rolfe, Schneider, G. Beck, Hans Winkler, Daniel, etc., have employed these names, though they otherwise profess adherence to the International Rules. Also the rules of horticultural nomenclature adopted by the International Horticultural Congress at Brussels in 1910 allow by their articles XIII and XIV generic names for bigeneric and multigeneric hybrids, and harmony in this respect between these two sets of rules would be very desirable.

If between the same genera sexual and asexual hybrids occur, they may be classed under one and the same name, since the name is intended for intermediate forms between the two genera, though some botanists make a distinction and retain e. g. *Cratae-Mespilus* Camus (1899) for sexual and *Crataegomespilus* Jouin (1898) for asexual hybrids between *Crataegus* and *Mespilus;* the latter name being the earlier should be adopted for all the hybrids between the two genera. As it is, however, important and desirable to keep both kinds of hybrids distinct, there should be given a distinct specific name to the sexual and another name to the asexual hybrid, the former with the customary sign ×, the latter with the sign + before the name, e. g. × *Pyronia Veitchii* Guillaumin for the sexual and + *P. Danieli* (Hans Winkler) Rehd. for the asexual hybrid.

Article 34

The wording of art. 34 of the International Rules might possibly be interpreted as allowing the use of a varietal name under a formula, but I

do not think that this is the intention of the rule, since in the examples only a case of a binomial with a variety, namely × *Mentha villosa* β. *Lamarckii* is cited, and a formula of which the variety belongs to the second component, namely *Salix caprea* × *daphnoides* var. *pulchra*. To what utterly confusing nomenclature these formulas with varietal names attached may lead is shown by some combinations published by R. Keller who enumerates under the formula *Rosa gallica* × *glauca* three forms A. *typica*, BI. *complicata* and BII. *myriodonta*,[1] representing hybrids of *R. gallica* with *R. glauca* f. *typica*, var. *complicata* and var. *myriodonta*.[2] According to my opinion Keller's names can not be considered correct, since in transferring these varietal names he applied them to different plants; he should have given new varietal names, as he did correctly in other instances, e. g. with *R. coriifolia* var. *complicata* × *gallica* M. Schulze (l. c. 56) which he called *R. gallica* × *coriifolia* f. *complicatoides* (l. c. 290). There was, however, no justification for changing Schulze's *R. coriifolia* f. *typica* × *gallica* f. *aprica* (l. c. 55) to *R. gallica* × *coriifolia apricoides*, since Schulze's f. *aprica* is a form of the hybrid and not of *R. gallica*. If both kinds of combinations should be considered admissible under the Rules, there should be at least some sign or abbreviation inserted to distinguish between varietal names belonging to the last component of the formula and those representing a subdivision of the hybrid. It seems, however, not logical to attach a varietal name to a formula, since a varietal name presupposes the existence of a specific name or a name corresponding to that of a species. If a hybrid between two species is not considered important enough to have a name of its own why should it be considered necessary to distinguish its variations by names?

Article 42

According to art. 40 "in order that the date may be readily verified it is necessary to quote the author who first published the name or combination of names in question." This emphasizes the importance of the publishing author and should lead in cases where besides the publishing author another author is given, to retain the more important author, if it is desirable or necessary to abbreviate a lengthy author citation. This is particularly important in names with the authority "Hort."; the citation "Hort." alone is almost meaningless, as it not infrequently happens that the same name has been used in different gardens for different plants and, moreover, this citation does not give the slightest hint when and where such a name may have started. A name like *Gesnera Donklarii* had no taxonomic or nomenclatural standing before Hooker described it, he is therefore responsible for it and should be cited as the responsible author. When botanical names are merely mentioned or quoted without citation of literature, it is usually desirable to abbreviate the author citation as

[1] In Ascherson & Graebner, Syn. Mitteleur. Fl. VI. pt. I. 288 (1902).
[2] M. Schulze in Mitt. Geog. Ges. Jena, v. Bot. Ver. Gesamtthür. p. 51, 52 (1887).

much as possible, and in such case a citation as *Mikania Karsteniana* Klotzsch apud Hieronymus should be shortened to *M. Karsteniana* Hieron. rather than to *M. Karsteniana* Klotzsch, because the latter citation would infer that the name could be found in a publication by Klotzsch and furthermore that the name was published before 1860, while in reality it was published 40 years later. The fact that Klotzsch wrote the name some time before 1860 on a herbarium specimen is comparatively unimportant, while the fact that Hieronymus published the name in 1901 with a descriptive note is of much greater importance.

A name of an older species is sometimes given erroneously to a plant which proves later to be a new species, e. g. *Pinus inops* Ait. was applied by Bongard to a Pine later described as *P. contorta* Dougl.; this name is always cited as *P. inops* Bong., though the full citation should read *Pinus inops* Aiton apud Bongard in Mém. Acad. Sci. St. Pétersb. ser. 6, II. 163 (1833), but in this case the publishing author is solely responsible for the interpretation of the name.

Recommendation XXV$^{quat.}$

It is usually very important to know whether a name has been published as a valid name or a synonym, but often there is no reference to this fact, even when otherwise complete synonymy is given, and in trying to form an independent opinion as to the validity of the accepted name, one is forced to consult the original publication to find out the standing of the name in question. Also a more uniform usage of the prepositions "ex, apud, in" is desirable.

Article 45

A different attitude in regard to articles 45 and 47 dealing with the division of groups is one of the most important consequences of the acceptance and application of the type method which hardly entered into the International Rules as adopted at Vienna but is gaining more and more adherents among botanists and also recognition in the Rules as shown e. g. by the recommendation XVIII^{bis} adopted in 1910 at Brussels which reads: "When publishing names of new groups to indicate carefully the subdivision which is regarded as the type of the group: the typical genus in a family, the typical species in a genus, the typical variety or specimen in a species."

Above all other considerations in deciding for which division the name of a genus is to be preserved, if it is divided into two or more genera, should stand the rule that it should contain at least one of the original species. This is not brought out in the rule as it stands, and by the examples cited one is led to assume that the conception and extent of the genus at the time of the division, should guide the decision for which part the generic name should be preserved. The original conception of the genus may have been considerably altered by that time, in some cases

even so much that the division for which the name was preserved has not contained any of the original species (as in *Alsine* L. in the sense of Wahlenberg and most later authors).

The rule that the name is reserved for the part which contains a great many more species is not sufficiently definite, for the opinion may differ how many species constitute a great many more. Should not according to this rule the name *Cistus* be given to the genus separated as *Helianthemum*, since many more species of *Cistus* in the original Linnean conception were transferred to *Helianthemum*, namely 20, while only 8 remained in *Cistus*? Why should not, as proposed above, the doctrine of residues which has been practiced to a great extent in the division of genera be followed with the safeguard that the group which retains the original name must always contain at least one of the species published with the first description? This species would then become the type or standard species of the genus.

In the case of *Erica* one could argue that *E. vulgaris* L. judging by its name should be considered the type of the genus, a conclusion strengthened by the fact that the generic description is based mainly on that species; this would result in renaming (as O. Kuntze did) all the species (about 500), except one, *E. vulgaris*, which would remain in the genus *Erica*. If we do not consider *E. vulgaris* L. the type species, the name will go to the larger part as well under the present rule, as under the rule as above proposed. It would, however, be advisable to place *Erica* on the list of Nomina conservanda with *E. Tetralix* L. as standard species to prevent any botanist from advocating to consider *E. vulgaris* the type species. Also such Linnean genera as *Mespilus*, *Crataegus*, *Bromus*, and many others should be placed on the list of nomina conservanda with citation of a standard species (see also Kew Bull. Misc. Inform. 1925, p. 49, 315).

Article 47

The proposed change allows of more general application than the original wording which referred chiefly to a special case. In many instances there is no form described earlier, but either a mixed description or a citation of additional specimens besides the one upon which the description is chiefly based. In many Linnean species it is often very difficult to decide which of the synonyms cited should be considered as representing the type or to which of the divisions of the original species the description applies. (see examples under art. 20 and 51, 4).

Article 48

If all the subdivisions of a genus and all the subdivisions of a species are considered as belonging to one rank as proposed under art. 28, the words "retaining there the same rank" become superfluous. As shown by the first example the subdivisions of a genus are apparently not considered as being of different rank, as may be also inferred from Recommendation

XXIX 2°; the same view should hold for subdivisions of a species which would be in accordance with Recommendation XXIX. 3°. (See also remarks under art. 28.)

Article 50

The wording of this rule as it stands has caused in many cases uncertainty in its application chiefly on account of the fact that no distinction is made between valid names and valid taxonomic groups, that is between nomenclatural and taxonomic validity. The wording of the rule: "No one is authorized to reject, change or modify a name .... because of the existence of an earlier homonym which is universally regarded as non-valid," seems contradictory in itself, for a name is either valid or non-valid, depending on whether it is formed in accordance with the rules or not and it cannot be made so by universal consent. This becomes clearer by the revised article 56 which reads in part: "By valid name is implied a name and especially a combination of names formed in accordance with the rules of nomenclature." The strict adherence to this ruling will exclude a considerable number of homonyms which otherwise tend to make nomenclature unstable. As names that have become synonyms by change of generic or specific limitations may be revived at any time by another change in the taxonomic valuation of genera or species, I have termed non-valid names unconditional synonyms, and synonyms for taxonomic reasons conditional synonyms (see Rhodora XVII. 61, footnote). As an example, *Picea canadensis* (Mill.) Britton, Sterns & Poggenburg, may be cited. This name cannot stand on account of the *P. canadensis* (L.) Link which is the correct name of the Hemlock Spruce under the genus *Picea*. Even if *Tsuga* is now recognized as a distanct genus by almost all botanists and therefore *Picea canadensis* Link referred to *Tsuga canadensis* as a synonym, this should not make any difference, since *P. canadensis* Lk. is a name formed in accordance with the rules and therefore valid and at any time some botanist may unite *Picea* and *Tsuga* again and thereby cause *P. canadensis* Lk. to be revived.

Article 51

3. The original wording of part 3 could be so interpreted as to exclude names like *Viburnum macrocephalum* Fort., *Hydrangea macrophylla* DC., *Rosa xanthina* Lindl., *R. hemispheria* Herrm. and other Roses, which all undoubtedly are monstrosities having double flowers, or all of them changed into sterile flowers, but their description is not based on the monstrous character, and they are distinguished by other characters from related species. Cases like that of *Datisca hirta* L. are somewhat different.

Even names as *Uropedium* separated by Lindley by a monstrous character from *Cypripedium* might be retained "charact. mutatis" for *Phragmopedilum* Rolfe as the oldest name, being the first generic name based on a member of this group. It seems hardly necessary to maintain Part 3 of

art. 51, since a name based on a monstrous character could in no case have a taxonomic standing and would be taxonomically non-valid and its nomenclatural validity would have no consequence.

This paragraph therefore can be cancelled and replaced by a rule that a name should not be considered valid "When it is the name of a species placed in a genus which has no affinity whatever to the genus to which the species really belongs." Such a rule will to a certain extent revive the so-called Kew rule and will prevent the acceptance of a name like *Rhodotypus scandens* based on *Corchorus scandens* for the well known *R. kerrioides* Sieb. & Zucc. It will prevent specific names given after careful study and comparison to species and placed in the right genus being superseded by names given without careful examination and without sufficient knowledge by careless workers like H. Léveillé. The original name in the wrong genus can and by most authors probably will be preserved even under the rule here advocated, if the plant is found to represent in the correct genus a new species e. g. *Berchemia alnifolia* Léveillé was transferred to *Corylopsis* by C. Schneider as *C. alnifolia* (Lévl.) Schneid; this is in accordance with the optional provision made in the last sentence of art. 56.

4. To secure the greatest possible stability in the nomenclature of binomials it seems necessary to know definitively which names should be considered a permanent source of confusion of error. The opinions of botanists in this respect are unfortunately not unanimous. Some consider names like *Betula alba* L., *Ulmus campestris*, L., *Rosa villosa* L., *Azalea lutea* as belonging to this category, while others retain these names and restrict them to one of the components of the original conception of the name. There seems to be only one way out of the differences in the application and use of these names and that is the compilation of a list of "nomina specifica rejicienda" which would form an appendix to the Rules.

Article 53

As already pointed out under art. 50 the introduction of taxonomic validity into the rules is not conducive to stability, therefore the expression valid group should be replaced by valid name or valid homonym, as defined in art. 56.

Article 58

It would be of great advantage and further the cause of the greatest possible stability in nomenclature if the Permanent Committee on Nomenclature could render binding decisions regarding interpretations of the Rules of Nomenclature, and add new names to the list of nomina conservanda and rejicienda. Undesirable changes of names and erroneous interpretation of the Rules could be prevented from gaining a foothold, if the discovery of a name which threatens the replacement of a well known name of an important genus or binomial could be brought before the Committee and a decision obtained within a reasonable time. If one has to wait

years before a congress convenes, changes in the names may be taken up by botanists though in many instances perhaps reluctantly and come into use, before decisive action could be taken. Moreover a congress is not the place to decide intricate questions of nomenclature, and even if carefully prepared by a special committee the voting on special cases of nomenclature would probably be more or less perfunctory, since the majority of voters would have no special knowledge of the case in question and not be able to obtain it on short notice.

If such a committee had existed, the coming into use of names like *Columella* Lour. for *Cayratia* Juss. which naturally will have in its wake the displacement of *Columellia* R. & P., the type of the family Columelliaceae, might have been prevented and also the changing of the name *Quercus rubra* from the Red Oak to the Spanish Oak and *Populus balsamifera* from the Balsam Poplar to the Cottonwood.

NOTE ON THE NAMES OF HORTICULTURAL VARIATIONS

As an appendix to the propositions and the statements made above I should like to add a few words on the nomenclature of horticultural forms. I am interested in horticultural nomenclature and have recently proposed a few amendments to the Rules of horticultural nomenclature adopted at the International Horticultural Congress at Brussels in 1910. At the outset I wish to state that I can see no inherent difference between a form or a variation originated in the wild and one originated in the garden; a large number of so-called garden forms have originated in the wild and were transferred to the garden afterwards or they originated in seed-beds from seed collected from wild plants. Why should corresponding variations, one known from the wild and the other only from gardens, have a different nomenclatural status? There is certainly no difference in the character and taxonomic status between *Alnus glutinosa* β *laciniata* Willd. described from cultivated plants and *A. incana* f. *tomophylla* Fernald described from a wild plant, nor between *Ilex serrata* f. *xanthocarpa* Rehd. and *I. verticillata* f. *chrysocarpa* Robins., the first described from cultivated, the second from wild plants. Therefore, I can see no objections in giving both kinds the same nomenclatural treatment, for all plants, spontaneous as well as cultivated, are objects of botanical classification and it is not the fact whether a plant is growing in a garden or in the wild that makes the difference, but the purpose of the names. The purpose of botanical nomenclature is classificatory; in the case of varieties it aims to provide a name for each of the groups into which the whole mass of variations of a polymorphous species may be divided, the name being usually based on a type around which a number of more or less similar plants are grouped. The purpose of horticultural nomenclature is selective; it aims to give a name to a certain selected outstanding form without considering its re-

lation to others. The name is therefore that of an individual plant or of the equivalent of an individual plant, usually propagated vegetatively and thus representing practically a part of the original plant[1]; or in the case of garden forms raised from seed the name is applied only to plants exactly like the mother plant, deviations are discarded or if of horticultural merit, are made the starting point of a new race under a different name. It is therefore advisable that such individual plants or equivalents of individual plants should receive names different from botanical names which represent group names, and the general custom has been to give to them vernacular names, usually nouns like Avalanche, Snowdrift, Venus, John Waterer, C. S. Sargent, Kirishima, etc., which do not form a part of a botanical combination if appended to them and should be printed in a different type and enclosed in quotation marks. These names may be compared to the names of human individuals and will lapse when the plant disappears from cultivation, while a botanical name remains valid, even if the plant on which it was based ceases to exist; the name will be used again, if at any time a form appears which answers the description or the type specimen of the original form. If a name indistinguishable from a botanical name is given to a plant, it will have to be treated as a botanical name and follow the rules of botanical nomenclature; it can not be considered the name of an individual, but must be taken as the name of a group. Therefore a horticulturist who gives a Latin name which forms part of a botanical combination, does so to his disadvantage, for under the botanical name, according to the rules of botanical nomenclature, other similar forms can be classed which may be of inferior horticultural value compared with plant originally sent out under that name. *E. g.*, the name *Berberis Thunbergii* "Silver Beauty" or "Silver Beauty Barberry" stands for a distinct form and should not be applied to any other form however similar, while under the name *B. Thunbergii argenteo-marginata* other variegated forms may be grouped, differing perhaps in the character or color of the variegation and possibly of inferior horticultural value. Thus in purchasing a plant under *B. Thunbergii argenteo-marginata* one might receive a plant inferior to the original form, while as "Silver Beauty" one can expect a plant exactly like the original form and has a right to refuse any inferior substitute. Likewise a name like *Thuja occidentalis* f. *aurea* may be applied to several yellow-leaved forms differing perhaps in the shade of yellow and also in other slight characters as habit, but a name like "Meehan's Golden" stands for an individual form of *Thuja occidentalis* and its vegetative progeny.

Horticultural forms which originated from hybridization should be treated similarly. The name in the vernacular stands for the individual plant while the botanical name stands for the group, *e. g.*, *Cattleya* "Lord Rothschild" stands as the name of the original hybrid form so named,

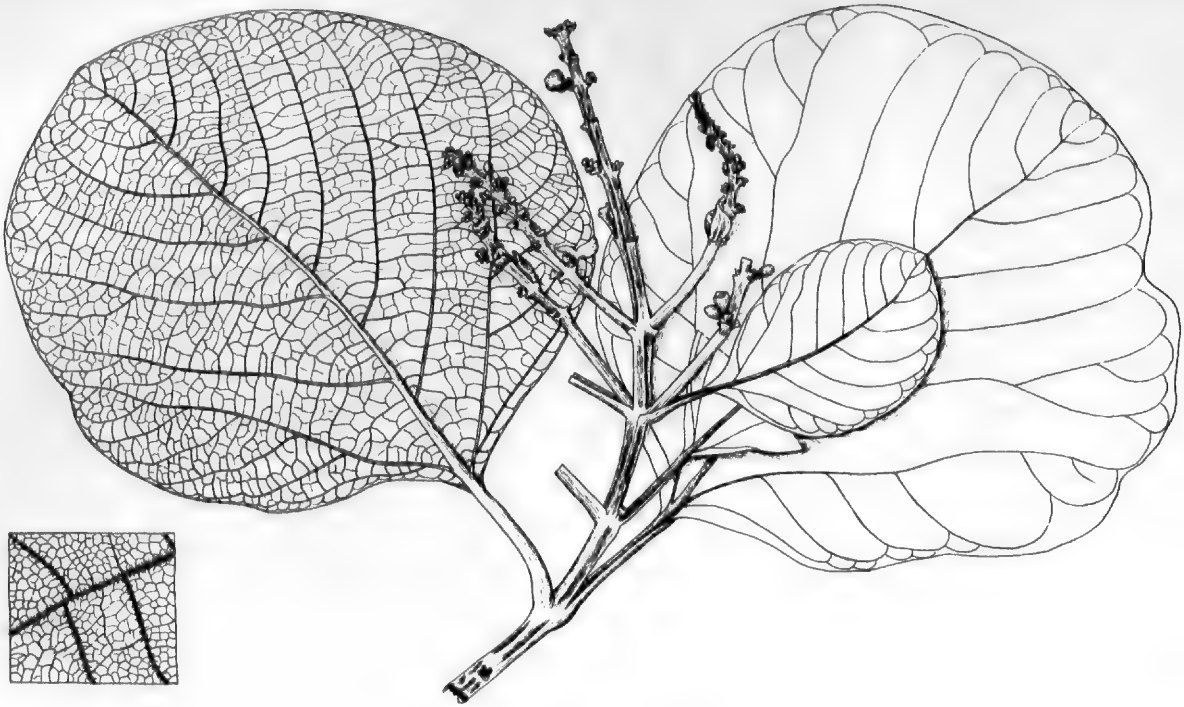
[1] To such units in plant life the term clon (with long o, plural clons) has been applied. A clon may comprise thousands of plants, but they are in fact merely parts of the original individual plant multiplied by vegetative propagation (see also p. 50).

while *Cattleya Rothschildiana* is the group name for all the hybrids between *Cattleya Dowiana* and *C. Gaskelliana*, of which "Lord Rothschild" represents the type; likewise *Syringa Prestoniae* and the Lilac "Isabella" are both based on the same form, but the former name includes all the hybrids between *S. reflexa* and *S. villosa* while the latter is restricted to the original plant and its vegetative progeny, and may be designated either as Lilac Isabella or as *Syringa Prestonae* "Isabella."

Another important difference between botanical names and horticultural names is that the latter do not form combinations with generic names or binomials, though they may be appended to such names, and the author, who in most cases is also the originator or raiser of the form, always remains the same, whether the name is appended to a botanical generic name, to a binomial or to a vernacular name; *e. g.*, the Lilac "Decaisne" Lemoine may be quoted as *Syringa* "Decaisne" Lemoine, as *S. vulgaris* "Decaisne" Lemoine, or Flieder "Decaisne" Lemoine without change of authority, also *Philadelphus Lemoinei* Lem. "Virginal" Lemoine if classed under *P. virginalis* Rehd. should be cited as *P. virginalis* "Virginal" Lem. but *Deutzia gracilis campanulata* Lemoine when transferred to *D. rosea* becomes *D. rosea* var. *campanulata* Rehd. or var. *campanulata* (Lem.) Rehd., since names indistinguishable from botanical names should follow the rules of botanical nomenclature. If they are undoubtedly names of individual plants these names in adjective form may be treated as nouns, written with capital letter and considered horticultural names as, *e. g.*, the Lilac "Coerulea superba" Ellw. & Barry or *S. vulgaris* "Coerulea superba" Ellw. & Barry (in McKelvey, Lilac Monog. 278 [1928]). From the examples cited above it becomes evident that a vernacular name should not be duplicated within a genus except in the case of well defined groups as Plums and Cherries, while the same botanical name may be used several times in the same genus if classed under different species.

Regarding the question of author citations it seems advisable and practical to retain as done above for vernacular names which do not form combinations the original author citation even if appended to different botanical names or combinations. It is also clear and in accordance with the Rules of Botanical Nomenclature that for each new combination the author who is responsible for it should be quoted, but it is still doubtful whether the author citation should be changed when the combination of names remains the same and only the taxonomic valuation of the subdivision of the species is slightly changed as in *Gentiana verna* f. *magellanica* Ronniger (1916) which was called by Pampanini *G. verna* var. *magellanica* in 1926, or when the combination of names is changed by the addition or omission of intercalated groups, but the taxonomic valuation of the subdivision remains either the same or is also changed. If complete and exact synonymy will be given, the status of the combination in question can be made clear, but if the combination is quoted without synonymy it will often be difficult to know who should be quoted as the author since

the Rules as they stand at present are not definite. The simplest way out of this difficulty would be to quote the author who first placed the subdivision under the correct binomial, leaving the exact statement of the taxonomic valuation of the group by different authors to the synonymy. It is to be hoped that the Rules will be amended so as to be more explicit on these points.



GMELINA PAPUANA Bakh.

Flowering branch (× ½) and portion of under side of leaf (× 2).

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME X APRIL, 1929 NUMBER 2

THE VERBENACEAE OF BRITISH PAPUA COLLECTED FOR THE ARNOLD ARBORETUM BY L. J. BRASS

R. C. BAKHUIZEN VAN DEN BRINK

Plates 16, 17

Callicarpa L.

Callicarpa pentandra Roxburgh, Flor. Ind. I. 409 (1820).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz. ser. 3, III. 11 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. p. 167 (Verben.) (1924).

var. **Cumingiana** (Schau.) Bakhuizen in Bull. Jard. Bot. Buitenz. ser. 3, III. 16 (1921).

forma **pentamera** (H. J. Lam) Bakhuizen, l. c. 17.

Sogeri, alt. 1000 ft., in rain forest, no. 659, Nov. 18, 1925 (slender tree, 20 ft. high, with very soft wood, sweet-scented, pink flowers and red fruit).

The specimen cited above, marked by the soft pubescent upper side and tomentose under side of leaves and the large cymes with subglabrous, 4–5-merous flowers, shows the same form as those collected by K. Gjellerup at Hollandia Bivak, in Dutch New Guinea (no. 67^b, Apr. 28, 1910 and no. 416^b, Dec. 31, 1910) and is not different from that of Lane-Poole no. 167, cited as *Geunsia farinosa* by Lane-Poole in his Report of the Forest Resources of the Territories of Papua and New Guinea, 136 (1925), and by White & Francis in Proc. Roy. Soc. Queensland, XXXVIII. 15, p. 257 (Plants collected in Papua by C. E. Lane-Poole) (1927).

DISTRIBUTION OF THE FORM: Philippines, Celebes, Moluccas, New Guinea.

Callicarpa cana Linnaeus, Mant. 198 (1771).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 20 (Rev. Verben.) (1921).

Loloki River, in riverine rain forest, alt. 1500 ft., no. 528, Oct. 30, 1925 (small tree, with sweet-scented, pink flowers).

This specimen differs from the type in having large, entire leaves, somewhat longer peduncles and larger inflorescences.

DISTRIBUTION: From Asia and China, Malay Archipelago, Philippines, New Guinea to Polynesia and tropical Australia.

Callicarpa longifolia Lamarck, Enc. Méth. Bot. I. 563 (1783).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 26 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 1. 168 (Verben.) (1924).

forma **subglabrata** Schauer in A. De Candolle, Prodr. XI. 645 (1847).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz. ser. 3, III. 26 (1921).

Ihu, Vailala River, in rain forest regrowths, no. 1013, Feb. 19, 1926 (large bush with pale leaves, white flowers and white fruit); Aisa River, Eastern Division, in rain forest regrowths, no. 1415, May 13, 1926 (small slender tree, with white fruit.—Vernacular name: Boja).

DISTRIBUTION: From Asia to Australia, also New Guinea.

Premna L.

Premna integrifolia Linnaeus, Mant. II. 154 (1771).—Lam in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 42 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 168 (Verben.) (1924).

Borabere, alt. 1000 ft., in rain forest regrowths, no. 729, Dec. 1, 1925 (tree of 10–15 ft. high); Port Moresby, coast, near beach, no. 864, Dec. 30, 1925 (spreading, densely foliaged tree 15–30 ft. high, with pale brown, thick, smooth bark, glossy leaves and black fruit when ripe); Ihu, Vailala River, common on the river banks, where the water is fresh, but influenced by the tides, no. 1101, March 4, 1926 (small, densely foliaged, glabrous tree, with rather fleshy, very smooth and shining leaves and white flowers); Hewa, Vailala River, edge of sago swamp, no. 1118, March 12, 1926 (large bush of 10–12 ft. high, with black fruit); Maclatchie Point, Gulf Division, common along the coast, no. 1174, March 19, 1926 (small glabrous tree, or large bush, with smooth and somewhat fleshy leaves and black fruit); Aisa River, Eastern Division, alt. 300 ft., in river bed, no. 1410, May 13, 1926 (slender tree.—Vernacular name: A-aru).

A very variable species of which the specimens cited above show in some respect the variability of the leaves.

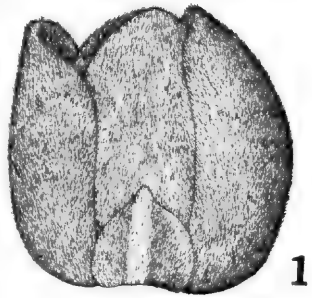
DISTRIBUTION: From Madagascar to Polynesia, including the Malay Archipelago, Philippines and New Guinea.

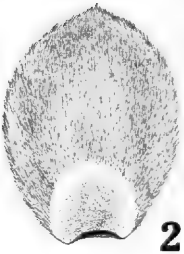
Teysmanniodendron Kds.

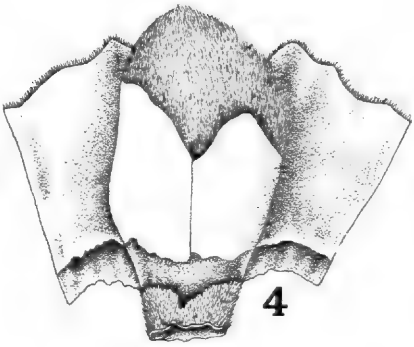
Teysmanniodendron bogoriense Koorders, in Ann. Jard. Bot. Buitenz. XIX. 19, tab. IV, fig. II–III (1904).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz. ser. 3, III. 29 (Rev. Verben.) (1921).

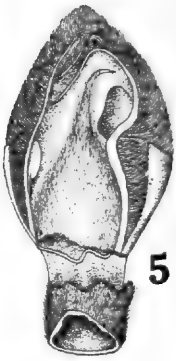
Borabere, alt. 1800 ft., in rain forest, no. 723, Nov. 30, 1925 (tree of 50 ft. high, with light brown scaly bark, 2-, 3-, or 4-foliated leaves and lavender flowers).

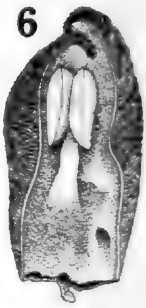
A very interesting find, because this species lately, with some doubt,

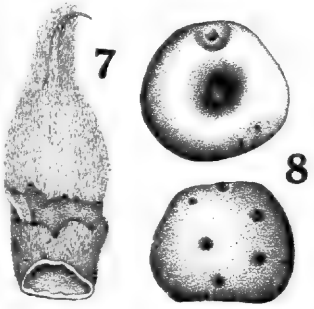


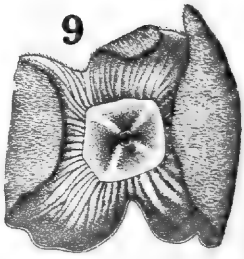


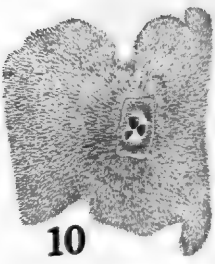












Gmelina papuana Bakh.

1–2. Bud with bract (× 7).— 3–6. Flower buds (× 7).— 7. Pistil (× 7).— 8. Seeds (× 2/3).— 9–10. Fruiting calyx (× 7).

was mentioned for the isle of Borneo only. Dr. S. H. Koorders found it cultivated in the Botanic Gardens of Buitenzorg and called it *Teysmanniodendron bogoriense*, the generic name after the supposed collector J. E. Teysmann and the specific name after the town of Bogor, the old, native name of Buitenzorg. Afterwards the area of this species was extended by various finds, to include the isle of Celebes and the Moluccas. Up till now, no information had come to me for the occurrence of the species in New Guinea.

DISTRIBUTION: Borneo, Celebes, Moluccas, New Guinea.

Gmelina L.

Gmelina papuana Bakh., nov. spec. Plates 16, 17.

Arbor mediocris, 15–20 m. alta; cortex pallide brunneus; lignum mollissimum; ramuli crassi, obtuse quadrangulares, sparse lenticellati, juniores dense tomentosi, deinde glabrescentes. Folia opposita, longiuscule petiolata, majora, obovato-subrotundata, 10–17 cm. longa, 9–16 cm. lata, coriacea, basi cuneata vel subobtusa, apice rotundata, margine integra vel irregulariter repanda, supra nitida, glabra, subtus pallidiora, opaca, praecipue in nervis venisque sparse puberula, basi glandulis 2 majusculis excavatis supra bullatis obsessa, penninervia, basi subtriplinervia; costa supra depressa, glabra, subtus prominens, breviter puberula; nervi laterales utrinque 5–9, adscendentes, secus marginem anastomosantes, supra depressi, glabri, subtus prominentes, sparse puberuli, nervi laterales basales ceteris longiores, latere exteriore nervos pinnatos emittentes, venae reticulatae densae, subtus prominulae; petiolus semiteres, supra late canaliculatus, dense tomentellus, deinde glabrescens, 2–4 cm. longus. Inflorescentia terminalis, conspicua, pyramidata, pedunculata, bracteata, dense hirsuto-tomentella, circiter 15 cm. longa, 10–12 cm. diametro, parte inferiore ramosa ramis oppositis 7–9 cm. longis pedunculatis; pedunculus rachisque depresso-quadrangulati, 2.5–3.5 cm. longi; flores conspicui, sessiles, ad axillas bractearum 3–5 fasciculati; bracteae sessiles, ovato-oblongae vel subrotundatae, concavae, intus glabrae, extus tomentellae, 0.5–0.7 cm. longae, circiter 0.5 cm. latae; calix cupuliformis, inaequaliter obtuse 5-dentatus, subtruncatus, extus dense villosus, glandulis 2–4 parvis discoideis obsessus, intus glaber, subnitidus, in alabastro circiter 0.5 cm. longus, fructifer vix auctus; corolla aperta non visa, in alabastro extus dense villosa, intus partim pubescens; stamina 4, didynamia; ovarium oviforme, sessile, pubescens, mox glabrum. Fructus baccatus, subglobosus, apice depressus, nitidus, glaber, maturitate caeruleus, 2.5–3 cm. diametro; endocarpium crasse lignosum.

Iawarere, Papua; alt. 1000 ft., in riverine forest, no. 695, Nov. 25, 1925 (slender tree, 50 ft. high, with pale brown bark and very soft wood; fruit blue, eaten by canowang).

This new species is closely related to *Gmelina moluccana* (Bl.) Backer, from which it differs in its sessile cymes, globose fruits and rounded leaves with shortly acuminate, subdecurrent base.

DISTRIBUTION: New Guinea.

Gmelina macrophylla (R. Br.) Bentham, Flor. Austr. v. 65 (1870).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 68 (Rev. Verben.) (1921).

Ihu, Vailala River, rain forest borders, no. 959, Feb. 13, 1926 (small smooth-trunked tree, leaves shining, pale beneath, with two large glands at base of lamina; flowers yellow, tinged pink; fruit pale blue, fleshy); Aisa River, Eastern Division, on the river bank, no. 1376, May 11, 1926 (handsome, pyramidal tree of 35–40 ft. high, with rough dark bark; leaves paler beneath; flowers yellow; fruit bright blue).

Inflorescences terminal, paniculate, many-flowered; calyx tomentose and glandular without, glabrous within, ovary hairy at the top, soon glabrous; leaves glabrous with the exception of the nerves beneath.

DISTRIBUTION: Australia, New Guinea.

Faradaya F. v. Muell.

Faradaya splendida F. v. Mueller, Fragm. Phyt. Austral. v. 21 (1865).—Lam in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 71 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 169 (Verben.) (1924).

Rigo, coast, on the bank of creek, no. 822, Dec. 12, 1925 (large rambling shrub, with white, sweet scented flowers); Bomgwina River, Eastern Division, in riverine rain forest, no. 1631, June 2, 1926 (large rambling shrub, or climber; leaves glossy above; nerves prominent below; flowers large, white, sweet scented).

DISTRIBUTION: Queensland, New Guinea, Borneo.

Clerodendron L.

Clerodendron inerme (L.) Gaertner, Fruct. Sem. Pl. I. 271, t. 75 (1788).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 77 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 170 (Verben.) (1924).

Port Moresby, sea-level, on rocky headlands, no. 853, Dec. 12, 1925 (large rambling shrub; flowers cream, tinged with mauve); Maclatchie Point, along the shore, no. 1181, March 19, 1926 (large rambling shrub, with white flowers and purple stamens); Domara, Eastern Division, along the coast, no. 1548, May 27, 1926 (rambling shrub, common all along the coast.—Vernacular name: Lapalapa).

DISTRIBUTION: Along the sea-coast from S. E. Asia and China to Polynesia and Australia, including the Malay Archipelago, Philippines and New Guinea.

Clerodendron tomentosum (Vent.) R. Brown, Prodr. Fl. Nov. Holland. I. 510 (1810).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 96 (Rev. Verben.) (1921).

? *Clerodendron medium* R. Brown, Prodr. Flor. Nov. Holland. I. 510 (1810).

Domara River, Eastern Division, on river bank, no. 1586, May 31, 1926 (small tree).

Leaves oblong or elliptic-oblong, base cuneate, apex acuminate, margins entire, covered with a soft down on both sides, velvety below, net-veined, nerves and reticulations hyalinous, depressed above, 5–12 cm. long, 2.5–4 cm. broad; petiole terete, softly tomentose, 1–2.5 cm. long. Branches obtusely quadrangular, densely and softly tomentose when young, glabrous afterwards by peeling of the cuticula, sparsely lenticellate. Cymes on the axils of leaves, at the end of the branchlets, forming pseudo-terminal leafy inflorescences, subtrichotomous, few-flowered, lax, densely puberulous. Flowers not seen; fruiting calyx enlarged, fleshy, slit half way down, tomentose without, short-pubescent inside, 1.2–1.5 cm. long, 1.5–2.25 cm. in diam., lobes ovate, acute, spreading or reflexed, 0.6–0.75 cm. long, 0.5–0.6 cm. broad; fruit globose, 4-lobed, 1 cm. in diam.

The material shows a rather lax, pseudo-terminal inflorescence, as is mentioned by R. Brown for his *Clerodendron medium*, but he added: "calycibus addultis . . . glabriusculis," which does not agree with our specimen.

Clerodendron buruanum Miquel in Ann. Mus. Bot. Lugd.-Bat. III. 252 (1867).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 90 (Rev. Verben.) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 171 (Verben.) (1924).

forma **Lindavianum** (Laut.) Bakhuizen in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 171 (Verben.) (1924).

Ihu, Vailala River, rain forest borders, no. 924, Feb. 10, 1926 (erect tree, 15–20 ft. high, with pale under side of leaves); Aisa River, Eastern Division, in river bed, no. 1412, May 13, 1926 (small tree, with thin, green bark and dark green leaves; fruit green; calyx pink.—Vernacular name: Jamu-Jamu).

This variety is only known from New Guinea up to the present and also from the Dutch division of it; it differs from the type, which chiefly occurs in the Moluccas, in having the leaves softly hairy at the upper side and the corolla tube very short, scarcely exceeding the calyx. The leaves, however, are very variable in size, now rather large, thin and with a long petiole, now smaller, chartaceous and with a rather short petiole. The species is also closely related to *Clerodendron infortunatum* L.

Clerodendron magnificum Warburg in Bot. Jahrb. XIII. 428 (1891).—Bakhuizen in Lam & Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 94 (Rev. Verben.) (1921).

Iawarere, alt. 1000 ft., no. 680, Nov. 22, 1925 (large shrub, 6 ft. high, with large, sappy leaves and salmon-colored flowers; common near river); Hewa, Vailala River, in rain forest clearings, no. 1129, March 13,

1926 (low fleshy shrub, 4 ft. high; young parts, petioles and under side of large nerves purple-red; fruit orange-yellow).

Leaves rather variable in form and size. A beautiful species, which up to now is known only from New Guinea and spreads apparently over the whole island on lowland country.

DISTRIBUTION: New Guinea.

Avicennia L.

Avicennia marina (Forsk.) Vierhapper in Denkschr. Akad. Wissensch. Wien, LXXI. 435 (Beitr. Kennt. Flor. Südarab. Socotra) (1907).—Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 203 (Rev. Gen. Avicenniae) (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 172 (Verben.) (1924).

var. **resinifera** (Forst.) Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 210. t. 16 (1921); in Bakhuizen & Lam in Nova Guinea, XIV. Bot. 172 (1924).

Kapa-kapa, at sea-level, in edge of tidal waters, no. 794, Dec. 7, 1925 (tree of 15–20 ft. high; bark smooth, greenish grey, peeling off in flakes); Port Moresby, sea-level, in mangrove, often grows above the tide mark, no. 882, January 1, 1926 (tree, with the leaves glossy above and grey beneath; flowers white; bark smooth, greenish-grey, peeling off in thin flakes).

A remarkable variety, which especially occurs on the eastern part of the Malay Archipelago and Australia. It is easily recognized by its oblong-lanceolate, acutely acuminate leaves and small flowers in capitate spikes. In my opinion, the so-called *A. officinalis*, no. 211, cited by Lane-Poole in his Report of the Forest Resources of the Territories of Papua and New Guinea, 136 (1925), would be nothing else than the var. *resinifera* (Forst.) Bakh. above mentioned, for he says: "Leaves lanceolate, acute; terminal cymes of orange sessile flowers in heads of 5 to 9; bark smooth, green and grey, thin, papery scales; inner bark pale yellow," all these particulars agreeing wholly with our variety.

DISTRIBUTION OF THE VARIETY: Along the coast of Queensland, New Guinea, Moluccas, Philippine Islands.

Avicennia officinalis Linnaeus, Spec. I. 110 (1753).—Bakhuizen in Bull. Jard. Bot. Buitenz., ser. 3, III. 214, t. 20, 21 (Rev. Gen. Avicenniae) (1921).

Lower Murua River, Gulf Division, mangrove formation, no. 1348, March 29, 1926 (small tree; sends down thick adventitious roots from lower branches overhanging the water; leaves grey beneath).

Though already mentioned for Merauke (Dutch New Guinea) this species seems to be a very rare one in New Guinea up till now. Its specific characters are the relatively large flowers with pubescent style and very small incurved stigmata, and the large fruit. If flowers are wanting the species is usually recognized by its obovate-oblong leaves

with glabrous petiole and subglabrous under side of the costa, and by the lenticellate, minutely tomentose peduncles. Barren or fruiting twigs of *Avicennia marina* (Forsk.) Vierh. var. *Rumphiana* (Hall. f.) Bakh. have sometimes a striking resemblance with *A. officinalis* L., but the petiole and the under side of the midrib and even the peduncles are always densely greyish tomentose, and moreover the peduncles are never provided with conspicuous lenticels.

DISTRIBUTION: Along the coast: S. E. Asia, Philippines, Malay Archipelago.

Botanic Garden at Buitenzorg
April 15, 1928.

DESCRIPTIONS OF NEW SPECIES COLLECTED IN BRITISH PAPUA BY L. J. BRASS

L. DIELS AND OTHERS

URTICACEAE

Determined by L. DIELS

Cypholophus Brassii Diels, n. sp.

Frutex elatus vel arbor parva; ramuli albido-villosi. Folia opposita, disparia; majora petiolo circiter 2 cm. longo praedita, subobliquo-lanceolata, apice longe acuminata, 10–16 cm. longa, 2.5–3.5 cm. lata, minora petiolo circiter 1–2 mm. longo praedita, oblonga, 3–3.5 cm. longa, 1.3–1.4 cm. lata, omnia valide rugulosa, scabra, albido-villosa, margine serrulata, trinervia apicem versus nervis lateralibus primariis utrinque 4–5 adscendentibus. Inflorescentiae masculae quae adsunt axillares, breviter pedunculatae, longe spicatae, ad 10 cm. longae, angustae, bracteis fasciculorum fuscis dorso pilosis; flores masculi 4-meri; perigonii lobi subovati cucullato-concavi, circiter 1 mm. longi; ovarii rudimentum conspicuum.

Owen Stanley Range, between Mts. Brown and Clarence, 900–1200 m., no. 1504, May 19, 1926 (tall bush or small tree with rugose leaves. Type).

This new species approaches *C. decipiens* H. Winkler but is easily distinguished by the villous tomentum of the branchlets and the greater disparity of the leaves.

Elatostemma pachypoda Diels, n. sp. (§ Pellionia).

Caules (ex collect.) e basi ampla tuberoso-tumida orti, simplices, cum foliis succulenti glabri. Foliorum petiolus 2–7 mm. longus; lamina glabra, inaequilateralis, oblanceolato-oblonga, dentato-serrata, 12–16 cm. longa, 4–4.5 cm. lata, nervi laterales primarii 10–12, pennati, conspicui, acutangulo-abeuntes, apicem versus arcuati. Inflorescentiae femineae axillares, pedunculo 0.5–1.5 cm. longo praeditae, subdiscoideae, multiflorae; flores feminei pedicellati, 5-meri; perigonii segmenta libera,

anguste lanceolata, inaequalia, 2 breviora, omnia apicem versus ciliolata; staminodia obcordata, multo breviora. Nucula brevissime stipitata, ovoidea, fusco-reticulata, glabra.

Loloki river, on damp rocks, alt. 375 m., no. 552, Oct. 31, 1925 (stems grow from large flattened tumid base, whole plant succulent.—Type).

This new species is near *E. Pellionianum* Gaud. but differs in the more conspicuous serration and nervation of the narrower leaves.

ANONACEAE

Determined by L. DIELS

Popowia polytricha Diels, n. sp.

Arbor (ex collect.) ramosa, 7 m. alta, cinereo-corticata. Rami foliaque novella cinnamomeo-tomentella. Foliorum petiolus perbrevis; lamina subchartacea, supra demum glabrata (sicca pallide cinerea), subtus subcinnamomea, dense pubescens, inaequilaterali-elliptica vel obovato-elliptica, apice breviter acuminata, 6–8.5 cm. longa, 2.5–4.5 cm. lata, nervi paulum prominuli, laterales primarii 6–8. Flores solitarii, 5–7 mm. longe pedunculati; sepala late triangularia, 1.5 mm. longa, 2.5 mm. lata, extus dense pubescentia; petala praecipue extus tomentella, 3 exteriora subovata, circiter 2 mm. longa, 2–2.5 mm. lata, 3 interiora crassa, exterioribus conspicue majora, 3–3.5 mm. longa, 2–2.5 mm. lata; stamina 15–18, circiter 1 mm. longa; carpella 6, dense sericea, stigmatibus subobovoideis praedita, 2 mm. longa.

Bisiatabu, on the edges of forests, alt. 460 m., no. 586 (Type).

This new species which is characterized by the cinnamon-colored, densely pubescent under side of the leaves differs from *P. Schefferiana* Diels with which it agrees in the shape of the petals, in the tomentulous branchlets, considerably broader leaves and fewer carpels.

Cyathocalyx lucidus Diels, n. sp.

Arbor (ex collect.) circiter 14 m. alta. Foliorum petiolus brevis, circiter 0.5 cm. longus; lamina ampla, papyracea, supra glabra, lucida, subtus ad costam nervosque primarios hispidula, oblonga, apice breviter acuminata, basi cordato-obtusa, ad 25 cm. longa, 9–10 cm. lata, nervi primarii utrinque 10–14 arcuato-adscendentes, subtus prominentes. Flores ex trunco in ramis abbreviatis cicatricibus numerosis nodoso-asperis orti, fasciculati; pedunculus 4.5–5 cm. longus, bracteola parva infra medium praeditus, fere glaber; flores (vivi virides) sicci nigrescentes; sepala 4–5 mm. longa, apice recurva, extus parce pilosula; petala parte basali extus minute pubescentia, ceterum glabra, carnosa, exteriora ad 2.8 cm. longa, 8–10 mm. lata, interiora minora, circiter 2 cm. longa; torus breviter pilosus; carpella compluria, conniventia, stigmatibus coalita, glabra, 2–2.5 mm. longa, ovulis numerosis biseriatis.

Hewa, Vailala River, in rain forests, no. 1142, March 13, 1926 (Type). Vernacular name: Buhu.

This is distinguished from the other Papuan species by its large short-

petioled leaves rounded at base and glabrous except the hispidulous nerves, by the flowers appearing in fascicles on the trunk, by the petals and by the numerous ovules.

MYRISTICACEAE

Determined by R. MARKGRAF

Myristica fatua Houtt. var. **papuana** Markgraf, n. var.

Arbor robusta, ad basin trunci radicibus aëreis instituta, cortice brunnea succigera obtecta; rami juveniles fusco-furfuracei, lineis prominulis brevibus, a petiolis oblique decurrentibus indistincte notati. Petioli 1 cm. longi, 3 mm. crassi, canaliculati; foliorum lamina coriacea, supra glabra, non nitida, subtus fusco-furfuracea, obovato-oblonga, supra mediam partem latissima, basi rotundata, apice breviter acuminata, usque ad 22 cm. longa, 8 cm. lata (in ramis junioribus), multinervia, venis rectis 20 in utroque latere, nervis minoribus non conspicuis. Pedunculi et pedicelli fructiferi laterales, extraaxillares, 5 mm. crassi; cicatrix bracteolae infra fructum dimidium pedicelli amplectens. Fructus fusco-furfuraceus, ellipsoideus, obtusus, 4 cm. longus, 3 cm. crassus, residuo stigmatis iuxta apicem inserto obliquus; pericarpium 8 mm. crassum; semen oblongo-cylindricum (marginibus parallelis), 2½ cm. longum, 1¼ cm. crassum, arillo profunde laciniato crasso aurantiaco involutum.

Aroara, Vailala River, in rain forest, alt. 60 m., no. 1070, Feb. 25, 1926 (Type).

Myristica fatua Houtt. should be represented according to Warburg's Monograph (p. 433) in New Guinea by *M. subcordata* Bl. The material before me, however, is so similar to *M. fatua* in the shape and size of the leaves, tomentum and aërial roots, that I must refer it to this species. The differences from the typical species are in the fruit which is in the variety considerably smaller, much less pubescent and provided with thicker flesh, because the seed has parallel margins and is therefore narrower. The shape of the fruit, however, is exactly like that of the typical species.

EUPHORBIACEAE

Determined by R. MANSFELD

Aporosa Brassii Mansfeld, n. sp. (§ Euaporosa Trichogynae Pax & Hoffm.)

Arbor ramulis dense brunneo-tomentosis. Folia alterna, interdum subopposita; stipulae caducae, oblique triangulari-ovatae, 4 mm. longae, 2 mm. latae, subtus brunneo-tomentellae; petiolus 3–7 mm. longus, brunneo-tomentellus; lamina 15–18 cm. longa, 5–7 mm. lata, oblongo-elliptica, apice acuminata vel breviter caudata, basi rotundata breviterque cordata, supra nervo medio et nervis lateralibus (utrinque 9–11) breviter brunneo-pilosis exceptis glabra, dense minutissime nigro-punctulata, subtus nervis prominentibus, nervis omnibus brunneo-tomentellis.

Inflorescentiae fasciculatae ex ramis defoliatis orientes, axibus tomentellis; spicae masculae usque 7 cm. longae, interrupte glomeruliflorae; flores masculi albi, sepalis 4 ovatis acutis margine ciliatis, staminibus 2 vel 3, filamentis calyce triplo longioribus; spicae femineae usque 4.5 cm. longae; flores feminei sepalis 5, extus brunneo-pilosis; ovarium ovato-globosum, brunneo-tomentellum, 3-loculare; stigmata subsessilia, bifida, plumosa.

Hohoro, Vailala River, rain forest, alt. 100 m., no. 1049, Feb. 22, 1926 (tree, 15 m., with a large spreading crown, leaves pale, shining above, several short racemes together on small knobs or swellings protruding from the trunk or principal branches; pistillate flowers.—Type); Aroara, Vailala River, in rain forests, alt. 60 m., no. 1062, Feb. 25, 1926 (slender, loosely branched tree, numerous spikes of small white flowers in clusters all along the stem; staminate flowers).

A closely related species is *A. reticulata* Pax & Hoffm. in which the ovary is attenuated into a distinct style, while the firmer leaves differ in the revolute margin and the absence of the dots.

Macaranga chrysotricha K. Schum. & Laut. var. **glaucescens** Mansfeld, n. var.

A typo differt ramulis laxius pilosis glaucis, foliis basi truncato-rotundatis vel rotundatis subtus dense nigro-glandulosis vix bullatis, stipulis brevioribus (circiter 1.5 cm. longis) extus sparse aureo-setulosis, glaucis, mox glabrescentibus.

Bisiatabu, rain forest, alt. 450 m., no. 589, Nov. 8, 1925 (slender tree, 6 m., trunk smooth, green; branches glaucous, covered with brown bristles.—Type).

Macaranga Brassii Mansfeld, n. sp. (§ Mecostylis Pax & Hoffm.)

Ramuli velutini. Foliorum petiolus 5–8 cm. longus, velutinus; lamina 8–17 cm. longa, 8–19 cm. lata, suborbiculari-ovata vel late ovata, apice breviter acuminata, basi alte cordata, indivisa vel vix trilobata, margine breviter denticulata, basi palmatinervia, utrinque nervis dense velutino-pubescentibus, supra glabrescens, subtus dense brunneo-granuloso-glandulosa, basi infra glandulis plerumque 4 notata; stipulae circiter 1.4 cm. longae, 4 mm. latae, lanceolatae, velutinae. Inflorescentia mascula paniculata, usque 6 cm. longa, paulo ramosa, axibus velutinis; bracteae lanceolatae, integrae vel ovatae, trilobatae, 1.5–4 mm. longae, extus pubescentes, intus apice patellari-glandulosae, utrinque sparse granuloso-glandulosae; flores masculi sepalis 3 oblongo-ellipticis concavis extus pubescentibus et versus apicem flavo-granuloso-glandulosis; stamina 8, antherae 4-loculares; inflorescentia feminea 10 cm. longa, velutina (pedunculo communi circiter 7 cm. longo), floribus in apice congestis; bracteae 2–0.8 cm. longae, 0.3–1.5 cm. latae, triangulari-ovatae, globoso-glanduloso-dentatae, utrinque velutinae et granuloso-glandulosae, intus sparse patellari-glandulosae; calyx truncatus, urceolaris,

extus puberulus, glandulosus, 1.5 mm. altus, intus subglaber. Ovarium glandulosum, velutinum, echinibus mollibus satis longis vestitum; stylus 6.5–8 cm. longus, plumosus, pubescens.

Domara River, Eastern Division, no. 1590, May 31, 1926 (a common weed tree; pistillate.—Type); Loloki River, alt. 425 m., no. 536, Oct. 31, 1925 (small tree, dioecious; staminate). No. 536 includes also a pistillate specimen which has inflorescences up to 35 cm. long with bracts up to 2.5 cm. long and partly more deeply lobed leaves.

In the arrangement by Pax this species should follow *M. Schleinitziana* K. Schum. At the beginning I was inclined to consider *M. Brassii* only a variety of *M. Schleinitziana*, but there are besides the differences in the shape of the leaf particularly its base also smaller differences in the flowers, whose constancy should be studied on additional material.

ELAEOCARPACEAE

Determined by O. C. Schmidt

Echinocarpus Brassii O. C. Schmidt, spec. nov.

Arbor grandis; rami cortice striato-ramoso, griseo-brunneo vel brunneo in partibus hornotinis velutini. Folia petiolis pilosis usque ad 3.5 cm. longis; lamina obovata vel leviter pyriformia, 10–17.5 cm. longa, 5.5–10.5 cm. lata, apice angustata et breviter acuminata, basi angustata, rotundata, chartacea, supra subtusque (praeter nervum medium) laevis; nervus medius supra leviter incisus, pilosus, subtus manifeste prominens, nervis lateralibus utroque latere circiter 8 supra prominulis subtus prominentibus, reti tenui conjunctis. Flores singuli, pedicellis dense pilosis usque ad 2 cm. longis et 1.8 mm. crassis; sepala late ovata vel ovata, apice attenuata, usque ad 1.7 cm. longa, dense brevi-pilosa, rosea (ex Brass); petala lanceolata vel elliptico-lanceolata, basi truncata, apice obtusiuscula, 1.6–1.7 cm. longa et circiter 0.8 cm. lata, extus dense brevi-pilosa, intus parte superiore et marginibus brevi-pilosa, alba (ex Brass); stamina numerosa, brevissime (dorso sericeo-) pilosa, usque ad 8 mm. longa, antherae circiter 4.5 mm. longae, filamenti productus circiter 1.8 mm. longus; ovarium subconicum, dense et brevissime pilosum, circiter 4 mm. longum, apice in stylum crassum usque ad 6 mm. longum attenuatum; locelli 4, decem-ovulati. Fructus circiter 5 cm. longus.

Bisiatabu, alt. 300 m., no. 619, Nov. 12, 1925 (Type).

This new species is the third from New Guinea; the two other species differ from it in the following characters: *Echinocarpus papuanus* Schlechter has smaller leaves only up to 10 cm. long with petioles up to 1.3 cm. long, smaller flowers with longer stamens up to 1.3 mm. long, and the petals are distinctly toothed at the apex, while *E. Forbesii* Schlechter has the leaves more or less densely pubescent beneath. The description of the new species is based on the specimen in the Berlin Herbarium.

Elaeocarpus ihuensis O. C. Schmidt, spec. nov.

Arbor; rami cortice striato-rimoso. Folia petiolis glabris supra canaliculatis (2–) 3–4.5 cm. longis et usque ad 2 mm. crassis; lamina anguste obovata, apice angustata et usque ad 15 cm. longe acuminata, apice ipsa obtusa et leviter emarginata, basi subcuneata, (10–)16–20 cm. longa, 4.5–7.8 cm. lata, supra subtusque laevis, margine distanter et leviter crenulato-denticulata; nervus medius supra prominulus subtus manifeste prominens, nervis lateralibus utroque latere 11–12 supra vix prominulis vel subimpressis, subtus bene prominentibus, reti supra subtusque tenui conjunctis. Inflorescentiae 5–7 cm. longae, brevi-pilosae, 7–12-florae; flores 5-meri, pedicellis dense brevi-pilosis usque ad 8 mm. longis; gemmae obtusae; sepala sublineari-lanceolata, basi truncata, apice obtusa, usque ad 7 mm. longa et usque ad 2.5 mm. lata, subcarnosa, extus dense brevi-pilosa; petala subcuneata, basi truncata, apice plus minusve 10-laciniata usque ad 9 mm. longa et (apice) usque 4.5 mm. lata, incarnata (ex Brass); stamina numerosa, usque ad 6 mm. longa, parce et brevissime pilosa, antherae circiter 1.8 mm. longae, filamenti productus setiformis circiter 1.5 mm. longus. Ovarium plus minusve semiglobosum, circiter 1.8 mm. longum, subvelutinum, in stylum brevi-pilosum circiter 4.2 mm. longum contractum; loculi 2, 8-ovulati; discus brevi-pilosus, 5-lobatus.

Ihu, Vailala River, no. 942, Feb. 12, 1926 (tall tree, glabrous; bark dark, hard, very thin; leaves shining above, clustered at enlarged ends of branches; petals dark pink with red streaks.—Type).

According to Schlechter's arrangement this species belongs to his section *Blepharoceras*. *Elaeocarpus coloides* Schlechter whose leaves have a similar shape is distinguished from this new species besides by other characters by the very prominent lateral veins of the under side of the leaves and especially by the anthers being furnished with a seta. The description is based on the specimen in the Berlin Herbarium.

DILLENIACEAE

Determined by L. DIELS

Saurauia pleurotricha Diels, n. sp.

Arbor parva (ex coll. 5–7 m. alta); rami paleis setiformibus patulis dense vestiti. Foliorum petiolus brevis ad 1 cm. longus costaque subtus eisdem setis sursum curvatis dense vestita; lamina subcoriacea (viva subtus ex coll. pallida), supra et subtus setulis quam setae costales multo minores conspersa, ceterum fere glabra, elongato-obovata, apice breviter acuminata, ad basin inaequi-lateralem sensim angustata, 20–25 cm. longa, 11–12.5 cm. lata, nervi laterales circiter ad 20 adscendentes, subtus prominentes. Inflorescentia subcapitata, pedunculo curvato dense setoso 2–2.5 cm. longo praedita, multiflora; bracteae circiter 5, basi inflorescentiae adnatae, subfoliaceae, exteriores cum petiolo 3–4 cm. longae, interiores decrescentes; bracteolae subrigidae, lanceolatae,

extus dense longeque setoso-paleaceae, flores subsessiles aequantes vel subsuperantes; sepala extus longe setosa, lanceolata, circiter 1.2 cm. longa; styli 5 ad medium connata.

Ihu, Vailala River, in rain forest, no. 968, Feb. 13, 1926 (Type).

This species is to be referred to the series *Obvallatae* and represents a transition to the *Setosae;* it seems related to *S. novoguinensis* Scheffer (in Ann. Jard. Buitenz. 1. 7) judging from the description, but the inflorescence is many-flowered and the styles are connate to the middle.

Saurauia Brassii Diels, n. sp.

Arbor parva (ex coll. circiter 5 m. alta); rami paleis setiformibus dense vestiti. Foliorum petiolus eisdem paleis dense obsitus circiter 1.5 cm. longus; lamina coriacea, ad costam marginemque parce setulosa ceterum glaberrima, subtus pallida, late oblanceolata, breviter obtuseque acuminata, basin versus longe angustata, margine antrorsum obsolete serrata (serraturis apice setulosis), 20–25 cm. longa, 7–8 cm. lata; nervi laterales 12–15 adscendentes, subtus conspicui. Flores (an solitarii?), pedunculus fructifer ad 4 cm. longus, glaber; styli 5, liberi. Fructus globosus, circiter 1.5 cm. diam. (ex coll. carnosus, albus).

Aroara, Vailala River, in rain forest, alt. 60 m., no. 1060, Feb. 25, 1926 (small compact tree, 4.5 m.; leaves pale below; fruit white, fleshy.—Type).

This new still uncompletely known species is referable to the Series *Setosae* and is easily distinguished from the related species by the long coriaceous leaves conspicuously and densely setose at the petiole and otherwise nearly glabrous.

FLACOURTIACEAE

Determined by E. Gilg

Casearia rhynchophylla Gilg, n. sp.

Frutex 1–1.5 m. altus; rami pubescentes. Foliorum stipulae linearilanceolatae, acuminatae, 7–15 mm. longae; petiolus brevissimus, 2–3 mm. longus; lamina herbaceo-papyracea, supra glabrata, subtus pallidior, pubescens, oblonga vel obovato-oblonga, apice acumine ad 1.5 cm. longo caudata, basi paulum inaequilateralis, cuneata, margine remote breviter dentato-serrata, 13–15 cm. longa, 4–5 cm. lata; nervi laterales primarii 12–13 adscendentes. Fructus (immaturi) pauci, axillares, pedicello circiter 1 mm. longo praediti, stylis basi pilosa coronati.

Ihu, Vailala River, rain forest, no. 965, Feb. 13, 1926 (small bush, 1–1.5 high.—Type).

Casearia megalophylla Gilg, n. sp.

Frutex 1.5–2 m. altus; rami glabri. Foliorum stipulae minutae, lanceolatae, mox deciduae; petiolus 6–8 mm. longus; lamina papyracea, fere glabra, ampla, elongato-rhombeo-elliptica, acuminata, basi valde inaequilaterali ipsa cuneata, margine obsolete brevissimeque crenato-

serrata, 20–32 cm. longa, 10–12.5 cm. lata, nervi laterales primarii circiter 12, cum secundariis prominuli; flores fasiculati, breviter pedicellati, albi [quae adsunt nondum maturi].

Kerema, Gulf Division, rain forest, no. 1211, March 24, 1926 (large bushy shrub, 2 m.; flowers white.—Type).

This new species is closely related to *C. cluytiifolia* Bl. but easily distinguished by the larger glabrate leaves.

MYRTACEAE

Determined by L. DIELS

Jossinia desmantha Diels, n. sp.

Arbor ex coll. parva circiter 5 m. alta, nonnunquam ad 1 m. reducta; truncus fissili-corticatus. Foliorum petiolus 3–4 mm. longus; lamina coriacea, sicca pallida, obovata vel obovato-elliptica, apice obtusa, basin versus cuneata margine (sicca) recurva, 3–5 cm. longa, 2–3 cm. lata, nervi paulum prominentes. Flores in axillis fasciculati, brevissime pedunculati vel subsessiles, cum pedunculo extus pubescentes; bracteolae subfuscae, 1.5 mm. longae; receptaculum obpyramidatum, 2-loculare, 2.5–3 mm. longum; lobi calycini 5 mm. lati, alteri circiter 3 mm. longi, alteri 1.5–2 mm. longi; petala suborbicularia, 6–7 mm. longa, alba, decidua; stylus glaber, circiter 5 mm. longus.

Port Moresby, in light rain-forest, alt. 230 m., no. 881, Dec. 31, 1925 (tree 4.5 m., with slender branches; bark dark, fissured; leaves dull dark green above, pale beneath; flowers white.—Type); same locality, on exposed cliff face, coast, no. 885, Jan. 8, 1926 (low tree, 1 m., stunted by high winds; bark brown and flaky; flowers white).

This new species is easily distinguished from the other species of the genus by the fascicled flowers.

Jambosa naiadum Diels, n. sp.

Arbor parva, ad 5 m. alta, gracilis. Foliorum petiolus 2–3 mm. longus; lamina chartacea, glabra, subtus (ex collect.) pallida, linearilanceolata, apicem versus longe acuminata saepe subfalcata, apice ipsa obtusa vel acuta, basi acuta, 4–9 cm. longa, 0.8–1.3 cm. lata, nervi nervulique paulum prominentes tenues. Paniculae plerumque axillares, graciles, circiter 4–5 cm. longae, e cymis paucis graciliter pedunculatis compositae; pedunculi stricti, fusci, bracteolae minutae; flores cymarum 3, sessiles; receptaculum inferum pedicelliforme, circiter 1 mm. longum, superum latiuscule cyathiforme, 2.5–3 mm. longum, 2.5 mm. latum; calycis lobi parvi. Fructus ex coll. niger.

Budatobara, river banks, alt. 100 m., no. 754, Dec. 3, 1925 (small riverside tree, 4.5 m.; bark smooth, brown; fruit black.—Type); Kurandi, Eastern Division, no. 1392, May 12, 1926 (small tree in river bed; leaves pale beneath; peduncles, pedicels and sepals reddish brown. —Vernacular name: Mokia); Loloki River, no. 1653, June 17, 1926

(small slender tree in river bed; fruit red, immature.—Vernacular name: Mahama).

This species grows on the banks of rivers and by its station and habit resembles *J. salicina* Ridl. and *J. xylopiacea* Diels but differs in its slenderer panicles and in the inferior receptacle being very short and pedicel-like.

Jambosa hylocharis Diels, n. sp.

Arbor ex coll. alta, gracilis, cortice (ex coll.) tenui pallide fusco. Foliorum petiolus 0.8–1.2 cm. longus; lamina papyracea, glabra, oblonga vel rarius elliptico-oblonga, basin versus acuta, 8–14 cm. longa, 3.5–4 cm. lata, nervi laterales primarii circiter 15 adscendentes marginem versus arcuato-conjuncti, supra insculpti subtus cum secundariis prominentes. Cymae ex ramis ortae, pedunculo circiter 0.5 cm. longo praeditae; pedicelli circiter 1 cm. longi; flores saturate rosei; receptaculum inferum circiter 8 mm. longum, anguste obconicum, basi longe attenuatum, superum cupuliforme, 2.5–3 mm. longum, 5–6 mm. latum; calycis lobi 4, semiorbiculares, hyalino-marginati; petala orbicularia, 7–8 mm. diam.

Aroara, Vailala River, in rain forest, alt. 60 m., no. 1065, Feb. 25, 1926 (tall slender tree; bark thin, pale brown, flaky; wood dark brown; leaves thin, pale; flowers numerous, dark pink, very showy.—Type).

This new species resembles in the shape of its leaves and inflorescence *J. brevicyma* Diels but differs in the inferior receptacle being much longer and in its narrower longer-petioled leaves.

Jambosa Sargentiana Diels, n. sp.

Arbor parva, ex coll. habitu varia; truncus nonnunquam radices adventivas demittens; rami ultimi quadranguli. Foliorum petiolus circiter 5 mm. longus; lamina subcoriacea, oblanceolata, apice obtusiuscula, basi cuneato-angustata, 9–10 cm. longa, 2.5–3 cm. lata, nervi laterales primarii subtus tenuissime prominuli, adscendentes, arcu conjuncti, arcu altero tenuiore intramarginali addito. Inflorescentiae terminales, breves, 3–6 cm. longae; receptaculum late obconico-turbinatum, basi pedicelliformi-attenuatum, circiter 1 cm. longum, apice 8–9 mm. diam.; calycis lobi inaequales, pallide marginati; petala orbicularia, alba, 8–9 mm. diam.

Loloki River, river banks, alt. 375 m., no. 551, Oct. 31, 1925 (small tree, of various habit, growing near water's edge; when flat growing sends down roots from branches.—Type).

This new species is related to *J. Pilgeriana* Lauterb. & K. Schum., but differs in the leaves being not fascicled and twice as large and in the not solitary flowers.

Jambosa Versteegii Lauterbach.

Descriptioni addendum:

Fructus amplus, laevis, subellipsoideus, apice calycis segmentis valde

incrassatis ampliatis connatis coronatus, cydoniaeformis, totus 6.5–7 cm. longus, 5–5.5 cm. latus, vertice (inter calycis segmenta) 1.5 cm. quasi excavatus, ex coll. rosaceus ("pink").

Kira, Vailala River, in rain forest, no. 1111, March 9, 1926 (small erect tree, 6 m.; bark close, gray; flowers in axillary clusters, pink with yellow anthers; fruit pink).

ASCLEPIADACEAE

Determined by T. MARKGRAF

Toxocarpus cyclosepalus Markgraf, n. sp.

Frutex scandens, ramis glabris rimosis lenticellosis. Foliorum petiolus 1–1.5 cm. longus; lamina glabra, coriacea, supra nitida, elliptica, brevissime apiculata, nervis rectis remotis notata, usque ad 8 cm. longa et 4.5 cm. lata. Inflorescentiae axillares, pluries trichasialiter cymosae, cyma media folio brevior; pedunculi ultimi cum pedicellis et bracteis breviter et appresse fusco-pilosi; lobi calycis orbiculares, obtusi, 1 mm. longi et lati, extus appresse fusco-pilosi, intus pauciglandulosi; corolla glabra, lutea, tubus membranaceus, 2 mm. altus, lobi lineares, recurvati, crassiores, 4 mm. longi, 1 mm. lati; coronae foliola ovato-triangularia, obtusa, antheras tertia parte excedentia; caput stigmatis subulatum, supra antheras vix incrassatum, 2 mm. longum.

Hewa, Vailala River, river banks, no. 1145, March 13, 1926 (small climber; leaves shining above, thick; flowers yellow.—Type).

The species approaches *T. orientalis* Schltr., hitherto known only from the Bismarck-Archipelago, which may be distinguished by its acuminate sepals, lower corona, and conspicuous, obtuse scales on the tops of the anthers.

Botanisches Museum, Berlin-Dahlem
February, 1929.

AN ENUMERATION OF THE ROSES OF YUNNAN

J. T. P. BYHOUWER[1]

While engaged in a study of Chinese Roses I became aware that the Roses of southwestern China were less well known than those of the other provinces of China. This and the large amount of undetermined material of Roses from Yunnan in the herbarium of the Arnold Arboretum induced me to make a special study of the Roses of this region. As the collections made in Yunnan by G. Forrest and by F. Kingdon Ward, E. E. Maire and others were not completely represented at the Arnold Arboretum Professor W. Wright Smith kindly loaned, upon my request, to the Arnold Arboretum the Yunnan Roses of the herbarium of the Botanic Garden

[1] Dr. Byhouwer left the Arnold Arboretum before his study of the Yunnan Roses was completely finished and the following paper was put into final shape from the manuscript he left behind and from his determinations by Dr. C. E. Kobuski under the supervision of the editors. Eds.

at Edinburgh, which included also the types of Léveillé's new species. For the loan of this rich and valuable collection I am deeply indebted, for it enabled me to present herewith a fairly complete enumeration of the Roses of Yunnan. In 1917 a list of the Roses of Yunnan was published by H. Léveillé (in his Cat. Pl. Yun-Nan, pp. 234–236) but this list did not give any localities or references to collectors and was based chiefly on literature and on collections made by E. E. Maire and some other collectors previous to 1915. Besides spontaneous specimens the different collectors gathered a considerable number of double-flowered garden Roses which could be identified only partly with known forms; most of them probably are hybrid forms which cannot be placed until we know more of the Chinese garden Roses.

I am greatly indebted to Messrs. E. H. Wilson and A. Rehder, who granted me the opportunity to work in the Arnold Arboretum and under whose guidance the study was made.

The specimens cited as (E) are in the herbarium of the Edinburgh Botanic Garden; all other are in the herbarium of the Arnold Arboretum.

Sect. Synstylae DeCandolle, Hort. Monsp. 137 (1813).

Rosa multiflora var. **cathayensis** Rehder & Wilson in Sargent, Pl. Wils. II. 304 (1915).—F. N. Meyer in U. S. Dept. Agr. Bur. Pl. Ind. Invent. Seeds Pl. Imp. XL. 33, no. 38823 (1917).—Rehder in Jour. Arnold Arb. v. 201 (1924).

Rosa multiflora Bunge in Mém. Div. Sav. Acad. Sci. St. Petersb. II. 100 (Enum. Pl. Chin. Bor. 26) (1833).—Hemsley in Jour. Linn. Soc. XXIII. 253 (1887), pro parte.—Crépin in Bull. Soc. Bot. Ital. 1897, 230.—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).—Non Thunberg.

Rosa damascena f. *floribus simplicibus* Focke in Not. Bot. Gard. Edinb. v. 66 (1911).

Rosa damascena f. *brachyacantha* Focke, l. c. 67 (1911).—Léveillé, Cat. Pl. Yun-Nan, 234 (1917).

Rosa multiflora f. *brachyacantha* Rehder & Wilson in Sargent, Pl. Wils. II. 334 (1915), pro parte.—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa cathayensis Bailey, Gent. Herb. I. 29 (1920).

? *Rosa Luciae* Léveillé, Cat. Pl. Yun-Nan, 235 (1917).—Non Franchet & Rochebrune.

Haies, plaine de Long-tan, alt. 2400 m., *E. E. Maire*, May [1910-14] (haut 1.5 m., fl. rosées) (E.); same locality, alt. 2500 m., *E. E. Maire*, Herb. Edinb. no. 843/1914, May [1910–14] (grimpants, à courts rameaux; fl. blanc rosé) (E.); haies de la plaine a Tong-tchouan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. no. 492/1913, May (fl. blanc-jaunâtre) (E.); Yun-nan-sen, *E. E. Maire*, Herb. Edinb., no. 379 [before 1906]; in shady, moist situations in the Lichiang valley, around the city, lat. 26° 50′ N., alt. 2500 m., G. Forrest, no. 2053, May 1906 (semi-scandent shrub 2–3 m.; fls. red-rose fragrant; type of *R. damascena floribus simplicibus*); open situations by streams, Tali valley, lat. 25° 45′ N., *G. Forrest*, no. 9905, May 1913 (rambling shrub 0.5–2 m.; fls. pale rose) (E.); ad vias et in sepibus, Yunnan Fu, alt. 1900 m., *A. Schoch*, no. 31, April 27, 1916 (fl. rubri); open situations around the city of Tali, lat. 25° 40′ N., alt. 2000 m., *G. Forrest*,

no. 4444, June 1906 (shrub 1–2 m. high; fls. white; type of *R. damascena* f. *brachyacantha* Focke); without exact locality, *G. Forrest*, no. 17919.

Maire's no. 379 is doubtfully referred here; it approaches typical *R. multiflora* in its small flowers disposed in many-flowered panicles; its leaflets are small and pubescent beneath.

It appears to be impossible to keep the villous var. *brachyacantha* Rehd. & Wils. separate from var. *cathayensis* Rehd. & Wils. and var. *carnea* Thory. In the material of E. E. Maire every gradation between slightly hairy and densely pubescent leaves is to be found, combined with different serrations and different color of the flowers.

Rosa multiflora var. **carnea** Thory in Redouté, Roses, II. 67, t. (1821).—Rehder & Wilson in Sargent, Pl. Wils. II. 305 (1915.—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa multiflora Sims in Bot. Mag. XXVI. t. 1059, (1807).—Aiton, Hort. Kew. ed. 2. III. 265 (1811).—Lindley in Bot. Reg. v. t. 428 (1819); Ros. Monogr. 119 (1820).—Andrews, Roses II. t. 83 (1820–28?).—Non Thunberg.

? *Rosa rubeoides* Andrews, Roses II. t. 84 (1822?).

Rosa diffusa Roxburgh, Hort. Beng. 92 (1814) (nomen nudum); Fl. Ind. ed. 2. II. 515 (1832).

Rosa florida Poiret, Encycl. Méth. Suppl. IV. 715 (1816).

Rosa Grevillii Sweet, Hort. Brit. 138 (1827).

Rosa Roxburghii Sweet, Hort. Brit. 138 (1827).—Non Trattinnick.

Rosa multiflora, β *plena* Regel, Tent. Monog. 84 (1877); in Act. Hort. Petrop. v. 368 (1878).

Rosa centifolia Focke in Not. Bot. Gard. Edinb. v. 66 (1911).—Léveillé, Cat. Pl. Yun-Nan, 234 (1917).—Non Linnaeus.

Rosa damascena f. *floribus semiplenis* Focke, l. c. 67 (1911), excl. no. 2052.

Rosa multiflora var. *brachyacantha* Rehder & Wilson in Sargent, Pl. Wils. II. 334 (1915), proparte.

Rosa Lebrunei Léveillé in Bull. Acad. Intern. Geogr. Bot. XXV. 46 (1915); Cat. Pl. Yun-Nan, 235 (1917.)

Rosa Blinii Léveillé, l. c. (1915); l. c. 234 (1917).

Rosa damascena Léveillé, Cat. Pl. Yun-Nan, 234 (1917).—Non Miller.

Haies, plaine de La-kou, alt. 2400 m., *E. E. Maire* (type of *R. Lebrunei* Léveillé) May [1910–14] (buissonnant-haut 0.8 m.; fl. roses ou rouges, inodores) (E.); haies de la plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire* (type of *R. Blinii* Léveillé) May [1910–14] (fl. rouges) (E.); plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 338, May [1910–14] (buissonnant; longs rameaux grimpants; fl. roses); tertres, plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 340, May [1910–14] (buissonnant; fl. roses); haies, plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 339, May [1910–14] (arbuste à rameaux déjetés; fl. rouges); haies de la plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. no. 471/1913, May [1910–14] (fls. rouges) (E.); haies, plaine de La-kou, alt. 2400 m., *E. E. Maire*, Herb. Edinb. no. 781/1914, May [1910–14] (grimpant, haut 1 m.; fl. roses ou rouges, inodores) (E.); vicinity of Yunnan-sen, *E. E. Maire*, Herb. Edinb. nos. 368, 381, 382, 866, 867, 1436/1913, 1704 (E.); shady situations amongst scrub around the city of Tali, lat. 25° 40′ N., alt. 2000 m., *G. Forrest*, no. 4449, June–July 1906 (shrub 2–2.5 m. high; fls. lilac-rose; partly co-type of *R. damascena* f. *fl.*

semiplenis and partly type of *R. centifolia*) (E.); open, moist situations. Lang kong valley, lat. 26° 20′ N., alt. 2135 m., *G. Forrest*, no. 5591, May 1910 (shrub 1–2 m. high; fls. rose) (E.); same locality, lat. 26° 16′ N., alt. 2135 m., *G. Forrest*, no. 9977, May 1913 (shrub 1–1.5 m. high; fls. pale rose) (E.); clay ground along sides of streams and in shady situations, Talifu, alt. 2000 m., *G. Forrest*, no. 284, Dec. 1904 (shrub 2–3 m., high; type of *R. damascena* f. *fl. semiplenis*) (E.); open situations, Teng yueh valley, lat. 25° N., alt. 1800 m., *G. Forrest*, no. 7782, May 1912 (shrub 0.5–1 m. high; fls. deep rose, fragrant) (E.); open situations in Lang kong valley, lat. 26° 12′ N., long. 100° 10′ E., alt. 2135 m., *G. Forrest*, no. 19405, May 1921 (shrub 0.5–1 m. high; fls. bright rose); open situations by streams in the Teng-chuan valley, lat. 26° 4′ N., long 100° 6′ E., alt. 2135 m., *G. Forrest*, nos. 19396 & 19399, May 1921 (shrub 0.5–1 m. high; fls. bright rose).

Rosa multiflora var. **carnea** f. **platyphylla**, Rehder & Wilson in Sargent, Pl. Wils. II. 306 (1915).

Rosa multiflora var. *platyphylla* Thory in Redouté, Roses, II. 69, t. (1821).—Lindley in Bot. Reg. XVI. t. 1372 (1830).—Willmott, Gen. Rosa, I. 29 (1910).

Rosa Thoryi Trattinnick, Ros. Monog. I. 85 (1823).

Rosa damascena f. *floribus semiplenis* Focke in Not. Bot. Gard. Edinb. v. 67 (1911), quoad no. 2052.

Vicinity of Yunnan-sen, *E. E. Maire*, Herb. Edinb. nos. 862 & 876 [before 1905]; shady situation around Lichiang, lat. 26° 50′ N., alt. 2450 m., *G. Forrest*, nos. 2052, May 1906 (erect shrub 2–2.5 m.; fls. dark crimson; co-type of *R. damascena* f. *fl. semiplenis*) (E.); dry stony situations around Teng yueh, lat. 25° N., alt. 1700–1800 m., *G. Forrest*, no. 7903, May 1912 (shrub 1–2 m., fls. bright rose) (E.); without precise locality, *G. Forrest*, nos. 11846 & 16424; in open thickets by streams, Shweli-Salwin divide, lat. 25° 30′ N., long. 98° 58′ E., alt. 1800–2100 m., *G. Forrest*, no. 24247, May 1924 (clambering shrub 2–3 m.; fls. deep rose).

Rosa Brunonii Lindley, Ros. Monog. 120, t. 14 (1820).—Hooker in Bot. Mag. LXIX. t. 4030 (1843).—Rehder & Wilson in Sargent, Pl. Wilson. II. 306 (1915).

Rosa Brownii Trattinnick, Ros. Monog. II. 96 (1823).

Rosa moschata var. *nepalensis* Lindley in Bot. Reg. X. t. 829 (1824).—Willmott, Gen. Rosa, I. 37, t. (1910).

Rosa Brunoni Wallich, Cat. No. 689 (1828).

Rosa pubescens Roxburgh, Fl. Ind. ed. 2, II. 514 (1832).

Rosa moschata Brandis, Forest Fl. Brit. Ind. 201 (1874).—Hooker f., Fl. Brit. Ind. II. 367 (1879).—Crépin in Bull. Soc. Bot. Blg. XVIII. 287 (1879).—Non Miller.

Rosa clavigera Léveillé in Fedde, Rep. Nov. Spec. XIII. 338 (1914); Cat. Pl. Yun-Nan, 234 (1917).

? *Rosa macrophylla* Léveillé, Cat. Pl. Yun-Nan, 235 (1917).—Non Lindley.

Haies, plaine de Long-tan, alt. 2500 m., *E. E. Maire* (type of *R. clavigera* Léveillé) May [1910–14] (fl. blanches) (E.); haies, plaine et monts à Tong-tchouan, alt. 2500–3000 m., *E. E. Maire*, Arnold Arb. no. 380, May [1910–14] (fl. blanches); haies de la plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire*, May [1910–14] (rameaux courts; fl. blanc jaunâtre) (E.); haies,

plaine de Long-tan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. no. 850/1914, May [1910–14] (grimpant à longs rameaux) (E.); open rocky situations, mountains of the Chungtien plateau, lat. 27° 55′ N., alt. 3000–3300 m., *G. Forrest*, no. 10565, July 1913 (shrub 2–3 m.; fls. white, fragrant) (E.); locality lacking, G. Forrest, no. 16381 in 1917–1919; in thickets in the Lichiang valley, lat. 27° 50′ N., long. 100° 15′ E., alt. 2600 m., *G. Forrest*, no. 21106, May 1922 (shrub 2–3.5 m.; branches arched; fls. fragrant, creamy-white, yellow when freshly opened); margin of thickets and by streams on the western flank of the Li-ti-ping Mekong-Yangtze divide, lat. 27° 12′ N., long. 99° 35′ E., alt. 2740 m., *G. Forrest*, no. 19423, June 1921 (shrub 2–3.5 m. with arched branches; fls. white, fragrant).

Rosa Helenae Rehder & Wilson in Sargent, Pl. Wilson. II. 310 (1915). *Rosa floribunda* Rolfe in Gard. Chron. ser. 3, LVIII. 210 (1915), pro parte.—Non Steven, nec Baker.

Vals et coteaux à Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 341, May [1910–14] (buissonnant; fl. blanches) (E.); paturâges des mont. derrière Tong-tchouan, alt. 2700 m., *E. E. Maire*, May [1910–14] (fl. blanches) (E.); plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 488, June [1910–14] (fl. blanches); haies, plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. no. 487, June [1910–14] (fl. blanches); open scrub and amongst rocks, lat. 27° 30′ N., alt. 3350 m., *G. Forrest*, no. 12705, July 1914 (shrub 3–4 m., fls. creamy white, fragrant) (E.); without precise locality, *G. Forrest*, nos. 7492 and 10220; ad margines dumetorum inter Lichiang et Taku, alt. 2800 m., *C. Schneider*, no. 3263, Aug. 3, 1914; in dumetis apertis ad. lat. orient. mont. niveor. prope Lichiang, alt. 3300 m., *C. Schneider*, no. 2473, Sept. 9, 1914 (frutex ad 2 m.; fr. aurant.); open situations, south end of the Lichiang valley, lat. 27° N., alt. 2440 m., *G. Forrest*, no. 10024, May 1913 (semi-scandent shrub, 3–6 m.); in thickets by streams on the Chien-chuan-Mekong divide, lat. 26° 40′ N., long. 99° 40′ E., alt. 3000 m., *G. Forrest*, no. 21519, July 1922 (clambering shrub 4–4.5 m. high; fls. white, fragrant); amongst scrub and in thickets on the hills S. W. of Lichiang, lat. 26° 48′ N., long. 100° 12′ E., alt. 3000 m., *G. Forrest*, no. 21196 May, 1922 (spinous shrub 3–3.5 m., branches arched; fls. creamy white, fragrant).

The two Forrest specimens nos. 21519 and 10024 are quite distinct from the other cited specimens in having double flowers. Whether the Arnold Arb., no. 341 of *E. E. Maire* really belongs here is doubtful since the material is poor. Forrest's no. 21196 has been referred to this species though it is lacking in the large umbellate clusters so typical of the species. However, the general leaf characters along with the pubescent midrib and occasionally pubescent lateral veins associates it with this species.

Rosa longicuspis A. Bertoloni in Mem. Acad. Sci. Bologna, XI. 201, t. 13 (1861); Misc. Bot. XXI. 15, t. 3 (1861).—Crépin in Bull. Soc. Bot. Belg. XIII. 255 (Prim. Ros. Monog. 262) (1874); XVIII. 295 (Prim. Ros. Monog. 541) (1879).—Hooker f., Fl. Brit. Ind. II. 367 (1878).—Brandis,

Ind. Trees, 288 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 313 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa sempervirens J. D. Hooker & T. Thomson, Herb. Ind. Orient. ex Hooker f., Fl. Brit. Ind. II. 367 (1879), pro synon.—Non Linnaeus.

Rosa moschata var. *yunnanensis* Crépin in Bull. Soc. Bot. Belg. XXV. pt. 2, 8 (1886).—Franchet, Pl. Delavay. 218 (1890).

Rosa Sinowilsonii Hemsley in Kew Bull. Misc. Inform. (1906), 158.—Willmott, Gen. Rosa, I. 73 (1910).

Rosa Willmottiana Léveillé in Fedde, Rep. Spec. Nov. XI. 299 (1912).—Willmott, Gen. Rosa, II. 521 (1914).

Rosa irridens Focke in Not. Bot. Gard. Edinb. v. 66 (1911).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa Soulieana Focke l. c. 70 (1911).—Non Crépin.

Rosa lucens Paul & Sons, Rose-Cat. 1915–16, 15 (1915).

Rosa Charbonneaui Léveillé in Fedde, Repert. Nov. Spec. XIII. 338 (1914); Cat. Pl. Yun-Nan, 234 (1917).

Brousse et haies à Long-ky, alt. 700 m., *E. E. Maire*, (type of *R. Willmottiana* Léveillé) June [1910–14] (eglantier épineux à longs rameaux; fl. blanches) (E.); haies, plaine de Long-tan, alt. 2500 m., *E. E. Maire* (type of *R. Charbonneaui* Léveillé), May [1910–14] (rameaux longs; fl. dabord blanches, puis sanguines) (E.); haies de Long-tan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. 447/1913, and 851/1914, May [1910–14] (fl. blanches) (E.); haies, plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, Arnold Arb. 489, June [1910–14] (longs rameaux; feuil. luisantes; fl. blanches); same locality, *E. E. Maire*, Herb. Edinb. 474/1913 and 494/1913, May [1910–14] (fleurs blanches) (E.) and *E. E. Maire*, May [1910–14] (fleurs blanches) (E.); paturâges des mont. derriére Tong-tchouan, alt. 2700 m., *E. E. Maire*, Herb. Edinb. 1064/1913, June [1910–14] (fl. blanches) (E.); vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. 276, 284, 369, 370, 377, 378, 380, 812, 877, 878, 879, 882, 1404, 1692, [before 1905] (E.); bei Schi lung pa, Yunnan-fu, *C. Schneider*, no. 111, Feb. 19, 1914, (Gebüsch, 1.5 m.); Hänge, zwischen Yunnan-fu und Pu chi, *C. Schneider*, no. 225, Mar. 7, 1914; Hänge bei Yunnan-fu, *C. Schneider*, no. 107, Feb. 19, 1914; in Hecke, Yunnan-fu, *C. Schneider*, no. 88, Feb. 8, 1914; thickets by streams, hedges on descent to Yangtze, lat. 26° 10′ N., 100° 30′ E., alt. 1830 m., *F. Kingdon Ward*, no. 3849, May 6, 1921 (bramble with long unkempt branches; fls. white flushed with pink) (E.); common in ditches, hedges, southeast of Meng-hua, alt. 1830–2135 m., *F. Kingdon Ward*, no. 3818, May 6, 1921 (fls. white, fragrant) (E.); near Chan-Chien headwaters of the Red River, or Menghuaho, from Maokai to Tatsang, *J. F. Rock*, no. 3073, Apr. 10, 1922 (scandent shrubs; fls. cream colored); in dry gullies or on banks in the thin pine woods, pass south of Yung-fei, lat. 26° 40′ N., long. 100° 40′ E., alt. 2440–2740 m., *F. Kingdon Ward*, no. 3898, in parte, May 19, 1921 (E.); amongst scrub in side valleys Jang-tzou Shan, Shweli-Salwin divide, lat. 25° 10′ N., alt. 2440–2740 m, *G. Forrest*, no. 18135, July 1919 (weakly-scandent shrub 4–6 m.; fls. creamy white); amongst scrub and in thickets by stream, hills west of Lung-fan, lat. 25° 50′ N., long. 98° 33′ E., alt. 2440–2740 m., *G. Forrest*, no. 27740, Nov. 1925 (clambering shrub of 3–6 m.) (E.); Chao-chiao-to, alt. 2000 m., *F. Kingdon Ward*, no. 250, May 1913

(compact bush 2 m. high) (E.); open situations in thickets along base of eastern flank of Tali Range, lat. 25° 40′ N., alt. 2135–2740 m., *G. Forrest*, no. 4443 in part, June–July 1906 (shrub 1.5–3 m.; fls. white, fragrant; type of *R. irridens* Focke) (E.); hills to the east of Teng-Yueh; lat. 25° N., alt. 1830 m., *G. Forrest*, no. 7567, May 1912 (shrub 1.3–2.5 m.; fls. creamy white, fragrant); without precise locality, *G. Forrest*, no. 8845, Aug. 1912, no. 15859, Aug. 1917 (E.); open situations at south end of Lichiang valley, lat. 27° N., alt. 2440 m., *G. Forrest*, no. 10108, May 1913 (semi-scandent shrub 2–3.5 m.; fls. creamy white, fragrant) (E.); open dry situations on descent to Hoching valley from the Lang kong-Hochine divide, lat. 26° 25′ N., alt. 2135 m., *G. Forrest*, no. 10020, May 1913 (shrub 2–3.5 m.; fls. creamy white, fragrant) (E.); open situations amongst scrub, Tali range, lat. 25° 40′ N., alt. 2740 m., *G. Forrest*, no. 11675, June 1913 (shrub 3–6 m.; fls. creamy white, fragrant) (E.); in sepibus prope Lichiang, alt. 2800 m., *C. Schneider*, no. 2875, Sept. 24, 1914; Mengtze, alt. 1525 m., *A. Henry*, no. 9236A (climber); Quang kia tchoang, Pe yen tsin, *Siméon Ten*, no. 74, Apr. 20, 1916 (shrub 1 m.; fls. white).

The three Maire numbers, namely Arnold Arb. 489, Herb. Edinburgh, 447/1913 and 1064/1913 are doubtfully placed in this species; the material at hand is too sparse to permit more than a dubious determination.

Rosa Rubus Léveillé & Vaniot in Bull. Soc. Bot. France, LV. 55 (1908).—Willmott, Gen. Rosa, II. 507, t. (1914).—Léveillé, Fl. Kouy-Tcheou, 354 (1915); Cat. Pl. Yun-Nan, 235 (1917).—Rehder & Wilson in Sargent, Pl. Wilson. II. 308 (1915).

Rosa Rubus var. *yunnanensis* Léveillé in Bull. Soc. Bot. France, LV. 55 (1908); Cat. Pl. Yun-Nan, 235 (1917).

Rosa moschata var. *hupehensis* Pampanini in Nuov. Giorn. Bot. Ital. n. ser. XVIII. 295 (1910).

Mont au bord de la plaine de Lo-pin-tcheou, *E. Bodinier*, Apr. 6, 1897 (arbisseau à branches sarmenteuses; fleurs blanches) (E.).[1]

Rosa Soulieana Crépin in Bull. Soc. Bot. Belg. XXXV. Compt.-Rend. 21 (1896).—Vilmorin & Bois, Frut. Vilmorin. 85, fig. (1904).—Hemsley in Bot. Mag. CXXXIII. t. 8158 (1907).—Willmott, Gen. Rosa, I. 57, t. (1910).—Rehder & Wilson in Sargent, Pl. Wilson. II. 314 (1915).—Léveillé, Cat. Pl. Yun-Nan, 236 (1917).

Rosa moschata var. *yunnanensis* Focke in Not. Bot. Gard. Edinburgh, V. 69 (1911).—Non Crépin.

Arid foothills on eastern flank of the Bei-ma-shan, lat. 28° 12′ N., alt. 1837–3000 m., *G. Forrest*, no. 13837, June 1917 (semi-scandent shrub 2–6 m.; fls. creamy white, fragrant) (E.); same locality, *G. Forrest*, no. 16965, Sept. 1918 (fr. red-orange) (E.); open situations Mekong valley, lat. 27° 40′ N., alt. 1830–2135 m., *G. Forrest*, no. 12867, July 1914 (shrub to 1 m.) (E.); without precise locality, *G. Forrest*, no. 10030, 10843 and 10993; in gullies amongst shrub growth, Mu-Li, alt. 2740 m., *F. Kingdon Ward*, no.

[1] Of *R. Gentiliana* Léveillé & Vaniot and of its var. *adenoclada* Léveillé, Cat. Pl. Yun-Nan 234 (1917), nomen, enumerated by Léveillé in his Cat. Pl. Yun-Nan no specimens from Yunnan have been seen.

4895, Sept. 2, 1921 (fls. white, fragrant; fr. ruddy orange) (E.); without exact locality, alt. 3350 m., *F. Kingdon Ward*, no. 782, July 15, 1913 (bush 1–2.5 m.; fls. white) (E.).

Rosa glomerata Rehder & Wilson in Sargent, Pl. Wilson. II. 309 (1915).

Amongst scrub by streams in the Atuntze valley, lat. 28° 25′ N., long. 98° 54′ E., alt. 3050 m., *G. Forrest*, no. 20998, Oct. 1921 (shrub 2–4.5 m.; fr. red); lat. 26° 40′ N., long. 99° 40′ E., alt. 3050–3350 m., *G. Forrest*, no. 22988, Oct. 1922; in thickets by streams on the Chien-chuan-Mekong divide, lat. 26° 36′ N., long. 99° 40′ E., alt. 3050 m., *G. Forrest*, no. 21469, July 1922 (weak scandent spinous shrub 3–5 m.; fls. fragrant, creamy white); open thickets and on trees, Mekong valley, lat. 28° 72′ N., alt. 1830–2135 m., *G. Forrest*, no. 15021, Oct. 1917 (scandent spinous shrub 6 m.; fr. red) (E.); without precise locality, *G. Forrest*, no. 22981, Oct. 1922 (E.); Chien-chuan-Mekong divide, lat. 26° 31′ N., long. 99° 40′ E., *G. Forrest*, no. 22337, Sept. 1922 (E.); in shady situations on banks of stream on plain at north end of Lichiang valley, lat. 27° 10′ N., alt. 3050 m., *G. Forrest*, no. 2370, June 1906 (semi-scandent, spinous shrub, 1.5–3 m.; br. arched; fls. white, fragrant) (E.); open situations by streams, north end of Lichiang valley, lat. 27° 20′ N., alt. 2740 m. *G., Forrest*, no. 5948, June 1910 (shrub 1–2 m.; fls. white, fragrant) (E.).

The last two specimens cited, namely Forrest 2370 and 5948 are doubtfully referred to *R. glomerata;* the distinctly smaller leaflets of these two specimens would suggest a possible variety.

Sect. Banksiae Crépin in Jour. Hort. Soc. XI. 3 (1889).

Rosa Banksiae Aiton, Hort. Kew. ed. 2, III. 258 (1811).—Sims in Bot. Mag. XLV. t. 1954 (1818).—Lindley, Ros. Monog. 131 (1820).—Thory in Redouté, Roses, II. 43, t. (1821).—Rehder & Wilson in Sargent, Pl. Wilson. II. 316 (1915).—Léveillé, Cat. Pl. Yun-Nan, 234 (1917).

Rosa Banksiae var. *albo-plena* Rehder in Bailey, Cycl. Am. Hort. IV. 1552 (1902).

Rosa Banksiae f. *subinermis fl. pleno* v. *semipleno albo* Focke in Not. Bot. Gard. Edinb. v. 65 (1911).

Rosa Banksiae f. *aculeata fl. pleno albo* Focke l. c. 66.

Rosa Banksiae f. *aculeata* Léveillé, Cat. Pl. Yun-Nan, 234 (1917).

Rosa Banksiae f. *subinermis* Léveillé, l. c.

Amongst scrub in open situations in the Lichiang valley, lat. 27° N., alt. 2440–2740 m., *G. Forrest*, no. 155, Sept. 1904 (type of *R. Banksiae* f. *aculeata fl. pleno albo* Focke) (E.); open situations in the Mekong valley above Yeh Chih, lat. 27° 30′ N., alt. 2440–2740 m., *G. Forrest*, no. 229, Sept. 1904 (co-type of *R. Banksiae* f. *aculeata* fl. *pleno albo* Focke) (E.); shady and open situations on and among trees and scrub in the Lichiang-fu valley, lat. 27° 10′ N., alt. 2500–3050 m., *G. Forrest*, no. 2051, May 1906 (semi-scandent shrub 3–6 m.; fls. pure white, fragrant; type of *R. Banksiae* f. *subinermis fl. pleno* v. *semipleno albo* Focke) (E.); on shrubs and trees, Lichiang valley, lat. 27° N., alt. 2440 m., *G. Forrest*, no. 10022 May 1913 (semi-scandent shrub 2–9 m.; fls. pure white) (E.); in open thickets on

mountains north of Yung peh, lat. 26° 50′ N., long. 100° 45′ E., alt. 3050 m., *G. Forrest*, no. 22080, Aug. 1922 (clambering shrub 3 m.); by water courses on the Lichiang range, lat. 27° 10′ N., long. 100° 10′ E., alt. 2740–3050 m., *G. Forrest*, no. 22212, Aug. 1922 (spinous shrub 1–2 m.; fr. orange-red); haies de la plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. nos. 797/1914 and 1006/1913, April–May [1910–14] (grimpant; fl. blanches, odorantes) (E.); bord de ruisseaux de la mont. haies de la plaine, environs de Yun-nan-sen, *E. Bodinier*, March 24, 1897 (fl. blanches) (E.); vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. nos. 353, 372, 374, 873, 881 and 1694 [before 1906] (E.); bei Yunnan fu, *C. Schneider*, no. 169, Feb. 20, 1914; bei Schi-lung-pa, Yunnan-fu, *C. Schneider*, no. 185, Feb. 20, 1914 (3–3.5 m.); Hecke in Puchi, Yunnan-fu, *C. Schneider*, no. 213, March 7, 1914 (Bl. weiss; 2 m.).

Rosa Banksiae var. **normalis** Regel, Tent. Ros. Monog. 91 (1877); in Act. Hort. Petrop. v. 376 (1878).—Rehder & Wilson in Sargent, Pl. Wilson, II. 317 (1915).

Rosa Banksiae Crépin in Bull. Soc. Belg. XIV. 162 (1875). Franchet in Nouv. Arch. Mus. Paris, ser. 2, v. 267 (Pl. David. I. 115) (1883); Pl. Delavay, 219 (1890).—Hemsley in Jour. Linn. Soc. XXIII. 248 (1887), quoad specimina Henryana.—Focke in Bot. Jahrb. XXIX. 405 (1900).—Henry in Gard. Chron. ser. 3, XXXI. 438, figs. 171, 172 (1902).—Léveillé, Fl. Kouy-Tcheou, 353 (1915).—Non Aiton.

Rosa Banksiae f. *subinermis fl. simpl.* Focke in Not. Bot. Gard. Edinb. v. 65 (1911), nomen nudum.

Rosa Banksiae f. *albiflora* Léveillé, Cat. Pl. Yun-Nan, 234 (1917), nomen.

South end of Lang kong valley, alt. 2440 m., *G. Forrest*, no. 214 in 1904 (E.); open and shady, dry and moist situations, Lang kong valley, lat. 26° 20′ N., alt. 1830–2440 m., *G. Forrest*, no. 5592, May 1910 (shrub 1–6 m.; fls. pure white, fragrant) (E.); ad vias et in sepibus, Yunnan-fu, alt. 1900 m., *O. Schoch*, no. 29, Apr. 27, 1916 (fl. albi); montant sur les arbres, Lan kong, Delavay, no. 819, Apr. 30, 1884 (fl. blanches, peu odorantes); open situations in thickets along the base of the eastern flank of the Tali range, lat. 25° 40′, alt. 2150–2750 m., *G. Forrest*, no. 4443 in part, June–July, 1906 (shrub 2–3 m., flowers white, fragrant; type of *R. subinermis fl. simplici* Focke).

Rosa Banksiae f. lutea Lindley Bot. Reg. XIII. t. 1105 (1827).

Rosa Banksiae f. *luteiflora* Léveillé, Cat. Pl. Yun-Nan, 234 (1917), nomen.

Haies, plaine de Tong-tchouan, alt. 2500 m., *E. E. Maire*, April [1910–14] (grimpant à longs rameaux; fl. jaunes, odorantes) (E.); same locality *E. E. Maire*, Arnold Arb., no. 378, April [1910–14] (fl. jaunes, inodores); moist, shady situations in the Lichiang plain, lat. 26° 50′ N., alt. 2500 m. *G. Forrest*, no. 2048, May 1906 (spreading shrub 2–2.5 m.; fls. rich yellow, not fragrant) (E.); open situations, Chung tien plateau, lat. 27° 30′ N., alt. 2740 m., *G. Forrest*, no. 12419, April 1914 (fl. yellow) (E.); amongst open scrub by streams, Shweli-Salwin divide, lat. 25° 20′ N., long. 98° 58′ E., alt. 2440–2740 m., *G. Forrest*, no. 24045, April 1924 (shrub 1–2 m.; fls. soft deep buff yellow); margins of open thickets, north of Wei-Hse, lat.

27° 20′ N., long. 99° 18′ E., alt. 2440 m., *G. Forrest*, no. 25476, June 1924 (semi-scandent shrub 2.5–3 m.; fls. yellow).

Sect. INDICAE Thory, Prodr. Gen. Rosae, 128 (1820).

Rosa odorata Sweet, Hort. Suburb. Lond. 119 (1818).—Rehder & Wilson in Sargent, Pl. Wilson. II. 338 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa indica odorata Andrews, Roses, II. t. 77 (1806).
Rosa indica β. odoratissima Lindley, Ros. Monog. 106 (1820); in Bot. Reg. x. t. 804 (1824).—Regel, Tent. Ros. Monog. 94 (1877); in Act. Hort. Petrop. v. 358 (1878).
Rosa odoratissima Sweet ex Lindley, Ros. Monog. 106 (1820), pro synon.
Rosa Thea Savi, Fl. Ital. II. t. 47 (1822).
Rosa indica var. *ochroleuca* Lindley in Trans. Hort. Soc. Lond. VI. 286 (1826).
Rosa indica sulphurea Andrews, Roses, II. t. 86 (1826-28).
Rosa fragrans Thory in Redouté, Roses, ed. 3, III. groupe 25, t. [19] (1835), (in tab. tantum).—K. Koch, Dendr. I. 273 (1869).
Rosa chinensis, a. *indica* Koehne, Deutsch. Dendr. 281 (1893), pro parte.
Rosa chinensis var. *fragrans* Rehder in Bailey, Cycl. Am. Hort. IV. 1551 (1902).
Rosa gechouitangensis Léveillé in Fedde, Rep. Spec. Nov. XI. 299 (1912).
Rosa oulengensis [sic] Léveillé, l. c. (1912).—Willmott, Gen. Rosa, II. 523, t. (1914).
Rosa tongtchouanensis Léveillé in Fedde, Rep. Spec. Nov. XI. 300 (1912).—Willmott, Gen. Rosa, II. 523, t. (1914).

Haies, plaine de La-kou, alt. 2400 m., *E. E. Maire*, Herb. Edinb. no. 794/1914, May [1910–14] (buissonnant, haut 0.7 m.; fls. inodores) (E.); same locality, *E. E. Maire*, Herb. Edinb. no. 814/1914, May [1910–14] (grimpant; fls. blanches, odorantes) (E.); haies de La-kou, alt. 2400 m., *E. E. Maire*, March [1910–14] (longs rameaux; fls. inodores; type of *Rosa tongtchouanensis* Léveillé), (E.); and *E. E. Maire*, March [1910–14] (fls. blanches, inodores) (E.); haies de la plaine à Tong-tchouan, alt. 2500 m., *E. E. Maire*, Herb. Edinb. no. 1009/1913 and without no., April [1910–14] (fl. roses, inodores) (E.); haies des tertres à Ou-long, alt. 2500 m., *E. E. Maire* [1910–14] (type of *R. oulengensis* Léveillé), April (fl. roses) (E.); brousse des collines arides a Kiang ti, alt. 2400 m., *E. E. Maire*, Herb. Edinb. no. 1015/1913, April [1910–14] (grimpants) (E.); a flanc de coteaux calcaires a Ge-choui-tang, alt. 2450 m., *E. E. Maire* (type of *Rosa gechouitangensis* Léveillé) April [1910–14] (grimpant, à longs rameaux) (E.); vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. nos. 865 and 869, April [1910–14] (fl. blanc-rose) (E.); coteaux arides, vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. no. 871 and 872, April [1910–14] (rose jaune souffrée) (E.); by streams in side valley, hills N. W. of Teng yueh, lat. 25° 20′ N., long. 98° 30′ E., alt. 2440 m., *G. Forrest*, no. 24054, April 1924 (spinous shrub 2–4 m.; fls. pale rose, fragrant); in open situations, Yang pi valley, lat. 25° 40′ N., alt. 1525 m., *G. Forrest*, no. 12354, April 1914 (shrub 2 m.; fls. deep rose) (E.); in thickets, Teng yueh plain, lat. 25° N., alt. 1675 m., *G. Forrest*, no. 12373, April 1914 (scandent-spinous shrub 6–12 m.; fls. rose-red, fragrant) (E.); open situations amongst scrub, Shweli valley, lat. 25° 10′ N., alt. 1830 m., *G. Forrest*, no. 12270, March 1914 (shrub 2–3 m.; fls. deep crimson) (E.); open dry situations, amongst scrub, Shweli valley,

lat. 25° 20′ N., alt. 1830 m., *G. Forrest*, no. 11856, June 1913 (spinous shrub 2–3 m.; fls. white-flushed rose, fragrant) (E.); on scrub in open situations, Shweli valley, lat. 25° 20′ N., alt. 1830–2135 m., *G. Forrest*, no. 11955 (scandent shrub 2.5–6 m.; fls. pale yellow, fragrant) (E.); in cultivation round Lichiang, lat. 27° N., long. 100° 12′ E., alt. 2440–2740 m., *G. Forrest*, no. 21164, May 1922 (scandent shrub 3–6 m.; fls. fragrant, white tinged green center); without exact locality, *G. Forrest*, no. 17879, in 1917–1919; Mengtze, cultivated?, *A. Henry*, no. 10828 (climber, pink flowers); in sepibus in districtu Yunnan-fu, alt. 1900 m., *O. Schoch*, no. 30, April 27, 1916 (fl. albi).

Rosa odorata var. **pseudindica** Rehder in Mitt. Deutsch. Dendr. Gesell. xxiv. 221 (1915); in Bailey, Stand. Cycl. Hort. v. 2987 (1916).

Rosa pseudindica Lindley, Ros. Monog. 132. 1820.

Rosa "Fortune's Double Yellow" Lindley in Jour. Hort. Soc. London, vi. 52 (1851).—Hooker in Bot. Mag. lxxiii. t. 4679 (1852).—Planchon in Fl. des Serr. viii. 53, t. 769 (1852).

Rosa Fortuneana Paxton Flow. Gard. iii. 157 (1852–53) Non Lindley.—Lemaire in Jard. Fleur. iv. 361 (1854).

Rosa chinensis var. *pseudindica* Willmott, Gen. Rosa. i. 85, t. (1911).

On trees in open situations, Chien-chuan valley, lat. 27° N., alt. 2135 m., *G. Forrest*, no. 12432, May 1914 (scandent shrub 9–12 m.; fls. fragrant, rich soft rose tinged yellow) (E.); on and amongst scrub and in thickets on the hills between the Lang kong and Chien-chuan valleys, lat. 26° 20′ N., long. 99° 45′ E., alt. 2135–2440 m., *G. Forrest*, no. 21149, May 1922 (semi-scandent shrub 3–6 m.; fls. fragrant, rose pink with a coppery tinge); on and amongst scrub in thickets on the hills around Yungpeh, lat. 24° 40′ N., long. 100° 45′ E., alt. 2135–2440 m., *G. Forrest*, no. 21131, March 1922 (semi-scandent shrub 3–6 m.; fls. fragrant, rose-pink with a coppery tinge); amongst scrub on hills around Wei-Hse, lat. 27° 12′ N., long. 99° 18′ E., alt. 2440–2740 m. ,*G. Forrest*, nos. 25439 and 26020, May–June 1924 (semi-scandent shrub 3–4 m.; fls. sweetly fragrant, interior very pale yellow, exterior fleshy pink); arid region at Tung chu ling, alt. 3050 m., *F. Kingdon Ward*, no. 317, 1913 (bush 1–1.5 m.; fls. copper pink) (E.);

Rosa odorata var. **gigantea** Rehder & Wilson in Sargent, Pl. Wilson. ii. 338 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa gigantea Collet apud Crépin in Bull. Soc. Bot. Belg. xxvii. 148 (1888); in xxviii, Compt. Rend. 11 (1889); in Gard. Chron. ser. 3, vi. 12, fig. 4 (1889).—Collet & Hemsley in Jour. Linn. Soc. xxviii. 55, t. 9 (1890).—Hemsley in Bot. Mag. cxxx. t. 7972 (1904).—Willmott, Gen. Rosa, i. 99, t. (1911).—Raffill in Gard. Chron. ser. 3, li. 314, fig. 159 (1912).

Rosa macrocarpa Watt apud Crépin in Bull. Soc. Bot. Belg. xxviii. Compt. Rend. 13 (1888).—Hemsley in Bot. Mag. cxxx. t. 7972 (1904), pro synon.—Willmott, Gen. Rosa, i. 100 (1911), pro synon.—Non Mérat, nec Nuttall.

Rosa xanthocarpa Watt apud Willmott, Gen. Rosa, i. 100 (1911).

Rosa Duclouxii Léveillé, Cat. Pl. Yun-Nan, 235 (1917), pro synon. *R. odorata* var. *gigantea*.

Bord des ruisseaux, dans la mont., environs Yun-nan-sen, *F. Duclous*, March 28, 1897 (grande liane, sarmenteuse; fl. blanches; (type of *Rosa*

Duclouxii Léveillé) (E.); brousse du Lao-koui-chan, alt. 2500 m., *E. E. Maire*, Herb. Arnold Arb. no. 237, March [1910–14] (fl. blanches); vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. nos. 864, 868, 870, 874, April [before 1906] (fls. blanches) (E.); by streams on margin of lava bed, west of Teng yueh, lat. 25° N., alt. 1525 m., *G. Forrest*, no. 7458, May 1912 (compact shrub 1–2 m.; fls. pure white or blush, fragrant) (E.); same locality, *G. Forrest*, no. 8799, July 1912 (shrub 2–3 m.) (E.); same locality, *G. Forrest*, no. 12082, May 1913 (scandent spinous shrub 6–9 m.; fls. creamy white, fragrant) (E.); open situations, hills to N. W. of Teng yueh, lat. 25° 10′ N., alt. 1830–2135 m., *G. Forrest*, no. 9803, Mar. 1913 (clambering spinous shrub 3–6 m.; fls. pale yellow, fragrant) (E.); amongst scrub and in thickets, Teng yueh-Shweli divide, lat. 25° N., alt. 2135 m., *G. Forrest*, no. 12328, April 1914 (semi-scandent shrub 3–6 m.; fls. fragrant, greenish white, green at base) (E.); same locality, *G. Forrest*, no. 9787, March 1913 (spinous shrub 1.5 m.; branches arched; fls. pale yellow fragrant); in open situations, Yangpi valley, lat. 25° 40′ N., alt. 1525 m., *G. Forrest*, no. 12363, April 1914 (shrub 2–3 m.; fls. creamy white, fragrant) (E.); open situations, ascent of hill east of Chutong, lat. 25° 35′ N., alt. 2135 m., *G. Forrest*, no. 12342; April 1914 (shrub 1–2 m., fls. rose pink, fragrant) (E.); in open scrub, Shweli-Salwin divide, lat. 25° N., alt. 2440 m., *G. Forrest*, no. 12310, April 1914 (shrub 4–5 m.; fls. white, greenish at base, fragrant) (E.); in thickets, divide between the Yung-chang & Salwin valleys, lat. 25° 6′ N., alt. 2440 m., *G. Forrest*, no. 16242, April 1918 (scandent shrub 2–6 m.; fls. creamy-yellow, fragrant) (E.); open scrub by streams in the Shweli valley, lat. 24° 42′ N., alt. 1830 m., *G. Forrest*, no. 16175, Feb. 1918 (scandent-spinous shrub 3–5 m. high) (E.); open situations on scrubs, margin of forests at Ghi shan east of Tali lake, lat. 25° 48′ N., alt. 2740 m., *G. Forrest*, no. 13519, Aug. 1914 (semi-scandent shrub 3–6 m.; fr. pale yellow) (E.); shady, moist situations, divide between Pu-piao and Yung-chang valleys, lat. 25° 6′ N., alt. 2135 m., *G. Forrest*, no. 5499, April 1910 (shrub 1–3 m.; fls. greenish white, fragrant) (E.); open situations, Shweli valley, lat. 25° N., alt. 1830–2135 m., *G. Forrest*, no. 9617, Feb. 1913 (shrub 2–2.5 m., fls. creamy yellow, fragrant) (E.); open dry situations, hills to N. W. of Teng yueh, lat. 25° 10′ N., alt. 1830–2135 m., *G. Forrest*, no. 9629, Feb. 1913 (shrub 1.5 m.; fls. white interior with rose exterior); open situations, Mekong valley, lat. 28° N., alt. 1830–2135 m., *G. Forrest*, no. 16546, June 1918 (semi-scandent, spinous shrub 2–4; fls. pale rose); open moist amongst scrub, Tali valley, lat. 25° 40′ N., alt. 2040 m., *G. Forrest*, no. 4446, May–June 1906 (shrub 0.5–2 m.; fls. rose, fragrant); grass hills, Mengtsze, alt. 1370–1525 m., *A. Henry*, nos. 9098a & 9098c (climber, fls. white, fragrant); watershed of the Black river, or Papienho, between Mohei and Maokoi, *J. F. Rock*, no. 2929, Mar. 21, 1922 (hedge plant; fls. pink, fragrant); To che fang, Pe yen tsin, Siméon Ten, no. 48, April 4, 1916 (prostratus, ad 1–2 m.; fl. albis); ad pedum collium in reg. Lichiang fu, alt. 2800 m., *C. Schneider*, no. 3209, Oct. 1914.

Rosa odorata var. **gigantea** f. **erubescens** Rehder & Wilson in Pl. Wilson. II. 339, (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa gigantea f. *erubescens* Focke in Not. Bot. Gard. Edinb. v. 68 (1911).

Shady situations in the Lichiang valley, lat, 26° 50′ N., alt. 2500 m., *G. Forrest*, no. 2049, May 1906 (semi-scandent shrub 3–6 m.; fls. rose-pink, fragrant); moist, open situations amongst dwarf scrub in the Tali valley, lat. 25° 40′ N., alt. 2040–2440 m., *G. Forrest*, no. 4452, May 1906 (shrub 1–2 m.; fls. rose-pink, fragrant); open situations, hills to the N. W. of Teng yueh, lat. 25° 10′ N., alt. 1830–2135 m., *G. Forrest*, no. 9848, April 1913 (shrub 2 m.; fls. pale rose, fragrant).

Rosa chinensis Jacquin, Obs. Bot. III. 7, t. 55 (1768).—Koch, Dendr. I. 272 (1869).—Willmott, Gen. Rosa, I. 79, t. (1911).—Rehder & Wilson in Sargent, Pl. Wilson. II. 320 (1915).—Léveillé, Cat. Pl. Yun-Nan, 234 (1917).

Rosa sinica Linnaeus, Syst. Veg. ed, 13, 394 (1774), forma calyce monstroso.

Rosa indica Loureiro, Fl. Cochin. 323 (1790).—Aiton, Hort. Kew. ed. 2, III. 266 (1811).—Lindley, Ros. Monog. 106 (1820).—Crépin in Bull. Soc. Bot. Belg. XI. 23 (Prim. Ros. Monog. 139) (1872); XIV. 168 (Prim. Ros. Monog. 372) (1875).—Hooker, f., Fl. Brit. Ind. II. 364 (1878).—Hemsley in Jour. Linn. Soc. XXIII. 249 (1887).—Dunn & Tutcher in Kew Bull. Misc. Inform. add. ser. X. 96 (Fl. Kwantung & Hongk.) (1914).—Non Linnaeus.

Rosa nankinensis Loureiro, Fl. Cochin. 323 (1790).

Rosa semperflorens β. Lawrence, Roses, t. 26 (1799).

Rosa bengalensis β. chinensis Persoon, Syn. Pl. II. 50 (1807).

Rosa Indica vulgaris Thory in Redouté, Roses, I. 51, t. (1817).—Lindley, Ros. Monog. 106 (1820).—Regel, Tent. Ros. Monog. 74 (1877); in Act. Hort. Petrop. v. 358 (1878).

Haies de Tong-tchouan, alt. 2500 m., *E. E. Maire*, April [1910–14] (fl. roses) (E.); open thickets along base of eastern flank of the Tali range, lat. 25° 45′ N., alt. 2135 m., *G. Forrest*, no. 12371, May 1914 (shrub 2–3 m.; fls. deep black-crimson) (E.); Mekong valley, lat. 28° N., alt. 1830–2440 m., *G. Forrest*, no. 16391, May 1918 (semi-cultivated spinous shrub 2–3 m.; fls. deep rose) (E.); locality lacking, *G. Forrest*, no. 4454a (E.); on scrub and trees in open situations, Tali range, lat. 25° 40′ N., alt. 2135–2440 m., *G. Forrest*, no. 7263, May 1910 (weakly scandent shrub 3–6 m.; fls. deep rose-pink) (E.); cultivated at temples on hills to north west of Tung yueh, lat. 25° 10′ N., alt. 1830–2135 m., *G. Forrest*, no. 8080, June 1912 (shrub 1–2 m.; fls. deep crimson) (E.); locality lacking, *G. Forrest*, no. 17184, Oct. 1918 (E.); open situations amongst scrub and by streams, Shweli-Salwin divide, lat. 25° 20′ N., alt. 2135 m., *G. Forrest*, no. 17548, June 1918 (shrub 1–2.5 m.; fls. rose) (E.); in open thickets by streams, Salwin-Kiu-Chiang divide, N. W. of Si-chi-to, lat. 28° 35′ N., long. 98° 30′ E., alt. 3050 m., *G. Forrest*, no. 21631, May 1922 (weakly scandent, spinous shrub 2.5–3 m., fls. deep crimson-rose) (E.); in thickets by streams, Salwin-Kiu-Chiang divide west of Chamatong, lat. 28° 18′ N., long. 98° 27′ E., alt. 2135 m., *G. Forrest*, no. 21676, June 1922 (clambering shrub 1.5–3 m.; fls. fragrant, rose) (E.); shores of La Hsi Pa Lake, La Hsi Pa valley, alt. 2590 m., *G. Forrest*, no. 226, Sept. 1907 (E.); mts. S. E. of Mengtze, alt. 1600 m.,

A. Henry, no. 11272; cultivated about Pe-yen-tsin, *Siméon Ten*, no. 1, Oct. 28, 1915.

Rosa chinensis var. **semperflorens** Koehne, Deutsch. Dendr. (1893) 281.

Rosa chinensis (c) *R. semperflorens* Koch Dendr. I. 273 (1869).
Rosa semperflorens Curtis, Bot. Mag. 284 (1794).
Rosa diversifolia Ventenat, Jard. Cels. t. 35 (1800).

Cultivated in and around villages along the base of Shweli-Salwin divide, lat. 25° 20′ N., long. 98° 58′ E., alt. 1830–2135 m., *G. Forrest*, no. 24059, April 1924 (shrub 1–2 m.; fls. deep crimson) (E.).

Sect. MICROPHYLLAE Crépin, in Jour. des Ros. XV. 77 (Nouv. Class. Ros. 29) (1891).

Rosa Roxburghii Trattinnick, Ros. Monogr. II. 233 (1823).—Rehder & Wilson in Sargent, Pl. Wilson. II. 319 (1915).

Rosa microphylla Roxburgh apud Lindley, Ros. Monogr. 9, 146 (1820).—Hooker in Bot. Mag. LXIII. t. 3490 (1836).—Hemsley in Jour. Linn. Soc. XXIII. 252 (1887).—Non Desfontaines.

Tali, *Delavay*, no. 1138, June 14, 1884 (arbrisseau de 50 a 90 cm.; fl. rouges); Tchen-fong-shan, *Delavay*, in 1894; open rocky slopes, Shweli-Salwin divide, lat. 25° 30′ N., alt. 2500 m., *G. Forrest*, no. 12061, May 1913 (shrub 1–2 m.; fls. deep rose, fragrant) (E.); open bouldery slopes, Shweli-Salwin divide, lat. 20° 29′ N., alt. 3000 m., *G. Forrest*, no. 17482, July 1918 (shrub 0.5–1 m. high; fls. rose) (E.); open situations by streams, foothills west of Teng-yueh, lat. 25° N. long. 98° 36′ E., alt. 1600 m., *G. Forrest*, no. 24036, April–May 1924 (shrub 1–2 m.; fls. white to pink, fragrant) (E.); open situations by streams, lower slopes Shweli-Salwin divide, lat. 25° 30′ N., long. 98° 59′ E., alt. 1200 m., *G. Forrest*, no. 24240, May 1924 (shrub 1–1.5 m.; fls. white to rose, fragrant) (E.).

Rosa Roxburghii Tratt. f. **normalis** Rehder & Wilson in Sargent, Pl. Wilson. II. 319 (1915).

Rosa microphylla Crépin in Bull. Soc. Bot. Ital. 1897, p. 234.—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).—Non Desfontaines, vix Roxburgh.
Rosa Forrestii Focke in Not. Bot. Gard. Edinb. v. 67, t. 62 (1911).—Léveillé, Cat. Pl. Yun-Nan, 234 (1917).
Rosa Roxburghii Léveillé, Cat. Pl. Yun-Nan, 235 (1917).—Vix Trattinnick.

Coteaux arides, Tchouan-se-pa, alt. 690 m., *E. E. Maire*, [1910–14] (fl. blanches) (E.); dry stony situations along base of Tali range, lat. 25° 40′ N., alt. 2200–2500 m., *G. Forrest*, no. 4450, June 1906 (shrub 0.5–1 m.; fls. pale rose or white; type of *R. Forrestii*) (E.); open situations by streams, Yang-pi and southern half of Tali valley, lat. 25° 40′–45′ N., alt. 1800–1950 m., *G. Forrest*, no. 9906, May 1913 (shrub 1–2 m.; branches arched; fls. bright deep rose) (E.).

Rosa praelucens, spec. nov.

Frutex; rami crassi, glabri, annotini purpureo-brunnei, aculeis conformibus sparsis magnis 1–1.5 cm. longis basi dilatatis fuscis muniti; ramuli inermes. Folia 7–13 foliolata, petiolo incluso 5–13 vel ad 20 cm. longa;

foliola obovata, obovato-elliptica vel ovalia, 1.4–2 vel ad 6 cm. longa et 0.8–1.2 vel ad 2.3 cm. lata, apice rotundata, basi rotundata vel obliqua, grosse simpliciter vel indistincte duplicato-serrata dentibus glandulosulis, supra obscure viridia, puberula, subtus cinerea, villosa vel in foliis maturis puberula, nervis vix elevatis; petioli 2.5–4.5 cm. longi, tomentosuli; petioluli 1–2 mm. longi, villosuli; stipulae adnatae, satis anguste, 1–2 cm. longi, auriculis divergentibus 5–8 mm. longis triangularibus vel lanceolatis, margine glanduloso-dentatis. Flores solitarii rubri, 8 cm. diam.; bracteae foliaceae, latae; pedicelli crassi, 6 cm. longi, glabri vel tenuiter tomentelli et interdum sparse stipitato-glandulosi; receptaculum depresso-globosum, glabrum vel laxe villosum, stipitato-glandulosum et leviter aculeolatum; sepala ovato-lanceolata, petalis paullo breviora, basim versus margine glanduloso-denticulata, apicem versus foliacea, serrata, utrinque dense villosa vel extus basin versus glabrescentia; petala late obovata, 4.5 cm. longa, rotundata vel emarginata, extus glabra; stamina numerosa; capitulum stigmatum sessile. Fructus depresso-globosus, basi truncatus, viridis vel brunneus, sparse aculeolatus, sepalis erectis persistentibus coronatus, sine calyce 1.8 cm. diam., 1.4 cm. longus.

Open situations amongst scrub, Chungtien plateau, lat. 27° 30′ N., alt. 2700–3000 m., *G. Forrest*, no. 12996 (type), July 1914 (shrub of 1.2–1.8 m., flowers fragrant, deep rose-pink) (E.); without precise locality, *G. Forrest*, nos. 16548 & 16936 in 1917–1919.

This beautiful large-flowered rose belongs in the section Microphyllae Crep., as it agrees in the characters; styles free, short, stipules adnate, not laciniate, narrow, flowers solitary, receptaculum armed, depressed-globose. It is easily distinguished from *R. Roxburghii* Tratt, which has shorter, strongly pinnate sepals, a more prickly receptacle and fruit, often more numerous and smaller leaflets and which lacks the velvety pubescense of *R. praelucens*. In the shape of the receptacle, the size of the flower, the hairiness and appearance of the leaves this new species recalls *R. rugosa* Thunb., probably it forms a link between this species and its allies of the section Cinnamomeae DC. and the heretofore isolated *R. Roxburghii* Tratt. Forrest's nos. 16548 and 16936 agree well with the type except that the leaves are larger; in the type the leaves are 5–8 cm. long and the leaflets 1–2.5 cm. long and 6–1.4 cm. broad, while in the cotype the leaves are up to 20 cm. long and the leaflets up to 5.5 cm. long and to 2.3 cm. broad.

Sect. CINNAMOMEAE DeCandolle apud Seringe, Mus. Helv. I. 2 (1818).

Rosa rugosa var. **Chamissoniana f. plena** Byhouwer, n. comb.

Rosa rugosa var. *rubro-plena* Rehder in Bailey, Stand. Cycl. Hort. v. 2992 (1916).

Rosa rugosa var. *plena* Regel, Tent. Ros. Monog. 26 (1877); in Gartenfl. XXIV. 321 t. 846 (1875).—Rehder, Man. Cult. Trees & Shrubs, 442 (1927).

Cultivé et subspontané jardins de Ton-ké-suin, alt. 3000 m., *E. E. Maire*, May [1910–14] (fl. rouges, très odorantes) (E.); same locality, *E. E. Maire*, Herb. Edinb. nos. 429/1913 & 176/1913, May [1910–14] (buissonnant)

(E.); vicinity of Yun-nan-sen, *E. E. Maire*, Herb. Edinb. no. 371 [before 1906] (E.); cultivated, Wei-Hse, Mekong-Yangtze divide, lat. 27° 12′ N., long. 99° 18′ E., alt. 2440–2740 m., *G. Forrest*, no. 25434, June 1924 (shrub 1 m.; fls. deep crimson).

Rosa Davidi Crépin var. **elongata** Rehder & Wilson in Sargent, Pl. Wilson. II. 323 (1915).

Rosa macrophylla f. *robusta* Focke in Not. Bot. Gard. Edinb. v. 68 (1911).
Rosa macrophylla f. *gracilis* Focke l. c. 69 (1911), quoad no. 2336.
Rosa Parmentieri Léveillé in Fedde Rep. Spec. Nov. XIII. 339 (1914); Cat. Pl. Yun-Nan, 235 (1917).

Brousse du Io-chan, alt. 3400 m., *E. E. Maire*, Herb. Edinb. no. 708/1914 (type of *Rosa Parmentieri* Léveillé) June [1910–14] (buissonnant; fl. blanches) (E.); in open thickets & cane brakes, Mekong-Salwin divide, lat. 28° 12′ N., alt. 3350–3650 m., *G. Forrest*, no. 14958, Sept. 1917 (sparingly spinous shrub 1–2 m.; fr. red and orange) (E.); margins of thickets and shady moist situations in ravines on the Bei-ma Shan, lat. 28° 18′ N., long. 99° 10′ E., alt. 2740–3050 m., *G. Forrest*, no. 19593, June 1921 (spinous shrub 1.5–2 m., stem arched, deep purple; fls. pale rose-pink) (E.); same locality, alt. 3650 m., *G. Forrest*, no. 13961, June 1917 (shrub 1–2 m., fls. deep rose) (E.); same locality, alt. 3950 m., *G. Forrest*, no. 20922, Oct. 1921 (shrub 2–3 m.; fr. bright scarlet) (E.); same locality, alt. 3650 m., *G. Forrest*, no. 16962, Sept. 1918 (shrub 2–3 m.; fls. deep rose) (E.); in and on the margin of thickets, N. Maikha-Salwin divide, lat. 26° 40′ N., alt. 2740 m., *G. Forrest*, no. 18200, July 1919 (shrub 1–2 m.; fls. white flushed deeply rose) (E.); open situations in pine forests, eastern flank of the Lichiang range, lat. 27° 40′ N., alt. 3050–3300 m., *G. Forrest*, no. 6303, Aug. 1910 (shrub 1–3 m.; fls. bright crimson-rose) (E.); amongst scrub on rocky slopes in side valleys on the Lichiang range, lat. 27° 20′ N., long. 100° 12′ E., alt. 3650 m., *G. Forrest*, no. 22353, Sept. 1922 (shrub 1–1.5 m.; fr. orange-scarlet); shady situations in pine and mixed forests, eastern flank of the Lichiang range, lat. 27° 10′ N., alt. 2740–3050 m., *G. Forrest*, no. 5558, May 1910 (shrub 1–3 m.; fls. rose, faintly fragrant) (E.); same locality, *G. Forrest*, nos. 2336 (type of *R. macrophylla* f. *gracilis* Focke) and 2504 (type of *R. macrophylla* f. *robusta* Focke), June 1906 (shrub 1–3 m.; fls. bright rose, non-fragrant; fr. bright scarlet) (E.); open situations in pine forest, mountains N. E. of the Yangtze bend, lat. 27° 45′ N., alt. 3300 m., *G. Forrest*, no. 11326, Sept. 1913 (shrub 2–2.5 m.; fr. scarlet) (E.); thickets in dry situations, Yung-peh mountains, lat. 26° 40′ N., alt. 2740 m., *G. Forrest*, no. 15309, Sept. 1917 (shrub 2–3 m.; fr. scarlet) (E.).

Rosa Sweginzowii Koehne in Fedde, Rep. Spec. Nov. VIII. 22 (1910); in Mitt. Deutsch. Dendr. Ges. XIX. 95, fig. 2 (1910); in Fedde, Rep. Spec. Nov. XI. 531, fig. 3 (1913).—Rehder & Wilson in Sargent, Pl. Wilson. II. 324 (1915).

Shrub belt, Doker-la, alt. 3650 m., *F. Kingdon Ward*, no. 776, July 12, 1913 (bush 1–2 m.) (E.); exact locality lacking, probably same as above,

alt. 3650 m., *F. Kingdon Ward*, no. 700, July 8, 1913 (bush or tall straggling shrub 2–4.5 m.) (E.); without exact locality, Ka-gur-pu temple, alt. 3500 m., *F. Kingdon Ward*, no. 903, July 1913 (shrub 3–4.5 m.) (E.).

Rosa Moyesii Hemsley & Wilson in Kew Bull. Misc. Inform. 1906, p. 159.—Garden, LXXII. 313, fig. (1908).—Hemsley in Bot. Mag. CXXXVI. t. 8338 (1910).—Willmott, Gen. Rosa, I. 229, t. fig. 74 (1911).—Bean, Trees & Shrubs Brit. Isl. II. 435, fig. (1914).—Rehder & Wilson in Sargent Pl. Wilson. II. 325 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa macrophylla f. *gracilis* Focke in Not. Bot. Gard. Edinb. v. 69 (1911), quoad no. 4442.

Open, stony situations in Tali valley, and on base of eastern flank of the Tali range, lat. 25° 40′ N., alt. 2040–2440 m., *G. Forrest*, no. 4442, June 1906 (shrub 1–1.5 m.; fls. crimson; co-type of *R. macrophylla* f. *gracilis* Focke) (E.); open situations in pine forests, eastern flank of Lichiang range, lat. 27° 10′ N., alt. 3050 m., *G. Forrest*, no. 5675, May 1910 (shrub 1–2 m.; fls. deep crimson) (E.); shady pine forests in side valleys, Tali Range, lat. 25° 40′ N., alt. 3300 m., *G. Forrest*, no. 7036, June 1910 (shrub 2–3 m.; fls. deep crimson) (E.); in collibus ad Lichiang fu, alt. 2900 m., *C. Schneider*, nos. 1883 and 1904, July 18, 1914 (fl. roseo-lilacini).

Rosa Moyesii f. rosea Rehder & Wilson in Sargent, Pl. Wilson. II. 325 (1915).

Rosa macrophylla f. *parce glandulosa* Focke in Not. Bot. Gard. Edinb. v. 69 (1911).

Shady situations in side valleys on eastern flank of Lichiang range, lat. 27° 20′ N., alt. 3050–3300 m., *G. Forrest*, no. 2402, June 1906 (branching shrub 1.5–2 m.; fls. bright rose, odorless; fr. bright scarlet; type of *R. macrophylla* f. *parce glandulosa* Focke).

Rosa sertata Rolfe in Bot. Mag. CXXXIX. t. 8473 (1913).—Osborn in Gard. Chron. ser. 3, LIV. 166, fig. 63 (1913).—Willmott, Gen. Rosa, II. 493 (1914).—Bean, Trees & Shrubs Brit. Isl. II. 443 (1914).—Rehder & Wilson in Sargent, Pl. Wilson. II. 327 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa Webbiana Vilmorin & Bois, Frut. Vilmorin 93 (1904).—Non Wallich.

Rosa macrophylla f. *gracilis* Focke in Not. Bot. Gard. Edinb. VII. 69 (1911), nos. 2336, 4442 exclusis.

Rosa iochanensis Léveillé in Fedde, Rep. Nov. Spec. XIII. 339 (1914); Cat. Pl. Yun-Nan, 234 (1917).

Mont. Io-chan, alt. 3300 m., *E. E. Maire*, Herb. Edinb. no. 707/1914 and without no. (type of *R. iochanensis* Léveillé) June [1910–14] (buisson-nant-haut 1 m.; fls. rouges) (E.); open hillside Litang river divide due N. of Yung-ning, alt. 3050 m., *F. Kingdon Ward*, no. 4142, June 3, 1921 (fls. pink, scented) (E.); open stony ground in Tali valley, lat. 25° 40′ N., alt. 2040 m., *G. Forrest*, nos. 4445, 4447, and 4453, May–June 1906 (shrub 2–2.5 m.; fls. pale rose, fragrant; co-types of *R. macrophylla* f. *gracilis* Focke) (E.); dry open situations in pine forests, eastern flank of the Lichiang range, lat. 27° 20′ N., alt. 3300–3650 m., *G. Forrest*, no. 5734, June 1910

(shrub 1–2 m.; fls. deep rose-crimson) (E.); same locality, alt. 2740–3050 m., *G. Forrest*, no. 5805, June 1910 (shrub 1–3 m.; fls. deep rose) (E.); shady pine and mixed forests, Tali range, lat. 25° 40′ N., alt. 2740 m., *G.* Forrest, no. 7064, Aug. 1910 (shrub 2 m.; fls. pale rose) (E.); in thickets and on margins of forests, Lichiang range, lat. 27° 30′ N., alt. 3300 m., *G. Forrest*, no. 17052, Oct. 1918 (shrub 1–1.5 m.; fr. scarlet) (E.); on cliffs in ravine on the divide between La-shi-pa and the Yangtze valley, lat. 26° 54′ N., long. 100° 6′ E., alt. 2740–3050 m., *G. Forrest*, no. 19435, May 1921 (weakly spinous shrub 2 m.; branches arched; fls. deep rose, white at base); amongst scrub on open bouldery slopes and in open thickets on the hills S. W. of Lichiang, lat. 26° 45′ N., long. 100° 12′ E., alt. 2740–3050 m., *G. Forrest*, no. 21205, June 1922 (shrub 1–2 m.; branches arched; fls. deep rose, base white or paler rose, faintly fragrant); open thickets in side valleys on the Chien-chuan-Mekong divide, lat. 26° 36′ N., long. 99° 40′ E., alt. 3050–3300 m., *G. Forrest*, no. 21999, Aug. 1922 (shrub 1–3 m.; branches slightly arched); open thickets in side valleys on the eastern flank of the Lichiang range, lat. 27° 15′ N., long. 100° 11′ E., alt. 3050–3300 m., *G. Forrest*, no. 22527, Oct. 1922 (shrub 2–2.5 m.; fls. rose; fr. scarlet-crimson).

Rosa multibracteata Hemsley & Wilson in Kew Bull. Misc. Inform. 156 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. II. 328 (1915).

Rosa reducta Baker in Willmott, Gen. Rosa II. 489, fig. 158 (1914).

Shrub belt, Mekong-Salwin divide, alt. 2740 m., *F. Kingdon Ward*, no. 398 in 1912 (E.); open situation amongst rocks, mountains in the N. E. of the Yangtze bend, lat. 27° 45′ N., alt. 3050 m., *G. Forrest*, no. 11207, Sept. 1913 (shrub 1–1.5 m.; fls. rose); open thickets and cane brakes, Mekong-Salwin divide, lat. 28° 12′ N., alt. 3300 m., *G. Forrest*, no. 15020, Oct. 1917 (shrub 1–2 m.; fr. orange red) (E.); exact locality lacking, *G. Forrest*, no. 17243, Oct. 1918 (fr. orange-red); in open pine forests, Mekong Salwin divide, lat. 27° 56′ N., long. 98° 45′ E., alt. 3050 m., *G. Forrest*, no. 20791, Sept. 1921 (shrub 0.5–1 m.; fr. orange red) (E.); open situations on the margins of pine forests on the Yang-dza Shan, Mekong-Salwin divide, lat. 28° 18′ N., long. 98° 43′ E., alt. 2135–2440 m., *G. Forrest*, no. 20152, Sept. 1921 (shrub 1–1.5 m.; fr. scarlet); open dry situations amongst scrub, Mekong valley, lat. 28° N., alt. 2135–2440 m., *G. Forrest*, nos. 16383 and 16383A, April 1918 (shrub 1–2 m.; fls. pale rose); under shelter of limestone rocks, on the open hillside, south flank, Yung-ning, alt. 3050 m., *F. Kingdon Ward*, no. 4119, June 1, 1921 (fls. bright pink) (E.); in open but well sheltered situations amongst the broken limestone cliffs, Mu li, alt. 2740 m., *F. Kingdon Ward*, no. 4926, June 9, 1921.

The specimen no. 16383 collected by G. Forrest, has been doubtfully referred to this species because the styles, although partly exserted, are not exserted to the extent that they equal the stamens in length.

Rosa orbicularis Baker in Willmott, Gen. Rosa, II. 493 (1914).—Rehder & Wilson in Sargent, Pl. Wilson. II. 342 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Without precise locality, *Th. Monbeig* (ex Baker).

We have seen no specimens from Yunnan referable to this species which seems to be very close to *R. multibracteata*.

Sect. SERICEAE Crépin in Jour. des Roses XV. (Nouv. Class. Ros. 25) (1891).

Rosa sericea Lindley, Monogr. Ros. 105 (1820).—Hooker in Bot. Mag. LXXXVI, t. 5200 (1860).

Rosa Wallichii Trattinnick, Ros. Monogr. II. 293 (1824).

Rosa tetrapetala Royle, Ill. Bot. Himal. I. 208, t. 42 (1839).

Among scrub in side valleys on the eastern flank of the Tali valley, lat. 25° 40′ N., alt. 2400–2700 m., *G. Forrest*, no. 4448, June–July 1906 (shrub 1–2 m.; fls. white) (E.); stony open situations amongst scrub on eastern flank of the Tali range, lat. 25° 40′ N., alt. 2700–3000 m., *G. Forrest*, no. 4451, May–June 1906 (shrub 1–2 m.; fls. white, strongly fragrant) (E.); open situations in and on margins of pine forests, Tali range, lat. 25° 40′ N., alt. 3000–3300 m., *G.Forrest*, no. 6978, July 1910 (shrub 2–2.5 m.; fls. creamy white, fragrant) (E.); open situations among rocks, Tali range, lat. 25° 40′ N., alt. 2700 m., *G. Forrest*, no. 7245, May 1910 (erect shrub 1 m. high; fls. creamy white, fragrant) (E.); sheltered situations on the margins of thickets and pine forests, western flank of Shweli-Salwin divide, lat. 25° 20′ N., alt. 3000 m., *G. Forrest*, no. 8971, Aug. 1912 (unarmed shrub 1–1.5 m.; fls. creamy white; fr. scarlet) (E.); in rocky side valleys, Shweli-Salwin divide, lat. 25° 30′ N., alt. 2700–3000 m., *G. Forrest*, no. 17595, July 1918 (shrub 1–2 m.; fls. white); from Tsang-shan to Tali, alt. 2650–2700 m., *J. F. Rock*, no. 3153 and 3155, April 22, 1922 (fls. cream color).

Rosa omeiensis Rolfe in Bot. Mag. CXXXVIII. t. 8471 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 438 (1914).—Rehder & Wilson in Sargent, Pl. Wils. II. 331 (1915).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa sericea Crépin in Bull. Soc. Bot. Belg. XIV. 151 (1875), quoad specimina Przewalskii; XXV. Compt. Rend. 9 (1886); in Bull. Soc. Bot. Ital. 1897, p. 234.—Diels in Not. Bot. Gard. Edinb. VII. 238 (1912).—Non Lindley.

Rosa sericea f. *glabrescens* Franchet, Pl. Delavay 220 (1890).—Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa sericea f. *intermedia* Franchet, l. c. (1890).—Léveillé l. c. (1917).

Rosa sericea f. *denudata* Franchet, l. c. (1890).—Léveillé l. c. (1917).

Rosa sericea f. *inermis eglandulosa* Focke in Not. Bot. Gard. Edinb. v. 69 (1911).

Rosa sericea f. *aculeata eglandulosa* Focke l. c. 70 (1911).

Rosa Sorbus Léveillé in Fedde, Rep. Spec. Nov. XIII. 338 (1914).

Rosa sericea f. *aculeata* Focke apud Léveillé, Cat. Pl. Yun-Nan, 235 (1917).

Rosa sericea f. *eglandulosa* Focke apud Léveillé, l. c.

Rosa sericea f. *inermis* Focke apud Léveillé, l. c.

Brousse à mi-mont du Io-chan, alt. 3300 m., *E. E. Maire*, Herb. Edinb. no. 716/1914, June, [1910–13] (buissonnant haut 2 m.; fl. blanches; type of *R. Sorbus* Léveillé) (E.); shrub belt, alt. 33–3900 m., *F. Kingdon Ward*, no. 746, July 10, 1913 (E.); mountain meadows and edges of pine forests on eastern flank of the Lichiang range, lat. 27° 12′ N., alt. 2850–3300 m., *G. Forrest*, no. 2256, June 1906 (spreading shrub 1–3 m.; fls. yellowish white, fragrant; type of *R. sericea* f. *aculeata eglandulosa*) (E.); same locality,

lat. 27° 15′ N., alt. 3300 m., *G. Forrest*, no. 5605, May 1910 (E.); open rocky pasture on western flank of the Shweli-Salwin divide, lat. 25° 20′ N., alt. 2700–3000 m., *G. Forrest*, no. 9041, Aug. 1912 (shrub 1 m. high) (E.); shady pine forests, Lichiang range, lat. 27° 40′ N., alt. 3000–3300 m., *G. Forrest*, no. 10234, June 1913 (shrub 1–2 m.; fls. creamy white) (E.); same locality, lat. 27° 15′ N., alt. 2700–3000 m., *G. Forrest*, no. 10464, July 1913 (E.); same locality, lat. 27° 30′ N., alt. 3300–3600 m., *G. Forrest*, no. 10956, Aug. 1913 (shrub 1–2 m.; fruit scarlet to yellow) (E.); open situations among boulders, Mekong-Salwin divide, lat. 28° 12′ N., alt. 3600 m., *G. Forrest*, no. 14982, Oct. 1917 (shrub 1–2 m.; fr. orange red) (E.); open situations on margins of forests on eastern flank of Lichiang range, lat. 27° 30′ N., long. 100° 11′ E., alt. 3300–3600 m., *G. Forrest*, no. 22526, Oct. 1922 (shrub 1–1.5 m.; fr. bright orange); same locality, lat. 27° 20′ N., long. 100° 10′ E., alt. 3300 m., *G. Forrest*, no. 23119, Aug. 1922 (fr. deep crimson) (E.); inter Yungpeh et Taowang, alt. 2400 m., *C. Schneider*, no. 1720, July 2, 1914 (fl. albi); prope Lichiang, alt. 3400 m., *C. Schneider*, no. 1969, July 20, 1914; same locality, alt. 3400 m., *C. Schneider*, no. 3431, Aug. 2, 1914.

Rosa omeiensis f. pteracantha Rehder & Wilson in Sargent, Pl. Wilson. II. 332 (1915).

Rosa sericea Crépin in Bull. Soc. Bot. Belg. XXV. Compt. Rend. 9, quoad specimen no. 861.—Vilmorin in Jour. Hort. Soc. London, XXVII. 490, fig. 140 (1902–03).—Non Lindley.

Rosa sericea f. *pteracantha* Franchet, Pl. Delavay 220 (1890).—Focke in Not. Bot. Gard. Edinb. v. 70 (1911).

Rosa sericea fructu rubro aculeis decurrentibus Bois & Vilmorin, Frut. Vilmorin 99, fig. (1904).

Rosa sericea var. *pteracantha* Anon. in Gard. Chron. ser. 3, XXXVIII. 260, figs. 98, 99 (1905).—Bean in Garden LXIX. 294, t. (1906); Trees & Shrubs Brit. Isl. II. 442 (1914).—Hutchinson in Bot. Mag. CXXXIV. t. 8218 (1908).

On ascent of Miu Chang pass from Yangtze valley to Chungtien plateau, lat. 27° 30′ N., alt. 3300 m., *G. Forrest*, no. 219, Sept. 1904 (shrub 2–3 m.; fls. white) (E.); amongst scrub in open situations in Lung-Kwei, Hocking and Lichiang valleys, lat. 26° 40′ N., alt. 2400–2700 m., *G. Forrest*, no. 2022, April 1906 (dwarf shrub 1 m.; fls. creamy white, fragrant) (E.); open thickets and on margins of pine forests at Bei Ma Shan, Mekong-Yangtse divide, lat. 28° 20′ N., alt. 3900 m., *G. Forrest*, no. 13207, Aug. 1914 (shrub 2–3 m.; fr. crimson) (E.); open situations on the margins of pine forests, Mekong-Salwin divide, lat. 28° 12′ N., alt. 3300 m., *G. Forrest*, no. 14984, Oct. 1917 (shrub 2 m.; fr. orange red) (E.); in open parts of forest, alt. 3300 m., *F. Kingdon Ward*, no. 458 (bush 2–3 m.) (E.); prope Lichiang, alt. 3200 m., *C. Schneider*, no. 3422, July 27, 1914.

Rosa Mairei Léveillé in Fedde, Rep. Spec. Nov. XI. 299 (1912); Cat. Pl. Yun-Nan, 235 (1917).—Willmott, Gen. Rosa II. 521 (1914).

Rosa sericea Hemsley in Jour. Linn. Soc. XXIII. 254 (1887), quoad specimen Andersonii.—Non Lindley.

Collines arides autour de Tong-tchouan, alt. 2600 m., *E. E. Maire*

(type), April 1911 (fortes épines triangulaires) (E.); same locality, alt. 2550–2700 m., *E. E. Maire*, Herb. Edinb. 649/1914, April–May (petit rosier, haut. 1 m.) (E.), alt. 2900–3000 m., *E. E. Maire*, Arnold Arb. 379, [1910–14] (fruits rouges), alt. 2560 m., *E. E. Maire*, Herb. Edinb. 1066/1913, June [1910–14] (fruits rouges à maturité; fl. blanches) (E.), and alt. 2560 m., *E. E. Maire*, Herb. Edinb. 790/1914, May [1910–14] (haut 60 cm. fl. blanches) (E.); coteaux arides de Tong-tchouan, alt. 2550 m., *E. E. Maire*, June 1911 (fl. blanches; fruits rouges) (E.); collines arides, tertres à Tong-tchouan, alt. 2550 m., *E. E. Maire*, Arnold Arb. no. 293, April [1910–14] (buissonnant; fl. blanches); moist open situations, Teng yueh valley, lat. 25° N., alt. 1650 m., *G. Forrest*, no. 5500, Mar. 1910 (shrub 1–2 m., fls. creamy white, fragrant) (E.); dry open situations, hills around Teng yueh, lat. 25° N., alt. 1700–1800 m., *G. Forrest*, no. 7517, May 1912 (shrub 1–2 m., fls. ivory white, fragrant; fr. bright scarlet) (E.); same locality, alt. 1500–2100 m., *G. Forrest*, no. 9745, Mar. 1913 (branches arched) (E.); dry, stony situations, Lang-kong-Hoching divide, lat. 26° 16′ N., alt. 2400 m., *G. Forrest*, no. 9960, May 1913 (shrub 1–2 m., fls. creamy white, fragrant) (E.).

Within this material the same variations are found which occur in *R. omeiensis* Rolfe; G. Forrest's nos. 5500, 7517, and 9960 are distinctly pteracanth; in no. 9960 the leaves are distinctly glandular below, while in no. 5500 the glands are entirely lacking. In number of pinnae, hairiness of receptacle and length of fruit-stalk great differences are to be found. Probably this species is nothing but a group of extremely hairy southern forms of *Rosa omeiensis* Rolfe.

Rosa Mairei f. **plurijuga** C. Schneider in Bot. Gaz. LXIV. 74 (1917).

Mont. Tsan, prope Tali fu, alt. 2800 m., *C. Schneider*, no. 2526, (type), Aug. 1914; open stony pastures, western flank of the Tali range, lat. 25° 40′ N., alt. 3000–3300 m., *G. Forrest*, no. 11569, July 1913 (shrub 1–2 m.) (E.); in open thickets on rocky slopes in side valleys on the Sung-kwei range, lat. 26° 18′ N., long. 100° 128′ E., alt. 3300–3600 m., *G. Forrest*, no. 21575, July 1922 (shrub 1–2 m.; fls. creamy white, fragrant).

For this whole group of closely related species and varieties, northwestern Yunnan seems to be the centre of dispersion; in the Tali and Lichiang areas every form is to be found. From this centre *R. sericea* Lindley has spread out west into Bhootan, Nepal, Kashmir and Punyab; *R. Mairei* Léveillé south through Yunnan and east to near the Kweichow borderline; the non-bristly forms of *R. omeiensis* Rolfe reach into Kansu, Shensi and Hupeh, the pteracanth form does not go further than central Szechuan, while the forms with glandular leaves are restricted to northwestern Yunnan and southeastern Thibet.

LISTS OF COLLECTORS NUMBERS

Delavay, Jean Marie
819. R. Banksiae var. normalis
1138. R. Roxburghii

Forrest, George
155. R. Banksiae
214. R. Banksiae var. normalis
219. R. omeiensis f. pteracantha
226. R. chinensis
229. R. Banksiae
284. R. multiflora var. carnea
2022. R. omeiensis f. pteracantha
2048. R. Banksiae f. lutea
2049. R. odorata var. gigantea f. erubescens
2051. R. Banksiae
2052. R. multiflora var. carnea f. platyphylla
2053. R. multiflora var. cathayensis
2256. R. omeiensis
2336. R. Davidii var. elongata
2370. R. glomerata
2402. R. Moyesii f. rosea
2504. R. Davidii var. elongata
4442. R. Moyesii
4443. R. longicuspis & R. Banksiae f. normalis
4444. R. multiflora var. cathayensis
4445. R. sertata
4446. R. odorata var. gigantea
4447. R. sertata
4448. R. sericea
4449. R. multiflora var. carnea
4450. R. Roxburghii f. normalis
4451. R. sericea
4452. R. odorata var. gigantea f. erubescens
4453. R. sertata
4454a. R. chinensis
5499. R. odorata var. gigantea
5500. R. Mairei
5558. R. Davidii var. elongata
5591. R. multiflora var. carnea
5592. R. Banksiae var. normalis
5606. R. omeiensis
5675. R. Moyesii
5734. R. sertata
5805. R. sertata
5948. R. glomerata
6306. R. Davidii var. elongata
6978. R. sericea
7036. R. Moyesii
7064. R. sertata
7245. R. sericea
7263. R. chinensis
7458. R. odorata var. gigantea
7492. R. Helenae
7517. R. Mairei
7567. R. longicuspis
7782. R. multiflora var. carnea
7903. R. multiflora var. carnea f. platyphylla
8080. R. chinensis
8799. R. odorata var. gigantea
8845. R. longicuspis
8971. R. sericea
9041. R. omeiensis
9617. R. odorata var. gigantea
9629. R. odorata var. gigantea
9745. R. Mairei
9787. R. odorata var. gigantea
9803. R. odorata var. gigantea
9848. R. odorata var. gigantea f. erubescens
9905. R. multiflora var. cathayensis
9906. R. Roxburghii f. normalis
9960. R. Mairei
9977. R. multiflora var. carnea
10020. R. longicuspis
10022. R. Banksiae
10024. R. Helenae
10030. R. longicuspis
10108. R. longicuspis
10220. R. Helenae
10234. R. omeiensis
10464. R. omeiensis
10565. R. Brunonii
10828. R. odorata
10843. R. longicuspis
10956. R. omeiensis
10993. R. longicuspis
11207. R. multibracteata
11326. R. Davidii var. elongata
11569. R. Mairei f. plurijuga
11675. R. longicuspis
11846. R. multiflora var. carnea f. platyphylla
11856. R. odorata
11955. R. odorata
12061. R. Roxburghii
12082. R. odorata var. gigantea
12270. R. odorata
12310. R. odorata var. gigantea
12328. R. odorata var. gigantea
12342. R. odorata var. gigantea
12354. R. odorata
12363. R. odorata var. gigantea
12371. R. chinensis
12373. R. odorata
12419. R. Banksiae f. lutea
12432. R. odorata var. pseudindica
12705. R. Helenae
12867. R. longicuspis
12996. R. praelucens
13207. R. omeiensis f. pteracantha
13519. R. odorata var. gigantea
13837. R. longicuspis
13961. R. Davidii var. elongata
14958. R. Davidii var. elongata

FORREST, GEORGE (*continued*)
14982. R. omeiensis
14984. R. omeiensis f. pteracantha
15020. R. multibracteata
15021. R. glomerata
15309. R. Davidii var. elongata
15859. R. longicuspis
16175. R. odorata var. gigantea
16242. R. odorata var. gigantea
16381. R. Brunonii
16383. R. multibracteata
16383a. R. multibracteata
16391. R. chinensis
16424. R. multiflora var. carnea f. platyphylla
16546. R. odorata var. gigantea
16548. R. praelucens
16936. R. praelucens
16962. R. Davidii var. elongata
16965. R. longicuspis
17052. R. sertata
17184. R. chinensis
17243. R. multibracteata
17482. R. Roxburghii
17548. R. chinensis
17595. R. sericea
17879. R. odorata
17919. R. multiflora var. cathayensis
18135. R. longicuspis
18200. R. Davidii var. elongata
19396. R. multiflora var. carnea
19399. R. multiflora var. carnea
19405. R. multiflora var. carnea
19423. R. Brunonii
19435. R. sertata
19593. R. Davidii var. elongata
20152. R. multibracteata
20791. R. multibracteata
20922. R. Davidii var. elongata
20998. R. glomerata
21106. R. Brunonii
21131. R. odorata var. pseudindica
21149. R. odorata var. pseudindica
21164. R. odorata
21196. R. Helenae
21205. R. sertata
21469. R. glomerata
21519. R. Helenae
21575. R. Mairei var. plurijuga
21631. R. chinensis
21676. R. chinensis
21999. R. sertata
22080. R. Banksiae
22212. R. Banksiae
22337. R. glomerata
22352. R. Davidii var. elongata
22526. R. omeiensis
22527. R. sertata
22981. R. glomerata
22988. R. glomerata
23119. R. omeiensis
24036. R. Roxburghii
24045. R. Banksiae f. lutea
24054. R. odorata
24059. R. chinensis var. semperflorens
24240. R. Roxburghii
24247. R. multiflora var. carnea f. platyphylla
25434. R. rugosa var. chamissoniana f. plena
25439. R. odorata var. pseudindica
25476. R. Banksiae f. lutea
26020. R. odorata var. pseudindica
27740. R. longicuspis

Henry, Augustine
9098. R. odorata var. gigantea
9098a. R. odorata var. gigantea
9236a. R. longicuspis
11272. R. chinensis

Maire, E. E. (Arnold Arboretum numbers)[1]
237. R. odorata var. gigantea
293. R. Mairei
338. R. multiflora var. carnea
339. R. multiflora var. carnea
340. R. multiflora var. carnea
341. R. Helenae
378. R. Banksiae f. lutea
379. R. Mairei
380. R. Brunonii
487. R. Helenae
488. R. Helenae
489. R. longicuspis

Maire, E. E. (Edinburgh Herbarium numbers)
276. R. longicuspis
284. R. longicuspis
353. R. Banksiae
368. R. multiflora var. carnea
369. R. longicuspis
370. R. longicuspis
371. R. rugosa var. chamissoniana f. plena
372. R. Banksiae
374. R. Banksiae
377. R. longicuspis
378. R. longicuspis
379. R. multiflora var. cathayensis
380. R. longicuspis
381. R. multiflora var. carnea
382. R. multiflora var. carnea
812. R. longicuspis

[1] The Maire specimens lack field numbers. The numbers cited in this paper are those given to the sets at the herbarium in Edinburgh and in the herbarium of the Arnold Arboretum; the last named institution has distributed duplicates under its set of numbers.

Maire, E. E. (*continued*)
862. R. multiflora var. carnea f. platyphylla
864. R. odorata var. gigantea
865. R. odorata
866. R. multiflora var. carnea
867. R. multiflora var. carnea
868. R. odorata var. gigantea
869. R. odorata
870. R. odorata var. gigantea
871. R. odorata
872. R. odorata
873. R. Banksiae
874. R. odorata var. gigantea
876. R. multiflora var. carnea f. platyphylla
877. R. longicuspis
878. R. longicuspis
879. R. longicuspis
881. R. Banksiae
882. R. longicuspis
1404. R. longicuspis
1692. R. longicuspis
1694. R. Banksiae
1704. R. multiflora var. carnea
143/1913. R. multiflora var. carnea
176/1913. R. rugosa var. chamissoniana f. plena
429/1913. R. rugosa var. chamissoniana f. plena
471/1913. R. multiflora var. carnea
474/1913. R. longicuspis
492/1913. R. multiflora var. cathayensis
1006/1913. R. Banksiae
1009/1913. R. odorata
1015/1913. R. odorata
1064/1913. R. longicuspis
1066/1913. R. Mairei
649/1914. R. Mairei
707/1914. R. sertata
708/1914. R. Davidii var. elongata
716/1914. R. omeiensis
790/1914. R. Mairei
794/1914. R. odorata
797/1914. R. Banksiae
814/1914. R. odorata
843/1914. R. multiflora var. cathayensis
851/1914. R. longicuspis

Rock, Joseph Francis
2929. R. odorata var. gigantea
3073. R. longicuspis
3153. R. sericea
3155. R. sericea

Schneider, Camillo
88. R. longicuspis
107. R. longicuspis
111. R. longicuspis
169. R. Banksiae
185. R. Banksiae
213. R. Banksiae
225. R. longicuspis
1720. R. omeiensis
1883. R. Moyesii
1904. R. Moyesii
1969. R. omeiensis
2473. R. Helenae
2526. R. Mairei var. plurijuga
2875. R. longicuspis
3209. R. odorata var. gigantea
3263. R. Helenae
3422. R. omeiensis f. pteracantha
3431. R. omeiensis

Schoch, O.
29. R. Banksiae var. normalis
30. R. odorata
31. R. multiflora var. cathayensis

Ten, Simeon
1. R. chinensis
48. R. odorata var. gigantea
74. R. longicuspis

Ward, F. Kingdon
250. R. longicuspis
317. R. odorata var. pseudindica
398. R. multibracteata
458. R. omeiensis var. pteracantha
700. R. Sweginzowii
746. R. omeiensis
776. R. Sweginzowii
782. R. longicuspis
903. R. Sweginzowii
3818. R. longicuspis
3849. R. longicuspis
3898. R. longicuspis (in parte)
4119. R. multibracteata
4142. R. sertata
4895. R. longicuspis
4926. R. multibracteata

NOTES ON THE LIGNEOUS PLANTS DESCRIBED BY H. LÉVEILLÉ FROM EASTERN ASIA

ALFRED REHDER

TIME and again I have had to take into consideration in the study and identification of Chinese plants species described by Léveillé which puzzled me, and which, owing to their insufficient descriptions, I was unable to place satisfactorily. This factor of uncertainty was increased, since I knew that frequently Léveillé's new species did not belong to the genera under which they were placed and sometimes even to systematically very distant families. Therefore I decided, when I had last year the opportunity to go to Europe, to spend some time at the Botanic Garden in Edinburgh where the herbarium of Léveillé is now preserved. I am greatly indebted to Professor Wm. Wright Smith, Regius Keeper of the Royal Botanic Garden, for the facilities placed at my disposal which enabled me to accomplish with the willing and kind coöperation of the staff a good deal in a comparatively short time. I took photographs of a large number of type specimens of which in most cases I received fragments; of those species of which the material was ample duplicates were kindly given to me. This material together with my notes has enabled me to study the species more in detail on my return, to identify a large proportion of them with previously described species and to place the others more definitely. I have restricted my investigations to ligneous plants and even of these I have not been able to give a complete list, a few genera like Rubus I passed by intentionally, of some genera the material was away on loan, some species described by Léveillé were apparently missing and others I may have overlooked in going through the whole very large collection in a limited time.

In the following enumeration I have included identifications made previously by botanists who had studied certain genera or species of the collection. Those of Léveillé's ligneous new species omitted in this enumeration I may treat later in a supplement.

TAXACEAE

Podocarpus neriifolia D. Don in Lambert, Descr. Pinus, II. 21 (1824), pro parte.

Myrica Esquirolii Léveillé in Fedde, Rep. Spec. Nov. XII. 537 (1913); Fl. Kouy-Tchéou, 281 (1914).

CHINA. Kweichou: en bas du lac à Piao-ouai-ho, *J. Esquirol*, no. 3223, Jan. 30, 1912 (arbrisseau 3 m.; type of *Myrica Esquirolii*).

PINACEAE

Pinus Armandi Franchet in Nouv. Arch. Mus. Paris, ser. 2, II. 95, t. 12 (Pl. David. I. 285) (1884).—Shaw in Sargent, Pl. Wilson. II. 12 (1914).—Wilson in Jour. Arnold Arb. VII. 45 (1926).

Pinus lewis Lemée & Léveillé in Fedde, Rep. Spec. Nov. VIII. 60 (1910).—Léveillé, Fl. Kouy-Tchéou, 112 (1914); Cat. Pl. Yunnan, 57 (1916).

Pinus Komaroni Léveillé, Fl. Kouy-Tchéou, 112 (1914).

China. Kweichou: Pin-fa, route de Tin-fan, montiuscules rocheux, *J. Cavalerie*, nos. 2220, 2221, 7 mars 1905 (co-type of *P. levis*); Pin-fa, *J. Cavalerie*, no. 870, Feb. 7, 1903 (arbre lisse; type of *P. Komarovii* and co-type of *P. levis*). Yunnan: Kiang-ty, *E. Bodinier*, April 9, 1897 (grande arbre à écorce verte et lisse; feuillage vert, tendre).

Pinus levis was identified with *P. Armandi* by G. R. Shaw in 1914. In 1910 Léveillé enumerates under *P. levis* Cavalerie's nos. 870 and 2220, but in 1914 he refers no. 870 to his *P. Komarovi*, of which I cannot find a previous description, and leaves only no. 2220 under *P. levis*; in the key he attributes clusters of 5 leaves to *P. Komarovi* and 3–4 leaves to *P. levis*, a statement which is not correct as his specimens show, for the latter has clusters with 5 leaves and the other characters of the subgen. *Haploxylon*, of which *P. Armandi* is the only species in China.

Pinus Massoniana Lambert, Descr. Pinus i. 17, t. 12 (1803).—Léveillé, Fl. Kouy-Tchéou, 112 (1914).

Pinus Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. viii. 60 (1910).

China. Kweichou: Pin-fa, montagnes, *J. Cavalerie*, no. 1695, March 22, 1902 (ex Léveillé, l. c.).

Of this species I have not seen the type specimen, but Léveillé himself referred in 1914 his *P. Cavaleriei* to *P. Massoniana*, which occurs in Kweichou and there is nothing in his original description to disagree with this identification.

Pinus densiflora Siebold & Zuccarini, Fl. Jap. ii. 22, t. 112 (1842).

Pinus nana Faurie & Lemée in Fedde, Rep. Spec. Nov. viii. 60 (1910).

Korea: Fusan, in collibus, *U. Faurie*, nos. 200 (type of *P. nana*), 201 (co-type.) May 1906.

This species is described as a "planta humillima," but Faurie's specimens represent normal branches and show no evidence of dwarfing.

Pinus tabulaeformis Hort. apud Carrière, Traité Conif. ed. 2, 510 (1867).

Pinus sinensis Mayr, Fremdl. Wald. & Parkb. 349, fig. 113 (1906), pro parte.—Non Lambert.

Pinus Argyi Lemée & Léveillé in Fedde Rep. Spec. Nov. viii. 60 (1910).—Léveillé in Mem. R. Acad. Sci. Barcelona, ser. 3, xii. no. 22, p. 7 (Cat. Pl. Kiang-Sou) (1916).

China. Kiangsu: Che-sang; Zuo-Se, *d'Argy* (ex Lemée & Léveillé).

I have not seen the type of Lemée & Léveillé's species, but the description agrees with *P. tabulaeformis* Carr. and not with *P. Massoniana* Lamb. which is the only other Pine known from Kiangsu. The var. *longevaginans* Léveillé (in Fedde, Rep. Spec. Nov. viii. 60 [1910]) is probably only a form with longer leaves collected earlier in the season, when the sheaths were still in perfect condition.

Keteleeria Davidiana (Bertrand) Beissner, Handb. Nadelholzk. 424, fig. 117 (1891).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 39 (1914).

Keteleeria Esquirolii Léveillé in Fedde, Rep. Spec. Nov. VIII. 60 (1910); Fl. Kouy-Tchéou, 112 (1914).

Podocarpus Mairei Lemée & Léveillé in Monde des Pl. ser. 2, XVI. 20 (1914).—Wilson in Jour. Arnold Arb. VII. 42 (1926).

CHINA. Kweichou: Sang-ka près Ka-Yang, *J. Esquirol*, no. 542, June 1905 (type of *K. Esquirolii*). Yunnan: colline de Kin-tchong-chan, alt. 2600 m., *E. E. Maire*, March 1911 (gros arbre en parasole, peu elancé, regimes dressés en forme de candelabre; type of *Podocarpus Mairei*).

Keteleeria Esquirolii was already doubtfully referred to *K. Davidiana* by Rehder & Wilson (l. c. 40) and on examination I find that the characters given by Léveillé as distinctive do not hold; the scales are as puberulous as in *K. Davidiana* and the bracts are not entire, though not quite as conspicuously 3-lobed at the apex. *Podocarpus Mairei* was labeled *Abies Davidi* on Maire's original label, a determination apparently disregarded by Léveillé; specimens of apparently the same collection were distributed by the Arnold Arboretum under no. 216 of Plantae yunnanenses coll. by E. E. Maire.

Cupressus Duclouxiana Hickel in Camus, Les Cypres, 91, t. 3, figs. 419–424 (1914).

? *Cupressus Mairei* Léveillé, Cat. Pl. Yun-Nan, 56 (1916).

CHINA. Yunnan: plaine de Tong-tchouan, pagodes, 2500 m., *E. E. Maire*, Jan. 1912 (ex Léveillé).

I have not seen the type specimen of *C. Mairei*, but in the herbarium of the Arnold Arboretum there is a specimen collected by E. E. Maire which represents *C. Duclouxiana*, but unfortunately it is without locality and date.

Juniperus formosana Hayata in Jour. Coll. Sci. Tokyo XXV. art. 19, p. 209, t. 38 (Fl. Mont. Formos.) (1908).—Wilson in Jour. Arnold Arb. VII. 63 (1926).

Juniperus Mairei Lemée & Léveillé in Monde des Pl. 2 sér., XVI. 20 (1914).

CHINA. Yunnan: collines de Tcheou-kia-tse-tsang, est de Tong-tchouan, 2550 m., *E. E. Maire*, March, 1911 (type of *J. Mairei*).

Juniperus Mairei has been identified with *J. formosana* by Wilson (l. c.) and there can be no doubt that this identification is correct.

LILIACEAE

Smilax glabra Roxburgh, Fl. Ind. ed. 2, III. 792 (1832).

Smilax Blinii Léveillé, Fl. Kouy-Tchéou, 256 (1914).

CHINA. Kweichou: Ma-jo, *J. Cavalerie*, no. 2973, July 1908 (type of *S. Blinii*).

Smilax ferox Wallich, Cat. no. 5119 (1830), nomen—A. De Candolle, Monog. Phaner. I. 103 (1878).

Smilax loupouensis Léveillé in Bull. Acad. Internat. Geog. Bot. XXV. 38 (1915); Cat. Pl. Yun-Nan, 169 (1916).

CHINA. Yunnan: brousse des mont. à Lou-pou, 3000 m., *E. E.*

Maire, Sept. 1912 (arbuste grimpant, un peu épineux; type of *S. loupouensis*).

Smilax castaneiflora Léveillé in Bull. Acad. Intern. Geog. Bot. xxv. 39 (1915); Cat. Pl. Yun-Nan, 168 (1916).

China. Yunnan: brousse du mont., à Tong-tchouan, alt. 2700 m., *E. E. Maire*, June [1912] (arbuste grimpant; fl. chocolat; fruits noirs: type).

Smilax Darrisii Léveillé in Fedde, Rep. Spec. Nov. xii. 533 (1913); Fl. Kouy-Tchéou, 356 (1914).

China. Kweichou: steppes et bois de Gan-chouen, *J. Cavalerie*, Dec. 1909 (type), *J. Esquirol*, no. 3145, May 1911 (co-type).

Smilax luteocaulis Léveillé in Fedde, Rep. Spec. Nov. xiii. 339 (1914); Cat. Pl. Yun-Nan, 169 (1916).

China. Yunnan: brousse du mont. Io-chan, alt. 3200 m., *E. E. Maire*, June [1913] (arbuste grimpant, un peu epineux; fl. verdatres: type).

Smilax Mairei Léveillé in Bull. Acad. Intern. Geog. Bot. xxv. 39 (1915); Cat. Pl. Yun-Nan, 169 (1916).

China. Yunnan: rochers à mi-haut de La-kou, *E. E. Maire*, June [1912] (arbuste grimpant, épineux; fl. jaunes; type).

The preceding four species I have been unable to identify with any previously described species.

CHLORANTHACEAE

Chloranthus brachystachyus Blume, Fl. Jav. fasc. viii. 13, t. 2 (1828–51).

Chloranthus Esquirolii Léveillé, Fl. Kouy-Tchéou, 74 (1914).
Ardisia Mairei Léveillé, Cat. Pl. Yun-Nan, 177 (1916), nomen.

China. Kweichou: Pe-long, en face de Ma-tchao-tchay, 500 m., *J. Esquirol*, no. 3646, June–July 1912 (type of *C. Esquirolii*). Yunnan: lieux humides et ombragés à Long-ky, alt. 700 m., *E. E. Maire*, June [1911–13] (sous-ligneuse; fleurs verdâtres; type of *Ardisia Mairei*).

The teeth of the leaves of *C. Esquirolii* are small and often reduced to a mucro as described by Léveillé, but otherwise the specimen does not differ from typical *C. brachystachys*; specimens with similar small-toothed leaves occasionally occur, e. g. Henry's no. 12341c from Yunnan. *Ardisia Mairei* represents typical *C. brachystachys;* apparently no description of this plant was published.

SALICACEAE

Populus macranthela Léveillé & Vaniot in Bull. Soc. Bot. France, lii. 142 (1905); in Monde des Pl. xii. 9 (1910); in Fedde, Rep. Spec. Nov. viii. 446 (1910).—Gombocz in Math. Termesz. Közl. xxx. 157 (Monog. Populi) (1908).—Schneider in Sargent, Pl. Wilson, iii. 25 (1916), as synon. of *P. rotundifolia* var. *Duclouxiana* Gombocz.

Populus rotundifolia Griff. α. *P. macranthela* Gombocz in Bot. Közl. x. 25, (7), fig. 2 (1911), as "α *macranthela*" on p. (7).

Populus rotundifolia Griff. var. *macranthela* Léveillé & Vaniot apud Léveillé, Fl. Kouy-Tchéou, 380 (1915); Cat. Pl. Yun-Nan, 250 (1917).

China. Kweichou: Pin-Fa, *J. Cavalerie*, no. 974, April 1, 1903 (type). Yunnan: Ko-kouy, près Tchao-tong, Père *Marc Mey*, no. 667, in 1906.

Gombocz in 1911 refers *P. macranthela* to *P. rotundifolia* Griff. as a variety or subspecies and cites *P. Duclouxiana* Dode as a synonym, though in 1908 he had referred the latter species to *P. rotundifolia* as *P. rotundifolia* var. α *Duclouxiana;* he justifies the change of the varietal name by stating that Léveillé's name is older than Dode's. In 1928 Handel-Mazzetti in a manuscript note on the sheets of the two specimens cited above identifies them with *P. adenopoda* Maxim. They differ, however, from *P. adenopoda* in the repand-denticulate serration of the leaves, their glabrousness and in the absence of the glands at the base of the blade and in the somewhat slenderer pedicels of the fruit. As I have not been able to compare *P. macranthela* with material of *P. rotundifolia* Griff. and *P. Duclouxiana* Dode, I prefer to let Léveillé's name stand for the present.

Populus Bonatii Léveillé in Monde des Pl. XII. 9 (1910); in Fedde, Rep. Spec. Nov. VIII. 445 (1910).—Gombocz in Bot. Közl. x. 25 fig. (7) (1911).—Schneider in Pl. Wilson. III. 39 (1916).

Populus Bonatiana Léveillé, Cat. Pl. Yun-Nan, 250 (1917).

China. Yunnan: Pa-ta-ouan, pres Pin-tchouan, *Jean Py*, no. 665, March 3, 1907 (type).

This seems to be very near the preceding species and seems to differ chiefly in the much broader more remotely dentate leaves. It is apparently widely distributed in western China and takes there the place of *P. tremula* var. *Davidiana* Schneid. of northern China and of *P. rotundifolia* of the Himalayas.

Salix Wilsonii Seemen in Bot. Jahrb. XXXVI. beibl. 82, p. 28 (1905).—Schneider in Sargent, Pl. Wilson. III. 40 (1916).—Léveillé in Mem. R. Acad. Ci. Art. Barcelona, ser. 3, XII. no. 22, p. 21 (Cat. Pl. Kiang-Sou) (1916).

Salix Argyi Léveillé in Fedde, Rep. Spec. Nov. x. 437 (1912).

China. Kiangsu: without locality, d'*Argy* [1846–66] (type of *S. Argyi*).

The type specimen consists of branches with staminate and pistillate flowers and was identified in 1916 by C. Schneider as *S. Wilsonii*.

Salix dodecandra Léveillé in Bull. Soc. Bot. France, LII. 141 (1905); LVI. 298 (1909); Fl. Kouy-Tchéou, 181 (1915).—Schneider in Pl. Wilson. III. 101 (1916).

China. Kweichou: Pin-fa, *J. Cavalerie*, no. 1317, March 22, 1902 (type); same locality and same collector, no. 2760, March 1906.

Cavalerie's no. 1317 which is the type has the rachis and scales of the staminate catkins (pistillate not seen) covered with dense and short white pubescence and the midrib of the leaves pubescent on both sides, while in no. 2760 the rachis only is white-pubescent and the scales glabrous and the leaves quite glabrous and less finely serrate. In both specimens the staminate flowers have 6–7, rarely 5 or 8, stamens not 12 as stated by Léveillé.

Salix Cavaleriei Léveillé in Bull. Soc. Bot. France, LVI. 298 (1909), Fl. Kouy-Tchéou, 181 (1915); Cat. Pl. Yun-Nan, 251 (1917).—Schneider in Sargent, Pl. Wilson. III. 101 (1916).

Salix polyandra Léveillé in Bull. Soc. Agr. Sci. Sarthe, XXXIX. 325 (Bouquet Fl. Chine, 10) (1904); in Fedde, Rep. Spec. Nov. VI. 377 (March 1909); in Bull. Soc. Bot. France, LVI. 300 (June 1909).

Salix Pyi Léveillé in Bull. Soc. Bot. France, LVI. 300 (1909).

Salix yunnanensis Léveillé, l. c. 301 (1909).

CHINA. Yunnan: Yun-nan-sen, pagode de He-long-tan, *F. Ducloux* no. 658, April 17, 1906 (type) and no. 669, March 19, 1905; environs de Yun-nan-sen, bord des canaux dans la plaine, *E. Bodinier*, no. 65, Febr. 15, 1897 (arbre; type of *S. polyandra*); Yun-nan-sen, vallons de Tchong-chan, *F. Ducloux*, Febr. 21, 1906 (type of *S. Pyi*); Yun-nan-sen, plaines, *F. Ducloux*, no. 653, April 4, 1906 (type of *S. yunnanensis*).

I have accepted Schneider's reduction of *S. polyandra*, *S. Pyi* and *S. yunnanensis* to *S. Cavaleriei;* also Léveillé in 1917 following Schneider enumerated these species in Catalogue of the Yunnan plants as synonyms of *S. Cavaleriei*. This species, the preceding and the following are closely related; they may all belong to one species and seem most closely related to *S. paraplesia* Schneid.

Salix anisandra Léveillé & Vaniot in Fedde, Rep. Spec. Nov. III. 22 (1906).— Léveillé in Bull. Soc. Bot. France, LVI. 297 (1909); Fl. Kouy-Tchéou, 381 (1915).—Schneider in Pl. Wilson. III. 102 (1916).

CHINA. Kweichou: Pia-fong, *J. Esquirol*, no. 362, March, 1905 (type).

Salix angiolepis Léveillé in Fedde, Rep. Spec. Nov. III. 22, (1906); in Bull. Soc. Bot. France, LVI. 297 (1909); Fl. Kouy-Tchéou, 381 (1915).—Schneider in Sargent, Pl. Wilson. III. 104 (1916).

CHINA. Kweichou: Pin-fa, *J. Cavalerie*, no. 2069, 1903 (staminate; type).

Schneider (l. c.) give a complete description based on the type specimen and refers the species to the sect. *Urbanianae* of which no species has been as yet recorded from China. Schneider who saw only catkins not fully grown, says in his description "filamentis brevissimis," but in the more advanced catkins the filaments are about as long as the scales.

Salix amygdalina L. var. **nipponica** (Franch. & Sav.) Schneider in Sargent, Pl. Wilson. III. 106 (1916).

Salix Kinashii Léveillé in Bull. Soc. Bot. France, LII. 141 (1905).
Salix amygdalina Koidzumi in Tokyo Bot. Mag. XXVII. 94 (1913).

JAPAN. Hondo: Aomori, *Kinashi*, no. 11, May, 1902 (type of *S. Kinashii*, ex Léveillé).

Salix Kinashii was first identified with *S. amygdalina* by Koidzumi and belongs according to Schneider to the var. *nipponica* of that species.

Salix hamatidens Léveillé in Bull Soc. Bot. France, LVI. 301 (1909).—Schneider in Sargent, Pl. Wilson. III. 108 (1916).

JAPAN. Hokkaido: prov. Ishikari, Sappora, secus aquas, *U. Faurie*, no. 263, June 13, 1908 (pistillate flowers; type).

This species is placed by Schneider in the sect. *Fragiles* with the remark that it looks somewhat like a hybrid between *S. eriocarpa* Franch. & Sav. or a related form, and *S. amygdalina* var. *nipponica* Schneid.

Salix hondoensis Koidzumi in Tokyo Bot. Mag. XXVII. 88 (1913).—Schneider in Sargent, Pl. Wilson. III. 110 (1916).

Salix dolichostyla var. *hirosakensis* Léveillé & Vaniot in Fedde, Rep. Spec. Nov. III. 22 (1906).

JAPAN. Hondo: prov. Mutsu, Hirosaki, secus aquas, *U. Faurie*, no. 6602, May 1905 (pistillate; type of *S. dolichostyla* var. *hirosakensis*).

Koidzumi (l. c.) had referred Léveillé's variety together with *S. dolichostyla* Seemen to *S. eriocarpa* Franch. & Sav. On the sheet of Faurie's no. 6602 in this herbarium there is a note by Enander which reads: "*S. purpurea* × *viminalis*."

This and the following two species belong to the section *Albae*.

Salix Makinoana Seemen in Fedde, Rep. Spec. Nov. I. 173 (1905).—Schneider in Sargent, Pl. Wilson. III. 110 (1916).

Salix gymnolepis Léveillé in Fedde, Rep. Spec. Nov. III. 22 (1906).

JAPAN. Hondo: prov. Mutsu, Hirosaki, secus rivos, *U. Faurie*, no. 6615, May, 1905 (pistillate; type of *S. gymnolepis*).

Salix koreensis Andersson in De Candolle, Prodr. XVI. pt. II. 271 (1868).—Schneider in Sargent, Pl. Wilson. III. 111 (1916).

Salix pogonandra Léveillé in Fedde, Rep. Spec. Nov. X. 436 (1912).
Salix pseudo-Gilgiana Léveille, l. c.
Salix pseudo-jessoensis Léveille, l. c.
Salix pseudo-lasiogyne Léveillé, l. c.
Salix Feddei Léveillé, l. c.

KOREA. Quelpaert: Piento Tchimpat, 400 m., *U. Faurie*, no. 4706, April 14, 1908 (type of *S. pogonandra*); without locality, *U. Faurie*, no. 3240, April 1909 (type of *S. pseudo-Gilgiana*); Chemulpo, *U. Faurie*, no. 3243 (type of *S. pseudo-lasiogyne*), no. 3244, May 1909; in pago Polmongi, *U. Faurie*, no. 144, April 1908 (co-type of *S. pseudo-jessoensis*); in sepibus Setchimin, *U. Faurie*, no. 3242, May 1909 (type of *S. Feddei*).

Faurie's no. 1441 in this herbarium has been determined by Enander as *S. purpurea* × *viminalis*.

Salix babylonica Linnaeus Spec. Pl. 1017 (1753).

Ficus Salix Léveillé in Fedde, Rep. Spec. Nov. IV. 66 (1907); Fl. Kouy-Tchéou, 433 (1915).

CHINA. K w e i c h o u: without locality, *J. Esquirol*, no. 771 (Type of *Ficus Salix*).

The specimen consists of a branch of *Salix babylonica* with galls on the leaves.

Salix erioclada Léveillé in Fedde, Rep. Spec. Nov. III. 22, (1906); in Bull. Soc. Bot France, LVI. 299 (1909); Fl. Kouy-Tchéou, 381 (1915).—Schneider in Sargent, Pl. Wilson. III. 118 (1916).

CHINA. K w e i c h o u: montes de Pia-fong à Sa-jang, *J. Esquirol*, no. 367, March 4, 1905 (staminate flowers; type).

Schneider refers this and the two following species to his sect. *Denticulatae*.

Salix Camusii Léveillé in Bull. Soc. Agr. Sarthe, ser. 2, XXXIX. 326, (Bouquet Fl. Chine, 11) (1904); in Fedde, Rep. Spec. Nov. VI. 378 (1909); in Bull. Soc. Bot. France, LVI. 297 (1909); Fl. Kouy-Tchéou, 381 (1915); Cat. Pl. Yun-Nan, 251 (1917).—Schneider in Sargent, Pl. Wilson. III. 119 (1916).

CHINA. K w e i c h o u: environs de Kouy-yang, Gan-pin etc., mont du College, *E. Bodinier*, no. 2134, March 29, 1898 (petit arbuste à branches dressées; pistillate and staminate; type). Y u n n a n: Yunnan-sen, Cheng-chan, mont., *F. Ducloux*, no. 671, April 13 (staminate flowers) and April 24 (pistillate flowers) 1905; mont. de Tong-chouan, *E. E. Maire*, April 1910 (staminate flowers).

The specimens from Yunnan though they are similar in appearance, differ more or less from the type; the specimen from Tong-chouan has less pubescent scales and the specimens from Cheng-chan has pubescent branchlets and a pubescent ovary.

Salix luctuosa Léveillé in Fedde, Rep. Spec. Nov. XIII. 342 (1914); Cat. Pl. Yun-Nan, 251 (1917).—Schneider in Sargent, Pl. Wilson. III. 119 (1916).

CHINA. Y u n n a n: brousses des montagnes à Kiao-me-ti, alt. 3200 m., *E. E. Maire*, May 1913 (staminate and pistillate flowers; type); brousse de Ta-hai-tse, alt. 3200 m., *E. E. Maire*, May [1911–1913] (pistillate flowers); montagne de Len-tchai-tse, alt. 700 m., June [1911–13], *E. E. Maire* (petit arbre; staminate flowers).

Salix vulpina Andersson in Mem. Am. Acad. VI. 452 (Gray, Bot. Jap.) (1859).—Koidzumi in Tokyo Bot. Mag. XXVII. 89 (1913).—Schneider in Sargent, Pl. Wilson. III. 130 (1916).

Salix Shirai var. *vulcaniana* Léveillé & Vaniot in Bull. Acad. Int. Geog. Bot. XIV. 209 (1904).

Salix ignicoma Léveillé & Vaniot, in op. cit. XVI. 141 (1906).

JAPAN. H o k k a i d o: volcan, de Tarumai, *U. Faurie*, nos. 10026,

10027, June 17, 1893 (type of *S. Shirai* var. *vulcaniana*, ex Léveillé). Hondo: prov. Mutsu, forêts d'Aomori, *U. Faurie*, no. 5763, May 1904 (type of *S. ignicoma*, ex Léveillé).

Salix Shirai var. *vulcaniana* was first identified with *S. vulpina* by Koidzumi.

Salix japonica Thunberg, Fl. Jap. 24 (1784).—Koidzumi in Tokyo Bot. Mag. XXVII. 90 (1912).—Schneider in Sargent, Pl. Wilson, III. 132 (1916).

Salix japonica var. *nipponensis* Léveillé in Bull. Acad. Int. Geog. Bot. XIV. 209 (1904).

Japan. Hondo, without locality and without collector (type of *S. japonica* var. *nipponensis*, ex Léveillé).

Léveillé's variety was first identified with typical *S. japonica* by Koidzumi.

Salix Caprea Linnaeus, Sp. Pl. 1020 (1753), excl. var. γ, δ.—Schneider in Sargent, Pl. Wilson. III. 149 (1916).

Salix hallaisanensis Léveillé in Fedde, Rep. Spec. Nov. X. 435 (1912).

Salix hallaisanensis var. *nervosa* Léveillé, l. c.

KOREA. Quelpaert: in silvis Hallaisan, circa 1200 m., *E. Taquet*, nos. 3251, 3256, 357 (1442, 1443, 3252–55, 3258–60, ex Léveillé), June 1909 (types of *S. hallaisanensis*); same locality, alt. 1500 m., *E. Taquet*, no. 1444, Aug. 12, 1908 (type of *S. hallaisanensis* var. *nervosa*).

Léveillé's specimens were referred by Schneider to *S. Caprea*, to which they are undoubtedly closely related. The variety agrees with the type and differs only in the less pubescent leaves lustrous above, but this may be due to their more mature state, having been collected in August while the type was collected in June.

Salix Wallichiana Andersson in Svensk. Vetensk. Akad. Handb. 1850, 477 (1851).—Schneider in Sargent, Pl. Wilson. III. 64 (1916).

Salix funebris Léveillé in Fedde, Rep. Spec. Nov. XII. 287 (1913).

Salix Mairei Léveillé, op. cit. XIII. 342 (1914).

CHINA. Yunnan: bord des lagunes de Ta-hai-tse, 3200 m., *E. E. Maire*, May 1912 ("Saule noir;" staminate; type of *S. funebris*); vallée de Kiao-me-ti, bord de torrent, 3000 m., *E. E. Maire*, April 1913 ("petit arbre;" pistillate; type of *S. Mairei*).

Salix Mairei was referred by Schneider (l. c.) to *S. Wallichiana* and I have little doubt that also *S. funebris* belongs to this species.

Salix pachyclada Léveillé in Fedde, Rep. Spec. Nov. III. 22, (1906); in Bull. Soc. Bot. France, LVI. 300 (1909); Fl. Kouy-Tchéou, 381 (1915).—Schneider in Sargent, Pl. Wilson. III. 150 (1916).

CHINA. Kweichou: montée de Sa-yang a Pia-fong, *J. Esquirol*, no. 368, March 4, 1905 (staminate; type).

According to Schneider (l. c.) this is very close to the preceding species and may be only a form of it.

Salix sachalinensis Fr. Schmidt in Mem. Acad. Sci. St. Pétersb. no. 7, XII. 73 (Reise Amurl. Sachal.) (1868).—Schneider in Sargent, Pl. Wilson. III. 158 (1916).

Salix korsakoviensis Léveillé in Bull. Soc. Bot. France, LVI. 302 (1909).

SAGHALIN: Korsakof, secus aquas, *U. Faurie*, no. 274 (type) 275, 276 (co-type).

Salix Blinii Léveillé in Fedde, Rep. Spec. Nov. X. 435 (1912).—Schneider in Sargent, Pl. Wilson. III. 161 (1916).

Salix Taquetii Léveillé, l. c.

KOREA. Quelpaert: in silvis secus torrentes, Hallaisan, circa 1200 m., *E. Taquet*, nos. 3248, 3249 (types of *S. Blinii*); in rupibus torrentium, Hallaisan, alt. 1700 m., *E. Taquet*, no. 3245, June 1909 (type of *S. Taquetii*).

Salix Taquetii was first referred by Schneider (l. c.) to *S. Blinii* from which it seems to differ only in its smaller leaves.

Salix sapporoensis Léveillé in Bull. Soc. Bot. France, LVI. 302 (1909).—Schneider in Sargent, Pl. Wilson. III. 166 (1916).

JAPAN. Hokkaido: circa Sapporo, secus aquas, *U. Faurie*, nos. 262 (ex Léveillé) 266 and 268 (types).

According to Schneider this species is close to *S. Miyabeana* Seemen and may be a hybrid. By Enander Faurie's no. 266 has been determined as *S. purpurea* × *viminalis* according to his note on the sheet in this herbarium.

Salix Duclouxii Léveillé in Bull. Soc. Bot. France, LVI. 298 (1909).—Schneider in Sargent, Pl. Wilson. III. 170 (1916).

CHINA. Yunnan: Yun-nan-sen, vallons, *P. Ducloux*, no. 670, July 23, 1905 (staminate and pistillate; type).

This species according to Schneider is closely related to *S. Bockii* Seemen and probably not different.

Salix andropogon Léveillé in Fedde, Rep. Spec. Nov. III. 21 (1906); in Bull. Soc. Bot. France, LVI. 297 (1909); Fl. Kouy-Tchéou, 381 (1915).—Schneider in Sargent, Pl. Wilson. III. 170 (1916).

CHINA. Kweichou: lit du fleuve, submergé aux grandes eaux, *J. Esquirol*, no. 327, Dec. 15, 1904 (type).

This species is closely related to *S. variegata* Franch. according to Schneider (l. c.).

Salix kouytchensis Schneider in Sargent, Pl. Wilson. III. 171 (1916).

Salix Duclouxii var. *kouytchensis* Léveillé in Bull. Soc. Bot. France, LVI. 298 (1909).

Salix Duclouxii Léveillé, Fl. Kouy-Tchéou 381 (1915); non Léveillé (1909).

CHINA. Kweichou: (Pin-fa), bord de la rivière de Ouen-tsen-kiao (Kouy-tin), *J. Cavalerie*, no. 728, Nov. 23, 1902 (pistillate; type).

This species is according to Schneider closely related to the two preceding species.

MYRICACEAE

Myrica rubra Siebold & Zuccarini in Abh. Akad. Münch. IV. pt. 3, p. 230 (Fl. Jap. Fam. Nat. II. 106) (1846).

Daphne Argyi Léveillé in Mem. R. Acad. Ci. Art. Barcelona, ser. 3, XII. no. 22, p. 22 (1916).

CHINA. Kiangsu: Vou-see, Chan-muen, bords du Tai hou, *d'Argy* [1846–66].

The leaves are not "integerrima" but partly remotely toothed toward the apex.

JUGLANDACEAE

Engelhardtia Colebrookiana Lindley apud Wallich, Pl. As. Rar. III. 4, t. 208 (1832).

Engelhardtia Esquirolii Léveillé in Fedde, Rep. Spec. Nov. XIII. 507 (1913).—Fl. Kouy-Tchéou, 203 (1914).

Carpinus Esquirolii Léveillé, Fl. Kouy-Tchéou, 203 (1914), pro synon. *E. Esquirolii*.

CHINA. Kweichou: Ouang-mou, *J. Esquirol*, no. 112, June 1904.

Léveillé's species agrees well with *E. Colebrookeana;* the differences given by Léveillé are very slight and do not hold.

BETULACEAE

Corylus hallaisanensis Nakai in Fedde, Rep. Spec. Nov. XIII. 250 (1914).

KOREA. Quelpaert: in silvis Hallaisan, *E. Taquet*, no. 333, Oct. 1907.

To the same number Léveillé had given in his herbarium another name which apparently remained unpublished.

Alnus Fauriei Léveillé & Vaniot in Bull. Soc. Bot. France, LVI. 423 (1904).—Schneider in Sargent, Pl. Wilson. II. 495 (1916).—Callier in Mitt. Deutsch. Dendr. Ges. XXVII. 86, t. 20, fig. 5, t. 23, fig. 17a, b, c (1918).

JAPAN. Hondo: in monte Gurvassan, *U. Faurie*, no. 783, Sept. 28, 1897 (ex Léveillé).

Betula Ermani Cham. var. **subcordata** Koidzumi in Tokyo Bot. Mag. XXVII. 148 (1913).—Schneider in Sargent, Pl. Wilson. II. 471 (1916).

Betula vulcani Léveillé & Vaniot in Bull. Soc. Bot. LI. 423 (1904).

Japan. Hondo: presqu'ile des Volcans, *U. Faurie*, no. 1438, Sept. 28, 1886 (ex Léveillé).

FAGACEAE

Castanopsis hystrix A. DeCandolle in Jour. Bot. I. 182 (1863).

Castanea Bodinieri Léveillé & Vaniot in Bull. Soc. Bot. France, LII. 142 (1905).

Quercus brunnea Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1913).

CHINA. Kweichou: Pin-fa, bois, *J. Cavalerie*, no. 2293, April 13, 1905 (type of *Q. brunnea*).—Yunnan: environs de Yun-nan-sen; bois de la pagode de Kiang-tchou-se, *E. Bodinier*, Febr. 2, 1897 (grand arbuste ou petit arbre, fruits en long epis; type of *Castanea Bodinieri*).

Bodinier's specimens show spikes of very young fruit only, but the leaves agree with those of *C. hystrix*.

Castanopsis Fargesii Franchet in Jour. de Bot. XIII. 195 (1899).
Quercus pinfaensis Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1913); Fl. Kouy-Tchéou, 128 (1914).
CHINA. Kweichou: Pin-fa, bois, *J. Cavalerie*, no. 1065, June 11, 1903 (grand arbre; type of *Q. pinfaensis*).

Castanopsis caudata Franchet in Nouv. Arch. Mus. Paris, ser. 3, VII. 87 (Pl. David I. 277) (1884).
Quercus Castanopsis Léveillé in Fedde, Rep. Spec. Nov. XII. 363 (1913); Fl. Kouy-Tchéou, 127 (1914).
Quercus trinervis Léveillé, l. c. 364 (1913); l. c. 128 (1914).
Quercus cepifera Léveillé, l. c. 364 (1913); l. c. 127 (1914), quoad specimina foliifera.
Castanopsis asymetrica Léveillé, Fl. Kouy-Tchéou, 125 (1914).
CHINA. Kweichou: Pin-fa, Ma-jo, hautes montagnes, *J. Cavalerie*, no. 57, May 1898, August 1908 (type of *Q. Castanopsis*); montagnes à Pin-fa, *J. Cavalerie*, no. 3275, Aug. 20, 1908 (type of *Q. trinervis*); sud de Pin-fa, rare, *J. Cavalerie*, no. 2341, June 8, 1903 (grand arbre; in part, as to the leaf specimens; co-type of *Q. cepifera*).—Kouy-yang, monts du Collège, *J. Chaffanjon* in herb. Bodinier, no. 2235, April 15, 1898 (arbre; type of *C. asymetrica*) et bois d'une pagode, *J. Cavalerie*, no. 2178 (co-type of *C. asymetrica*).

Though *C. caudata* has been recorded so far only from the eastern provinces, the specimens cited above seem to be referable to this species. The type of *Quercus cepifera* belongs to *Lithocarpus spicata* Rehd. & Wils. Cavalerie's no. 2178 with more sharply serrate leaves, co-type of *C. asymetrica*, probably does not belong here.

Castanopsis tribuloides var. **echidnocarpa** King apud Hooker, f., Fl. Brit. Ind. v. 623 (1888).
Quercus Cavaleriei Léveillé & Vaniot in Bull. Soc. Bot. France, LII. 142 (1905); Fl. Kouy-Tchéou, 127 (1914).
CHINA. Kweichou: Pin-fa, hautes montagnes, *J. Cavalerie*, no. 57, July 15, 1902 (type of *Q. Cavaleriei*).

Castanopsis tibetana Hance in Jour. Bot. XIII. 367 (1875).
Quercus Franchetiana Léveillé, Fl. Kouy-Tchéou, 128 (1915).
CHINA. Kweichou: sud de Pin-fa, bord de la riviére, *J. Cavalerie*, no. 2407, July 5, 1905 (grand arbre; type of *Q. Franchetiana*).

Castanopsis cryptoneuron, comb. nov.
Quercus cryptoneuron Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1914); Cat. Pl. Yun-Nan, 67 (1916).
CHINA. Yunnan: forêts de Long-ky, alt. 700 m., *E. E. Maire* (type).
A very distinct species with oblong leaves about 8 cm. long, with close brown tomentum beneath, denticulate near the acute apex and with subglobose nuts about 1 cm. across enclosed by a thin splitting cupula armed with scattered short spinescent spreading prickles.

Castanopsis spec.

Quercus Argyi Léveillé in Mem. R. Acad. Ci. Art. Barcelona, ser. 3, XII. no. 22, p. 8 (Cat. Pl. Kiang-Sou) (1916), nomen.

CHINA. Kiangsu: Sonose, *d'Argy*, no. 842 [1846–66].

This species which is represented only by a branch with pistillate spikes seems to be related to *C. caudata* Franch., but the leaves are thinner and more frequently and more sharply serrate; also Cavalerie's no. 2178, a co-type of *Castanopsis asymetrica* may belong here.

Lithocarpus spicata Rehd. & Wils. in Sargent, Pl. Wilson. III. 207 (1916).

Quercus cepifera Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1913); Fl. Kouy-Tchéou, 127 (1914), excl. specim. foliiferis.

CHINA. Kweichou: sud de Pin-fa, rare, *J. Cavalerie*, no. 2341, Jan. 1906 (fruiting spike; type of *Q. cepifera*).

On the label it is stated that the fruiting spike was found on the ground and its belonging to the leaf-specimen is questioned. As the name of the species is based on the fruit, it is obvious that the fruiting spike represents the type of *Q. cepifera*. The leaf specimens have been referred to *Castanopsis caudata* Franch.

Lithocarpus spec.

Quercus Mairei Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1913); Cat. Pl. Yun-Nan, 67 (1916).

CHINA. Yunnan: forêts de Long-ky, alt. 700 m., *E. E. Maire*, June 1912 (arbre moyen; type of *Q. Mairei*).

This species is possibly identical with *L. megalophylla* Rehd. & Wils. for which it would be an earlier name, but as the material of both species is still incomplete and comes from different regions, I hesitate to refer it to that species. The leaves of *Q. Mairei* are narrower and shorter, only 12–17 cm. long and the specimen bears only staminate inflorescences which are paniculate and with the peduncle 12–16 cm. long, while of *L. megalophylla* only leaves and fruits are known.

Quercus serrata Thunberg, Fl. Jap. 176 (1784).

Quercus glandulifera Blume, Mus. Bot. Lugd.-Bat. I. 295 (1850).—Nakai, Fl. Sylv. Kor. III. 25, t. 13 (1917).

Quercus coreana Léveillé in litt. ex Nakai, l. c. (1917), pro synon. *Q. glandulifera*.

KOREA. Quelpaert: in silvis, *E. Taquet*, no. 5985, May 1911 (type of *Q. coreana*).

The name *Q. serrata* Thunb. which had been erroneously applied to *Q. acutissima* Carruth. and to *Q. variabilis* Bl. belongs according to the specimens in Thunberg's herbarium to the species hitherto called *Q. glandulifera* Bl.

Quercus mongolica Fischer apud Turczaninow in Bull. Soc. Nat. Moscou, XI. 101 (Cat. Baical. Dahur.) (1838); nomen.—Ledebour, Fl. Ross. III. pt. II. 589 (1850).

Quercus mongolica var. β. *liaotungensis* f. *funebris* Nakai, Fl. Sylv. Kor. III. 24 (1917).

Quercus funebris Léveillé in litt. ex Nakai, l. c. (1917), pro synon. preced.

KOREA. Quelpaert: in sylvis, *E. Taquet*, no. 5984, May 1911 (type of *Q. funebris*).

According to the type specimen consisting of branches with young not fully developed leaves, *Q. funebris* does not belong to *Q. liaotungensis* Koidz. but to true *Q. mongolica*. I have not seen Léveillé's specimens of his *Q. funebris* var. *glabra* and *Q. undulatifolia;* both have been referred by Nakai (l. c.) as forms to *Q. mongolica* var. *liaotungensis*.

Quercus phillyreoides Gray in Mem. Am. Acad. n. ser. VI. 406 (Bot. Jap.) (1859).

Maesa singuliflora Léveillé in Fedde, Rep. Spec. Nov. X. 440 (1912); Fl. Kouy-Tchéou, 287 (1914).

CHINA. Kweichou: Tin-fan, bois, *J. Cavalerie*, no. 3626, June 1909 (petit arbre; type of *Maesa singuliflora*).

The specimen differs somewhat from typical *Q. phillyreoides* in the longer and narrower leaves which are oblong-lanceolate to ovate lanceolate, acute or subacuminate and about 6 cm. long and 2 cm. wide.

Quercus guyavaefolia Léveillé in Fedde, Rep. Spec. Nov. XII. 363 (1913); Cat. Pl. Yun-Nan, 67 (1916), as Q. guyavifolia.

CHINA. Yunnan: montagnes de Siao-ou-long, 2600 m., *E. E. Maire*, Nov. 1912 (petit arbre; type).

The leaves of this species agree exactly with those of *Q. semicarpifolia* Smith, but the cupula has thick closely appressed scales, not loose thin scales forming a fringed margin as in *Q. semicarpifolia*. There is, however, a possibility that the cups which are not attached to the branches, do not belong to the leaf specimens; in that case, the name would become a synonym of *Q. semicarpifolia*, since, the name being based on the leaves, the latter constitute the type of the species.

Quercus Prainiana Léveillé in Fedde, Rep. Spec. Nov. XII. 363 (1913); Fl. Kouy-Tchéou, 128 (1914).

CHINA. Kweichou: Ou-kouen a Li-le, ouest de Lo-fou, sommet des montagnes, rare, *J. Cavalerie*, no. 2641, Nov. 1905 (type).

On the label Léveillé remarks that it is near *Q. Engleriana* Seemen, but this species belongs to the section *Lepidobalanos*, while *Q. Prainiana* belongs to sect. *Cyclobalanopsis*. It is apparently near *Q. vestita* Rehd. & Wils., but is less pubescent and has broader more coarsely toothed leaves.

Quercus glauca Thunberg, Fl. Jap. 175 (1784).

Quercus Vaniotii Léveillé in Fedde, Rep. Spec. Nov. XII. 364 (1913).

Quercus Taquetii Léveillé nov. hybr. in litt. ex Nakai, Fl. Sylv. Kor. III. 36 (1917), pro syn. *Q. myrsinaefoliae* Bl.

CHINA. Kweichou: Pin-fa, bois, rare, *J. Cavalerie*, no. 3274, April 1905 (type of *Q. Vaniotii*).

KOREA. Quelpaert: in silvis, *E. Taquet*, no. 6001, May 1911 (type of *Q. Taquetii*).

According to the label on the type specimen Léveillé considered *Q. Taquetii* to represent a hybrid between *Q. glauca* and *Q. serrata* [*Q. acutissima* Carruth.] and Nakai referred *Q. Taquetii* to *Q. myrsinaefolia* Bl., but the young leaves show the pubescence typical for *Q. glauca*, while *Q. myrsinaefolia* has even the young leaves quite glabrous.

Quercus acuta Thunberg, Fl. Jap. 175 (1784).—Nakai, Fl. Sylv. Kor. III. 33, t. 22 (1917).

Quercus Kasaimok Léveillé in litt. ex Nakai, l. c.
Quercus pseudoglauca Léveillé, l. c.
Quercus quelpaertensis Léveillé, l. c.
Quercus kasaiensis Léveillé in sched. = *? Q. Kasaimok* Léveillé ex Nakai.

KOREA. Quelpaert: in silvis, *E. Taquet*, no 5995 (type of *Q. kasaiensis*), no. 5996 (type of *Q. quelpaertensis*).

Taquet's no. 5996 has most of the leaves serrate near the apex, less distinctly veined and the branchlets slightly less tomentose, which suggests a possible hybrid with *Q. myrsinaefolia* Bl. The type specimens of *Q. pseudoglauca* and *Q. kasaiensis* bear Dr. Handel-Mazzetti's determination as *Q. acuta* Thunb.

Quercus spec.

Myrica Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. XII. 537 (1913).

CHINA. Kweichou: haut plateau, route de Pin-fa a Kouy-yang, *J. Cavalerie*, no. 3184, April–June 1908 (grand arbre; type of *Myrica Cavaleriei*).

The type specimen consists of 2 leafless branches of a deciduous species of Quercus with not fully developed staminate catkins and a leafy branch with short axillary spikes of pistillate flowers and with lanceolate, slender-petioled leaves 10–12 cm. long and about 2 cm. broad, and glabrous except a villous tomentum along the midrib, probably a Castanopsis.

ULMACEAE

Celtis Bodinieri Léveillé in Fedde, Rep. Spec. Nov. XIII. 265 (1914); Fl. Kouy-Tchéou 424 (1915).—Schneider in Sargent, Pl. Wilson. III. 276 (1916).

CHINA. Kweichou: Kouy-yang-fan, jardin de Pe-tang, commun aux environs de la ville, *E. Bodinier*, no. 1633, June 10, 1897 (grand arbre; type); environs de Kouy-yang, bois de la pagode Lan-yo-chan, *E. Bodinier*, no. 2587, April 10, 1899 (flowers; co-type).

Celtis Bungeana Blume, Mus. Bot. Lugd.-Bat. II. 71 (1852).—Schneider in Sargent, Pl. Wilson. III. 269 (1916).—Léveillé, Cat. Pl. Yun-Nan 274 (1917).

Celtis Mairei Léveillé in Fedde, Rep. Spec. Nov. XIII. 264 (1914).

CHINA. Yunnan: plaine près Long-tan à Tong-tchouan, 2500 m., *E. E. Maire*, Aug. 1912 (type of *C. Mairei*).

Celtis Biondii Pamp. var. **Cavaleriei** Schneider in Sargent, Pl. Wilson. III. 273 (1916).—Léveillé, Cat. Pl. Yun-Nan, 274 (1917).

Celtis Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. x. 440 (1912); Fl. Kouy-Tchéou, 424 (1915).

CHINA. K w e i c h o u: Pin-fa, *J. Cavalerie*, no. 394, Sept. 4, 1904 (arbre; type).

Celtis Biondii var. **heterophylla** Schneider in Sargent, Pl. Wilson. III. 282 (1916).

Celtis Bungeana var. *heterophylla* Léveillé in Fedde, Rep. Spec. Nov. x. 476 (1912).

Celtis Leveillei Nakai in Tokyo Bot. Mag. XXVIII. (266, fig. 2, b, g) (1914).

KOREA. Q u e l p a e r t: in pago [locality illegible: Tupyangenap ex Léveillé; Tschangmani ex Schneider], *E. Taquet*, no. 3213, Aug. 1909 (type of *C. Bungeana* var. *heterophylla*).

Pteroceltis Tatarinowii Maximowicz in Bull. Acad. Sci. St. Petersb. XVIII. 293, fig. (1873); in Mél. Biol. IX. 27, t. (1873).—Schneider in Sargent, Pl. Wilson. III. 284 (1916).

Ulmus Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. XI. 296 (1912); Fl. Kouy-Tchéou, 436 (1915).

CHINA. K w e i c h o u: Gan-chouen, bois, *J. Cavalerie*, no. 3784, May 1910 (type of *Ulmus Cavalerei*).

Trema orientalis Blume, Mus. Bot. Lugd.-Bat. II. 62 (1856).

Trema Dunniana Léveillé in Fedde, Rep. Spec. Nov. X. 146 (1911).

CHINA. K w e i c h o u: without precise locality, *J. Esquirol*, no. 871, June 1906 (type of *T. Dunniana*).

The type specimens bears Dr. Handel-Mazzetti's determination as *T. orientalis* Bl.

MORACEAE

Morus australis Poiret, Encycl. Méth. IV. 380 (1797).

Morus acidosa Griffith, Not. Pl. As. IV. 388 (1854) as *M. acidosus*.—Schneider in Sargent, Pl. Wilson. III. 297 (1916).—Léveillé, Cat. Pl. Yun-Nan, 275 (1917).

Morus Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. x. 146 (1911); Fl. Kouy-Tchéou, 434 (1915).

Morus inusitata Léveillé in Fedde, Rep. Spec. Nov. XIII. 265 (1914).

CHINA. K w e i c h o u: Ma-jo, *J. Cavalerie*, no. 3283, April 20, 1908 (type of *M. Cavaleriei*). Y u n n a n: coteaux arides à La-kou, 2400 m., *E. E. Maire*, March 1912 (mûrier sauvage, arbuste inutilisé; type of *M. inusitata*).

According to Nakai (in Jour. Arnold Arb. VIII. 236 [1927] who saw the type specimen *M. australis* Poir is the oldest name for the species identified by Schneider (l. c.) with *M. acidosa* Griff. and representing the *M. indica* of Roxburgh and others.

Ficus gibbosa Bl. var. **cuspidifera** King in Ann. Bot. Gard. Calcutta, I. 4, t. 2A (Spec. Ficus) (1888).

Ficus cuspidifera Miquel in London Jour. Bot. VII. 434 (1848).

Ficus longepedata Léveillé, Fl. Kouy-Tchéou, 431 (1915), quoad spec. Esquirol no. 3550.—Non Léveillé & Vaniot.

Ficus rhomboidalis Léveillé & Vaniot, in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 153 (Ficus Spec. China, 15) (1907); in Fedde, Rep. Spec. Nov. 86 (1907).—Léveillé l. c. 433 (1915), excl. spec. Esquirol, no. 3267.

Ficus Michelii Léveillé in Fedde, Rep. Spec. Nov. VIII. 61 (1910); Fl. Kouy-Tchéou, 432 (1915).

CHINA. Kweichou: lac de Pia-ouai, alt. 700 cm., *J. Esquirol*, no. 3550, Feb. 1905 (sub *F. longepedata*); alrededores de Hoang-ko-chou, *L. Martin*, no. 2560, Feb. 22, 1899 (ex Léveillé & Vaniot, type of *F. rhomboidalis*); Ririn, *J. Esquirol*, no. 2705, July 1911; Tchai-choui-ho, *J. Esquirol*, no. 1583, July 1909 (type of *F. Michelii*).

Esquirol's nos. 2705 and 3550 had been determined by Handel-Mazzetti as *F. cuspidifera* Miq. Esquirol's no. 1583 (*F. Michelii*) differs somewhat in its smaller leaves.

Ficus lacor Hamilton in Trans. Linn. Soc. Lond. XV. 150 (1827).—Schneider in Sargent, Pl. Wilson. III. 309 (1916).

Ficus infectoria Roxburgh, Fl. Ind. ed. 2, III. 310 (1832).—King in Ann. Bot. Gard. Calcutta I. 60, t. 75 (1888).—Non Willdenow.

Ficus Tenii Léveillé in Fedde, Rep. Spec. Nov. VI. 112 (1908); Cat. Pl. Yun-Nan, 275 (1917).

Ficus fecundissima Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IX. 19 (1910).—Léveillé, Fl. Kouy-Tchéou, 430 (1915).

Ficus pseudoreligiosa Léveillé, l. c. 432 (1915).

CHINA. Kweichou: Lo-fou, jardin de l'Eglise, *J. Cavalerie*, no. 3588, March 1909 (grand arbre; type of *F. fecundissima*); Lo-hou, rocher derrière le fort, alt. 500 m., *J. Esquirol*, no. 3518, June 5, 1912 (type of *F. pseudoreligiosa*). Yunnan: Kiao-kia *Siméon Ten*, no. 733, Jan. 5, 1906 (type of *F. Tenii*).

Siméon Ten's no. 733 had been determined by Dr. Handel-Mazzetti as *F. superba* Miq. which is a species from Java and differs in its distinctly peduncled receptacles and longer-stalked leaves with undulate margin.

Ficus clavata Wallich Cat. 4495 (1830), nomen.—Miquel in Lond. Jour. Bot. VII. 431 (1848).—King in Ann. Bot. Gard. Calcutta, I. 87, t. 111 (1888).

Ficus acanthocarpa Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 65 (1907); Fl. Kouy-Tchéou, 429 (1915).

CHINA. Kweichou: Pin-fa, *J. Cavalerie*, no. 2519, Sept. 24, 1905 (type of *F. acanthocarpa*); Ma-jo, *J. Cavalerie*, no. 2519 [bis], July 1908.

Ficus foveolata Wallich Cat. no. 4493 A–E (1830), nomen.—Miquel in Ann. Mus. Bot. Lugd.-Bat. III. 294 (1867).—King in Ann. Bot. Gard. Calcutta, I. 133, t. 166–168 (1888).

Ficus Chaffanjoni Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 148 (Ficus Spec. Chin. 10) (1907); in Fedde, Rep. Spec. Nov. IV. 83 (1907).—Léveillé, Fl. Kouy-Tchéou, 429 (1915).

Ficus Duclouxii Léveillé & Vaniot, l. c. 149 (11) (1907); l. c. 84 (1907).—Léveillé, l. c. 430 (1915).

Ficus rufipes Léveillé & Vaniot, l. c. 154 (16) (1907); l. c. 86 (1907);—Léveillé, l. c. 433 (1915).

Ficus Fortunati Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 66 (1907).—Léveille, Fl. Kouy-Tchéou, 430 (1915).

Ficus Seguinii Léveillé in Fedde, Rep. Spec. Nov. XII. 536 (1913); Fl. Kouy-Tchéou, 433 (1915).

China. Kweichou: environs de Kouy-yang, mont. du Collège, rochers des gorges de Yang-pa, *J. Chaffanjon* in herb. Bodinier, no. 2226, April 31, 1898 (type of *F. Chaffanjoni*); environs de Mytsao, bois de la montagne, *Fr. Ducloux*, no. 106, March 6, 1897 (arbre; type of *F. Duclouxii*); Tou-chan, *J. Cavalerie*, Sept. 1899 (co-type of *F. Duclouxii*); sur arbres sacrés de Ma-miang, alt. 1200 m., *J. Esquirol*, no. 2189, July 1910 (in herb. sub *F. Duclouxii*); ruisseau à droite des villages Miao-tse, Ngaiang-ouang, *J. Cavalerie*, no. 340, Aug. 31, 1902 (ex Léveillé & Vaniot; type of *F. rufipes*); Tien-sen-kiao, rochers, alt. 900, *J. Esquirol*, no. 2090, May 1910 (arbrisseau à rameaux pendants, très allongées; in herb. sub *F. rufipes*); route de Tong-tchéou, rochers, *J. Esquirol*, no. 477, June 1905 (type of *F. Fortunati*, ex Léveillé & Vaniot), no. 3761, July 1912 (in herb. sub *F. Fortunati*); Hong-tong, 900 m., *J. Esquirol*, no. 3080 (type of *F. Seguinii*, ex Léveillé), no. 3707, Oct. 1912 (in herb. sub *F. Seguinii*).

In his herbarium Léveillé has referred several Korean specimens to his *F. Chaffanjoni*, namely Taquet's nos. 1399, 3223, 4467 and 5971, all from Quelpaert; these specimens are also referable to *F. foveolata*.

Ficus foveolata var. **Thunbergii** King in Ann. Bot. Gard. Calcutta, I. 134, t. 167, G (1888).

Ficus Thunbergii Maximowicz in Mél. Biol. XI. 339 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 552 (1882).

Ficus Fauriei Léveillé & Vaniot in Fedde, Rep. Spec. Nov. V. 281 (1908).—Nakai in Jour. Coll. Sci. Tokyo, XXXI 199 (Fl. Kor. II) (1911).

Korea. Quelpaert: in dumosis, *U. Faurie*, no. 895, Oct. 1906 (type of *F. Fauriei*); in petrosis secus torrentes, *U. Faurie*, no. 1993, Aug. 1907 (co-type of *F. Fauriei*); secus torrentes, Hong-no, *E. Taquet*, no. 316, Nov. 1907 (co-type of *F. Fauriei*); scandens in rupibus torrentium, Hong-no, *E. Taquet*, no. 4466, Dec. 30, 1910; scandens in arboribus secus torrentes, Hongo, *E. Taquet*, no. 4530, Febr. 1, 1911.

The receptacles are only slightly pubescent or sometimes as in Taquet's no. 4466 almost glabrous. Var. *macrocarpa* Léveillé (in Fedde, Rep. Spec. Nov. XI. 65 [1912]) based on Taquet's no. 5972 from Quelpaert I have not seen.

Ficus impressa Champion apud Bentham in Hooker's Jour. Bot. & Kew Gard. Misc. VI. 76 (1854).

Ficus foveolata var. *impressa* King in Ann. Bot. Gard. Calcutta, I. 134, t. 167F (1888).

Ficus Bodinieri Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 147; (Ficus Spec. Chin. 9) (1907); in Fedde, Rep. Spec. Nov. IV. 83 (1907).

China. Hongkong, *E. Bodinier*, May 9, 1894, and no. 563, June 5, 1898 (tiges rampant sur les rocs des ravines et emettant des branches dressées; type of *F. Bodinieri*).

Ficus erecta Thunberg, Diss. Ficus, 9, 15 (1786).—King in Ann. Bot. Gard. Calcutta I. 141, t. 178 (1888).

Ficus pseudo-piriformis Léveillé & Vaniot in Fedde, Rep. Spec. Nov. V. 282 (1908).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 199 (Fl. Kor. II) (1911).
Ficus Taqueti Léveillé & Vaniot, l. c. (1908).—Nakai l. c. (1911).

KOREA. Quelpaert: Hong-no, secus torrentes, *U. Faurie*, no. 1991, July 1907 (type of *F. pseudo-piriformis*); in petrosis, *U. Faurie*, no. 2024, July 1907 (co-type of *F. pseudo-piriformis*); secus torrentes, *E. Taquet*, no. 4422, July 28, 1910 (in herb. sub *F. pseudoformis*); in dumosis littoris, *U. Faurie*, no. 897, Oct. 1906 (type of *F. Taqueti*); in silvis, *U. Faurie*, no. 898, Oct. 1906 (co-type of *F. Taqueti*); in littoralibus, *U. Faurie*, no. 900, Oct. 1905 (co-type of *F. Taqueti*).

Faurie's no. 2024 as represented in this herbarium has broad, obovate or rhombic-obovate leaves, not lanceolate as described by Léveillé. Faurie's no. 2023 and Taquet's nos. 315 and 317 enumerated as co-types of *F. Taqueti* I have not seen.

Ficus heteromorpha Hemsley in Hooker's Icon. XXVI. t. 2533, 2534 (1897).

Ficus pinfaensis Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 152 (Ficus Spec. Chin. 14) (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907); Fl. Kouy-Tchéou, 432 (1915).
Ficus Kouytchense Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 65 (1907); Fl. Kouy-Tchéou, 431 (1915).
Ficus Mairei Léveillé in Fedde, Rep. Spec. Nov. XII. 535 (1913); Cat. Pl. Yun-Nan, 275 (1917).
Ficus pandurata Léveillé & Vaniot apud Léveillé, Fl. Kouy-Tchéou, 432 (1915) nomen.—Non Hance.

CHINA. Kweichou: Pin-fa, mont., *J. Cavalerie*, no. 532, Sept. 24, 1902 (type of *F. pinfaensis*); without locality, *J. Cavalerie* (type of *F. kouytchense*); Ouang-mou, *J. Esquirol* (type of *F. pandurata*). Yunnan: vallée de Long-ky, rives des torrents; alt. 700 m., *E. E. Maire*, Aug. [1910–13] (type of *F. Mairei*).

As *F. pandurata* is enumerated in Fl. Kouy-Tchéou without description, it is to be assumed that the species had been published before, but I have been unable to find the place of publication.

Ficus hispida Linnaeus f. Suppl. 442 (1781).—King in Ann. Bot. Gard. Calcutta, I. 116, t. 154, 155 (1888).
Ficus sambucixylon Léveillé in Fedde, Rep. Spec. Nov. IX. 444 (1911); Fl. Kouy-Tchéou, 433 (1915).

CHINA. Kweichou: rivière à Lo-fou, *J. Esquirol*, no. 2217, Sept. 1910 (type of *F. sambucixylon*) and no. 3712 (arbre).

Ficus hirta Vahl. Enum. II. 201 (1806).—King in Ann. Bot. Gard. Calcutta, I. 149, t. 188 (1888).
Ficus Porteri Léveillé & Vaniot, in Fedde, Rep. Spec. Nov. VIII. 550 (1910).—Léveillé, Fl. Kouy-Tchéou, 432 (1915).
Ficus laus-Esquirolii Léveillé, Fl. Kouy-Tchéou, 431 (1915), quoad specim. Esquirol, no. 3634.

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 3594, March 1909 (type of *F. Porteri*); Chang-tsin, *J. Esquirol*, no. 3634, Nov. 1912 (co-type of *F. laus-Esquirolli*).

Ficus hirta var. **Roxburghii** (Miq.) King in Ann. Bot. Gard. Calcutta, I. 150, t. 189 (1888).

Ficus Esquiroliana Léveillé in Bull. Acad. Intern. Geog. Bot. XXIV. 252 (1914).
Ficus laus-Esquirolii Léveillé, Fl. Kouy-Tchéou, 431 (1915), excl. spec. Esquirol, no. 3634.
Ficus neo-Esquirolii Léveillé, Fl. Kouy-Tchéou, 431 (1915), pro syn. *F. laus-Esquirolii*.

CHINA. Kweichou: Chang-tsin, alt. 900 m., *J. Esquirol*, no. 3636, Nov. 1912 (type of *F. Esquiroliana* and *F. laus-Esquirolii*).

Léveillé changed the name *F. Esquiroliana* to *F. laus-Esquirolii* on account of his *F. Esquirolii* of 1907, but according to the International Rules these two names are different and the change therefore was unnecessary. *Ficus Esquiroliana* is based on Esquirol's no. 3636, but under *F. laus-Esquirolii* Léveillé quotes besides no. 3636 Esquirol's no. 3634 and cites two synonyms, namely *F. Esquiroliana* Lévl. and *F. neo-Esquirolii* Lévl. It is not clear, however, whether the latter name for which I have not found a previous place of publication, is merely another substitute for *F. Esquiroliana* or applies to J. Esquirol's no. 3634, but I think the former supposition is more likely to be correct.

Ficus formosana Maximowicz in Mél. Biol. XI. 331 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 546 (1882).—King in Ann. Bot. Gard. Calcutta, I. 153, t. 177a (1888).

Ficus lageniformis Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 151 (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907).

CHINA. Hongkong: Tay-mo-chan, bosquets autour des villages, *E. Bodinier*, no. 1165, May 8, 1895 (petit arbuste, type of *F. lageniformis*).

Léveillé's species of Ficus mentioned above as synonyms I have been able to identify with previously described species, while the two following are identical with species described later by other authors under new names which therefore become synonyms. Of the rest of the species enumerated below in alphabetical order some will be found on closer study identical with species already described, but for the present they have to be enumerated as distinct species.

Ficus Martini Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 152 (Ficus Spec. Chin. 14) (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907); Fl. Kouy-Tchéou, 432 (1915).

Ficus Baileyi Hutchinson in Bailey, Gent. Herb. I. 19, fig. 4, B. C (1920).

CHINA. Kweichou: environs de Gan-pin, commun partout sur les rochers, *L. Martin* in herb. Bodinier, no. 2123, March 20, 1898 (type of *F. Martini*).

Ficus longepedata Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 152 (Ficus Spec. Chin. 14) (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907).—Léveillé, Fl. Kouy-Tchéou, 431 (1915).

Ficus trichopoda Léveillé in Fedde, Rep. Spec. Nov. XII. 538 (1913); Fl. Kouy-Tchéou, 533 (1915).

Ficus sordida Handel-Mazzetti in Akad. Wiss. Wien Anz. 1922, no. 7 (Pl. Nov. Sin. Forts. 15, p. 7) (1922).

CHINA. Kweichou: Pin-fa (Tai-tchen), *J. Cavalerie*, no. 876, Feb. 17, 1903 (type of *F. longepedata*); Gan-chouen, *J. Cavalerie*, no. 3968, in 1912 (type of *F. trichopoda*); ad flumen infra oppidum Sandjio in silva frondosa prope vicum Pingu, alt. 350 m., *H. Handel-Mazzetti*, no. 10849, July 18, 1917 (frutex; type of *F. sordida*).

Ficus sordida was identified by Dr. Handel-Mazzetti himself with *F. trichopoda* Lévl. (in sched. herb. Léveillé).

Ficus asymetrica Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 147 (Ficus Spec. Chin. 9) (1907); in Fedde, Rep. Spec. Nov. IV. 82 (1907); Fl. Kouy-Tchéou, 429 (1915).—Non *F. asymmetrica* Hutchinson (1915).

CHINA. Kweichou: bord du Hoa-kiang, *L. Martin* in herb. Bodinier, no. 2577, Febr. 18, 1899 (type); Lo-fou, *J. Cavalerie*, no. 3596, March 1909; bord de Ta-ram rivière, Ta-ras, *J. Esquirol*, nos. 2692 and 3549.

This species invalidates Hutchinson's *F. asymmetrica* (in Kew Bull. Misc. Inform. 1915, p. 336) from Angola.

Ficus botryoides Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 148 (Ficus Spec. Chin. 9) (1907); in Fedde, Rep. Spec. Nov. IV. 83 (1907); Fl. Kouy-Tchéou, 429 (1915).

CHINA. Kweichou: environs de Tsin-gay, rochers au bord de la rivière à Cha-teou-tchay, *E. Bodinier*, no. 2653, June 27, 1899 (type).

Ficus Cavaleriei Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 148 (Ficus Spec. Chin. 10) (1907); in Fedde, Rep. Spec. Nov. IV. 83 (1907).—Léveillé, Fl. Kouy-Tchéou, 429 (1915).

CHINA. Kweichou: Pin-fa, sud ouest, bord du ruisseau, *J. Cavalerie*, no. 244, Aug. 21, 1902 (type); Pin-fa, rochers près ruisseau, rare, *J. Cavalerie*, no. 1494, Nov. 12, 1903.

Ficus congesta Léveillé & Vaniot apud Léveillé, Fl. Kouy-Tchéou, 429 (1915), nomen.—Non Roxburgh.

CHINA. Kweichou: Tche-chou (bois), *J. Esquirol*, no. 2506, Sept. 1909.

I have not been able to find the original place of publication of this species. Léveillé cites another specimen from Tien-sen-kiao, Esquirol no. 2093, which I have not seen.

Ficus cuneata Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 149 (Ficus Spec. Chin. 11) (1907); in Fedde, Rep. Spec. Nov. IV. 84 (1907).—Léveillé, Fl. Kouy-Tchéou, 429 (1915).—Non Miquel, nec Wallich, nec Blume.

CHINA. Kweichou: environs de Kouy-young, mont. du Collège, gorge de Yang-pa, rocailles (May 16, 1898), environs de Tou-chan (May

31), *E. Bodinier*, no. 2363 (type); Pin-fa, *J. Cavalerie*, no. 1351, Sept. 8, 1903 (co-type).

The receptacle of Bodinier's no. 2363 is slender-stalked and glabrous, while that of Cavalerie's no. 1351 is subsessile and pubescent. Var. *congesta* Léveillé & Vaniot (l. c.), from Pin-fa, *J. Cavalerie* (without no.), I have not seen.

Ficus Cyanus Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 149 (Ficus Spec. Chin. 11) (1907); in Fedde, Rep. Spec. Nov. IV. 84 (1907).—Léveillé, Fl. Kouy-Tchéou, 429 (1915).

CHINA. K w e i c h o u: Si-liéou-gay, trous profonds, *J. Cavalerie*, no. 169, July 30, 1902 (type); arrivé a Tong-kai (ruisseau), *J. Esquirol*, no. 3031, July 25, 1911.

Var. *viridescens* Lévl. & Vant. (l. c.) has been referred later to the typical form by Léveillé (Fl. Kouy-Tchéou, 429) by citing the type of it under *F. cyanus*.

Ficus hederifolia Léveillé in Fedde, Rep. Spec. Nov. IX. 323 (1911).

KOREA. Q u e l p a e r t: in declivibus altis, repens in rupibus et tapetem formans, *E. Taquet*, no. 4425, July 2, 1910 (type).

The specimen is sterile and represents apparently a juvenile form; it resembles juvenile forms of *F. pumila* L., but the leaves are lobed and *F. pumila* has not been recorded from Qualpaert where *F. foveolata* var. *Thunbergii* (Maxim.) King takes its place.

Ficus hypoleucogramma Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 65 (1907).—Léveillé, Fl. Kouy-Tchéou, 430 (1915).

CHINA. K w e i c h o u: without precise locality, *J. Esquirol*, no. 597 (type); Tchai-choui-ho, *J. Esquirol*, no. 1584, July 1909.

This species seems to be most closely related to *F. obtusifolia* Roxb., but the leaves are shorter and broader and the petioles longer. The type specimen is not cited by Léveillé in his Flora of Kwei-chou, but instead Esquirol's no. 1584.

Ficus Jamini Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VIII. 550 (1910).— Léveillé, Fl. Kouy-Tchéou, 430 (1915).

CHINA. K w e i c h o u: Lo-fou, *J. Cavalerie*, no. 3601, March 1909 (type).

Ficus Kingiana Léveillé, Fl. Kouy-Tchéou, 431 (1915), nomen.— Non Hemsley.

CHINA. K w e i c h o u: Houa-kiang, *J. Cavalerie*, no. 2172, June 3, 1904 (type); Ly-po, *J. Cavalerie*, Feb. 15, 1900 (co-type ?).

I have not been able to find the place of the original publication of this species whose name is invalidated anyhow by *F. Kingiana* Hemsley from Formosa. The two specimens cited differ in the size of the leaves and length of petiole.

Ficus laceratifolia Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, IV. 151 (Ficus Spec. Chin. 13) (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907).— Léveillé, Fl. Kouy-Tchéou, 431 (1915).

CHINA. K w e i c h o u: environs de Kouy-yang, premières pentes de la mont., *E. Bodinier*, no. 1663, July 12, 1897 (petite arbuste; figues petites, vertes, piquetées elegamment de rose-pourpre; type).

Very distinct on account of its strongly dentate or lobulate and caudate leaves.

Ficus lacrymans Léveillé, Fl. Kouy-Tchéou, 531 (1915).

CHINA. K w e i c h o u: Ta-rin, alt. 900 m., *J. Esquirol*, no. 3573, April 12, 1913 (arbre pleureur; type).

This species was identified by Dr. Handel-Mazzetti (in sched. in herb. Léveillé) with *F. Baileyi* Hutch., but the texture of the leaves, though they are similar in shape, is quite different and the species does not belong into the affinity of *F. foveolata;* in its habit, too, it is different, being a tree with pendent branches and not a scandent shrub.

Ficus Letaqui Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VIII. 550 (1910); Fl. Kouy-Tchéou, 531 (1915).

CHINA. K w e i c h o u: Lo-fou, *J. Cavalerie*, no. 3599, March 1909 (arbrisseau 2–3 m.; type).

This is a very distinct species with the receptacles on elongated apparently leafless branches and large leaves on slender petioles up to 15 cm. long.

Ficus macrocarpa Léveillé & Vaniot in Mem. Acad. Ci. Art. Barcelona, ser. 3, VI. 152 (Ficus Spec. Chin. 14) (1907); in Fedde, Rep. Spec. Nov. IV. 85 (1907).—Léveillé, Fl. Kouy-Tchéou, 431 (1915), sub *F. macrocarpa* Wight.—Non *F. macrocarpa* Wight.

CHINA. K w e i c h o u: without precise locality, *J. Cavalerie* (without number); in 1899 (type); Lo-fou, *J. Cavalerie*, no. 3593, Nov. 1909 (bel arbre).

In his Flore de Kouy-Tchéou Léveillé cites Wight as the author of his *F. macrocarpa*, but the species may be distinguished from *F. macrocarpa* Wight at the first glance by the dentate leaves and the smaller receptacles.

Ficus macropodocarpa Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 66 (1907).—Léveillé, Fl. Kouy-Tchéou, 531 (1915).

CHINA. K w e i c h o u: without precise locality, *J. Esquirol*, no. 838 (type); rivière, Lo-fou, alt. 600 m., *J. Esquirol*, no. 2216, Sept. 1910.

Ficus Nerium Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 66 (1907).—Léveillé, Fl. Kouy-Tchéou, 433 (1915).

CHINA. K w e i c h o u: without precise locality, *J. Esquirol* (type, ex Léveillé & Vaniot); Tchen-fong, *J. Esquirol*, no. 914.

Ficus orthoneura Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 66 (1907).—Léveillé, Fl. Kouy-Tchéou, 432 (1915).

CHINA. Kweichou: without precise locality, *J. Cavalerie*, no. 2050, June 6, 1904 (type).

Ficus pseudobotryoides Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IV. 67 (1907).—Léveillé, Fl. Kouy-Tchéou, 432 (1915).

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 2734, April 1, 1906 (type); Ta-than, *J. Esquirol*, no. 2704, Aug. 1911.

Esquirol's no. 2704 apparently belongs to a species different from the type.

Ficus retusiformis Léveillé in Fedde, Rep. Spec. Nov. VIII. 549 (1910); Fl. Kouy-Tchéou, 433 (1915).

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 3601, March 1909 (type).

Ficus rhomboidalis Léveillé, Fl. Kouy-Tchéou, 433 (1915), quoad specim. Esquirol, no. 3267.—Non Léveillé & Vaniot.

CHINA. Kweichou: Tong-tchéou, jardin du *F.* Marchand, alt. 1400 m., *J. Esquirol*, no. 3267, June 22, 1902.

Esquirol's no. 3267, referred by Léveillé in 1915 to *F. rhomboidalis* is quite different from the type of *F. rhomboidalis* which becomes a synonym of *F. gibbosa* var. *cuspidifera* (Miq.) King.

Ficus Schinzii Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VIII. 550 (1910).—Léveillé, Fl. Kouy-Tchéou, 433 (1915).—Non *F. Schinziana* Warb.

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 3592, April 1909 (type); Tsao-ly, bord de la rivière, alt. 600 m., *J. Esquirol*, no. 3503, Feb. 5, 1912.

Ficus Stapfii Léveillé in Fedde, Rep. Spec. Nov. IX. 325 (1911); Fl. Kouy-Tchéou, 433 (1915).

CHINA. Kweichou: montagnes abruptes au nord de Hoang-tsao-pa, *J. Esquirol*, no. 1556, June 1909 (type).

Ficus suberosa Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VIII. 549 (1910).—Léveillé, Fl. Kouy-Tchéou, 433 (1915).

Ficus Blinii Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VIII. 558 (1910).—Léveillé, Fl. Kouy-Tchéou, 429 (1915).

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 3597, March 1909 (type); Lo-fou, *J. Cavalerie*, no. 3595, March, 1909 (type of *F. Blinii*); Piao-ouai-lo, alt. 600 m., *J. Esquirol*, no. 2197, Sept. 1910 (as *F. suberosa* in Fl. Kouy-Tchéou).

The specimens of *F. Blinii* hardly differ from those of *F. suberosa* except that the petioles are only about 1.5 cm. long.

OLACACEAE

Schoepfia jasminodora Siebold & Zuccarini in Abh. Akad. Muench. IV. pt. III. 135 (Fl. Jap. Fam. Nat. II. 11) (1846).

Vaccinium Cavaleriei Léveillé & Vaniot in Fedde, Rep. Spec. Nov. IX. 447 (1911); Fl. Kouy-Tchéou, 154 (1914).

CHINA. Kweichou: Pin-fa, *J. Cavalerie*, no. 20bis, April 4, 1902 (fleurs odorantes, d'une jaune sombre).

(*To be continued*)

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM[1]

ALFRED REHDER

Lithocarpus aculeata, comb. nov.

Pasania aculeata Markgraf in Bot. Jahrb. LIX. 73 (1924).

SOUTHEASTERN NEW GUINEA.

Lithocarpus aspericupula, comb. nov.

Pasania aspericupula Markgraf in Bot. Jahrb. LIX. 78 (1924).

NORTHEASTERN NEW GUINEA.

Lithocarpus bancana, comb. nov.

Quercus bancana Scheffer in Natuurk. Tijdschr. Neederl. Ind. XXXI. 361 (Obs. Phytog. II. 49) (1869); in Flora, LIII. 251 (1870).—King in Ann. Bot. Gard. Calcutta, II. 62, t. 56B (1889).

Pasania bancana Markgraf in Bot. Jahrb. LIX. 79 (1924).

BANCA, NORTHEASTERN GUINEA.

Lithocarpus Blumeana, comb. nov.

Quercus Blumeana Korthals, Kruidkunde in Verhand. Natuurl. Geschied. Nederl. Bezitt. Bot. 208, t. 44 (1839–42).—King in Ann. Bot. Gard. Calcutta, II. 76, t. 70 (1889).—Koorders & Valeton in Meded. Land's Plantent. LVIII. 57 (Bijdr. Boomsoort. Java, X) (1904).

Pasania Blumeana Gamble in Jour. As. Soc. Bengal. LXXV. 445 (1915).

MALESIA.

Lithocarpus borneensis, comb. nov.

Quercus borneensis Merrill in Philip. Jour. Sci. XXI. 516 (1922).

BORNEO.

Lithocarpus boholensis, comb. nov.

Quercus boholensis Merrill in Philip. Jour. Sci. XXIX. 476 (1926).

PHILIPPINE ISLANDS.

Lithocarpus Cantleyana, comb. nov.

Quercus Cantleyana King in Hooker f., Fl. Brit. India, V. 613 (1890); in Ann. Bot. Gard. Calcutta, II. 64, t. 59 (1890).

Pasania Cantleyana Gamble in Jour. As. Soc. Bengal, LXXV. 433 (1915).—Ridley, Fl. Malay. Pen. III. 381 (1924).

Synaedrys Cantleyana (King) Koidzumi in Tokyo Bot. Mag. XXX. 190 (1916).

MALESIA.

Lithocarpus Ewyckii, comb. nov.

Quercus Ewyckii Korthals, Kruidkunde in Verhand. Natuurl. Geschied. Nederl. Bezitt. Bot. 212, t. 46 (1839–42).—King in Ann. Bot. Gard. Calcutta, II. 68, t. 62a (1890).

[1] Continued from vol. IX. 31.

Cyclobalanus Ewyckii Oersted in Naturh. For. Vidensk. Meddel. XVIII. 80 (1866).
Pasania Ewyckii Gamble in Jour. As. Soc. Bengal. LXXV. 431 (1915).
Synaedrys Ewyckii (Korth.) Koidzumi in Tokyo Bot. Mag. XXX. 191 (1916).
MALESIA.

Lithocarpus Falconeri, comb. nov.
Quercus Falconeri Kurz in Jour. As. Soc. Bengal. XLIV. pt. II. 197 (1875).—Hooker f., Fl. Brit. Ind. V. 608 (1890).—King in Ann. Bot. Gard. Calcutta, II. 42, t. 34 (1890).
Pasania Falkoneri [*sic*] (Kurz) Schottky in Bot. Jahrb. XLVII. 676 (1912).
Synaedrys Falconeri (Kurz) Koidzumi in Tokyo Bot. Mag. XXX. 195 (1916).
BURMA.

Lithocarpus luzoniensis, comb. nov.
Quercus luzoniensis Merrill in Philip. Jour. Sci. III. Bot. 323 (1908); V. Bot. 342 (1910); Enum. Philip. Flow. Pl. II. 28 (1923).
Synaedrys luzoniensis (Merr.) Koidzumi in Tokyo Bot. Mag. XXX. 197 (1916).
PHILIPPINE ISLANDS.

Lithocarpus minahassae, comb. nov.
Quercus minahassae Koorders apud Elmer in Leafl. Philip. Bot. III. 941 (1910).—Koorders in Koorders-Schumacher, Syst. Verz. Herb. Koorders, III. 28 (1911), nomen.—Merrill, Enum. Philip. Flow. Pl. II. 28 (1923).
CELEBES, PHILIPPINE ISLANDS.

Lithocarpus Nymanniana, comb. nov.
Pasania Nymanniana Markgraf in Bot. Jahrb. LIX. 77 (1924).
NEW GUINEA.

Lithocarpus papuana, comb. nov.
Quercus pseudo-molucca var. *papuana* Warburg in Bot. Jahrb. XIII. 286 1891).—Seemen in K. Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 263 (1901).
Quercus grandifrons Seemen, op. cit. Nachtr. 240 (1905).—Non King.
Quercus lamponga Warburg in Bot. Jahrb. XIII. 286 (1901).—Non King.
Pasania papuana Markgraf in Bot. Jahrb. LIX. 74 (1924).
NEW GUINEA.

Lithocarpus rizalensis, comb. nov.
Quercus rizalensis Merrill in Philip. Jour. Sci. XIII. Bot. 272 (1918); Enum. Philip. Flow. Pl. II. 30 (1923).
PHILIPPINE ISLANDS.

Lithocarpus rufo-villosa, comb. nov.
Pasania rufo-villosa Markgraf in Bot. Jahrb. LIX. 74, fig. 3, fig. 4 B, C (1924).
NEW GUINEA.

Lithocarpus spicata (Sm.) **Rehd. & Wils. var. placentaria,** comb. nov.
Quercus depressa Blume in Verh. Bat. Genootsch. IX. 209, t. 2 (1823).
Quercus placentaria Blume, Bijdr. 518 (1825); Fl. Javae Cupulif. 19, t. 9 (1829–52).—DeCandolle, Prodr. XVI. pt. II. 87 (1864).—Non Wallich.
Quercus spicata var. *placentaria* Miquel, Fl. Ind. Bat. I. 849 (1855); Fl. Ind. Bat. I. pt. I. 849 (1855).
Quercus spicata var. *depressa* King in Ann. Bot. Gard. Calcutta, II. 48 (1890).—Koorders & Valeton in Meded. Land's Plantent. LXVIII. 42 (Bijdr. Boomsoort. Java, X) (1904).

Pasania spicata (Sm.) Oerst. var. *placentaria* (Miq.) Schottky in Bot. Jahrb. XLVII. 664 (1912).—Markgraf in Bot. Jahrb. LIX. 79, fig. 4a (1924).

JAVA, NEW GUINEA.

Lithocarpus Vidalii, comb. nov.

Quercus Vidalii Fernandez-Villars, Nov. App. Fl. Filip. 209 (1880).—Vidal, Sin. Pl. Leñ. Filip. Atl. 41, t. 92, fig. B (1883); Rev. Pl. Vasc. Filip. 260 (1886).—Elmer in Leafl. Philip. Bot. VI. 1981 (1913).—Merrill, Enum. Philip. Flow. Pl. II. (1923).

PHILIPPINE ISLANDS.

Sophora secundiflora Lag. f. **xanthosperma**, forma nov.

A typo recedit seminibus flavis.

TEXAS: San Antonio, on the north side of a low ridge running west from the extreme north end of Brackenridge Park and San Antonio River, *L. W. Nuttall*, February and March, 1927 (Type); also in other counties in southwestern Texas (L. W. Nuttall in a letter of Dec. 15, 1928).

No yellow-seeded form of *S. secundiflora* has been so far recorded. The seeds collected by Mr. Nuttall vary somewhat in color; most of them are antimony yellow running to ochraceous-orange (Ridgway, pl. XV) while the palest run to mustard-yellow (Ridgway, pl. XVI). There are also shrubs which bear seeds mottled yellow and red, but the great majority of shrubs in that particular locality bear pods with the typical red seeds which run from nopal red to Brazil red and scarlet (Ridgway, pl. I). Regarding the frequency of the shrubs which bear yellow seeds, Mr. L. W. Nuttall, in a letter of March, 1927, writes as follows: "A few days ago I spent several hours in further investigation of the Sophora shrubs on which the yellow seeds are found. I went with a preconceived idea that I would find them on old injured or partly dead specimens. I found them on sound specimens 20 feet high and the clearest and palest were on one that was not over 4 feet high. I also found that some produce only dark rich red seeds, these constitute the bulk and are of various heights. There are others, perhaps one in a thousand, that have more or less mottled seeds, all having at least a slight tint of yellow, then there are those that have pale yellow seeds, these I judge number about one in ten thousand." In a letter dated December 15, 1928, Mr. Nuttall writes that the yellow-seeded form grows in more than one county in southwestern Texas and adds that it "has been much used by the children in playing games, when added to the true species they are used as counters, etc., the red, yellow and spotted ones having different values."

The fact that it is much used by children in their play shows that it is of fairly frequent occurrence in that part of the country and it seems strange that the form has not been recorded before.

Hypericum kouytchense Léveillé in Bull. Soc. Agric. Sarthe, XXXIX. 322 (Bouquet Fl. Chine, 7) (1904); in Bull. Soc. Bot. France, LIV. 592 (1907); Fl. Kouy-Tchéou, 198 (1914).

Hypericum spec. Rehder in Sargent Pl. Wilson. III. 452 (1917).

China. Kweichou: mountains of Lou-tsong-koan, *Em. Bodinier*, no. 1603, May 31, 1897 (common in the mountains; handsome yellow flowers). Eastern Szechuan: Wushan, cliffs and thickets, alt. 1000 m., *E. H. Wilson*, Arnold Arb. Exp. no. 256, 1907 (shrubby, 0.6 m. tall; flowers yellow. Seeds only).—Plants raised from seed of no. 256: Aldenham House Gardens, Elstree, Herts, England, *S. Beckett*, 1928.

This species belongs to the sect. *Norysca* and seems intermediate between *H. lysimachioides* Wall. and *H. patulum* Thunb.; it is most closely related to the latter, but differs in the ovate-lanceolate acuminate sepals, the obovate-oblong petals, the shorter stamens, the longer styles, longer than the elliptic-ovoid ovary and the stamens, and the generally more pointed leaves. By its rather narrow sepals and petals it resembles *H. lysimachioides* Wall., but that species has still narrower sepals and petals, longer stamens and shorter styles. As Léveillé's description is incomplete, I give here a description chiefly based on the specimens received from Aldenham: Much-branched shrub about ½ m. tall; branchlets slightly two-edged, usually purplish; leaves subsessile, elliptic-ovate to elliptic-oblong, acute or acutish, broadly narrowed at base, 2–4.5 cm. long and 0.8–2 cm. broad, glaucescent beneath. Flowers golden-yellow, about 5 cm. across, in 3-flowered cymes, pedicels 5–10 or rarely to 15 mm. long, the lateral ones with small lanceolate or linear lanceolate bracts; sepals ovate-oblong or oblong-lanceolate, acuminate, 5–10 mm. long and 2.5–4 mm. broad; petals obliquely oblong-obovate, 2–2.5 cm. long and 1.2–1.5 cm. broad, minutely denticulate on one side above the middle; stamens about half as long as petals; styles 5, slender, straight, recurved only at apex, exceeding the stamens, longer or as long as the elliptic-ovoid ovary.

✓ **Pertya discolor,** spec. nov.

Frutex metralis, valde ramosus, ramis gracilibus erecto-patentibus cortice fibroso solubili flavido-griseo obtectis; ramuli juniores tenuiter adpresse pubescentes; gemmae ovoideae, obtusiusculae, pauciperulatae, griseo-pubescentes. Folia decidua, membranacea, sparsa, alterna, in ramulis annotinis 2–3-fasciculata interdum paucis minoribus additis, brevipetiolata, anguste vel lineari-lanceolata, acuta, basi attenuata, 1–2.5(–3) cm. longa et 3–4.5 mm. lata, integra, supra glabra, laete viridia, subtus dense tomento albo villoso-sericeo obtecta, costa media supra impressa subtus elevata, nervis lateralibus paucis vix visibilibus. Capitula solitaria in axillis foliiferis ramulorum annotinorum pedunculo gracili pubescente 4–7 mm. longo suffulta, oblongo-ovoidea, 7–8 cm. longa, 3–4-flora; involucri squamae albido-pubescentes, circiter 10, exteriores ovatae et acuminulatae, circiter 3 mm. longa, interiores oblongae, ad 6 mm. longa, obtusae, vix venosae; pappi setae scabrae, corolla paullo breviores; corolla rubro-purpurea, 6–7 mm. longa, fere ad medium divisa, lobis linearibus acuminatis; antherae 3.5–4 mm. longae, breviter

acuminatae, basi longe caudatae. Achaenia obovoideo-oblonga, subteretia, 5 mm. longa, 1.5 mm. crassa, decemcostata, breviter subadpresse pilosa, pappi radiis 6 mm, longis scabridis albidis basin versus leviter fuscescentibus.

CHINA. Central Kansu: en route to Lin hoa shan, from Choni via Tao chow, among scrub, *J. F. Rock*, no. 12667, July, 1925 (plant 1 m.; leaves silvery white beneath; florets dark purplish red; type). Shansi: Chieh-shin distr., Mien-shan-ye, ad rupes apricas in silva frondosa, et ad marginem silvae in rupibus, alt. 1900–2000 m., *Harry Smith*, nos. 5786 and 7839, June 19 and Sept. 5, 1924 (flower-buds and fruit).

This very distinct new species seems to be most nearly related to *P. sinensis*, but is readily distinguished by its pubescence, the smaller and narrower leaves tomentose beneath, the shorter-peduncled few-flowered smaller heads, with purple flowers. This species is the only really ligneous Composite collected by Rock on his expedition to Kansu and northeastern Tibet; there are some suffruticose species which with the herbaceous Compositae collected during this expedition are in the hands of Dr. J. Mattfeld for determination.

A.
Pandanus Brassii Martelli
Domara River, Eastern Division

B.
Pandanus pendulinus Martelli
Ihu, Vailala River, Central Division

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME X JULY, 1929 NUMBER 3

THE PANDANACEAE COLLECTED FOR THE ARNOLD ARBORETUM BY L. J. BRASS IN NEW GUINEA

U. MARTELLI

Plate 18

DURING the Arnold Arboretum Expedition to New Guinea in 1925 and 1926 Mr. L. J. Brass collected some Pandanaceae chiefly in the Gulf Division of the Territory of Papua in the region of the Vailala River which empties into the sea at about 150 miles northwest of Port Moresby and also in the region of the Laloki River which runs along the coast between Redscan Bay and Port Moresby. These Pandanaceae were kindly sent to me in 1927 for study by Mr. C. T. White of Brisbane who had undertaken to determine the collections of the expedition. I at once determined the material sent, but did not publish the results at that time. I now present here an enumeration of the Pandanaceae collected by Mr. Brass with descriptions of those I consider new to science. I also have included a Freycinetia collected in Papua Territory by Mr. Lane Poole who visited that Territory some time ago and published in 1925 a very interesting report entitled: "The Forest Resources of the Territories of Papua and New Guinea." Of this Mr. White also forwarded to me a specimen. I am greatly obliged to Mr. White for having entrusted to me the study of scientific material of such importance.

The types of the new species are in the herbarium of the Arnold Arboretum except when stated otherwise.

Freycinetia stenophylla (Sectio Oligostigma) Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 53 (1905).

Laloki River, alt. 370 m., in riverine rain forests, no. 546, ♀ Oct. 30, 1925 (In Herb. Martelli, in Herb. Arnold Arboretum).

Freycinetia sp. (indeterminanda).

Fr. stenophyllae Warburg valde proxima (♂).

Murna River, Gulf Division, alt. 100 m., in the rain forests, no. 1332.

Freycinetia Beccarii (Sectio Oligostigma) Solms-Laubach in Ann. Gard. Bot. Buitenz. iii. 100 (1883), non Hemsley.

Thur, Vailala River, large rain forest, no. 929, Oct. 10, 1926 (♀).

Freycinetia fibrosa, spec. nov. (Sectio Oligostigma).

Caulis 5–7 mm. crassus, internodis 1 cm. longis, ramulis longiuscule foliosis. Folia patulo-ascendentia, subcoriacea, lanceolato-linearia, 25–40 cm. longa, 1 cm. lata (in planta ♂ 5–7 mm. lata) superne longe attenuato-acuminata et brevi spatio canaliculata, in parte basilari subaequaliter loriformia, 7 mm. lata, ima basi semi-amplectentia haud vaginantia, utrinque longitudinaliter dense venosa; marginibus dentibus subdistantibus, brevissimis, crassiusculis, acutiusculis, basim versus subhorizontalibus, in reliqua parte minutissimis acuminatis et divaricatis; costa media, in pagina inferiore, tenuissima et a medio ad apicem spinis parvis, sursum curvis, subdistantibus munita; auriculis (stipulis) in numerosas fibras intricatas elongatas caulem et basim foliorum ut in Palmis involventes solutis. Inflorescentia ♂ terminalis, spathis brevibus 3 cm. longis ovato-lanceolatis acuminatis; spatha exteriore longissime caudata; marginibus et costa media apicem versus acutissime serratis; pedicellis tenuibus, 17 mm. longis, cum parte staminifera oblonga, 4 mm. elongata; inflorescentia ♀ terminalis, 1–4, brevis, a spathis nonnullis brevioribus lanceolato-acuminatis suffulta; pedicellis brevibus, 1.5 cm. longis, tenuibus (2 mm. crassis). Syncarpia oblonga, 2–3.5 cm. circiter longa, 1.5–2 cm. diam.; baccae numerosae, lageniformes, pentagonae, 7 mm. longae, 3 mm. crassae, in parte superiore 3 mm. longa, liberae et in rostrum pyramidatum acute angulosum, vertice angusto, truncatum producta; stigmata 2–3; semina parva 1 mm. longa, curvula, a raphe et strophiolo angusto cincta.

Hokoro, Vailala River, 100 m. alt. in the rain forests, no. 1048, Febr. 22, 1926.

This species was collected for the first time by Dr. Schlechter in 1908 "in den Wäldern des Rand-Gebirges, Kaiser-Wilhemsland" at 1000 m. alt.: Schlechter, Pflanzen des Monsun-Gebietes, nos. 16675, 17702 (in Herb. Berlin). In 1912 Dr. Ledermann found it again during the Kaiserin Augusta-Fluss Expedition, at Lago, April 18 (Ledermann, no. 9772) and at Etappenberg, 850 m. alt. (Ledermann, no. 8954 [♀], no. 9190 [♂], in Herb. Berlin).

Freycinetia pseudo-insignis (Sectio Oligostigma) Warburg in Engler, Pflanzenr. IV–9, p. 33 (Pandan.) (1900).

Thur, Vailala River, no. 1052 (♀).

Freycinetia Lauterbachii (Sectio Oligostigma) Warburg in Engler, Pflanzenr. IV–9, p. 34 (1900).

Hydrographer's Range, all through the rain-forests from sea-level to 1800 m. alt., *C. E. Lane Poole,* no. 236, Aug. 1922 (in herb. Martelli).

Pandanus tectorius (Sectio Keura) forma.—Solander, Prim. Fl. Ins. Pacif. 350 (ined.)—Parkinson, Jour. Voy. South Sea (1773).

Pandanus odoratissimus Linnaeus fil., Suppl. 424 (1781).

Kerema, Gulf Division, common on the sea beach, no. 1228, March 25, 1926.

The specimen consists only of one leaf, a portion of the male inflorescence and some few unripe phalanges. Under these conditions it is not possible to determine whether this form of *P. tectorius* can be referred to one of the forms already known from New Guinea or not.

Pandanus scabribracteatus, nov. spec. (Sectio Keura).

Arbor 7 m. circiter alta, in parte apicali pluriramosa, stipite ad basin radicibus aëreis crassis suffulto. Folia 2–2.5 m. circiter longa, 8–10 cm. lata, glaucescentia, in apice sensim attenuato-acuta, utrinque et praecique ad apicem longitudinaliter perspicue venata, marginibus serratis, costa media in pagina inferiore prominente, ad basim late triangulari, irregulariter acute denticulato-serrata. Spadix ♀ circiter 40 cm. longus, curvus (?), rachi acute trigona, crassa, in parte inferiore spathis viridibus foliis brevioribus subsimilibus munitus, in parte superiore (florifera) plurimis spathis conspicuis albis armatus; haec spathae superiores, parce dissitae, caducae ?, crasse coriaceae, ovato-lanceolatae, naviculares, acutae, profunde concavae, interdum basin versus angustatae et ima basi in dorso gibbosae, 14–20 cm. longae, 7–8 cm. latae (ad basim), dorso carinatae, in pagina inferiore venulatae et rugoso-sagrinato-scabrae, in superiore profunde concavae et, praecipue in parte basilari, longitudinaliter venatae et transverse tessellatae, scabriusculae, marginibus et carina inermibus. Syncarpia, in specimine nostro, 4, non conferta, in racemo subflexuoso disposita, in axilla unumquodque spathae involventis situm sessilia; phalanges plurimae, pluriloculares.

Lepokera, Vailala River, no. 987, Febr. 16, 1926.

Pandanus Brassii, spec. nov. (Sectio Keura). Plate 18, fig. A.

Arbor 4–6 m. alta, trunco fusco-nitido, radicibus aëreis orbato, superne 4–5 ramis inter se distantibus, divaricatis, ascendentibus. Folia circiter bimetralia, coriacea, glauca, basim versus vix sensim latiora, in dimidia inferiore parte et ultra profunde plicato-canaliculata, in parte superiore expansa (7 cm. lata) et longissime sensim angustata et acuminato-subulata, utrinque, sed praecique in pagina inferiore, crebre longitudinaliter venosa; marginibus basilaribus parum dentatis, dentibus brevibus, subulatis, divaricato-ascendentibus, in reliqua parte nudis vel cum raris et minutissimis dentibus; plicis lateralibus vix notatis et inermibus; costa, media in pagina inferiore, angusta, inermis, basin versus tantum aliquibus dentibus brevissimis munita. Syncarpium pendulum, solitarium, globosum, pedunculo elongato circiter 40 cm., 2 cm. crasso, angulato, acute trigono; phalanges obpiriformes, 8 cm. longae, 5 cm. latae, persaepe compressae, 3.5–4.5 cm. crassae, pentagonae, faciebus planis haud rimosis, in tertia superiore parte liberae, convexae, ibique longitudinaliter a numerosissimis cicacitribus linearibus suberosis notatae, in ⅔ inferioribus connatae, sensim in basim angustam attenuatae, superne subplanae, convexiusculae, a loculis 6–10 superatae; loculis a sulcis angustis haud profundis separatis, pyramidatis, plusminusve

prominentibus, subirregulariter pentagonis, in basi latis, 1–2 interioribus subminoribus, vertice subpapilliformibus cum stigmate verticali, haud prominente; endocarpium osseum, in medio phalangis locatum, 3.5 cm. spissum, ambitu rotundatum, superne sulcato-rugosum, inferne subtruncatum; mesocarpium superum 1.5 cm. spissum, lacunosum, medullosospongiosum, inferius 2.5 cm. spissum, fibrosum.

Domara River, Eastern Division, on small areas of open grass land near coast, no. 1604, May 31, 1926.

Pandanus leptocarpus (Sectio Bryantia) Martelli in Webbia IV. pt. I. 21 (1913); pt. II. t. 33, fig. 8 (1914), sine descriptione.

Folia ultra unum metrum longa, 3.5 cm. lata, subcoriacea, acute et anguste plicato-canaliculata, utrinque longitudinaliter crebre et minute striata, in pagina superiore minutissime tessellata, sursum sensim attenuato-acuminata, in apice subulata, in basi dilatata et late amplectentia, levia; ad margines dentibus minutis munita, basim versus latiusculis, propinquis, longiusculis, sursum curvatis et subulatis; costa media acuta, in fere dimidiam superiorem partem dentibus distantibus, minutissimis praedita. Syncarpium cylindricum, 30 cm. longum, 15 cm. diam., rubro-aurantiacum et virescens (Versteeg). Drupae confertae, lineares, prismaticae, penta-hexagonae, basim versus attenuato-caudatae, in sicco rubro-aurantiacae, 5 cm. longae, 4 mm. latae, pileo apicali brevissimo 5 mm. longo penta-hexagono, pyramidato-subrotundato in vertice explanato, discoideo, anguloso a superficie stigmatica fere repleto; mesocarpii pars superior alba, medullosa, 2.5 cm. longa, pars infera fibrosa; endocarpium lignosum, tenue, infra medium drupae situm, 9 mm. longum, oblongum.

Dutch New Guinea: Noord River, *Versteeg*, no. 1101, in 1907 (type in herb. Utrecht). Territory of Papua: Kiva, Vailala River, on slow swampy river bank, *L. J. Brass*, no. 1164, March 16, 1926.

In 1913 in my Enumerazione delle Pandanaceae, in Webbia (l. c.) I published this new species, collected by Mr. Versteeg on the Noord River (Versteeg, no. 1101) in Dutch New Guinea during the expedition in 1907, but I gave no description of it. The Versteeg specimen is in the Utrecht herbarium.

Pandanus kivi, sp. nov. (Sectio Lophostigma).

Arbor gracilis, 4.5–7 m. alta, ramosa, trunco basin versus spinis brevibus sine ordine sparsis instructo, apicem versus cicatricibus foliaceis notato (Brass). Folia 120–180 cm. longa, angusta, sensim attenuata, acuminata, intense viridia, coriacea, in dimidia inferiore parte plicata et anguste canaliculata, in reliqua parte plana, 4 cm. lata; in pagina inferiore, in dimidia superiore parte, longitudinaliter minute venata, in dimidia inferiore cum venis evanescentibus, plicis lateralibus acutiusculis et apicem versus in pagina superiore parce et minute denti-

culatis, costa media, in pagina inferiore, angusta et acuta, ultra mediam partem tantum usque ad apicem minute serrata, dentibus brevissimis, minutis congestis inaequaliter dispositis et interdum geminis. Syncarpium solitarium cernuum, pedunculo trigono, circiter 20 cm. longo, in basi tenui (1 cm. diam.), nudo, in apice 4 cm. crassa, spathis confertis, imbricatis, in plurimis ordinibus dispositis induto; spathae decrescentes, naviculares, lanceolato-ellipticae, exteriores 30 cm. longae, 8 cm. latae, crasse coriaceae, interiores cartilagineae; marginibus plus minusve minute breviter serratis; syncarpium circiter 20 cm. longum, spathis involutum, conicum, circiter 7 cm. diam. (ad basim); drupae dense adpressae, numerosissimae, prismatico-paulum-cuneatae, hexagonae, maturae 17 mm. longae, 4–5 mm. diam., connatae, apice brevissime pileatae, hic subliberae; pileo (2 mm. spisso) convexiusculo-subplano, in sicco vix rugoso cum areola levi centrali subconcava; stylus subeccentricus, parvus, adpressus, depressus, interdum ex abrupto adscendens, supra planus, levis, flabelliformis; stigma subdigitatum, nigrescens; endocarpium osseum, cuneato-oblongum, sursum rotundatum, 9 mm. longum; mesocarpium superum cavernoso-fibrosum, 3 mm. longum, inferum fibrosum, 5 mm. longum.

Lower Mori River, Eastern Division, on the river bank, no. 1557, May 28, 1926.—Indigenous name: "Kivi."

Pandanus Lauterbachii (Sectio Agrostigma) Schumann & Warburg in Engler, Pflanzenr. IV–9, p. 81 (1900).

Lepokera, Vailala River, in swampy rain forest, no. 986, Febr. 16, 1926 (in Herb. Martelli and Arnold Arboretum).

Pandanus ihuanus, spec. nov. (Sectio Acrostigma).

Dumosus, cum stipite ramoso, circiter 30 m. alto. Folia numerosa, cernua, circiter 2.5 m. longa, late linearia, lanceolata, 6 m. lata, apicem versus sensim attenuata et in acumen breve subulatum desinentia, coriacea, utrinque, sed praecipue in pagina superiore, conspicue longitudinaliter venata et transverse venulato-tessellata; marginibus serratis vel cum dentibus brevibus, tenuibus, distantibus, subhorizontalibus; costa media in parte basilari longo spatio, aculeis brevibus, crassiusculis, reversis armata; plicis lateralibus in pagina superiore et apicem versus crebre aculeatis, interdum aculeis in duplici serie dispositis; folia ramulorum juvenilium parva et inermia (fide Brass). Syncarpium solitarium, globoso-trigonum, 11–12 cm. diam., rufum, pedunculo 1.5 cm. crasso, erecto, acute trigono, brevi (12 cm.), plurimis bracteis subapproximatis deciduis suffultum; drupae numerosae, in toto 4.5 cm. et ultra longae, in parte inferiore connatae, in superiore liberae; pars inferior seminifera 2 cm. longa, cuneata, in apice 6 mm. crassa, basi acuta; pars superior in maturitate facile secedens, crassiuscule coriacea, 2.5 cm. longa, (in sectione longitudinali medullosa) acute hexagona, cum faciebus inaequalibus, planis et levibus, e tertia superiore parte (ubi est etiam 8

mm. crassa, asymmetrica, plus minusve subgibbosa) usque ad basim attenuato-cuneata, et in sicco plus minusve valide et acute plicato-costulata; desuper in tertia superiore parte pyramidata et in stylum mucroniformem producta, cum superficie stigmatica angusto-lineari deorsum vergente, 6 mm. longa; endocarpium osseum, tenuissimum, 12 mm. longum, cuneatum, ad basim acutum; mesocarpium inferum subnullum, cum caverna supraseminali subrotundata, circiter 6 mm.

Vailala River, in the rain forest, no. 978, Febr. 15, 1926.

Pandanus pendulinus, spec. nov. (Sectio Acrostigma). Plate 18, fig. B.

Arbor 7–8 m. alta (fide Brass) cum stipite spinis (radicibus aëreis abortivis?) munito, et in summo plurimus ramis coronato, in basi radicibus aëreis circiter 3 m. longis, crassis, grallaeformibus, fibrosis et dense spinosis (spinis, fide Brass, sursum curvis) suffulto. Folia 3–3.5 m. et ultra longa, circiter 10 cm. lata, recurva, coriacea, canaliculata, apicem versus subplana et sensim attenuato-acuminata, in marginibus serrata, cum dentibus basi lata brevibus, patentibus, acutis; in pagina inferiore glaucescentia, longitudinaliter crebre, minute et superficialiter venata; costa media acuta, valide prominens, minute et brevissime denticulata. Inflorescentia ♂ tantum nota, reclinata, spicata, plus quam unum metrum longa, plurimis spathis paulum distantibus vestita, cum rachi crassa; spathis decrescentibus, inferioribus ultra ½ m. longis, lanceolato-sensim-acuminatis, navicularibus; superioribus angustis, lineari-lanceolatis, sensim acuminatis; una spicula elongata in axilla cujusque spathae sita, subsessilis et densissime staminibus omnino tecta; spiculae apice attenuatae, inferiores etiam 20 cm. longae, 4 cm. crassae (ad basim); stamina numerosissima, densissime conferta, sine columna, unumquodque super bulbillum axis spicae affixum; antherae lineares, 2–2.5 mm. longae, apiculatae, immaturae, erectae, densissime confertae, subsessiles, maturae filamento longissimo, tenuissimo, 2.5 mm. longo plus minusve flexuoso sustentae quare antherae pendulae fiant.

Ihu, Vailala River, Central Division, no. 1053, Febr. 24, 1926.

Florence, Italy
April, 1929

FICUS SPECIES COLLECTED FOR THE ARNOLD ARBORETUM IN NEW GUINEA BY L. J. BRASS

V. S. SUMMERHAYES

Sect. PALAEOMORPHE

Ficus acanthophylla, sp. nov.

Arbor parva, ramis crassis cortice laevi griseo obtectis; ramuli subangulares, juventute aculeolis rectis vel leviter curvatis praediti, demum laeves, glabri, pallide brunnei. FOLIA oblonga vel oblongo-obovata, apice breviter acuminata, basi rotundata vel leviter cordata, matura subcoriacea, 14–24 cm. longa, 6–12 cm. lata, juniora utrinque praesertim

nervis aculeolata, supra costa parce aculeolato-pilosa excepta glabra, subtus praesertim nervis venisque pubescentia, matura supra nitida glabra, subtus pubescentia, asperula, costa ut nervi supra prominula subtus valde prominente, nervis lateralibus utrinsecus 7–10 infimis adscendentibus brevibus ceteris patentibus curvatis prope marginem pulchre arcuatim conjunctis, nervis transversis prominulis, rete venularum indistincto; petiolus 1.5–4.5 cm. longus, leviter compressus, supra canaliculatus, juventute aculeolatus, scaberulus, demum sublaevis; stipulae lanceolatae, acutae, circiter 1 cm. longae, extra scaberulae. RECEPTACULA pedunculata, axillaria, solitaria, vel e ligno veteri fasciculata, purpureo-viridia, 2–2.75 cm. diametro, glabra, asperula, flores ♂, ♀ et ♀ cecidiophoros commixtos includentia; pedunculus pro receptaculo gracilis, 2.5–3.5 cm. longus, 1.5–2 mm. diametro, scaberulus, basi bracteis minutis instructus. FLORES ♂ saepissime prope ostiolum, pedicellati, perianthii segmentis 4 oblongis obtusis apice subcucullatis staminibus aequalibus; stamina 2, filamentis 0.7 mm. longis, antheris 0.8–1 mm. longis. FLORES ♀ floribus ♀ cecidiophoris commixti, 3–3.5 mm. longe pedicellati, perianthii lobis 4 linearibus vel oblongis; stamen 1; ovarium cecidiophorum ellipsoideum vel abortivum, stylo brevissimo. FLORES ♀ cecidiophori sessiles vel usque ad 3.5 mm. longe pedicellati, perianthii lobis 5 linearibus liberis ovario aequalibus; ovarium ellipsoideum vel obovoideum, laeve, stylo brevi, stigmate minuto. FLORES ♀ non visi.

Kuranin, Eastern Division, no. 1388, May 12, 1926 (small riverbank tree).

The presence of hermaphrodite flowers places this plant in sect. Palaeomorphe although it does not resemble very closely any of the species of that section. The presence of both male and hermaphrodite flowers has been recorded in *F. lamprophylla* Laut. & K. Sch., also from New Guinea, but the two species are quite different in other respects. King describes the rare occurrence of hermaphrodite flowers among the usual 2-staminate male flowers in *F. dumosa* King belonging to sect. Eusyce, and suggests that the species is intermediate in this character between that section and sect. Palaeomorphe.

Ficus adenosperma Miquel in Ann. Mus. Bot. Lugd.-Bat. III. 233, 296 (1867).

Lotoki River, riverine rain-forest, 360 m. alt., no. 550, Oct. 31, 1925 (small tree); Kurandi, Eastern Division, no. 1389, May 12, 1926 (tree 20 feet or more in height, forming dense thicket in river bed).

Vernacular Name:—Boko.

Ficus androbrota sp. nov.

Arbor erecta, 3 m. alta; ramuli teretes, juventute scaberuli, demum glabri, cortice pallide brunneo fere laevi obtecti. FOLIA breviter petiolata, elliptica vel elliptico-obovata, obtusa vel rotundata, apiculata,

basi rotundata vix cordata, 2–6 cm. longa, 1.5–4 cm. lata, chartacea vel tenuiter coriacea, juventute scabrido-pilosa, demum utrinque glabra, supra scaberula, subtus asperula, costa subtus prominente, nervis lateralibus utrinsecus 7–9 patentibus curvatis subtus prominulis, rete venularum tenuissimo distincto; petiolus supra concavus, 4–6 mm. longus, scaber; stipulae lineari-lanceolatae, acutae, pubescentes, brunneae, scariosae. RECEPTACULA pedunculata, axillaria, solitaria, maturitate nigra, subglobosa, ostioli bracteis prominentibus, 7–8.5 mm. diametro, basi interdum in stipem brevissimum angustata, bracteis basalibus tribus triangularibus subacutis 0.5–1 mm. longis instructa, glabra, asperula; pedunculus 2–4 mm. longus, asperulus. FLORES ♂ juxta ostiolum, sessiles, perianthii segmentis 5 liberis linearibus usque subspathulatis interdum subfalcatis 2–2.5 mm. longis hyalinis ciliolatis; stamen singulum, filamento 0.8 mm. longo, anthera 1.2 mm. longa. FLORES ♀ inter florem ♂ et ♀ cecidiophorum dispositi, pedicellati, perianthio ei florum ♂ simili; stamen singulum, filamento 0.8 mm. longo, anthera 1 mm. longa; ovarium incomplete evolutum, stylo pro rata longiusculo. FLORES ♀ cecidiophori sessiles vel usque ad 2 mm. pedicellati, perianthii segmentis 4–5 liberis linearibus acutis 2.5–3.5 mm. longis hyalinis ciliolatis; ovarium globosum vel obovoideum, stylo infra-apicali brevi, stigmate capitato vel leviter 3–4-lobo. FLORES ♀ non visi.

Kappa Kappa, open coast lands, no. 800, Dec. 8, 1925 (eaten by natives).

This species very evidently belongs to sect. Palaeomorphe where it is closely allied to *F. adenosperma* Miq., a native of Eastern Malaya. In this latter species some of the uppermost gall flowers bear an abortive anther, whereas in *F. androbrota* the hermaphrodite flowers bear perfect anthers, while it is doubtful if the ovaries ever develop properly. *F. adenosperma* differs from the present species in having the stems and under surfaces of the leaves tawny pubescent when young, in the longly acuminate leaves and in the larger hairy receptacles.

Ficus gibbosa Blume, Bijdr. 466 (1825).

U-uma River headwaters, Eastern Division, 450 m. alt., no. 1448, May 18, 1926 (handsome riverbank tree, 20–25 feet).

Ficus subulata Blume, Bijdr. 461 (1825).

Lotoki River, no. 549, Oct. 31, 1925 (large parasitic fig); Ihu, Vailala River, rain forests, no. 907, Febr. 9, 1926 (small tree); same locality, no. 1020, Febr. 20, 1926 (medium rigid tree); Bomgwina River, Eastern Division, no. 1620, June 2, 1926 (large tree over-hanging river, common).

Ficus xanthosyce, sp. nov.

Arbor parva vel usque ad 12 m. alta; ramuli teretes, longitudinaliter striati, scabrido-pilosi, demum glabri, cinereo-brunnei, internodiis usque ad 4 cm. longis. FOLIA petiolata, oblongo-elliptica, elliptica vel oblanceolata, apice subacuta usque breviter acuminata, basi rotundata vel

leviter et interdum inaequaliter cordata, 4–14 cm. longa, 2–5.5 cm. lata, tenuiter coriacea, supra papillis albidis scabridis praedita, costa albido-pilosa demum glabra, subtus praesertim costa nervisque breviter scabrido-pilosa, costa supra leviter impressa subtus prominente, nervis lateralibus utrinsecus 5–10 adscendentibus indistincte vel vix conjunctis, nervis tertiariis manifestis quadratim conjunctis, rete venularum subtilissimo; petiolus supra complanatus vel concavus, 5–10 mm. longus, scabrido-pilosus, cinereus; stipulae lanceolatae, acuminatae, pilosae, cito deciduae. RECEPTACULA pedunculata, axillaria, solitaria usque ternata, subglobosa, 5–7 mm. longa, 5–9 mm. diametro, flava, scaberula, umbilico prominulo, ostiolo leviter depresso, basi in stipem brevem angustata, bracteis basalibus tribus minutis; pedunculus 2–4 mm. longus, scaberulus. FLORES dioici, squamis linearibus hyalinis commixtis; ♂, ⚥ et ♀ cecidiophori in receptaculis plantae masculae dispositi; ♀ tantum in receptaculis aliarum plantarum lati. FLORES ♂ prope ostiolum, sessiles vel breviter pedicellati, perianthii segmentis 3 linearibus vel subspathulatis superne coalitis antheram includentibus brunneo-maculatis; stamen 1, filamento 0.5 mm. longo, anthera 0.7 mm. longa. FLORES ⚥ prope ostiolum, sessiles vel pedicellati, perianthii segmentis 4 eis floris ♂ similibus; stamen 1, filamento 0.5 mm. longo, anthera 0.5 mm. longa; ovarium imperfecte evolutum, stylo brevi, stigmate apice cavo. FLORES ♀ cecidiophori sessiles vel usque ad 1.5 mm. longe pedicellati, perianthii segmentis 5 basi ± coalitis linearibus vel subspathulatis superne adhaerentibus 2–2.5 mm. longis rubescentibus; ovarium ellipsoideum, laeve, stylo infra-apicali, stigmate apice cavo. FLORES ♀ sessiles vel usque ad 2.5 mm. longe pedicellati, perianthii segmentis 4 liberis linearibus vel subspathulatis ovario saepissime longioribus superne saepe adhaerentibus rubescentibus brunneo-maculatis vel albidis; ovarium compresse ellipsoideum vel ovoideum margine a stylo averso carinatum, rugulosum, stylo laterali, stigmate clavato vel subclavato.

Sogeri, rain forest, 450 m., no. 651, Nov. 16, 1925 (female plant); U-uma River, Eastern Division, no. 1520, May 20, 1926 (small tree in river bed; male-gall plant) (type); Kerema, Gulf Division, rain forest regrowths, no. 1209, March 24, 1926 (female plant).

As with *F. androbrota* Summerhayes the characters place this species in sect. Palaeomorphe although the very rough leaves are not found in most of the other and typical species of the section. From *F. androbrota* itself, to which it seems to be allied, it is separated by the scaly outgrowths on the inside of the receptacle and the more acuminate leaves which are hairy underneath. *F. lima* Laut. & K. Schum., which also has rough leaves, has quite different floral characters and differs in a number of other points. In general characters, apart from the presence of hermaphrodite flowers, *F. xanthosyce* shows considerable affinity with many species in sect. Sycidium.

No. 1209 differs in some respects from the other two specimens the leaves being almost glabrous and of different texture while the perianth of the female flower is colorless. In most characters it agrees with the type and is best included with the others.

Sect. UROSTIGMA

Ficus Benjamina Linnaeus, Mant. 129 (1767).

Lower Mori River, Eastern Division, no. 1573, May 28, 1926 (large riverbank tree).

Vernacular Name:—Ban.

Ficus Rigo F. M. Bailey in Queensl. Agric. Jour. I. 235 (1897).

Rigo, on coast, no. 820, Dec. 9, 1925 (large handsome spreading tree).

Sect. SYCIDIUM

Ficus Armiti King in Jour. As. Soc. Bengal, LV. pt. II. 404 (1886).

Ihu, Vailala River, rain forests, no. 945, Febr. 12, 1926, (small tree); Mowabula, Eastern Division, rain forests, no. 1372, May 11, 1926 (slender tree 50–60 feet).

Ficus Brassii, sp. nov.

Arbor parva, 2–3 m. alta; ramuli teretes, longitudinaliter rugulosi, cinereo-brunnei, glabri, cicatricibus annularibus stipularum delapsarum distincte notati. FOLIA breviter petiolata, anguste lanceolata vel oblanceolata, acuta vel acuminata, apice ipso rotundata, basi cuneata, 10–16 cm. longa, 1.5–3.5 cm. lata, discoloria, coriacea, laevia, supra juventute longiuscule adpresse pilosa deinde glabra, subtus costa longiuscule adpresse pilosa excepta glabra, minute tuberculata, costa supra impressa subtus prominente, nervis lateralibus numerosis e costa angulo 80° exeuntibus prope marginem nervo marginali interiore conjunctis, nervis tertiariis distinctis; petiolus 7–12 mm. longus, supra concavus, glaber; stipulae lanceolatae, acuminatae, extra dense adpresse pilosae, intus glabrae, circiter 3 cm. longae, cito deciduae. RECEPTACULA axillaria, sessilia, solitaria vel gemina, globosa, 1 cm. diametro, laevia, minute rugulosa, viridia, basi bracteis duabus vel tribus latis bilobis lobis ovatis obtusis, ostiolo vix distincto. FLORES ♂ et ♀ cecidiophori per totum receptaculum commixti. FLORES ♂ pedicellati, pedicellis 1–2 mm. longis, perianthii segmentis 3 conjunctis; stamen 1, filamento 0.8 mm. longo. FLORES ♀ cecidiophori sessiles vel pedicellati, perianthii segmentis 3 conjunctis late ovatis; ovarium ovoideo-globosum, stylo laterali, stigmate integro vel 2–3-fido lineari-filiformi 0.5–1.2 mm. longo. FLORES ♀ non visi.

Lotoki River no. 1660, June 17, 1926 (small river bed tree, 6–8 feet hihg).

Vernacular name:—Manamadubu.

I have been unable to find any close relative of this plant. *F. irregularis* Miq. has similarly shaped leaves, but differs in its much smaller,

long-stalked receptacles. *F. Brassii* is probably correctly placed in sect. Sycidium.

Ficus dichroa, sp. nov.

Arbor parva, compacta; ramuli leviter compressi, longitudinaliter striati, scabri, internodiis usque ad 5 cm. longis. FOLIA opposita, petiolata, elliptico-ovata vel elliptico-obovata, brevissime acuminata, apice ipso obtusa vel fere retusa, apiculata, basi rotundata vel leviter cordata, 12–18 cm. longa, 6–7 cm. lata, chartacea, utrinque scaberula, costa supra prominula inferne leviter canaliculata subtus subprominente, nervis lateralibus utrinsecus 5–8 infimis e costa angulo 40–50° ceteris angulo 50–60° exeuntibus prope marginem irregulariter conjunctis utrinque prominulis, rete venularum tenuissimo vix distincto; petiolus complanatus, 1–2.5 cm. longus, scaber; stipulae parvae, oblongo-lanceolatae, 3 mm. longae, scabro-pubescentes, ciliolatae, cito deciduae. RECEPTACULA pedunculata, axillaria, solitaria vel gemina, fere globosa, 9–10 mm. diametro, scaberula, viridia atque brunnea, ostioli bracteis numerosis prominentibus pubescentibus; pedunculus gracilis, 4–8 mm. longus, scaber, apice in cupulam tenuissimam, 3–4 mm. diametro, receptaculo arcte adnatam, margine bracteas tres deltoideas obtusas ciliolatas ferentem productus. *Flores* ♂ prope ostiolum, sessiles, perianthii segmentis 3–4 linearibus hyalinis superne coalitis; stamen 1, filamento 0.8–1 mm. longo. FLORES ♀ cecidiophori sessiles vel usque ad 2 mm. longe pedicellati, perianthii segmentis 3–4 hyalinis linearibus ± coalitis; ovarium globosum vel obovoideo-globosum, stylo infra-apicali, stigmate brevi clavato. FLORES ♀ non visi.

Gulf Division, Keura, on the sea beach, no. 1190, March 22, 1926.

This species is very similar to *F. balica* Miq. which however, has the leaves much longer petiolate and the receptacles with long slender peduncles. Only the female flowers are known in *F. balica*.

Ficus eulampra K. Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 279 (1901).

Lotoki River, riverine rain-forests no. 556, Oct. 31, 1925 (small tree).

Ficus hystricicarpa Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 244 (1905).

Bisiatabu, rain forest floor, 450 m. alt., no. 827, Nov. 13, 1924 (shrub 3 ft.).

Ficus saxicola, sp. nov.

Arbor parva, 5 m. alta; ramuli teretes, plus minusve longitudinaliter rugulosi, glabri, cortice cinereo-brunneo obtecti, cicatricibus foliorum delapsorum notati. FOLIA breviter petiolata, oblongo- vel elliptico-lanceolata, plus minusve caudata, basi subcuneata, 14–18 cm. longa, 2.5–4 cm. lata, coriacea, utrinque glaberrima, supra nitentia, subtus siccitate cuprea, costa supra prominula subtus prominente, nervis

lateralibus numerosis parallelis e costa fere angulo recto exeuntibus rectis prope marginem nervo marginali interiore conjunctis utrinque subprominentibus, rete venularum distincto; petiolus supra concavus, 7–11 mm. longus, glaber, rugulosus; stipulae anguste lanceolatae, acuminatae, extra praesertim prope costam adpresse fulvo-pilosae, 2–4 cm. longae. RECEPTACULA axillaria, solitaria, sessilia, fere globosa, 8–10 mm. diametro, basi bracteis tribus late reniformibus plus minusve bilobis 2–2.5 mm. longis instructa, ostiolo leviter impresso bracteis vix manifestis. FLORES ♂ et ♀ cecidiophori per totum receptaculum commixti, squamis oblongis vel lanceolatis interspersis. FLORES ♂ pedicellati, pedicellis 0.5–2 mm. longis, perianthii segmentis 3 obtusis conjunctis; stamen 1, filamento 0.5 mm. longo. FLORES ♀ cecidiophori sessiles vel usque 2 mm. longe pedicellati, perianthii segmentis 3 vel 4 ovatis vel lanceolato-ovatis 0.8–1 mm. longis basi coalitis; ovarium ellipsoideo-globosum vel ovoideum, stylo laterali, stigmate lineari-filiformi 0.5 mm. longo integro vel 2–3-fido. FLORES ♀ non visi.

Iawarere, on rocks at water's edge, 300 m. alt., no. 699, Nov. 25, 1925 (small tree 15 feet high).

This species is closely allied to *F. Brassii* Summerhayes, but differs in having caudate leaves with different shape and venation and the midrib perfectly glabrous on the under surface. The floral characters are very similar, but in the absence of female flowers it is best to consider them as separate species.

Sect. COVELLIA

Ficus Bernaysii King in Jour. As. Soc. Bengal, LV. pt. II. 406 (1886).

Bisiatabu, rain forest, alt. 450 m., no. 569, Nov. 6, 1925 (small shapely tree, 20 feet high).

Ficus casearia F. Mueller ex Bentham, Fl. Austral. VI. 177 (1873).

Hula, in light jungle near beach, no. 527, Oct. 21, 1925 (small tree 10–15 feet); Sogeri, rain forest, 450 m. alt., no. 638, Nov. 16, 1925 (small tree 15 feet); Ihu, Vailala River, rain forest regrowths, no. 1055, Febr. 24, 1926 (small tree).

Ficus Chalmersii King, in Jour. As. Soc. Bengal, LV. pt. II. 406 (1886).

RECEPTACULA flores ♂ et ♀ cecidiophoros gerentia ramis tuberculatis brevibus e tronco exeuntibus disposita, pedunculata, pyriformia, umbilico valde depresso, 2–3 cm. longa, 2.5–3.5 cm. diametro, glabra, laevia, bracteis basalibus nullis. FLORES ♂ prope ostiolum, 0.7 mm. longe pedicellati, perianthii segmentis 3 fere orbicularibus valde imbricatis stamine includentibus; stamen 1, filamento crasso 0.5 mm. longo, anthera 1 mm. longa. FLORES ♀ cecidiophori sessiles vel usque ad 2 mm. longe pedicellati, perianthii segmentis in cupulam membranaceam margine irregularem ovario duplo breviorem coalitis; ovarium maturum subglobosum, stylo primo terminali deinde sub-apicali, stigmate brevissimo.

Ihu, Vailala River, in rain forests, no. 1059, Febr. 24, 1926.

In leaf and branch characters this specimen agrees exactly with the type-specimen of *F. Chalmersii*. Only the female receptacles of this species have been described, and as *Brass* 1059 bears male-gall receptacles only and these are considerably larger than those described by King the identity of the two is not absolutely certain. However, the male flowers have one stamen, thus agreeing with sect. Covellia in which *F. Chalmersii* was placed, while the shape and other characters of the two types of receptacles are very similar. An additional point of agreement is in the perianths of the gall and female flowers of the respective specimens, both being cupular and membranous. The description of the male-gall receptacles is accordingly furnished above to complete the description of the species.

Ficus myriocarpa Miquel in Ann. Mus. Bot. Ludg.-Bat. III. 230 (1867).

Sogeri, riverine rain forest, 450 m. alt., no. 654, Nov. 17, 1925 (spreading tree 30 feet); Ihu, Vailala River, rain forest regrowths, no. 934, Febr. 11, 1926 (small tree 20–25 feet).

Ficus ribes Reinwardt in Blume, Bijdr. 463 (1825).

Sogeri, rain forest, 450 m. alt., no. 647, Nov. 16, 1925 (spreading tree, 30 feet high).

Ficus setistyla Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 248 (1905).

Upoia, Vailala River, no. 1159, March 15, 1926 (low spreading tree 30 feet high).

Sect. EUSYCE

Ficus calodictya sp. nov.

Arbor erecta, gracilis, 9 m. alta, cortice compacto brunneo; ramuli teretes, sublaeves, glabri, cinereo-brunnei, lenticellis numerosis atro-brunneis notati. FOLIA petiolata, late elliptica, apice rotundata vel subobtusa, basi rotundata, 3–5.5 cm. longa, 2–4 cm. lata, subcoriacea, margine undulata, utrinque glabra, costa utrinque prominula, nervis lateralibus utrinsecus 4–5 prominulis e costa angulo 50° exeuntibus prope marginem arcuatim conjunctis, nervo marginali nullo, rete venularum subtilissimo; petiolus supra canaliculatus, 7–10 mm. longus, rugulosus, glaber, in laminas tenues quadratas vel polygonas decorticans; stipulae lanceolatae, acutae, 4–5 mm. longae, glabrae. RECEPTACULA pedunculata, axillaria, solitaria vel gemina, pendula, obovoideo-pyriformia, 3.5–4.5 mm. longa, glabra, viridia, basi in stipem brevissimam angustata; pedunculus gracilis, 3–4 mm. longus, apice bracteis ad annulum angustissimum reductis. FLORES ♂ prope ostiolum, sessiles vel usque ad 1 mm. longe pedicellati, bractea lineari-lanceolata, 1–2 mm. longa, perianthii segmentis 3 liberis linearibus vel lineari-lanceolatis acutis 1 mm. longis; stamina 2, filamentis 0.7 mm. longis, antheris 1 mm. longis. FLORES ♀ cecidiophori sessiles vel breviter pedicellati, perianthii segmentis

2 raro 3 liberis vel basi connatis, purpureo-brunneis; ovarium fere globosum, flavidum, stylo infra-apicali vel subterminali brevi, stigmate minuto. FLORES ♀ non visi.

The Cupola, Gulf Division, rain forest, 150 m. alt., no. 1360, April 1, 1926.

In general characters this plant seems to agree with the sect. Eusyce, but no species in that section seems very closely allied to it. *F. diversifolia* Bl. has larger and differently shaped fruits and very different leaves but has a somewhat similar facies, and may be the closest ally of *F. calodictya*.

Ficus Odoardi King in Ann. Bot. Gard. Calcutta, I. 156, t. 198 (1888).

Ihu, Vailala River, in rain forests, no. 965[A], Febr. 13, 1926 (scandent).

Ficus rhizophoraephylla King in Jour. As. Soc. Bengal. LV. pt. II. 410 (1886).

Lepokera, Vailala River, in rain forests, no. 989, Febr. 16, 1926 (large glabrous tree).

Sect. NEOMORPHE

Ficus grandis King in Ann. Bot. Gard. Calcutta, I. 170, t. 214 (1888).

Bisiatabu, rain forest, 450 m. alt., no. 606, Nov. 11, 1925 (spreading tree, 40 feet high).

Ficus nodosa Teysmann & Binnendyk in Nat. Tijds. Ned. Ind. XXIX. 245 (1866).

Ihu, Vailala River, no. 1058, Febr. 24, 1926 (pretty little riverside tree with dense crown).

Ficus rhodocarpa, sp. nov.

Arbor parva, 3–4.5 m. alta, cortice pallide griseo; ramuli teretes, juventute scabri, fulvo-brunnei, demum scaberuli, castaneo-grisei, internodiis brevibus. FOLIA saepissime opposita, petiolata, oblanceolata vel anguste obovata, subacuta, basi subcuneata, 4–12 cm. longa, 1.5–5 cm. lata, coriacea, discoloria, juventute scabrido-pilosa, demum utrinque glabra, asperula, supra nitida, costa supra prominula subtus prominente, nervis lateralibus utrinsecus 7–10 infimis adscendentibus ceteris e costa angulo 60–70° exeuntibus prope marginem arcuatim conjunctis utrinque prominulis, rete venularum distincto supra prominulo; petiolus gracilis, supra canaliculatus, 0.6–2.2 cm. longus, scaberulus; stipulae lanceolatae, acutae, membranaceae, asperulae, cito deciduae. RECEPTACULA e ligno veteri exeuntia, fasciculata, longiuscule pedunculata, fere globosa, 10 mm. longa, 10–13 mm. lata, ostiolo prominente, pallide rubra, glabra, minute asperula; pedunculus gracilis, 7–13 mm. longus, glaber, supra medium bractea minuta instructus. FLORES ♂ prope ostiolum, 0.5–1 mm. longe pedicellati, perianthii segmentis 4–5 liberis linearibus stamen aequantibus vel paulo excedentibus; stamina 1 vel 2, filamento 1.5 mm. longo, antheris lateralibus 0.6–0.7 mm. longis. FLORES

♀ cecidiophori sessiles vel usque ad 3.5 mm. longe pedicellati, perianthii segmentis 4 liberis linearibus 2.5 mm. longis breviter ciliatis; ovarium ellipsoideum vel globosum, stylo infra-apicali brevissimo, stigmate apice cavo. FLORES ♀ non visi.

Borabere, alt. 360 m., no. 732, Dec. 1, 1925.

The cauliflorous habit and the two stamens in many of the male flowers should place this species in the sect. Neomorphe, in which, however, it seems to have no close allies. From the description *F. Dielsii* Warburg seems to resemble it closely, but has only one stamen, while in addition the perianth of both male and gall flowers is different and some of the leaf characters do not agree.

Incertae Sectionis

A certain number of specimens, although quite distinct from any described species and worthy of description, cannot be placed with any degree of confidence in any of the sections of the genus.

In these cases the affinities of the species with regard to leaf characters, position of receptacles etc. are often with species belonging to several different sections, and as the specimens lack either male-gall or female receptacles they are best left under the above heading until the other type of receptacle is known.

F. apolepomena, sp. nov.

Arbor patula, 9 m. alta, trunco ramisque in laminas tenuissimas brunneas decorticantibus; ramuli hornotini longitudinaliter sulcati, dense ferrugineo-tomentosi, annotini cinerei, breviter cinereo-tomentosi demum glabrescentes. FOLIA petiolata, elliptica vel oblongo-elliptica, apice rotundata, breviter cuspidata, basi ± leviter cordata, 6–16 cm. longa, 4–9 cm. lata, tenuiter coriacea, supra scaberula, nervis dense ceterum parce fulvo-pilosa, subtus praesertim nervis breviter pubescentia, costa subtus prominente, nervis lateralibus utrinsecus 7–9 e costa infimis angulo acuto ceteris angulo 50–60° exeuntibus prope marginem arcuatim conjunctis, nervis tertiariis transversis manifestis, rete venularum tenuissimo distinctissimo; petiolus compresse teres, 1–2 cm. longus, dense fulvo-tomentosus; stipulae lanceolatae, acuminatae, circiter 1 cm. longae, dense sericeo-tomentosae. RECEPTACULA sessilia, ramulis aphyllis insidentia, sphaeroidea, 1.4–1.8 cm. longa, 1.7–2.2 cm. lata, glabra, minutissime papillosa, scaberula, umbilico vix prominulo, ostioli bracteis depressis. FLORES ♂ prope ostiolum; stamen 1. FLORES ♀ cecidiophori sessiles vel pedicellati; ovarium globosum, stylo brevi. FLORES ♀ non visi.

Bisiatabu, in rain forest, 450 m. alt., no. 575, Nov. 11, 1925.

This plant strongly resembles the Papuan species *F. pteleaephylla* S. Moore which is said to belong to sect. Palaeomorphe. That species, however, has much smaller receptacles on stalks as long as the receptacle. *F. xerophila* Domin, an Australian species, is very similar in appearance

to *F. apolepomena* but has opposite leaves and smaller receptacles. *Ficus trachypison* K. Schum. also has much smaller and very rough receptacles and more acute leaves. The receptacles of *F. apolepomena* are so badly preserved inside, having been attacked by some insect (not the gall insect, the young larva of which are present in each gall ovary) that the characters of the perianth of neither male nor gall flowers can be observed. It is therefore best not to attempt to place the species in any definite section.

Ficus charadrophila, sp. nov.

Arbor parva, circiter 2 m. alta, ramis horizontalibus. Ramuli teretes, juventute dense subadpresse griseo-hispidi, demum glabri, longitudinaliter rugulosi, postremo cortice rubro-brunneo in laminas parvas subquadrangulares decorticante obtecti, internodiis brevibus usque ad 1 cm. longis. Folia oblanceolata vel elliptico-oblanceolata, apice leviter emarginata usque subacuta, basi cuneata vel subcuneata, 2–4.5 cm. longa, 1–1.6 cm. lata, marginibus planis, discoloria, subcoriacea, supra juventute pilis parcissimis albidis adpressis, demum glabra, sublaevia, subtus juventute praesertim nervis marginibusque longiuscule albido-pubescentia, costa subtus prominula, nervis lateralibus utrinsecus 6–8 adscendentibus leviter curvatis prope marginem conjunctis, rete venularum conspicuo; petiolus 4–9 mm. longus, superne canaliculatus, dense albido-pubescens, demum glaber; stipulae subpersistentes, linearilanceolatae, acuminatae, 5–8 mm. longae, chartaceae, glabrae. Receptacula axillaria, solitaria, globosa, 12 mm. diametro, bracteis sparsis instructa, ostiolo bracteis numerosis carnosis obtusissimis prominulis circumdato, basi in stipem 2.5 mm. longam angustata, sparse albido-pubescentia; pedunculus 5–8 mm. longus, puberulus, bracteis tribus triangularibus acutis coronatus. Flores pilis hispidis interspersi. Flores ♂ circum ostiolum haplostichi, sessiles, perianthii segmentis 5 liberis linearibus 1 mm. longis, stamine singulo, filamento brevissimo. Flores ♀ cecidiophori sessiles, perianthii segmentis 3 liberis lanceolato-spathulatis 1–2 mm. longis ciliatis ungue laminae aequilongo, stylo laterali glabro, stigmate apice leviter infundibuliformi.

Numa River, Gulf Division, no. 1347, March 29, 1926 (tough, flat-topped small tree, 5–6 feet high, in the beds of swiftly running mountain streams).

I have been unable to find any Malayan or Australian species of *Ficus* at all closely related to this plant, so in the absence of female flowers it is difficult to assign it to any section of the genus.

Ficus clusiaefolia, sp. nov.

Arbor grandis, multiramosa, trunco ramisque radices adventicias demittentibus, cortice laevi griseo obtectis, ramulis longitudinaliter rugulosis, glabris. Folia longipetiolata, elliptica vel obovato-elliptica, apice obtusa vel breviter mucronata, basi cuneata, 8–12 cm. longa, 5.5–

7.5 cm. lata, coriacea, utrinque glabra, laevia, costa supra prominula subtus subprominente, nervis lateralibus numerosis parallelis crebris, nervis marginalibus duobus, interiore multoties arcuato nervis lateralibus conjuncto, exteriore margini perpropinquo; petiolus 3.5–5 cm. longus, supra canaliculatus, glaber; stipulae ovatae, acutae, extra brevissime pubescentes, alis marginalibus angustis glabris exceptis. RECEPTACULA subsessilia, solitaria vel gemina, ellipsoidea, 10–12 mm. longa, 7–8 mm. diametro, praesertim inferne brevissime pubescentia, aurantiaca, lenticellis viridibus notata, ostiolo bracteis tribus imbricatis obtusissimis annulo prominente castaneo-brunneo circumdato, bracteis basalibus ad annulum sinuatum reductis; pedunculus brevis, 1–4 mm. longus. FLORES ♂ pedunculati, pedunculo 0.5–0.8 mm. longo, perianthii segmentis 4 lanceolato-ovatis basi coalitis; stamen 1, filamento 1 mm. longo. FLORES ♀ cecidiophori sessiles vel breviter pedicellati, perianthii segmentis 3 raro 4 liberis lanceolatis acuminatis 1.5 mm. longis: ovarium globoso-ellipsoideum vel globoso-ovoideum, stylo terminali vel sublaterali stigmate lineari vel lineari-clavato 0.7–0.8 mm. longo coronato. FLORES ♀ non visi.

Sogeri, foothill forests, alt. 500 m., no. 641, Nov. 16, 1925.

This species is very similar to *F. garciniaefolia* Miq. from Timor, which however, has much larger receptacles. This is placed in sect. Urostigma. *F. rhizophoraephylla* King, a Papuan species, which has somewhat similar foliage, has prismatic ovaries and has been placed in sect. Eusyce. Fertile female flowers were not found in the present species, but as in some species belonging to the section Urostigma they are very few in number it is possible that *F. clusiaefolia* belongs to that section.

Ficus ihuensis, sp. nov.

Arbor parva, ramuli teretes, laeves vel leviter rugulosi, juventute atro-brunnei, deinde pallide brunnei, glaberrimi. FOLIA breviter petiolata, elliptico-lanceolata vel oblanceolata, apice breviter obtuse acuminata, basi cuneata, 6–12 cm. longa, 2–4 cm. lata, subcoriacea, laevia, nitida, discoloria, utrinque glabra, costa subtus subprominente, nervis lateralibus utrinsecus 6–9 e costa angulo 60–70° exeuntibus prope marginem arcuatim conjunctis utrinque prominulis, rete venularum subtus distincto; petiolus supra canaliculatus, 6–10 mm. longus, glaber, atro-brunneus; stipulae anguste lanceolatae, acuminatae, 7–10 mm. longae, glabrae. RECEPTACULA pedunculata, axillaria, solitaria, globosa vel pyriformi-globosa, 4–6 mm. longa, 3–5 mm. lata, tuberculato-rugulosa, glabra, viridia siccitate atro-brunnea, umbilico prominente, ostioli bracteis distinctis siccitate flavo-brunneis; pedunculus gracilis, 6–7 mm. longus, bracteis 2–4 minutis sparsis instructus. FLORES ♀ juveniles sessiles vel pedicellati, perianthii segmentis 3–4 ± coalitis; ovarium subglobosum, imperfecte evolutum, stylo infra-apicali, stigmate lineari vel subfiliformi bifido 0.7 mm. longo. FLORES ♂ et ♀ cecidiophori non visi.

Ihu, Vailala River, rain forests, no. 941, Feb. 12, 1926.

This resembles somewhat *F. pubinervis* Bl. in general facies, but that species belongs to sect. Urostigma in which this species cannot be placed. In the absence of the male-gall receptacles it is difficult to assign *F. ihuensis* to any of the sections of the genus.

Ficus xanthoxyla, sp. nov.

Arbor, circiter 9 m. alta; ramuli teretes, rugulosi, juventute adpresse pilosi, brunnei, deinde glabri, grisei, cicatricibus annularibus stipularum delapsarum notati, internodiis brevibus sed raro usque ad 3.5 cm. longis. FOLIA petiolata, elliptica vel lanceolato-elliptica, apice brevissime acuminata, obtusa, basi cuneata, 5–10 cm. longa, 2–5.5 cm. lata, chartacea vel subcoriacea, juventute utrinque praesertim subtus nervis marginibusque longiuscule adpresse pilosa, demum glabra, costa supra leviter impressa subtus prominente, nervis lateralibus utrinsecus 7–9 e costa angulo 60° exeuntibus leviter curvatis versus marginem arcuatim conjunctis, rete venularum tenuissimo distinctissimo; petiolus supra canaliculatus, 1–2.5 cm. longus, primo adpresse pilosus, demum glaber; stipulae anguste lanceolatae, acuminatae, curvatae, 8–12 mm. longae, extra longiuscule adpresse fulvo-pilosae. RECEPTACULA breviter pedunculata, axillaria, gemina vel solitaria, subglobosa, 8–10 mm. diametro, glabra, ostioli bracteis prominulis; pedunculus 2–4 mm. longus, glaber, versus apicem bracteis duabus parvis instructus. FLORES ♀ sessilia vel usque ad 2 mm. longe pedicellata, pilis setiformibus interspersis, perianthii segmentis 3 liberis spathulatis ungue angusto 1–2 mm. longis 0.7 mm. latis; achenium lateraliter compressum vel plano-convexum, secus marginem superiorem sulco distincto sed haud profunde impresso instructum, epicarpio tenui rubescente, stylo infra-apicali, stigmate obclavato compresso. FLORES ♂ et ♀ cecidiophori non visi.

Ihu, Vailala River, in rain forests, no. 1019, Febr. 20, 1926.

In general appearance this species is very similar to *F. Nugentii* Domin from Queensland, which however is a climber. As there are no male flowers it is impossible to say whether the species belongs to sect. Eusyce or sect. Sycidium. The presence of setae on the inside of the receptacle suggests that *F. xanthoxyla* may be related to *F. laevis* Bl. and *F. obtusa* Hassk. which are close relatives of *F. Nugentii* and which also possess this character.

Herbarium, Royal Botanic Gardens, Kew
May, 1929

TWO NEW SPECIES OF CARPINUS FROM SZECHUAN

H. H. HU

Carpinus Fangiana, spec. nov.

Arbor parva, 5–8 m. alta; ramuli graciles, brunneo-purpurei, lenticellati. Gemmae parvae, globosae, obtusae 1.5–2.5 mm. diam., perulis

late ovatis obtusis ciliatis nitidis fuscis. Folia oblonga, elliptico-oblonga vel oblongo-lanceolata, 6–18 cm. longa et 2.5–7 cm. lata, longe acuminata, oblique cordata, inaequaliter duplicato-serrata, supra intense viridia et glabra, subtus pallidiora, pilis longis adpressis ad venas et densius ad costam vestita, venis utrinque 24–28; petioli glabri, 6–16 mm. longi. Inflorescentia fructifera cylindrica, ad 21 cm. longa, pedunculo 3 cm. longo suffulta; bracteae papyraceae, imbricatae, 18 mm. longae et 9 mm. latae, planae, oblique late ovatae, ad apicem et ad partem inferiorem marginis interioris remote serratae, lobo basali destitutae, venis primariis 5 distantibus, tenuiter reticulatae, basi extus pilis sericeis barbatae; nuculae maturae non visae.

Small tree 5–8 m. high; branchlets slender, brownish-purple, lenticellate; bud small, globose, obtuse, 1.5–2.5 mm. in diameter, scales broad ovate, obtuse, margin ciliate, shining brown; leaves oblong, elliptic-oblong or oblong-lanceolate, long-acuminate, obliquely cordate, irregularly and doubly serrate, 6–18 cm. long, 2.5–7 cm. broad, dark green and glabrous above, paler and with appressed long hairs along the veins and more so along the midrib beneath, veins 24–28 pairs; petiole glabrous, 6–16 mm. long; fruiting ament cylindric to 21 cm. long, peduncle 3 cm. long; bracts papery, imbricate, flat, obliquely broad-ovate, remotely serrate at apex and along the lower portion of inner margin, without a basal lobe, bearded on the outside at base with silky hairs, delicately reticulate, with 5 distant primary veins, 18 mm. long, 9 mm. broad; mature nutlet unknown.

Allied to *C. cordata* Blume, differing in the much longer fruiting ament and thin papery bracts delicately veined and without basal lobe.

SZECHUAN: Nanchuan Hsien, in thickets, 1500–1800 m., *W. P. Fang*, no. 1351 (type), no. 1352, June 1, 1928.

Carpinus Wilsoniana, spec. nov.

Arbor parva, 15 m. alta, trunco 30 cm. diam., cortice laevi brunneo; ramuli intense fusci, lenticellati. Gemmae magnae, ovoideo-lanceolatae, ad 1 cm. longae, acutae, perulis late ovatis obtusis vel emarginatis ciliatis pallide brunneis. Folia oblonga, 7–17 cm. longa et 4–7.5 cm. lata, acuminata, basi leviter cordata vel late cuneata, irregulariter duplicato-serrata, supra intense viridia et glabra, subtus pallidiora et pilis adpressis ad venas et densius ad costam instructa; petioli 12 mm. longi. Inflorescentia anguste cylindrica, ad 30 cm. longa, basin versus attenuata, pedunculo 5 cm. longo suffulta; bracteae membranaceae, imbricatae, concavae, oblique elliptico-lanceolatae, utrinque acutae, ad apicem et in parte inferiore marginis exterioris remote serrulatae, parte parva marginis interioris basi inflexa et nuculam partim amplectente, sed non distincte lobatae, venis primariis 5 satis congestis, basi extus pilis sericeis barbata; nuculae ellipsoideo-oblongae, 3.5 mm. longae, glabrae, levissime costatae.

Small tree, 15 m. high 30 cm. in diameter, bark smooth, brown; branchlets dark brown, conspicuously lenticelled; buds large, ovate-lanceolate, acute, to 1 cm. long, scales broad-ovate, obtuse to emarginate at apex, margin ciliate, light brown; leaves oblong, 7–17 cm. long 4–7.5 cm. broad, acuminate, slightly cordate to subcuneate at base, irregularly and doubly serrate, dark green and glabrous above, paler and with long appresed hairs along the veins and more so along the midrib beneath; petiole 12 mm. long. Fruiting ament narrow-cylindric, to 30 cm. long, tapering toward the base, peduncle 5 cm. long; bracts thin, membranaceous, imbricate, concave, obliquely elliptic-lanceolate, acute at both ends, remotely serrulate at apex and along the lower portion of outer margin, bearded on the outside at base with silky hairs, with a small portion of inner margin folding in and embracing the nutlet, not distinctly lobed, primary veins 5, rather close; nutlet oblong, 3.5 mm. long.

Allied to *C. cordata* Blume, differing in much longer fruiting ament and elliptic-lanceolate bracts without basal lobe.

SZECHUAN: Mt. Omei, in thickets, 1675–1800 m., *W. P. Fang*, no. 2685 (type), Aug. 9, 1928.

This species is named in honor of Mr. E. H. Wilson, Keeper of Arnold Arboretum, whose intensive and extensive exploration in western China marked an epoch of discovery in the history of Chinese botany.

Fan Memorial Institute of Biology, Peking

April, 1929

CULTURES OF PUCCINIASTRUM AMERICANUM (FARLOW) ARTHUR AND P. ARCTICUM (LAGERHEIM) TRANZSCHEL

G. D. DARKER

INTRODUCTION

Two species of Rubus rusts, *Pucciniastrum americanum* (Farlow) Arthur and *Pucciniastrum arcticum* (Lagerheim) Tranzschel, have been distinguished in North America. As these species had not been associated with aecial forms experiments were undertaken to establish their connections with alternate hosts. Field associations of *P. americanum* with *Peridermium ingenuum* Arthur finally furnished the clue which led to the solution of the problem. Successful infections of *Rubus idaeus* var. *strigosus* with aeciospores of *P. ingenuum* established the connection of this rare spruce rust with *P. americanum*. Later experiments with teliosporic material on Rubus as inoculum confirmed this relationship. Other cultures established as the alternate stage of *P. arcticum* a form of *P. ingenuum* indistinguishable from that produced by *P. americanum*. As a verification of these experiments aeciospores from cultures of both species were inoculated back on suspected uredinial

hosts. Infection took place only on the hosts from which the teliosporic inoculum originated. Thus, also, by cultural methods Arthur's (1920) views concerning the separate identity of *P. arcticum* and *P. americanum* were substantiated.

HISTORICAL

Pucciniastrum arcticum (Lagerheim) Tranzschel was first described by Lagerheim (1889) as *Uredo arcticus* Lagerheim. The type material was on the host *Rubus arcticus* collected near Lulea, Sweden. Tranzschel (1895) described the teliosporic stage from Russia. In North America its distribution ranges according to Arthur (1907, 1925) from Alaska to New Brunswick and north-western Connecticut. Its hosts in North America are *Rubus stellatus, R. acaulis, R. Chamaemorus* and *R. triflorus.*

Pucciniastrum americanum (Farlow) Arthur, with a somewhat more southern range than *P. arcticum*, has been reported (Dodge 1923, Arthur 1925) on a number of Rubus hosts, *Rubus idaeus* var. *strigosus* being apparently most commonly collected. *P. americanum* was first described by Farlow (1908) as *P. arcticum* (Lagerh.) Tranz. var. *americanum* Farlow. The chief point of difference between the variety and the species *arcticum* was recognized in the form of the peridium. Clinton (1911) reported *P. arcticum* var. *americanum* on cultivated raspberries, and in the same paper, basing his statements upon hosts and parasite associations observed by Blakeslee (Clinton 1908), suggested *Peridermium balsameum* on Balsam Fir as the alternate stage. Fraser (1911) also reported field observations which pointed to Pucciniastrum on *R. idaeus* var. *aculeatissimus* as the alternate stage of *P. balsameum*, but later (1912) he stated that this connection did not seem probable. Arthur (1920) raised the name *americanum* to specific rank. This change was questioned by Davis (1921) who pointed out that the differences might be due to the hosts themselves rather than to specific differences in the parasites. Later, however, Davis (1922) cited the work of C. W. Bennett of the Department of Plant Pathology of the University of Wisconsin in which experiments were performed which indicated that *P. americanum* and *P. arcticum* were distinct species. Bennett found that urediniospores from *R. triflorus* failed to infect *R. strigosus* and *R. occidentalis* while spores from *R. strigosus* infected that host and also *R. occidentalis.* Dodge (1923) noted the occurrence of *P. americanum* on canes of Rubus and suggested that the necessity for an alternate stage might therefore be obviated in some localities. He believed that certain variations in the size and form of the sori indicated that *P. arcticum* and *P. americanum* were not distinct species.

Aecidium ingenuum Arthur was based by Arthur (1919) upon a collection of this rust on *Picea canadensis* made by Orton in 1917 at Walden, Vt. Arthur also recorded as co-type two gatherings made in Wisconsin in 1913 and 1914 by J. J. Davis. Davis (1922) listed these collections

under the name *Aecidium ingenuum* but pointed out that the aecium in this species was of the type which he referred to the genus *Peridermium* in his provisional list (1914) of the parasitic fungi in Wisconsin. Arthur (1924) redescribed the species under the name *Peridermium ingenuum* Arthur and extended the geographical range to include South Dakota. In this paper mention was made by Arthur of an earlier use of the name *P. ingenuum* Arth. as applied to the same species by Rhoads, Hedgcock, Bethel and Hartley (1918). No description of the species was made by Rhoads and others but a quotation was published from Arthur's (1919) paper which was at that time still in manuscript. In a bibliographical error, however, an earlier paper by Arthur and Kern was cited as the source of the quotation. Arthur (1919) stated that *P. ingenuum* belonged doubtless to a species of Pucciniastrum.

CULTURES

The cultures performed with *Pucciniastrum americanum* and *P. arcticum* fall into five main divisions as follows: *P. americanum* inoculations—(1) cultures with field material of *Peridermium ingenuum* of unknown telial origin as inoculum, (2) cultures with teliosporic inoculum, (3) cultures with authentic aecial material; *P. arcticum* inoculations—(4) cultures with teliosporic inoculum and (5) cultures with authentic aecial material.

CULTURES OF PUCCINIASTRUM AMERICANUM (FARLOW) ARTHUR

Cultures with Peridermium ingenuum Arthur

Peridermium ingenuum Arthur on *Picea canadensis* (=*P. glauca*) was collected in June 1923 by Dr. J. H. Faull at Otter, Ontario. Field associations seemed to point to *Rubus idaeus* var. *strigosus* as the alternate host.

On July 5, 1927 *Peridermium ingenuum* was found on Bear Island, Lake Timagami, Ontario, producing an abundant though scattered infection on a single isolated tree of *Picea canadensis*. This tree had been cut off about four feet above the ground and several branches were struggling for the leadership, making a low compact growth very favorable to rust infection. It was situated in a small clearing in a balsam fir grove and immediately surrounding it and in many cases intertwined with its lower branches were numerous canes of *Rubus idaeus* var. *strigosus*. About one hundred yards away *Pucciniastrum americanum* had been observed on Rubus during the summers of 1924, 1925 and 1926. Accordingly the alternate host was at once suggested.

Free-hand sections of infected spruce needles collected at Lake Timagami, Ontario, revealed subcuticular pycnia characteristic of *Peridermium ingenuum*.

Inoculations

Aeciospores of *Peridermium ingenuum* were scraped from the spruce needles into a few drops of water in a watch glass. At suitable places

in the forest, isolated from previously known infections of *Pucciniastrum americanum*, specimens of *Rubus idaeus* var. *strigosus*, *R. triflorus* and *Pyrola elliptica* were selected for inoculation. The inoculum was then smeared with a camel's hair brush on leaves of these plants, especially on their lower surfaces. The inoculated portions were marked with metal tags and enclosed for several days within celluloid cylinders (Hubert 1916) which were plugged at the ends with wet sphagnum.

Another type of inoculation was tried out but with less success. Leaflets of *Rubus idaeus* var. *strigosus* and *R. triflorus* were placed in petri dishes on filter paper moistened with water. These leaflets, except for controls, were inoculated with spores of *Peridermium ingenuum*.

Infections

After an incubation period ranging from 7 to 11 days minute uredinia appeared in the field experiments on *Rubus idaeus* var. *strigosus* (See Table I) and in several cases infection was very heavy. In the case of inoculation of leaflets in petri dishes a slight infection of *R. idaeus* var. *strigosus* was obtained on 3 out of 8 leaflets inoculated (See Table IV).

Free-hand sections of the rusted leaves of *Rubus idaeus* var. *strigosus* established the identity of the infections as *Pucciniastrum americanum* (Farl.) Arth. The sections showed numerous small uredinia, each of which exhibited an extraordinarily elongated peridium surmounted by a corona of spiny apical cells. Urediniospores from infections produced in Experiment 405 (See Table I) measured 9–14 × 17–22 μ which is in fairly close agreement with measurements recorded by Arthur (1925).

A heavy natural infection of *Pucciniastrum americanum* developed on leaves of *Rubus idaeus* var. *strigosus* in the vicinity of the Spruce tree which carried *Peridermium ingenuum* earlier in the season.

TABLE I

Peridermium ingenuum Arth. on *Picea canadensis*

Host inoculated—*Rubus idaeus* var. *strigosus*

Experiment number	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
405	5.7.27	5.7.27	5	7	8	15.7.27	3	9	8	89	1350
406	5.7.27	5.7.27	9	11	11	28.7.27	3	15	8	53	150
409	5.7.27	5.7.27	6	9	10	19.7.27	3	9	8	89	630
410	5.7.27	5.7.27	6	8	9	19.7.27	3	9	9	100	1300
437	5.7.27	5.7.27	9	10	10	19.7.27	2	6	6	100	2200
438	5.7.27	5.7.27	9	9	11	19.7.27	2	7	6	86	470
439	5.7.27	5.7.27	9	10	10	19.7.27	3	9	7	78	2190
460	5.7.27	7.7.27	5	7	8	26.7.27	2	6	6	100	650
461	5.7.27	7.7.27	5	7	8	26.7.27	1	5	3	100	1720

TABLE II

Peridermium ingenuum Arth. on *Picea canadensis*

Host inoculated—*Rubus triflorus*

Experiment number	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
407	5.7.27	5.7.27	6	—	—	7.8.27	—	—	—	—	—
408	5.7.27	5.7.27	6	—	—	7.8.27	—	—	—	—	—
459	5.7.27	7.7.27	5	—	—	29.7.27	—	—	—	—	—

TABLE III

Peridermium ingenuum Arth. on *Picea canadensis*

Host inoculated—*Pyrola elliptica*

Experiment number	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of leaves infected	Percentage of leaves infected	Approximate no. of uredinia
456	5.7.27	7.7.27	5	—	—	29.7.27	—	—	—	—
457	5.7.27	7.7.27	5	—	—	29.7.27	—	—	—	—
458	5.7.27	7.7.27	5	—	—	29.7.27	—	—	—	—

TABLE IV

Peridermium ingenuum Arth. on *Picea canadensis*

Host inoculated (in petri dish)—*Rubus idaeus* var. *strigosus*

Experiment number	Inoculum collected	Date of inoculation	Appearance of uredinia
440	5.7.27	6.7.27	—
441	5.7.27	6.7.27	14.7.27
442	5.7.27	6.7.27	14.7.27
443	5.7.27	6.7.27	—
444	5.7.27	6.7.27	14.7.27
445	5.7.27	6.7.27	—
446	5.7.27	6.7.27	—
447	5.7.27	6.7.27	—
448	5.7.27	6.7.27	—

TABLE V

Peridermium ingenuum Arth. on *Picea canadensis*

Host inoculated (in petri dish)—*Rubus triflorus*

Experiment number	Inoculum collected	Date of inoculation	Appearance of uredinia
449	5.7.27	6.7.27	—
450	5.7.27	6.7.27	—
451	5.7.27	6.7.27	—
452	5.7.27	6.7.27	—
453	5.7.27	6.7.27	—
454	5.7.27	6.7.27	—
455	5.7.27	6.7.27	—

Cultures with Teliosporic inoculum

Pucciniastrum americanum was found in several small patches of *Rubus idaeus* var. *strigosus* on Bear Island, Lake Timagami, Ontario, during the years 1924 to 1928. The rust was identified by its subepidermal teliospores and also by its elongated peridium which is surrounded by a crown of spiny apical cells.

Care of the inoculum

Leaves of *Rubus idaeus* var. *strigosus* bearing teliospores were overwintered in cheese-cloth bags which had been dipped into hot paraffin. A number of these bags were tied, at a distance of a few inches above the ground, to stakes which were set out in shady thickets on Bear Island, Lake Timagami. Other material, overwintered at the Department of Botany, University of Toronto, was kept in a refrigerator until cold weather arrived. Every three or four weeks the inside of the box in which the inoculum was stored was moistened with water. On the arrival of cold weather the material was taken to a shady spot in the open where it was tied to the inside of a box in such a manner that when the box was inverted the material was suspended at a distance of a few inches above the soil. On the return of warm weather in the spring the inoculum was again placed in the refrigerator.

Just before the opening of the Spruce buds in the spring the inoculum was placed in petri dishes lined with moist filter paper and as soon as basidia began to appear the inoculation experiments were set up. Sometimes inoculum was used which did not show any signs of germination. This was considered necessary on account of the limited amount of inoculum bearing teliospores and also because of the difficulties experienced in the observation of the basidia which were hidden by the hairs on the lower surfaces of the Rubus leaves.

A few observations of germinating teliospores of *Pucciniastrum americanum* showed colorless basidia about 5 μ in thickness and about 80 μ in length. Sterigmata measured 5–8 μ in length and basidiospores were about 5.5 μ in diameter.

Technique of inoculation

In some inoculation experiments the inoculum was merely placed above the host needles which were then enclosed in a celluloid tube plugged at the ends with moist sphagnum or cotton. A more economical manner of distribution of the inoculum was used when the formation of basidia was observed. In this case the inoculum was placed on a small rectangle of moistened blotting paper and a piece of fine wire window screening was placed above it. The blotter and screening were then tied lightly together and the whole was inverted carefully over the host needles inside a celluloid tube in such a way that the basidiospores could fall through the meshes of the screening.

Inoculations

The following inoculations of *Abies balsamea, Tsuga canadensis, Picea canadensis* and *P. mariana* were made in order to test out these conifers as possible alternate hosts of *Puccinia strum americanum.*

Year	Host	No. of inoculations
1926	Abies balsamea	14
	Tsuga canadensis	6
1927	Abies balsamea	2
	Tsuga canadensis	2
	Picea canadensis	12
	Picea mariana	7
1928	Tsuga canadensis	2
	Picea canadensis	30
	Picea mariana	13

Infections

Of the experiments listed above only certain of the 1928 inoculations on *Picea canadensis* gave positive results. Failure to obtain similar infection on *P. canadensis* in 1927 was very probably due to the fact that the Spruce inoculations in that year were performed too late in the season. The fact that peridermia are often mature on *P. canadensis* before the young leaves of *P. mariana* have unfolded suggests a reason for failure to infect the latter host. Additional inoculations should be performed on *P. mariana* under more favorable conditions.

As shown by Table VI *Picea canadensis* proved to be susceptible to infection by the rust and after an incubation period of 9–14 days pycnia appeared on the spruce needles. These were followed at the end of 13–17 days from the date of inoculation by peridermia.

Pycnia and peridermia produced on *Picea canadensis* by infections with *Puccinia strum americanum* answered fairly closely to descriptions of Arthur's *Peridermium ingenuum.* Pycnospores from Experiment 31 measured 3.9–5.9 × 2.0–2.4 μ. Aeciospores from Experiment 39 were 20–28 × 17–21 μ and the aecial peridial cells from the same experiment measured 32–44 × 17–21 × 13–16 μ, the last measurement representing their thickness. Measurements were made of the lengths of uniformly infected portions of needles and the peridermia along one of the stomatal areas in each of these portions were counted. From these counts the numbers of peridermia per centimetre of leaf length were calculated for a number of leaf surfaces. An average of 34 counts from a number of experiments with *P. americanum* gave 22 peridermia per cm. of leaf face. Occasionally peridermia are borne along all four of the leaf faces of the spruce needle.

Inoculations with aeciospores

In order to verify the experiments carried out with *Peridermium ingenuum* in 1927 aeciospores of *Puccinia strum americanum* from the foregoing experiments were employed to inoculate *Rubus idaeus* var.

strigosus, *R. triflorus* and *Agrimonia mollis*. As shown in Tables VII, VIII and IX an extremely heavy infection was obtained on *R. idaeus* var. *strigosus* while *R. triflorus* and *A. mollis* remained free from infection.

TABLE VI

Pucciniastrum americanum (Farl.) Arth. on *Rubus idaeus* var. *strigosus*

Host inoculated—*Picea canadensis*

Experiment number	Inoculum placed in moist chamber	Date of inoculation	Cylinder on branch (days)	First appearance of pycnia (days)	First appearance of peridermia (days)	First breaking of peridermia (days)	Date harvested	No. of 1928 needles in inoculation tube	No. of needles bearing peridermia	No. of needles bearing pycnia only	Percentage of infection
24	7.6.28	12.6.28	6	12	16	18	29.7.28	248	1	1	1
25	7.6.28	12.6.28	6	10	14	17	3.7.28	225	11	2	6
26	7.6.28	12.6.28	6	—	—	—	29.7.28	—	—	—	—
27	7.6.28	12.6.28	5	11	?	?	19.7.28	306	1	1	1
28	7.6.28	12.6.28	5	11	—	—	19.7.28	459	0	4	1
29	7.6.28	12.6.28	5	—	—	—	19.7.28	—	—	—	—
30	7.6.28	12.6.28	5	11	?	?	19.7.28	454	2	1	1
31	7.6.28	12.6.28	5	10	18	16	1.7.28	524	41	5	9
32	7.6.28	12.6.28	5	9	14	18	1.7.28	610	3	0	0
35	7.6.28	12.6.28	5	14	—	—	26.7.28	170	0	2	1
36	7.6.28	12.6.28	5	—	—	—	26.7.28	—	—	—	—
37	7.6.28	12.6.28	5	11	17	19	3.7.28	352	12	4	5
38	7.6.28	12.6.28	5	12	17	20	3.7.28	411	4	5	2
39	7.6.28	12.6.28	5	9	13	18	3.7.28	482	27	2	6
40	7.6.28	12.6.28	5	13	15	18	3.7.28	433	5	0	1
41	7.6.28	12.6.28	5	9	13	15	3.7.28	471	16	1	4
42	7.6.28	12.6.28	5	10	14	18	3.7.28	354	7	2	3
43	7.6.28	12.6.28	5	13	—	—	26.7.28	162	0	2	1
53	7.6.28	13.6.28	1	10	15	20	10.7.28	47	3	0	6
54	7.6.28	13.6.28	1	10	14	18	10.8.28	61	2	5	11
55	7.6.28	13.6.28	1	12	14	18	10.8.28	52	1	0	2
56	7.6.28	13.6.28	1	12	—	—	10.8.28	30	0	1	3
57	7.6.28	13.6.28	1	—	—	—	10.8.28	32	—	—	—
58	7.6.28	13.6.28	1	—	—	—	10.8.28	57	—	—	—
59	7.6.28	13.6.28	1	12	—	—	10.8.28	38	0	2	5
60	7.6.28	13.6.28	1	?	?	?	10.8.28	47	2	0	4
137	18.6.28	23.6.28	5	—	—	—	29.7.28	—	—	—	—
138	18.6.28	23.6.28	5	—	—	—	29.7.28	—	—	—	—
139	18.6.28	23.6.28	5	—	—	—	29.7.28	—	—	—	—
147	18.6.28	23.6.28	5	—	—	—	10.8.28	—	—	—	—

TABLE VII

Pucciniastrum americanum (Farl.) Arth. on *Picea canadensis*

Host inoculated—*Rubus idaeus* var. *strigosus*

Experiment number	1928 inoculations used as sources of inoculum	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
200	31, 32	1.7.28	2.7.28	6	8	9	13.7.28	2	6	6	100	4300
205	25, 37	3.7.28	4.7.28	6	7	8	13.7.28	2	6	6	100	5000
206	39, 40, 41	3.7.28	4.7.28	6	7	8	13.7.28	2	6	6	100	4300

TABLE VIII

Pucciniastrum americanum (Farl.) Arth. on *Picea canadensis*

Host inoculated—*Rubus triflorus*

Experiment number	1928 inoculations used as sources of inoculum	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
201	31, 32	1.7.28	2.7.28	6	—	—	2.8.28	—	—	—	—	—

TABLE IX

Pucciniastrum americanum (Farl.) Arth. on *Picea canadensis*

Host inoculated—*Agrimonia mollis*

Experiment number	1928 inoculations used as sources of inoculum	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
207	25, 37, 39, 40,	3.7.28	4.7.28	7	—	—	17.8.28	—	—	—	—	—
208	41	3.7.28	4.7.28	7	—	—	17.8.28	—	—	—	—	—

CULTURES OF PUCCINIASTRUM ARCTICUM (LAGERHEIM) TRANZSCHEL

Cultures with teliosporic inoculum

Pucciniastrum arcticum found on *Rubus triflorus* on Bear Island, Lake Timagami, Ontario, during the seasons of 1925, 1926 and 1927 was overwintered and used to carry out inoculations as described under *P. americanum* cultures above. The following species of conifers were used as hosts for inoculation: *Abies balsamea, Tsuga canadensis, Taxus canadensis, Picea mariana* and *Picea canadensis.*

Year	Host	No. of inoculations
1926	Abies balsamea	14
	Taxus canadensis	1
	Tsuga canadensis	14
1927	Abies balsamea	3
	Tsuga canadensis	2
	Picea canadensis	3
	Picea mariana	4
1928	Tsuga canadensis	4
	Picea canadensis	15
	Picea mariana	38

Infections

Infection was obtained with *Pucciniastrum arcticum* on *Picea canadensis* only (See Table X). On this host pycnia appeared in 10 to 11 days followed by peridermia in 15 to 18 days. Although infection was not heavy it was at least sufficiently abundant that the connection of

TABLE X

Pucciniastrum arcticum (Lagerh.) Tranz. on *Rubus triflorus*

Host inoculated—*Picea canadensis*

Experiment number	Inoculum placed in moist chamber	Date of inoculation	Cylinder on branch (days)	First appearance of pycnia (days)	First appearance of peridermia (days)	First breaking of peridermia (days)	Date harvested	No. of 1928 needles in inoculation tube	No. of needles bearing peridermia	No. of needles bearing pycnia only	Percentage of infection
63	7.6.28	13.6.28	5	11	15	?	15.7.28	443	2	1	1
64	7.6.28	13.6.28	5	—	—	—	15.7.28	—	—	—	—
72	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—
73	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—
74	7.6.28	14.6.28	5	10	18	20	8.7.28	392	18	18	9
75	7.6.28	14.6.28	5	?	?	21	8.7.28	460	1	0	0
76	7.6.28	14.6.28	5	11	18	20	8.7.28	427	6	0	1
77	7.6.28	14.6.28	5	11	18	20	10.7.28	534	2	1	1
78	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—
79	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—
80	7.6.28	14.6.28	5	?	—	—	13.8.28	270	0	1	0
81	7.6.28	14.6.28	5	10	16	18	5.7.28	305	17	1	6
82	7.6.28	14.6.28	5	?	?	?	7.7.28	134	3	1	3
83	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—
84	7.6.28	14.6.28	5	—	—	—	13.8.28	—	—	—	—

TABLE XI

Pucciniastrum arcticum (Lagerh.) Tranz. on *Picea canadensis*

Host inoculated—*Rubus triflorus*

Experiment number	1928 inoculations used as sources of inoculum	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
209	81	5.7.28	5.7.28	6	15	17	2.8.28	2	6	6	100	1310
210	81	5.7.28	5.7.28	6	17	19	2.8.28	1	3	3	100	730

TABLE XII

Pucciniastrum arcticum (Lagerh.) Tranz. on *Picea canadensis*

Host inoculated—*Rubus idaeus* var. *strigosus*

Experiment number	1928 inoculations used as sources of inoculum	Inoculum collected	Date of inoculation	Cylinder on branch (days)	First appearance of uredinia (days)	Uredinia mature (days)	Date harvested	No. of leaves inoculated	No. of pinnae inoculated	No. of pinnae infected	Percentage of pinnae infected	Approximate no. of uredinia
211	81	5.7.28	5.7.28	6	—	—	2.8.28	1	5	—	—	—

the peridermium produced on the spruce needles with *P. arcticum* was considered to have been established.

Field measurements from fresh material of *Pucciniastrum arcticum* on *Picea canadensis* were as follows: pycnospores—3.9–4.7 × 1.3–1.6 μ, aeciospores—17–25 × 14–18 μ and aecial peridial cells—30–47 (length)

× 14–21 μ (breadth). An average of 19 peridermia per cm. along a single leaf face was obtained for three estimates. From these measurements it is obvious that the aecial stage of *P. arcticum* on *P. canadensis* is very closely related to the aecial stage of *P. americanum* and indeed in the field the two species on *P. canadensis* are indistinguishable. Microscopically they may show specific differences but at present the name *Peridermium ingenuum* undoubtedly covers the aecial stages of both species.

Cultures with aecial inoculum

Aeciospores of *Pucciniastrum arcticum* from Experiment 81 were cultured on leaves of *Rubus triflorus* and *R. idaeus* var. *strigosus*. Although only a few experiments were set up the results were in striking contrast to those performed with *P. americanum*. After an incubation period of 15 to 17 days uredinia appeared on *R. triflorus* while the single inoculated leaf of *R. idaeus* var. *strigosus* remained free from infection (See Tables XI and XII).

The writer wishes to acknowledge his indebtedness for numerous helpful suggestions during the course of these investigations to Professor J. H. Faull at whose proposal the problem was undertaken. Assistance was freely given from the Special Research Fund of the University of Toronto.

SUMMARY

Pucciniastrum americanum (Farl.) Arth. on *Rubus idaeus* var. *strigosus* has its aecial stage, *Peridermium ingenuum* Arthur (in part), on *Picea canadensis*. Successful infections were obtained in both directions.

No infection was obtained with this rust on *Abies balsamea*, *Picea mariana*, *Tsuga canadensis*, *Rubus triflorus*, *Agrimonia mollis* and *Pyrola elliptica*.

Pucciniastrum arcticum (Lagerh.) Tranz. on *Rubus triflorus* has its aecial stage, *Peridermium ingenuum* Arthur (in part), also on *Picea canadensis*. Successful infections were obtained in both directions.

No infection was obtained with *Pucciniastrum arcticum* on *Abies balsamea*, *Taxus canadensis*, *Tsuga canadensis*, *Picea mariana* and *Rubus idaeus* var. *strigosus*.

Artificial infections establish *Pucciniastrum americanum* and *P. arcticum* as distinct species.

Peridermium ingenuum is a name that has apparently designated the aecial stages of both *Pucciniastrum americanum* and *P. arcticum*.

BIBLIOGRAPHY

1. Arthur, J. C. (1907). Uredinales. North American Flora, **7**(2): 83–160.
2. ———— (1919). New species of Uredineae—XI. Bull. Torrey Bot. Club, **46**: 107–125.
3. ———— (1920). New species of Uredineae—XII. Bull. Torrey Bot. Club, **47**: 465–480.
4. ———— (1924). Uredinales. North American Flora, **7**(9): 605–668.
5. ———— (1925). Uredinales. North American Flora, **7**(10): 669–732.

6. Clinton, G. P. (1908). Heteroecious rusts of Connecticut having a peridermium for their aecial stage. Report of the Station Botanist, 1907. Conn. Agric. Exp. Station Report 1907–1908. Issued **1908**: 369–396.
7. ———— (1911). Report of the Station Botanist, 1909–1910. Conn. Agric. Exp. Station Report 1909–1910. Issued **1911**: 713–774.
8. Davis, J. J. (1914). A provisional list of the parasitic fungi of Wisconsin. Trans. Wisc. Acad. Sc., Arts and Letters, **17**: 846–984.
9. ———— (1921). (Pucciniastrum). Mycologia, **13**: 58.
10. ———— (1922). (Pucciniastrum). Mycologia, **14**: 46.
11. ———— (1922). Notes on parasitic fungi in Wisconsin VIII. Trans. Wisc. Acad. Sc., Arts and Letters **20**: 413–431.
12. Dodge, B. O. (1923). Morphology and host relations of Pucciniastrum americanum. Journ. Agric. Res. **24**: 885–894.
13. Farlow, W. G. (1908). Notes on fungi—I. Rhodora, **10**: 9–17.
14. Fraser, W. P. (1911). Cultures of some heteroecious rusts. Mycologia, **3**: 67–74.
15. ———— (1912). Cultures of heteroecious rusts. Mycologia, **4**: 175–193.
16. Hubert, E. E. (1916). Celluloid cylinders for inoculation chambers. Phytopathology, **6**: 447–450.
17. Lagerheim, G. (1889). Ueber einige neue oder bemerkenswerthe Uredineen. Hedwigia, **28**: 103–112.
18. Rhoads, A. S., G. G. Hedgcock, E. Bethel and C. Hartley (1918). Host relationships of the North American rusts, other than Gymnosporangiums, which attack conifers. Phytopathology, **8**: 309–352.
19. Tranzschel, W. von (1895). O teleitosporsack gribow, Uredo arcticus Lag., Uredo Agrimoniae D C. i Melampsora Alni Thuem. Script. Bot. Hort. Univ. Imp. Petrop. **4**: 299–302.

Arnold Arboretum Laboratory, Harvard University,
Jamaica Plain, Mass.

THE CHROMOSOMES OF SOME SPECIES OF THE GENUS PHILADELPHUS

Walter Bangham

The Mock-oranges were cultivated as garden plants in very early Southern European gardens. With the exception of *Philadelphus coronaria* L. which occurs in southeastern Europe and the Caucasus the genus is now found represented in the flora of three regions, Eastern Asia, Southeastern U. S. A. and Western North America, although it is now cultivated in most of the temperate regions.

While no fossil record of Philadelphus has been found it seems certain that the genus existed in the late eocene or in miocene times and that it was present in the flora of northern North America and Asia which at that time supported a temperate to subtropical flora. According to Berry[1] the end of the eocene period was marked by the elevation of the Rocky Mountain region with the consequent development of aridity in the Great Plains. Those features prevented the escape of other plants into the Pacific coast area as the Arctic regions again became cold and the temperate flora retreated to more southern localities.

Hydrangea, a closely allied genus and one which shows an almost identical distribution to that of Philadelphus, has left its fossil record

[1] Berry, Edward W., Tree ancestors, 1923.

in this Miocene deposit. Its flowers were found in the Mascall flora near Spokane, Washington.[1]

A separation of the species since the late eocene (a matter of several million years) should have given an ample opportunity for a change to have taken place in the number and genetic constitution of the chromosomes unless they form an extremely stable group. Many hybrid forms have originated under cultivation wherever several species have grown in close proximity.

An examination of the pollen-mother cells of about forty of the species, hybrids and varieties found in the Arnold Arboretum, which represent all the taxonomic groups and native localities of the genus, revealed no marked difference in their chromosome groups. All the species examined had a haploid chromosome count of 13 and the chromosomes seemed to be perfectly compatible in the hybrids. There was no evidence of lagging or other aberrant behavior. Counts were usually made at diakinesis as there was usually some clumping of the chromosome at the first metaphase. The anthers were smeared, fixed permanently with Nawaschin's solution, and stained with crystal violet by Newton's method.

As will be noted below, *P. maximus* is given by Rehder[2] as a cross between *P. tomentosus* of Himalayan origin and *P. pubescens* which is a native of Southeastern U. S. A. The chromosomes seem to be completely compatible in *P. maximus* which would indicate that there must have been very little change in their makeup in the millions of years that they, or their ancestors, have been separated.

The only departures from complete fertility were the hybrids *P. cymosus* "Bannière," with a semi-double flower having modified anthers but no pollen, and *P. insignis* which developed no anthers.

The chromosomes of the following forms were counted. The grouping is that of Rehder.[2]

Group 1. GORDONIANI Koehne.

P. Lewisii Pursh; Mont. to Wash. and Ore.
P. confusus Piper; Wash.
P. Gordonianus Lindl.; B. C. to Idaho and N. Calif.
P. pubescens Lois.; Tenn. to Ala. and Ark.
P. pubescens var. intectus A. H. Moore; Tenn.
P. monstrosus Rehd. (P. ? Gordonianus × pubescens).

Group 2. SERICANTHI, Rehd.

P. Magdalenae Koehne; W. China.
P. incanus Koehne; W. China.
P. subcanus Koehne; C. and W. China.
P. sericanthus Rehderianus Koehne; W. China.
P. purpurascens Rehd.; W. China.
P. Delavayi L. Henry; Yunnan.

[1] KNOWLTON, FRANK HALL, Plants of the past, 1927.
[2] REHDER, ALFRED, Manual of cultivated trees and shrubs, 1927.

Group 3. Coronarii Koehne.
P. satsumanus Miq.; Japan.
P. satsumanus var. nikoensis Rehd.
P. tomentosus Wall.; Himalayas.
P. maximus Rehd. (P. pubescens × tomentosus).
P. nepalensis Koehne; Himalayas.
P. pekinensis Rupr.; N. China to Korea.
P. Schrenkii var. Jackii Koehne; Korea, N. China.
P. coronarius L.; S. Eur., Italy to Cauc.
P. coronarius var. salicifolius Jacques.
P. Zeyheri Schrad. (P. coronarius × inodorus or grandiflorus).
P. floribundus Schrad. (P. coronarius × ? Gordonianus).
P. Falconeri Sarg. (P. coronarius × laxus).
Group 4. Speciosi Koehne.
P. laxus Schrad.; Ga.
P. inodorus L.; N. C. to Fla. and Ala.
P. splendens Rehd. (P. grandiflorus × ? Gordonianus).
P. magnificus Koehne (P. grandiflorus × pubescens).
P. floridus Beadle; N. C. to Ga.
Group 5. Microphylli Koehne.
P. Lemoinei Lemoine (P. microphyllus × coronarius).
P. polyanthus Rehd. "Favorite" (P. Lemoinei × ? insignis).
P. cymosus Rehd. (P. Lemoinei × ? grandiflorus).
P. " "Norma."
P. " "Conquete."
P. virginalis Rehd. (P. Lemoinei × ? nivalis plenus).
Group 5. Gemmati Koehne.
P. hirsutus Nutt.; N. C. and Tenn. to Ga. and Ala.
P. "Atlas" Lemoine and P. "Girandole" Lemoine are two garden hybrids of which the parents are unknown.

I wish to express the highest appreciation for the advice and assistance of Professor Karl Sax and Mr. Alfred Rehder, which they gave freely throughout this investigation.

Arnold Arboretum Laboratory
Jamaica Plain, Mass.

ORCHIDS COLLECTED BY J. F. ROCK ON THE ARNOLD ARBORETUM EXPEDITION TO NORTHWESTERN CHINA AND NORTHEASTERN TIBET

Charles Schweinfurth

Cypripedium luteum Franchet in Nouv. Arch. Mus. Hist. Nat. Paris, sér. 2, x. 88 (1887).

Southwestern Kansu: Upper Tebbu country, outskirts of spruce forest, near gulch leading to Wapaku, southern slopes of Minshan, alt. 3000 m., no. 12536, June, 1925 (flowers yellow).

Cypripedium nutans Schlechter in Meddel. Göteb. Bot. Trädgård, I. 128 (1924) (as *Cypripedilum nutans*), ex char.

SOUTHWESTERN KANSU. Upper Tebbu country: southern slopes of Minshan; along bank of mountain stream, alt. 3200 m., no. 12499, June, 1925 (flowers reddish brown, striped).

These specimens differ from the typical plant (as described) in that the ovary and upper part of the peduncle are somewhat sparingly cellular-pubescent and the lamina of the connate lateral sepals is markedly narrower than specified.

Cypripedium tibeticum King ex Hemsley in Jour. Linn. Soc. XXIX. 320 (1892).

SOUTHWESTERN KANSU. Upper Tebbu country: along banks of Kaiochowho, southern slopes of Minshan, common, alt. 3200 m., no. 12521, June, 1925.

EASTERN TIBET. Radja and Yellow River gorges: grassy northern slopes of river valley south of Radja, alt. 3200 m., no. 13989, May 25, 1926 (flowers red to purple); alpine meadows of mountains opposite Radja, alt. 3500 m., no. 14165, June, 1926.

Orchis Chusua D. Don, Prodr. Fl. Nepal. 23 (1825).

CENTRAL KANSU. Lien hoa shan: in mossy ground and spruce forests, between Taochow and Titao, alt. 3000 m., no. 12735, July 14–20, 1925 (flowers deep rich purple).

SOUTHWESTERN KANSU. T'ao River basin: on boulders of Shiaoku, at Shimen, beyond Adjuan, alt. 3000 m., no. 12833, July, 1925 (flowers rich purple); Upper Tebbu country: on mossy boulders in Abies and Picea forests, road to Pandrukikoa, alt., 3350 m., no. 13115, Aug., 1925 (flowers purplish lavender).

Orchis salina Turczaninow ex Lindley, Gen. and Sp. Orch. 259 (1835), ex char.

EASTERN TIBET. Radja and Yellow River gorges: grassy slopes opposite bank of Yellow River, alt. 3200 m., no. 13978, May 25, 1926 (flowers deep purplish red). Ba valley: alt. 3000 m., no. 14251, June, 1926 (flowers purple), swampy meadow near Saoch Rongwa villages, alt. 2900 m., no. 14356, July, 1926 (flowers deep purple).

Orchis spathulata Reichenbach f. ex Hooker f., Fl. Brit. Ind. VI. 127 (1890).

CENTRAL KANSU. Lien hoa shan: in spruce forests and mossy ground between Taochow and Titao, alt. 3000 m., no. 12713, July 12–20, 1925 (flowers purple).

This is a small form with very narrow leaves (5–9 mm. wide).

Aceratorchis tschiliensis Schlechter in Fedde Rep. Spec. Nov. Beihefte, XII. 329 (1922), ex char.

EASTERN TIBET. Radja and Yellow River gorges: alpine meadows, mts. southwest of Radja; south of river, alt. 3600–3900 m., no. 14190, June, 1926 (flowers white).

The writer shares with Dr. Schlechter, the author of this genus and species, the suspicion that this plant may well be a peloric form of some species of Orchis. For if it were not for the complete absence of a spur, it would be inseparable from that genus.

It is, however, a decided error to refer *Orchis Delavayi* Schltr. (Vide Schlechter in Fedde Rep. Spec. Nov. Beihefte, XII. 330 (1922) which has a 3-lobed lip and a prominent spur, to the synonymy of this simple-lipped, spurless species.

The plant cited in this enumeration differs from the type description in its markedly larger white, not rosy, flowers.

Amitostigma monanthum (Finet) Schlechter in Fedde Rep. Spec. Nov. Beihefte, IV. 94 (1919), ex char.

SOUTHWESTERN KANSU. T'ao River basin: mossy boulders and on banks of Hsiaoku stream, alt. 3000 m., no. 12622, July 6, 1925 (flowers white, spotted brownish-white).

The writer does not feel entirely satisfied with the distinctness of this genus from Orchis. However, this collection surely represents *Peristylus monanthus* Finet in Rev. Gén. Bot. XIII. 523, t. 17, figs. 1–9 (1901).

Herminium tanguticum Rolfe in Jour. Linn. Soc. XXXVI. 51 (1903), ex char.

CENTRAL KANSU. Lien hoa shan: in mossy ground and spruce forests, between Taochow and Titao, alt. 3000 m., no. 12736, July 14–20, 1925 (flowers whitish green).

The plants of this collection show racemes which are generally longer than typical.

Habenaria conopsea Bentham in Jour. Linn. Soc. XVIII. 354 (1881).

Gymnadenia conopsea R. Brown in Aiton Hort. Kew. ed. 2, v. 191 (1813).

SOUTHWESTERN KANSU. T'ao River basin: ridges of Merku valley, southwest of Choni, in spruce forest, alt. 3000 m., no. 12944, July, 1925 (flowers pale pink lavender, very fragrant); Upper Tebbu country: grassy slopes beyond Pandrukika, on road to Sungpan, Drjakana, alt. 3800 m., no. 13120, Aug., 1925 (flowers reddish purple; odor of vanilla).

Habenaria cucullata (L.) Hoefft, Cat. Pl. Kursk. 56 (1826).

Gymnadenia cucullata L. C. Richard in Mém. Mus. Paris, IV. 57 (1818).

SOUTHWESTERN KANSU. Lower Tebbu country: in mossy ground and humus; open places in forests, Wantsang valley, alt. 2500 m., no. 14700, Sept. 3, 1926 (leaf dark green spotted purple; flowers lilac or pale lavender, fragrant).

Habenaria spiranthiformis Ames and Schlechter in Fedde Rep. Spec. Nov. Beihefte, IV. 52 (1919).

EASTERN TIBET. Radja and Yellow River gorges: grassy sand banks of Yellow river, southeast of Radja, alt. 3000 m., no. 14210, June, 1926 (flowers green).

This collection represents a mature form of the species.

Amesia longibracteata, sp. nov.

Herba terrestris, elata, foliosa. Folia elliptica vel lanceolata, amplectentia. Inflorescentia sublaxe multiflora; bracteae inferiores flores multo superantes; sepala lanceolata, unicarinata, lateralia paulo obliqua; petala ovato-lanceolata; labellum in hypochilium et epichilium divisum; hypochilium valde saccatum nervis quinque incrassatis; epichilium ovato-cordatum, in basi conspicue bicallosum.

Plant tall, about 68 cm. high to the tip of the inflorescence. Stem erect above the more slender basal portion, loosely 7-leaved, the basal third leafless but showing the remains of 3 sheaths, glabrous below, densely short pubescent above. Leaves elliptic-ovate to narrowly lanceolate, many-nerved, the middle ones much the largest, rounded at the sessile more or less clasping base, with the margins and veins of the upper surface minutely papillose-scabrous; lower leaf relatively small, broadly elliptic-ovate, 4.5 cm. long, 3.1 cm. wide, subacute, provided with a close tubular sheath about 2.5 cm. long; middle leaves elliptic to broadly lanceolate, the largest exceeding 12 cm. long (tip broken off), 4.8 cm. wide, lower blades abruptly acute, upper long acuminate; uppermost leaf narrowly lanceolate, 8.7 cm. long, 1 cm. wide near the base, long attenuate. Raceme (rachis) 15.3 cm. long, rather loosely many-flowered. Floral bracts narrowly lanceolate, up to 6 cm. long and 8 mm. wide, foliaceous, long acuminate, the lowest much the largest and about thrice surpassing the flower, the uppermost much reduced and subequaling the subtended flower. Sepals lanceolate, strongly carinate on the outer surface, 5-nerved, the upper part conspicuously papillose without, with recurved tips. Dorsal sepal about 1.3 cm. long, 5 mm. wide across the concave basal part, acuminate. Lateral sepals similar, slightly oblique, about 1.4 cm. long, 5 mm. wide, anterior margin slightly dilated near the concave base, apical margins minutely erose. Petals ovate-lanceolate, about 1.2 cm. long, 4.8 mm. wide near the base, gradually narrowed to an acute complicate tip, 3-nerved with the lateral nerves irregularly branching, the mid-nerve carinate without. Labellum sharply divided into a horizontal hypochil and recurved epichil; hypochil deeply saccate, about 4.5 mm. long, traversed by 5 longitudinal thickened ribs of which the outer has 2 branches; epichil cordate-ovate, 5 mm. long, 4.4 mm. wide near the rounded base, complicate-acute, margins crenate-erose, bearing a pair of large fleshy approximate calli in the center of the base. Column short, very stout, about 3.6 mm. high. Pedicellate ovary clavate, densely short pubescent.

CHINA. Central Kansu. Lien hoa shan: grassy slopes, alt. 2900 m., no. 13216, August, 1925 (flower whitish green) (Type in Herb. Ames, no. 34915).

Apparently allied to **Amesia squamellosa** (Schltr.) C. Schweinfurth, comb. nov. (*Epipactis squamellosa* Schlechter in Fedde Rep. Spec. Nov. Beihefte, IV. 56 [1919]), but differs in being much taller, with longer leaves, and somewhat larger flowers with differently proportioned lip.

In general appearance it recalls the widespread and variable *A. latifolia* (Huds.) Nels. & Macbr. of Europe and North America, but it has larger flowers with more acuminate segments and carinate-veined hypochil of the lip.

Description made from dried specimen.

✓ **Oreorchis Rockii,** sp. nov.

Herba parva, pusilla. Folium singulum, lanceolato-ellipticum, patens. Scapus folium multo superans, gracilis, vaginis tribus ornatus; racemus laxe 1- ad 3-florus; sepala lateralia lanceolata, valde falcata; sepalum dorsale longius, oblanceolato-oblongum; petala falcato-oblanceolata; labellum trilobatum; lobi laterales parvi, falcato-lanceolati; lobus intermedius multo major, obovato-spathulatus, retusus; discus prope basim bicarinatus.

Plant small for the genus, 8–12.7 cm. high including the terminal flower. Pseudobulb cylindric to ovoid, 5–6 mm. long, with longitudinal axis horizontal or oblique, emitting a few fibrous lanuginose roots. Leaf solitary, basal, slender-petioled; lamina (only one present) elliptic-lanceolate, recurved-spreading, nearly 3 cm. long, about 7 mm. wide, shortly acuminate or acute, cuneate at base, the lower half conduplicate, many-nerved; petiole 1–1.7 cm. long. Scape slender, erect to arcuate, 7.5–11 cm. long when extended, glabrous, provided with 3 tubular sheaths—the lower one marcescent—which are gradually dilated above. Raceme 1- to 3-flowered, very loose. Floral bracts minute, ovate, scarious, spreading. Flowers large for the plant, erect or nearly so, purple according to collector's note. Sepals and petals subconnivent, 5–nerved. Lateral sepals strongly falcate, lanceolate, 10 mm. long, 2.8 mm. wide in the middle, acute or obtuse. Dorsal sepal oblanceolate-oblong, 11.8–12 mm. long, 2.2 mm. wide above the middle, obtuse or acute. Petals oblanceolate, falcate, 9.4–9.7 mm. long, about 2 mm. wide above the middle, subacute, 3- to 5-nerved. Labellum recurved and parallel to the column in natural position, deeply 3-lobed below the middle, shortly clawed with the slightly saccate base adnate to the column, 8.5–9 mm. long when extended, with a pair of short approximate semi-elliptic keels in the center near the base; lateral lobes upcurved in natural position, small, porrect, lanceolate-falcate, rounded at the tip, the free portion 1.5–1.9 mm. long; middle lobe much larger, broadly obovate-spatulate, 5.2–6 mm. long, 5.3–5.8 mm. wide across the rather abruptly dilated anterior half, broadly rounded and minutely retuse, the

sides of the basal portion more or less fleshy-thickened. Column strongly arcuate, 5–6 mm. long, dilated at base, concave on the anterior face. Pollinia 4, complanate-ovoid. Pedicellate ovary clavate, 5–7.7 mm. long.

CHINA. CENTRAL KANSU. Lien hoa shan: alpine meadows, alt. 3000 m., no. 12744, July 14–20, 1925 (Type in Herb. Ames, no. 34914).

Oreorchis Rockii has two rather close allies from the same general region, and it appears to be intermediate between them. It differs from *O. nana* Schltr. in its taller habit, larger flowers, 5-nerved perianth segments and twice longer column. It is a much shorter plant than *O. oligantha* Schltr., with markedly smaller flowers and a retuse lip.

In the dried flowers the sepals and petals appear to be dark brown and the lip lighter with dark spots.

Description drawn from dried specimens.

BOTANICAL MUSEUM OF HARVARD UNIVERSITY
CAMBRIDGE, MASS.

PAPUAN PTERIDOPHYTES COLLECTED FOR THE ARNOLD ARBORETUM BY L. J. BRASS

E. B. COPELAND

THE collection of about 100 specimens of Papuan ferns made by L. J. Brass for the Arnold Arboretum has been received for determination. The country in which Mr. Brass collected was largely covered previously by the Rev. Copland King, and a very large part of Mr. Brass' species were familiar from the King collections. Additional species and notes on species already known follow.

Lycopodium Brassii, sp. nova.

Phlegmaria gracilis, fructuosissima sporophyllis minutis; caule deorsum 3 mm. crasso septangulo, sursum sensim usque ad 0.6 mm. et quadrangulo decrescente, epiphytico, quinties dichotomo, parte sterile 45 cm. longa ramis divaricatis; foliis caulem non occultantibus, deorsum usque ad 7 mm., sursum plerisque circiter 4 mm. longis, circiter 1.6 mm. latis, acutis, subfalcatis, sessilibus vix decurrentibus, integris, glabris, planis, subcoriaceis, costa gracili, ramis cum foliis circiter 7 mm. latis; spicis permultis circiter 11 cm. longis dichotomis rarius iterum furcatis, 1 mm. crassis; sporophyllis circiter 0.6 mm. longis, 0.7 mm. latis, supra basin dilatatam triangularibus, acutis, integris, leviter carinatis vel bicarinatis, quam sporangia fere 1 mm. longa et lata distincte minoribus.

U-uma river, on a tree overhanging the river, no. 1521, May 20, 1926.

A relative of *L. Phlegmaria*, slender in a degree known among species with gradual transition from foliage leaves to sporophylls, but unfamiliar among those with the spikes sharply delimited.

Marattia platybasis, sp. nova.

Trunco teste lectore brevissimo; fronde teste eodem 150–180 cm. longa, cum pinnis oppositis 20–25 cm. remotis; pinna 60 cm. longa,

subsessili, rhachi ima basi articulata, squamis fuscis linearibus usque ad 3 mm. longis aspersa, foliolo apicali 13 cm. longo; pinnulis 20–25-paribus plerisque oppositis, infimis reductis 5 cm. longis, medialibus 12 cm. longis, 15 mm. latis, fere sessilibus, basi utrinque truncatis sed inaequalibus, latere acroscopico circiter 9 mm., basiscopico vix 5 mm. latis, apice in caudas 2 cm. longas 2–3 mm. latas haud abrupte contractis, ubique serratis, subcoriaceis, inferne pallidis; costa inferne deorsum paleis parvis angustissimis paucis praedita, venis simplicibus, 1.5–2.0 mm. remotis, sparsissime squamuliferis; synangiis 1 mm. a margine remotis, vix 2 mm. longis, squama inconspicua persistente subtensis; sporangia circiter 10-paribus.

Ihu, Vailala river, no. 1005, Feb. 19, 1926.

Conspicuous because of the bases of pinnules squarely truncate on both sides. I have fragmentary material of at least two other undescribed Papuan species, collected by Copland King. The genus seems to be rich locally in very distinct species.

Hymenophyllum longifolium van Aldervelt van Rosenburgh.

U-uma river headwaters, Eastern Division, alt. 450–600 m. no. 1467, May 18, 1926 (fronds pendulous from tree trunks).

This species was described from Celebes, the description applying satisfactorily to our specimens with the help of its author's English version showing that the stipe is winged *at least* in the upper part; this wing may be a full millimeter wide on each side. It is nearly related to *H. Junghuhnii*, the head of the receptacle widened to fully twice its length. It differs from that species in its very elongate fronds, broader wings on the rachises and costae, and shorter segments, which may be emarginate as described, or rounded. It may be suspected that the *H. dilatatum* reported in New Guinea by Brause (in Bot. Jahrb. LVI. 40 [1920]) with very long and narrow fronds, is really this species.

Trichomanes atrovirens (Presl) Kunze.

T. rhomboideum J. Smith, nomen nudum.

Cephalomanes rhomboideum v. d. B.

Owen Stanley range, between Mt. Brown and Mt. Clarence, no. 1482; Iwarere, no. 677; perhaps also Ihu, Vailala river, no. 973 (small and ill developed).

Not before reported from New Guinea. Distinguished from *T. javanicum* by the slightly enlarged mouth of the involucre and by the long, curved laciniae on the lower margin of the pinnae. Quite identical with Philippine specimens. Brause (in Bot. Jahrb. LVI. 35, 36 [1920]) has described two Papuan species as related to this, both apparently distinguishable by broader involucres.

Cyathea Brassii, sp. nova.

Caudice gracili teste lectore 6 m. alto et stipite paleaceo, ambobus ceterum ignotis; fronde 2 m. longa, fere tripinnata, rhachi fulva paleis

fulvis usque ad 1 cm. longis angustissimis brevissime castaneo-ciliatis ad bases nigras breves insidentibus mox deciduis ornata, inter quales minute pallide subdecidue arachnoideo-furfuracea, demum paleis abscissis spinulosa; pinnis medialibus 40 cm. longis, abrupte acuminatis, breviter (1 cm.) stipitulatis, rhachi purpureo-maculata, squamulis amorphis pallidis appressis aspersa, glabrescente; pinnulis sessilibus, utroque latere circiter 25, medialibus horizontalibus 6 cm. longis, 15 mm. latis, infra apices abrupte contractis, papyraceis, inferne pallidis haud glaucis, costa superne pilis debilibus rufis et pallidis haud dense pubescente, inferne squamulis sparsis pallidis amorphis obsita et praeique deorsum paleis nonnullis fere albis nitentibus 1 mm. longis lanceolatis apices suas versus ciliatis ornata; segmentis utroque latere circiter 15, 3 mm. latis, patentibus, subfalcatis, obtusis, serratis, pilis paucis 0.5 mm. longis ciliatis, costula superne pilis paucis incurvatis usque ad 0.7 mm. longis obsita, inferne deorsum squamulis pallide fulvis integris elongato-bullatis valde apiculatis sat dense obsita; venulis circiter 12-paribus plerisque furcatis; soris costularibus circiter 7-paribus, parvis (circiter 0.7 mm. diametro), contiguis, paraphysatis, squamulis laceratis subtensis vel primo involucratis.

Aisa River, Eastern Division, no. 1421, May 15, 1926.—Nom. indig.: *Bunu-bunu.*

A species well characterized by its assortment of peculiar hairs and paleae; not very closely related to the wide-spread and common *C. contaminans*, in spite of their common possession of a so-called false indusium. Abortive sori consist of a cluster of scales, or of a rudiment surrounded by the scales, which as the sori develop, are normally pressed down flat, with only their tips protruding or entirely concealed.

Dryopteris pseudostenobasis, sp. nova.

Rhizomate ignoto, stipite teste lectore 1 m. alto; fronde 130 cm. alta, 50 cm. lata, in apicem parvam pinnatifidam abrupte contracta, pinnis infimis paucis subremotis diminutis, ubique nuda, rhachi pallide fusca deorsum 4 mm. crassa; pinnis medialibus alternantibus, eodem latere rhacheos 3 cm. remotis sessilibus, subhorizontalibus, 25 cm. longis vix 15 mm. latis, sensim in caudam longam integram attenuatis, basin versus subattenuatis papyraceis, profunde pinnatifidis; segmentis 5–6 mm. longis, 3 mm. latis, apice rotundatis, integris, rectis, patentibus; venulis simplicibus, circiter 10-paribus, infimis plerumque anastomosantibus rarius solummodo infra sinus approximatis et parallelis; soris medialibus, circiter 9-paribus nudis et sine paraphysibus; sporis nigris.

Ihu, Vailala river, in rain forests, no. 1000, Feb. 19, 1926. The collector's notes read: "Grows in large masses. Leaves 6–7 ft. long. Lower 3 ft. of (stipe) without pinnae."

To the naked eye, this would pass perfectly for *D. stenobasis* C. Chr. That species, as already shown by the original collection, is quite variable in width of pinnae,—from 1 to 3 centimeters,—and in their contraction

at the base. It is constant in the presence of glandular paraphyses, probably in its minute, glandular indusium, and in the exceedingly minute pubescence of the nether surface, in all of which microscopic characters *D. pseudostenophylla* is different. Both are inconstant in the anastomosis of the lowest veinlets. Mettenius, Phegopteris und Aspidium, no. 233, described the nether surface of *D. stenobasis* as "sub lente minutissime glandulosa;" the spores are likely to make both species look that way.

Dryopteris albo-ciliata, sp. nova.

Caudice erecto brevi, paleis castaneis 1 cm. longis anguste lanceolatis acuminatissimis plerisque minute pubescentibus immerso; stipite 25–30 cm. alto, gracili, stramineo, puberulo; fronde 35–45 cm. alta, 17 cm. lata, acuminata, bipinnatifida, rhachi straminea pilis albis aspersa; pinnis sessilibus valde acuminatis, infimis vix diminutis deflexis, medialibus horizontalibus 8.5 cm. longis, 1 cm. latis, basi hastulatis vel subauriculatis, herbaceis, utraque facie pilis albis ad costam et venas usque at 0.8 mm. longis ad laminam brevioribus obsitis et ciliatis, caudis serrulatis, alibi profunde pinnatifidis; segmentis 4 mm. longis, 2.5 mm. latis, obtusis, integris; venulis simplicibus, 6-paribus, infimis 1-paribus anastomosantibus; soris medialibus; indusiis orbiculari-reniformibus, 0.4 mm. latis, persistentibus, hirsutis haud glanduligeris, integris.

Basiatibu, alt. 450 m., on floor of rain forest, no. 566, Nov. 6, 1925.

Apparently a member of the great group of "*D. parasitica,*" in spite of the absence of reduced basal pinnae, characterized within the group by the white hairs on all parts, including the indusia, and gradually long-acuminate pinnae.

Polystichum lastreoides Rosenstock in Fedde, Rep. Spec. Nov. IX. 425 (August, 1911).

Dryopteris Kingii Copeland in Philip. Jour. Sci. VI. 73 (June, 1911), non C. Chr.

Dryopteris tamatana C. Christensen, Ind. Suppl. 40 (1913).

Brass, Aisa river, on creek banks, no. 1422, May 15, 1926.

My description of this species was based on a specimen of King, no. 149, which had lost its indusia. Rosenstock's was based on King no. 194 and described with "indusio persistente, coriaceo, aterrimo, exacte rotundato-peltato, margine eroso-fimbriata." Mr. King later sent me a frond of his no. 194 and additional material of no. 149, bearing indusia. The two are absolutely identical. The indusia are peltate. On my specimens of both of King's numbers and on Brass's plant they are brown, sometimes approaching black, and perfectly entire.

These indusia make the plant a *Polystichum, by definition,* and Rosenstock ascribed it to the group of *P. varium.* In spite of the indusia, I do not believe that it belongs in this genus.

Tectaria Weinlandii (Christ), comb. nov.

Aspidium Weinlandii Christ in Bull. Herb. Boiss. ser. 2, I. 453 (1901).

Laloki river, no. 541, Oct. 31, 1925.

Larger than the type and with several lateral pinnae, and the indusia fairly persistent; identical with a specimen received under this name from Dr. Rosenstock, Fil. novoguinenses exsic., no. 184, leg. Bamler.

It is related to the common and variable *T. crenata* Cav., and to *T. papuana* Copel. A single frond from the Owen Stanley range, alt. 1050 m., Brass, no. 1480, is intermediate between *T. crenata* and *T. Weinlandii*.

Tectaria craspedocarpa, sp. nova.

Sagenia; rhizomate paleis linearibus atrocastaneis 7 mm. longis integris vestito; stipite usque ad 35 cm. alto, gracili, atropurpureo, nitido, sub lente minute puberulo; fronde trifida basi late cordata vel trifoliata cum foliolo mediali trilobato basi cuneato, usque ad 25 cm. longa, 20 cm. lata, superne costa et inferne tota fronde minute puberula, papyracea, lobis acuminatis, margine integra vel subundulata, lobo, segmento vel foliolo laterali quoque basiscopice acuta et ramo minore praedita; venatione conspicua more Sageniae reticulata; soris magnis (1.5 mm. latis) in lineam fere marginalem instructis, indusio orbiculari-reniforme, integro, persistente.

Laloki river, alt. 450 m., in damp soil under rocks near river, no. 557, Oct. 31, 1925.

Except for the position of the sori, this resembles Malayan specimens called *Aspidium latifolium*, but is not very nearly related to Forster's Polynesian plant. Only one fruiting frond was collected; it has a simple, lobed frond, nearly 20 cm. wide, with the middle segment deformed. The sori form a row almost entirely around it, without a sorus elsewhere.

Asplenium squamuligerum (Rosenst.) Hieronymus in Bot. Jahrb. LVI. 147 (1920), as to the description.

? Iawarere, alt. 300 m., on rocks, no. 671, Nov. 22, 1925.

In dealing with the Mindanao fern, *Athyrium Ramosii* Copeland (in Philip. Jour. Sci. XXXVIII. 140 [1929]) construed as this species by Hieronymus in error, I overlooked the publication of *A. squamuligerum* cited above. The Brass material now in hand conforms to the descriptions. It and the Mindanao species have a remarkable superficial resemblance, although most certainly not nearly related, Brass' plant being a true *Asplenium*.

If this were the whole story, it would be one more illustration of the accident which sometimes befalls even the best collectors,—the confusion of superficially similar plants. This remains barely possible, however; for, on the heels of the Brass collection, I have received from Dr. Rosenstock a good specimen of Keysser's no. 228, the type collection of "*A.* *squamuligerum*, and this specimen is an unmistakable *Athyrium*.

Following the policy explained in the publication of *A. Ramosii*, of close specific discrimination in this group, I continue to regard Athyrium

squamuligerum (Rosenst.: Hieron.) Copeland, n. comb., and *A. Ramosii* as distinct species, the former being smaller, more finely dissected but less toothed. The apical segments of the pinnae, as represented here, are not entire, but their teeth are far less conspicuous than those of *A. Ramosii*.

Brass' plant may be new; or it may be a very reduced form of a known *Asplenium*.

Dennstaedtia erythrorachis Christ.

U-uma river headwaters, alt. 450 m., no. 1512 (large fern in river bottom).

This is exactly the plant already known from Papua by this name. It is thinner than the Mindanao plant so identified by Christ, and has relatively broader pinnules and smaller sori.

Lindsaya sessilis Copeland.

Ihu, Vailala river, scandent in rain forest, no. 1077.

This collection includes fronds twice as large as those of the type, probably reaching a length of 45 cm. and a width of 5.5 cm., and with stipes about 1 cm. long. The smaller fronds are perfectly typical.

Humata tenuis Copeland.

U-ume river headwaters, alt. 450–600 m., creeping on fallen logs, no. 1465.

The lamina is less contracted than that of the type collection, i. e., the segments are broader.

Cyclophorus aglaophyllus, sp. nova.

Rhizomate 6 mm. crasso, paleis atrocastaneis supra basin 0.5 mm. latam acicularibus densissime vestito; stipitibus caespitosis validis triangularibus superne valde sulcatis 5–15 cm. altis; fronde 60–75 cm. alta, ca. 5 cm. lata, acuminata, deorsum sensim longe attenuata, coriacea superne primo albo-lanosa in vetustate glabra laete castanea, inferne paleis primo pallidis tum demum obscuris inter quales multis cum spina centrali atropurpurea 0.3 mm. longa praeditis vestita; costa valida superne plana v. sulcata, inferne carinata; venis perconspicuis; venulis immersis in reticulationem inconspicuam compactam more Tectariae anastomosantibus; soris minutis, partem superiorem frondis omnino oltegentibus.

Ibelva, Vailala river, no. 1143, March 13, 1926.

A very near relative of the Philippine *C. splendens* from which it is distinguished by much firmer texture, more stipitate fronds, narrower fronds in the case of those seen, and in having the spines from the middle of the scales less than half as long but identical in type.

Cyclophorus stellatus, sp. nova.

C. adnascenti affinis squamulis stellatis densioribus et persistentioribus distinctus, statura minore, rhizomate late repente, 1 mm. crasso, paleis

appressis ovato-lanceolatis 1.5 mm. longis acuminatis atrocastaneis cum puncto fixationis nigro margine albida in vetustate perdita vestito; stipitibus sese 1–2 cm. remotis, ad phyllopodia circiter 1.5 mm. alta articulatis, frondium sterilium 5–10 mm., fertilium 3–4 cm. longis; fronde sterili 2–5 cm. longa, 4–7 mm. lata, acuta v. obtusa, deorsum angustata, coriacea, primo ubique squamulis stellatis densissime vestita in vetustate extrema solummodo superne glabra punctulis nigris aspersa, inferne subglabra, venis omnino occultis; fronde fertili lineari usque ad 10 cm. longa, 5 mm. lata, quam sterilis persistentius squamulosa, ubique basi valde angustata excepta sorifera, soris 0.6–0.8 mm. latis, inter costam gracilem et marginem circiter 4-seriatis.

Territory of New Guinea, Friedrich-Wilhelmshafen, on coconut trunks, *W. A. Setchell*, s. no., March 1904 (type in Herb. Univ. Calif., no. 71391); also Territory of Papua, U-uma River headwaters, *L. J. Brass*, no. 1473.

C. adnascens is common on coconut trunks well throughout the eastern tropics. It varies widely in size and shape of fronds; but almost always its sterile fronds are larger than those of *C. stellatus*, and always relatively broader and more rounded, and more promptly glabrescent; and its fertile fronds, commonly broader throughout, are almost always broadest and sterile near the base. In another direction, *C. stellatus* shows affinity to *C. rupestris*, and thus to *C. dispar*.

Cyclophorus dimorphus, sp. nova.

Rhizomate late repente fere 2 mm. crasso, duro, paleis vel relictis palearum appressis lanceolatis nigris anguste albide marginatis et ciliatis persistentibus vestito; stipitibus vix 2 cm. inter sese distantibus, ad phyllopodia 2–4 mm. longa articulatis, superne sulcatis, frondium sterilium 2–3 cm., fertilium 3–5 cm. longis, sursum alatis; fronde sterili circiter 6 cm. longa, 2 cm. lata, basi cuneata, apice late rotundata, rigide coriacea, utraque facie paleis minutis albidis stellatis sparsis et inconspicuis persistentibus praedita; costa inferne deorsum conspicua apicem versus occulta, venis omnino immersis; fronde fertili 15–20 cm. longa, 1 cm. lata, explanata sed in speciminibus convoluta et deinde vix 5 mm. lata, obtusa, basi excepta soris circiter 1 mm. latis dense obtecta, costa inferne conspicua, gracili.

Lower Mori river, on exposed rocks at river mouth, no. 1575, May 28, 1926.

Nearly related to the wide-spread and variable *C. adnascens*, from which the persistent though inconspicuous pubescence of both surfaces distinguishes it; it is also peculiar in having larger and more broadly rounded sterile fronds than are usual in that species. It may be near to *C. Ledermanni* Brause, but that is described as having the sterile fronds densely pilose beneath, the apex abruptly contracted to a short apex, and the stipes winged to the base. It is probably closer to the little-known *C. pachydermus*, and like it in having rather large sori, for

the group. That species, from Kei, is described as smaller throughout, with naked upper surface. No rhizome tip is present and the young paleae are accordingly not known. A lacerate whitish margin persists until they are quite old.

Brause (in Bot. Jahrb. LVI. 205 [1902]) lists ten species of *Cyclophorus* as known in New Guinea, and *C. varius* is quite surely still to be reported. The following artificial key will serve to distinguish the species now known there.

Cyclophorus of New Guinea

Fronds commonly 30 cm. or more long
- Main veins conspicuous
  - Stellate paleae with a central spine ..... 1. *C. aglaophyllus*
  - Stellate paleae without a central spine ..... 2. *C. princeps*
- Main veins invisible ..... 3. *C. acrostichoides*

Fronds smaller
- Sori in one row on each side of costa
  - Sori immersed ..... 4. *C. Lauterbachii*
  - Sori superficial ..... 5. *C. confluens*
- Sori numerous
  - Fronds uniform ..... 6. *C. macropodus*
  - Fronds dimorphous but equally long ..... 7. *C. Ledermanni*
  - Sterile fronds shorter than fertile
    - Fertile fronds subsessile ..... 8. *C. dispar*
    - Fertile fronds stipitate
      - Sterile fronds acute, about 10 cm. long ..... 9. *C. Bamleri*
      - Sterile fronds obtuse, usually smaller
        - Upper surface stellate
          - Sterile fronds under 1 cm. wide ..... 10. *C. stellatus*
          - Sterile fronds larger ..... 11. *C. dimorphus*
        - Upper surface glabrescent
          - Sori about 1 mm. broad ..... 12. *C. pachydermus*
          - Sori smaller ..... 13. *C. adnascens*

Microsorium Brassii, sp. nova.

Rhizomate ad terram repente, gracili, 1.3 mm. crasso, paleis erecto-patentibus lanceolato-ovatis fuscis membranaceis integris 1–1.5 mm. longis acuminatis basibus aut peltatis aut cordatis persistentibus vestito; stipitibus plus minusve 2 cm. inter sese remotis, 2–3 cm. longis, non articulatis, gracilibus, laete castaneis, paleis parvis paucis adspersis; fronde 15–20 cm. longa, 10–12 mm. lata, utrinque acuminata, integra, membranacea, glabra, costa gracili inferne praestante; venis $\frac{2}{3}$ ad marginem protensis et seriem unam areolarum magnarum includentibus, venulis in reticulam areolarum secundariarum anastomosantibus, cum liberis inclusis simplicibus vel hamatis; soris in areolis primariis solitariis, rarissime duo, deinde utroque latere costae uniseriatis, ad costam quam ad marginem propioribus, parvis, superficialibus.

Upoia, Vailala river, on wet clay river bank, no. 1153, March 15, 1926.

Similar to *Polypodium wobbense* Brause in general appearance and texture, but smaller, narrower, and with the sori seriate. *P. Raapii* v. A. v. R., of the Batu Islands, must be a very similar species, but is described as having two or three rows of irregular areolae, naked stipes,

and glabrescent rhizomes. The single row of major areolae of *M. Brassii* is decidedly regular. With the adoption of the terrestrial habitat, the articulation of the stipe, characteristic of the group, has effectively disappeared.

Merinthosorus drynarioides (Hooker) Copeland in Philip. Jour. Sci. Bot. VI. 92 (1911).

Acrostichum drynarioides Hooker, Sp. Fil. v. 282.
Photinopteris drynarioides Beddome, Ferns Brit. India, pl. 325.
Dryostachyum drynarioides Kuhn in Ann. Lugd.-Bat. IV. 296; Forschungsreis. Gazelle, pl. II.

Owen Stanley range, between Mt. Brown and Mt. Clarence, alt. 1375 m., no. 1503 (coarse ground fern).

The type of the genus, collected by Copland King, shows no locality more definite than "Papua," and consists of the upper part of a frond. Beddome's figure is equally incomplete. Kuhn's illustration shows an entire frond, with dilated base, and with fertile pinnae longer than the sterile segments. Brass's specimen has a contracted base and comparatively short fertile pinnae, conforming at least in the former respect with Hooker's description.

Whether we have to deal with a single species, or with two or more, may best not be decided from the available information. In some ferns of this group, the form of the base is a fixed specific character; in others, I believe it to be very inconstant. If a Papuan species of this genus is fixed in its terrestrial habitat, it can hardly be conspecific with the one with broad base, figured by Kuhn. The ancestry is surely epiphytic.

HERBARIUM, UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

TWO NEW RHODODENDRONS OF THE TSUTSUTSI SECTION

ALFRED REHDER

Rhododendron annamense, spec. nov.

Frutex ramis erectis subverticillatis; ramuli dense pilis brevibus paleaceis fulvis ad secundum annum persistentibus vestiti, vetustiores fusco-grisei. Gemmae florales perulis pluribus late ovatis subito acuminulatis secus medium dorsum minute puberulis et strigosis marginem ciliatum versus glabris. Folia persistentia, chartacea, anguste oblongo-lanceolata vel oblanceolata, 2.5–6.5 cm. longa et 6–8 mm. lata, acuta vel breviter acuminata, basi anguste cuneata, initio utrinque dense pilis adpressis applanatis fulvis nitentibus vestita, maturitate sparsius strigosa, supra interdum glabrescentia vel pilis griseis conspersa, atroviridia, leviter rugulosa, costa non impressa, subtus pallide viridia, satis dense strigosa, ad costam dense paleaceo-strigosa, margine integra, adpresse ciliata;

petioli 3–7 mm. longi, supra plani, dense breviter paleaceo-strigosi. Inflorescentia 1–2-flora; pedicelli circiter 5 mm. longi, dense paleaceo-strigosa; sepala inaequalia, ovato-oblonga vel oblonga, 3–5 mm. longa, obtusa, extus dense longeque setosa-strigosa, intus glabra; corolla infundibuliformis, 4–4.5 cm. longa, ut videtur roseo-purpurea et maculis destituta, tubo 18–20 mm. longo a basi sensim dilatato extus glabro intus leviter papilloso-pilosa, lobis ovalibus 2.2–2.5 cm. longis et 15–17 mm. latis glabris; stamina 10, inaequalia, fere recta, longiora corollam aequantia, breviora lobos medios attingentia, filamentis infra medium papilloso-pilosis basi complanatis, antheris oblongis 2 mm. longis purpureo-fuscis; ovarium dense adpresse setoso-strigosum; stylus 4.5–5 cm. longus, corollam superans, leviter vel vix curvatus, glaber, stigmate capitato.

ANNAM: near Hué, *R. W. Squires*, no. 94, Jan. to May, 1927.

This new species is most nearly related to *R. hainanense* Merr. which differs chiefly in its considerably smaller flowers, smaller leaves glaucescent beneath and glabrous or nearly glabrous at maturity except the strigose midrib, glabrous above at maturity. The species extends the range of the Tsutsutsi section beyond China into Annam.

✓ **Rhododendron Simsii** Planch. var. **mesembrinum**, var. nov.

Rhododendron mesembrinum Balfour f. & Forrest in sched.—[Rhododendron Society], A list of Rhododendrons in their series. Ed. 1 & 2, p. 7 (1925), ed. 3, p. 7 (1927), name only.

A typo recedit praecipue corolla minore circiter 3 cm. longa alba et extus roseo suffusa intus purpureo-maculata, tubo intus leviter papilloso-piloso, foliis minus dense strigosis subtus glaucescentibus.—Frutex 2–2.5 m. altus, ramulis, petiolis, pedicellis, costa media subtus densissime fusco-paleaceo-strigosis. Folia anguste elliptica ad oblongo-ovata, 1.5–4.5 cm. longa, acuta vel acutiuscula, mucronata, supra satis sparse pilis arcte adpressis strigosis basi bulbosis vestita, subtus glaucescentia sparsius pilis fuscis strigosis vestita. Inflorescentia 2–6-flora, pedicellis perbrevibus; sepala semiorbicularia ad late ovata, 1–2 mm. longa, extus dense longe setosa; corolla infundibuliformis, circiter 3 cm. longa, alba extus roseo suffusa, ad basin lobi superioris purpureo-maculata, lobis ovalibus tubum circiter aequantibus; stamina 10, inaequalia, longiora quam corolla breviora, filamentis infra medium pilosis; stylus glaber, corollam aequans vel paullo longior; ovarium dense strigosum.

YUNNAN: Jang-tzow shan, Shweli-Salwin divide, Lat. 25°, 10′, *G. Forrest*, no. 17914, May, 1919 (shrub 6–8 ft.; flowers white, flushed rose exterior, with a few crimson markings; in mixed thickets).

On account of the smaller more numerous white flowers this Azalea appears at the first glance quite different from typical *Rh. Simsii* Pl., but there is no morphological character to separate it specifically. The other white form described, *Rh. Simsii* var. *eriocarpum* (Hay.) Wilson from the Kawanabe Islands, has larger flowers and broader often obovate

more pubescent leaves, and the corolla apparently lacks the crimson markings.

The variety looks in flower and leaf somewhat intermediate between *Rh. Simsii* and *Rh. microphyton* Franch. which was collected by Forrest at the same locality (no. 17918), but the latter species is easily distinguished by its much smaller corolla, with cylindric tube and 5 stamens exceeding the corolla-lobes, and by its smaller leaves.

NOTES ON THE LIGNEOUS PLANTS DESCRIBED BY H. LÉVEILLÉ FROM EASTERN ASIA[1]

ALFRED REHDER

ARISTOLOCHIACEAE

Aristolochia moupinensis Franchet in Nouv. Arch. Mus. Paris, sér. 2, X. 79 (Pl. David. II. 117) (1887).

Aristolochia Bonatii Léveillé in Bull. Soc. Bot. France, LVI. 608 (1909); Cat. Pl. Yun-Nan, 11 (1915).

CHINA. Yunnan: taillis des montagnes, *E. E. Maire*, Herb. Bonati, no. 446, July, 1906 (type of *A. Bonatii*).

The leaves are less pubescent than usually in *A. moupinensis*, but otherwise the specimen agrees with that species.

Aristolochia Feddei Léveillé in Fedde, Rep. Spec. Nov. XII. 287 (1913); Cat. Pl. Yun-Nan. 13 (1915).

CHINA. Yunnan: rochers de Ti-li, alt. 2800 m., *E. E. Maire*, June [1910–14] (type).

POLYGONACEAE

Polygonum emodi Meisn. var. **dependens** Diels in Notes Bot. Gard. Edinb. V. 256 (1912).

Polygonum zigzag Léveillé & Vaniot in Fedde Rep. Spec. Nov. VI. 112 (1908)—Léveillé, Cat. Pl. Yun-Nan, 208 (1916).

CHINA. Yunnan: Lou-pou, près Tong-chouan, *J. Tchang*, no. 541, Sept. 1906 (type; ex Léveillé).

Polygonum zigzag Lévl. & Van. of which I have seen no specimen is according to Dr. G. Samuelsson (in litt.) identical with *P. emodi* var. *dependens* Diels. The variety *dependens* Diels known only from Yunnan seems to differ very little from the Himalayan type except in its more vigorous habit and larger leaves, but Schneider's no. 3675 from Chung-tien, Yunnan, is scarcely different from the type.

Polygonum urophyllum Franchet & Bureau in Jour. de Bot. V. 150 (1891).

Polygonum Mairei Léveillé in Fedde Rep. Spec. Nov. VII. 338 (1909); Cat. Pl. Yun-Nan, 208 (1916).

CHINA. Yunnan: Yun-nan-sen, haies, montagnes arides, *E. E.*

[1] Continued from p. 132.

Maire, nos. 348, 366, May, June, 1904–1905 (type; ex Léveillé); rocailles à mi-mont de Kiang-ti, alt. 2000 m., *E. E. Maire*, [1911–14].

Léveillé's species has been identified by Dr. G. Samuelsson (in litt.) with *P. urophyllum* Franch. & Bur. Of this species I have seen only the specimen from Kiang-ti which is not cited by Léveillé and bears the name "*Polygonum Statice* Levl." in Léveillé's handwriting on the label, but in Léveillé's herbarium it was correctly placed in the folder of *P. Mairei*. There is also a specimen in the Bonati Herb. under no. 7482 Ser. B. labeled "*P. Mairei* Lév.?" and collected by E. E. Maire at Kin-tchong-tschau, alt. 2800 m., Juin 1910. The species is known only from Yunnan.

Polygonum multiflorum Thunberg, Fl. Jap. 169 (1784);—Meisner, Monog. Gen. Polygon. 64, t. 4, fig. *Q* (1826); in De Candolle, Prodr. XIV. 136 (1856).

Polygonum Statice Léveillé in Fedde, Rep. Spec. Nov. VII. 338 (1909); Fl. Kouy-Tchéou, 321 (1915).

CHINA. K w e i c h o u : without locality, *J. Esquirol*, no. 164 (type of *P. Statice;* ex Léveillé).

Léveillé's species of which I have seen no specimen is according to Dr. Samuelsson *P. multiflorum* Thbg. The species is widely distributed throughout China and extends to Manchuria, Japan and Formosa.

AMARANTHACEAE

Deeringia amaranthoides (Lam.) Merrill, Interpret. Herb. Amb. 211 (1917).

Deeringia baccata (Retz.) Moquis-Tandon in De Candolle, Prodr. XIII. pt. II. 236 (1849).

Mallotus neo-Cavaleriei Léveillé, Fl. Kouy-Tchéou, 165 (1914).

CHINA. K w e i c h o u : Lo-fou, *J. Cavalerie*, no. 3516, March, 1909 (type of *Mallotus neo-Cavaleriei*).

RANUNCULACEAE

Clematis fusca Turczaninow in Bull. Soc. Nat. Moscou, XIII. 60 (1840).—Finet & Gagnepain in Bull. Soc. Bot. France, I. 516 (1903); Contrib. Fl. As. Or. I. 31, 40 (1905).

Clematis Coreana Léveillé in Bull. Acad. Intern. Geog. Bot. XI. 298 (1902).—Nakai in Jour. Coll. Sci. Tokyo, XXVI. art. 1, p. 11 (Fl. Kor. I) (1909).—Non *C. koreana* Komar.

KOREA. Monts Nai-piang, 1208 m., *U. Faurie*, no. 8, July, 1901 (type of *C. Coreana;* ex Léveillé).

Finet & Gagnepain have referred *C. Coreana* which I have not seen to *C. fusca*.

Clematis Clarkeana Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 170 (1902).—Léveillé, Fl. Kouy-Tchéou, 332 (1915); Cat. Pl. Yun-Nan, fig. 56 (1917).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 545 (1903); Contrib. Fl. As. Or. I. 30 (1905).

CHINA. Kweichou: environs de Gan-pin, dans la depression, grotte, *L. Martin & E. Bodinier*, no. 1990, Oct. 24, 1897 (type).

Clematis pterantha Dunn in Hooker's Icon. Pl. XXVIII. t. 2713 (1913).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 544 (1903); Contrib. Fl. As. Or. I. 29 (1905).—Léveillé, Fl. Kouy-Tchéou, 333 (1915).

Clematis Philippiana Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 169 (1902).

CHINA. Kweichou: environs de Lo-pie, Tchen-li-tchéou, borde de la route, haies, *L. Martin & E. Bodinier*, no. 1992, Oct. 6, 1897 (type of *C. Philippiana*).

Clematis Leschenaultiana De Candolle, Syst. I. 151 (1818).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 542 (1903); Contrib. Fl. As. Or. I. 27 (1905).—Léveillé, Fl. Kouy-Tchéou, 333 (1915).

Clematis splendens Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 171 (1902), quoad specim. nos. 2248 et 2248 bis.

CHINA. Kweichou: environs de Hoang-ko-chou dans les rocailles, *L. Martin* in herb. Bodinier, no. 2248bis, Feb. 10, 1899 (syntype of *C. splendens*); district de Tchen-lin, environs de Lo-pie, *J. Seguin* in herb. Bodinier, no. 2248, March, 1898 (syn-type of *C. splendens*).

The identification by Finet & Gagnepain of *C. splendens* with this and the following species was accepted by Léveillé in his Flore de Kouy-Tchéou.

Clematis rubifolia Wright in Kew Bull. Misc. Inform. 1896, p. 21.—Finet & Gagnepain in Bull. Soc. Bot. France, L. 543 (1903); Contrib. Fl. As. Or. I. 28 (1905).—Léveillé, Fl. Kouy-Tchéou, 333 (1915).

Clematis splendens Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 171 (1902), exclud. specim. nos. 2248 et 2248 bis.

CHINA. Kweichou: environs de Tsin-gay, vallée de Kia-la tchong, *J. Laborde* in herb. Bodinier, no. 2024, Dec. 1897, 1898 (syntype of *C. splendens*).

Clematis montana Buchanan-Hamilton apud De Candolle, Syst. I; 164 (1818).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 524 (1903). Contrib. Fl. As. Or. I. 9 (1905).—Léveillé, Fl. Kouy-Tchéou, 333 (1915).

Clematis Kuntziana Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 171 (1902).

CHINA. Kweichou: borde de la route entre Hin-y-fou et le fleuve Hoa-kiang, *E. Bodinier*, no. 1576, April 20, 1897 (type of *C. Kuntziana;* ex Léveillé).

Finet & Gagnepain have referred *C. Kuntziana* which I have not seen to *C. montana*.

Clematis Vanioti Léveillé & Porter in Fedde, Rep. Spec. Nov. VII. 20 (1910).— Léveillé, Fl. Kouy-Tchéou, 334 (1915).

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 3581, March, 1909 (type).

This species seems related to *C. Armandi* Franch., but differs considerably in its 5-foliolate leaves and in the 3-flowered long-peduncled inflorescence with the pedicels about as long as the peduncle and the lateral ones with small broad basal bractlets; sometimes the peduncle is 1-flowered.

Clematis smilacifolia Wallich in As. Research. XIII. 402 (1820).—Hooker in Bot. Mag. LXXII. t. 4259 (1846).

Clematis Esquirolii Léveillé & Vaniot in Bull. Herb. Boissier, sér. 2, VI. 504 (1906).—Léveillé, Fl. Kouy-Tchéou, 332 (1915).

CHINA. Kweichou: Pin-tong, *J. Esquirol*, no. 264, Dec. 25, 1904 (type of *C. Esquirolii*); Lo-fou, Pin-yang, *J. Cavalerie*, nos. 2663 and 3578, Dec. 1905 and March, 1909 (sub *C. Esquirolii* in Léveillé, Fl. Kouy-Tchéou, l. c.).

Clematis Duclouxii Léveillé in Fedde, Rep. Spec. Nov. VII. 97 (1909); Cat. Pl. Yun-Nan, 220 (1917).

CHINA. YUNNAN: Tso-kio, sur la route de Yun-nan-sen à Houy-ly-tcheou, *Martin, Ma.*, no. 575, March, 1907 (type).

This species seems nearest to *C. Pavoliniana* Pamp. from which it differs in the simple leaves and in the obtuse anthers with a minute obtuse mucro and in the white hairs of the carpels; the two pairs of simple leaves present in the type specimen may be reduced from normally 3-foliolate or pinnate leaves, as it sometimes happens in the leaves of lateral branchlets.

Clematis Pavoliniana Pampanini in Nuov. Giorn. Bot. Ital. n. ser. XVII. 270 (1910).

Clematis Finetiana Léveillé & Vaniot in Bull. Soc. Bot. France, LI. 219 (1904).—Léveillé, Fl. Kouy-Tchéou, 332 (1915).

CHINA. Kweichou: Pin-fa, *J. Cavalerie*, no. 1347, May 5, 1902 (syn-type of *C. Finetiana*); Pin-fa, borde des ruisseaux, *J. Cavalerie*, no. 605, Oct. 5, 1902 (syn-type of *C. Finetiana*).

Clematis chinensis Retzius, Observ. II. 18 no. 53, t. 2 (1781).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 535 (1903); Contrib. Fl. As. Or. I. 20 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. I. 329 (1913).—Léveillé, Fl. Kouy-Tchéou, 332 (1915).

Clematis funebris Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 168 (1902).

Clematis oligocarpa Léveillé & Vaniot, op. cit. XVII. no. 210–11, p. II (1907).—Léveillé, Fl. Kouy-Tchéou, 333 (1915).

Clematis Cavaleriei Léveillé & Porter in Fedde, Rep. Spec. Nov. IX. 20 (1910).—Léveillé, Fl. Kouy-Tchéou, 332 (1915).

CHINA. Kweichou: environs de Gan-pin, *L. Martin & E. Bodinier*, no. 1787, Aug. 9, 1897 (type of *C. funebris;* ex Léveillé & Vaniot and Finet & Gagnepain); route de Pin-fa, Sang-li, *J. Cavalerie* no. 2490, Aug. 19–20, 1911 (type of *C. oligocarpa*); Gan chouen, *J. Cavalerie*, no. 2490 [bis] Nov. 1909 (under *C. oligocarpa* in Fl. Kouy-Tchéou); Lo-fou, *J. Cavalerie*, no. 3582, March, 1909 (type of *C. Cavaleriei*).

Finet & Gagnepain have already identified *C. funebris* with *C. chinensis*, and this determination has been accepted by Léveillé in his Flore de Kouy-Tchéou. *Clematis Cavaleriei* differs somewhat from typical *C. chinensis* in the narrower leaflets cuneate at base and slightly pubescent on the veins, and in the sepals being rather densely pubescent outside.

Clematis uncinata Champion in Hooker's Jour. Bot. & Kew Gard. Misc. III. 255 (1851).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 523 (1903); Contrib. Fl. As. Or. I. 8 (1905).—Rehder & Wilson in Sargent, Pl. Wilson, I. 327 (1913).—Léveillé, Fl. Kouy-Tchéou, 334 (1915).

Clematis Drakeana Léveillé & Vaniot in Bull. Acad. Intern. Geog. Bot. XI. 168 (1902).

Clematis Gagnepainiana Léveillé & Vaniot in Bull. Soc. Bot. France, L. 219 (1904).—Léveillé, Fl. Kouy-Tchéou, 332 (1915).

CHINA. Kweichou: environs de Kouy-yang, mont du Collège, gorges de Yang-pa, *E. Bodinier*, no. 1680, June 20, 1898 (syn-type of *C. Drakeana;* ex Léveillé & Vaniot); environs de Gan-pin, *L. Martin & L. Bodinier*, no. 1680 [bis], July 3, 1897 (syn-type of *C. Drakeana;* ex Léveillé & Vaniot and Finet & Gagnepain); Pin-fa, montagnes boisées, *J. Cavalerie*, no. 664, Oct. 30, 1902 (type of *C. Gagnepainiana*).

Clematis Drakeana had already been identified with *C. uncinata* by Finet & Gagnepain and enumerated under the latter name by Léveillé in his Flore de Kouy-Tchéou.

Clematis paniculata Thbg. var. **dioscoreifolia** Rehder in Jour. Arnold Arb. I. 195 (1920).

Clematis dioscoreifolia Léveillé & Vaniot in Fedde, Rep. Spec. Nov. VII. 339 (1909).

KOREA. Quelpaert: in sepibus Hogno, *E. Taquet*, no. 502, Sept. 2, 1908 (type).

Clematis Chanetii Léveillé in Fedde, Rep. Spec. Nov. XI. 495 (1913).

CHINA. Chili: Kia-chan, *L. Chanet*, no. 560, Aug. 1910 (type); montagnes de Ping-chan, *L. Chanet*, no. 229, June 15, 1908 (sub *C. Chanetii* in Herb. Léveillé).

As stated by Léveillé in his description the species is related to *C. Flammula* L., which has not yet been recorded from northern China, and until I have seen more complete material, I hesitate to identify it with that species. From other related species as *C. paniculata* Thbg., and *C. chinensis* Retz. it differs in its bipinnate leaves and from *C. angustifolia* Jacq. in its climbing habit, axillary inflorescences and different venation of the leaflets. The plant seems to blacken in drying like *C. chinensis*.

Clematis Gouriana Roxburgh apud De Candolle, Syst. I. 138 (1818).

Clematis Martini Léveillé in Bull. Acad. Intern. Geog. Bot. XVII. no. 210–11, p. II (1907); Fl. Kouy-Tchéou, 333 (1915).

CHINA. Kweichou: route de Pien-yang à Lo-fou, *J. Cavalerie*, no. 2662, Nov. 1905 (type of *C. Martini;* ex Léveillé); bords du fleuve

Hoa-kiang, *J. Esquirol*, no. 576, Aug. 5, 1905 (syn-type of *C. Martini*); Lo-fou, *J. Cavalerie*, no. 3583, March, 1909 (sub *C. Martini* in Léveillé, Fl. Kouy-Tchéou).

LARDIZABALACEAE

Akebia trifoliata Koidz. var. **australis,** comb. nov.
Akebia lobata Dcne. var. *australis* Diels in Bot. Jahrb. XXIX. 344 (1900).
Akebia Chaffanjoni Léveillé in Bull. Soc. Agr. Sci. Sarthe, XXXIX. 316 (Bouquet Fl. Chine 1) (1904); in Fedde, Rep. Spec. Nov. VI. 372 (1909).
Akebia lobata var. *Chaffanjoni* Léveillé, Fl. Kouy-Tchéou, 47 (1914).
CHINA. Kweichou: environs de Kouy-yang, Gan-pin, mont du Collège, *J. Chaffanjon* in herb. Bodinier, no. 2159, April 3, 1898 (fruit comestible; type of *A. Chaffanjoni*).

Holboellia coriacea Diels in Bot. Jahrb. XXIX. 342 (1900).
Artabotrys Esquirolii Léveillé, Fl. Kouy-Tchéou, 29 (1914).
CHINA. Kweichou: Gny-hien, bords du ruisseau, 700 m., *J. Esquirol*, no. 2184, June, 1910 (syn-type of *Artabotrys Esquirolii*).
The description by Léveillé does not seem to fit Esquirol's no. 2184; the other syn-type, Esquirol's no. 2033, I have not seen.

Holboellia spec.
Akebia Cavaleriei Léveillé, Fl. Kouy-Tchéou, 47 (1914).
CHINA. Kweichou: Pin-fa, contreforts de Yuin-ou-chan; *J. Cavalerie*, no. 955, May 28, 1903 (type of *Akebia Cavaleriei*).
This species seems nearest to *H. coriacea* Diels, but the leaves are mostly 4-foliolate and the leaflets rather small and usually obtuse.

BERBERIDACEAE

Berberis Griffithiana Schneider in Bull. Herb. Bossier ser. 2, v. 403 (1905); VIII. 198 (1908).—Léveillé, Fl. Kouy-Tchéou, 48 (1914).
Berberis Cavaleriei Léveillé in Fedde Rep. Spec. Nov. IX. 454 (1911).
CHINA. Kweichou: entre Kouen-chan et Kouy-yang, *J. Cavalerie*, no. 3209, April, 1907 (type of *B. Cavaleriei;* ex Léveillé).
I have not seen Cavalerie's no. 3209 and follow Léveillé who in his Flore de Kouy-Tchéou refers it to *B. Griffithiana*.

Berberis bicolor Léveillé in Fedde, Rep. Spec. Nov. IX. 454 (1911).
CHINA. Kweichou: Ma-jo, *J. Cavalerie*, no. 3043, May, 1908 (hauteur 1.50 m.; fleurs exterieurement rouges, interieurement blanches; type).
This species seems very near *B. Gagnepainii* Schneid., but the leaves are broader with the margin scarcely undulate and with rather fine appressed-setose serration.

Berberis Wilsonae Hemsley in Kew Bull. Misc. Inform. 1906, p. 151; in Bot. Mag. CXXXVIII. t. 8414 (1912).—Léveillé, Fl. Kouy-Tchéou, 48 (1914), as *B. Wilsoni*.
Berberis Bodinieri Léveillé in Fedde, Rep. Spec. Nov. IX. 454 (1911); Cat. Pl. Yun-Nan, 17 (1915).

CHINA. Kweichou: Long-li, Ma-jo, *J. Cavalerie*, no. 3042, Nov. 1908. Yunnan: environs de Yun-nan-sen, *E. Bodinier*, Nov. 17, 1896 (type of *B. Bodinieri*).

I have seen neither of the specimens enumerated above. In his Flore de Kouy-Tchéou Léveillé refers his *B. Bodinieri* to *B. Wilsonae*, but cites Cavalerie's no. 3042 from Kwei-chou which he did not mention with his original description.

Mahonia ganpinensis Fedde, Rep. Spec. Nov. VI. 372, nota (1909).—Léveillé, Fl. Kouy-Tchéou, 49 (1914).—Takeda in Notes Bot. Gard. Edinb. VI. 238 (1917).

Berberis (*Mahonia*) *Ganpinensis* Léveillé in Bull. Soc. Agr. Sci. Arts Sarthe, XXXIX. 317 (Bouquet Fl. Chin. 2) (1904); in Fedde, Rep. Spec. Nov. VI. 372 (1909).

Mahonia confusa Sprague in Kew Bull. Misc. Inform. 1912, p. 339.—Takeda in Notes Bot. Gard. Edinb. VI. 234 pl. 25, 26, fig. 168–172 (1917).

Mahonia Zemanii Schneider in Sargent, Pl. Wilson. I. 378 (1913).

CHINA. Kweichou: environs de Gan-pin dans la grande depression-caverne, *L. Martin* in herb. Bodinier, no. 1929, Oct. 24, 1897 (type of *B. ganpinensis*); Ma-jo, *J. Cavalerie*, no. 3054, Sept. 5, 1907 (under *M. ganpinensis* in Fl. Kouy-Tchéou).

The type specimens of *M. confusa* Sprague and *M. Zemanii* Schneid. are almost identical but differ from typical *M. ganpinensis* in the more numerous and broader leaflets, about 7 pairs, while typical *M. ganpinensis* has 4 to 5 pairs not counting the small basal pair; the leaflets are up to 12 mm. and in Cavalerie's no. 3054 not more than 8 mm. wide. The difference in the width of the leaflets between the Kweichou and the Hupeh specimens is more pronounced than that between Henry's nos. 3117 and 3351, syn-types of *M. confusa*, while Wilson's no. 2883, the type of *M. Zemanii*, agrees well with Henry's no. 3117. *Mahonia confusa* had been already referred to *M. ganpinensis* by C. Schneider in the herbarium of the Arnold Arboretum.

MAGNOLIACEAE

Michelia Martini Finet & Gagnepain apud Léveillé, Fl. Kouy-Tchéou, 270 (1914).—Dandy in Kew Bull. Misc. Inform. 1927, p. 263.

Magnolia Martini Léveillé in Bull. Soc. Agr. Sci. Art. Sarthe, XXXIX. 321 (Bouquet Fl. Chin. 6) (1904); in Fedde, Rep. Spec. Nov. VI. 374 (1909).

CHINA. Kweichou: environs de Gan-pin, a Leang-chouy-tsin, *L. Martin* in herb. Bodinier, no. 2066, 9–20 Febr. 1898 (fleurs blanc-crême; type of *Magnolia Martini*).

Michelia Leveilleana Dandy in Kew Bull. Misc. Inform. 1927, p. 263.

Michelia Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. IX. 459 (1911); Fl. Kouy-Tchéou, 270 (1914).—Non Finet & Gagnepain.

CHINA. Kweichou: Ma-jo and Lon-mong-touan, *J. Cavalerie*, no. 3045, Apr. and May, 1908 (type of *M. Cavaleriei*).

Kadsura chinensis Hance in Bentham, Fl. Hongkong. 8 (1861).—Léveillé, Fl. Kouy-Tchéou, 269 (1914).

Kadsura (*Schizandra*) *Cavaleriei* Léveillé in Fedde, Rep. Spec. Nov. IX. 459 (1911).

CHINA. Kweichou: Pin-fa, près de cascades, *J. Cavalerie*, no. 3046, Mai (type of *K. Cavaleriei*), no. 1023, May 28, 1903.

Schizandra Henryi Clarke in Gard. Chron. ser. 3, XXXVIII. 162, fig. 55 (1905).

Schizandra hypoglauca Léveillé in Fedde, Rep. Spec. Nov. IX. 459 (1911); Fl. Kouy-Tchéou, 270 (1914); Cat. Pl. Yun-Nan, 175 (1916).

CHINA. Kweichou: without precise locality, *J. Esquirol*, no. 58, May 7, 1904 (liane; fleurs jaunes; type of *S. hypoglauca*).

Schizandra propinqua Hook. f. & Thoms. var. **sinensis** Oliver in Hooker's Icon. XVIII. t. 1715 (1887).

Embelia Valbrayi Léveillé, Cat. Pl. Yun-Nan, 177 (1916).

CHINA. Yunnan: rochers derrière La-kou, alt. 2400–2500 m., *E. E. Maire*, July, Sept., 1912 (type of *Embelia Valbreyi*).

The type consists of two different specimens almost alike and collected at the same locality on different dates. In the same cover resembling these specimens in the shape of the leaves there was another specimen without label which proved to be *Stachyurus salicifolius* Franch.

ANNONACEAE

Miliusa sinensis Finet & Gagnepain in Mém. Soc. Bot. France, LIII. 151 (1906); Contrib. Fl. As. Or. II. 151, t. 18 (1907).—Léveillé, Fl. Kouy-Tchéou, 29 (1914).

Evodia Lyi Léveillé in Bull. Geog. Bot. XXIV. 142 (1914); Fl. Kouy-Tchéou, 376 (1915).

CHINA. Kweichou: Yuin-lin, *J. Cavalerie*, no. 3971, in 1912. (type of *Evodia Lyi*).

Cavalerie's specimen is in fruit, and though I have not seen the type of *Miliusa sinensis* and its description is based only on a flowering specimen, I have little doubt that *Evodia Lyi* belongs here, since the specimens before me agrees well in all its vegetative characters with Finet & Gagnepain's description and plant figured, and the fruiting carpels are borne on a peduncle as long and slender as that of the flowers figured. The nearly mature carpels, however, are glabrous, while the young carpels are described as "omnino villosa."

✓ **Fissistigma retusum,** comb. nov.

Melodorum retusum Léveillé in Fedde, Rep. Spec. Nov. IX. 458 (1911); Fl. Kouy-Tchéou, 29 (1914).

CHINA. Kweichou: Lo-fou, *J. Cavalerie*, no. 2994, April, 1908 (type).

This species in the shape, venation and pubescence of the leaves and also in the character of its inflorescence is very similar to *F. polyanthoides* (A. DC.) Merr., but the calyx-lobes are about 5 mm. long and taper from a triangular-ovate base into a slender linear-lanceolate point.

As Merrill (in Philip. Jour. Sci. XV. 125 [1919]) has pointed out,

the genus *Melodorum* of Hooker f. & Thomson and later authors is not congeneric with *Melodorum* Loureiro whose type species is *M. fruticosum* Lour., and he adopts *Fissistigma* Griff. as the next oldest name for *Melodorum* in the sense of Hook. f. & Thoms.

Fissistigma Cavaleriei, comb. nov.

Uvaria Cavaleriei Léveillé, Fl. Kouy-Tchéou, 29 (1914).

CHINA. Kweichou: Tou-chan, *J. Cavalerie,* Oct. 1899 (fl. blanc-jaune).

This is another species of *Fissistigma* and not an *Uvaria;* it resembles somewhat *F. Oldhamii* (Hemsl.) Merr., but differs in its denser, fulvous and more villous tomentum, acute or acuminulate leaves, in its much smaller sepals, only 1–2 mm. long and glabrous inside, and narrower petals. The flowers seem to be always solitary.

LAURACEAE

Cinnamomum Mairei Léveillé in Fedde, Rep. Spec. Nov. XIII. 174 (Feb., 1914); Cat. Pl. Yun-Nan, 150 (1916).

Cinnamomum argenteum Gamble in Sargent, Pl. Wilson. II. 67 (March, 1914).

CHINA. Yunnan: forêts de Long-ky, 700 m., *E. E. Maire,* June 1912 (arbre moyen; fleurs grises; type).

Cinnamomum argenteum has been already enumerated by Léveillé (Cat. Pl. Yun-Nan, 150) as a synonym of his *C. Mairei.*

Cinnamomum glanduliferum Meisner in De Candolle, Prodr. XV. pt. I. 25 (1864).

Machilus Dominii Léveillé in Fedde Rep. Spec. Nov. XIII. 174 (1914); Cat. Pl. Yun-Nan, 151 (1916).

CHINA. Yunnan: forêts de Ku-long-tchang, 800 m., *E. E. Maire,* July, 1912 (petit arbre; fleurs blanches; type of *Machilus Dominii*).

Machilus Cavaleriei Léveillé in Bull. Geog. Bot. XXIV. 142 (1914); Fl. Kouy-Tchéou, 221 (1914).

CHINA. Kweichou: Gan-chouen, *J. Cavalerie,* no. 2131, May 1912.

This differs from all other Chinese species of *Machilus* known to me in its obtuse prominently reticulate leaves.

Notaphoebe omeiensis (Gamble) Chun in Jour. Arnold Arb. VIII. 21 (1927).

Lindera Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. X. 371 (1912); Fl. Kouy-Tchéou, 219 (1914).

Machilus Mairei Léveillé in Fedde, Rep. Spec. Nov. XIII. 174 (1914); Cat. Pl. Yun-Nan, 151 (1916).

Machilus Dunnianus Léveillé in Fedde, Rep. Spec. Nov. XIII. 174 (1914); Cat. Pl. Yun-Nan, 151 (1916).

Alseodaphne omeiensis Gamble in Sargent, Pl. Wilson. II. 70 (1914).

CHINA. Kweichou: Tsin-gai, Kao-po, bord des ruisseaux, *J. Cavalerie,* no. 1222, Aug. 5, 1903 (petit arbre; type of *Lindera Cavaleriei*). Yunnan: forêts de Long-ky, 700 m., *E. E. Maire,* May, 1912 (arbre;

fl. blanc-jaunâtre; type of *Machilus Mairei*); collines boisées à Long-ky, 700 m., *E. E. Maire*, June, 1912 (petit arbre, fl. blanches; type of *Machilus Dunnianus*).

I can see no specific difference between *Machilus Mairei* and *Machilus Dunniana*. Léveillé gives as chief difference the lateral not axillary panicles of *M. Mairei* and the axillary many-flowered panicles longer than the leaves of *M. Dunniana*, but in the type specimen of *A. omeiensis* the panicles are borne partly in the axils of the leaves and partly lateral on the basal leafless portion of the branches exactly as in the type of *M. Mairei* in which they also are partly lateral and partly axillary. In *M. Dunniana* the panicles happen to be all axillary and they are somewhat larger than in the types of *A. omeiensis* and *M. Mairei* which agree perfectly with each other, but they are still shorter than the leaves and not longer as described by Léveillé.

This species was originally described by Gamble under *Alseodaphne*, but as Hu points out the unequal and persistent perianth removes it from that genus and points to *Notaphoebe*.

Neolitsea spec.

Litsaea Dunniana Léveillé in Fedde, Rep. Spec. Nov. IX. 460 (1911); Fl. Kouy-Tchéou, 220 (1914).

CHINA. Kweichou: forêts de Gam-go, *J. Esquirol*, no. 565, Dec. 15, 1905 (arbre; type of *L. Dunniana*).

This is remarkable for its large leaves densely villous-pubescent beneath.

Neolitsea spec.

Litsea undulatifolia Léveillé, Fl. Kouy-Tchéou, 220 (1914).

CHINA. Kweichou: Pin-fa, Tou-chan, *J. Cavalerie*, no. 1954, March 14, 1900 (arbuste; fl. blanches, odoriferantes; type of *L. undulatifolia*).

This species in general appearance closely resembles *Actinodaphne confertifolia* (Hemsl.) Gamble, but is readily distinguished by the narrower leaves not glaucescent beneath and undulate at the margin, by the glabrous branchlets and the flowers with only 7–8 stamens.

Neolitsea spec.

Eurya Esquirolii Léveillé, Fl. Kouy-Tchéou, 415 (1915), nomen nud.

CHINA. Kweichou: Gan-chouen, *J. Esquirol*, no. 3893, March, 1912 (type of *E. Esquirolii*).

I have not seen the original publication if there is one of this species; it is not cited in Index Kewensis. I have referred the three preceding species to *Neolitsea* on account of their flowers having 6–8 stamens, but I have not been able to identify them with any of the species described under this or an allied genus. As one or the other may possibly belong to a species described under another genus or to a species unknown to me, I prefer for the present at least, not to propose new combinations for these species.

Litsea cubeba Persoon, Syn. II. 4 (1807).
Litsea citrata Blume, Bijdr., 565 (1825).
Lindera Dielsii Léveillé in Fedde, Rep. Spec. Nov. X. 370 (1912).
Litsaea Dielsii Léveillé, Fl. Kouy-Tchéou, 220 (1914), nomen.
CHINA. Kweichou: Pin-fa, montagnes, *J. Cavalerie*, nos. 932, March 22, 1903, and no. 1299, Febr. 27, 1902 (syn-types of *Lindera Dielsii*).

In 1914 Léveillé enumerates Cavalerie's two numbers as "*Litsaea Dielsii*" without citing *Lindera Dielsii* as a synonym. Cavalerie's no. 932 is labeled in Léveillé's handwriting "*Litsea Cavaleriei* Levl.," but the species described under this name is Cavalerie's no. 65, referred by him later as a synonym to his *L. Esquirolii* which is identical with *Benzoin commune* (Hemsl.) Rehd.

Benzoin commune (Hemsl.) Rehder, Jour. Arnold Arb. I. 144 (1919).
Litsaea Esquirolii Léveillé in Fedde, Rep. Spec. Nov. IX. 459 (1911); Fl. Kouy-Tchéou, 220 (1914).
Litsea Cavaleriei Léveillé, l. c. X. 371 (1912).
Lindera Bodinieri Léveillé, l. c. (1912); Fl. Kouy-Tchéou, 219 (1914).
Lindera yunnanensis Léveillé, l. c. (1912); Cat. Pl. Yun-Nan, 150 (1916).
CHINA. Kweichou: bois de Tsai-men-tse, *J. Esquirol*, no. 372 July 2, 1905 (sous-arbre; type of *Litsaea Esquirolii*); Pin-fa, hautes montagnes, *J. Cavalerie*, no. 65, July 15, 1902 (arbrisseau 1–2 m.; type of *Litsea Cavaleriei*); environs de Kouy-yang; mont du College, bois de Kien-lin-chan, *E. Bodinier*, no. 2179, April 12–14, 1898 (syn-type of *Lindera Bodinieri*). Yunnan: environs de Yun-nan-sen, dans la grande ravine boisée, *E. Bodinier*, no. 105, March 21, 1897 (grand arbuste ou petit arbre, dioïque, plante mâle; syn-type of *Lindera yunnanensis*.)

Litsea Cavaleriei was referred by Léveillé himself as a synonym to *L. Esquirolii*. Bodinier's no. 105 (*Lindera yunnanensis*) differs from the typical form in the glabrescent branchlets and the smaller less pubescent leaves.

Benzoin glaucum Siebold & Zuccarini in Abhandl. Akad. Münch. IV. pt. III. 205 (Fl. Jap. Fam. Nat. II. 81) (1846).
Pirus brunnea Léveillé in Mem. Acad. Sci. Art. Barcelona, ser. 3, XII. no. 22, p. 19 (Cat. Pl. Kiang-Sou) (1916), nomen; non Léveillé, 1912.
CHINA. Kiangsu, *d'Argy*, no. 105 [1846–66].

Léveillé's enumeration of *Pirus brunnea* in his Catalogue of the plants of Kiangsu is apparently based on d'Argy's no. 105 which in Léveillé's herbarium is placed in the folder of *P. brunnea*. The type of his *Pirus brunnea* comes from Quelpaert, Korea, and is identical with *Photinia villosa* var. *laevis* (DC.) Dipp.

Benzoin touyunense, comb. nov.
Lindera megaphylla Hemsley in Jour. Linn. Soc. XXVI. 389 (1891).
Litsea touyunensis Léveillé in Fedde, Rep. Spec. Nov. XI. 63 (1912); Fl. Kouy-Tchéou, 220 (1914), as "*Litsaea touyounensis*."
Benzoin grandifolium Rehder in Jour. Arnold Arb. I. 145 (1919).

China. Kweichou: Tou-yun, *J. Cavalerie*, no. 1, Nov. 10, 1902. Cavalerie's specimen differs from typical *B. grandifolium* Rehd. (*Lindera megaphylla* Hemsl.) in the leaves being villous-pubescent beneath, while Hemsley describes the leaves as "glaberrima." Of the 23 specimens of this species before me all but two are quite glabrous and in the two pubescent ones the pubescence is not quite as conspicuous as in Cavalerie's specimen, the hairs being slightly shorter and sparser. The pubescent specimens are both from Hupeh, one from Ichang (E. H. Wilson, no. 302 in part, March 20, 1909) and one from Changyang Hsien (E. H. Wilson, no. 302 in part, Nov., 1907). As Wilson collected at the same localities also specimens with quite glabrous leaves, the pubescence apparently does not indicate a geographical variety, but only a form of slight value. Cavalerie's specimen differs from the other specimens besides in the pubescence also in the somewhat shorter and broader leaves, which do not exceed 14 cm. in length and are up to 4.5 cm. wide.

Unfortunately the identity of Léveillé's species was not known when I transferred Hemsley's *Lindera megaphylla* to *Benzoin* and changed the specific name to *B. grandifolium* on account of the older *B. megaphyllum* Kuntze. This adds another synonym to this species and at the same time makes the rare pubescent form the nomenclatorial type of the species, while the widely distributed glabrous form would have to be considered a variety or form, if it should appear desirable to distinguish the two forms.

CAPPARIDACEAE

Capparis Bodinieri Léveillé in Fedde, Rep. Spec. Nov. IX. 450 (1911); Cat. Pl. Yun-Nan 26 (1915).

Capparis tenera Diels in Not. Bot. Gard. Edinb. v. 90 (1912).—Non Dalziell.
Capparis subtenera Craib & W. W. Smith in Not. Bot. Gard. Edinb. IX. 90 (1916).

China. Yunnan: Yun-nan-sen; ça et là dans l'interieur de la ville; endroits inhabités, *E. Bodinier*, May 24, 1877 (petit arbre à branches épineuses; fl. blanches; type of *C. Bodinieri*); autour de Motsou, alt. 800 m., *E. E. Maire*, May [1912–13] (grand arbre épineux, toujours vert, luisant; fl. blanches; in herb. Léveillé); among scrubs on lava-bed to west of Teng yueh, lat. 25° N., alt. 1500 m., *G. Forrest*, no. 7589, May, 1912 (syn-type of *C. subtenera*); open pasture and in thickets on the hills west of Teng yueh, alt. 1500–1800 m., *G. Forrest*, no. 9721, March, 1913 (syn-type of *C. subtenera*).

Burma. Open situations in the Taping valley, lat. 24° 20′ N., alt. 600 m., *G. Forrest*, no. 9654, Feb. 1913 (syn-type of *C. subtenera*).

Capparis masaikai Léveillé, Fl. Kouy-Tchéou, 59 (1914).

China. Kweichou: Lo-kouen, chemin de Pin-fa, *J. Esquirol*, no. 3230, May 15, 1912 (frutex scandens; fl. blanches; syn-type of *C. masaikai*).

Reevesia Cavaleriei Lévl. & Van. has been referred to *C. masaikai* by Léveillé in his Flore de Kouy-Tchéou, but this must be a mistake, since Cavalerie's no. 2347 (not 3347, as cited) is *Reevesia pubescens* Mast.

I have not been able to identify this species with any previously described *Capparis*.

(*To be continued*)

NOTES

A key to the Conifers based on leaf characters.—Under the title "Coniferae: keys to the genera and species, with economic notes"[1] H. M. Fitzpatrick has published a paper which aims to facilitate the determination of Conifers by the morphology of their foliage. Including the Taxaceae 47 genera are recognized. There is a key to the genera based on vegetative characters. The brief generic descriptions include also cones and seeds and are followed by remarks on the economic importance of the principal species and their cultivation. A key to the species of each genus is given with short description of each species. In most genera all or nearly all species are enumerated, but in genera like Callitris, Dacrydium, Podocarpus and Juniperus only the more important species are mentioned. The keys are not carried down to the individual species, but lead only to groups of species and it is left to the reader to find in the brief descriptions the differentiating characters. There is a special key (pp. 236–241) for the species of Cupressus, Thuya, Biota, Microbiota, Thujopsis, Libocedrus and Fokienia, which cannot be separated generically by vegetative characters; juvenile forms of these genera are not included in this key nor are they mentioned in the descriptions. A drawback of the paper is the lack of synonymy. There are e. g. no synonyms given of *Picea alba*, *P. nigra*, *Tsuga Pattoniana*, *Pseudotsuga Douglasii*, *Larix leptolepis*, *L. americana*, *Pseudolarix amabilis*, *Pinus austriaca* and others which in many recent publications bear other names; under *Abies brachyphylla* the author cites only *A. umbellata* Wilson [sic!], but not *A. homolepis*. In the bibliography at the end of the paper one misses such important works as Shaw's "Genus Pinus" and "Pines of Mexico," Bailey's "Cultivated Evergreens" and Silva Tarouca & Schneider's "Unsere Nadelhölzer." The seven plates contain 76 drawings chiefly of branches and they will facilitate the determination of specimens particularly in the Cupressineae which are especially well illustrated. The paper will certainly be very helpful in the identification of coniferous specimens without cones and may be considered a valuable supplement to other larger works on Conifers in which no special attention is paid to vegetative characters.—A. R.

[1] In Scient. Proc. R. Dublin Soc. XIX. n. ser., no. 19, pp. 189–260, pls. 9–15 (1929).

JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME X OCTOBER, 1929 NUMBER 4

LIGNEOUS PLANTS COLLECTED IN THE TERRITORY OF PAPUA (BRITISH NEW GUINEA) IN 1925–26 BY L. J. BRASS

C. T. WHITE

ASSISTED BY VARIOUS BOTANISTS

IN the early part of 1925 the late Professor C. S. Sargent wrote and asked me if I would undertake to visit New Guinea on behalf of the Arnold Arboretum. Official duties at the time did not allow me to avail myself of the chance to revisit a country the flora of which, due to its Australian relationships, had a great deal of interest for me. I wrote Professor Sargent that I could not get away but thought it would be a good plan if a collector could be appointed to work for some months in the Territory and recommended Mr. L. J. Brass, a former assistant in the herbarium at Brisbane, for the work. Mr. Brass subsequently accepted a position as collector for the Arnold Arboretum. He arrived at Port Moresby, the capital of the Territory of Papua, in the middle of October, 1925 and left in June, 1926, thus spending eight months in the field.

New Guinea is divided politically into three Territories; namely, Dutch New Guinea, occupying approximately the western half of the island; the Territory of New Guinea (late German New Guinea), occupying the north-eastern quarter of the island (previously known as Kaiser Wilhelm's Land) and the Bismarck Archipelago; and the Territory of Papua (previously known as British New Guinea) occupying the south-eastern corner of the island.

Writing in 1914 in the report of the botany of the Wollaston Expedition (Trans. Linn. Soc. London Bot. IX) H. N. Ridley stated: "The flora of British New Guinea has been more neglected than that of Dutch and German New Guinea. Except for Forbes's collections on the Sogeri Mountains which have not yet been fully worked out and a small lot obtained by Macgregor and Guilianetti no collecting of importance has been done there." Since this was published several contributions to the flora of the Territory have been made. Forbes's plants have been worked out and a complete account published as a supplement to the "Journal of Botany" for 1923. The present writer visited the Territory in 1918 and published an account of his findings in the Proceedings

of the Royal Society of Queensland for 1922, giving as an introduction a history of botanical work in the Territory. Mr. C. E. Lane-Poole, Commonwealth Inspector-general of Forests, visited the Territory in 1922–23 and made extensive collections. His general results, both in the Territory of Papua and in the Territory of New Guinea, have appeared as a Parliamentary Paper, Melbourne, 1925, while his new species have been mostly described in the Proceedings of the Royal Society of Queensland by Mr. W. D. Francis and myself.

Describing his experiences, Mr. L. J. Brass writes:—

"Papua is characterized physically by high central mountains flanked by rugged subsidiary ranges, swift flowing rivers, large coastal swamp areas, and in the west, extensive river deltas. A high divide, called the Owen Stanley Range, rises at the south-eastern extremity of the mainland and trending north-west for a distance of about 250 miles joins the central mountains at Mount Victoria (13,150 ft.). The average annual rainfall ranges from a little over 30 inches at Port Moresby to 230 inches or more in the Gulf of Papua.

"Such a range of rainfall and elevation naturally produce conditions favorable for the support of a flora of widely differing types. Among the principal associations are dry hilly grasslands sparsely covered with small species of *Eucalyptus* and *Albizzia*, *Cycas media*, etc.; dense mangrove formations; steamy Sago swamps; rich tropical rain-forests; highland forests of Fagaceae; and with increase in altitude, *Podocarpus* and *Araucaria* associations; mossy forests; forests of *Libocedrus* and *Phyllocladus;* and high-mountain grasslands.

"Most of my collecting was done in the lowland rain-forests, foothills, coast swamps, deltas, and beach forests between Abau in the east and the Purari Delta in the west; and the dry savannahs and riverine rain-forests between Port Moresby and Hula. The highest altitude reached was about 5000 ft.—the lowermost limit of the *Araucaria* zone on the Owen Stanley Range between Mts. Clarence and Brown.

"My party was of necessity small, which was not altogether a disadvantage, as everything has to be transported by native carriers over country for the most part mountainous; where the roads, when such exist, are merely native tracks cut through the forests. Carriers are often hard to get, and as supplies of native food are not to be depended upon, even where the country is inhabited, they must carry rice for themselves in addition to camp gear and supplies. But little practical assistance was forthcoming from the Government, and without official help it is both difficult and expensive to penetrate far inland.

"Many plants widely distributed through the Western Pacific and Malaya are well represented in the beach formations. *Premna* spp., *Barringtonia* spp., *Terminalia catappa* L., *Calophyllum inophyllum* L., *Desmodium umbellatum* DC., *Scaevola frutescens* (Mill.) Krause and many other cosmopolitan shore plants are common all along the coast.

"In the estuaries, and on low delta islands, *Rhizophoraceae*, *Aegiceras*, *Sonneratia alba* Sm. and *S. lanceolata* Bl. (?), and *Nipa fruticans* Thunb. predominate.

"The Sago Palm (*Metroxylon*) inhabits large areas of coast swamp lands, and is commonly found inland wherever swampy conditions prevail. In the western districts it provides the staple food of the natives.

"The limits of the *Eucalyptus* forests of the dry areas are very clearly defined, but this cannot be said of the several zones of hygrophilous types which extend from the edges of these grasslands, and from the sea coast of the rainy areas, to the mountains. Species commonly found on the low coast lands sometimes occur at altitudes of 2,000 and 3,000 feet, and plants of the mountain associations, *Pasania aspericupula* Mgf. (No. 1440) for instance, often descend to altitudes of only a few hundred feet.

"The rain-forests of the lower levels contain a large admixture of species, growing sporadically, and in close formation. Many species show remarkably developed buttresses and aërial prop roots. Dense secondary growths of saplings, and the smaller species of trees, fill the spaces between the scattered large trees; lianes and scandent shrubs abound; Ferns and Aroids are well represented among the floor plants; and every opening is crowded with monocotyledonous undershrubs. Epiphytes are numerous, but as a rule grow high up in the taller trees or on trees occupying open situations, such as the banks of creeks and rivers. Species of *Terminalia*, *Flindersia*, *Octomeles*, *Pterocarpus*, *Elaeocarpus*, *Ficus*, and *Maniltoa* are amongst the most conspicuous trees. On badly drained ground *Pandanus* spp. and a great variety of palms mingle with the usual tangle of undergrowth. The river banks carry the heaviest forest, there being a very noticeable decrease in tree growth out from the waterways.

"The foothill slopes and other comparatively dry elevations rising from the heavy forest lands, are clothed with brushier forests of diminished height growth, and composed of heterogenous types. This intermediate zone reaches to the cloud belts, where the forests become more open in character, and there is a marked alteration in general appearance and specific composition. Buttressed trees are rare and undergrowth scanty. The almost pure stands of Fagaceae are a feature of this zone, *Podocarpus* is fairly common, and *Araucaria* commences to appear, but is apparently rare at elevations of less than 5,000 feet.

"Owing to difficulty in procuring carriers, and the more formidable matter of monetary expense, I was unable to ascend any of the high mountains. My collections are all from the floral regions stretching below the *Araucaria* line.

"My thanks for assistance rendered are due to the Hon. Staniforth Smith and Mr. W. R. Humphries of the Papuan Government Service; to the planters and traders of the coast, who were ever ready to help; and

above all to Mr. C. T. White, Queensland Government Botanist, who, through his experience in the tropics, was able to give much valuable advice."

Though so close to Australia and though most of the country in the south is north-Australian in general appearance, the Australian element, even in the southern region, is poorly represented in the Papuan flora and a knowledge of the Malayan flora is of much more use in working out a collection of Papuan plants than is a knowledge of the Australian one. Owing to this and to the more important fact that most of the types of described Papuan species are in European herbaria, I found when I got well into the study of the Brass collection that it was necessary to send a good deal of material, including some whole families, to various workers abroad and their help is here most gratefully acknowledged.

Especially are my thanks due to workers at Kew, the British Museum and Berlin, respectively; also to Professor U. Martelli of Florence for his determinations of the Pandanaceae, and to the botanists at the Botanic Gardens, Buitenzorg, Java, for help on some points. Specific acknowledgement is made in the text under the family heading or after the species record as the case may be. Species and varieties described as new are marked by an asterisk (*).

Botanic Museum and Herbarium
Brisbane, Queensland, Australia.

CYCADACEAE

Cycas circinalis Linnaeus, Sp. Pl. 1188 (1753).

Ihu, Vailala River, no. **994** (an erect, unbranched Cycad, 3 m. high, with a smooth brown caudex; leaves recurved, 2.50–2.75 m. long, shining; male cones erect, 50 cm. long; growing in rain-forest).

Cycas media R. Brown, Prodr. 348 (1810).

Port Moresby, no. **877** (erect, usually unbranched, 2.50 m. high; leaves 1–1.25 m. long; common in dry savannah forests).

Native name "Astoru."

TAXACEAE

Podocarpus neriifolius D. Don in Lambert, Gen. Pinus, II. 21 (1824).

Murua River, Gulf Division, alt. approx. 250 m., no. **1344** (leaf specimens only from a solitary sapling growing on the west of a high ridge several hundred feet above the river).

PINACEAE

Araucaria Cunninghamii Sweet, Hort. Brit. ed. 2, p. 475 (1830), nomen.—Aiton mss. apud D. Don in Lambert, Descr. Pinus, III. t. [96] (1837).

Owen Stanley Range, between Mt. Brown and Mt. Clarence, alt. 1350 m., no. **1489** (very large, dark foliaged tree, branching high above the ground; bark dark brown, ragged with narrow exfoliating strips; grows scattered along top of high spur).

The specimens are in leaf only but seem to represent typical *A. Cunninghamii* Sweet.

GNETACEAE

Gnetum costatum Schumann in Schumann & Hollrung, Fl. Kaiser-Wilhelmsl. 15 (1889).

Karaudi, Eastern Division, no. **1447** (erect tree, 10 m., excurrent, branches whorled, branchlets articulate; seeds pink, prominently ribbed; young leaves boiled and eaten by natives and Europeans; inner bark used for making cordage).

Gnetum Gnemon Linnaeus, Mant. I. 125 (1767).

Bisiatabu, alt. 1350 m., in rain-forests, no. **593** (slender tree up to 30 ft. high, excurrent; trunk marked with annular ridges running from the attachment of the branches; male inflorescences eaten by the natives); Borabere, alt. 300 m. in foothill forests, no. **717** (slender tree 6–9 m., excurrent, with a close grey lenticellate bark); Hewa, Vailala River, no. **1127** (slender excurrent tree 6–9 m. high; branches horizontal, jointed; bark close, grey; inner bark fibrous; wood hard, free in the grain; the young leaves are boiled and eaten; the inner bark fibres are twisted into string for fishing nets, etc.); Kuraudi, Eastern Division, no. **1526** (small erect tree, branches articulate; bark close, brown; seeds yellowish brown; the seeds and young shoots are boiled and eaten by both natives and Europeans; the inner bark is used in making twine and ropes).

The plant recorded by Bailey in Ann. Rep. Brit. New Guinea, 1900–1901, p. 144, as *G. latifolium* Blume belongs to *G. Gnemon* L.

Native name "Hoboi."

PANDANACEAE

Determined by U. Martelli

Freycinetia stenophylla Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 53 (1905).—Martelli in Jour. Arnold Arb. x. 137 (1929).

Loloki River, no. **546** (climbing in dense masses on trees in riverside forests).

Freycinetia Beccarii Solms-Laubach in Ann. Gard. Bot. Buitenz. III. 100 (1883).—Martelli in Jour. Arnold Arb. x. 137 (1929).—Non Hemsley.

Ihu, Vailala River, no. **929** (climber ascending large rain-forest trees; fruit red).

***Freycinetia fibrosa** Martelli in Jour. Arnold Arb. x. 138 (1929).

Hohoro, Vailala River, no. **1048** (rain-forest climber; leaves clustered at the ends of short lateral branches; fruit red).

Freycinetia pseudo-insignis Warburg in Engler, Pflanzenr. IV–9, p. 33 (Pandan.) (1900).—Martelli in Jour. Arnold Arb. x. 138 (1929).

Ihu, Vailala River, no. **1052** (climbing by means of adventitious aërial roots; lower stem very slender, thickening and bearing numerous divaricate leafy branches high above the ground, stem branching close below

the inflorescence; leaves close below the inflorescence, red at the base; inflorescence composed of three heads together, enclosed in soft broad pink bracts).

Freycinetia spec. Martelli in Jour. Arnold Arb. x. 137 (1929).

Murua River, Gulf Division, alt. 100 m., no. 1332.

Closely related to *F. stenophylla* Warb.

Pandanus tectorius (Sol.) Parkinson forma Martelli in Jour. Arnold Arb. x. 138 (1929).

Kerema, Gulf Division, no. 1228 (tree common on the sea-beach, 6 m. high, trunk covered with short thick scattered thorns; mass of small cylindrical aërial prop roots at base of trunk, upper ones armed; stems for about 30 cm. below the leaf-crown smooth, brown and marked by leaf-scars; leaves thick and glaucous, finely pointed, with a few marginal prickles towards the base and occasional dorsal ones near the top; male inflorescence enclosed in long yellowish bracts).

***Pandanus scabribracteatus** Martelli in Jour. Arnold Arb. x. 139 (1929).

Lepokera, Vailala River, no. 987.

***Pandanus Brassii** Martelli in Jour. Arnold Arb. x. 139, pl. 18, fig. A (1929).

Domara River, Eastern Division, no. 1604.

Pandanus leptocarpus Martelli in Webbia, IV. pt. I. 21 (1913); pt. II. t. 33, fig. 8 (1914), sine descriptione; in Jour. Arnold Arb. x. 140 (1929).

Kira, Vailala River, no. 1164 (slender branched tree, 7.50 m. high, growing on low swampy river flats; trunk very pale gray, supported by large aërial stilt-roots; leaves thin and narrow, 1.50 m. long; fruit head green, on recurved peduncle).

***Pandanus kivi** Martelli in Jour. Arnold Arb. x. 140 (1929).

Lower Mori River, Eastern Division, no. 1557.

Native name "Kivi."

Pandanus Lauterbachii Schumann & Warburg in Engler, Pflanzenr. IV–9, p. 81 (1900).—Martelli in Jour. Arnold Arb. x. 141 (1929).

Lepokera, Vailala River, no. 986 (erect tree, 7.50 m. high, with small dense crown of short leafy branches; leaves thin, pendulous, often 4.50 m. long, terminating in a short boat-shaped tip, serratures irregular, turned upwards; inflorescence terminal, not much recurved; fruit-heads brown, close together in three lateral rows of three each and a terminal one; peduncle 50 cm. long).

***Pandanus ihuanus** Martelli in Jour. Arnold Arb. x. 141 (1929).

Vailala River, no. 978.

***Pandanus pendulinus** Martelli, l. c. 142, pl. 18, fig. B (1929).

Ihu, Vailala River, Central Division, no. 1053.

GRAMINEAE

Determined by Aimee Camus

***Schizostachyum Brassii** A. Camus in Jour. Arnold Arb. IX. 144 (1928).

Ihu, Vailala River, no. 1105 (Bamboo in clumps, 3–4.50 m. high, overhanging the river; leaves pale green).

Native name "Be-ero."

***Bambusa Brassii** A. Camus in Jour. Arnold Arb. IX. 145 (1928).

Borabere, alt. 350 m., no. 715 (rambling or climbing Bamboo growing in the foothill forests).

Native name "Linoo."

PALMAE

Nipa fruticans Thunberg in Vet. Akad. Nya Handl. Stockholm, III. 231 (1782).

Kapaira River, no. 1096, March 2, 1926 (leaves erect 6–7.50 m. long, from underground stems lying horizontally in the mud; fruits fleshy in hanging spherical heads 30–42 cm. in diameter).

Native name "Beri."

There are about eight other species of Palms collected by Brass which have been sent to Dr. Burret, Botanic Museum, Berlin-Dahlem, for determination.

FLAGELLARIACEAE

Flagellaria indica Linnaeus, Sp. Pl. 333 (1753).

Ihu, Vailala River, no. 951 (a large rain-forest rambler).

Flagellaria indica var. **minor** (Bl.) Hooker, Fl. Brit. Ind. VI. 391 (1892).

Kapa Kapa, no. 811 (straggling over small trees near the beach); Ihu, Vailala River, no. 951 (climbing over bushes on rain-forest borders); Domara River, Eastern Division, no. 1602 (a rambling river bank shrub).

LILIACEAE

Cordyline terminalis Kunth in Abh. Akad. Berlin, 1920, p. 30.

Ihu, Vailala River, no. 995 (erect shrub, 1.50–1.80 m.; leaves pale green, tips recurved; flowers white; growing on creek banks in the rain-forest); Domara River, no. 1600 (shrub 1.25–1.80 m.; leaves pale green; common in the Mori, Bomgwina and Domara River rain-forests).

Dracaena angustifolia Roxburgh, Hort. Beng. 24 (1814), nomen; Fl. Ind. ed. 2, II. 155 (1832).

Sogeri, alt. 450 m., no. 660 (small rain-forest tree, 3–4.50 m. with a smooth, slightly wrinkled bark; fruit brown).

Smilax leucophylla Blume, Enum. Pl. Jav. I. 18 (1827).

Bisiatabu, alt. 450 m., no. 583 (a rain-forest climber; leaves pale beneath; fruits reddish).

The above specimen was kindly compared with Malayan material by Mr. V. S. Summerhayes, Royal Botanic Gardens, Kew, who wrote

"agrees very well with specimens from Java named by A. de Candolle, also with other specimens we possess from Malaya generally."

CASUARINACEAE

Casuarina nodiflora G. Forster, Fl. Ins. Austral. Prodr. 64 (1786).

Bisiatabu, alt. 450 m., no. **632** (a large tree with a thick, rough, grey bark; growing in dry savannah forests).

PIPERACEAE

Determined by WILLIAM TRELEASE

Piper subgen. **Eupiper** C. DC.

***Piper arbuscula** Trelease in Jour. Arnold Arb. IX. 146 (1928).

U-uma River, young forest, no. **1449**.

Native name "Boni."

***Piper Brassii** Trelease, l. c. 147 (1928).

Iawarere, alt. 350 m., in the foothill forests, no. **683**.

***Piper corylistachyopse,** Trelease, l. c. (1928).

Sogeri, rain-forest, alt. 450 m., no. **655**.

***Piper flavifructum** Trelease, l. c. (1928).

Domara River, swampy rain-forest, no. **1644**.

***Piper fragrans** Trelease, l. c. (1928).

Iawarere, alt. 550 m., no. **701** (flowers very sweet-scented).

***Piper melula** Trelease, l. c. 148 (1928).

Hewa, Vailala River, rain-forest, no. **1130**.

Native name "Melula."

***Piper morianum** Trelease, l. c. (1928).

Lower Mori River, rain-forest, no. **1562**.

Native name "Boidiboro."

***Piper pavimentifolium** Trelease, l. c. (1928).

Murua River, alt. 100 m., rain-forest, no. **1338**.

***Piper pullibaccum** Trelease, l. c. 149 (1928).

Vailala River, edge of rain-forest, no. **966**.

***Piper rhizocaule** Trelease, l. c. (1928).

Kira, Vailala River, rain-forest, no. **1115**.

***Piper rhodocarpum** Trelease, l. c. (1928).

U-uma River, alt. 150 m., rain-forest, no. **1427**.

***Piper viridibaccum** Trelease, l. c. 150 (1928).

Mowabula, rain-forest, no. **1370**.

FAGACEAE

Determined by FR. MARKGRAF

Castanopsis acuminatissima (Bl.) Rehder in Jour. Arnold Arb. I. 121 (1919.)

Castanopsis Junghuhnii (Miq.) Markgraf in Bot. Jahrb. LIX. 62, fig.1, a–d (1924).

Iaritari, alt. 450 m., no. **703** (a large handsome tree, with a thick

furrowed, dark gray bark; leaves pale brown beneath; growing in foothill forests.

Native name "Manati."

Lithocarpus Lauterbachii (Seemen) Markgraf in Bot. Jahrb. LIX. 69 (1924).

Iaritari, alt. 550 m., no. **704** (a medium-sized tree, 12–15 m., with a scaly, tuberculate bark and pale, hard wood; leaves glaucous beneath, shining above; growing in foothill forests; also observed at Uniori, near the dry belt, at altitudes of less than 300 m.).

Native name "Taro."

Pasania aspericupula Markgraf in Bot. Jahrb. LIX. fig. 78, fig. 1, e (1924).

Lithocarpus aspericupula Rehder in Jour. Arnold Arb. x. 132 (1929).

Iawarere, alt. 375 m., no. **681** (large, straight-boled tree with a thick, brown, scaly bark and hard, dark, straight grained wood; leaves dull beneath; growing in foothill forests); U-uma River headwaters, Eastern Division, no. **1440** (tall rain-forest tree, 20–24 m., with a dark gray bark covered with short, obtuse, conical prickles; leaves smooth and shiny above, pale beneath).

Pasania rufo-villosa Markgraf in Bot. Jahrb. LIX. 74, fig. 3, 4, 6, c (1924).

Lithocarpus rufo-villosa Rehder in Jour. Arnold Arb. x. 133 (1929).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 900–1050 m., no. **1496** (large tree forming open forests on high spurs; bark pale gray, channelled; inner bark and wood white; leaves pale beneath).

ULMACEAE

Celtis philippinensis Blanco, Fl. Filip. 197 (1837).

Kapa Kapa, no. **793** (a low-spreading tree with a smooth, light brown bark; growing near the beach; fruit red).

Trema virgata (Planch.) Blume, Mus. Bot. Lugd.-Bat. II. 59 (1856).

Hula, no. **837** (a small tree near the beach).

MORACEAE

Malaisia scandens (Lour.) Planchon in Ann. Sci. Nat. sér. 4, III. 293 (1855).

Malaisia tortuosa Blanco, Fl. Filip. 789 (1837).

Mowabula, Eastern Division, no. **1368** (large river bank rambler; fruit red.)

Native name "Doi-a."

Cudrania javanensis Trécul in Ann. Sci. Nat. sér. 3, VIII. 123 (1847).

Vanieria cochinchinensis Loureiro, Fl. Cochinch. 565 (1790).

Port Moresby, no. **839** (a large straggling shrub).

Artocarpus communis Forster, Char. Gen. 100 (1776).

Artocarpus incisa Linnaeus f., Suppl. 411 (1781).

Lepokera, Vailala River, no. **981** (in favorable situations a large, erect and handsome tree; sometimes loosely branched and sparsely

foliaged; bark smooth, close, pale gray; largely planted by the natives in their gardens and about the villages).

Native name "Lauga." English name "Breadfruit Tree."

Ficus

Determined by V. S. SUMMERHAYES

Sect. PALAEOMORPHE

***Ficus acanthophylla** Summerhayes in Jour. Arnold Arb. x. 142 (1929).

Kuraudi, Eastern Division, no. **1388** (small river bank tree with thick branches, young shoots muricate; bark smooth, gray; fruit green, tinged with purple).

Vernacular name "Din-e."

Ficus adenosperma Miquel in Ann. Mus. Bot. Lugd.-Bat. III. 233, 296 (1867).—Summerhayes, l. c. 143 (1929).

Loloki River, riverine rain-forest, alt. 360 m., no. **550** (small tree with light green flattened fruit); Kuraudi, Eastern Division, no. **1389** (tree to 6 m.; fruit depressed, green).

***Ficus androbrota** Summerhayes, l. c. (1929).

Kapa Kapa, open coast land, no. **800** (erect tree, 3 m.; fruit black when ripe, eaten by natives).

Ficus gibbosa Blume, Bijdr. 466 (1825).—Summerhayes, l. c. 144 (1929).

U-uma River headwaters, Eastern Division, alt. 450 m., no. **1448** (fruit orange-yellow).

Ficus subulata Blume, l. c. 461 (1825).—Summerhayes, l. c. (1929).

Loloki River, no. **549** (large parasitic Fig forming large spreading crown above dead post tree; bark smooth, light gray); Ihu, Vailala River, rain-forest, no. **907** (small tree with smooth gray bark; fruit globose, pale green, flecked with white); same locality, no. **1020** (medium-sized tree; fruit globose, depressed, smooth, yellowish green). Bomgwina River, Eastern Division, no. **1620** (large tree with close brown bark; fruit purple-black when ripe).

***Ficus xanthosyce** Summerhayes, l. c. (1929).

Sogeri, rain-forest, alt. 450 m., no. **651** (tree 9–12 m., bark light brown); U-uma River, Eastern Division, no. **1520** (small tree; fruit yellow) (type); Kerema, Gulf Division, rain-forest regrowth, no. **1209** (small erect compact tree, 6 m. or more in height; fruit orange yellow).

Sect. UROSTIGMA

Ficus Benjamina Linnaeus, Mant. 129 (1767).—Summerhayes, l. c. 146 (1929).

Lower Mori River, Eastern Division, no. **1573** (large river-bank tree, glabrous; bark pale brown; fruit pink,eaten by natives.)

Ficus Rigo F. M. Bailey in Queensl. Agric. Jour. I. 235 (1897).—Summerhayes, l. c. (1929).

Rigo, on coast, no. 820 (large spreading tree with few aërial roots on trunk and main branches; trunk often divided close to ground).

Discovered and planted by A. C. English of Rigo who is testing it as a source of commercial rubber. Known as English's Rubber Tree.

Sect. Sycidium

Ficus Armiti King in Jour. As. Soc. Bengal. LV. pt. II. 404 (1886).—Summerhayes, l. c. (1929).

Ihu, Vailala River, rain-forest, no. 945 (small tree; fruit orange-red); Mowabula, Eastern Division, no. 1372 (slender tree 15–18 m.; bark brown, close; fruit reddish brown).

***Ficus Brassii** Summerhayes, l. c. (1929).

Loloki River, no. 1660 (small river bed tree, 2–3 m. tall, with smooth gray bark; fruit green).

***Ficus dichroa** Summerhayes, l. c. 147 (1929).

Keuru, Gulf Division on the sea beach, no. 1190 (small compact tree, with green and brown fruit).

Ficus eulampra Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 279 (1901).—Summerhayes, l. c. (1929).

Loloki River, riverine rain-forests, no. 556 (small tree; fruit borne singly or in clusters on trunk and branches, dark purple).

Ficus hystricicarpa Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 244 (1905).—Summerhayes, l. c. (1929).

Bisiatabu, rain-forest floor, alt. 450 m., no. 827 (unbranched shrub, 1 m. high).

***Ficus saxicola** Summerhayes, l. c. (1929).

Iawarere, on rocks at water's edge, alt. 300 m., no. 699 (small tree, 5 m.).

Sect. Covellia

Ficus Bernaysii King in Jour. As. Soc. Bengal. LV. pt. II. 406 (1886).—Summerhayes, l. c. 148 (1929).

Bisiatabu, rain-forest, alt. 450 m., no. 569 (small shapely tree; bark light brown, lenticellate).

Ficus casearia F. Mueller apud Bentham, Fl. Austral. VI. 177 (1873).—Summerhayes, l. c. (1929).

Hula, in light jungle near beach, no. 527 (small tree, 3–4.50 m. high, with light brown close bark; fruit depressed, ribbed); Sogeri, rain-forest, alt. 450 m., no. 638 (small tree, 4.50 m. high, with light brown close bark); Ihu, Vailala River rain-forest regrowths, no. 1055 (small glabrous tree; fruit white, in axillary pairs).

Ficus Chalmersii King in Jour. As. Soc. Bengal. LV. pt. II. 406 (1886).—Summerhayes, l. c. (1929).

Ihu, Vailala River, in rain-forest, no. 1059 (small tree, with spreading crown; fruit depressed-pyriform, in large clusters on trunk).

Ficus myriocarpa Miquel in Ann. Mus. Bot. Lugd.-Bat. III. 230 (1867).—Summerhayes, l. c. 149 (1929).

Sogeri, riverine rain-forest, alt. 450 m., no. 654 (spreading tree, 9 m. wide; bark dark gray, finely furrowed, exfoliating in small scales; fruit numerous on slender much-branched branches borne on stem and main branches); Ihu, Vailala River, rain-forest regrowths, no. 934 (small tree, 6–7.50 m.; fruit on pendulous loosely branched leafless fruiting branches 1–1.25 m. long, produced on stem and main branches).

Ficus ribes Reinwardt in Blume, Bijdr. 463 (1825).—Summerhayes, l. c. (1929).

Sogeri, rain-forest, alt. 450 m., no. 647 (spreading tree, 9 m.; bark close, light brown; leaves pale beneath; fruit on leafless branches 1–1.25 m. long, clustered on lower trunk and scattered on upper trunk and main branches).

Ficus setistyla Warburg in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 248 (1905).

Upoia, Vailala River, no. 1159 (low spreading tree, 9 m.; leaves gray beneath; clusters of large brown fruit on stem and branches).

Sect. EUSYCE

***Ficus calodictya** Summerhayes, l. c. (1929).

The Cupola, Gulf Division, rain-forest, alt. 150 m., no. 1360 (erect slender tree, 9 m.; bark close, brown; fruit green).

Ficus Odoardi King in Ann. Bot. Gard. Calcutta, I. 156, t. 198 (1888).—Summerhayes, l. c. 150 (1929).

Ihu, Vailala River, in rain-forest, no. 965* (scandent, branches diverging laterally from host trunk; fruit reddish brown; yields a thick yellow latex).

Ficus rhizophoraephylla King in Jour. As. Soc. Bengal, LV. pt. II. 410 (1886).—Summerhayes, l. c. (1929).

Lepokera, Vailala River, in rain-forest, no. 989 (large glabrous tree; fruit reddish brown).

Sect. NEOMORPHE

Ficus grandis King in Ann. Bot. Gard. Calcutta, I. 170, t. 214 (1888).—Summerhayes, l. c. (1929).

Bisiatabu, rain-forest, alt. 450 m., no. 606 (spreading tree, 12 m.; trunk 1 m.; fruit to 7.5 m. diam., depressed in large clusters on lower trunk).

Ficus nodosa Teysmann & Binnendyk in Nat. Tijdschr. Ned. Ind. XXIX. 245 (1866).—Summerhayes, l. c. (1929).

Ihu, Vailala River, no. 1058 (riverside tree with dense crown of large shining leaves; bark pale brown, smooth; fruit pale brown, mottled with green).

***Ficus rhodocarpa** Summerhayes, l. c. (1929).

Borabere, alt. 360 m., no. 732 (small tree, 3–4.50 m., with light gray bark; fruit pink, in small clusters on stem).

INCERTAE SECTIONIS

***Ficus apolepomena** Summerhayes, l. c. 151 (1929).

Bisiatabu, in rain-forest, alt. 450 m., no. 575 (spreading tree, 9 m.; fruit solitary or in pairs).

***Ficus charadrophila** Summerhayes, l. c. 152 (1929).

Murua River, Gulf Division, no. 1347 (flat-topped, horizontally branched, small tree, about 2 m.; fruit greenish brown, subglobose).

***Ficus clusiaefolia** Summerhayes, l. c. (1929).

Sogeri, foothill forest, alt. 500 m., no. 641 (very large spreading tree branched from near ground and sending down adventitious roots from main branches and trunk; bark thin, smooth, gray; fruit orange mottled with green; this tree yields large quantities of latex).

***Ficus ihuensis** Summerhayes, l. c. 153 (1929).

Ihu, Vailala River, rain-forest, no. 941 (small glabrous tree, with smooth shining leaves; fruit globose, green).

***Ficus xanthoxyla** Summerhayes, l. c. 154 (1929).

Ihu, Vailala River, rain-forest, no. 1019 (tree 9 m., with bright brown bark).

URTICACEAE

Determined by L. DIELS

***Cypholobus Brassii** Diels in Jour. Arnold Arb. x. 75 (1929).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 900–1200 m., no. 1584.

PROTEACEAE

Grevillea pinnatifida Bailey, Syn. Queensl. Fl. Suppl. II. 52 (1888). *Grevillea Edelfeltii* F. Muell. Descr. Not. Papuan Pl. II. 9 (1885), nomen.

Budatobara, no. 781 (slender tree, 6 m., with a dark, rough, scaly bark; young leaves bright golden color beneath, silvery when old; grows in dry savannah forests).

Grevillea subargentea C. T. White in Proc. Roy. Soc. Queensland, XXXIV. 24 (1923).

Bisiatabu, no. 623 (small tree, 4.50–6 m.; branches erect; bark gray; grows in dry savannah forests).

***Helicia microneura** C. T. White, sp. nov.

Arbor parva gracilis virgata (fide Brass); ramulis junioribus ferrugineo-pubescentibus mox glabris; foliis petiolatis; petiolis ca. 3 mm. longis basi incrassatis; laminis usque ad 7 cm. longis et 2.5 cm. latis (2½–3-plo longioribus quam latae), lanceolatis, margine paucidentatis vel rarius integris, apice acutis basi cuneatis in petiolum sensim angustatis, utrinque glabris costa media subtus exceptis, utrinque minute reticulatis, in sicco subtus multo pallidioribus; racemis 3–4.5 cm. longis, rhachi ferrugineo-pubescente, pedicellis bifloris vel rarius unifloris 0.5 mm. longis; petalis extus pilis ferrugineis longioribus sparsioribusque vestitis, 5 mm. longis; antheris ca. 0.75 mm. apiculatis; pistillo 5 mm. longo;

disci squamis 4 liberis, ovario dense hirsuto, stylo glabro, stigmate clavato costato.

Owen Stanley Range between Mts. Brown and Clarence, 900–1200 m., no. 1490, May 19, 1926 (small, slender, virgate tree; flowers white).

Among previously described Papuan species the present one seems to approach most closely to *H. Ledermannii* Diels, which differs, however, among other characters, in having somewhat broader leaves with a brown, appressed pubescence underneath.

***Helicia peltata** C. T. White, sp. nov.

Arbor alta, ramulis partibus junioribus petiolis foliis subtus inflorescentiae rhachique pilis atro-ferrugineis velutinis vestitis; foliis peltatis, petiolis 3–4 cm. longis; laminis ovatis ovato-lanceolatis vel ellipticis usque ad 34 cm. longis et 17 cm. latis plerumque 2¼-plo longioribus quam latae, basi rotundis apice acuminatis, apice ipso 1–2 cm. longo, supra glabris et nitidis costa media et venis exceptis, subtus pubescentibus praecipue venis et venulis, venis et venulis utrinque visibilibus sed subtus elevatis et multo magis prominentibus, margine integris undulatis; racemis e ramis orientibus 12–22 cm. longis densifloris; pedicellis singularibus vel geminatis 3–5 cm. longis; petalis cremeis ("cream-colored" ex Brass) 2.5 cm. longis extus pilis plus minusve sparse vestitis; antheris 3 mm. longis; disci glandulis carnosis plus minusve connatis; pistillo ca. 2 cm. longo, ovario sessili glabro, stylo glabro, stigmate ad apicem pubescente.

Bisiatabu, alt. 450 m. no. 574 (a tall tree 18–24 m., with a light brown bark; inner bark brown; flowers borne on the old wood, cream-colored; sap-wood pale, heart-wood light brown.

Native name "Oraluma."

A very distinctive species at once characterized by its peltate leaves. The floral characters seem typically those of Helicia, but when fruit is known it may prove a distinct genus.

Banksia dentata Linnaeus f., Suppl. 27 (1781).

Bisiatabu, 450 m., no. 621 (small, stunted tree, 3–4.50 m., with a brown, tuberculate bark; flowers yellow; grows in dry savannah forests).

LORANTHACEAE

Determined by L. DIELS

Loranthus oxycladus Lauterbach & Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 298 (1900).

Wame River, Purari Delta, no. 1078 (on rain-forest trees; leaves fleshy, shining above; flowers red and yellow).

Loranthus dolichocladus Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 258 (1905).

Budatobara, alt. 150 m., no. 746, Dec. 2, 1925 (on small savannah trees).

Loranthus spec., aff. *L. strongylophyllus* Lauterb.

Kuraudi, Eastern Division, no. 1377, May 12, 1926 (sparsely foliaged, leaves fleshy; flowers axillary, white).

Notothixos leiophyllos Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 260 (1905).

U-uma River, Eastern Division, alt. 150 m., no. 1442, May 14, 1926 (young leaves golden-yellow).

SANTALACEAE

Exocarpus latifolia R. Brown, Prodr. 356 (1810).

Port Moresby, no. 862 (a small thick-foliaged tree, 3–4.50 m.; branches pendulous; bark thick and scaly; common just behind the beach.

Henslowia Ledermannii Pilger in Bot. Jahrb. LIX. 126 (1924).

Bisiatabu, alt. 450 m., no. 613 (twining parasite on small tree on edge of rain-forest; leaves fleshy).

***Santalum papuanum** Summerhayes in Kew Bull. Misc. Inform. 1929, p. 125.

Rigo, no. 819, Dec. 1925 (a coast timber cut for export).

OLACACEAE

Ximenia americana Linnaeus, Sp. Pl. 1193 (1753).

Domara, Eastern Division, no. 1539 (a large bush in beach scrub; leaves pale and shining; fruit yellow, edible).

Native name "Kinija."

POLYGONACEAE

Muehlenbeckia platyclados Meissner in Bot. Zeit. XXIII. 313 (1865).

Calacinum platycladum Macbride in Field Mus. Nat. Hist. Pub. Bot. Ser. IV. 115 (1927).

Borabere, no. 725 (shrub 1.25–2 m., growing in old garden plots).

NYCTAGINACEAE

Pisonia longirostris Teysmann & Binnendyk in Tijdschr. Nederl. Ind. XXV. 40 (1863).

Borabere, alt. 300 m., no. 720 (tree 3–4.50 m., in riverine rain-forest; bark soft, gray; wood very soft and light; leaves large, fleshy).

Pisonia umbellifera (Forst.) Seemann ex Nadeaud, Enum. Pl. Tahiti, 46 (1873).

Rigo, no. 818 (a compact, handsome tree, 12 m., with a close, brown bark).

RANUNCULACEAE

Clematis Pickeringii A. Gray U. S. Expl. Exped. Bot. Phan. I. 1 (1854).

Ihu, Vailala River, no. 1010 (a large vine, climbing over trees in rain-forest; leaves pale and shining).

MENISPERMACEAE

Stephania hernandiaefolia (Wight & Arn.) Walpers, Rep. I. 96 (1842).

Loloki River, alt. 350 m., no. 540 (a small twiner in rain-forests fringing the river).

Parabaena tuberculata Beccari in Malesia, I. 137 (1877).

Upoia, Vailala River, no. 1154 (a small rain-forest twiner; flowers white).

Determined by L. Diels.

Hypserpa polyandra Beccari in Malesia, I, 148 (1877).

Domara River, Eastern Division, no. 1587 (a large rambling shrub growing among the mangroves on the beach; leaves smooth and shining, paler beneath; flowers yellow).

Determined by L. Diels.

MAGNOLIACEAE

***Elmerrillia sericea** C. T. White, sp. nov.

Arbor ca. 20 m. alta; partibus junioribus dense pilis longis sericeis vestitis; ramulis lenticellatis; stipulis dense sericeo-pubescentibus convolutis 3–5 cm. longis mox deciduis; foliis petiolatis petiolis pubescentibus ca. 2 cm. longis; laminis demum supra glabris ad 27 cm. longis ca. 2½-plo longioribus quam latae, late lanceolatis, apice acuminatis, acumine ipso ad 2 cm. longo, nervis praecipuis lateralibus utrinque 16–18, venis et venulis supra et subtus subprominentibus; pedunculis 1–2-floris dense velutino-pubescentibus ca. 1.5 cm. longis; floribus odoratis, alabastris spatha diphylla obvolutis, spatha ad 2.7 cm. longa extus velutino-pubescente intus glabra, perianthii segmentis 15 glabris ad 3 cm. longis et 0.7 cm. latis; staminibus numerosis (ca. 25); ovario dense pubescente.

Rain-forests at Sogeri, alt. 450 m., no. 661, Nov. 15, 1925 (large, straight-boled tree, 15–18 m. high; branches with a wide spread, drooping; outer bark light brown, inner bark fibrous, aromatic; leaves pale beneath; flowers cream-colored, strongly scented).

I had described this plant in the manuscript at first under *Talauma* and made a note to the effect that "the species is characterized by its peduncles often being 2-flowered: in this respect it resembles *Michelia longifolia* Bl. var. *racemosa* Bl. It has more the general appearance of *Michelia* than *Talauma*, but its sessile ovary removes it from the former genus"; but when Dandy's account of the genera of Magnolieae in the Kew Bulletin, 1927, pp. 257–264 came to hand I changed it into *Elmerrillia*.

ANNONACEAE

Determined by L. Diels

Papualthia spec.

U-uma River, Eastern Division, no. 1436 (river bank tree, 6–9 m., with slender branches; flowers white).

Papualthia spec.

Kuraudi, Eastern Division, no. 1525 (tall pubescent bush; fruit orange-yellow).

The two preceding specimens are too incomplete for exact determination.

***Popowia polytricha** Diels in Jour. Arnold Arb. x. 76 (1929).

Bisiatabu, alt. 460 m., on the edge of forests, no. **586** (much branched tree, 6 m. high, with thin light gray-brown bark).

Xylopia papuana Diels in Bot. Jahrb. LII. 180 (1915).

Ihu, Vailala River, no. **954** (a very large buttressed rain-forest tree; soft, yellowish, flaky bark and soft, yellow wood; leaves pale beneath; fruit green, tinged with red).

Cyathocalyx osmanthus Diels in Bot. Jahrb. LII. 177 (1915).

Ihu, Vailala River, no. **948** (a tall, slender, rain-forest tree, 15–18 m. high, with a close, gray bark; leaves dark and glossy above).

***Cyathocalyx lucidus** Diels in Jour. Arnold Arb. x. 76 (1929).

Hewa, Vailala River, in rain-forests, no. **1142** (erect tree 12 m. with close brown bark; flowers clustered on raised knobs of trunk, green).

Native name "Buhu."

Eupomatia laurina R. Brown, App. Flinders' Voy. II. 597, t. 2 (1914).

The Cupola, Gulf Division, no. **1362** (a large, straggling bush in the rain-forest; leaves thin, glossy; flowers white, one or two in the axils below the leaves, usually on the old wood).

The two following specimens are too incomplete for definite identification of the genus:

Borabere, alt. 450 m., no. **736**, Dec. 2, 1925 (slender shrub).

Budatobara, alt. 100 m., no. **782**, Dec. 5, 1925 (slender shrub).

MYRISTICACEAE

Determined by FR. MARKGRAF

Horsfieldia Lauterbachii Warburg in Nov. Act. Nat. Cur. LXVIII. 285 (1897).

Aisa River, Eastern Division, no. **1414** (a small tree with horizontal branches).

Native name "Korua."

Horsfieldia tuberculata (K. Schum.) Warburg in Nov. Act. Nat. Cur. LXVIII. 279 (1897).

Kerema, Gulf Division, no. **1220** (a small tree growing on sago swamp borders; leaves pale beneath; flowers yellow).

Myristica Buchneriana Warburg in Bot. Jahrb. XIII. 311 (1891).

Kalo, no. **510** (spreading tree, 6 m., with a light brown bark; fruit brown); Mori River, Eastern Division, no. **1633** (tree 10 m. high; branches drooping; close, brown bark; leaves pale on the underside; fruit ferruginous pubescent; growing in riverine rain-forest).

Myristica Hollrungii Warburg in Nov. Act. Nat. Curios, LXVIII. 490 (1897).

Lower Mori River, Eastern Division, no. **1552** (weak, branched tree, 7–8 m., growing on river bank; leaves large, pale; fruits several together in the axils of fallen leaves; yellowish seeds with a red arillus.)

Native name "Menalara."

***Myristica fatua** Houtt. var. **papuana** Markgraf in Jour. Arnold Arb. x. 77 (1929).

Aroara, Vailala River, alt. 60 m., rain-forest, no. **1070**, Feb. 25, 1926 (tall buttressed tree, aërial roots on lower trunk, thin brown bark and pale brown wood, both secreting large quantity of thin red gum; fruit brown, in lateral clusters of three).

Myristica lepidota Blume, Rumphia, I. 189, t. 61 (1835).

Ihu, Vailala River, no. **940** (tall rain-forest tree, with a rough, dark bark and hard, red wood; leaves pale beneath; fruits yellow, eaten by the natives).

Native name "Ahau."

Myristica subalulata Miquel in Ann. Mus. Bot. Lugd.-Bat. II. 47 (1865).

Bisiatabu, alt. 450 m., no. **570** (small, rain-forest tree); U-uma River headwaters, Eastern Division, alt. 300 m., no. **1454** (tree 6–9 m.; leaves brownish-gray beneath; fruit brown, in axillary and lateral clusters).

Myristica subcordata Blume, Rumphia, I. 186 (1835).

Lower Mori River, Eastern Division, no. **1553** (small, slender tree in riverine rain-forests; leaves stiff, glossy above, paler beneath; fruit solitary in the axils, densely covered with stiff, pale brown hairs.)

Myristica spec.

Bisiatabu, alt. 450 m., no. **610**, Nov. 11, 1925 (compact tree, 10 m. high, bark channelled, scaly, light brown; fruit brown, compressed, 1-seeded).

Gymnacranthera Zippeliana (Miq.) Warburg in Nov. Act. Nat. Cur. LXVIII. 372 (1897).

Ihu, Vailala River, no. **971** (tall, slender tree with a close pale brown bark and hard brown wood; leaves pale on the under side; fruit yellow-brown).

MONIMIACEAE

Determined by L. DIELS

Steganthera insignis Perkins in Engler, Pflanzenr. IV.-101, Heft 49, p. 24, fig. 9 (Monimiac. Nachtr.) (1911).

Murua River, Gulf Division, alt. 125 m., no. **1331** (small rain-forest tree, 4.50 m.; leaves dull, pale beneath; fruit black).

Kibara spec.

Iawarere, alt. 300 m., no. **668**, Nov. 22, 1925 (large weak shrub; fruit yellow).

LAURACEAE

Determined by O. C. SCHMIDT

***Litsea Brassii** O. C. Schmidt, sp. nov.

Arbor 20-pedalis, cortice brunneo, ramis pendulis (ex Brass). Folia petiolis 1.5–2.5 cm. longis velutinis circiter 2 mm. crassis; lamina elliptica, basi angustata, apice angustata et acuminata rarius rotundata, 19–24 cm.

longa et 5.5–7.5 cm. lata, subpergamentacea, supra leviter vel vix (in nervis dense) pilosa, subtus fere velutina, margine interdum leviter undulata; nervus medius supra prominulus, subtus bene prominens, nervis lateralibus utroque latere plerumque 11–13, supra leviter impressis, subtus prominulis, reti nervis parallelis supra tenuiter modo vel vix conspicui, subtus prominulo conjunctis. Flores in umbellulis 4-involucratis, flavi (ex Brass); pedunculi velutini, usque ad 1.5 cm. longi; involucra 9-flora; bracteae involucrales 4, suborbiculares usque ad 6.5 mm. longae, concavae; flores perianthii lobis nullis; stamina 12, introrsa, filamentis applanato-subulatis usque ad 1.9 mm. longis, longe pilosis, partim basi glandulis subcordatis circiter 0.3 mm. longis et circiter 0.3 mm. longe stipitatis munita, antheris obovato-rectangularibus circiter 0.9 mm. longis, apice obtusis vel levissime emarginatis; ovarium rudimentarium ellipsoideum, glabrum, cum stylo circiter 1 mm. longum; flores ♀ ignoti.

Kapa Kapa, no. 813 (type), Dec. 9, 1925 (slender tree, branches drooping; bark rough, light brown; flowers yellow); Budatobara, alt. 150 m., no. 743, Dec. 2, 1925 (handsome tree, 4.50 m. high; bark close and hard, light gray).

This species is easily distinguished from all other Papuan species by the 9-flowered involucres. All the other species have 4- or 6-flowered involucres and their flowers have the lobes of the perianth more or less well developed.

The description is based on the specimen in the Botanical Museum at Berlin.

*Litsea domarensis O. C. Schmidt, sp. nov.

Arbor 40–50-pedalis, cortice griseo, bene foliata. Folia petiolis crassis usque ad 4 cm. longis subvelutinis; lamina obovata vel obovato-elliptica, apice angustata et acuminata, basi angustata, obtusiuscula, 16.5–34 cm. longa et 10–19 cm. lata, chartacea, supra praeter nervos glabra, subtus pilosa; nervus medius supra prominens, dense puberulus, subtus manifeste prominens, utroque latere nervis lateralibus 13–15 leviter arcuatim abeuntibus; nervi ceteri supra leviter impressi, praecipue paralleli, conspicui. Flores 6 in involucro, albi (ex Brass); pedunculi 1.5–2 cm. longi; bracteae involucrales 6, obovatae vel suborbiculares, 8–9 mm. longae et usque ad 7.5 mm. latae, concavae; flores perianthii lobis 6 plus minusve lanceolatis usque ad 4.5 mm. longis, extus brevi-pilosis; stamina 12, filamentis longe pilosis usque ad 3.5 mm. longis, antheris obovato-rectangularibus circiter 1.5 mm. longis, apice levissime acuminatis vel obtusiusculis, partim basi glandulis sessilibus subovato-ellipticis et basi leviter cordatis munita; ovarium nullum; flores ♀ ignoti.

Domara River, Eastern Division, no. 1595, May 31, 1926 (dense-foliaged pyramidal tree, 12–15 m. high, with close gray bark; flowers white).

This species is related to *L. Engleriana* Teschn. which differs in its

yellowish brown and smaller flowers with the involucral bracts only up to 5.5–6 mm. long. The description is based on the specimen in the Botanical Museum at Berlin.

Cassytha filiformis Linnaeus, Sp. Pl. 35 (1753).

Maclatchie Point, Gulf Division, no. **1180** (growing over beach trees); Bomgwina, Eastern Division, no. **1615** (growing over *Ipomaea pes-caprae*).

HERNANDIACEAE

Gyrocarpus americanus Jacquin, Select. Stirp. Am. Hist. 282 (1763).

Port Moresby, no. **868** (tree 6–9 m. high, with a compact crown, the leaves clustered at the end of the branchlets; bark gray or brown, smooth; common along the coast).

Hernandia ovigera Linnaeus, Herb. Amboin. Diss. O. Stickman (1754); Amoen. Acad. IV. 125 (1788).

Hernandia peltata Meisner in De Candolle, Prodr. XV. pt. I. 263 (1864).

Kerema, Gulf Division, no. **1201** (a large tree with a brown, close bark; leaves shining above; fruit black, enclosed in a white fleshy involucel; growing on the beach under a high rocky headland); Sandbank Bay, Eastern Division, no. **1642** (large beach tree; leaves glossy above; flowers white, sweet-scented; fruit black, enclosed in a yellowish green involucel).

***Hernandia papuana** C. T. White, sp. nov.

Arbor tenuis 25–30 m. alta, ramulis terminalibus in sicco nigris angularibus, partibus junioribus fusco-tomentosis, adultis glabris. Folia petiolata, petiolis 5–13 cm. longis; laminis 10–18 cm. longis 1½–2-plo longioribus quam latae oblongo-ovatis ad late ovatis in parte superiore apicem versus gradatim angustatis, apice ipso obtuse acuminato, nervis lateralibus utrinque 4–5 et in pagina superiore et inferiore distinctis, venulis transversis et reticulatis in sicco utrinque visibilibus sed subtus magis prominentibus. Paniculae axillares petiolos aequantes sed paniculae fructiferae multo longiores ramulis tomentosis, ramulis ultimis involucro 4-bracteato terminatis; bracteis tomentosis ovatis 4 cm. longis, 2.5 cm. latis; flores masculi (in alabastra modo visi) dense tomentosi, pedicellati; pedicellis 3–4 cm. longis; perianthii segmentis 6, 3 mm. longis; staminibus 3, antheris 1.5 mm. longis, filamentis planis ca. 1 mm. longis, glandulis ad basin omnium staminum 2 planis magnis; flores feminei non visi. Fructus involucello aucto inclusus; involucello fructifero inflato albo-viridi laevi subcoriaceo globoso 5–6 cm. diam., venis longitudinalibus distinctis, venulis transversis et reticulatis visibilibus, ore centrali irregulariter oblongo ca. 2.5 × 1 cm.; fructu stipitato subgloboso ca. 2 cm. diam.; semine ca. 1.8 cm. diam. ruminato.

Ihu, Vailala River, no. **1073**, Feb. 26, 1926 (a tall, slender, rain-forest tree, 24–27 m., with a pale-brown, soft, thick bark exfoliating in thin flakes; wood white and very soft; fruit enclosed in a much inflated, fleshy, greenish-white involucre).

Readily distinguished from the only other Papuan species, the widely-spread *H. ovigera* (*H. peltata* Meisn.), by its non-peltate leaves. It also differs in habitat, being a rain-forest, not a beach, tree.

The flowering material available for description and all the flowers examined by me were males in bud only. I failed to find a female flower sufficiently advanced to describe. The fruiting involucels were described from formalin material and in these the veins and veinlets are distinctly visible, though it is possible in a fresh state that the texture of the involucel is more fleshy and the veins and veinlets more or less obscured.

CAPPARIDACEAE

Capparis lucida (DC.) R. Brown apud Bentham, Fl. Austr. I. 96 (1863).

Kapa Kapa, no. **504** (small straggling tree, 3–4.5 m. high, bark brown, rather corky; flowers cream; fruit dark brown; tree grows mostly on tidal flats).

Capparis sepiaria Linnaeus, Syst. Nat. ed. 10, II. 1071 (1759).

Capparis umbellata R. Brown apud De Candolle, Prodr. I. 247 (1824).

Kapa Kapa, no. **796** (large straggling shrub, common on edge of tidal area; fruit black when ripe).

In the Proc. Roy. Soc. Queensl. XXXIV. 31 (1922) I recorded the above plant for Papua as *C. umbellata* R. Br. Bentham, in the "Flora Australiensis" I. 93, states that the Australian *C. umbellata* R. Br. differs chiefly from the common Indian and Philippine *C. sepiaria* in its sessile umbels and less numerous flowers. The Papuan specimens referred to above show great variability in the inflorescence but I have no hesitation in referring them to typical *C. sepiaria* L. Most of the Australian specimens of *C. umbellata* R. Br. examined by me show the umbels to be sessile but in some the umbels are shortly peduncled. Hooker (Fl. Brit. India I. 177) describes the umbels of *C. sepiaria* L. as sessile or shortly peduncled. It seems, under the circumstances, that it is impossible to retain *C. umbellata* R. Br. as a distinct species and that it should be referred to *C. sepiaria* L. which is now shown to range from India and the Philippines, through New Guinea, to tropical Australia. Our southernmost record for tropical Australia is Percy Is. (leg. H. Tryon).

NEPENTHACEAE

Nepenthes mirabilis (Lour.) Druce in Rep. Bot. Exch. Brit. Isles, 1916, p. 637 (1917).

Nepenthes phyllamphora Willdenow, Sp. Pl. IV. pt. II. 874 (1806).

Mt. Warirata, on dry savannah, alt. 600 m., no. **558**, October 31, 1925 (stems raise from flat woody stock; pitchers mottled with purple within); Kerema, Gulf Division, no. **1208**, March 24, 1926 (straggling undershrub, about ½ m. tall).

CUNONIACEAE

Schizomeria floribunda Schlechter in Bot. Jahrb. LII. 156 (1914).

Iaritari, on streams of the foothill forest, alt. 350 m., no. 713, Nov. 29, 1925 (straggling tree, overhanging water, with light gray slightly scaly bark).

ROSACEAE

Rubus glomeratus Blume, Bijdr. 1111 (1826).

Bisiatabu, alt. 450 m., no. 580 (a large rambler growing on the edge of the rain-forest); Kerema, Gulf Division, no. 1222 (scrambling over small trees near the sea-shore).

As I could not place this plant satisfactorily with the literature and specimens available at Brisbane, I sent specimens to the Royal Botanic Gardens, Kew, England, for comparison with other Papuan material. In reply the Assistant Director (Dr. T. T. Chipp) wrote:

"The specimens appear to be *R. glomeratus* Blume, a Malayan species to which most of the New Guinea material in our herbarium also belongs. *R. glomeratus* shows a considerable degree of variation in its indumentum."

Rubus rosaefolius Smith, Pl. Icon. Ined. III. t. 60 (1789).

Owen Stanley Range, between Mt. Brown and Mt. Clarence, alt. 1200 m., no. 1477 (a straggling shrub with pale green leaves).

Native name (Kuraudi dialect) "E-eri."

Pygeum spec. aff. *P. Forbesii* Koehne.

U-uma River, Eastern Division, no. 1386[a] (large, river bank tree with slender drooping branches; leaves shining above; flowers white).

Specimens were referred to the Royal Botanic Gardens, Kew and reported on by Mr. V. S. Summerhayes as follows:

"I have compared this with the specimens and descriptions of the described Papuan species of *Pygeum*. The plant is nearest *P. Forbesii* Koehne, but differs in having a less shining upper surface to the leaves while the reticulation of the veins is different. In *P. Forbesii* moreover the midrib is quite glabrous underneath. Both agree in having only male flowers present which in Brass no. 1386A are less hairy inside and have a much larger tuft of hairs around the sterile ovary. Mr. Brass's specimen therefore seems to represent a new species but it is certainly very closely allied to *P. Forbesii*."

Pygeum spec. aff. *P. Schlechteri* Koehne.

Kuraudi, Eastern Division, no. 1386 (tree growing on the river bank, 12 m. high, with long, weak, crooked branches; leaves shining above, pale beneath; flowers greenish-white in axillary racemes; fruit pale-green).

Native name "Ganema."

Specimens were referred to the Royal Botanic Gardens, Kew and reported on by Mr. V. S. Summerhayes as follows:

"This plant has been compared with the type specimen of *Pygeum Schlechteri* Koehne with which it is very closely allied. It differs, however, in the shorter indumentum of the leaves and stem. The venation of the leaves is also different, the lateral veins being given off at a more acute angle. The peduncles in Brass's specimens are thicker, and are ascending whereas in *P. Schlechteri* they are almost horizontal and possess a relatively longer indumentum. It seems probable that the specimen represents a new species of the section *Sericospermum*. *Pygeum tetradenium* Koehne has much smaller leaves and quite different fruit."

CONNARACEAE

Connarus spec.

Rigo, coast, no. **816**, Dec. 9, 1925 (large shrub branched from ground; fruit bright brownish red in terminal panicles).

LEGUMINOSEAE

Serianthes Ledermannii Harms in Bot. Jahrb. LV. 43 (1917).

Ihu, Vailala River, no. **1107** (low spreading tree on river bank; thick trunk and branches; close brown bark; leaves shining above; flowers white).

Determined by H. Harms.

Albizzia moluccana Miquel, Fl. Ind. Bat. I. 26 (1855).

Bisiatabu, alt. 450 m., no. **576** (tall, slender, horizontally branched tree, 18–24 m., growing on the edge of the rain-forest; bark pale-gray; branches lenticellate).

Determined by H. Harms.

Albizzia procera Bentham in Hooker Lond. Jour. Bot. III. 89 (1844).

Port Moresby, no. **875** (erect tree, 6–7.50 m., with a small, leafy crown, common on rich flats near the sea; bark smooth, yellowish-green; lower bark sometimes rough and scaly).

Determined by H. Harms.

Acacia auriculaeformis A. Cunningham apud Bentham in Hooker Lond. Jour. Bot. I. 377 (1842).

Port Moresby, no. **856** (spreading tree with thick trunk and drooping branches; trunk very rough and channelled; grows near the beach); Kerema, Gulf Division, no. **1219** (very large spreading tree 15 m. high; bark dark gray, hard, fibrous and furrowed; phyllodes dark green, flowers yellow; a solitary tree close behind the mangroves).

Acacia Farnesiana Willdenow, Sp. Pl. IV. 1083 (1806).

Port Moresby, no. **871** (large straggling shrub, forming thickets near the beach).

Piptadenia novoguineensis Warburg apud Taubert in Engler & Prantl, Nat. Pflanzenfam. III. pt. 3, p. 122 (1892).

Domara River, Eastern Division, no. **1596** (erect, thin-foliaged tree, 6–7.50 m., growing on river bank; close gray bark; leaves pale; flowers white, profuse).

Determined by H. Harms.

Bauhinia binata Blanco, Fl. Filip. 331 (1837).

Tidal Flats, Kapa Kapa, no. **506**, Oct. 20, 1925 (tree 4.50–6 m., with rough, brown bark and with spreading, drooping branches; flowers white).

Native name "Tiasi."

I had myself collected specimens of this plant at Port Moresby bearing pods only and could not be sure of the identity until I had received Mr. Brass's flowering specimens. It is common about Port Moresby, where it grows near the sea-front and forms a shrub or small tree of straggling habit. Not previously recorded for Papua.

Bauhinia Williamsii F. Mueller, Descr. Not. Papuan Pl. IV. 61 (1876).

Budatobara, no. 753 (a large liane, leaves and portion of stem only); Kuraudi, Eastern Division, no. 1380 (a large thin-stemmed climber climbing over river bank trees); Loloki River, no. 1658 (a large liane, stems flattened, bent and indented at short regular intervals; leaves smooth, pale, brown beneath when young; flowers bright red; grows in riverine rain-forests).

Native name "Lefa" (no. 1380) and "Bata-wasinaka" (no. 1658).

The remarkable flattened serpentine stems resemble closely those of the Indian *B. anguina* Roxb. to which the Papuan plant is evidently closely allied. The leaves in most of the specimens are cordate-rotundate and entire, but Brass's No. 1658 shows some of the leaves to be deeply indented at the top as in *B. anguina* Roxb., and further to be indented along the margin. Though Mr. Brass described the young leaves as brown underneath, in the dried stage they are markedly purple.

Maniltoa Hunsteiniana Harms in Bot. Jahrb. LV. 51 (1917).

Borabere, alt. 375 m., no. 727 (slender tree 6–9 m., with a close brown bark; young shoots enclosed in an involucre of pale pink bracts; flowers white and numerous; grows in riverine forest).

Native name "Lubeia."

The above specimens agree with the description published by Harms except that the bud scales or bracts are almost glabrous, not rather silky villous.

***Maniltoa lenticellata** C. T. White in Jour. Arnold Arb. VIII. 130 (1927).

Budatobara, no. 779 (a handsome tree 9–12 m., with a rough brown bark; grows in riverine rain-forests).

Maniltoa spec.

Borabere, alt. 375 m., no. 735, Dec. 2, 1925 (slender tree, 10 m., with horizontal branches; bark light brown, slightly rough).

Afzelia bijuga A. Gray, U. S. Expl. Exped. Bot. Phan. I. 467 (1854).

Keuru, Gulf Division, no. 1199 (large tree with spreading branches; bark brown and flaky; petals white; stamens red; a beach tree); Lower Mori River, Eastern Division, no. 1569 (large tree in riverine rain-forests; lower bark rough and scaly, upper bark smooth and brown).

Considered to be the best hardwood in Papua and known there as "Bedila."

Cassia alata Linnaeus, Sp. Pl. 378 (1753).

Borabere, no. 733 (large shrub, growing near old village, probably planted).

Caesalpinia crista Linnaeus, Sp. Pl. 380 (1753).

Uniori, no. 742 (a large scrambling riverside shrub); Mori River, Eastern Division, no. 1530 (a large scrambling shrub on river-bank).

Native name "Ed-e."

Caesalpinia nuga (L.) Aiton, Hort. Kew. ed. 2, III. 32 (1811).

Siroura River, Gulf Division, no. 1352 (a rambling shrub; leaves

shining above; flowers yellow; growing in the mangrove fringe along salt-water creeks); Lower Mori River, Eastern Division, no. 1559 (a large rambler on the river bank).

Native name "Gangan."

Ormocarpum cochinchinense (Lour.) Merrill in Philipp. Jour. Sci. v. 76 (1910).

Ihu, Vailala River, no. 1103 (a large, densely foliaged shrub overhanging river waters; flowers white; common on the river banks throughout the Gulf Division).

Desmodium dependens Blume apud Miquel, Fl. Ind. Bat. I. pt. I. 248 (1855).

Hula, no. 509 (shrub 1.50–1.75 m.; trailing branches and long pendulous racemes; growing in riverine rain-forests); Domara River, Eastern Division, no. 1603 (small weak, branched bush, leaves shining above; flowers white; a rain-forest species).

Desmodium gyroides De Candolle, Mém. Legum. 322 (1825); Prodr. II. 326 (1825).

Desmodium papuanum C. T. White in Proc. Roy. Soc. Queensl. XXXIV. 34 (1922).

Budatobara, no. 757 (erect shrub 2 m.; growing in dry savannah forest).

Desmodium heterocarpum (L.) De Candolle Prodr. II. 337 (1825).

Orokolo Bay, no. 1027 (abundant on the sea beach; shrubby perennial, 1.50–1.75 m.).

Desmodium pulchellum (DC.) Bentham, Fl. Hongk. 83 (1861).

Bisiatabu, no. 622 (shrub, 1–2 m., growing in dry savannah forest).

Desmodium umbellatum De Candolle, Prodr. II. 325 (1825).

Port Moresby, no. 847 (small tree 4.50 m., with a close pale gray bark and pendulous branches; flowers white, growing in coastal scrub); Kapa Kapa, no. 783 (spreading tree up to 6 m., with a brown scaly bark; flowers white; growing in coastal brushes); Budatobara, no. 763 (river-side tree 3–4.50 m., flowers white); Orokolo Bay, no. 1028 (small tree of drooping habit; bark close, gray, rough at base, flowers white; very abundant; grows in dense thickets all along the foreshore); Loloki River, no. 1654 (small tree on river bank).

Native name "Kaiupa" (no. 1028) and "Urara" (no. 1654).

Uraria lagopodioides (L.) Desvaux in Mém. Soc. Linn. Paris, IV. 308 (1826).

Siroura River, Gulf Division, no. 1351 (an erect plant of 1 m.; a weed in the native gardens).

Phylacium bracteosum Bennett, Pl. Jav. Rav. 159 (1838–59).

Headwaters of the U-uma River, Eastern Division; alt. 450 m., no. 1457 (small twiner on river bank).

Dalbergia candenatensis (Dennst.) Prain in Jour. As. Soc. Bengal. LXX. 49 (Nov. Ind. XVIII.) (1901).

Domara River, Eastern Division, no. 1598 (a low rambling shrub; flowers white; growing on banks of salt-water creeks).

Dalbergia densa Bentham in Hooker Lond. Jour. Bot. II. 217 (1843).

Mt. Warirata, alt. 600 m., no. 560 (large straggling shrub; growing in savannah forests).

Pterocarpus indicus Willdenow, Spec. Pl. III. 904 (1803).

Borabere, alt. 300 m., no. 722 (very large spreading tree, trunk buttressed, bark brown and scaly; wood pale, cross grained, used by natives for making drums; bark contains large quantity of thin red gum. Wood said to yield fast yellow dye; common in the foothill forests from Sogeri to Kapa Kapa); Ihu, Vailala River, no. 1108 (a large thick-boled tree with spreading crown; bark dark gray, marked with shallow grooves or channels, upper branches smooth; abundant in rain-forests; coppice shoots, which are freely produced by the stumps of trees that have been felled, take root and grow when planted).

Native name "Ila" (no. 722) and "Opa" (no. 1108). English name "Drum-wood."

Pongamia pinnata (L.) Merrill, Interpret. Rumph. Herb. Amboin. 271 (1917).

Rigo, no. 821 (a handsome spreading tree, 12 m. high, with a close light-brown bark; branches drooping; grows along river banks); Upoia, Vailala River, no. 1150 (a thick-foliaged tree, 9 m. high, overhanging rivers); Kerema, Gulf Division, no. 1225 (small tree, growing on edge of mangrove swamps); Lower Mori River, Eastern Division, no. 1567 (weak branched tree, 6 m., growing on river bank).

***Pongamia pinnata** (L.) Merr. var. **velutina** C. T. White, n. var.

A typo foliolis supra tenuiter subtus dense pilis velutinis mollibus obsitis recedit.

Port Moresby, no. 841 (a small, densely foliaged tree 4.50 m., with drooping branches and a close gray bark; grows in coastal gullies).

Differs from the type in the leaves being clothed with a soft, velvety pubescence, thin on the upper surface and dense on the lower. When better known may prove a distinct species but the specimens unfortunately lack flowers.

Derris trifoliata Loureiro, Fl. Cochinch. 433 (1790).

Derris uliginosa (DC.) Bentham in Miquel, Pl. Junghuhn. 252 (1851–55).

Lower Vailala River, no. 1179 (small climber on river bank flowers pink); Keura, Gulf Division, no. 1195 (climber or rambling shrub; buoyant pods abundant in beach drift).

Derris spec.

Ihu, Vailala River, no. 1100, March 4, 1926 (large climber, deciduous, flowering before the leaves appear; flowers white tinged with pink).

Probably new species differing from D. *elliptica* Benth. in its smaller less pilose calyx (H. Harms).

Abrus precatorius Linnaeus, Syst. Nat. ed. 12, II. 472 (1767).

Port Moresby, no. 1403 (small rambling or trailing shrub).

Erythrina indica Lamarck, Encycl. Méth. II. 391 (1788).

Kapa Kapa, no. 803 (spreading tree 6 m.; trunk and branches thick and sappy, armed with large scattered thorns, smaller branches prickly, growing on creek banks near the sea).

Strongylodon lucidus (Forst. f.) Seemann, Fl. Vit. 61 (1865).

Upoia, Vailala River, no. 1156 (a small, glabrous rain-forest twiner; young branches, petioles and peduncles purple; calyx orange-yellow; petals various, greenish-white to reddish-brown).

Strongylodon spec. aff. *S. lucidus* Seem.

Aisa River, Eastern Division, no. 1524, May 13, 1926 (small vine on river bank).

Mucuna Bennettii F. Mueller, Descript. Not. Papuan Pl. I. (IV.) 63 (1876).

Lower Mori River, Eastern Division, no. 1572 (climbing over river bank trees; leaves smooth and shining, paler beneath; flowers vivid scarlet in short racemes on last year's wood.)

Native name "Damala."

The inflorescence is described (F. Mueller, l. c.) as "few-flowered," and dried specimens would give one this idea for they are in very thick bunches and some would have to be removed to facilitate drying. Brass's No. 1572 consists of three sheets of leaf specimens, one with the flowers attached, and the other two with the inflorescences preserved in formalin. One of these latter possesses 16 flowers and shows several prominent scars indicating where other flowers have become detached. The central rachis measures only 2 cm. or less and is covered with very short processes, each bearing 2 or 3 flowers. The species is figured by F. M. Bailey in Annual Report of British New Guinea 1900–1901, Appendix I. (2) facing p. 144.

Mucuna Warburgii Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 365 (1900).

Maira, Vailala River, no. 1032 (large climber, ascending tall trees and forming a dense wall of vegetation between the river bank rain-forest trees; flowers rich bright crimson, racemes two together in leaf axils on previous year's wood).

Common name "D'Albertis Creeper."

This species had not previously been recorded for British New Guinea (Territory of Papua); it makes the third red-flowering species from that region. All the Mucunas are known to the British residents of New Guinea as "D'Albertis Creeper," though the name refers more particularly to these red-flowering species.

Canavalia lineata (Thunb.) DeCandolle, Prodr. II. 404 (1825).

Canavalia obtusifolia De Candolle, l. c. (1825).

Orokolo Bay, no. 1026 (large beach creeper, common on the beaches between Hula and Orokolo Bay; flowers pink)..

Flemingia strobilifera (Willd.) Aiton, Hort. Kew. ed. 2, IV. 350 (1812).

Haga, Loloki River, no. **896** (shrub 2 m., growing on rain-forest borders); Loloki River, no. **1657** (shrub about 2 m. high, growing on river banks).

Native name "Mineata."

Vigna marina (Burm.) Merrill, Interpret. Rumph. Herb. Amboin. 285 (1917).

Vigna lutea A. Gray, U. S. Expl. Exp. Bot. Phan. I. 452 (1854).

Maclatchie Point, Gulf Division, no. **1178** (a creeper on the beach, sometimes climbing over small bushes; flowers yellow); Domara River, Eastern Division, no. **1589** (trailing on muddy creek banks).

LINACEAE

Durandea pentagyna (Warb.) Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 278 (1905).

Hewa, Vailala River, no. **1135** (large rambling shrub growing on river banks; fruit brown).

Native name "Quamo."

RUTACEAE

Evodia alata F. Mueller, Fragm. Phytog. Austral. VII. 142 (1871).

Bomgwina River, Eastern Division, no. **1625** (river bank tree 9 m. high, with slender drooping branches; leaves pale, thin).

These specimens are much more robust than the type from Queensland; the petiole measures up to 24 cm. long with the wings at the top 5 cm. broad on the one side; the terminal leaflet in the largest leaf has the point broken off and measures 27.5 cm. long,—(probably another 2 cm. could be added for the broken portion), and 13 cm. broad about two-thirds up. The inflorescences, which are in the uppermost axils, measure up to 20 cm. long and 12 cm. across, the lowermost branches being the longest.

***Evodia albiflora** C. T. White, sp. nov.

Arbor erecta gracilis 8 m. alta (fide Brass); partibus junioribus molliter fulvo-tomentosis; ramulis ad nodos applanatis; foliis trifoliolatis, petiolis 5–7 cm., foliolis breviter petiolulatis petiolulis 3–5 mm., laminis ellipticolanceolatis, ellipticis vel rarius ovatis, apice acuminatis, basi subrotundis, 8.5–17 cm. longis, 2–3-plo longioribus quam latae, supra in adultis glabris, subtus praecipue in nervis tomentosis, minute et dense atro-punctatis, nervis lateralibus 13–16, supra leviter immersis subtus elevatis, venis et venulis utrinque prominulis; paniculis ex axillis defoliatis ortis, ad 10 cm. longis, ramulis inferioribus ad 4 cm. longis, rhachi et ramulis molliter tomentosis; floribus albis (fide Brass) dense confertis, pedicellis 0.75 mm. tomentosis, sepalis ovatis 2 mm. longis, staminibus 4, filamentis glabris ca. 2 mm., antheris 1 mm. longis angusto-ellipticis, carpellis sericeo-tomentosis, stylo glabro.

Ihu, Vailala River, no. **1098**, March 4, 1926 (slender erect tree, 7.50 m.

high, growing on the river bank; flowers white, crowded in axillary panicles).

Among previously described Papuan species it seems to come closest to *E. pachypoda* Lauterb., and in Lauterbach's key to the Papuan species (Beitr. Fl. Papuas. VI. in Bot. Jahrb. LV. 224–225) comes between that species and *E. spectabilis* Ridl. From the former it differs in its smaller inflorescence, the peduncle without a corky bark, and from the latter in its smaller flowers.

Evodia altissima Baker fil. in Jour. Bot. LXI. Suppl. 7 (1923).

Rain-forests, Murua River, Gulf Division, alt. 100 m., no. **1336** (tall, buttressed tree with a smooth, brown bark; leaves glossy above, pale beneath; flowers white).

Seems to agree fairly well with Baker's species as far as can be told from the very short description; the flowers are in bud only, the petals about 1 mm. long, and coherent along the margins, particularly towards the apex.

Evodia hortensis Forster, Char. Gen. 13, t. 7 (1776).

Ihu, Vailala River, no. **925** (small, pale-foliaged tree 2.50–3.50 m. high, with a silver-gray bark; leaves strongly smelling of aniseed; flowers white; the leaves are worn by the natives in their armbands).

Lauterbach (Beitr. Fl. Papuas. VI. in Bot. Jahrb. LV. 233) has attempted to distinguish several varieties and forms of this widely distributed species. According to his account the above plant would be placed under *E. hortensis* Forst. var. *sinuata* Lauterb. f. *simplicifolia* K. Schum.

Evodia microsperma F. M. Bailey in Queensl. Agric. Jour. XXIV. 20 (1910).

Kuraudi, Eastern Division, no. **1408** (small slender tree, aromatic; leaves smooth and shining; fruit green, glandular, peppermint-scented; seeds black, shining; grows in light rain-forests).

Native name "Amaga."

These specimens differ from the type of *E. microsperma* Bail. in being more robust in all parts; the seeds are larger, measuring about 3 mm. diam. In Lauterbach's account of the Papuan species (Beitr. Fl. Papuas. VI. in Bot. Jahrb. LV. 224–240) this species is placed close to *E. tetragona* K. Schum., which would seem its natural affinity though its aromatic scent and bluish-black seeds connect it with his section "Aromaticae."

Evodia Muelleri Engler in Engler & Prantl, Nat. Pflanzenfam. III. pt. IV. 121 (1896).

Borabere, alt. 300 m., no. **728** (erect, sparsely branched tree 6–7.50 m., with a close light brown bark; flowers pink on main branches or branches below the leaves).

The above specimens were determined at the Royal Botanic Gardens, Kew, after comparison with the type material from Berlin.

Evodia tetragona Schumann in Schumann & Hollrung, Fl. Kaiser Wilhelms Land, 57 (1889).

Wame River, Purari Delta, no. **1083** (an erect tree 12 m., with a gray suberose bark and pale soft wood; leaves glossy; flowers pale pink; growing in rain-forests).

Specimens were forwarded to the Royal Botanic Gardens, Kew, England, where they were reported on by Mr. V. S. Summerhayes as follows, "Brass no. 1083 is *Evodia tetragona* K. Schum., the specimen agreeing with the type gathering quite satisfactorily."

***Melicope parviflora** C. T. White, sp. nov.

Arbor 13 m. alta (fide Brass); ramulis junioribus angularibus sed mox teretibus; partibus junioribus dense et breviter pubescentibus; foliis simplicibus, petiolis 1–1.5 cm., apicem versus subarticulatis, laminis 10–12 cm. longis, 2–2½-plo longioribus quam latae, obovatis ad apicem rotundis vel leviter acuminatis, utrinque glabris, subtus pallidioribus, nervis lateralibus ca. 10, venis et venulis (in sicco) utrinque prominulis; paniculis in axillis superioribus dispositis, saepe folia superantibus, ad 14 cm. longis, ramulis pubescentibus; floribus parvis, pedicellis 2–3 mm., dense et breviter pubescentibus; sepalis late ovatis 0.5 mm., extus dense pubescentibus; petalis triangularibus, extus dense pubescentibus intus paucis pilis vestitis 2 mm. longis, staminibus 8, filamentis glabris applanatis, 4 longioribus 1 mm. longis, 4 brevioribus, antheris vix 0.5 mm., ovario dense piloso; stylo glabro.

Iawarere, rain-forests, no. **689**, Nov. 4, 1925 (tree 12 m. high, trunk 15 in. diam.; wood light and straight grained).

Among previously recorded Papuan species the affinities of *M. parviflora* lie with *M. sarcococca* Lauterb. and *M. papuana* Lauterb. from both of which it differs in its markedly more elongate inflorescence.

Lunasia quercifolia (Warb.) Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 376 (1900).

Loloki River, no. **1646** (an erect bush 1.25 m., growing on river bank).

Lunasia quercifolia (Warb.) Lauterb. & Schum. forma.

Head-waters of U-uma River, Eastern Division, alt. 450 m., no. **1459** (small river bank tree).

The above specimens differ from the type in having narrower (oblanceolate or narrowly obovate) leaves and not very deeply indented, in fact sometimes almost entire.

***Lunasia quercifolia** (Warb.) Schum. & Lauterb. var. **lanceolata** C. T. White in Jour. Arnold Arb. VII. 232 (1926).

Differs from the type in the leaves being entire or almost so and lanceolate, not sinuate-dentate and oblong-obovate in outline.

Budatobara, alt. 100 m., no. **761** (a large slender shrub 2.50 m. high; growing in light rain-forest).

Lauterbach (Beitr. Fl. Papuas. VI. in Bot. Jahrb. LV. 249) has referred to the variability in leaf shape of the closely allied *L. amara* Blanco.

The present specimens are in fruit only but have the carpels and vestiture of *L. quercifolia*. I hesitated a long time before applying a varietal name to this form, particularly after the receipt of specimens intermediate between it and the type (Brass no. 1459), but the foliage is so very different from the type that the bestowal of a distinct varietal name seems justified.

Micromelum minutum (Forst. f.) Seem. var. **intermedium** Tanaka in herb.

Budatobara, Hunter River, no. **764** (a small spreading tree with a light brown, slightly rough bark; fruits orange-colored; grows in light rain-forest).

Determined by T. Tanaka.

Glycosmis Greenei Elmer, Leafl. Philip. Bot. IV. 1512 (1912).

Kapa Kapa, no. **835**, Dec. 15, 1925 (large bush or small tree, with hard gray bark; flowers white, sweet-scented).

Determined by T. Tanaka.

Citrus macroptera Montrousier in Mém. Acad. Lyon, X. 187 (1860).

Hewa, Vailala River, no. **1119** (an erect, rather loosely branched tree attaining 6 m. in height; leaves dark, glossy green; fruit yellow (?) when fully ripe, sour, with a thick, fleshy white rind; seldom eaten by the natives; grows on low, wet, stiff clay ridges close to the sago swamps, seen also in the Purari Delta).

Native name "Parua."

Determined by T. Tanaka.

***Echinocitrus Brassii** (C. T. White) T. Tanaka in Jour. Arnold Arb. IX. 137 (1928).

Paramignya Brassii C. T. White in Jour. Arnold Arb. VII. 231 (1926).

Rigo, no. **817** (slender bush, attaining 2 m., branches drooping; leaves glossy, dark green; flowers sweetly scented; fruit various, bright scarlet when ripe, up to 3 cm. long and 2 cm. diam., pulp scanty, insipid, rather sweet, oil-glands numerous; seeds large; common on rich creek flats; small stunted bushes, very spiny, well grown plants almost unarmed).

SIMARUBACEAE

Suriana maritima Linnaeus, Sp. Pl. 284 (1753).

Port Moresby, no. **503** (an erect littoral shrub 2 m.; leaves fleshy).

BURSERACEAE

Santiria acuminata Schumann in Schumann & Hollrung, Fl. Kaiser Wilhelms Land, 64 (1889).

Iawarere, alt. 450 m., no. **685**, Nov. 24, 1925 (large tree, hard corky bark; wood white, fairly hard).

Garuga floribunda Decaisne in Nouv. Ann. Mus. Paris, III. 477 (1834).

Loloki River, alt. 350 m., no. **542** (large tree with a rough, scaly bark, secretes a light colored gum; leaves light green, clustered at the ends of

the branches: fruiting inflorescence lateral or axillary; fruit edible; grows in riverine rain-forests; bark and wood mango-scented).

Motu name "Kagi Kagi."

Mr. Brass's note on the mango-scent of the wood and bark is interesting; an allied Burseraceous tree, *Protium australasicum* (Bail.) Sprague, is commonly known in Southern Queensland, as Mango Bark due to characteristic mango odor of the bark when cut.

MELIACEAE

Xylocarpus granatum Koenig in Naturforscher, XX. 2 (1784).

Domara, Eastern Division, no. **1538** (spreading mangrove 10 m. high; bark pale brown, peeling in large flakes; flowers white).

Native name "Savili."

Xylocarpus moluccensis (Lam.) M. Roemer, Fam. Nat. Syn. I. 124 (Hesper.) (1846).

Kapa Kapa, no. **792** (a low spreading tree with a dark, scaly bark; growing near the beach).

Turraea pubescens Hellenius in Vet. Acad. Nya Handl. Stockh. IX. 308, t. 10, fig. 1 (1788).

Kapa Kapa, no. **825** (slender, erect shrub 1.5–2 m.; flowers white and showy; grows on sand hills near the beach.)

Dysoxylum Kunthianum Miquel in Ann. Mus. Bot. Lugd.-Bot. IV. 13 (1868).

Ihu, Vailala River, no. **953** (slender rain-forest tree 10 m. high, with a close gray bark; leaves pale; flowers white); Wame River, no. **1091** (small bushy rain-forest tree; flowers white).

Dysoxylum Nymanianum Harms in Schumann & Lauterbach, Fl. Deutsch. Schutzgel. Südsee, Nachtr. 282 (1905).

The Cupola, Gulf Division, alt. 150 m., no. **1351** (spreading rain-forest tree, 7.50 m. high; leaves dull; flowers brown; fruit subglobose, yellow).

Determinations of this and the preceeding species received from the Director, Botanic Garden and Museum, Berlin.

Dysoxylon spec. aff. *D. amooroides* Miq.

Lepokera, Vailala River, no. **983**, Feb. 16, 1926 (tall buttress tree, with close gray bark; leaves clustered at end of branches).

Dysoxylon spec.

Ihu, Vailala River, no. **1075**, Feb. 26, 1926 (slender tree, 12 m., upper bark smooth and gray, lower pale brown, deciduous in large irregular scales; fruit brown, tuberculate in short racemes or trunk and branches.

Chisocheton spec. aff. *C. Schumannii* C. DC.

Wame River, Purari Delta, no. **1080**, Feb. 28, 1926 (small tree; fruit globose, brown.

Aglaia spec.

U-uma River, Eastern Division, no. 1438, May 14, 1926 (small tree in light rain-forests).

Native name "Madurama."

MALPHIGIACEAE

Tristellateia australasica A. Richard, Sert. Astrolabe, 159 (1832).

Domara, Eastern Division, no. 1536 (a large rambling shrub or climber of the beach mangrove formations).

Rhyssopterys timorensis Blume apud A. Jussieu in Delessert, Icon. Select. Pl. III. 21, t. 35 (1837).

Domara River, Eastern Division, no. 1588 (climbing over mangrove trees; flowers pale yellow).

The specimens bear ripe fruits and the leaves are almost quite glabrous on the under surface.

POLYGALACEAE

***Xanthophyllum suberosum** C. T. White, sp. nov.

Arbor magna; cortice duro suberoso (fide Brass); ramulis glabris lenticellatis; foliis glabris in sicco atro-fuscis petiolatis, petiolis 7 mm. longis, laminis 6–8.5 cm. longis et 3–4.5 cm. latis, ovato-lanceolatis ad basin cuneatis ad apicem acuminatis, acumine ipso 0.5–1 cm. longo, supra subnitidis, venis et venulis subtus prominentibus; racemis foliis brevioribus, rhachi tenui pubescente, floribus magnis, pedicellis tenuibus pubescentibus 1–1.3 cm. longis; sepalis inaequalibus utrinque pubescentibus, 2 interioribus majoribus, oblongis vel late ovatis 8 mm. longis et 5 mm. latis, exterioribus ovatis 6 mm. longis et 3 mm. latis; petalis pubescentibus basin versus in unguem sensim angustatis, 2 superioribus angustis recurvis cum ungui ca. 1.2 cm. longis et 2 mm. latis, 3 inferioribus 1.2 cm. longis et 3–3.5 mm. latis; staminibus 8, filamentis pilis albis longis vestitis ad 1.5 cm. longis, antheris 1.5 mm. longis; ovario breviter stipitato dense pubescente, stylo ca. 1.5 cm. longo in parte inferiore pilis longis vestito; fructu ignoto.

Foothill forests, Iawarere, no. 682, Nov. 24, 1925 (a large handsome straight-boled free-flowering tree, 90 cm. diam., with a hard, corky, lenticellate bark; wood light, straight grained; flowers white).

The only species of *Xanthophyllum* previously recorded from the Papuan region is *X. excelsum* (Bl.) Miq. (*X. affine* Korth.) from which the present species is very different. The present plant is a very distinctive one, characterized by its comparatively large flowers, and leaves drying brown not the characteristic yellowish-green of most species.

DICHAPETALACEAE

***Dichapetalum venulosum** C. T. White, sp. nov.

Arbor gracilis, 6–8 m. alta (fide Brass); ramulis junioribus fulvo-tomentosis, lenticellatis. Folia petiolata, petiolis pilosis ad 1.3 cm. longis, laminis ellipticis vel obovata-ellipticis vel lanceolatis, 12.5–18.5

cm. longis, 2¼–2½-plo longioribus quam latae, apice acutis vel subacuminatis, basi cuneatis vel subcuneatis, supra glabris subnitidis (in sicco atro-castaneis), subtus (in sicco opacis et pallidioribus) in nervis sparse pilosis, nervis lateralibus in utroque latere 6–8, nervis, venis et venulis utrinque visibilibus sed subtus prominentioribus. Cymae axillares, dichotomae, laxe multiflorae, ad 6.5 cm. diam., ramulis dense pilosis, pedunculo communi ad 1.5 cm. longo sed longitudine variabili; flores parvi, sepalis subovatis 1.5 mm. longis, extus dense pilosis; petalis glabris late spathulatis sepala aequantibus, ad apicem breviter bifidis intus carinatis; staminibus 5 petala aequantibus, filamentis glabris, antheris introrsis, connectivo crasso; squamis parvis, carnosis, simplicibus, glabris; ovario dense piloso, stylo glabro, apice bilobo. Fructus ignotus.

Aisa River, Eastern Division, no. **1661**, May 11, 1926 (slender tree, 6–7.50 m., in light pole forests; leaves glossy above).

Belongs to the section Eu-dichapetalum and among previously described Papuan specimens comes closest to *D. papuanum* (Becc.) Engl., which, however, differs in habit, being described as a climbing shrub, in the hypogynous glands being pilose and bilobed and in the style being 3-lobed.

EUPHORBIACEAE

Determined by R. MANSFELD

Flueggea virosa Baillon, Et. Gén. Euphorb. 593 (1858).

Port Moresby, no. **843** (low, shapely tree, 3 m., with a light brown, rather scaly bark, growing in coastal brushes).

Phyllanthus rubriflorus J. J. Smith in Nova Guinea, VIII. 781 (1912).

Upoia, Vailala River, rain-forest, no. **1155** (tall glabrous bush, with horizontal branches; flowers brown in long pendulous axillary panicles).

Phyllanthus lamprophyllus Mueller Arg. in De Candolle, Prodr. XV. pt. II. 324 (1866).

Uniori, alt. 250 m., no. **741**, Dec. 2, 1925 (shrub 0.30–1 m., at water's edge).

Phyllanthus spec.

Haga, Loloki River, no. **897** (tree 6 m., with gray smooth bark; flowers pink).

Phyllanthus spec.

Sandbank Bay, Eastern Division, no. **1635**, June 3, 1926 (small tree or large bush).

Glochidion spec.

Bisiatabu, alt. 450 m., no. **611**, Nov. 11, 1925 (small tree, 3 m.; inner bark pink).

Glochidion spec.

Lepokera, Vailala River, no. **993**, Feb. 16, 1926 (slender-branched small tree or large bush).

Glochidion spec.

Ihu, Vailala River, no. **1057**, Feb. 24, 1926 (small riverside tree, with close pale brown bark).

Glochidion spec.

Kuraudi, Eastern Division, no. **1383**, May 12, 1926 (small river bank tree; fruit green, seeds red).

Glochidion spec.

No. **1456**.

Glochidion spec.

Bomgwina River, Eastern Division, no. **1624**, June 2, 1926 (small river bank tree; leaves shining above, pale beneath; fruit red).

Breynia cernua Mueller Arg. in De Candolle, Prodr. xv. pt. II. 439 (1866).

Kuraudi, rain-forest regrowth, Eastern Division, no. **1402**, May 12, 1926 (small tree).

Breynia spec. vel *B. acuminata* Mueller Arg.

No. **646**.

Drypetes australasica (F. Muell.) Pax & Hoffmann in Engler, Pflanzenr. IV–147, XV. 270 (1922).

Port Moresby, light rain-forest, nos. **878** and **879** (small tree, 4.50 m., with light gray bark; leaves glossy above).

***Aporosa Brassii** Mansfeld in Jour. Arnold Arb. x. 77 (1929).

Hohoro, Vailala River, rain-forest, alt. 100 m., no. **1049**, Aroara, Vailala River, rain-forest, alt. 60 m., no. **1062**.

Antidesma novoguineense Pax & Hoffmann in Engler Pflanzenr. IV.—147, XV. 153 (1922).

Mori River, Eastern Division, no. **1531**, May 23, 1926 (pubescent small tree or large bush; fruit red).

Bischofia javanica Blume, Bijdr. 1168 (1826).

Ihu, Vailala River, rain-forest, no. **947**, Feb. 12, 1926 (handsome tree, 12 m., with thick dark flaky bark; leaves pale and somewhat fleshy; fruit globose, pale brown).

Bridelia minutiflora Hooker f., Fl. Brit. Ind. v. 273 (1887).

Bisiatabu, rain-forest, alt. 450 m., no. **615** (handsome tree, 9 m., with a gray rather flaky bark); Iaritari, foothill forests, alt. 450 m., no. **831** (slender tree, 6 m., with gray tuberculate bark).

Croton spec.

Bisiatabu, alt. 450 m., no. **624**, Nov. 12, 1925 (compact tree, 450 m., with close light brown bark).

Claoxylon indicum Hassk. var. **novo-guineense** J. J. Smith apud Valeton in Bull. Dép. Agr. Ind. Néerl. x. 26 (1907).

Sogeri, rain-forest, alt. 450 m., no. **639** (tree 12 m., with a thick close gray bark; seeds red).

Claoxylon tumidum J. J. Smith in Nova Guinea, VIII. 233 (1910).

Ihu, Vailala River, rain-forest borders, no. **910** (tree 4.5 m., leaves pale, glossy above).

Claoxylon spec.

Port Moresby, coast, no. **842**, Dec. 29, 1925 (thick-branched shrub 1.50 m., with gray bark; leaves at end of branches, pale green).

Mallotus floribundus Muell. Arg. var. **pilosus** Pax & Hoffmann in Engler, Pflanzenr. IV.–147, VII. 174 (1914).

Bisiatabu, alt. 450 m., no. **616** (rain-forest tree 6 m. high, with a thin, light gray bark; leaves glaucous below).

Mallotus muricatus (Wight) Muell. Arg. var. **Walkerae** Pax & Hoffmann in Engler, Pflanzenr. IV.–147, VII. 190 (1914).

Haga, Loloki River, no. **903** (small tree with a close gray bark; growing in riverine rain-forests).

Mallotus oblongifolius (Miq.) Mueller Arg. in Linnaea, XXXIV. 192 (1865).

Budatobara, rain-forest, alt. 100 m., no. **780**, Dec. 5, 1925 (large shrub or small tree).

Mallotus philippinensis (Lam.) Mueller Arg. in Linnaea, XXXIV. 196 (1865).

Rigo, no. **814** (slender tree with a close, brown bark; leaves pale beneath; fruit rufous; growing in coastal brushes).

Mallotus repandus Mueller Arg. in Linnaea, XXXIV. 197 (1865).

Budatobara, no. **731** (shrub 1.50 m., in rain-forest regrowth).

Mallotus ricinoides (Pers.) Mueller Arg. in Linnaea, XXXIV. 187 (1865).

Ihu, Vailala River, no. **1022** (small tree in rain-forest regrowth).

Alchornea rugosa Mueller Arg. in Linnaea, XXXIV. 170 (1865).

Bisiatabu, alt. 450 m., no. **588** (rain-forest shrub 1 m.; petioles tinged with red).

Macaranga subpeltata Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 339 (1900).

Aroara, Vailala River, rain-forest, no. **1061**, Feb. 25, 1926 (loosely branched bush, 1.50 m.; fruit red).

Macaranga aleuritoides F. Mueller, Descr. Not. Papuan Pl. II. 21 (1876).

Ihu, Vailala River, rain-forest regrowth, no. **904**, Feb. 9, 1926 (tree 7.50 m., with pale smooth bark; leaves gray beneath; secretes a clear brown gum in bark); Bomgwina River, river bank, Eastern Division, no. **1622**, (small tree; leaves pale below).

***Macaranga Brassii** Mansfeld in Jour. Arnold Arb. X. 78 (1929).

Loloki River, alt. 425 m., no. **536**; Domara River, Eastern Division, no. **1590**.

Macaranga quadriglandulosa Warburg in Bot. Jahrb. XIII. 350 (1891).

Loloki River, alt. 350 m., light rain-forest, near river, no. **537**, Oct. 31, 1925 (small tree 4.50 m.; smooth green bark; leaves glossy); Domara River, river bank, rain-forest regrowth, Eastern Division, no. **1585**, May 31, 1926 (small tree).

Macaranga densiflora Warburg in Bot. Jahrb. XIII. 350 (1891).

Bisiatabu, light rain-forest, alt. 450 m., no. **562**, Nov. 6, 1925 (slender tree 4.5–6 m., with pale gray bark).

***Macaranga chrysotricha** K. Schum. & Lauterb. var. **glaucescens** Mansfeld in Jour. Arnold Arb. x. 78 (1929).

Bisiatabu, rain-forest, alt. 450 m., no. **589**.

Macaranga spec. aff. *M. strigulosa* Muell. Arg.

Wame River, Purari Delta, rain-forest, no. **1090**, March 1, 1926 (erect tree, 9 m.; bark thin, brown; wood pale; leaves very large clustered at end of branches; inflorescence axillary, paniculate; fruit green covered with yellow granular substance).

Macaranga spec.

Kerema, Gulf Division, rain-forest regrowth, no. **1204**, March 24, 1926.

Macaranga spec.

No. **526**.

Acalypha insulana Muell. Arg. var. **glabrescens** Mueller Arg. in Flora, XLVII. 439 (1864).

U-uma River headwaters, Eastern Division, no. **1460** (small river bank tree; leaves stiff, pale green).

Acalypha insulana Muell. Arg. var. **pubescens** Mueller Arg. in Flora, XLVII. 439 (1864).

Sogeri, on edge of rain-forest, 450 m., no. **636** (soft-wooded shrub, 2 m.); Ihu, Vailala River, rain-forest regrowth, no. **1023** (large bush; common everywhere in the Gulf Division of Papua).

Codiaeum variegatum Bl. var. **moluccanum** Mueller Arg. in De Candolle, Prodr. XV. pt. II. 1119 (1866).

Loloki River, nos. **555**, **1647**, **1648** (small, straggling shrub growing in riverine rain-forests); Budatobara, nos. **751** and **762** (erect shrub, 1.50–2 m., in riverine rain-forest).

Excoecaria spec.

Bomgwina River, Eastern Division, no. **1535**[a], June 2, 1926 (small river bank tree).

Homalanthus novoguineensis (Warb.) Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 407 (1900).

Bisiatabu, alt. 450 m., no. **612** (small tree, 6 m., on borders of rain-forest).

Homalanthus spec.

U-uma River, Eastern Division, riverine rain-forest, no. **1517**, May 20, 1926 (small tree; leaves smooth above, gray beneath).

Pimeleodendron papuanum Warburg in Bot. Jahrb. XVIII. 198 (1894).

Lepokera, Vailala River, no. **992** (tree 12 m., with a soft, pale bark and wood; yields a large quantity of thick yellow latex).

Sapium indicum Willdenow, Sp. Pl. IV. pt. I. 572 (1805).

Vailala Estuary, Gulf Division, no. **1168** (small tree, overhanging

water; leaves shining above, pale beneath; flowers white; inflorescences terminal on lateral shoots; fruit subglobose; used as a fish poison by the Hall Sound natives, the fruits are pounded up and mixed with grated coconut which, saturated with the poison, is eaten by the fish with fatal results).

Euphorbia plumerioides Teysm. var. **acuminata** J. J. Smith in Nova Guinea, VIII. 794, t. 42 (1912).

Hewa, Vailala River, alt. 100 m., no. **1123**, March 12, 1926 (erect bush, 3 m. high; branches erect; plant secretes great quantities of thin milky latex; leaves chopped up and thrown into small pools of water to poison fish).

Native name "Ohenu."

Euphorbia atoto Forster f., Fl. Ins. Austr. Prodr. 36 (1786).

Bomgwina, Eastern Division, on loose beach sand, no. **1613**, June 1, 1926 (erect, 30–40 cm. high).

Native name "O-na-uda."

ANACARDIACEAE

Mangifera minor Blume, Mus. Bot. Lugd.-Bat. I. 198 (1850).

Hewa, Vailala River, no. **1141** (a large dark-foliaged rain-forest tree).

Native name "Bebi."

Buchanania heterophylla Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 300 (1905).

Lower Mori River, Eastern Division, no. **1636**, June 3, 1926 (erect tree, 7.50–9 m., growing in riverine rain-forests; leaves stiff, glossy, clustered round the branches to a depth of 5–7.5 cm. at intervals of 10–12.5 cm.; lateral panicles surmounting branch tips with leaf buds close above; each panicle in the axil of a hard, acute bract, a number of empty (not panicle subtending) bracts below the flowering portion, the bracts persisting for several seasons; flowers white).

This very interesting plant was previously only known from the single specimen collected by Nyman. The specimens collected by Brass, together with his field notes, give a good idea of the plant's methods of growth. The specimens are in flower and are therefore younger than Nyman's, which were in young fruit; the panicle branches are densely clothed with a soft, woolly, rust-colored tomentum which no doubt thins considerably with age. The older leaves, i. e. those below the flowering portion, attain a large size, the largest in the material to hand measuring 53 cm. long and 14.5 cm. broad in the widest part.

Semecarpus australiensis Engler in De Candolle, Monog. Phanér. IV. 482 (1883).

Port Moresby, no. **848** (tree 6 m. high, with a rough, gray bark; common near the sea).

Semecarpus undulata C. T. White in Proc. Roy. Soc. Queensland, XXXIX. 41 (1923).

Budatobara, in dry savannah forests, no. **777** (slender, unbranched shrub or small tree; leaves clustered round the stem at intervals of 20–30 cm., spreading and drooping; panicles come on stem below the leaves).

Semecarpus spec.

Ihu, Vailala River, rain-forest, common, no. **963**, Feb. 13, 1926 (small bush; inflorescence racemose, terminal; fruit dull green, upon a much enlarged fleshy yellow calyx).

Semecarpus spec.

Ihu, Vailala River, rain-forest, no. **974**, Feb. 15, 1926 (small slender tree with usually unbranched stem and a crown of very large oblanceolate leaves; inflorescence a pendulous panicle, 2 or 3 together on lower portion of trunk).

Rhus retusa Zollinger apud Teysmann & Binnendijk, Cat. Hort. Bogor. 230 (1866), nomen.—Engler in De Candolle, Monog. Phanér. IV. 450 (1883).

Lower Mori River, Eastern Division, no. **1577** (tree 12–15 m. high with a pale, close gray bark; flowers white; fruit glossy black, slightly viscid; tree secretes a dark brown gum).

HIPPOCRATEACEAE

Hippocratea sogerensis Baker fil. in Jour. Bot. LXI. suppl. 10 (1923).

Mori River, Eastern Division, no. **1532** (large rain-forest liane; leaves glossy, rigid; flowers greenish-brown).

I have not seen the type of *H. sogerensis* Bak. fil., the identification being based on the author's very meagre description.

Salacia prinoides (Willd.) De Candolle, Prodr. I. 571 (1824).

Lower Mori River, Eastern Division, no. **1560** (rambling shrub; fruit scarlet, edible; grows in riverine rain-forests.

Native name "Odi."

ICACINACEAE

Polyporandra scandens Beccari, Malesia, I. 125 (1877).

Iawarere, alt. 300 m., no. **829** (a liane in riverine rain-forest).

Some of the flowers in the above material were 7-merous though the majority were typically 6-merous.

SAPINDACEAE

Allophylus micrococcus Radlkofer in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 307 (1905).

Sogeri, foothill forests, alt. 450 m., no. **640** (slender tree 9 m. high, with a close, gray bark).

Alectryon repando-dentatus Radlkofer in Bot. Jahrb. LVI. 274 (1920).
Alectryon ferrugineus C. T. White in Proc. Roy. Soc. Queensland, XXXIV. 42 (1922); non Radlkofer.

Port Moresby, in gullies in dry savannah forests, no. **502** (small tree 3–4 m. with light gray bark).

Dodonaea viscosa Jacquin, Enum. Pl. Carib. 19 (1760).—Linnaeus, Mant. 228 (1771).

Port Moresby, no. **866** (large bush or small tree common along foreshores).

RHAMNACEAE

Colubrina asiatica (Linn.) Brongniart in Ann. Sci. Nat. sér. 1, x. 369 (1827).

Kapa Kapa, no. **836** (large rambling shrub, growing near the beach); Domara, Eastern Division, no. **1540** (large shrub, growing among beach mangroves; fruit brown).

Native name "Orogogo."

Alphitonia zizyphoides (Spreng.) A. Gray, Bot. Wilkes U. S. Explor. Exped. 278 (1854).

Alphitonia moluccana Teysmann & Binnendijk, Cat. Hort. Bogor. 221 (1866), nomen.

Owen Stanley Range between Mts. Brown and Stanley, alt. 600 m., no. **1497** (handsome, thickly foliaged tree with a gray channelled bark; flowers white); Sandbank Bay, near the beach, Eastern Division, no. **1637** (small tree, 4.50 m., with a close, pale gray bark).

Alphitonia Petriei Braid & White in Kew Bull. Misc. Inform. 1925, p. 178, fig. 1.

Bisiatabu, rain-forests, no. **578** (a tree, 9 m., with a light gray bark; flowers greenish-white).

Previously known only from Queensland.

Gouania microcarpa DC. var. **mollis** Lauterbach in Bot. Jahrb. LVII. 340 (1922).

Domara River, Eastern Division, no. **1549** (large rambling shrub on river bank).

VITACEAE

Determined at the Botanic Museum, Berlin-Dahlem

Cissus discolor Blume, Bijdr. 181 (1825).

Uniori, in light rain-forest, no. **738** (small climber; flowers red; fruits red); Kuraudi, Eastern Division, no. **1390** (climbing over river bank trees; leaves dull above, pale and glaucous beneath; fruit black on red pedicels).

Native name "Jarui."

Cissus lineata Warb. var. **fusco-lanata** Lauterbach in Bot. Jahrb. LIX. 528 (1925).

Hewa, Vailala River, no. **1137** (large vine growing on river bank; flowers bright yellow).

Native name "Koiabo."

Cissus adnata Roxburgh, Hort. Bengal. 11 (1814), nomen; Fl. Ind. ed. 2, I. 405 (1832).

Iawarere, rain-forest, alt. 300 m., no. **679**, Nov. 22, 1925 (large vine; glabrescent form).

Cissus repens Lamarck, Encycl. Méth. I. 31 (1783).

Lower Mori River, Eastern Division, no. **1579** (large, glabrous, fleshy climber on tree overhanging river; leaves shining on both sides; flowers brown; fruit pale green, succulent).

Tetrastigma Lauterbachianum Gilg in Engler & Prantl, Nat. Pflanzenfam. III. pt. 5, p. 447, fig. 218 (1896), nomen et icon.—Lauterbach in Bot. Jahrb. LIX. 510 (1925).

Iawarere, alt. 300 m., no. **700** (rain-forest liane; fruits black).

Tetrastigma spec. aff. *T. pisocarpum* (Miq.) Planch.

Haga, Laloki River, coast savannahs, no. **900**, Jan. 1926 (pretty slender vine; flowers reddish; fruit black, edible, slightly acid).

Tetrastigma spec. aff. *T. maluense* Lauterb.

Aisa River, Eastern Division, no. **1411**, May 13, 1926 (large climber on river bank trees; leaves thick, fleshy; inflorescence axillary; fruit fleshy, green, globose).

Native name "Karu."

Leea sambucina Willdenow, Sp. Pl. I. pt. II. 1177 (1798).

Lowa, Vailala River, river bank, no. **1149** (large soft-wooded bush; fruit small, black); Bomgwina River, river bank, Eastern Division, no. **1628** (a fleshy bush, 2 m. tall).

ELAEOCARPACEAE

Determined by O. C. SCHMIDT

***Elaeocarpus ihuensis** O. C. Schmidt in Jour. Arnold Arb. X. 80 (1929).

Ihu, Vailala River, no. **942.**

Elaeocarpus arnhemicus F. Mueller, Descr. Not. Papuan Pl. I. 6 (1875).

Port Moresby, on rocky headlands, no. **874** (small tree 6 m. high, with a rough gray bark and bright blue fruits).

Elaeocarpus dolichodactylus Schlechter in Bot. Jahrb. LIV. 112 (1916).

Aroara, Vailala River, rain-forest, alt. 50 m., no. **1069**, Feb. 25, 1926 (slender buttressed tree, 15 m. high; leaves smooth and shining; flowers green).

Elaeocarpus spec.

Bisiatabu, alt. 450 m., no. **571**, Nov. 6, 1925 (large straight-boled tree; trunk buttressed; with thin pale mottled bark; fruit pale blue, to 3.5 cm. thick).

Elaeocarpus spec.

Iawarere, rain-forest, alt. 300 m., no. **697**, Nov. 25, 1925 (tall straight-boled tree, with pale brown, thick, corky bark; fruit large, green, woody)

Anonioides sterculiacea Schlechter in Bot. Jahrb. LIV. 152 (1916).

Iawarere, alt. 350 m., no. **691**, Nov. 25, 1925 (large straight-boled tree; bark brittle, corky; wood pale, hard).

Echinocarpus Brassii O. C. Schmidt in Jour. Arnold Arb. X. 79 (1929).

Bisiatabu, alt. 300 m., no. **619.**

TILIACEAE

Brownlowia Riedelii Hemsley, Bot. Voy. Challenger, I. 128 (1885).

Ihu, Vailala River, border of rain-forest, no. **952** (a small tree with a close, gray bark; leaves dark and shining above, gray beneath); Murua River, river banks close to the coast, Gulf Division, no. **1354** (small tree, leaves green and shining above, dull brown beneath).

Grewia aspera Roxburgh, Hort. Bengal. 42 (1814), nomen; Fl. Ind. ed. 2, II. 591 (1832).

Budatobara, dry savannah, no. **774** (shrub or under-shrub with slender, erect branches from a woody stock). Also: Rigo, *Rev. R. Lister Turner*; Port Moresby, *C. T. White*, no. 59; Astrolabe Range, *C. T. White*, no. 250.

The Port Moresby and Astrolabe specimens were recorded by me for Papua (Proc. Roy. Soc. Queensland, XXXIV. 43) as *G. latifolia* F. Muell. The record was somewhat doubtful, being based on fruiting specimens only. Specimens were sent to the Royal Botanic Gardens, Kew, for an expression of opinion and the Director (Dr. A. W. Hill) replied as follows:

"Concerning the species of *Grewia* collected in Papua by Mr. L. J. Brass, these have been examined at the Herbarium and are found to agree precisely with the Indian specimens of *Grewia aspera* Roxb. The species of this genus are in some confusion but your specimens agree with some in Roxburgh's own collection, and named by him *G. aspera*. I think, therefore, you may take it that the Papuan species is identical with the Indian one."

***Microcos Brassii** Summerhayes in Kew Bull. Misc. Inform. 1927, p. 248.

Ihu, Vailala River, rain-forests, no. **949**, Feb. 12, 1926 (erect tree 9–12 m. high, with a close, brown bark; leaves shining on both sides).

Native name "Amapu."

Columbia aequilateralis White & Francis in Proc. Roy. Soc. Queensland, XXXVIII. 240, fig. 7 (1927).

Loloki River, riverine rain-forests, no. **1655** (compact tree 10 m., with a close, gray bark).

Triumfetta Bartramia Linnaeus, Syst. Nat. ed. 10, II. 1044 (1759).

Triumfetta rhomboidea Jacquin, Enum. Pl. Carib. 22 (1760).

Vailala Village, no. **1175** (erect, slender undershrub 1 m.; a common beach plant).

MALVACEAE

Abutilon auritum (Wall.) G. Don, Gen. Syst. I. 500 (1831).

Port Moresby, in deserted native gardens, no. **870** (erect shrub 1.50 m.).

Abutilon indicum (L.) G. Don, Gen. Syst. I. 504 (1831).

Port Moresby, on beach, no. **863** (shrub 2 m. high; leaves silvery beneath).

Sida rhombifolia Linnaeus, Sp. Pl. 684 (1753).

Vailala, no. **1170** (a common weed on the coast).

Urena lobata Linnaeus, Sp. Pl. 692 (1753).

Bisiatabu, edge of rain-forest, alt. 450 m., no. 629 (slender undershrub 1.50–2 m.); Ihu, Vailala River, borders of rain-forest, no. 906 (much branched undershrub, 1.50 m.; flowers pink).

Hibiscus abelmoschus Linnaeus, Sp. Pl. 696 (1753).

Loloki River, alt. 425 m., no. 533 (undershrub); Ihu, Vailala River, no. 1106 (undershrub of 0.75–1 m.; flowers yellow; growing on river-side grass land of lower and upper Vailala).

Hibiscus ficulneus Linnaeus, Sp. Pl. 695 (1753).

Haga, Loloki River, in dry savannah country, no. 901 (shrub 1.50 m.).

Hibiscus tiliaceus Linnaeus, Sp. Pl. 694 (1753).

Hula, no. 512; Orokolo Bay, no. 1029 (low spreading beach tree with a close, gray bark; flowers yellow, throat brown; very common on the sea beaches between Hula and Orokolo Bay); Domara, Eastern Division, no. 1545 (spreading beach tree).

Thespesia populnea Solander apud Correa in Ann. Mus. Paris, IX. 290 (1807).

Bomgwina, Eastern Division, no. 1630 (compact beach tree, 6 m.; leaves glossy, blue-green; flowers yellow).

BOMBACACEAE

Bombax Ceiba Linnaeus, Sp. Pl. 511 (1753).

Bombax malabaricum De Candolle, Prodr. I. 479 (1824).

Port Moresby, no. 876 (a tree, 12 m. high, with a rough, gray bark; trunk and branches thick, armed with large brown prickles; tree common on coastal hills and known to European residents as "Cotton Tree").

STERCULIACEAE

Melochia odorata Linnaeus f., Suppl. 302 (1781).—Forster f., Fl. Ins. Austr. Prodr. 47 (1786).

Melochia vitiensis A. Gray, Bot. U. S. Wilkes Expl. Exped. I. 193 (1854).

Borabere, alt. 300 m., no. 734 (tree 4.50–6 m. with a close, gray bark; occurs as second growth in rain-forest, also common on the coast); Domara River, Eastern Division, no. 1584 (small river bank tree, 3–4.50 m.; flowers pale pink).

Native name "Ulari."

Melochia umbellata (Houtt.) Stapf in Kew Bull. Misc. Inform. 1913, p. 317.

The Cupola, Gulf Division, no. 1365 (a small, low tree 3–4.50 m.; leaves silvery grey above, flowers pink; a rain-forest species).

Commersonia bartramia (L.) Merrill, Interpr. Rumph. Herb. Amboin. 362 (1917).

Commersonia echinata Forster, Char. Gen. 43, t. 22 (1776).

Kerema, Gulf Division, no. 1212 (tall horizontally-branched tree with a close, pale gray bark; very common everywhere, one of the first regrowth trees to appear after the primary forest has been felled); Kuraudi, Eastern Division, no. 1528 (erect tree, 12 m., with a smooth, gray bark; flowers white; occurs as a rain-forest regrowth).

Abroma augusta Linnaeus f., Suppl. 341 (1781).

Loloki River, on fringe of light rain-forests, no. **543** (shrub 1.50–2 m.).

Abroma fastuosa R. Brown in Aiton, Hort. Kew, ed. 2, IV. 409 (1812).

Domara River, on old garden clearings, Eastern Division, no. **1605**, (bush 2 m. high).

Kleinhovia hospita Linnaeus, Sp. Pl. ed. 2, 1365 (1763).

Ihu, Vailala River, no. **937** (tree attaining 12 m. in height, with a pale, hard wood and soft, spongy, gray bark; flowers pink); the Cupola, Gulf Division, no. **1357** (small tree 6 m., with a close, pale brown bark; flowers pink; a common plant of the sea-beaches and the banks of the fresh-water streams; sometimes extending to the hills up to 100–125 m.); Mowabula, no. **1369** (small slender tree on river banks and in rain-forest regrowth); Domara River, Eastern Division, no. **1583** (small river-bank tree 3–4.50 m.; flowers pink; common along river banks and in rain-forest regrowths on the coast from the Purari Delta to Abau); Loloki River, no. **1656** (slender tree 6–7.50 m., with a smooth, gray bark and pale, soft wood; a common river bank tree).

Native name "Mato" (Loloki River) and "Kea" (Mowabula).

Sterculia ampla Baker fil. in Jour. Bot. LXI. Suppl. 5 (1923).

Bisiatabu, alt. 450 m., no. **590** (tall, slender rain-forest tree, 15–18 m., with a light-colored, fibrous bark; inner bark pithy; leaves often over 60 cm. long and 36 cm. wide, entire or irregularly toothed towards the apex, ridged between the principal nerves; stipules persistent long after leaf falls; inflorescence axillary); Kerema, Gulf Division, no. **1214** (slender tree 4.50–6 m.; leaves at end of branches, wrinkled, large brown persistent stipules; inflorescence axillary; fruit rich crimson, scarlet within; seeds brown, mucilaginous).

Native name "Mada."

Determined by Mr. V. S. Summerhayes, Royal Botanic Gardens, Kew, England, who remarks:—

"Brass 590 and 1214. These seem to belong to the same species. They both match the type of *Sterculia ampla* Baker f. at the British Museum. In spite of Baker's description fruit of this species is unknown since the fruiting specimen referred by him to the species belongs to a different though closely allied species."

The fruits of Brass's No. 1214 are bright red both inside and out when fresh (Brass), brownish when dry, due to a dense covering of ferruginous hairs, 5 cm. long and 2½–3 cm. broad; seeds ellipsoid, 1.3 x 0.7 cm.

Heritiera littoralis Dryander in Aiton, Hort. Kew. III. 546 (1789).

Bomgwina River, Eastern Division, no. **1629** (a common littoral tree).

ACTINIDIACEAE

Determined by L. DIELS

***Saurauia Brassii**, Diels in Jour. Arnold Arb. X. 81 (1929).

Aroara, Vailala River, rain-forest, alt. 60 m., no. **1060**.

***Saurauia pleurotricha** Diels in Jour. Arnold Arb. X. 80 (1929).

Ihu, Vailala River, rain-forest, no. **968**.

Saurauia Andreana (F. Muell) Oliver apud F. Mueller, Census Austr. Pl. Suppl. II. 3 (1885), nomen.—F. M. Bailey, Queensl. Fl. I. 106, t. 5 (1899).

U-uma River headwaters, riverine rain-forest, Eastern Division, no. 1462 (small tree 4.50 m.; flowers pink).

Saurauia conferta Warburg in Bot. Jahrb. XIII. 379 (1891).

Bisiatabu, alt. 450 m., no. 602 (rain-forest tree 6 m. high, fruits axillary, several enclosed in a fleshy involucre); Ihu, Vailala River, common on rain-forest borders, no. 970 (small tree 4–4.5 m.; leaves shining above); U-uma River, riverine rain-forest, Eastern Division, no. 1461 (a form with leaves longer than the type; small tree 3–4 m.; leaves thin, pale beneath; inflorescence enclosed in stiff, white bracts).

Saurauia Dufaurii (F. Muell.) Diels in Bot Jahrb. LVII. 447 (1922).

Foothill forests, Sogeri, alt. 550 m., no. 648 (small tree, 2.75 m.; bark brown; petals dark pink, edges pale); Kuraudi, Eastern Division, no. 1398 (slender, weak-branched tree, 4.50–7.50 m., growing on river bank; leaves dark and shining above; petals pink); Owen Stanley Range, between Mts. Brown and Clarence, alt. 1200 m., no. 1478 (small, dense-foliaged tree; leaves dark, dull green; flowers pink).

Saurauia spec.

Iawarere, foothill forest, alt. 350 m., no. 667, Nov. 22, 1925 (small tree, 3 m.; flowers pink).

TERNSTROEMIACEAE

Determined by L. Diels

Ternstroemia megacarpa Merrill in Philipp. Jour. Sci. Bot. XIII. 309 (1918).

Bisiatabu, foothill forest, alt. 450 m., no. 627, Nov. 13, 1925 (tree 12 m.; bark rather rough, peeling in small flakes, inner bark stains brown; wood light yellow, hard; leaves tinged red; fruit orange-colored, breaking often irregularly).

OCHNACEAE

Schurmannsia Henningsii Schumann in Bot. Jahrb. IX. 210 (Fl. Deutsch. Ostas. Schutzgeb.) (1887).

Murua River, Gulf Division, no. 1340 (small tree 3–4.5 m. high; leaves clustered at the ends of the branches; growing on banks of streams).

GUTTIFERAE

Calophyllum inophyllum Linnaeus, Sp. Pl. 513 (1753).

Maclatchie Point to Kerema, Gulf Division, no. 1188; Sandbank Bay, Eastern Division, no. 1641 (very handsome, large, thickly foliaged tree, with a rough, dark, fissured and scaly bark; flowers white; an extremely common beach tree).

Garcinia spec.

Bisiatabu, alt. 450 m., no. 568, Nov. 6, 1925 (shapely tree 15 m.;

bark light brown, somewhat scaly; fruit terminal, solitary; secretes bright yellow sticky substance particularly around seeds; wood pale brown).

Garcinia spec.

Budatobara, riverine rain-forest, alt. 100 m., no. **755**, Dec. 4, 1925 (slender and handsome tree, 6–9 m. high; bark scaly brown; fruit solitary, axillary, light green, edible).

Garcinia spec.

Hewa, Vailala River, on low clay ridges close to the sago swamps, no. **1117**, March 12, 1926 (small compact stiff-branched tree, 4.50 m. high; leaves shining above, pale below; fruit globose, brown, eaten by the natives).

Garcinia spec.

Owen Stanley Range, between Mts. Brown and Clarence, alt. 1200 m., no. **1481**, May 19, 1926 (low bush; fruit flat, green, fleshy, solitary in axils).

Garcinia spec.

Lower Mori River, river banks, Eastern Division, no. **1565**, May 28, 1926 (large bush; leaves dark, fleshy; fruit green, solitary in axils).

BIXACEAE

Bixa orellana Linnaeus, Sp. Pl. 512 (1753).

Kuraudi, Vailala River, no. **1160** (large bush; flowers pink; fruit reddish brown; planted by the natives who use the seeds for dyeing their hair a reddish brown).

COCHLOSPERMACEAE

Cochlospermum Gillivraei Bentham, Fl. Austral. I. 106 (1863).

Port Moresby, no. **889** (small tree 4.50–6 m., with a pale, gray, channeled and scaly bark; flowers yellow, conspicuous; grows commonly on dry rocky places along the coast).

VIOLACEAE

Rinorea amboinensis Merrill in Philipp. Jour. Sci. Bot. XI. 292 (1916).

Bisiatabu, alt. 450 m., no. **599** (rain-forest shrub 1.50 m. high).

A specimen was referred to the Royal Botanic Gardens, Kew and reported on by Mr. V. S. Summerhayes as follows:

"This resembles strongly *Rinorea amboinensis* Merrill but our specimen is not sufficiently complete to be able to decide definitely. The venation and indumentum of the leaves in the two specimens agree exactly but the young stems are more hairy in the Amboina specimen; this may be due to the different ages of the specimens. The Amboina specimen has immature flowers only."

Rinorea spec.

Iawarere, rain-forest, alt. 300 m., no. **669** (small tree, 3 m.).

A specimen was referred to the Royal Botanic Gardens, Kew and reported on by Mr. V. S. Summerhayes as follows:

"This matches exactly Forbes' 134 which in E. G. Baker's account of Forbes' New Guinea Plants (Journ. Bot. 1922) is named *Alsodeia Astrolabes* Lauterb. &

Schum. (*Rinorea Astrolabes* (L. & S.) Melch.). However, I have seen the type specimen of this species and find that it is quite distinct. The surface and venation of the leaves are quite different (e. g. the lateral veins are prominent above whereas in Brass 669 they are slightly impressed), while the fruiting petals are much smaller and the sepals narrower. I can match Brass 669 with no described species."

FLACOURTIACEAE

Erythrospermum Wichmannii Valeton in Bull. Dép. Agric. Indes Néerl. x. 34 (1907).

Aroara, Vailala River, no. **1071** (a rain-forest tree 15 m.; fruit green; seeds red).

Osmelia philippina (Turcz.) F. Villar, Noviss. App. Fl. Philipp. 93 (1880).

Ihu, Vailala River, rain-forest, no. **909** (weak bush 1–1.5 m. high; fruit 3-angled, rich velvety red); Hewa, Vailala River, rain-forest, no. **1138** (small, weak shrub; fruit rich velvety red).

Native name "Kuwa."

Pangium edule Reinwardt in Syll. Ratisb. II. 12 (1828).

Bisiatabu, alt. 450 m., no. **565** (tree 24–30 m.; trunk buttressed; light, close, brown bark; leaves clustered at the ends of the branches).

***Scolopia nitida** C. T. White, sp. nov.

Frutex vel arbor parva; ramulis lenticellatis velutino-pubescentibus; foliis breviter petiolatis, petiolis breviter velutino-pubescentibus, 3 mm. longis; laminis glabris costa media supra exceptis, 3–5 cm. longis, 1.5–2 cm. latis (ca. duplo longioribus quam latae), oblongo-lanceolatis, supra nitidis, subtus pallidis, subcoriaceis, obscure tripli-nerviis, venis et venulis in sicco utrinque visibilibus, margine integris vel leviter crenulato-dentatis; racemis simplicibus, 2–5 mm. longis, 2–6-floris, rhachi et pedicellis velutino-pubescentibus; pedicellis 3–5 mm. longis; bracteis minutis, acutis; calycis lobis 6, 1.5 mm. longis, ciliolatis; petalis 6, ciliolatis 2 cm. longis; staminibus numerosis disco glanduloso insertis, filamentis 4–5 mm. longis, antheris parvis cum appendice connectivi fere 1 mm. longis; pistillo staminea aequante.

Port Moresby, on the coast just above tide mark, no. **850**, Dec. 29, 1925 (a much-branched bush or slender tree with a rough, brown bark; flowers white).

In general facies the present species somewhat resembles the Australian *S. Brownii* F. Muell., which differs in its perfectly glabrous character and in the number of sepals and petals being 4 not 6. *Scolopia novo-guineensis* Warb., the only previously described species from the Papuan region, differs in having smaller leaves rounded at the base and in having flowers solitary in the axils not in racemes.

Homalium pachyphyllum Gilg in Bot. Jahrb. LV. 276 (1918).

Iaritari, alt. 450 m., no. **711** (slender tree, 15 m. high, overhanging river; bark gray, slightly furrowed).

Native name "Tala."

Casearia

Determined by E. GILG

***Casearia rhynchophylla** Gilg in Jour. Arnold Arb. x. 81 (1929).

Ihu, Vailala River, rain-forest, no. 965.

***Casearia megalophylla** Gilg in Jour. Arnold Arb. x. 81 (1929).

Kerema, Gulf Division, rain-forest, no. 1211.

Casearia flexicaulis Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 320 (1905).

Kapa Kapa, on tidal flats, no. 805, Dec. 8, 1925 (weak shrub 2–2.5 m.; fruit yellow, streaked red; seeds red).

Casearia spec.

Ihu, Vailala River, rain-forest regrowth, no. 1021, Feb. 20, 1926 (divaricately branched bush, 2.50 m. high; nerves of young leaves red on lower surface; fruit red).

PASSIFLORACEAE

Adenia populifolia Engler in Bot. Jahrb. xv. 573 (1893).

Modecca populifolia Blume, Rumphia, I. 168 (1835).

Bomgwina River, Eastern Division, no. 1627 (a climber on trees overhanging the river; leaves dark green; fruit 7.5–12.5 cm. long, bright red).

Pulle (in Nova Guinea, VIII. 673) records a species of *Adenia* from the south coast of Dutch New Guinea but thinks it may be different from *A. populifolia* (Bl.) Engl. Brass's No. 1627 matches very well specimens from North Queensland. The type comes from Timor and the flora of Timor, southern New Guinea and North Australia are very closely allied and contain many species in common.

DATISCACEAE

Octomeles sumatrana Miquel, Fl. Ind. Bat. Suppl. 336 (1861–62).

Octomeles moluccana Teysmann & Binnendijk apud Hasskarl in Abh. Naturf. Ges. Halle, IX. 208 (1866).—Warburg in Bot. Jahrb. XIII. 386 (1891).

Ihu, Vailala River, no. 961 (a very large, straight-boled, rain-forest tree with long, thick buttresses and spreading, sparsely foliaged crown; bark pale brown, fibrous, 2.5 cm. or more thick, falling in large irregular scales; leaves clustered at the ends of the branches, main nerves reddish).

In these specimens and in the only other Papuan material seen by me (Lane-Poole No. 34) the styles are mostly seven, but sometimes only six in number. This point is stressed by Warburg. Merrill (Interpret. Herb. Amb. 378 [1917]) has followed Schumann & Lauterbach in reducing *O. moluccana* Warb. to *O. sumatrana* Miq. Examination of a large series of specimens and comparison of trees in the field may yet show two species to be present. In the only Philippine specimen at my disposal (Bureau of Science no. 28165) the flowers are 6–7-merous. In Papua the tree is almost universally known as "Ilimo" and is much cut as a soft wood.

THYMELAEACEAE

Phaleria spec.

Kuraudi, Eastern Division, no. **1664**, May 1926 (slender bush; flowers white).

LYTHRACEAE

Lagerstroemia Archeriana F. M. Bailey, Syn. Queensland Fl. 196 (1883).

Port Moresby, gullies in the savannah forests, no. **888** (small tree 3 m., with a smooth, brown bark; flowers delicate puce; inner surface of calyx lobes reddish; anthers of the outer stamens dark-colored, on stout pink filaments; inner stamens yellow).

Lagerstroemia Koehneana Schumann in Schumann Hollrung, Fl. Kaiser Wilhelms Land, 85 (1889).

Budatobara, no. **748** (a small riverside tree of 3–4.50 m., with a light, brown, rather corky and flaky bark).

The above two species were sent along with other *Lagerstroemia* material from Papua and Queensland to the Royal Botanic Gardens, Kew, where they were determined as above by Mr. V. S. Summerhayes.

SONNERATIACEAE

Sonneratia alba Smith in Rees, Cycl. XXXIII. no. 2 (1819).

Kapa Kapa, no. **790** (tree 6–9 m. with a very rough, dark bark, the branches brittle, much bent and contorted; growing amongst mangroves); Port Moresby, no. **891** (a large spreading tree 6–9 m.; bark gray, very rough and scaly, lower bark (below tide level) smooth and brown; leaves thick and fleshy, flowers white; associated with Rhizophoraceae on the shingle beaches of the harbor); Lower Murua River, Gulf Division, no. **1350** (a low tree with pale, fleshy leaves; growing on low, estuarine mud-banks).

Sonneratia lanceolata Blume, Mus. Bot. Lugd.-Bat. I. 337 (1851).

Small, much branched riverside tree of 6–9 m.; roots sending up numerous slender pneumatophores. Branchlets terete. Leaves papyraceous, glabrous, lanceolate or ovate-lanceolate, acute, often oblique at the base and tapering into a short petiole. Petiole 5–6 mm., but not always distinct from the blade. Blade 7–10 cm. long, 2–4 cm. wide, widest part usually below the middle. Medium nerve and main lateral nerves distinctly visible on both sides, lateral nerves numerous, joining in a distinct intramarginal vein about 1 mm. from the edge of the leaf. Flowers solitary, terminal; buds ellipsoid or ovoid, not angled. Calyx 6-lobed. Petals absent (?). Stamens white, numerous. Fruit depressed, about 4 cm. diam. and 2 cm. high, surmounted by the remains of the style and seated in the persistent calyx. Calyx lobes horizontal or slightly reflexed about 2 cm. long and about 1.5 cm. broad at the base; tube very flat and short.

Lepokera, Vailala River, no. **980** (an erect tree 6–9 m. high with a

pale, gray bark. Grows abundantly on the mud banks of all the brackish and fresh-water rivers of the Gulf of Papua and Purari Delta. It is the resting tree of a species of firefly which gathers in such numbers on certain individual trees that at night the whole tree is lit with a soft greenish glow which is often reflected quite distinctly in the water); Bomgwina River, Eastern Division, no. 1617 (small, much branched tree, growing on water's edge above the tidal portion of the river where the water is quite fresh or at times slightly brackish).

I recorded this plant (Proc. Roy. Soc. Queensl. XXXIV. 45 [1922]) for Papua as *S. lanceolata* Bl. This species has since been referred by Merrill (Enum. of Borneo Pl. 418) to the widely distributed *S. alba* Sm. Apparently, however, Blume's species is very little known. I therefore sent specimens to the Botanic Gardens, Buitenzorg, for comparison and received the following reply from the Director (Dr. W. Docters van Leeuwen),

"The specimens of *Sonneratia* collected by Mr. Brass in Papua were compared by Dr. Beumée with the Sonneratia collection of the Buitenzorg Herbarium, no one of which completely agreed with your specimens, although some specimens from New Guinea of *S. acida* were very much alike. I am sorry to state that any authentic material of *S. lanceolata* Bl. was not extant, so that the question whether Merrill is right in referring it to alba could not be settled. The form of the twigs, as described by Blume, would indicate the possibility of Merrill's conception."

The Papuan plant seems quite distinct from all forms of *S. alba* Sm., but I hesitate to describe it as new without seeing a series of specimens from Celebes and Borneo given by Blume as localities for his *S. lanceolata*.

CRYPTERONIACEAE

Xenadendron spec. aff. *X. polyanthum*.

Iawarere, rain-forest, alt. 300 m., no. 675, Nov. 22, 1925 (small tree 7–9 m. high, on stilt roots, small aërial roots hanging from branches; bark thin, hard; wood light yellow, hard).

LECYTHIDACEAE

Planchonia timorensis Blume in Fl. des Serr. VII. 25 (1851).

Iawarere, alt. 300 m., no. 664 (large tree overhanging river; outer bark scaly, inner bark fibrous; flowers white; fruit pale green).

Barringtonia speciosa Linnaeus f., Suppl. 312 (1781).

Keuru to Kerema, Gulf Division, no. 1189 (large tree with low, spreading branches and a dark, slightly grooved and fissured bark; leaves fleshy, very smooth and shining above, crowded at the ends of the branchlets; flowers large and showy, petals white; filaments pink in the upper part, anthers yellow; fruit large, 4-angled; a common and very conspicuous beach tree).

In addition to the above the Brass collection contains two other species—one in very young bud (no. 1571 from Lower Mori River), the other in fruit (no. 747 from Budatobara). The latter seems to have close affinities with *B. flava* Lauterb., but differs from that species in the leaf buds being glabrous and in the racemes being longer.

RHIZOPHORACEAE

Ceriops tagal C. B. Robinson in Philipp. Jour. Sci. Bot. III. 306 (1908).
Ceriops Candolleana Arnott in Ann. Nat. Hist. I. 364 (1838).

Kapa Kapa, no. **787** (small, loosely-branched tree 2.50 m., with a rough, slightly fissured, light brown bark, inner bark pink; leaves pale green, flat, or margins very slightly recurved; flowers in clusters on short swollen peduncles, fruit erect, the protruding radicle 4-ribbed, dark green, up to 14 cm. long); Kapa Kapa, no. **788** (an erect shrubby plant 2–2.50 m., with a brown tuberculate bark; inner bark light pinkish brown; leaves erect, recurved; sepals green, tinged with red; petals white, fruit pendulous with the protruding radicle very dark green, ribbed and slightly muricate).

Ceriops tagal C. B. Rob. var. **australis** C. T. White.

Kapa Kapa, no. **786** (compact, much branched, small tree about 2 m. high, with a light brown, rather corky and flaky outer bark, inner bark pale yellowish brown; leaves dark green, margins recurved; sepals green, inner face reddish; petals white; fruit divaricate, the protruding radicle terete, slightly muricate, pale green, about 7.5 cm. long).

Rhizophora apiculata Blume, Enum. Pl. Jav. I. 91 (1827).
Rhizophora candelaria De Candolle, Prodr. III. 32 (1828).
Rhizophora conjugata auct. plur., non Linnaeus.

Kapa Kapa, no. **784** (straggling tree 4.50–6 m., developing stilt roots—often arched—from stem and lower branches; outer bark rough and brown, inner bark pink; leaves with basal margin revolute and incurved towards the tip; fruit with the protruding radicle muricate and showing traces of angles or ribs.)

Rhizophora mucronata Poiret in Lamarck, Encycl. Méth. VI. 189 (1804).

Siroura River, Gulf Division, no. **1356** (slender, stilt-rooted tree, 9 m. high, with a rough, dark bark. Forms dense formations near the river's mouth).

Native name "Pana."

Rhizophora mucronata Poir. β. **stylosa** (Griff.) Schimper in Bot. Mitth. Trop. III. 92 (Indo-Malay. Strandfl.) (1891).

Kapa Kapa, no. **785** (straggling, stiffly-branched, stilt-rooted tree; outer bark gray, inner bark red; leaves flat or margins slightly recurved, tip curved down, lower surface punctate; flowers greenish-white; fruit with the protruding radicle 25–30 cm. long, muricate).

Determined by F. M. Salvoza.

Bruguiera conjugata (L.) Merrill in Philipp. Jour. Sci. Bot. IX. 118 (1914).

Bruguiera gymnorhiza Lamarrk, Tab. Encycl. Méth. II. t. 397 (1797).

Kapa Kapa, no. **789** (a stilt-rooted, spreading tree, 3–4.50 m. with a dark gray, fissured, very rough bark, inner bark reddish; leaves with recurved margins, grooved along midrib, apex acute, much recurved; calyx red; fruit with the protruding radicle ribbed up to 22 cm. long; a very common mangrove); Domara River, Eastern Division, no. **1537**

(a common mangrove; calyx red; petals white); Domara, Eastern Division, no. **1662** (tree with rough, scaly bark).

Native name "Avila."

In all the above specimens the petals possess a seta in the notch and several at the ends of the lobes (*B. Rheedii* Blume).

Bruguiera cylindrica Blume, Enum. Pl. Jav. I. 93 (1828).

Bruguiera caryophylloides Blume, l. c. (1828).

Kapa Kapa, no. **797** (shapely tree 4.50–6 m., with a rough, brown bark; leaves undulate, apex recurved, dark green above, pale beneath; fruit with the protruding radicle slightly grooved, 16 cm. long; a very handsome mangrove).

Bruguiera parviflora (Roxb.) Wight & Arnott, Prodr. 311 (1834).

Murua River, Gulf Division, no. **1349** (slender, erect tree, 4.50–6 m. high without aërial roots; bark rough, scaly, dark brown. Abundant in the estuarine mangrove forests); Domara River, Eastern Division, no. **1541** (tall, slender mangrove with a pale bark and wood; no stilt roots).

Native name "Kala Kala" (Murua River) and "Miau" (Domara River).

Bruguiera sexangula (Lour.) Poiret in Lamarck, Encycl. Méth. Suppl. IV. 262 (1816).

Bruguiera eriopetala Wight & Arnott in Ann. Nat. Hist. I. 368 (1838).

Kapa Kapa, no. **808** (tree or shrub 2–2.50 m. high, with a rough, gray outer bark, inner bark yellow, streaked with red; young leaves with recurved margins, tip turned downwards, petioles grooved, depression extending along the midrib to near the apex, old leaves almost flat; fruit with the protruding radicle, 8–13 cm. long, striate, dark green with pink tip; a common mangrove); Lower Mori River, Eastern Division, no. **1554** (slender mangrove; calyx greenish yellow; radicle short and thick, eaten roasted by the natives).

Native name "Avera."

In No. 1554 the petals are typical—one seta in the notch and one at the end of each lobe. In No. 808 setae are lacking altogether, but otherwise the specimens seem typical *B. sexangula*.

ALANGIACEAE

***Alangium** (Marlea) **ferrugineum** C. T. White, sp. nov.

Arbor ca. 8 m. alta (fide Brass) ramulis petiolis foliis subtus pedunculis pedicellis calycibusque pilis velutinis atro-ferrugineis dense vestitis; foliis petiolatis; petiolis 0.7–1 cm. longis; laminis 11–16 cm. longis ca. 2½-plo longioribus quam latae, supra nitidis et costa media in parte inferiore excepta glabris, subtus ferrugineo-pubescentibus praecipue costa media et nervis praecipuis, elliptico-lanceolatis basi plerisque subrotundatis apicem versus in acumen sensim angustatis, acumine ipso ca. 1 cm. longo; cymis axillaribus 3–4 cm. diam., pedunculis 1–1.5 cm. longis; calycibus 7 mm. longis breviter et obtuse 5-dentatis; petalis albis (fide Brass) 1.5 cm. longis extus dense hirsutis intus glabris; staminibus

5, filamentis pilis longis vestitis 3 mm. longis; antheris linearibus 4 mm. longis; stylo 6 mm. longo, stigmatis lobis 2 curvis 3 mm. longis; drupa flava cylindracea (Brass), in sicco compressa ovoidea irregulariter costata apicem versus angustata 3.5 cm. longa in parte inferiore 1.5 cm. lata.

Aroara, Vailala River, rain-forests, alt. 60 m., no. 1066, Feb. 25, 1926 (handsome tree 7.50 m.; leaves dark and glossy above; flowers white; fruit yellow, cylindrical).

The present species is characterized by its dense ferruginous velvety pubescence. It makes a fifth species from the Papuan region.

COMBRETACEAE

Terminalia catappa Linnaeus, Mant. II. 519 (1771).

Keura to Kerema, Gulf Division, abundant on the beach, no. 1198 (a handsome, horizontally branched tree with a dark gray, scaly bark; leaves turning red before falling).

Terminalia complanata Schumann in Schumann & Hollrung, Fl. Kaiser Wilhelms Land, 83 (1889).

U-uma River Headwaters, on river bank, Eastern Division, alt. 450 m., no. 1463 (compact tree 7.50–9 m.; leaves glossy above; fruit compressed, red).

Native name "Doana."

***Terminalia latialata** C. T. White, sp. nov.

Arbor magna, ramulis validis; foliis petiolatis; petiolis 2–3.5 cm. longis in sicco nigrescentibus; laminis 10–12 cm. longis et 6–7 cm. latis, obovatis utrinque glabris in sicco castaneis supra nitidis apice rotundis abrupte et brevissime apiculatis apiculo ipso ca. 2 mm. longo, basi cuneatis, nervis lateralibus utrinque 6 arcuatis, venis et venulis utrinque prominentibus; spicis axillaribus interruptis ad 8.5 cm. longis; floribus ignotis; fructibus pilis brevibus parce obsitis, late bi-alatis 1.7–2 cm. longis cum alis 5 cm. latis, drupa ipsa in facie anteriore carinata.

Lower Vailala River, rain-forests, no. 1147, March 15, 1926 (very large, straight-boled, buttressed tree, with a close, brown bark).

Though the specimens are in fruit only, they seem so distinct from all other Papuan species that I have no hesitation in naming them as new. The nearest ally seems *T. calamansanai* (Blanco) Rolfe, of the Philippine Islands, which differs in its relatively narrow, usually more lanceolate, less shining leaves. Our plant has also close affinities with *T. volucris* R. Br. from North Australia which differs in having much smaller, opaque leaves, the apex of which is rounded or emarginate, not apiculate.

Terminalia Okari C. T. White in Proc. Roy. Soc. Queensland, XXXIV. 46 (1923).

Ihu, Vailala River, no. 1102 (a tall handsome tree; branches horizontal, whorled; bark gray, scaly; leaves shining above; seeds form one of the most tasty articles of native diet; an inland forest tree planted by the natives around their villages).

Terminalia spec.

Iawarere, no. 663 (large tree with spreading branches and light brown, scaly bark; growing on river bank); Budatobara, riverine rain-forest, no. 778 (large handsome spreading tree 18–21 m., with a rough scaly bark; fruit stains a dark rose color).

The above specimens were in fruit only and I was unable to place them satisfactorily with any species recorded from Papua. I thought they might possibly represent the little known *T. microcarpa* Dcne. and sent specimens to the Royal Botanic Gardens, Kew, England where they were examined by Mr. V. S. Summerhayes who reported:

"I have compared Brass 663 and 778 with duplicates of the type of *T. microcarpa* Dcne. from Paris and find that they are very similar, although in one case there are no flowers, in the other no fruit.

"The leaves of Brass' specimens differ from those of *T. microcarpa* Dcne. in the following points:

"1. The leaves are rather larger (13–21 cm. long by 5.5–8.5 cm. broad as against 8–15 cm. long by 3.5–7.5 cm. broad).

"2. They are more longly cuneate at the base.

"3. They are shining on the upper surface instead of dull.

"4. The tertiary veins are more distinct.

"5. The midrib is impressed above instead of prominent.

"In addition to these points in *T. microcarpa* there is a pair of impressed glands, one on each side of the midrib, just above the base of the lamina. In Brass' specimens these glands are either absent or very poorly developed. Also the fruits of Brass' specimens do not seem to conform to Decaisne's term 'olivaeformibus.'

"I therefore consider the Papuan specimens to be distinct from *T. microcarpa* and as they cannot be matched with any other species in the Herbarium, they probably represent a new species. Until flowering material is available, however, it appears inadvisable to describe it."

In addition to the above the collection contains another species of Terminalia (Brass no. 991) from Lepokera, Vailala River, that seems to represent an undescribed species. The specimens are in fruit only and as it is not a particularly distinctive plant I hesitate to name it as a new species. The leaves are obovate, narrowed and cuneate at the base, rounded and apiculate at the apex, glabrous except the petiole and the midrib on the upper surface; petiole about 2 cm., the blade averaging about 10.5 cm. long and 2½ times longer than broad. The fruits are about 1.7 cm. long, ellipsoid, somewhat compressed, but the edges not so keeled or ancipitous as in *T. complanata* K. Schum. and *T. foveolata* White & Francis; the putamen is hard, bony and irregularly rugose.

Combretum Goldieanum F. Mueller, Descr. Not. Papuan Pl. IV. 66 (1876).

Kapa Kapa, no. 802 (large climber with a warty bark, grows in coastal brushes).

Quisqualis indica Linnaeus, Sp. Pl. ed. 2, 556 (1762).

Ihu, Vailala River, rain-forest borders, no. 935 (a large rambling shrub, flowers pink; the majority of the flowers are badly galled with an ovary-like gall in the middle of the tube).

Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calcutt. 39 (1845).

Keuru, Gulf Division, no. 1196 (an erect, compact, much-branched

tree, 4.50–6 m.; leaves fleshy, shining above and below; clustered at swollen ends of branches; flowers bright scarlet; a mangrove).

Domara, on edge of mangrove formation, Eastern Division, no. **1547** (compact, virgate tree, 4.50–7.50 m., with a dark channeled bark; leaves dark green, shining and fleshy; flowers red).

Lumnitzera racemosa Willdenow in Neu. Schrift. Ges. Naturforsch. Fr. IV. 187 (1803).

Domara, Eastern Division, no. **1544** (slender tree about 3 m.; leaves fleshy; flowers white; grows in thick clumps along the beach).

Native name "Bete."

MYRTACEAE

Subfam. MYRTOIDEAE

Determined by L. DIELS

Decaspermum spec. aff. *D. prunoides* Diels.

Kerema, Gulf Division, behind the mangroves, no. **1226, March 25, 1926** (large bush, 2–2.50 m.; flowers pink); Lower Mori River, riverine rain-forests, Eastern Division, no. **1563, May 28, 1926** (tall slender tree; leaves shining above; fruit small brown, numerous in corymbose panicles).

Decaspermum spec.

Kuraudi, light rain-forests, Eastern Division, no. **1527, May 21, 1926** (tree 15 m., with brown fibrous furrowed bark; leaves glossy; fruit black).

Octamyrtus Behrmannii Diels in Bot. Jahrb. LVII. 376 (1922).

Aroara, Vailala River, rain-forest, no. **1067** (slender tree 6 m., with gray flaky bark; flowers large and showy, clustered on small raised knobs on base of trunk; petals and filaments bright crimson; anthers yellow).

Rhodomyrtus trineura (F. Muell.) F. Mueller apud Bentham, Fl. Austral. III. 272 (1866).

Bisiatabu, dry savannah forests, alt. 450 m., no. **577** (slender erect shrub of 1.50–2 m.).

***Jossinia desmantha** Diels in Jour. Arnold Arb. X. 82 (1929).

Port Moresby, in light rain-forest, alt. 230 m., no. **881**, same locality on exposed cliff face, coast, no. **885.**

Jambosa goniocalyx Lauterbach in Nova Guinea, VIII. 51 (1912).

Sogeri, rain-forest borders, alt. 450 m., no. **657** (slender tree 6 m. with a papery bark and hard wood).

Jambosa nutans (K. Schum.) Niedenzu in Engler & Prantl, Nat. Pflanzenfam. III. 7, p. 84 (1893).

Kuraudi, rain-forest, Eastern Division, no. **1444** (small tree with a flaky brown bark and hard dark wood; flowers terminal or axillary, solitary or in pairs, sepals and stamens pink, petals a darker pink).

Jambosa trachyantha Diels in Bot. Jahrb. LVII. 394 (1922).

U-uma River, Eastern Division, alt. 300 m., no. **1433** (tree 9–12 m., with a flaky, brown bark; flowers solitary, terminal or axillary).

***Jambosa naiadum** Diels in Jour. Arnold Arb. X. 82 (1929).

Budotabara, river banks, alt. 100 m., no. 754; Kuraudi, Eastern Division, no. 1392; Loloki River, no. 1653.

Vernacular name "Mokia."

***Jambosa hylocharis** Diels, l. c. 83 (1929).

Aroara, Vailala River, rain-forest, alt. 60 m., no. 1065.

***Jambosa Sargentiana** Diels, l. c. (1929).

Loloki River, river banks, alt. 375 m., no. 551.

Jambosa Versteegii Lauterbach in Nova Guinea, VIII. 320 (1910).—Diels in Jour. Arnold Arb. X. 83 (1929).

Kira, Vailala River, rain-forest, no. 1111.

Jambosa vulgaris De Candolle, Prodr. III. 286 (1828).

Port Moresby, close to the beach, no. 890 (handsome thickly foliaged tree, 12 m., with light brown flaky bark; leaves shining, dark above; fruit rich red, 1-seeded, solitary or in pairs on trunks and branches).

Native name "Orgari."

Jambosa spec. aff. *J. platycarpa* Diels.

Lowa, Vailala River, riverine rain-forest, alt. 50 m., no. 1148, March 15, 1926 (pretty riverside tree; bark brown, flaky; small red fruit in profusion).

Jambosa spec. aff. *J. lagynocalyx* Diels.

Ihu, Vailala River, rain-forests, no. 955, Feb. 12, 1926 (slender tree 12 m.; leaves pale beneath; flowers axillary, solitary; petals pink; base of calyx tuberculate).

Jambosa spec. aff. *J. megalosperma* K. Schum.

Port Moresby, near coast, gully rain-forest, no. 838, Dec. 29, 1925 (small tree 5 m., with horizontal branches; bark smooth, greenish, exfoliating in thick flakes).

Jambosa spec. aff. *J. longipes* Warb.

Borabere, rain-forest, alt. 350 m., no. 714, Nov. 30, 1925 (slender handsome tree to 15 m.; bark light brown, slightly fissured, exfoliating in long flakes; fruit pale green, flushed pink); Murua River, rain-forest, Gulf Division, alt. 125 m., no. 1345, March 29, 1926 (tall bush; flowers dark pink, in terminal pendulous panicles).

Native name "Em-mana."

Jambosa spec. aff. *J. domestica* DC.

Bisiatabu, alt. 450 m., no. 600, Nov. 11, 1925 (slender tree 12 m., with buttressed trunk; bark light brown, rather flaky; fruit solitary or in clusters, axillary, usually below leaves on main branches).

Native name "Sali."

Jambosa spec.

Borabere, rain-forest, alt. 300 m., no. 737, Dec. 2, 1925 (handsome profusely branched tree, 9 m.; bark close, brown; fruit bright crimson, on branches below leaves).

Jambosa spec.

Bomgwina River, riverine rain-forest, no. 1619, June 2, 1926 (tall

tree 18–25 m.; bark bright pale brown, flaky; leaves pale below; fruit fleshy, dark purple, in lateral panicles, eaten by the natives).

Jambosa spec.

Kuraudi, Eastern Division, no. **1393**, May 12, 1926 (large riverbank tree; bark bright pale brown, papery; leaves pale beneath; inflorescence terminal or axillary; fruit green, rugose and prominently ribbed.

Native name "Wau-uda."

Jambosa spec.

Wame River, Purari Delta, rain-forests, no. **1079**, Feb. 28, 1926 (tree 9 m., bark bright brown, flaky; fruits solitary or two together on lateral peduncles 2.5 cm. long).

Syzygium Branderhorstii Lauterbach in Nova Guinea, VIII. 322 (1910).

Port Moresby, near beach, no. **844** (handsome tree, 7.50 m.; bark brown fissured, flaky; leaves glossy above; flowers white, showy, in large cymes on trunk and branches; fruit white).

The following number belongs to the Myrtoideae but is too incomplete to be referred definitely to its genus.

Ihu, Vailala River, rain-forests, no. **977** (small slender tree 9 m. high).

Subfam. LEPTOSPERMOIDEAE

Determined by C. T. WHITE

Osbornia octodonta F. Mueller, Fragm. Phytog. Austral. III. 31 (1862).

Port Moresby, among mangroves on narrow sandy beaches, no. **855** (compact much-branched bush or low tree, about 3 m. high; bark brown, papery; flowers white, numerous).

Eucalyptus alba Reinwardt apud Blume, Bijdr. 1101 (1826).

Budatobara, open savannah forests, no. **771** (medium-sized, compact tree with a smooth, pale greenish-white bark, the dead bark shed in large thin flakes; wood hard, yellow).

Eucalyptus clavigera A. Cunningham apud Schauer in Walpers Rep. II. 926 (1843).

Port Moresby, no **849** (small tree of stunted appearance 6–7.50 m.; bark on lower part of trunk tessellated, on the upper part of trunk and on the branches smooth, greenish-gray, peeling in large, thin flakes; flowers in dense panicles often as much as 15 cm. in length; very common on hills of low coast range).

Melaleuca spec. aff. *M. Leucadendron* L. (cf. C. T. White in Proc. Roy. Soc. Queensl. XXXIV. 46 [1922]).

Bisiatabu, dry savannah forest, alt. 450 m., no. **631** (a tree 6–18 m. with a papery bark; leaves glaucous); Sandbank Bay, coastal grass lands, Eastern Division, no. **1638** (tall tree, bark papery).

MELASTOMACEAE

Determined at the Botanic Museum, Berlin-Dahlem

Otanthera setulosa Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 327 (1905).

Hohoro, Vailala River, rain-forest, no. 1042 (tall bush; young branches, petioles and principal nerves of leaves covered with stiff, purple hairs; flowers a very pale pink); Hewa, Vailala River, clayey ridges near sago swamps, no. 1121 (weak-stemmed, much-branched shrub 1 m. high; petioles, peduncles and young branches covered with long, stiff, brown hairs; flowers white; fruit red, fleshy).

Melastoma polyanthum Blume in Flora, XIV. 480 (1831).

Mt. Warirata, savannah forests, alt. 600 m., no. 559 (small shrub); Hohoro, Vailala River, rain-forests, no. 1045 (handsome, thin-foliaged bush; flowers delicate lavender); Kira, Vailala River, no. 1161 (small riverside bush, 1 m.); Murua River, Gulf Division, rain-forest, no. 1343 (large bush or small tree); Owen Stanley Range, between Mts. Brown and Clarence, alt. 900 m., no. 1500 (compact bush, 1.50–2 m. high; fruit pink, bursting irregularly).

Poikilogyne cordifolia (Cogn.) Mansfeld in Bot. Jahrb. LX. 111 (1925).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 1200 m., no. 1488 (large, spreading, sparsely-foliaged bush, 2–2.50 m.; leaves soft, dark, pale below; flowers white); U-uma River headwaters, Eastern Division, alt. 450 m., no. 1645 (large, spreading bush, 1.50–2 m.; leaves thin, dark, pale below; flowers conspicuous, pink).

Ochthocharis borneensis Blume, Mus. Bot. Lugd.-Bat. I. 40 (1849) "bornensis."

Lower Mori River, Eastern Division, no. 1578 (river bank bush, 4 ft., with crisp, shining leaves; fruit green).

New for New Guinea.

Medinilla crassinervis Blume in Flora, XIV. 510 (1831).

Iawarere, rain-forest, alt. 300 m., no. 693 (large climber; flowers axillary, solitary or in pairs or small clusters; fruit pink).

Medinilla quintuplinervis Cogniaux apud Boerlage, Handb. Fl. Med. Indië, I. 534 (1890), nomen; apud Warburg in Bot. Jahrb. XIII. 393 (1891).

Hewa, Vailala River, rain-forest, no. 1131 (rather fleshy, thick-branched shrub, 1–1.25 m. high; leaves dull, fleshy, yellow-green on lower surface; flowers pink, in small axillary clusters; fruit globose).

Medinilla Teysmanni Miquel in Ann. Mus. Bot. Lugd.-Bat. I. 217 (1863–64).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 1200–1325 m., no. 1487, May 19, 1926 (erect bush 1.25 m. tall; leaves fleshy; fruit dark purple, on crimson peduncles and pedicels).

Bammlera tenuifolia Mansfeld in Bot. Jahrb. LX. 142 (1925).

Owen Stanley Range, between Mts. Brown and Clarence, low forest on summit of a high spur, alt. 1375 m., no. 1507 (small, compact tree 4–4.5 m.; leaves thick, 3-nerved, reticulations conspicuous beneath; flowers pale pink).

Astronia spec.

Owen Stanley Range, between Mts. Brown and Clarence, in low

scrubby forest on top of high spur, alt. 1350 m., no. 1506, May 19, 1926 (tree 6 m. high; bark dark, rough; flowers white).

ARALIACEAE

Plerandra Stahliana Warburg in Bot. Jahrb. XVIII. 203 (1894).

Domara River, common in swampy rain forests, Eastern Division, no. 1643 (slender, often unbranched tree 9–12 m.; trunk with a smooth, gray bark, marked with prominent leaf-scars towards the top; wood very soft, white; leaves large and shining; flowers greenish-white; fruiting umbels drooping with weight of numerous glossy black fruit.

Native name "Lau-a."

Boerlagiodendron novoguineense (Scheff.) Harms in Engler & Prantl, Nat. Pflanzenfam. III. 7, p. 31 (1894).

Borabere, along river bank, alt. 400 m., no. 726, Nov. 30, 1925 (tree 3 m., branched or unbranched with crown of large leaves; peduncles and flowers a rich purple).

When better known the present plant may be found to represent an undescribed species. I had, in fact, drawn up a description of it as such but the specimens were broken and until better are available think it wiser to keep them under *B. novoguineense* (Scheff.) Harms, from the type of which it differs in its glabrous, flattened, longer (up to 23.5 cm.) peduncles.

Polyscias Forbesii Baker f. in Jour. Bot. LXI. Suppl. p. 22 (1923).

Bisiatabu, rain-forest, alt. 450 m., no. 604 (slender, sparsely branched tree, with leafy crown; about 9 m. high).

Polyscias spec.

Small, soft-wooded tree or large bush, glabrous in all parts. Leaves simply pinnate, leaflets fleshy and shining (Brass), opposite in 8 pairs and a terminal odd one; rhachis and petiole angular in the dried specimens, channeled above, petiole and rhachis together about 70 cm. long, petiole itself about 12 cm., stem-clasping at the base, the vagina extending up the petiole for slightly more than half its length; lower leaflets subcordate on petioles of about 2.5 cm., blade about 12 cm., long and nearly as broad; upper and intermediate leaflets ovate-lanceolate, blunt at the base, acuminate at the apex; intermediate leaflets 20 cm. long and about twice as long as broad, on petiolules of 1.5 cm., uppermost leaflets somewhat smaller; terminal leaflets oblong or elliptical, pointed at the apex, subacute at the base, on a petiolule of about 3 cm.; inflorescence a large terminal panicle, the lateral branches up to 40 cm. long and subtended by bracts up to 6 cm. long; ultimate branches bearing umbels of 6–9 flowers. Pedicels slender 4–5 mm. long; flowers small, calyx-teeth very short and broad, acute; ovary compressed, 2-celled, each cell with thickened margins and a prominent midrib; styles 2, recurved. Fruit black and fleshy (Brass), in the dried state compressed-globose, 5 mm. broad.

Domara River, on river bank, Eastern Division, no. 1606, May 31,

1926 (small, soft-wooded tree or large bush; inflorescence terminal, much-branched panicle; fruit small, black, fleshy).

According to the key to the Papuan species of *Polyscias* published by Harms (in Bot. Jahrb. LVI. 409 [Beitr. Fl. Papuas. VII.] [1923]) the present plant would come under *P. pinnata* Forst. When the synonomy of this species is cleared up our plant will probably be found to represent a new species. As Harms (l. c.) states *Polyscias pinnata* Forst. is common in the Indo-Malayan region I wrote to the Botanic Gardens, Buitenzorg, for material for comparison with our plant, but the Director (Dr. W. Docters van Leeuwen) informed me that no authentic material of this species was represented in their herbarium. To him I am indebted for a copy of the description of *Panax Zippeliana* Miq. to which Valeton (in Bull. Dép. Agric. Ind. Néerland.) refers the Papuan plant recorded by Warburg in Bot. Jahrb. XIII. 397 (1891) as *P. pinnata* Forst. Our plant seems, however, quite distinct from *P. Zippeliana* (Miq.) Valet. In the herbarium material it is characterized by its sharply aromatic odor, a feature mentioned by Harms.

***Anomopanax variaefolius** C. T. White, sp. nov.

Frutex glaber, 1 m. alta (fide Brass). Folia longe petiolata petiolis ad 12 cm. longis basi in vaginam amplexicaulem dilatatis, apice constrictis, laminis digitatis vel pinnatis 3–5-foliolatis, foliolis infirmis brevissime petiolatulis, petiolulis 2–5 mm., foliolis intermediis longe petiolulatis petiolulis ad 4 cm. longis, laminis folioliorum lateralium ovatis vel elliptico-lanceolatis ambitu variabilis ad 18 cm. longis et 8.5 cm. latis, basi rotundis vel cuneatis, apice acutis vel abrupte acuminatis, acumine ipso ca. 1 cm. longo, in foliolis angustioribus 2½–3-plo longioribus quam latae, in foliolis latioribus 2-plo longioribus quam latae; foliolo terminali longe petiolulato, petiolulo ad 7 cm. longo; lamina folioli terminalis integra vel tripartita, ovata vel elliptica, ad 16 cm. longa et 8 cm. lata, plerumque 2-plo longiore quam lata, lobis lateralibus foliolorum tripartitorum ad 12 cm. longis et 3.5 cm. latis plerumque 3-3½-plo longioribus quam lati, lobo terminali stipitato, stipite ca. 3 cm. longo, elliptico vel obovato-oblongo ad 16 cm. longo et 6 cm. lato, 2–3-plo longiore quam latus; in omnibus foliolis et lobis marginibus integris, textura in sicco chartaceis, nervis lateralibus utrinque 7–10. Panicula ramosissima ad 18 cm. diam. cum pedunculo ad 24 cm. longa; pedunculo ipso ad 11.5 cm. longo ad apicem bracteato, bracteis anguste lanceolatis ad 2 cm. longis et 3 mm. latis; ramis primariis ad 9 cm. longis apice bracteatis. Flores (masculi) albi (fide Brass), pedicellati, pedicellis tenuibus ad 5 mm. longis ex axilla bracteae minutae ortis, bractea 0.5 mm. longa, calycis lobis triangularibus ca. 0.5 mm. longis; petalis 5 basi non distincte unguiculatis apice in acumen inflexum retusum caudiforme productis, cum acumine 1.5 mm. longis, acumine ipso 0.5 mm. longo; staminibus 5, filamentis ca. 1 mm., antheris 0.75 mm. diam., loculis oblongis; disco margine undulato, ovario in floribus masculis nullo. Flores feminei et fructus ignoti.

U-uma River, Eastern Division, alt. 300–450 m., no. 1439, May 14, 1926 (fleshy bush 1 m., flowers minute, white).

This makes the fourth species of *Anomopanax* recorded for New Guinea, so the genus would seem to find its greatest development there. The present species comes very close to *A. celebicus* Harms and *A. philippinensis* Harms, but these differ in being larger in all parts and in having the edges of the leaflets usually toothed in the upper part. It is very desirable that more material of all the described species be collected to see how far the differences are really constant and specific.

?Schefflera bractescens Ridley in Jour. Bot. LII. 290 (1914).

Loloki River, rain-forest, alt. 300 m., no. 534 (a small tree 3–4.50 m., with a few erect branches).

The plant represented by no. 534 is a very common shrub or small tree in the rain-forests of the Loloki River and Astrolabe Range and I had previously determined it as *S. tanyrhachis* Harms, but on the examination of Brass's material came to the conclusion it was *S. bractescens* Ridl. I therefore sent specimens to the British Museum, London, for comparison with Ridley's type. The specimens were examined by Mr. Spencer Moore who reported as follows:

"Brass No. 534, sent as *Schefflera bractescens*, I find to be conspecific with Forbes 115, referred by Baker in Dr. H. O. Forbes's New Guinea Plants (Journal of Botany 1923 Suppl. p. 22) to *S. bractescens* Ridl. but on comparing it with the type the (young) fruits seem different, being longer and narrower than those of Ridley's species and this would point to the two not belonging to the same species.

"I thought yours might possibly be *S. tanyrhachis* Harms (ex descript.), and as we have it not, sought for a specimen at Kew, but without success. It has also been impossible to compare your specimen with specimens of Harms's other species of the genus published in Engler's Jahrbücher LVI, as none of these is here or at Kew. For certain determination I fear it will be necessary to wait till better material comes to hand."

Schefflera spec.

Lower Mori River, Eastern Division, no. 1580, May 28, 1926 (small thick-branched tree; petiole about 1 m. long, flattened above; leaflets 24–28, folded inwards or concave, glossy above; inflorescence a large 4-branched terminal umbel; branches thick slightly incurved, bearing large numbers of thick-pedicelled umbels of sessile red flowers; pedicels and peduncles purplish; two large incurved bracts were under the inflorescence).

CORNACEAE

Mastixiodendron pachyclados (K. Schum.) Melchior in Bot. Jahrb. LX. 168, t. 1 (1925).

Ihu, Vailala River, rain-forests, no. 943, Feb. 12, 1926 (large soft-wooded tree with thick crooked branches; young shoots viscid; bark pale yellow; leaves shining, paler beneath.

MYRSINACEAE

Maesa polybotrya Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee Nachtr. 341 (1905).

Bisiatabu, rain-forest, alt. 450 m., no. **604**, Nov. 11, 1925 (large slender shrub, 2.50–3 m.).

Maesa protracta F. Mueller, Descr. Not. Papuan Pl. v. 92 (1877).

Hewa, Vailala River, river bank, no. **1136**, March 13, 1926 (erect shrub 1 m.; fruit white fleshy).

Native name "Dolipo."

Maesa spec.

Bisiatabu, rain-forest, alt. 450 m., no. **598**, Nov. 11, 1925 (tall shrub 3–3.50 m.).

U-uma River headwaters, Eastern Division, no. **1502**, May 20, 1926 (bush 2 m.; flowers white).

Aegiceras corniculatum (L.) Blanco, Fl. Filip. 79 (1837).

Aegiceras majus Gaertner, Fruct. I. 216, t. 46 (1788).

Kapa Kapa, no. **798**, Dec. 4, 1925 (small mangrove, 2–2.50 m. high; only a few plants seen); Domara, fringing salt creeks, Eastern Division, no. **1543**, May 27, 1926; Lower Murua River, Eastern Division, fringing the low muddy banks of tidal creeks, no. **1355**, March 30, 1926.

Native name "Bula."

The following numbers belong to the Myrsinaceae, but are too incomplete to be referred to their proper genera.

Ihu, Vailala River, rain-forest, no. **998**, Feb. 19, 1926 (loosely branched bush 1.5–2 m. high, young parts fleshy; leaves thick and fleshy, glossy above; fruit flat, red and shining).

Hohora, Vailala River, open rain-forest, alt. 100 m., no. **1044**, Feb. 22, 1926 (weak bush, 1 m.; leaves clustered at end of branches).

Murua River, Eastern Division, rain-forest, alt. 100 m., no. **1337**, March 28, 1926 (weak somewhat fleshy bush, about 1½ m. high; fruit red, depressed).

Mori River, Eastern Division, light rain-forest, no. **1529**, May 13, 1926 (compact tree 4.50 m.; leaves pale and dull, gland-dotted; fruit brown, depressed punctate).

PLUMBAGINACEAE

Aegialitis annulata R. Brown, Prodr. 1. 426 (1810).

Kapa Kapa, high among rocks on exposed point, no. **791** (small mangrove-like undershrub 30–45 cm.; flowers white).

SAPOTACEAE

Mimusops Elengi L. var. **parvifolia** (R. Br.) H. J. Lam in Bull. Jard. Bot. Buitenz. sér. 3, VII. 236 (1925).

Port Moresby, no. **852** (a tree 4.50–6 m., bark gray, rough and channeled; flowers greenish white; common just behind the beach).

I have followed Lam (l. c.) in placing *M. parvifolia* R. Br. merely as a variety of the widely distributed *M. Elengi* L.

Planchonella obovata Pierre, Not. Bot. Sapot. 35 (1890).—H. J. Lam in Bull. Jard. Bot. Buitenz. sér. 3, VII. 209 (1925).

Lower Mori River, Eastern Division, on exposed rocks at the mouth of the river, no. 1576 (low, bushy tree 2 m. high; leaves shining above; fruit black).

Rather a small-leaved form with the leaves very soon glabrous on the under surface.

EBENACEAE

Maba spec.

Port Moresby, coast, gullies in dry savannah, no. 501, Oct. 1925 (large diffuse shrub, 1.5-2 m.).

Maba spec.

Bomgwina, edge of mangrove formation, Eastern Division, no. 1604, June 1, 1926 (handsome pyramidal tree, 9 m.; bark pale gray, close; leaves paler beneath; flowers small, white).

Maba spec.

Loloki River, in river bed, no. 1652, June 17, 1926 (densely foliaged bush or small tree, 2–2.5 m.; fruit red).

Diospyros spec.

U-uma River, Eastern Division, no. 1441, May 15, 1926 (slender bush in pole forest; leaves pale beneath; fruit green).

OLEACEAE

Ligustrum novoguineense Lingelsheim in Bot. Jahrb. LXI. 15 (1927).

Bomgwina River, in riverine rain-forests, Eastern Division, no. 1623 (virgate tree 6 m.; flowers white, sweet-scented); Domara, Eastern Division, no. 1663 (a beach shrub; flowers white).

Jasminum aemulum R. Brown, Prodr. 521 (1810).

Port Moresby, nos. 873 and 884 (a large straggling shrub; flowers white, sweet scented; a common beach plant); Ihu, Vailala River, on rain-forest borders, no. 1011 (straggling shrub 1.50 m.; flowers white).

Jasminum Turneri C. T. White in Proc. Linn. Soc. N. S. Wales, LI. 297, pl. 17 (1926).

Jasminum pseudanastomosans Lingelsheim in Bot. Jahrb. LXI. 20 (1927); in Nova Guinea, XIV. 330, t. 39 (1927).

Port Moresby, in light rain-forest, no. 880 (a free-flowering climber; flowers white).

LOGANIACEAE

Determined by SPENCER LE M. MOORE

***Couthovia Brassii** S. Moore in Jour. Bot. LXVII. 50 (1929).

Kerema, low swampy ground, Gulf Division, no. 1221 (small tree 4.50 m. high; leaves grayish green, paler beneath; flowers white, fleshy).

***Fagraea aurantiodora** S. Moore in Jour. Bot. LXVI. 105 (1928).

Sogeri, foothill forests, alt. 550 m., no. 642 (large, handsome tree 24 m. high, with a brown, furrowed, fibrous bark; inner bark green; leaves glossy above; flowers white, orange-scented; possesses a pale, hard wood).

Fagraea pluvialis S. Moore in Jour. Bot. LXVII. 49 (1929).

Ihu, Vailala River, rain-forest, no. 944, Feb. 12, 1926 (small, weak-branched tree, 4.50 m. high; leaves glossy, paler beneath; flowers white, sweet-scented).

Fagraea racemosa Jack apud Roxburgh, Fl. Ind. ed. Carey, II. 35 (1824).

Iaritari, foothill forests, alt. 450 m., no. 709 (large vine; flowers white, showy); Wame River, rain-forest, no. 1089 (loosely branched tree, 7.50 m. high; flowers white with salmon centre).

Fagraea spec.

Aisa River, light rain-forest, Eastern Division, no. 1418, May 13, 1926 (tree 12 m. high, with dense crown; bark pale gray; wood very hard, pale; leaves shining above, paler beneath; fruit orange-yellow).

Native name "Amana."

APOCYNACEAE

Alstonia longissima F. Mueller, Descr. Not. Papuan Pl. v. 91 (1877).

Kapa Kapa, in coastal brushes, no. 507 (small spreading tree 6 m.); Sandbank Bay, just above tide mark, Eastern Division, no. 1632, June 3, 1926 (slender tree, 9 m. high, unbranched to near summit; bark close, gray; latex copious).[1]

Native name "Oli."

Alstonia paucinervis Merrill in Philipp. Jour. Sci. Bot. v. 224 (1910).

Bisiatabu, alt. 450 m., no. 630, Nov. 13, 1925 (tall and slender tree 18–24 m. tall, unbranched to near top, wide light crown, 50–60 cm. in girth; bark thin light gray; yielding latex).

Determined by Dr. Markgraf who says (in litt.) that, though without flowers, it is fairly certain this species.

Alstonia scholaris (L.) R. Brown in Mem. Wern. Soc. I. 75 (1809).

Iawarere, alt. 300 m., no. 686 (tree 18 m. high, 60 cm. diameter, with a pale, corky bark; wood light, soft, straight-grained).

A form with short broad leaves; up to 7 cm. broad and in some cases less than 1½ times as long as broad.

Tabernaemontana aurantiaca Gaudichaud, Voy. Freycinet Bot. 50 (1826), nomen.—De Candolle, Prodr. VIII. 374 (1844).

Ihu, Vailala River, rain-forest, no. 930 (small tree; large quantity of latex in bark and leaves; fruit orange-yellow).

Ervatamia montensis S. Moore in Jour. Bot. LXI. suppl. p. 32 (1923).

Bisiatabu, dry savannah forest, alt. 450 m., no. 596 (shrub or small tree 3–4.50 m.; flowers white); Bisiatabu, rain-forest, alt. 450 m., no. 628 (tree 9 m., 75 cm girth; bark light brown, rough and corky, latex yielding); Kuraudi, rain-forest regrowth, Eastern Division, no. 1400 (small tree, flowers white; fruit orange-yellow).

[1] No. 1632, not mentioned by Mr. C. T. White I have referred to *A. longissima* F. Muell. By Dr. Markgraf (in litt.) this number and no. 507 had been determined as probably *A. macrophylla* Wall. var. *glabra* DC. to which he doubtfully refers as a synonym *A. longissima* F. Muell. known to him only from the description.—Ed. (A. R.).

The above determinations were kindly verified for me by Mr. Spencer Le M. Moore after comparison with the type of his species.

Ervatamia spec.

Small, weak-branched tree 4.50 m. high (Brass), glabrous in all parts. Branchlets covered with a light brown, wrinkled bark. Leaves petiolate, petioles 5 mm. long; blade up to 10 cm. long and 5.5 cm. broad, oblong to obovate, apex abruptly acuminate, acumen 5–8 mm. long, in the dried state dark brown above, paler beneath, main nerves about 8 on either side of the midrib, visible on both faces but more prominent underneath where the reticulations are also visible; carpels usually unequal, the larger ones attaining 4 x 3 x 2 cm., obliquely oblong, obscurely 3-angled; seeds about 12 in the larger and 6 in the smaller carpels, enclosed in a bright scarlet pulp, irregularly angular, about 8 x 5 x 4 mm., testa a dull black or very dark brown. The specimens bore one small inflorescence but the flowers were too young to give any measurements of specific value.

Ihu, Vailala River, rain-forest, no. **923** (small, weak-branched tree, 4.50 m. high).

The above specimens probably represent an undescribed species but in the absence of flowers it has not been thought advisable to give it a specific name. Specimens were sent to Mr. Spencer Moore who kindly compared them with the material at the British Museum and Kew herbaria but could not match them with any specimens in either herbarium.

Voacanga papuana (F. Muell.) Schumann in Engler & Prantl, Nat. Pflanzenfam. IV.–2, p. 149 (1895).

Bisiatabu, rain-forest, alt. 450 m., no. **626** (tree 9 m. with a thin, light gray bark and light yellow wood; leaves light green; flowers cream, 7.5 cm. diam., foetid; tree yields a large quantity of latex); Ihu, Vailala River, rain-forest borders, no. **969** (small tree 4.50–6 m.; fruit green, large); Aisa River, Eastern Division, light rain-forest, no. **1424** (small tree; leaves glossy above; flowers pale yellow, foetid).

No. 969 is in fruit; these are described as green by the collector and may be unripe. The following is a description: Carpels smooth and glossy, subglobose, about 6 x 5 x 5 cm.; seeds numerous, reniform, 7 x 5 x 2 mm.; testa black, rugose.

Alyxia ruscifolia R. Brown, Prodr. 470 (1810).

Owen Stanley Range, between Mts. Brown and Clarence, on the crest of a high spur, alt. 1200–1350 m., no. **1492** (a slender bush 1.30 m.; fruit red).

The specimens possess comparatively narrow leaves and represent a form very common in Queensland and distinguished by F. M. Bailey (Queensland Flora, 979) as var. *pugioniformis*.

Cerbera floribunda Schumann in Schumann & Hollrung, Fl. Kaiser Wilhelms Land, 111 (1889).

Hewa, Vailala River, rain-forest, no. 1134 (large tree; leaves smooth and shining); The Cupola, Gulf Division, rain-forest, alt. 125 m., no. 1217 (a slender tree 9 m. high; leaves shining above, pale beneath; flowers white, sweet scented; fruit large, ovoid, pale blue).

Native name "Huli."

Both specimens were accompanied by fruits in formalin; the largest of these measured 8.5 x 6.5 x 5.5 cm.

Cerbera Manghas Linnaeus, Sp. Pl. 208 (1753).

Keuru, Gulf Division, on the beach, no. 1191 (small tree or large bush; leaves dull green above, paler beneath; flowers cream colored, heavy scented).

Kentrochrosia monocarpa Lauterbach & Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee 506 (1900).

Ihu, Vailala River, rain-forest, no. 939 (tree 6 m. high, with a rough, dark bark; leaves shining above; flowers white with a red centre).

Delphyodon oliganthus Schumann in Bot. Jahrb. XXIV, beibl. 59, p. 31 (1898).

U-uma River, Eastern Division, no. 1515, May 20, 1926 (large climber; leaves with the nerves darker green on lower surface).

Determined by Dr. Fr. Markgraf.

Papuechites aambe (Warb.) Markgraf in Nova Guinea, XIV. 288 (1926).

The Cupola, rain-forest borders, Gulf Division, alt. 100 m., no. 1367, April 1, 1926 (glabrous climber with pink flowers).

Determined by Dr. Fr. Markgraf.

Ichnocarpus frutescens (L.) R. Brown in Mem. Werner. Soc. I. 62 (1809).

Kira, Vailala River, river bank, no. 1162, March 16, 1926 (tree 6 m. high; bark rough, dark; leaves shining above; flowers white with red centre).

Parsonsia curvisepala Schumann in Bot. Jahrb. IX. 215 (Fl. Deutsch. Ostas. Schutzgeb.) (1887).

Iawarere, alt. 300 m., no. 692, Nov. 25, 1925 (small vine; stems used by natives for binding garden fences, house timbers, etc.).

Determined by Dr. Fr. Markgraf.

Parsonsia lata (Warb.) Markgraf in Bot. Jahrb. LXI. 221 (1927).

No. 1218.

Determined by Dr. Fr. Markgraf.

ASCLEPIADACEAE

Calotropis gigantea (Willd.) Aiton, Hort. Kew, ed. 2, II. 78 (1811).

Kalo, sand hills near the coast, no. 511 (a large shrub or small tree, 4.50 m. high; flowers pale blue).

***Toxocarpus cyclosepalus** Markgraf in Jour. Arnold Arb. X. 84 (1929).

Hewa, Vailala River, river banks, no. 1145.

Gymnema spec. vel **Toxocarpus** spec.

U-uma River, river bank, no. 1514, May 20, 1926 (small climber; leaves shining above pale beneath).

BORAGINACEAE

Cordia dichotoma Forster f., Fl. Ins. Austral. Prodr. 18 (1786).
Cordia obliqua Willdenow, Sp. Pl. I. pt. II. 1072 (1798).
Cordia myxa, C. B. Clarke in Hooker, Fl. Brit. Ind. IV. 136 (1883) et al., non Linnaeus.

Kapa Kapa, coast brushes, no. 799 (spreading tree 6 m. high, with a rough, fibrous and fissured bark).

Cordia subcordata Lamarck, Tabl. Encycl. Méth. I. 420 (1791).

Kapa Kapa, no. 810 (compact, littoral tree, 4.50 m. with a close, brown bark); Port Moresby, no. 860.

Tournefortia mollis F. Mueller, Fragm. Fl. Austral. I. 59 (1858).

Kapa Kapa, fringing tidal areas, no. 505 (an erect shrub, 1.50–2 m.).

Tournefortia sarmentosa Lamarck, Tabl. Encycl. Méth. I. 416 (1791).

Ihu, Vailala River, river bank, no. 1050 (large straggling or climbing shrub; fruit soft, white).

VERBENACEAE

Determined by Bakhuizen van den Brink

Callicarpa pentandra Roxb. var. **Cumingiana f. pentamera** Bakhuizen in Bull. Jard. Bot. Buitenz. sér. 3, III. 17 (1921); in Jour. Arnold Arb. X. 69 (1929).

Sogeri, alt. 300 m., rain-forest, no. 659.

Callicarpa cana Linnaeus, Mant. II. 198 (1771).—Bakhuizen in Jour. Arnold Arb. X. 69 (1929).

Loloki River, riverine rain-forest, alt. 450 m., no. 528.

Callicarpa longifolia Lam. f. **subglabrata** Schauer in De Candolle, Prodr. XI. 645 (1847).—Bakhuizen in Jour. Arnold Arb. X. 70 (1929).

Ihu, Vailala River, in rain forest regrowths, no. 1013, Feb. 19, 1926 (large bush with pale leaves, white flowers and white fruit); Aisa River, Eastern Division, in rain forest regrowths, no. 1415, May 18, 1926 (small slender tree with white fruit).

Vernacular name "Boja."

Premna integrifolia Linnaeus, Mant. II. 154 (1771).—Bakhuizen in Jour. Arnold Arb. X. 70 (1929).

Borabere, alt. 300 m., rain-forest regrowth, no. 729; Port Moresby, coast, near beach, no. 864; Ihu, Vailala River, common on river banks, no. 1101; Hewa, Vailala River, edge of sago swamp, no. 1118, Maclatchie Point, Gulf Division, common along coast, no. 1174; Aisa River, Eastern Division, alt. 100 m., in river bed, no. 1410.

Vernacular name "A-aru" (under no. 1410).

Teysmanniodendron bogoriense Koorders in Ann. Jard. Bot. Buitenz. sér. 3, XIX. 19, t. IV. fig. 2–3 (1904).—Bakhuizen in Jour. Arnold Arb. X. 70 (1929).

Borabere, rain-forest, alt. 550, no. 723.

Vitex negundo Linnaeus, Sp. Pl. 638 (1758).

Port Moresby, coast, no. 859, Dec. 28, 1929 (small tree with dark rough bark; leaves pale green, gray beneath; flowers blue).

***Gmelina papuana** Bakhuizen in Jour. Arnold Arb. x. 71, t. 16, 18 (1929).

Iawarere, riverine forest, alt. 300 m., no. 695.

Gmelina macrophylla (R. Br.) Bentham, Fl. Austr. v. 65 (1870).—Bakhuizen in Jour. Arnold Arb. x. 72 (1929).

Ihu, Vailala River, rain-forest borders, no. 959; Aisa River, river bank, Eastern Division, no. 1376.

Faradaya splendida F. Mueller, Fragm. Phyt. Austr. v. 21, (1865).—Bakhuizen in Jour. Arnold Arb. x. 72 (1929).

Rigo, coast, bank of creek, no. 822; Bomgwina River, riverine rain-forest, Eastern Division, no. 1631.

Clerodendron inerme (L.) Gaertner, Fruct. I. 271, t. 75 (1788).—Bakhuizen in Jour. Arnold Arb. x. 72 (1929).

Port Moresby, sea-level, on rocky headland, no. 853; Maclatchie Point, along the shore, no. 1181; Domara, Eastern Division, along the coast, no. 1548.

Vernacular name "Lapalapa."

Clerodendron tomentosum (Vent.) R. Brown, Prodr. I. 510 (1810).—Bakhuizen in Jour. Arnold Arb. x. 72 (1929).

Domara River, Eastern Division, river bank, no. 1586.

Clerodendron buruanum Miq. f. **Lindavianum** (Lauterb.) Bakhuizen in Bakhuizen & Lam in Nova Guinea, XIV. 171 (1924); in Jour. Arnold Arb. x. 73 (1929).

Ihu, Vailala River, rain-forest borders, no. 924; Aisa River, Eastern Division, in river bed, no. 1412.

Clerodendron magnificum Warburg in Bot. Jahrb. XIII. 428 (1891).—Bakhuizen in Jour. Arnold Arb. x. 73 (1927).

Iawarere, alt. 300 m., no. 680; Hewa, Vailala River, rain-forest clearings, no. 1129.

Avicennia marina (Forsk.) Vierh. var. **resinifera** Bakhuizen in Bull. Jard. Bot. Buitenz. sér. 3, III. 210, t. 16 (1921); in Jour. Arnold Arb. x. 74 (1929).

Kapa-kapa, at sea-level, in edge of tidal waters, no. 794; Port Moresby, sea-level, in mangrove, often grows above the tide mark, no. 882.

Avicennia officinalis Linnaeus, Sp. Pl. I. 110 (1753).—Bakhuizen in Jour. Arnold Arb. x. 74 (1929).

Lower Murua River, Gulf Division, mangrove formation, no. 1348.

SOLANACEAE

Solanum torvum Swartz, Prodr. Veg. Ind. Occ. 47 (1788).

Loloki River, rain-forest borders, alt. 300 m., no. 529 (undershrub 1 m.; fruit red).

Solanum verbascifolium Linnaeus, Sp. Pl. 184 (1753).

Bisiatabu, edges of rain-forests, no. **581** (shrub or small tree 2.50–3 m.; flowers greenish white); Kuraudi, Eastern Division, rain-forest regrowth, no. **1406** (large bush; flowers white; anthers yellow).

BIGNONIACEAE

Dolichandrone spathacea (L. f.) Schumann, Fl. Kaiser Wilhelm's Land, 123 (1889).

Ihu, Vailala River, river bank, no. **1054** (small tree, 4.50–6 m.; stem branching from near the ground; stems erect, young parts viscid).

CYRTANDACEAE

Determined by Spencer Le M. Moore

Cyrtandra quercifolia S. Moore in Trans. Linn. Soc. Bot. ix. 130 (1916).

Owen Stanley Range between Mts. Brown and Clarence, alt. 900 m., no. **1505** (small bush, 1–1.25 m.; leaves blue-green; flowers pink, solitary or in small clusters).

Differs from the type in having leaves with inconspicuous lower-face side nerves and shorter calyx lobes.

***Cyrtandra externata** L. Moore in Jour. Bot. lxvii. 50 (1929).

Hohoro, Vailala River, rain-forest plains, no. **1043**, Feb. 22, 1926 (unbranched bush, 1.25 m. high; flowers greenish yellow, striped and mottled with red).

ACANTHACEAE

Determined by Spencer Le M. Moore

Acanthus ilicifolius Linnaeus, Sp. Pl. 639 (1753).

Kalo, river banks, no. **508** (erect, fleshy undershrub 1–1.25 m.; leaves of old plants usually less spiny than those of the younger ones; flowers lavender); Kapaira River, no. **1094** (erect fleshy shrub 0.75–1 m. high; young plants armed with stipular thorns and pungent leaf dentations, old plants quite unarmed; leaves entire; flowers conspicuous, lavender; an estuarine plant common on low muddy banks from Kemp-Welch River to the Delta); Bomgwina River, no. **1542** (leaves glossy, entire or toothed; flowers lavender; a common estuarine plant all along the southern coast).

Graptophyllum Gilligani (F. M. Bailey) S. Moore in Jour. Bot. lviii. 80 (1920).

Iawarere, rain-forest, alt. 300 m., no. **834** (shrub 1.50–2 m., flowers showy, reddish-purple).

Graptophyllum pubiflorum S. Moore in Trans. Linn. Soc. Bot. ix. 135 (1916).

Iawarere, river bank, alt. 300 m., no. **832** (herbaceous shrub 1–1.30 m.).

Graptophyllum spinigerum F. Mueller, Fragm. Phytog. Austral. x. 87 (1876).

Port Moresby, near the beach, no. 854 (slender erect shrub 2 m. high; flowers white).

Graptophyllum spec.

U-uma River, Eastern Division, rain-forest plains, alt. 150 m., no. 1443, May 14, 1929 (weak bush, 1–1.25 m. high; leaves dark green, pale below; flowers purple-red).

Justicia Chalmersii Lindau in Bot. Jahrb. XIX. beibl. 48, p. 6 (1894).

Budatobara, no. 749 (small shrub 0.75–1 m.; flowers puce); U-uma River, Eastern Division, river bank, no. 1431 (small undershrub; leaves dark green; flowers pale purple).

RUBIACEAE

Determined by SPENCER LE M. MOORE

Xanthophytum papuanum Wernham in Jour. Bot. LVI. 70 (1918).

Aisa River, Eastern Division, river bank, no. 1409 (weak shrub 0.75–1 m., with pale thin leaves, the reticulations prominent beneath; flowers white).

Wendlandia buddleacea F. Mueller, Descr. Not. Papuan Pl. VIII. 45 (1886).

U-uma River, Eastern Division, river bank, no. 1429 (small erect tree; leaves pale; flowers white).

Native name "Jo-feana."

***Dolicholobium rufiflorum** S. Moore in Jour. Bot. LXV. 242 (1927).

Hohoro, Vailala River, open rain-forests on the ridges, no. 1046 (small slender tree; flowers white).

Uncaria appendiculata Bentham in Lond. Jour. Bot. II. 222 (1843).

Bisiatabu, rain-forest, alt. 450 m., no. 561 (large woody climber; flowers green).

Uncaria sclerophylla Roxburgh, Hort. Bengal. 86 (1914) nomen; Fl. Ind. ed. 2, I. 520 (1832).

Iawarere, rain-forest, alt. 300 m., no. 678 (large liane).

***Neonauclea Brassii** S. Moore in Jour. Bot. LXV. 241 (1927).

Sogeri, in marshy places in rain forest, alt. 450 m., no. 658 (slender tree 4.50–6 m.); Iawarere, in foothill rain-forests, alt. 300 m., no. 687 (handsome tree 18 m. high).

Neonauclea Chalmersii (F. Muell.) Merrill in Jour. Wash. Acad. Sci. v. 539 (1915).

Loloki River, near water's edge, alt. 375 m., no. 553 (small tree; flowers with reddish purple corolla lobes); Kuraudi, Eastern Division, river-bed, no. 1381 (small horizontal-branched tree).

Neonauclea spec.

Iawarere, rain and foothill forest, alt. 300 m., no. 687, Nov. 24, 1925 (handsome tree, 18 m. high).

Sarcocephalus cordatus Miquel, Flor. Ind. Bat. II. 133 (1856).

Port Moresby, near the beach, no. **846** (handsome tree 9 m. high, with a dark-brown, scaly bark; leaves dark green; fruit brown, 3.5–5 cm. diam.); Lepokera, Vailala River, riverine rain-forests, no. **985** (large erect tree with a rough, dark bark and bright yellow wood).

Native name "Hubu."

Anthocephalus indicus A. Richard in Mém. Soc. Hist. Nat. Paris, v. 238 (1834).

Lepokera, Vailala River, rain-forest, no. **984** (very large, straight-boled, buttressed tree; bark pale gray, channeled, deciduous in long scales or strips; wood pale and soft; flowers sweet-scented, brown, in terminal globular heads).

Native name "Hubu."

***Mussaenda ornata** S. Moore in Jour. Bot. LXV. 243 (1927).

Hewa, Vailala River, rain-forest, no. **1126** (climber or large rambling shrub; flowers yellow, subtended by a large, leaf-like, white bract).

***Mussaenda pluviatilis** S. Moore in Jour. Bot. LXV. 244 (1927).

Kuraudi, Eastern Division, in rain-forest regrowth, no. **1401** (large rambling shrub; flowers yellow).

Mussaenda spec. aff. *M. macrantha* Valet.

Sogeri, rain-forest, alt. 450 m., no. **649**, Nov. 16, 1925 (large rambling shrub with brown bark; fruit brown).

Urophyllum britannicum Wernham in Jour. Bot. LVI. 72 (1918).

Murua River, Gulf Division, rain-forest, no. **1346** (small tree or large bush; leaves shining above; fruit yellow).

Randia ixoraeflora Wernham in Jour. Bot. LVI. 74 (1918).

Bisiatabu, in rain-forest regrowth, alt. 450 m., no. **625** (compact tree 4.50–6 m. high; Budatobara, riverine rain-forests, no. **769** (spreading tree 9 m. high; flowers white, delicately perfumed).

***Randia suavissima** S. Moore in Jour. Bot. LXV. 245 (1927).

Ihu, Vailala River, no. **927** (slender tree or tall bush; fruit colored yellow and green); Ihu, Vailala River, rain-forest, no. **967** (small tree 4.50 m.; flowers white, stiff, sweet-scented).

Randia spec.

Lower Mori River, Eastern Division, riverine rain-forest, no. **1564**, May 28, 1926 (glabrous tree, 7.50 m. high; flowers in terminal corymbs; fruit dark green, marked with several pale lines from base to apex).

***Gardenia dryadum** S. Moore in Jour. Bot. LXV. 246 (1927).

Loloki River, rain-forest, alt. 300 m., no. **547** (small tree; leaves pale green; flowers white).

Scyphiphora hydrophyllacea Gaertner f., Fruct. III. 91, t. 196 (Suppl. Carpol.) (1805).

Port Moresby, among mangroves, no. **851** (a large compact and much-branched shrub; flowers white); Kerema, Gulf Division, bordering the mangrove creeks on the main beach, no. **1230** (compact bush, 1–1.50 m.

high; branches erect; young shoots viscid; leaves fleshy, shining above; flowers white; fruit white); Domara, Eastern Division, no. **1546** (stiff branched shrub in dense formation, 1.50 m. high; leaves thick, fleshy, glossy; flowers pinkish-white; fruit pale green, prominently ribbed; a beach plant).

Native name "Akora."

***Airosperma fusca** S. Moore in Jour. Bot. LXV. 266 (1927).

Hohoro, Vailala River, ridges in open rain-forest, no. **1050** (weak bush 2 m. high).

Airosperma spec.

Owen Stanley Range, between Mts. Brown and Clarence, alt. 1200 m., no. **1485**, May 19, 1926 (low bush; leaves shining above, paler beneath; flowers white).

Guettarda speciosa Linnaeus, Sp. Pl. 991 (1753).

Port Moresby, no. **861a** (small compact tree 3–4.50 m. high; flowers white; a common beach plant).

Guettarda spec.

Kapa Kapa, open coast lands, no. **801**, Dec. 8, 1925 (erect tree, 4.50–6 m. high with crooked trunk; bark rough, corky; flowers white).

***Timonius Brassii** S. Moore in Jour. Bot. LXV. 265 (1927).

Budatobara, dry savannah forests, no. **758** (small tree, 9 m. high, with a dark, tessellated bark; fruit light green); Bomgwina River, Eastern Division, in small grass patches in the rain-forests, no. **1626** (small tree with a rough, dark bark; flowers white).

Timonius merokensis Wernham in Jour. Bot. LVI. 130 (1918).

Iawarere, rain-forest, alt. 300 m., no. **684** (tree 9 m. high, with a brown, flaky bark and light wood).

***Timonius sylvestris** S. Moore in Jour. Bot. LXV. 247 (1927).

Bisiatabu, rain-forest, alt. 450 m., no. **582** (small tree 4.50 m. high with a thin gray bark).

***Timonius Whiteanus** S. Moore in Jour. Bot. LXV. 246 (1927).

Ihu, Vailala River, river bank, no. **1109** (small compact tree 3.50–4.50 m. high; flowers white; fruit green).

Timonius spec.

Iaritari, foothill forest, on stream, alt. 450 m., no. **707**, Nov. 29, 1926 (small compact tree 4.50 m.; fruit green).

Timonius spec.

Haga, Loloki River, common on coastal savannahs, no. **902**, Jan. 1926 (pale foliaged tree, 6–7.50 m. high; bark very dark and rough ;fruit green).

Timonius spec.

Ihu, Vailala River, rain-forests, no. **946**, Feb. 12, 1926 (tree 9 m. high bark thick, dark, flaky; flowers solitary, in axils of terminal leaves; fruit red).

Plectronia suborbicularis C. T. White in Proc. Linn. Soc. N. S. Wales, LI. 296, t. 17 (1926).

Port Moresby, no. **1405** (small compact tree on rocky foreshores).

Pavetta platyclada Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 570 (1900).

Bisiatabu, edge of rain-forest, alt. 450 m., no. **573** (slender tree 2–2.50 m. high; leaves pale green, shining; flowers white).

***Ixora Brassii** S. Moore in Jour. Bot. LXV. 267 (1927).

Owen Stanley Range between Mts. Brown and Clarence, alt. 1200 m., no. **1509** (bush 1–1.25 m. high; leaves glossy, pale beneath; flowers pink, in dense terminal clusters).

***Ixora ihuensis** S. Moore in Jour. Bot. LXV. 267 (1927).

Ihu, Vailala River, rain-forest, no. **997** (loosely branched bush, 2.50 m. high; leaves pale; flowers white; fruit black, succulent).

Psychotria Beccarii Schumann in Schumann & Hollrung, Fl. Kaiser Wilhelms Land, 135 (1889).

Bisiatabu, rain-forest, alt. 450 m., no. **563** (slender tree, 9 m. high; flowers waxy, white, tinged with pink).

***Psychotria Brassii** S. Moore in Jour. Bot. LXV. 268 (1927).

Iawarere, rain-forest, alt. 300 m., no. **688** (large liane).

Psychotria lolokiensis S. Moore in Jour. Bot. LXVII. 49 (1929).

Haga, Loloki River, riverine rain forests, no. **898**, Jan. 1926 (thick-foliaged tree 4.50–6 m. high; leaves dark green, glossy above; flowers and peduncles white).

***Psychotria montensis** S. Moore in Jour. Bot. LXV. 268 (1927).

Owen Stanley Range between Mts. Brown and Clarence, alt. 1200 m., no. **1511** (bush 1 m. high; leaves dark green, rather fleshy; flowers white; peduncles and pedicels white; fruit white).

***Psychotria reticulatissima** S. Moore in Jour. Bot. LXV. 269 (1927).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 900–1050 m., no. **1484** (tall bush; flowers white; fruit orange-yellow).

Psychotria spec.

Sogeri, rain-forests, alt. 450 m., no. **635**, Nov. 16, 1925 (tall shrub 2.50–3 m. high, with soft and sappy trunk; leaves glossy above).

Psychotria spec.

Iawarere, rain-forest, alt. 350 m., no. **676**, Nov. 22, 1925 (small tree, with close brown bark and yellow wood).

Psychotria spec.

Ihu, Vailala River, rain-forest, no. **918**, Feb. 9, 1926 (large bush; leaves dark and glossy, pale beneath, fleshy, midrib white above; fruit red).

Psychotria spec.

Mowabula, Eastern Division, rain-forest, no. **1375**, May 11, 1926 (large virgate bush 2–2.25 m. high; leaves dark dull, pubescent beneath; fruit red, globose, interminal clusters).

Psychotria spec.

Aisa River, Eastern Division, light pole forest, no. **1419**, May 13, 1926 (small tree; fruit white, succulent).

Psychotria spec.

U-uma River headwaters, Eastern Division, alt. 450 m., no. **1472**, May 18, 1926 (tall tree; bark soft, dark; leaves dark, glossy, paler below; fruit (immature) in terminal panicle).

Psychotria spec.

Loloki River, river bank, no. **1647a**, June 16, 1926 (bush 1 m. high).

Lasianthus spec.

Bisiatabu, rain-forest, alt. 450 m., no. **585**, Nov. 8, 1925 (small shrub with black fruit).

Amaracarpus spec.

Hohoro, Vailala River, rain-forest, alt. 100 m., no. **1039**, Feb. 22, 1926 (small compact bush, 1 m. high, with horizontal branches; fruit red).

***Hydnophytum amplifolium** S. Moore in Jour. Bot. LXV. 270 (1927).

Upoia, Vailala River, rain-forest, no. **1151** (saprophytic shrub on trees; several fleshy unbranched stems from a large swollen base; leaves fleshy).

***Hydnophytum Brassii** S. Moore in Jour. Bot. LXV. 271 (1927).

Keuru, Gulf Division, beach, no. **1200** (large saprophyte on trees; leaves dull, fleshy; flowers white; fruit orange-yellow).

***Hydnophytum camporum** S. Moore in Jour. Bot. LXV. 271 (1927).

Bisiatabu, savannah forest, alt. 450 m., no. **605** (epiphyte on trees; short, fleshy stems arising from a large, flat, succulent stock which is usually honeycombed by a species of black ant; leaves fleshy).

Morinda citrifolia Linnaeus, Sp. Pl. 176 (1753).

Kapa Kapa, open situations near the coast, no. **823** (small compact, spreading tree, 4.50 m. high, with a light brown, slightly fissured bark); Ihu, Vailala River, on river bank; no. **1099** (small, compact tree with thick trunk and branches; leaves dark and glossy; flowers white; fruit conical, greenish-yellow).

Morinda spec.

Budatobara, rain-forest, alt. 100 m., no. **772**, Dec. 4, 1925 (liane; fruit syncarpous, in terminal clusters).

The following number belongs to the Rubiaceae, but the genus has not been determined).

Owen Stanley Range, between Mts. Brown and Clarence, alt. 900 m., no. **1495**, May 19, 1926 (bush 1.50 m. tall; flowers white, on long axillary peduncles; fruit globose fleshy, pale green).

GOODENIACEAE

Scaevola frutescens (Mill.) Krause in Engler, Pflanzenr. IV. 277, p. 125 (1912).

Scaevola Koenigii Vahl, Symb. Bot. III. 36 (1794).

Port Moresby, no. **861** (large fleshy shrub; flowers white; fruit white, succulent); Maclatchie Point, Gulf Division, no. **1171** (fleshy shrub or small tree; common on all the beaches between Kapa Kapa and Orokolo).

Scaevola novo-guineensis Schumann in Bot. Jahrb. IX. 222 (1887).

Kerema, Gulf Division, in light rain forest, no. **1210** (a straggling shrub with long, slender branches; flowers yellow).

COMPOSITAE

Pluchea indica Lesser in Linnaea, VI. 150 (1831).

Kapa Kapa, on tidal flats and on sandy soil some distance from the sea, no. **807** (much branched shrub 2 m. high; flowers tinged with pink); Domara, Eastern Division, river bank, no. **1593** (a large leafy shrub).

APPENDIX

LIST OF HERBACEOUS PLANTS COLLECTED IN NEW GUINEA BY L. J. BRASS

PTERIDOPHYTA

Determined by E. B. COPELAND

Trichomanes aphlebioides Christ
Nos. 1041, 1471

Trichomanes atrovirens (Presl) Kunze
Nos. 677, 1482

Trichomanes spec. affinis *T. atrovirens* (Presl) Kunze
No. 973

Trichomanes cupressoides Desv.
No. 1508

Trichomanes grande Copel.
No. 1040

Hymenophyllum longifolium Alderv. v. Rosenb.
No. 1467

Dicksonia papuana F. Muell.
Nos. 1087, 1470

***Cyathea Brassii** Copeland in Jour. Arnold Arb. x. 175 (1929)
No. 1421

Cyathea scabriseta Copel.
No. 1570

Cyathea Versteegii Christ
No. 1006

Dryopteris arida (Don) O. Kuntze
No. 1407

***Dryopteris albo-ciliata** Copeland in Jour. Arnold Arb. x. 177 (1929)
No. 566

***Dryopteris pseudostenobasis** Copeland in Jour. Arnold Arb. x. 176 (1929)
No. 1000

Dryopteris unita (L.) O. Kuntze
No. 933

Sphaerostephanos polycarpa (Bl.) Copel.
No. 544

Polystichum accedens Bl.
No. 1474

Polystichum lastreoides Rosenst.
No. 1422

***Tectaria craspedocarpa** Copeland in Jour. Arnold Arb. x. 178 (1929)
No. 557

Tectaria irregularis (Presl) Copel.
No. 567

Tectaria menyanthidis (Presl) Copel.
No. 975

Tectaria Weinlandii (Christ) Copeland in Jour. Arnold Arb. x. 177 (1929)
No. 541

Tectaria spec. vel *T. crenata* Cav. vel *T. Weinlandii* Copel.
No. 1480

Lomagramme articulata (J. Sm.) Copel.
No. 1468

Nephrolepis biserrata (Sw.) Schott
No. 1610

Nephrolepis spec. (perhaps a small N. biserrata Schott)
No. 1085

Athropteris obliterata (R. Br.) J. Sm.
No. 956

Humata parvula (Wall.) Mett.
No. 694

Humata tenuis Copel.
No. 1465

Davallia solida (Forst.) Sw.
Nos. 1182, 1609

Sphenomeris decipiens (Cav.) Copel.
No. 1434

Dennstaedtia erythrorachis(Christ) Diels
No. 1512

Lindsaya sessilis Copel.
No. 1077

Lindsaya tenuifolia Bl.
No. 1004

Athyrium accedens (Bl.) Milde
Nos. 830, 1374

Athyrium bulbiferum (Brack.) Copel.
No. 979

Athyrium cyatheaefolium (Rich.) Milde
No. 603

Antrophyum alatum Brack.
No. 643, 1476

Asplenium laserpitiifolium Lam.
Nos. 1114, 1611.

Asplenium nidus L.
Nos. 1068, 1192

Asplenium pellucidum Lam.
No. 1466

Asplenium scandens J. Sm.
No. 1113

Asplenium squamuligerum (Rosenst.) Hieron., as to descrip. (cf. Jour. Arnold Arb. x. 178 (1929)
No. 671
Asplenium tenerum Forst. var. **acuminatum** Hook.
No. 1464
Stenochlaena palustris (Burm.) Bedd.
No. 936
Craspedodictyum quinatum (Hook.) Copel.
No. 1494
Pteris Beccariana C. Chr.
No. 1163
Pteris pacifica Hieron.
No. 1086
Vittaria zosterifolia Wall.
No. 1088
Hymenolepis spicata (L. f.) Presl
No. 1475
Polypodium accedens Bl.
No. 1474
Polypodium glossipes Baker
No. 618
Polypodium nigrescens Bl.
No. 1455
Polypodium punctatum (L.) Sw.
Nos. 535, 673
Polypodium Scolopendria Burm. (*P. phymatodes* L.)
No. 1173
***Microsorium Brassii** Copeland in Jour. Arnold Arb. x. 181 (1929)
No. 1153
Cyclophorus acrostichoides (Forst.) Presl
No. 1608
***Cyclophorus aglaophyllus** Copeland in Jour. Arnold Arb. x. 179 (1929)
No. 1143
***Cyclophorus dimorphus** Copeland, l. c. 180 (1929)
No. 1575
***Cyclophorus stellatus** Copeland, l. c. 179 (1929)
No. 1473
Lecanopteris sinuosa (Wall.: Hook.) Copel.
No. 1551
Drynaria sparsisora Desv.
No. 1480a
Acrostichum aureum L.
Nos. 518, 1025, 1591
Merinthosorus drynarioides (Hook.) Copel.
No. 1503
Schizaea dichotoma (L.) Sm.
No. 592
Lygodium circinatum (Burm.) Sw.
No. 1358
Lygodium dimorphum Copel.
No. 1499
Lygodium flexuosum (L.) Sw.
No. 633
Lygodium Kingii Copel.
No. 1420
Lygodium scandens (L.) Sw.
No. 1206
Angiopteris spec. aff. *A. Dahlii* Hieron.
No. 601
***Marattia platybasis** Copeland in Jour. Arnold Arb. x. 174 (1929)
No. 1005
Helminthostachys zeylanica (L.) Hook.
No. 1353
Equisetum debile Roxb.
No. 1432
***Lycopodium Brassii** Copeland in Jour. Arnold Arb. x. 174 (1929)
No. 1521
Lycopodium cernuum L.
No. 579
Lycopodium Dielsii Herter?
No. 1064
Psilotum triquetrum Sw.
No. 1574

SELAGINELLA

Determined by O. C. SCHMIDT

Selaginella Belangeri Hieron.
No. 1152.
Selaginella gracilis Moore
Nos. 645, 1003, 1416
Selaginella Hellwigii Hieron.
Nos. 1047, 1355, 1396
Selaginella Hieronymiana Alderv. v. Rosenb., forma
No. 1435
Selaginella Hindsii Hieron.
Nos. 696, 1008

GRAMINEAE[1]

Determined by A. S. HITCHCOCK

Paspalum cartilagineum Presl
No. 1183
Paspalum orbiculare Forst.
No. 521
Paspalum vaginatum Sw.
No. 1229
Ischaemum digitatum Brongn.
No. 1213
Ischaemum muticum L.
Nos. 514, 1177, 1616
Miscanthus japonicus (Thunb.) Anderss.
No. 920
Apluda mutica L.
No. 522
Pogonatherum paniceum (Lam.) Hack.
Nos. 768, 1391

[1] An enumeration of the Grasses collected by L. J. Brass with localities and collector' field-notes was published in Proc. Linn. Soc. N. S. Wales, LIV. 145–146 (1929).

Themeda gigantea (Cav.) Hack.
No. 634, 1205
Themeda triandra Forsk.
No. 765
Rottboellia ophiuroides Benth.
No. 776
Elionurus citreus Munro
No. 1397
Centotheca latifolia (Osb.) Trin.
No. 976
Leptaspis urceolata R. Br.
Nos. 587, 964
Polytoca macrophylla Benth.
No. 1203
Coix lacryma-Jobi L.
No. 1417
Leptochloa scabra Nees
No. 1597
Leptochloa virgata (L.) Beauv.
Nos. 750, 1599
Pennisetum macrostachyum Trin.
No. 538
Oplismenus hirtellus (L.) Beauv.
No. 1534
***Isachne Brassii** Hitchcock in Proc. Linn. Soc. N. S. Wales, LIV. 146 (1929)
No. 1018
Panicum pilipes Nees
No. 1423.

ORCHIDACEAE

Determined by C. SCHWEINFURTH

Neuwiedia calanthoides Ridl.
No. 1426
Oberonia diura Schlechter
No. 1216
Geodorum nutans (Presl) Ames
No. 899
Dendrobium dulce J. J. Sm.
No. 1167
Bulbophyllum hymenobracteum Schlechter
No. 1483

URTICACEAE

Determined by L. DIELS

***Elatostemma pachypoda** Diels
No. 552

LEGUMINOSAE

Crotalaria linifolia L.
No. 520
Crotalaria striata DC.
No. 905
Psoralea badocana Benth.
No. 872
Zornia diphylla (L.) Pers.
No. 1186
Clitoria ternatea L.
No. 845

ONAGRACEAE

Jussiaea villosa Lam.
No. 1227

APOCYNACEAE

Vinca rosea L. var. **alba** Sweet
No. 812

ASCLEPIADACEAE

Asclepias curassavica L.
No. 1399

VERBENACEAE

Stachytarpheta dichotoma Vahl.
No. 886

LABIATAE

Hyptis suaveolens Poit.
No. 1172
Ocimum basilicum L.
Nos. 1187, 1640

SOLANACEAE

Nicotiana Tabacum L.
No. 828

PEDALIACEAE

Josephinia grandiflora R. Br.
No. 887

ACANTHACEAE

Determined by SPENCER LE M. MOORE

Thunbergia fragans Roxb.
No. 539
Hemigraphis glaucescens C. B. Clarke
No. 1037
Hemigraphis reptans T. Anders.
No. 770
Ruellia Forbesii S. Moore
No. 915
Lepidagathis hyalina Nees
No. 912
Ancylacanthus cyrtandroides Lindau
No. 911a
Pseuderanthemum variabile Radlk.
No. 1009
Peristrophe jalappaefolia Nees
No. 1035

RUBIACEAE

Determined by SPENCER LE M. MOORE

***Oldenlandia Aparine** S. Moore in Jour. Bot. LXV. 243 (1927)
No. 1017
Oldenlandia paniculata L.
No. 894
Ophiorhiza spec.
Nos. 617, 1413

COMPOSITAE

Synedrella nodiflora Gaertn.
No. 895

NOTES

The Arnold Arboretum during the Fiscal year ended June 30, 1929.

The Arboretum.—During the year 1928–29 the weather was exceedingly favorable to the living collections in the Arboretum. The late summer and autumn months brought a good rainfall and seasonable weather; the winter was almost ideal, there being no long periods of low temperatures and an abundant snowfall in February came at the right time. During the spring months good rains fell but May and June were dry, indeed, with the exception of one good downfall there were no rains worth mentioning, and at the end of June signs of drought were apparent. Under such favorable weather conditions the trees and shrubs made a good growth and blossomed freely in season. The winter being mild less damage than is customary was done to the foliage of broad-leaved evergreens; Conifers suffered not at all. The rejuvenation of the Lilac collection is complete and the plants blossomed freely, the size of the flower clusters being extra large.

During the autumn months the task begun in 1927–28 of spreading out and regrouping different collections was continued, the Berberis, Spiraea, and Deutzia groups being entirely rearranged. Several hundred Conifers, many of them of considerable size, were moved from the supplementary Pinetum alongside of Walter Street to the Pinetum proper, and it is satisfying to record that not a single plant suffered. This and other work now in progress has for its object the making of the best use of land available in the Arboretum and of giving each tree and bush full opportunity to develop its character and beauty. In the autumn some four thousand bulbs of Snowdrops, Narcissi, Grape Hyacinths and Squills were planted under the Magnolias in front of

the Administration Building. They flowered freely and gave a pleasing touch of color in early spring.

The late Professor C. S. Sargent in his account of the first fifty years of the Arnold Arboretum drew attention to the fact that the land on which the Arboretum is established was a worn out farm. During the Arboretum's first half century little money was available for fertilizers so the soil perforce remained poor and the growth of shrubs proportionately slow. The needs of the Arboretum above anything else are fertilizers and cultivation. Thanks to the more favorable financial position this is now possible and a commencement has been made. The collections of Crabapples, Japanese Cherries, Hawthorns and Lilacs have been treated with fertilizer and at the end of one season show beneficial results. Each succeeding year it is hoped to extend the work of feeding to other collections.

The roads have been kept in excellent condition by the Park Commission of the City of Boston and it is pleasant to record the hearty coöperation of the members of the Park Board. It is regrettable that during the year more damage than usual was done by boys and especially annoying is the breaking of display labels and the destruction of identification tags. The police protection afforded the Arboretum is very inadequate and under existing conditions it is impossible to check vandalism.

During the year 4,073 plants (including grafts and cuttings) were distributed in the United States, Germany, Great Britain, Poland, Canada, and Russia, and 1,424 packets of seed were distributed in the United States, Canada, Great Britain, New Zealand, China, France, Japan, Norway, Germany, Australia, India, Cuba and Java. There have been received 18,583 plants (including grafts and cuttings) from the United States, Japan, Canada, and Costa Rica, and 501 packets of seed from the United States, Great Britain, France, Africa, Java, Cuba, India, Germany, China, Poland, Czechoslovakia, Rumania, New Zealand, Japan, Russia, Turkestan, Holland, Manchuria, Hawaii, India, Esthonia, and Santa Cruz.

Four numbers of the "Journal of the Arnold Arboretum" and eighteen numbers of "The Bulletin of Popular Information" were issued during the year. The circulation of both publications is increasing. The Bulletin has subscribers in forty states of the union and a number of foreign countries; the Journal is a most valued medium of exchange and either in exchange or by subscription goes to all the principle botanic libraries in the world.

The popularity of the Arboretum increases yearly; this is shown not alone by the increased number of visitors but by the large increase in correspondence. Letters seeking information on all phases of dendrology and horticulture come from all states of the Union and from many countries beyond the seas. Also, there is a large increase in the number

of plants sent for identification. During the year more than six thousand letters answering questions and giving advice in one form and another were sent out from the Keeper's office. The Arboretum has no means of recording the thousands who visit the grounds but increased numbers are obvious. At the Administration Building no fewer than 1,208 visitors registered. Of these some 50 came from Europe, Asia and other distant lands. The garden clubs are making great use of the Arboretum and during May alone members of seven of these clubs spent a day or more looking over the collections. With the increased popularity there is a notable increase in the number of its friends. An appeal issued on the first of April resulted in monetary contributions from some two hundred new friends who had not heretofore contributed to the upkeep of the Arboretum.—E. H. W.

Pathological Laboratory.—In 1928–29, for the first time in the history of the Arboretum, provision was afforded for research and instruction on the diseases of trees and shrubs of ornamental plantings and of forests. Professor J. H. Faull was appointed to take charge of this work and he began his duties on July 1, 1928. A part of the new building erected by the Arboretum on the grounds of the Bussey Institution for Research in Applied Biology was set aside as a pathological laboratory and arrangements for the accommodation of research students were effected with the Bussey Institution and the Department of Cryptogamic Botany in the Farlow Building.

The year has been occupied with organization, attention to inquiries of correspondents and investigation.

The new laboratory was ready for occupancy by the end of September. It is equipped with the necessary apparatus, with several thousand pamphlets on plant pathology and allied subjects, and an extensive collection of specimens. An attached experimental greenhouse has recently been built and will shortly be in use.

Many inquiries on plant diseases, usually accompanied by specimens, have been received during the year. They have come from a dozen or more states and two or three foreign countries. While most of these required letters only in reply, a few have been of more than passing interest, and in some of these cases personal visits have been made.

Progress has been made in the study of a number of major problems:—

1. Rusts of Firs and Spruces. One paper published (see Journal of the Arnold Arboretum, x. 156–167). 2. Browning of White Pine Transplants. 3. Phacidium Blight of Coniferous Stock (for preliminary account see Journal of the Arnold Arboretum, x. 3–8). 4. Needle Cast Diseases of Conifers. 5. Diseases of Lilacs, Red Stain of Jack Pine.—J. H. F.

Cytological Laboratory.—A cytological survey of the plants in the Arboretum is being made by Dr. Karl Sax. A knowledge of the chromo-

some number and behavior in the various genera of woody plants should be of value as a basis for breeding work and should often serve as a check on taxonomic classification. During the past year chromosome counts were obtained in more than 200 species. Practically all of the available species have been studied in the following genera: *Syringa*, *Vitis*, *Lonicera* and *Philadelphus*. In *Syringa persica* the variety *laciniata* is the only pure species. Cytological studies show that all of the other forms of this species in cultivation are hybrids. Chromosome counts in Vitis and allied genera are in accord with breeding results and taxonomic classification.

Cytological work with certain generic hybrids in the Pomoideae subfamily of the Rosaceae indicate that many of these genera are rather closely related and that generic hybrids of horticultural value might be produced.

Dr. Sax is also doing considerable breeding work in the Arboretum to produce new types of ornamental plants. In the spring of 1929 more than 425 crosses were made involving 41 genera and 135 species. A large number of species crosses were made between *Syringa* species and varieties. A considerable number of generic crosses were made in the Rosaceae, Caprifoliaceae, and Saxifragaceae. Most of the generic crosses are not expected to set seed but the few successful ones should be of considerable horticultural and scientific value.—K. S.

The Herbarium.—The Herbarium contains now 315,156 sheets, 18138 having been added during the time from July 1, 1928 to June 30, 1929. Of these accessions approximately 3250 were natives of the United States and Canada, 3450 of Central and South America including Mexico and the West Indies, 1900 of Europe and Western and Central Asia, 3200 of China and 549 of Japan including Formosa, 1050 of Southern Asia and Malaysia, 700 of Africa, 850 of Australasia and about 1000 were cultivated plants. Among the more important collections received during the year may be mentioned about 1500 specimens, including a large number of interesting Cacti, Yucca and Agave, collected by Mrs. S. D. McKelvey in Arizona and New Mexico and generously presented with numerous duplicates and wood specimens to the Arnold Arboretum, about 2500 numbers with numerous duplicates collected by E. J. Palmer chiefly in the Southern States, 1200 specimens collected by P. C. Standley in British Honduras, 875 collected by G. F. Gaumer in Yucatan, Mexico, 464 collected by Ynes Mexia in Mexico, about 800 numbers with duplicates collected by J. G. Jack in Cuba, 150 collected by E. Werdermann in Chile, 744 received from J. Bornmüller and collected in Europe and western Asia, about 500 specimens collected chiefly in Turkestan and received from the Botanic Garden in Leningrad, about 725 specimens consisting of photographs and duplicates of types mostly collected in China from the Léveillé collection in Edinburgh, about 1500 specimens collected in southeastern China

received from the Sun-Yatsen University in Canton, 870 specimens collected by Harry Smith in China, 644 specimens collected by M. S. Clemens in Indo-China and 162 by C. D. Squires also in Indo-China, 172 specimens collected by R. Marloth in Africa, about 250 specimens collected in Madagascar by H. Humbert, and 784 specimens from Australia mostly collected by C. T. White.

Besides the constant use of the herbarium by the staff in the determination of plants sent in for identification and in the working up of larger collections chiefly from North America and Eastern Asia, the facilities of the herbarium have been used by students in other departments of the University, as by Mr. W. N. Bangham, in regard to African plants and by Mr. F. M. Salvoza in a monographic study of the genus Rhizophora; also by Dr. J. T. P. Byhouwer in a revision of the Roses of Yunnan published in the Journal of the Arnold Arboretum (x. 84–107). For study outside the Arboretum 654 specimens have been loaned to sixteen institutions and individuals in this country and in Europe.

There have been distributed from the herbarium 17434 specimens to forty institutions in the United States and Canada, and in Europe, Australia and Africa. This is the largest distribution in the history of this institution.

The fruit collection which forms part of the herbarium and consists of dry fruits in boxes and in small jars and of fleshy fruits preserved in formalin solution and kept in small jars holding 8 oz. and in larger jars holding 32 oz. of fluid, comprises now approximately 6900 numbers. A large number of the fruits correspond to herbarium specimens of the same collection.

For a number of years miscellaneous wood specimens have been accumulating, but not until this year had a beginning been made to organize and arrange these specimens. Up to now about 1500 specimens have been properly labeled and arranged in systematic order in cases and are thus made easily accessible. Of many of the specimens, particularly of those collected in the Arboretum, in Cuba by Professor J. G. Jack, in Arizona by Mrs. S. D. McKelvey, and in the southern states by Mr. E. J. Palmer, there are corresponding herbarium specimens collected from the same trees. Besides this collection of miscellaneous woods the Arboretum has the Jesup Collection of North American Woods, which is a duplicate of the collection in the New York Museum of Natural History and contains more than 400 large museum specimens, also a collection of more than 1250 small specimens of American woods, duplicates of the material on which the Report on the woods of the United States published in the Report of the Tenth Census was based. There are also several smaller special collections of woods of certain countries amounting to 522 specimens.

Botanical explorations partly or wholly financed by this institution

have been carried on in different parts of the world, the most important being those in Madagascar and in the New Hebrides mentioned already in last year's report as having started. Dr. H. Humbert and Dr. Charles F. Swingle arrived in Madagascar on July 1, 1928 and collected for the first three months in southern Madagascar. In the beginning of October Dr. Swingle left Madagascar to return to Washington taking with him the living plants collected for the Department of Agriculture. Dr. Humbert continued to collect in Madagascar working northward and then crossed over to the continent to collect in the mountains of East Africa with the intention to make a comparison of the flora of Madagascar with that of East Africa; he intended to return to Algiers some time during the summer. In Madagascar he collected about 3000 numbers with many duplicates. Mr. S. F. Kajewski collected in the New Hebrides and Santa Cruz Islands from February 1928 to April 1929, when he returned to Australia to recuperate from an attack of fever he contracted in the humid climate of the New Hebrides; he is now collecting on the Atherton Tableland in North Queensland and is expected to return at the end of this year to the New Hebrides or the Solomon Islands. Mr. W. P. Fang returned in the autumn of 1928 from his collecting tour to western China already mentioned in last year's report; he collected up to 4000 numbers with many duplicates. In Australia Mr. C. T. White continued his explorations of the Queensland flora in which this institution participates. Assistant Professor J. G. Jack spent again several months, from November to the middle of December 1928 and from February to April 1929, in Cuba continuing the botanical exploration of the region near the Harvard Tropical Garden at Soledad. Mr. E. J. Palmer collected from the beginning of April to the beginning of July at first in the southeastern states and then in northern Missouri, Iowa, and in the Black Hills of South Dakota, paying special attention to the genus Crataegus, to the study of which he will devote most of his time in the near future. Mr. A. Rehder, from the middle of July to the middle of October 1928, visited various botanical institutions in Europe chiefly for the purpose of studying and photographing type specimens of plants of Eastern Asia; most of the time he spent in Edinburgh in the study of the Léveillé herbarium, in Leningrad where he studied critical material from Eastern Asia and secured a considerable amount of duplicates of Turkestan plants and in Upsala where he looked through the Thunberg herbarium.—A. R.

The Library.—Additions to the Library during the past year include 698 volumes, 275 pamphlets and 1,033 photographs, giving a total of 38,435 bound volumes, 9,214 pamphlets and 14,782 photographs, together with unbound volumes to the number of about 200, which have not been, and many of which perhaps cannot be completed.

The periodicals now number approximately 385, nearly 40 new ones having been added since our last report. These new periodicals come

chiefly as exchanges for Arboretum publications and herbarium material and include several from Czechoslovakia, Russia, China, Japan, and Ukraine, and from Bulgaria, Poland, Uzbekistan and Turkestan. The Bussey Institution transferred to the Arboretum Library 40 volumes of gardening periodicals. The largest single purchases were Tectona, 20 vols., 1908–1927 and Annali di botanica, vol. 13–18, 1915–1928.

Nearly 2,000 cards have been filed in the catalogue of books and an equal number of slips for the supplement to the printed catalogue; 1500 cards were filed in the catalogue of photographs, 653 cards for plates representing type specimens, prints of which are mounted in the Herbarium, and 4600 in the "Card-index of new genera, species and varieties of North and South American plants" published by the Gray Herbarium. There have been added to the manuscript "Index of illustrations and of new genera, species and varieties of ligneous plants since 1915" prepared at the Arboretum 3,324 cards making the present total 83,097.

Nearly 600 books have been bound including periodicals, and about 1,000 titles and 1,033 photographs catalogued.

Two stacks have been set up to hold pamphlets, and two steel sections added to relieve congestion among the books.

About 200 volumes and pamphlets have been received as gifts.

The most important accessions of the year are:—

WALCOTT, MARY V. North American wild flowers. Vol. 4. 1925.—Set of beautiful colored plates. Gift of Mrs. L. A. Frothingham in addition to the three earlier volumes presented by her.

MCKELVEY, Mrs. Susan D. The Lilac. 1928.—A monumental monograph, illustrated with 172 half-tone plates and 4 color charts. A large part of Mrs. McKelvey's work was done at the Arboretum and the book bears the touching dedication To "The Professor." Gift of the author.

AMES, Oakes. Orchidaceae. 7 vol. 1905–22.—Gift of the author.

AMERICAN Magazine. 1834.—Gift of the Library of the Department of agriculture.

GAUTHEROT, C. Specimen of British trees and woods. [187–?] 46 plates.—Each plate consists of an herbarium specimen and a section of wood. Gift of Professor Oakes Ames.

DIGBY, Kenelme. Dissertatio de plantarum vegetatione. 1663.

HU, H. H. A preliminary survey of the forest. Nanking. 1926.—Gift of the author.

LIU, J. C. Enumeration of plants collected in Chefoo.—Gift of Peking Union Medical College.

PILLEMENT, V., fils. Etudes de paysages, dessinées et gravées. Livr. 7. 1819. Fragment.—Gift of Professor Oakes Ames.

WILSON, E. H. China, mother of gardens. [1929.]—Gift of the author.

ANDERSON, John. A report on the expedition to western Yunnan. 1871.

Bryk, Felix. Linnaeus im Auslande. [With] Nachtrag, 1919–21.

Jacquin, N. J. Genitalia Asclepiadearum controversa. 1811.—Gift of Massachusetts Institute of Technology.

Haworth, A. H. Observations on the genus Mesembryanthemum. 1794.—Gift of Massachusetts Institute of Technology.

Haworth, A. H. Saxifragearum enumeratio. 1821.—Gift of Massachusetts Institute of Technology.

A large number of pamphlets and parts of periodicals were collected by Mr. Alfred Rehder during his travels last summer in Russia and Scandinavia, and several Latvian works were received from Dr. Karl Starcs in exchange for herbarium specimens.

Among the photographs added are 11 of Arizona cacti and palms from Professor Oakes Ames; Arizona cacti and Yucca from Mrs. S. D. McKelvey; 100 taken at Harvard Tropical Gardens at Cuba by Mr. Alfred Rehder; 50 miscellaneous photographs, a gift from Agassiz Museum; 100 taken by Mr. Joh. Mattfeld in Turkey and Bulgaria and 35 from Mr. J. H. Lovell. About 25 of the photographs taken in Africa in 1923 by Mrs. A. G. Curtis have been identified by Mr. W. N. Bangham and filed in the collection.

One large steel cabinet has been added for the large photographs.

Photographic negatives number at present more than 6500 including 1203 of type specimens. Of the type specimens 500 were made by Mr. Rehder in Edinburgh, Upsala and Leningrad during the summer of 1928. To make the negatives available seven five drawer steel cabinets have been purchased and the task of arranging them in suitable order completed.

The number of books loaned was 166, or 66 more than last year, a large proportion having been used for commercial purposes, testifying to the very practical help the Library is able to give.

There is a constantly increasing demand upon the Library for books, photographs, photostat copies of missing pages and information. During the year about 100 photographs have been sold and both books and photographs used to a large extent in the building by students and research workers from Holland, Philippines and from various parts of the United States.—E. M. T.

Staff of the Arnold Arboretum, 1929–30

Oakes Ames, A.M., Professor of Botany, Supervisor.
Ernest Henry Wilson, A.M., Keeper.
John George Jack, Assistant Professor of Dendrology
Alfred Rehder, A.M., Curator of the Herbarium
Joseph Horace Faull, Ph.D., Professor of Forest Pathology
Karl Sax, Sc.D., Associate Professor of Cytology
Ernest Jesse Palmer, Collector & Assistant in the Herbarium
Clarence Emmeren Kobuski, Ph.D., Assistant in the Herbarium
Ethelyn Maria Tucker, Librarian
Ethel Antoinette Anderson, Business Secretary
Elizabeth Dean Bennett, A.B., Assistant in the Library
Louis Victor Schmitt, Superintendent
William Henry Judd, Propagator

ERRATA

Page 43, line 13 for 32112 read 32115
" 69, line 9 from below *for* Mant. *read* Mant. II
" 71, line 4 from below *for* canowang *read* the cassowary
" 77, line 5 for R. MARKGRAF read FR. MARKGRAF
" 84, line 8 for T. MARKGRAF read FR. MARKGRAF
" 137, line 9 *for* Laloki *read* Loloki
" " , line 10 *for* Redscan *read* Redscar
" " , line 8 from below *for* Laloki *read* Loloki
" " , line 4 from below *for* Murna *read* Murua
" " , line 1 from below *for* Thur *read* Ihu
" 138, line 25 *for* Hokora *read* Hohora
" " , line 10 from below *for* Thur *read* Ihu
" 140, line 17 from below *for* Kiva *read* Kira
" " , line 16 from below *for* slow *read* low
" 143, line 24 *for* Kuranin *read* Kuraudi
" " , line 8 from below *for* Lotoki *read* Loloki
" " , line 7 from below *for* Kurandi *read* Kuraudi
" 144, line 22 *for* Kappa Kappa *read* Kapa Kapa
" " , line 9 from below *for* Lotoki *read* Loloki
" 146, line 5 from below *for* Lotoki *read* Loloki
" 147, line 26 *for* Keura *read* Keuru
" " , line 12 from below *for* Lotoki *read* Loloki
" 152, line 11 from below *for* Numa *read* U-uma
" 175, line 11 from below *for* Iwarere *read* Iawarere
" 177, line 22 *for* Basiatabu *read* Bisiatabu
" 178, line 1 *for* Laloki *read* Loloki
" " , line 20 *for* Laloki *read* Loloki
" 179, line 20 *for* U-ume *read* U-uma
" " , line 8 from below *for* Ibelva *read* Hewa
" 185, replace lines 12–25 by the following:

Polygonum Statice Léveillé in Fedde, Rep. Spec. Nov. VII. 338 (1909); Fl. Kouy-Tchéou, 321 (1915).—Samuelsson in Handel-Mazzetti, Symbol. Sin. VII. 186 (1929).

CHINA. K w e i c h o u: without locality, *J. Esquirol*, no. 164 (type; ex Léveillé).

This is according to Dr. Samuelsson in litt. a distinct species related to *P. urophyllum* Franch. & Bur.

Polygonum multiflorum Thunberg, Fl. Jap. 169 (1784).

One specimen named *P. Statice* by Léveillé, but not identical with his type; according to Dr. Samuelsson in litt.[1]).

[1] The identification of *P. Statice* with *P. multiflorum* on p. 185 was based on a list received from Edinburgh and containing Dr. Samuelsson's determinations of the species of *Polygonum* in Léveillé's Herbarium; in this list *P. Statice* Lévl. was enumerated as identical with *P. multiflorum* Thbg. As Dr. Samuelsson wrote me in a recent letter, this identification did not refer to typical *P. Statice* Lévl., which he considers a distinct species, but to an additional specimen named *P. Statice* in Léveillé's herbarium, but not representing typical *P. Statice*.

INDEX

Synonyms are printed in *italics;* new names in **bold-face** type.