MISCELLANEOUS.

(Names of Donors are in *Italics*.)

Chambers, E., F.R.S.—Cyclopœdia: or an Universal Dictionary of Arts and Sciences, 4 vols. Folio, London, 1786. *Hon. Sec. F. B. Kyngdon.*

Lockwood, Prof. Samuel, Ph.D.—Raising Diatoms in the Laboratory. *The Author.*

"*The Illustrated Sydney News,*" Vol. XXIV., No. 10, October 15th, 1887. *The Proprietors, Sydney.*

"*The South Australian Register,*" 5 October, 1887, containing Report of the Annual Meeting of the Royal Society of South Australia, 4 Oct., 1887. *R. T. Hall.*

"*Trübner's American, European, and Oriental Literary Record,*" New Series, Vol. VIII., No. 3, 1887. *The Proprietors.*

Warren, Professor W. H., M.I.C.E.—The Strength and Elasticity of New South Wales Timbers of Commercial Value. *The Author*

SOME NEW SOUTH WALES TAN-SUBSTANCES.

PART IV.—*Leaves only.*

By J. H. MAIDEN, F.R.G.S., Curator of the Technological Museum, Sydney.

[*Read before the Royal Society of N.S.W., December 7, 1887.*]

NOTES—(Third Supplement).

1. It has been quite an oversight on my part that I have omitted to state that all the determinations of tannic acid detailed by me in the present (1887) Journal of this Society, have been made by Fleck's process. The tannate of copper has in all cases been reduced to cupric oxide, and Eeler's factor (1·3061) has been employed to calculate the tannic acid. Fleck's acetate of copper and ammonium carbonate process has been frequently used by me during the last few years with very satisfactory results. Even Procter, who has subjected the various processes for the estimation of tannin, to as rigid a scrutiny as any chemist with whose writings I am acquainted, does not impugn the accuracy of the method, so far as I am aware. Being a gravimetric process it is tedious, but considerations of this nature have had no weight with

me in the present series of experiments. Nevertheless, as the improved process of Löwenthal is rapidly superseding all others (at least on the continent of Europe), I will probably use it exclusively in future, in any future experiments I may be permitted to bring under the notice of our Society.

2. I began by treating the leaves with benzene in an exhauster, similar in principle to that described by J. West-Knights (*Analyst* viii., 65), but comparative experiments between fresh leaves, and leaves thus treated, showed me that the oil present did not perceptibly affect the determinations of tannic acid by the process adopted.

3. There is likely to be greater differences between analyses of leaves than of barks, inasmuch as the life of a leaf is much less than the bark of a tree, and so all the stages from the state in which it consists almost entirely of cellular matter to that in which it contains its maximum of fibre, and (usually) minimum of active principles, are passed through in a comparatively short space of time.

4. The amount of tannin in some of the determinations may appear high, but it must be borne in mind that the moisture in leaves is comparatively great, and that these determinations have, as usual, been calculated on the leaves thoroughly dried at 100° C.

5. A convenient way of preparing the leaves for experiment is to put them on a board and cut them in small portions by *pressing* the sharp blade of a tomahawk over them. The fragments are then passed through a small mill.

6. The leaves and petioles *only* have been taken in each case, all other portions of the twigs having been removed.

7. The state of the leaves has been noted. Owing to the dampness of the weather, in some instances, the collector was not always successful in drying them in a satisfactory manner.

8. The measurements of the leaves have been determined in the following way. Twenty average leaves of each species have each been measured with a millimetre rule, the greatest length (including petiole), and breadth taken, and the mean calculated. Mr. G. S. Home, my assistant, has been kind enough to do this for me.

9. In each case I have attached a physical description of the leaf, the minute description of the Eucalypts being from the "Eucalyptographia" of Baron Mueller, while the less detailed descriptions of *Eucalyptus* and *Acacia* are from the "Flora Australiensis." In the "Eucalyptographia" the Baron takes cognizance of the (a) shape, (b) colour, (c) lateral veins, (d) circumferential vein—(the intermarginal vein of Bentham), (e) oil dots; and although these characteristics are of course not sufficient for a diagnosis of a species, yet they are valuable aids

and will be more thoroughly studied as Eucalyptus leaves increasingly enter into commerce. Where a leaf under examination presents a difference from the published description, that difference has been pointed out.

10. According to Watts' Dict: Chevreul discovered a yellow colouring matter in Sumach, which separates from a concentrated decoction on cooling, in small crystalline grains. I have been unsuccessful, up to the present, in tracing the original memoir, but the yellow colouring matter before you, has been deposited from Eucalyptus leaves in a similar manner to that of the yellow pigment of Chevreul obtained from Sumach. Of those species, I have up to the present examined, *E. maculata* contains a small quantity, but *E. macrorrhyncha* contains it in abundance. In boiling the leaves with a limited quantity of water, the greater part of the tannic acid is dissolved out, and but little colouring matter. Prolonged boiling with a second water extracts the colouring matter freely. This is but a preliminary note, for the substance is of such great interest, and, probably, of commercial importance, that I am subjecting it to careful examination from the point of view both of the chemist and colourist.

Tannic Acid in Leaves—Preliminary notes.

1. Allusions to the tannin of leaves (with the exceedingly important exception of Sumach) in text-books and the proceedings of societies, are of the rarest occurrence. I have therefore considered it convenient to present a few notes which I have come across, on the leaves of such plants as have been examined for tannic acid. It will be interesting to compare these results with those of the few New South Wales species referred to in the present paper. Leaves as a rule are solely valued as a manure, and hence the frequent determinations of the ash of them, *e.g.*, Gueymard (Comptes Rendus, lix., 989).

2. Tannin (Tannic acid) is found more constantly in cells presenting a low degree of vital activity, as those of the wood and bark ; and that of early decaying excrescences, as galls : but still it is found in many leaves, as those of the tea-plant, and of the *Ericaceæ ;* but here, perhaps, it only occurs in the bundles of vessels, or less actively vital cells of the leaf. (Princip. of Scientific Botany, Schleiden, 1849).

(A.) *Tannic Acid in Leaves not Australian.*

1. Although I cannot find it specifically stated that the leaves of any Indian Acacia are used in tanning, yet the astringent properties of the leaves of some species cause them to be used in medicine. The leaves of *A. arabica*, for instance, are used in India as an astringent and stimulant application to ulcers attended

with sanious discharge. They are also used in mucous discharges. Poultices made of the young tender leaves are usually employed by the native practitioners.

2. *Acacia Cebil*, Grisebach, (Leguminosæ), the red Cebil of the Argentine Republic, contains 6 – 7 per cent. in the leaves. Another variety, the white Cebil, contains 7 – 8 per cent. in the leaves.

3. In the Argentine Republic the leaves of *Acacia guarensis*, ? Grisebach, an Algarobillo, are used (as well as the bark and pods) for tanning. (F. Fol. *Moniteur industriel*, March 1879).

4. *Arbutus Unedo*, Linn., (Ericaceæ). The "Strawberry tree." Both the leaves and bark are used for tanning in Greece, while the bark alone is used for that purpose in Spain.

5. *Arctostaphylos Uva-ursi*, Wimm., (Ericaceæ), "Bearberry." The whole plant is used for tanning in Russia and Sweden, and the leaves also as an astringent in medicine, finding a place in the British Pharmacopœia. Meiphen found the leaves to contain no less than 36·4 per cent. of tannin.

6. *Comptonia asplenifolia*, Gaertn., (Myricaceæ), the "Sweet Fern" of the United States. Dr. McMurtrie found 9·42 per cent. of tannic acid in some leaves which were gathered at Boston, Mass.

7. *Coriaria myrtifolia*, Linn., (Coriariæ). These leaves are used for tanning in the South of France, but their principal use is in dyeing black. They form a very inferior Sumach.

8. *Cybistax antisyphilitica*, Mart., (Bignoniaceæ). (A plant with many synonyms). Its leaves called "Caroba leaves," are used in medicine. They contain ·439 per cent. of tannic acid according to Dr. Zaremba of Chicago. (Therap. Gazette, 1880, p. 34).

9. *Ephedra antisyphilitica*, C. A. Mey, (Gnetaceæ). Dr. McMurtrie found 11·9 per cent. of tannic acid in the leaves of this plant, which is found in the table-lands of Arizona and Utah.

10. *Osyris compressa*, DC., (Santalaceæ), 17 per cent. of tannin. This species is from the Cape of Good Hope, and a North Indian species is used as a substitute for tea. Although Riddell states that this plant came into use on account of the similarity in appearance of its leaves to those of the tea-plant, its astringency has doubtless confirmed its use.

11. *Polygonum amphibium*, Linn., (Polygonaceæ). The whole plant, from Nebraska, 11·6 per cent. of tannic acid. (McMurtrie) Dr. McMurtrie states—"The percentage of tannic acid found in these leaves is very much below that found by Professor Samuel Aughey of the University of Nebraska. The sample we examined had been collected over a year, and was the best we could obtain." This plant is common enough in Europe, and other species are more or less astringent.

12. *Quercus sp.* In 1768 Lavoisier used oak-leaves, but their general employment was restricted by their strength for tanning

varying with the period of the year, and the variety of the tree whence they where obtained, (Jour. Soc. Arts 1884). Leaves of different trees (oaks) exhibit considerable diversity in their yield of tannin. The tannin of the leaves is identical with the bark. Oser (Chem. Centr. 1875, 517) makes reference to the fact that the green leaves of the oak contain a considerable quantity of quercitanic acid, so that they would prove a good material for tanning purposes.

13. *Quercus tinctoria*, Willd., (Cupuliferæ). "Quercitron leaves." "Avec le quercitrin coexiste assez souvent le tannin, quelquefois l'acide gallique, matières qui ont avec lui ce caractère commun de donner une couleur brune avec les sels de fer. A côté du quercitrin ou en son absence, on trouve aussi la quercétine et la méline. (Bolley, Stein). Ces matières, quercitrin, tannin, acide gallique &c. . . . . ont une diffusion ou généralite d'existence très différente; le quercitrin est le plus répandu; le tannin l' est beaucoup moins; l' acide gallique est rare." (Chatin et Filhol, Comptes Rendus lvii., 39). Pendant la coloration automnale des feuilles, les matières qui colorent les sels de fer disparaissent, et leur destruction a lieu dans l' ordre suivant: quercitrin, tannin, acide gallique. Cet ordre de destruction est le même que celui de leur diffusion, qui est sans doute celui de leur importance physiologique." *(loc. cit.)*

14. *Fagus sylvatica*, Linn., (Amentiferæ). Beech leaves. The leaves were gathered in ? England on the 26th of each month, except November 7th. They yielded tannic acid per cent. :— June, 1·164; July, 1·804; August, 2·395; September, 2·93; October, 2·802; November, 3·576. (Journ. Chem. Soc., xxviii., 1279). Beech leaves gave 20·8 per cent. of extract to Wanklyn.

15. *Spirea tomentosa*, Linn., (Rosaceæ) of New England, U.S.A. Called "Hardhack." The leaves and young shoots are rich in tannin, and once in three years the plant is mowed, cured, and sold to the tanners at prices which afford a fair profit for the use of the land. (Monthly Reports of Depart. of Agric., Washington, 1873, p. 35).

16. *Tea.*—Chinese Green (Hyson) 17·8 per cent. Chinese Black (Congou) 12·88 per cent. Java Green (Hyson) 17·56 per cent. Java Black (Congou) 14·8 per cent. (Mulder in Watts' Dict.) Hassall gives 18·69 per cent. for green tea and 15·24 per cent. for black. S. Jauke, using the copper acetate process, finds, taking 18 samples of black tea, the maximum to be 9·142 per cent., the minimum 6·922 per cent., and the mean 8·1. Of three samples of green tea 9·94 the maximum, 8·56 the minimum, and 9·57 the mean. Wigner gives the percentage of tannic acid in some astringent teas he examined at from 27·7 to 42·3. Hill (Analyst, 1881, p. 95 – 99) gives 14·8 per cent. as the average of 32 samples of black and green tea.

17. Stenhouse in Watts' Dict. i., 1075, gives the percentage of tannic acid in coffee-berries at 3 – 5, and states that it exists in combination with calcium and magnesium. "They also appear to contain a larger proportion of caffetannic acid than the beans; the proportion of matter extracted by water was 38·8 per cent."

18. *Ilex paraguayensis*, St. Hil. (Aquifoliaceæ). "Maté or Paraguay tea" contains "little more than 6 per cent. of tannic acid."

(B.) *Tannic Acid in Australian Leaves.*

1. Leaves of the following Australian plants have already been examined by me with respect to their tanning properties:—*Rhus rhodanthema*, F.v.M., page 185; *Eremophila longifolia*, F.v.M., page 199; *Polygonum plebejum*, R. Br., p. 200.

2. In addition to those noted under the species described in this paper, the following notes on tannic acid in leaves of Australian plants will be useful:—*Eucalyptus cosmophylla*, F.v.M.—"The ordinarily dry leaves gave 13 per cent. of tannin according to a solitary experiment; equal to nearly 15 per cent. in absolutely dry leaves." Decade 7 "Eucalyptographia," (Mueller).

3. *E. doratoxylon*, F.v.M., 7·01 per cent. in the dried leaves. (Dec. 4, "Eucalyptographia.")

4. "The leaves of *E. leucoxylon* have yielded us here from dry material 9½ per cent. of Eucalypto-tannin, whereas the dry foliage of *Acacia pycnantha* furnished as much as 15 – 16 per cent. of Mimosa-tannic acid, and therefore still more approaches in its richdom of tan-principle to the genuine Sumach-leaves of *Rhus coriaria*. Our experiments here showed that about four weeks were required to effect the tanning of cow-hides (which were used on this occasion) by simple immersion in the tan-liquor, as obtained by decoction, without any additions of other substances, whether leaves or bark were employed, except in the case of *E. Gunnii*, the tanning process with that species being completed in two weeks, and with *E. goniocalyx* in three weeks. The leather obtained from leaves of *E. leucoxylon* was grey-brown, hard and tough; that from the bark of *E. Gunnii*, light brown and rather flexible; that from bark of *E. viminalis*, *E. goniocalyx*, and *E. amygdalina* reddish-brown and tough; that from the bark of *E. macrorrhyncha* and *E. melliodora* darker still than that of the preceding three; that from the bark of *E. obliqua* red-brown in colour." (Dec. 7, "Eucalyptographia.")

5. It will here be convenient to present the results of the determinations of tan and extract in the present paper, in tabular form, in order of tanning power and quantity of extractive matter. Similar tables (compiled from my former papers read before the Society) are also given in regard to such barks as were obtained from the trees which yielded the leaves described in the present paper:—

TABLE I.—LEAVES.

No.	Species.	Percentage of Extract.
1	E. melliodora	49·8
2	E. hæmastoma	47·19
3	E. amygdalina (Bombala)	44·24
4	E. Stuartiana	42·74
5	E. stellulata	42·14
6	E. obliqua	41·13
7	E. Gunnii (Delegate)...	41·08
8	E. rostrata	40·8
9	E. Gunnii (Bombala)...	40·61
10	E. viminalis, var.	40·59
11	E. odorata, var.	40·19
12	E. macrorrhyncha	40·18
13	A. vestita	40·18
14	E. corymbosa	36·72
15	E. robusta	34·7
16	E. piperita, var.	34·08
17	E. Sieberiana	32·31
18	E. amygdalina (Nelligen)	32·13
19	A. glaucescens	30·96
20	E. polyanthemos	29·69
21	E. maculata	28·32
22	A. melanoxylon	23·22
23	E. siderophloia	22·93
24	A. longifolia	21·55

TABLE II.—LEAVES.

No.	Species.	Percentage of Tannic Acid.
1	E. corymbosa	18·377
2	E. obliqua	17·2
3	E. stellulata	16·62
4	E. Gunnii (Bombala)...	16·59
5	A. vestita	15·18
6	E. piperita, var.	12·59
7	E. robusta	12·069
8	E. hæmastoma...	11·27
9	E. Stuartiana	10·158
10	E. macrorrhyncha	10·13
11	E. amygdalina (Bombala)	8·75
12	E. Gunnii (Delegate)	8·28
13	E. melliodora	7·89
14	E. odorata, var.	6·775
15	E. rostrata	6·62
16	E. siderophloia	5·95
17	E. maculata	5·263
18	E. viminalis	3·998
19	A. melanoxylon	3·382
20	A. glaucescens	2·874
21	E. sieberiana	2·389
22	A. longifolia	1·932
23	E. polyanthemos	1·881
24	E. amygdalina (Nelligen)	1·815

TABLE III.—BARKS.

No.	Species.	Percentage of Extract.
1	A. vestita	50·82
2	A. longifolia	30·35
3	E. stellulata	27·64
4	A. melanoxylon	20·63
5	E. maculata	20·865
6	E. Gunnii (Bombala)...	10·84
7	E. Gunnii (Delegate)	19·4
8	E. viminalis	18·65
9	E. Stuartiana	15·39
10	A. glaucescens...	14·29
11	E. siderophloia...	14·2
12	E. corymbosa	12·16

TABLE IV.—BARKS.

No.	Species.	Percentage of Tannic Acid.
1	A. vestita	27·96
2	A. longifolia	18·93
3	E. stellulata	12·86
4	E. Gunnii (Bombala)...	11·35
5	A. melanoxylon	11·12
6	E. maculata	9·74
7	E. Gunnii (Delegate)...	9·45
8	A. glaucescens...	8·10
9	E. viminalis	7·504
10	E. siderophloia...	6·702
11	E. corymbosa	5·85
12	E. Stuartiana	5·25

It will be observed that the percentage of tannic acid in the Eucalyptus leaves examined, varies between 1·815 and 18·377 per cent., and in Acacia leaves between 1·932 and 3·382 per cent., with the exceptional instance of *A. vestita*, (15·18 per cent.), which forms a notable exception to the general poverty of Acacia *leaves* as regards tannin. It has been previously noted that Baron Mueller and Mr. Rummel found between 15 and 16 per cent. of tannic acid in the leaves of *Acacia pycnantha;* these two Acacias therefore agree very closely in wealth of tanning power. But Wattle (Acacia) leaves are as a rule of no value to the tanner, and likewise many species of gum (Eucalyptus) leaves which, although richer, are still not of much value. Yet although in these researches I have scarcely crossed the threshold of the subject, I think I have shown that some leaves are worth conserving, and the intelligent farmer herein should receive an additional stimulus to acquire the names of the trees upon his property. The percentage

of extract in the leaves of the Acacias examined varies between 21·55 and 40·18 per cent., and of Eucalypts between 22·93 and 49·8 per cent. In the barks (Tables 3 and 4) there is a fair agreement in numerical order between extracts and tans; in the case of the leaves (Tables 1 and 2), I fail to find any such relation. Also, in the barks the percentage of tannin is roughly about one-half that of the extract; no such proportion (or in fact *any* that I can detect), occurs in the case of the leaves.

6. Count Maillard de Marafy has suggested that the leaves of *E. globulus* can be utilized as a substitute for sumach ("L'Eucalyptus, nouvel emploi industriel). I have not access to the original memoir, but the following passage, not so full as could be desired, will be found, *Pharm. Journ.*, [3] iii., 43 :—"Leaves of *E. globulus*, taken from a plantation near Alexandria, and pulverized like Sumach, when used upon cotton and wool in the same proportion as the best Sicilian Sumach, gave an intense black that left nothing to be desired." The process alluded to is the usual one with lime water and copperas (Sulphate of iron). Of course if the value of the leaves for producing a black dye in this way be proved, their value as a tan-substance is proved likewise. As the result of my experiments I am impressed with the general similarity of the behaviour of Eucalyptus leaves to Sumach. They are inferior in tanning power of course to the latter, but as they will doubtless yield light-coloured leather, and as they are so exceeding abundant, they should not be beneath the notice of an enterprising tanner to perform systematic experiments with them. At least *E. corymbosa*, *E. obliqua*, *E. stellulata*, and *E. Gunnii*, are worthy of attention on account of their high yield of tannin, and subsequent researches will doubtless augment the list. I have not yet analysed the leaves of *E. globulus*, but I must confess that although I commenced this paper not seriously thinking that the leaves of any Eucalypt were worthy to be ranked with Sumach, I have now come to the conclusion that the Comte de Marafy's remark was not an unjustifiable one.

7. I would throw out the suggestion that the residue left after the distillation of oil from Eucalyptus leaves might be used for tanning purposes.

55. Acacia vestita, *Ker*, N.O. Leguminosæ, B. Fl. ii., 375.

Found in Southern New South Wales and Northern Victoria.

Locality whence this particular specimen was obtained—Quiedong, near Bombala.

Geological Formation—Limestone.

Part of Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 20 to 30 feet, diameter 10 to 18 inches.
Collected 9th April, 1887. Analysed 11th to 17th November, 1887.

Phyllodia obliquely ovate elliptical, more or less recurved falcate, undulate, mostly about ½ inch long, with a fine, but not pungent point, cuneate at the base, 1-nerved. (B. Fl.) Each phyllode is softly pubescent. The shrub from which these leaves (phyllodia) were taken, contained abundance of quarter-grown flower-buds. These leaves were scarcely discoloured in drying. Average length 15·45 mm., average breadth 5·4 mm. Colour of the powdered leaves, sage-green.

Extract.—They dissolve in water at 100° C. to the extent of 40·18 per cent., yielding a solution of a ruby colour (like *A. melanoxylon*). The extract clogs the filter, making the operation exceptionally difficult.* Colour of moist residue, light brown with a greenish tinge.

Catechu-tannic acid.—15·18 per cent.

56. Acacia melanoxylon, *R. Br.*, N.O. Leguminosæ, B. Fl. ii., 388. Figured Tab. 1659 Curtis' Bot. Mag.
Found in all the Colonies except Queensland and Western Australia.
Vernacular Names—"Blackwood." "Lightwood."
Locality whence this particular specimen was obtained—Monga, near Braidwood.
Geological Formation—Granite.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 40 to 60 feet, diameter 1 foot.
Collected 28th September, 1886. Analysed 11th to 17th November, 1887.

These leaves (phyllodia) have lost much of their original greenness in drying, their prevailing colour being brownish. The branchlets contain a few half-opened flower-buds.† Phyllodia falcate-oblong or almost lanceolate, 3 to 4 inches long, the common varieties ½ to 1 inch broad, obtuse or rarely almost acute, much narrowed towards the base, coriaceous, with several longitudinal nerves and numerous anastomosing veins. (B. Fl.) Average

* A similar observation was made in regard to the bark of this species at p. 89.

† These were of course removed for the purpose of the experiments See p. 251.

length 94 mm., average breadth 4·75 mm. They form a powder of a dirty sage-green tint.

Extract.—They dissolve in water to the extent of 23·22 per cent., yielding a solution of a light ruby colour; colour of moist residue light brown.

Catechu-tannic acid—3·382 per cent.

57. ACACIA LONGIFOLIA, *Willd.*, N.O. Leguminosæ, B. Fl. ii., 397. Figured in Part 6 Brown's "Forest Flora of S.A." and Tab. 1828 Curtis' Bot. Mag.
Found in all the Colonies except Western Australia.
Vernacular Name—"Golden Wattle."
Locality whence this particular specimen was obtained—Cambewarra.
Geological Formation—Sandstone.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 12 to 15 feet, diameter 4 to 6 inches.
Collected 20th August, 1886. Analysed 12th to 17th November, 1887.

Phyllodia from broadly oblong to oblong-lanceolate or linear, very obtuse or almost acuminate, usually narrowed towards the base, with 2 to 5 more or less prominent longitudinal nerves, and conspicuously or faintly reticulate between them, varying in length from 2 to 3 inches in some varieties, to 5 or 6 inches in others. (B. Fl.) This wattle was in flower when the leaves (phyllodia) were taken. Average length 159·25 mm., average breadth 9 mm. These leaves have lost much of their fresh appearance in drying. In powder they afford a sage-green tint rather darker than that of *A. melanoxylon.*

Extract.—They dissolve in water to the extent of 21·55 per cent., yielding a solution of a dark orange colour, and a moist residue of different shades of brown. The extract of these leaves is very difficult to filter.

Catechu-tannic acid—1·932 per cent.

58. ACACIA GLAUCESCENS, *Willd.*, N.O. Leguminosæ, B. Fl. ii., 406.
Found in Victoria, New South Wales, and Queensland.
Vernacular Name—"Myall."
Locality whence these particular specimens were obtained—Quiedong, near Bombala.
Geological Formation—Limestone.
Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 20 to 25 feet, diameter 6 to 12 inches.

Collected 8th April, 1887. Analysed 12th to 21st November, 1887.

Phyllodia oblong-falcate or lanceolate, narrowed at both ends, mostly 4 to 6 inches long, ½ to near 1 inch broad in the middle, coriaceous, striate, with numerous very fine nerves, 3 to 5 rather more prominent, the smaller ones occasionally anastomosing, and all free from the lower margin from the base. (B.Fl.) This wattle was in bud (flower) when collected. Average length 62.25 mm., average breadth 7.8 mm. The uncrushed foliage has a beautiful silvery appearance. It yields a powder of a dark pea-green colour.

Extract.—Yields 30.96 per cent. to water at 100°. Colour of extract light lemon, of moist residue light brown. Extract difficult to filter.

Catechu-tannic acid—2·874 per cent.

59. EUCALYPTUS STELLULATA, *Sieb.*, N.O. Myrtaceæ, B. Fl. iii., 200. Figure Dec. 6, "Eucalyptographia."

Found in Victoria and New South Wales.

Vernacular Name—"Sally" or "Black Gum."

Locality whence this particular specimen was obtained—Little River, near Braidwood.

Geological Formation—Granite.

Parts of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 40 to 60 feet, diameter 1 to 2 feet.

Collected 5th November,, 1886. Analysed 24th October to 28th November, 1887.

Leaves scattered, on rather short stalks, from oval- to narrow-lanceolar or rarely linear-lanceolar, of firm consistence, hardly inequilateral, not much elongated, shining and of equal colour on both sides ; primary *veins almost longitudinal*, mostly prominent, three of them arising almost jointly from near the acute base of the leaf, the circumferential vein removed from the edge ; oil-dots much concealed or quite obliterated. (Eucalyptographia).

Leaves elliptical, lanceolate, or the lower ones ovate, rarely much above 3 inches long, usually straight or nearly so, acuminate and much narrowed towards the base, the veins very oblique and anastomosing, a few of the principal ones prominent, starting from near the base, and almost parallel to the midrib. (B. Fl.)

In these specimens the leaves are more or less falcate, and the circumferential vein *close to* the edge. Average length 116·4 mm.,

average breadth 19·25 mm. These leaves were evidently collected damp, for they have not dried green. They yield a pale dirty-brown powder.

Extract.—Yield 42·14 per cent. to water at 100° C. Colour of extract ruby, of moist residue reddish-brown.

Kino-tannic acid—16·62 per cent.

60. EUCALYPTUS SIEBERIANA, *F.v.M.*, (*E. virgata*, Sieb., B. Fl. iii., 202). N.O. Myrtaceæ. Figure Dec. 2 "Eucalyptographia."

Found in all the Colonies except Queensland and Western Australia.

Vernacular Name—"Cabbage Gum."

Locality whence these particular specimens were obtained—Monga, near Braidwood.

Geological Formation—Granite.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 1 to 2 feet.

Collected 28th September, 1887. Analysed 11th to 21st November, 1887.

Leaves scattered, sickle-shaped lanceolar, shining and nearly of equal colour on both sides, more or less transparently dotted; *their lateral veins more longitudinal than transverse and faint*, the intramarginal vein somewhat removed from the edge or evanescent. (Eucalyptographia).

Leaves lanceolate, usually narrow falcate and acuminate, 4 to 6 inches long or sometimes longer, thick and shining, with the veins more oblique than in *E. obliqua* . . . and often very indistinct. (B. Fl.)

The present are large coriaceous leaves more or less spotted through insect punctures and evidently from a well-matured tree. Average length 153·5 mm., average breadth 26·6 mm. Yield a pale green powder of a yellowish tint, containing a fair quantity of a fine fibre.

Extract.—They yield 32·31 per cent. to water at 100° C. Colour of extract lemon, and of moist residue dirty yellowish-brown.

Kino-tannic acid—2·389 per cent.

61. EUCALYPTUS AMYGDALINA, *Labill.*, var., N.O. Myrtaceæ, B. Fl. iii., 202. Figure Dec. 5, "Eucalyptographia," and Tab. 3260, Curtis' Bot. Mag.

This particular variety is found in South-east Australia.

Vernacular Name—" Ribbon Gum."
Locality whence this particular specimen was obtained—Nelligen, Clyde River.
Geological Formation—Granite.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 100 to 120 feet, diameter 2½ feet.
Collected 21st September, 1886. Analysed 24th October to 24th November, 1887.

Leaves on rather short stalks, scattered or rarely opposite, narrow- or sickle-shaped-lanceolar or very narrow, usually attenuated into an acute but oblique base, generally not of thick consistence, mostly of a saturated green and somewhat shining on both sides ; *lateral veins very thin, not much spreading*, nor closely approximated, the circumferential vein remote from the edge of the leaf ; *oil-dots very copious transparent.* (Eucalyptographia.)

Leaves from linear to broadly lanceolate, straight or falcate, mostly acuminate and 2 to 4 inches long, when narrow rather thin, when broad thicker, the veins few and oblique but often inconspicuous, the intra-marginal one at a distance from the edge, or rarely near to it. (B. Fl.)

These leaves are tapering linear, slightly falcate, very thin, and with very prominent midrid. Many of them are slightly spotted through insect punctures. Oil dots inconspicuous.

Average length 127·8 mm., average breadth 10·6 mm. They yield an olive-brown powder.

Extract.—Yield 32·13 per cent. to water at 100° C. Colour of extract dark lemon, of moist residue, brown.

Kino-tannic acid—1·815 per cent.

For a note on leather made from the leaves of the same species see p. 255.

The collector observed, " the leaves of this species ought to be rich in oil," before he knew the species. They are very fragrant yet. This species yields much of the " Eucalyptus globulus " oil of commerce ; the specific name *globulus* adherring to ninety-nine hundredths of the Eucalyptus oil sold, in defiance of botanical science.

62. EUCALYPTUS AMYGDALINA, *Labill.*, var.
Vernacular Name—" Peppermint."
Locality whence this particular specimen was obtained—Bombala.
Geological Formation—Limestone.
Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 3 feet.

Collected 14th February, 1887. Analysed 24th October to 24th November, 1887.

These leaves are as different from the previous variety as it is possible for Eucalyptus leaves to be. They are lanceolate to nearly ovate, are slightly inequilateral, and have very prominent oil-dots. The tree was in flower-bud when they were gathered. They are deliciously aromatic, more so than the previous variety, but they have been better dried than those leaves. Average length 90·25 mm., average breadth 26·6 mm. They yield a greenish powder containing a certain excess of yellow,—"quaker green."

Extract.—They yield 44·24 per cent. to water at 100° C. Colour of extract light yellow, slightly turbid, and of moist residue dark drab.

Kino-tannic acid—8·75 per cent.

63. EUCALYPTUS OBLIQUA, *L'Hérit.*, N.O. Myrtaceæ, B. Fl., iii., 204. Figured in Brown's "Forest Flora of S.A." (Part i.), Dec. 3, "Eucalyptographia,"

Found in South Australia, Tasmania, Victoria, and New South Wales.

Vernacular Name—"Stringybark."

Locality whence these particular specimens were obtained—Cambewarra.

Geological Formation—Sandstone.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 60 to 80 feet; diameter 2 feet.

Collected 30th August, 1886. Analysed 12th to 17th November, 1887.

Leaves scattered, sickle-shaped or sometimes oval-lanceolar, equally green and shining on both sides; their *lateral veins not very spreading*, rather prominent, the circumferential vein rather removed from the edge, oil-dots concealed. (Eucalyptographia.)

Leaves in the usual form mostly oval-lanceolate, falcate and very oblique at the base, more or less acuminate, 4 to 6 inches long, thick with very oblique distant anastomosing veins, the intramarginal one at some distance from the edge. (B. Fl.)

Average length 159 mm., average breadth 35 mm. They yield a powder of a sage-green tint.

Extract.—They yield 41·13 per cent. to water at 100° C. Colour of extract ruby, and of moist residue light yellowish brown.

Kino-tannic acid—17·2 per cent.

64. EUCALYPTUS MACRORRHYNCHA, *F. v. M.*, N.O. Myrtaceæ, B. Fl., iii., 207. Figured Dec. 1, "Eucalyptographia."
Found in New South Wales and Victoria.
Vernacular Name—"Stringybark."
Locality whence this particular specimen was obtained—Delegate.
Geological Formation—Mudstone (Silurian).
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 2 to 3 feet.
Collected 12th May, 1887. Analysed 24th October to 28th November, 1887.

Leaves scattered, elongate or sickleshaped-lanceolar, rarely verging into an almost oval form, equally green on both sides, with very subtle much concealed oil-dots; their lateral veins moderately spreading, the intramarginal vein distinctly removed from the edge. (Eucalyptographia.)

Leaves mostly falcate, rather narrow and acuminate, 3 to 5 inches long, the lower ones broader, thick and coriaceous, the very oblique rather distant veins prominent. (B. Fl.)

Average length 91·8 mm., average breadth 35·5 mm. They yield a powder of a Brunswick green colour, On account of the large quantity of oil they contain they clog the mill a good deal.

Extract.—They yield 40·18 per cent. to water at 100° C. Colour of extract same as that of *E. amygdalina* (Nelligen), with yellow deposit on cooling; and of moist residue light olive-brown.

Kino-tannic acid—10·13 per cent.

65. EUCALYPTUS PIPERITA, *Smith*, var., N.O. Myrtaceæ, B. Fl. iii., 207. Figured Dec. 3, "Eucalyptographia."
Found in Victoria and New South Wales.
Vernacular Names—"Messmate," "Narrow or Almond-leaved Stringybark."*
Locality whence these particular specimens were obtained—Brooman, Clyde River.
Geological Formation—Granite.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 100 to 120 feet, diameter 2 to 3 feet.
Collected 14th September, 1886. Analysed 31st October to 24th November, 1887.

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* This tree much resembles *E. obliqua*, the ordinary Stringybark, but the leaves are narrower, the bark not so stringy; it is also much richer in kino.

Leaves scattered, sickle-shaped lanceolar, not very long, rather more shining above than below ; their lateral *veins very subtle* and numerous, usually more erect than transverse, the circumferential vein somewhat removed from the margin of the leaf; oil-dots copious, more or less pellucid. (Eucalyptographia).

Leaves from ovate-lanceolate and very oblique to lanceolate and nearly straight, rarely above 1 inch long, rather thick and rigid, the veins very oblique, almost as in *E. obliqua*, but usually fine and less conspicuous, and more numerous, especially in the narrower leaves. (B. Fl.)

Average length 154·8 mm., average breadth 30·2 mm. Colour of powdered leaves, olive-brown with a slight tinge of blue.

Extract.—They yield 34·08 per cent. to water at 100° C. Colour of extract ruby, but lighter than *E. stellulata ;* of moist residue, brown.

Kino-tannic acid—12·59 per cent.

66. EUCALYPTUS MELLIODORA, *A. Cunn.*, N.O. Myrtaceæ, B. Fl., iii., 210. Figured in Dec. 3 "Eucalyptographia," also "Botanic Teachings" (Mueller).

Found in Victoria and New South Wales.

Vernacular Name—"Yellow Box."

Locality whence these particular specimens were obtained—Colombo, near Candelo.

Geological Formation—Granite.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 30 to 50 feet, diameter 2 feet.

Collected 23rd December, 1886. Analysed 24th October to 25th November, 1887.

Leaves narrow-lanceolar or somewhat sickle-shaped, sometimes verging into an oblong or oval form, not very long, mostly of a dull-green on both sides, seldom shining ; their lateral veins neither very spreading nor very numerous nor unusually prominent, the marginal vein distinctly removed from the edge ; oil-dots rather copious, but many concealed. (Eucalyptographia.)

Leaves lanceolate, usually narrow, acuminate and often falcate, mostly 3 to 4 inches long, rather thick, with very fine and rather numerous but oblique veins, the intramarginal one at a distance from the edge. (B. Fl.)

Average length 95·2 mm., average breadth 19·1 mm. Colour of powder dirty olive-green.

Extract.—They yield 49·8 per cent. to water at 100° C. Colour of extract dark orange, and of moist residue, light olive-brown.

Kino-tannic acid—7·89 per cent.

67. EUCALYPTUS HÆMASTOMA, *Smith*, N.O. Myrtaceæ, B. Fl. iii., 212. Figured Dec. 2, "Eucalyptographia."
Found in Tasmania, Victoria, New South Wales, and Queensland.
Vernacular Name—"Rough or small-leaved Stringybark."
Locality whence these particular specimens were obtained—Colombo, near Candelo.
Geological Formation—Granite.
Part of the tree examiued—Leaves.
Particulars of the trees whence they were obtained—Height 40 to 60 feet, diameter 2 feet.
Collected 23rd December, 1886. Analysed 24th October to 25th November, 1887.

Leaves sickle-shaped-lanceolar, occasionally much narrower or exceptionally also verging to a somewhat oval form, shining and of equal green on both sides; their lateral veins more longitudinal than transverse, the intramarginal vein somewhat removed from the edge. (Eucalyptographia).

Leaves usually oblique or falcate, lanceolate, about 4 to 6 inches long, thickly coriaceous, the veins very oblique not close and often anastomosing as in *E. obliqua*, the lower ones sometimes broader and more reticulate. (B. Fl.)

Average length 94·8 mm., average breadth 20 mm. Colour of the powdered leaves dark pea-green.

Extract.—They yield 47·19 per cent. to water at 100° C. Colour of extract light orange, of moist residue light brown of a bronze-green tint.

Kino-tannic acid—11·27 per cent.

68. EUCALYPTUS POLYANTHEMOS, *Schauer.*, N.O. Myrtaceæ, B. Fl iii., 213. Figured Dec. 3, "Eucalyptographia."
Found in Victoria and New South Wales.
Vernacular Name—"Box."
Locality whence these particular specimens were obtained—Quiedong, near Bombala.
Geological Formation—Limestone.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 3 to 4 feet.
Collected 10th April, 1887. Analysed 24th October to 24th November, 1887.

Leaves on rather long stalks, *orbicular or broad ovate or roundish, of an almost ashy-hue or dull-greenish*, occasionally verging into

an oval-lanceolar form; primary veins considerably spreading, the circumferential veins distinctly removed from the edge. (Eucalyptographia).

Leaves on rather long petioles, broadly ovate-orbicular or rhomboidal, obtuse or rarely shortly acuminate, mostly under 3 inches long, passing in older trees into ovate-lanceolate obtuse, and 3 inches long or more, rather rigid with fine diverging anastomosing veins, the intramarginal ones distant from the edge. (B. Fl.)

Average length 97·1 mm., average breadth 35·75 mm. Colour of powdered leaves, dark Brunswick green.

Extract.—They yield 29·69 per cent. to water at 100° C. Colour of extract, exceedingly pale lemon, of moist residue light olive-brown.

Kino-tannic acid—1·881 per cent.

69. EUCALYPTUS ODORATA, *Behr.*, var., N.O. Myrtaceæ, B Fl. iii., 215. Figured in Part 6 of Brown's "Forest Flora of S.A." Dec. 2, "Eucalyptographia" and "Plants Indigenous in Victoria" (Mueller).

Found in South Australia, Victoria, and New South Wales.
Vernacular Name—"White Box."
Locality whence these particular specimens were obtained—Wongrabell, near Eden.
Geological Formation—(?)
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 100 to 150 feet, diameter 6 to 8 feet.
Collected 5th February, 1887. Analysed 11th to 28th November, 1887.

Leaves narrow-lanceolar, rarely broad, often on comparatively short stalks, not much elongated, rather dull-green or somewhat shining, of equal colour on both sides; their veins mostly spreading at a very acute angle and not crowded, the two longitudinal veins somewhat removed from the edge. (Eucalyptographia.)

Leaves lanceolate, usually narrow, but sometimes broad, rarely above 4 inches long, rather rigid, the veins oblique, and sometimes very much so, and not close, the intramarginal one at some distance from the edge. (B. Fl.)

Average length 111·2 mm., average breadth 25·5 mm. Colour of powder bronze green.

Extract.—They yield 40·19 per cent. to water at 100° C. Colour of extract dark orange, of moist residue bronze-green.

Kino-tannic acid—6·775 per cent.

70. EUCALYPTUS SIDEROPHLOIA, *Benth.*, N.O. Myrtaceæ, B. iii., 220. Figured Dec. 4, "Eucalyptographia."
Found in New South Wales and Queensland.
Vernacular Name—"Ironbark."
Locality whence this particular specimen was obtained—Cambewarra.
Geological Formation—Sandstone.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Saplings about 6 inches in diameter.
Collected 21st August, 1886. Analysed 11th to 17th November, 1887.

Leaves elongate or narrow-lanceolar, moderately or not much curved, often not very inequilateral, of almost equal colour on both sides; primary *veins numerous, subtle, and very spreading*, the circumferential vein near to the edge of the leaf; oil-dots much concealed. (Eucalyptographia.)

Leaves ovate-lanceolate or lanceolate, much acuminate, straight or more frequently falcate, about 3 to 6 inches long, often rather thick, with numerous fine diverging veins, the intramarginal one close to the edge. (B. Fl.)

Average length 117·6 mm. Average breadth 20·1 mm. Colour of powdered leaves olive-brown.

Extract.—They yield 22·93 per cent. to water at 100° C. Colour of extract orange, of moist residue pure brown.

Kino-tannic acid—5·95 per cent.

71. EUCALYPTUS ROBUSTA, *Smith*, N.O. Myrtaceæ, B. Fl. iii., 228. Figure Dec. 7, "Eucalyptographia."
Found in New South Wales and Queensland.
Vernacular Name—"Mahogany."
Locality whence this particular specimen was obtained—Brooman, Clyde River.
Geological Formation—Granite.
Part of the tree examined—Leaves.
Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 1 foot 6 inches.
Collected 15th September, 1886. Analysed 11th to 28th November, 1887.

Leaves large, scattered, oval-lanceolar, pointed, of thick consistence, shining, *paler beneath, hardly or slightly inequilateral; veins copious, prominent, very spreading*, the circumferential vein

rather close to the slightly recurved margin of the leaf; oil-dots much concealed or obliterated. (Eucalyptographia.)

Leaves ovate-lanceolate, nearly straight or the upper ones narrower and falcate, 4 to 6 inches long or sometimes more, with numerous fine but prominent parallel veins almost transverse, the intramarginal one very near or close to the edge. (B. Fl)

Average length 136·5 mm., average breadth 53·2 mm. Colour of the powdered leaves olive-brown with a slight tinge of blue.

Extract.—They yield 34·7 per cent. to water at 100° C. Colour of extract light ruby (with slight flocculent masses owing to presence of mucilage), of moist residue brown, with a slight yellowish tinge.

Kino-tannic acid—12·069 per cent.

72. EUCALYPTUS VIMINALIS, *Labill.*, N.O. Myrtaceæ, B. Fl. iii., 239. Figured in Part 7 of Brown's "Forest Flora of S.A." and Dec. 10, "Eucalyptographia."

Found in all the colonies except Queensland and Western Australia.

Vernacular Names—"Manna Gum," "Ribbony Gum."

Locality whence these particular specimens were obtained—Quiedong, near Bombala.

Geological Formation—Limestone.

Part of Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 2 to 3 feet.

Collected 6th April, 1887. Analysed 24th October to 24th November, 1887.

Leaves elongate- or falcate-lanceolar, of equal colour on both sides; *lateral veins rather subtle, crowded, pinnately spreading*, the circumferential vein somewhat removed from the edge of leaf; oil-dots mostly concealed. (Eucalyptographia.)

Leaves lanceolate and more or less falcate and acuminate, 3 to 6 inches long, the veins rather regular, numerous and diverging, the intramarginal one near the edge. (B. Fl.)

Average length 143·5 mm., average breadth 29·75 mm. Colour of powdered leaves, dark Brunswick green.

Extract.—They yield 40·59 per cent. to water at 100° C. Colour of extract pale orange; of moist residue light bronze-green.

Kino-tannic acid—3·998 per cent.

Mueller and Rummel found 3·47 per cent. in leaves of this species.

For a note on leather made from these leaves, see p. 255.

73. EUCALYPTUS ROSTRATA, *Schlecht.*, N.O. Myrtaceæ, B. Fl. iii., 242. Figured Dec. 4, "Eucalyptographia."
Found in all the Colonies except Tasmania.
Vernacular Name—"Red Gum."
Locality whence these particular specimens were obtained—Colombo, near Candelo.
Geological Formation—Granite.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 80 to 100 feet, diameter 2 to 4 feet.
Collected 27th June, 1887. Analysed 24th October to 24th November, 1887.

Leaves lanceolar-sickleshaped, of equal colour on both sides; lateral veins rather subtle, crowded, pinnate-spreading; the circumferential vein somewhat removed from the edge; oil-dots scanty or obscured. (Eucalyptographia.)

Leaves lanceolate, mostly falcate and acuminate, 3 to 6 inches long and even more, the lower ones sometimes ovate or ovate-lanceolate and straight, not thick, the veins rather regular, numerous and oblique, the intramarginal one not close to the edge, or in some desert specimens thick, with the veins much less conspicuous. (B. Fl.)

Average length 129 mm., average breadth 14·4 mm. Colour of powdered leaves, pea-green.

Extract.—They yield 40·8 per cent. to water at 100° C. Colour of extract lemon, of moist residue light ochre, inclining to brown.

Kino-tannic acid—6·62 per cent. "The fresh leaves" yielded Mueller and Rummel 4·68 per cent. of tannic acid. (Dec. 4, "Eucalyptographia.) My experiments were as usual, on leaves dried at 100° C. Making suitable allowance for moisture, the Baron's result and my own closely approximate.

74. EUCALYPTUS STUARTIANA, *F. v M.*, N.O. Myrtaceæ, B. Fl., iii., 243. Figured Dec. 4, "Eucalyptographia."
Found in all the Colonies except Queensland and Western Australia.
Vernacular Name—"Apple-tree."
Locality whence these particular specimens were obtained—Quiedong, near Bombala.
Geological formation—Limestone.
Part of the Tree Examined—Leaves.
Particulars of the trees whence they were obtained—Height 80 to 100 feet, diameter 3 to 4 feet.

Collected 7th April, 1887. Analysed 24th October to 28th November, 1887.

Leaves lanceolar sickle-shaped, shining and equally dark-green on both sides, copiously dotted, but the oil-glands often partly concealed; lateral veins very thin, considerably spreading, but neither crowded nor almost transverse, the circumferential vein distinctly removed from the edge. (Eucalyptographia.)

Leaves from broadly ovate-lanceolate to narrow lanceolate, mostly 3 to 6 inches long, much narrowed at the base, usually equal or nearly so, but sometimes oblique, thick, the nerves rather regular and diverging, but scarcely conspicuous. (B. Fl.)

Average length 158·2 mm., average breadth 22 mm. Colour of powdered leaves light Brunswick green.

Extract.—They yield 42·74 per cent. to water at 100° C. Colour of extract very pale lemon, almost as pale as *E. polyanthemos*, of moist residue dirty yellowish brown.

Kino-tannic acid—10·158 per cent.

75. EUCALYPTUS GUNNII, *Hook., fil.*, var., N.O. Myrtaceæ, B. Fl., iii., 246. Figured in Brown's "Forest Flora of S.A.," Part 1, Dec. 4, "Eucalyptographia."

Found in South Australia, Tasmania, Victoria, and New South Wales.

Vernacular Name—"Red Gum."

Locality whence these particular specimens were obtained—Bombala.

Geological Formation—Granite.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 80 to 100 feet, diameter 3 to 4 feet.

Collected 6th January, 1887. Analysed 24th October to 28th November, 1887.

Leaves oval, or oblong, or elongate-lanceolar, or almost oval, acute at the base and apex, *not very inequilateral*, rigid, shining, and of equal and saturated green on both sides, their oil-dots concealed or hardly developed, their lateral veins slightly prominent, somewhat distant and moderately spreading, the circumferential vein distinctly removed from the edge of the leaf. (Eucalyptographia).

Leaves from ovate-lanceolate or elliptical and obtuse to lanceolate-acute, under 3 inches long, usually much narrowed at the base and rarely oblique, thick, with the veins not numerous and scarcely conspicuous. (B. Fl.)

Average length 117·2 m.m., average breadth 34 mm. Colour of dried leaves pale olive-green, inclining to sage.

Extract.—They yield 40·61 per cent. to water at 100° C. Colour of extract deep orange, of moist residue light brown.

Kino-tannic acid—16·59 per cent.

76. EUCALYPTUS GUNNII, *Hook., f.*, var.

Vernacular Names—"Bastard Gum," "Flooded Gum."

Locality whence this particular specimen was obtained—Delegate.

Geological Formation—Mudstone (Silurian).

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 60 to 80 feet, diameter 2 to 3 feet.

Collected 25th May, 1887. Analysed 24th October to 24th November, 1887.

Average length 119·8 mm., average breadth 68·4 mm. Colour of powdered leaves rather a bright green with a bluish tint.

Extract.—They yield 41·08 per cent. to water at 100° C. Colour of solution pale orange, of moist residue yellowish brown.

Kino-tannic acid—8·28 per cent.

77. EUCALYPTUS CORYMBOSA, *Smith*, N.O. Myrtaceæ, B. Fl. iii., 256. Figured Dec. 5, "Eucalyptographia."

Found in New South Wales and Queensland.

Vernacular Name—"Bloodwood."

Locality whence these particular specimens were obtained—Cambewarra.

Geological Formation—Sandstone.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 80 to 100 feet, diameter 3 to 4 feet.

Collected 28th August, 1886. Analysed 11th to 21st November, 1887.

Leaves of firm consistence, ovate or elongate-lanceolar, slightly curved or somewhat sickle-shaped, *paler beneath, the lateral veins very numerous, subtle, almost transversely spreading*, the circum-

ferential vein nearly contiguous to the edge, the oil-dots generally concealed or obliterated. (Eucalyptographia.)

Leaves ovate-lanceolate or lanceolate, acuminate, about 3 to 6 inches long, with numerous fine transverse parallel veins, often scarcely visible. (B. Fl.)

Average length 95·8 mm., average breadth 24·25 mm. Yield a greenish drab powder.

Extract.—They yield 36·72 per cent. to water at 100° C. Colour of solution orange, of moist residue light brown.

Kino-tannic acid—18·377 per cent.

78. EUCALYPTUS MACULATA, *Hook.*, N.O. Myrtaceæ, B. Fl. iii., 258. Figured Dec. 3, "Eucalyptographia."

Found in New South Wales and Queensland.

Vernacular Name—"Spotted Gum."

Locality whence these particular specimens were obtained—Cambewarra.

Geological Formation—Sandstone.

Part of the Tree Examined—Leaves.

Particulars of the trees whence they were obtained—Height 100 to 120 feet, diameter 3 to 4 feet.

Collected 10th August, 1886. Analysed 11th to 17th November, 1887.

Leaves elongate or narrow-lanceolar, often somewhat sickle-shaped, seldom more oval, of equal green on either side; their *lateral veins crowded, pinnate-spreading, prominent*, the circumferential vein very close or almost contiguous to the edge; oil-dots more or less concealed. (Eucalyptographia.)

Leaves ovate-lanceolate or lanceolate, straight or falcate, acuminate, mostly 4 to 6 inches long or even more, with numerous parallel but rather oblique veins . . . . rather coarse, the intramarginal one close to the edge. (B. Fl.)

Average length 165·2 mm., average breadth 38·8 mm. Colour of powdered leaves dull olive-brown.

Extract.—They yield 28·32 per cent. to water at 100° C. Colour of solution reddish-orange, of moist residue brown.

Kino-tannic acid—5·263 per cent.

Qualitative Tests—Notes—(Third Supplement).

1. After the present paper I do not propose to continue these voluminous schedules of qualitative tests of tan-substances. My object in presenting them has partly been to show that the reactions of the species of a genus often differ considerably amongst themselves, so that it is absurd, as is the case in some text-books, to give a reaction with "Mimosa bark," "Eucalyptus bark," as if it were quite generic. Characteristic re-actions will, however, continue to be noted.

2. *Column* 2*a*. *E. piperita* var., was the only one which gave a precipitate at once.

3. *Column* 4*a*. Where "no change" is stated, the only action of the Ferric chloride is to produce a slight purplish colour.

4. *Column* 4*b*. When Ammonia is added, the liquids in which no precipitate exist are turned brown in colour.

5. *Column* 5. Precipitates form at once in all cases. With *E. viminalis*, *E. polyanthemos*, and *E. Gunnii* (Delegate), the precipitate is but slight.

6. *Column* 6. A precipitate is given in all cases with the exception of *E. viminalis* and *A. longifolia*.

7. *Column* 8*a*. No immediate change in any case, *E. stellulata* and *E. haemastoma* excepted. Colours of precipitates taken on standing.

8. *Column* 8*b*. In this case also the precipitates were taken on standing, the only leaves giving precipitates at once being *A. vestita* and *E. amygdalina* (Bombala).

9. *Columns* 9*a and* 11. Precipitates were given at once; colours &c. were noted on standing.

Species—Leaves.	1 Reaction.	2 Boiled with equal volume of Sulphuric Acid: (1 in 5)	
		a—in the cold.	*b*—on boiling.
55. ACACIA vestita, *Ker.*	Slightly acid.	Brown precipitate on standing.	Precipitate does not dissolve on boiling.
56. ACACIA melanoxylon, *R. Br.*	ditto.	Very slight brownish ppt. on standing.	Precipitate dissolves on boiling
57. ACACIA longifolia, *Willd.*	ditto.	Light brown ppt. on standing.	Precipitate does not dissolve on boiling.
58. ACACIA glaucescens, *Willd.*	Distinctly acid	Dark dirty salmon-coloured precipitate on standing.	Ditto.
59. EUCALYPTUS stellulata, *Sieb.*	Slightly acid.	Light brown ppt. on standing.	Precipitate dissolves on boiling
60. EUCALYPTUS sieberiana, *F.v.M.*	Distinctly acid	No change on standing	No change.
61. EUCALYPTUS amygdalina, *Labill.*, (Nelligen.)	Slightly acid.	Very slight light brownish precipitate on standing.	Precipitate does not dissolve on boiling
62. EUCALYPTUS amygdalina, *Labill.*, (Bombala.)	Distinctly acid	Ditto; but very slight on standing.	Ditto.
63. EUCALYPTUS obliqua, *L' Hérit.*	ditto.	Light brown ppt. on standing.	Ditto.
64. EUCALYPTUS macrorrhyncha, *F.v.M.*	Faintly acid.	No change on standing	No change.
65. EUCALYPTUS piperita, *Smith*, var.	Distinctly acid	Brown precipitate	Precipitate does not dissolve on boiling
66. EUCALYPTUS melliodora, *A. Cunn.*	Faintly acid.	Precipitate of a light dirty drab colour on standing.	Precipitate disappears on boiling
67. EUCALYPTUS haemastoma, *Smith*	Distinctly acid	Light dirty drab ppt. on standing.	Precipitate dissolves on boiling
68. EUCALYPTUS polyanthema, *Schauer*	ditto.	No change on standing	No change
69. EUCALYPTUS odorata, *Behr.*, var.	Faintly acid.	Very slight precipitate on standing	Precipitate does not dissolve on boiling
70. EUCALYPTUS siderophloia, *Benth.*	ditto.	Slight light brownish precipitate on standing	Ditto.
71. EUCALYPTUS robusta, *Smith*	Distinctly acid	Brown precipitate on standing	Ditto.
72. EUCALYPTUS viminalis, *Labill.*, var.	ditto.	No change on standing	No change
73. EUCALYPTUS rostrata, *Schlecht.*	ditto.	Ditto.	Ditto.
74. EUCALYPTUS Stuartiana, *F.v.M.*	ditto.	Ditto.	Ditto.
75. EUCALYPTUS Gunnii, *Hook., f.* (Bombala.)	Acidity very marked	Orange-brown ppt. in good quantity on standing	Precipitate does not dissolve on boiling
76. EUCALYPTUS Gunnii, *Hook., f.* (Delegate.)	Distinctly acid	Drab precipitate on standing	Ditto.
77. EUCALYPTUS corymbosa, *Smith*	Acidity very marked	Ditto	Ditto.
78. EUCALYPTUS maculata, *Hook., f.*	Faintly acid	Light brown ppt. on standing	Ditto.

3	4		5
Bromine Water.	Dilute Ferric Chloride.	Add Ammonia.	Baric Hydrate.
Orange-coloured ppt. (slight) on standing	Vandyke-brown ppt.	No change	Dark brown precipitate
Ditto; on standing	Very slight brown ppt. copious Vandyke-brown precipitate on standing	Ditto.	Reddish-brown ppt.
Ditto.	Very slight ppt. increases on standing; of a dark brown colour	Precipitate dissolves	Olive-brown ppt.
Very light orange-tinted precipitate on standing	Dark brown precipitate increases on standing.	Nearly all dissolves	Olive precipitate
Orange-coloured ppt.	Copious dark olive-brown ppt., same on standing	Becomes more copious; of a purplish-black	Dark brown precipitate
No change.	Precipitate of a very dark Vandyke-brown	Almost entirely dissolves	Orange-brown ppt.
Ditto.	Precipitate of a dark brown	Ditto.	Dark orange-brown precipitate
Ditto.	Very slight precipitate dark brown	No change	Light olive precipitate
Precipitate copious of a light orange colour	Slight precipitate	Purplish-brown ppt.	Light brown ppt.
Orange precipitate on standing	No change	No change	Ditto.
Precipitate copious of a light orange colour	Copious precipitate almost black	Turns ppt. purple	Copious reddish-brown precipitate
Precipitate very light orange tint, copious on standing	No change	No change	Reddish-brown ppt.
Lemon tint precipitate on standing	Slight precipitate	Ditto.	Very light olive-brown precipitate
Very slight precipitate on standing	Precipitate of a dark purplish colour	Ditto.	Light orange-brown precipitate
Precipitate very copious, of a light orange tint	No change	Ditto.	Reddish-brown ppt., copious
Slight precipitate, on standing orange tint	Copious precipitate, brownish-black	Ditto.	Orange coloured ppt.
Ditto.	Precipitate very slight	Precipitate increases of a purplish-brown colour	Dark brown ppt.
Precipitate orange colour	No change	No change	Very light precipitate of an orange-brown
No change.	Copious precipitate, dark purple	Ditto.	Orange precipitate
Very slight light ppt.	No change	Ditto.	Very light orange-brown precipitate
Precipitate light orange colour	Ditto.	Ditto.	Dark brown ppt.
Very light precipitate on standing	Ditto.	Ditto.	Light orange-brown precipitate
Slight light precipitate	Ditto.	Ditto.	Reddish-brown ppt.
No change.	Copious precipitate, Vandyke-brown	Ditto.	Dark reddish-brown precipitate

Species—Leaves	6 Cobalt Acetate.	7 Potassic Dichromate.	8 Tartar Emetic.
55. ACACIA vestita, *Ker.*	Dark purplish-grey ppt.	Very slight brownish precipitate	No change.
56. ACACIA melanoxylon, *R. Br.*	Pure brown ppt	No change.	No change.
57. ACACIA longifolia, *Willd.*	Turbidity	Ditto.	Turbidity.
58. ACACIA glaucescens, *Willd.*	Brown ppt.	Ditto.	Turbidity.
59. EUCALYPTUS stellulata, *Sieb.*	Copious purplish-grey precipitate	Ppt. dark brown	Slight Indian-red ppt.
60. EUCALYPTUS sieberana, *F.v.M.*	Dark brown precipitate.	No change.	No change.
61. EUCALYPTUS amygdalina, *Labill.*, (Nelligen.)	Ditto.	Ditto.	No change.
62. EUCALYPTUS amygdalina, *Labill.*, (Bombala.)	Very light dirty olive-brown precipitate	Very slight brownish precipitate	Very slight dirty yellow precipitate.
63. EUCALYPTUS obliqua, *L' Hérit.*	Ppt. light purplish-brown	Copious pure brown precipitate	Dirty salmon coloured precipitate.
64. EUCALYPTUS macrorrhyncha, *F.v.M.*	Same as *E. obliqua*	No change.	No change.
65. EUCALYPTUS piperita, *Smith*, var.	Copious dark brown ppt.	Copious dark brown precipitate	Slight reddish-brown precipitate
66. EUCALYPTUS melliodora, *A. Cunn.*	Dark brown precipitate	No change.	No change.
67. EUCALYPTUS haemastoma, *Smith*	Brownish-grey precipitate	Precipitate very slight brownish	Yellowish precipitate
68. EUCALYPTUS polyanthema, *Schauer*	Brown ppt.	No change.	No change.
69. EUCALYPTUS odorata, *Behr.*, var.	Slight brown precipitate	No change.	No change.
70. EUCALYATUS siderophloia, *Benth.*	Olive-brown precipitate.	No change.	No change.
71. EUCALYPTUS robusta, *Smith*	Dark purplish-grey ppt.	Precipitate dark olive-brown	Slight reddish-brown precipitate
72. EUCALYPTUS viminalis, *Labill.*, var.	No precipitate	No change.	No change.
73. EUCALYPTUS rostrata, *Schlecht.*	Light olive-brown ppt.	No change.	No change.
74. EUCALYPTUS Stuartiana, *F.v.M.*	Ditto.	No change.	Slight yellowish ppt.
75. EUCALYPTUS Gunnii, *Hook.*, *f.* (Bombala.)	Ditto; but with a tinge of red	Precipitate very slight brownish	Slight reddish-brown precipitate
76. EUCALYPTUS Gunnii, *Hook. f.* (Delegate.)	Ditto.	No change.	Turbidity.
77. EUCALYPTUS corymbosa, *Smith*	Dark olive-precipitate.	Precipitate very slight brownish	No change.
78. EUCALYPTUS maculata, *Hook.*, *f.*	Very dark brown ppt.	No change.	No change.

	9		10
Add Ammonic Chloride	*a*—Copper Sulpate.	*b*—Add Ammonia.	One drop of strong sulphuric acid to one drop of extract on a white glazed tile.
Turbidity; light reddish-brown ppt.	Very light reddish-brown precipitate	Purple-brown ppt.	Yellowish brown colour
No change	Brown ppt.	Light brown ppt.	Slight reddish-brown colour.
Slight light reddish-brown ppt., a little lighter than that of *A. vestita*	Very light brown ppt.	Very slight brown ppt.	Ochre colour
Precipitate same as that of *A. longifolia*	Very light brown ppt.	Brown precipitate	Yellow colour.
Very dark salmon ppt. almost a light purple	Light purplish-brown precipitate	Very dark and copious purple-brown ppt.	Rose madder colour fading to brown on standing
No change	Dark olive-brown ppt.	Slight olive-brown ppt.	Yellow colour same as *A. glaucescens*
No change	Slight brown ppt.	Very slight brownish precipitate	Slight yellow ochre colour
Precipitate light olive-brown	Brown precipitate	Reddish-brown ppt.	Bright yellow colour.
Very light reddish-brown precipitate	Very dark purplish-grey precipitate	Brown precipitate	Orange-brown colour
Very slight dirty brown precipitate	Brown precipitate.	Ditto.	Very bright yellow colour
Reddish-brown ppt. in good quantity	Brown precipitate.	Ditto.	Light reddish brown colour
Very slight brownish precipitate	Light olive-brown ppt.	Very slight brown ppt.	Colour same as *E. piperita*, var.
Yellowish-drab ppt.	Greyish-brown ppt.	Brown precipitate	Slight yellow ochre colour
Very slight brownish precipitate	Slight brown ppt.	Very slight brown ppt.	Slight yellow ochre colour scarcely distinguishable
No change	Very dark olive-brown precipitate.	Precipitate dissolves	Light reddish-brown colour
Slight yellowish-brown precipitate	Dirty brown ppt.	Brown precipitate	Very slight light brown colour
Reddish-brown ppt.	Dark brown ppt. with a greyish tinge	Brown precipitate	Light reddish-brown colour
No change	Very slight light brown precipitate	Precipitate dissolves	Yellow colour
Dark drab ppt.	Dark dirty grey ppt.	Brown precipitate	Slight yellowish colour scarcely distinguishable
Dark drab ppt.	Brown precipitate	Ditto.	Same as *E. rostrata*
Light reddish-brown precipitate	Very light brown ppt.	Dark brown ppt.	Reddish-brown colour
Light reddish-brown precipitate	Ppt. darker and more dirty than that from Bombala	Brown precipitate	Very slight brownish colour
Light olive ppt.	Light brown ppt.	Brown precipitate	Yellow colour but slight
Light reddish-brown precipitate	Very dark brown ppt.	Light brown ppt.	Ochre yellow colour

Species—Leaves.	11 Lead Nitrate.	12 Manganese Acetate.	13 Chrome Alum.
55. ACACIA vestita, *Ker.*	Dark brown precipitate	Slight brown ppt. after standing	Purplish-brown ppt.
56. ACACIA melanoxylon, *R. Br.*	Dark brown ppt. same as *A. vestita*	No change.	Ditto.
57. ACACIA longifolia, *Willd.*	Very dark dirty grey ppt.	Slight light brown ppt. on standing	Ditto.
58. ACACIA glaucescens, *Willd.*	Light dirty grey ppt.	No change.	Dark grey precipitate
59. EUCALYPTUS stellulata, *Sieb.*	Very dark salmon ppt.	Purple-brown ppt. on standing	Purple-brown ppt.
60. EUCALYPTUS sieberiana, *F.v.M.*	Olive-brown precipitate	No change	No change
61. EUCALYPTUS amygdalina, *Labill.* (Nelligen.)	Olive-brown precipitate	No change	Turbidity
62. EUCALYPTUS amygdalina, *Labill.* (Bombala.)	Light yellowish drab ppt.	Light greyish bronze-green precipitate on standing	No change.
63. EUCALYPTUS obliqua, *L'Hérit.*	Light greyish-brown ppt.	Dark dirty salmon ppt. on standing	Precipitate dark dirty grey
64. EUCALYPTUS macrorrhyncha, *F.v.M.*	Yellowish-brown precipitate	No change; very slight yellowish-brown ppt. on standing	No change
65. EUCALYPTUS piperita, *Smith*, var.	Dark greyish-brown ppt. in good quantity	Light reddish-brown ppt. on standing	Precipitate very dark greyish-brown
66. EUCALYPTUS melliodora, *A. Cunn.*	Light orange-brown ppt.	No change; very slight brownish precipitate on standing	Ppt. slightly more brown than that of *E. piperita*, var.
67. EUCALYPTUS haemastoma, *Smith*	Light drab ppt.	Greenish-drab ppt. on standing	Dark dirty grey ppt.
68. EUCALYPTUS polyanthema, *Schauer*	Slight olive-precipitate	No change; very slight ppt. of a brownish-colour on standing	No change.
69. EUCALYPTUS odorata, *Behr.*, var.	Brown ppt.	No change.	No change.
70. EUCALYPTUS siderophloia, *Benth.*	Light olive-brown ppt.	Dirty grey precipitate on standing	Slight greyish-brown precipitate
71. EUCALYPTUS robusta, *Smith*	Brown ppt. with a slight greyish tinge	Brown precipitate on standing	Greyish-brown ppt.
72. EUCALYPTUS viminalis, *Labill.*, var.	Olive-brown precipitate	No change.	No change.
73. EUCALYPTUS rostrata, *Schlecht.*	Light dirty brown ppt.	Greyish-drab ppt. on standing	No change
74. EUCALYPTUS Stuartiana, *F.v.M.*	Dark brownish drab ppt.	Dirty grey precipitate on standing	No change
75. EUCALYPTUS Gunnii, *Hook., f.* (Bombala.)	Greyish-brown ppt. in good quantity	Light purple-brown precipitate on standing	Slight brownish ppt.
76. EUCALYPTUS Gunnii, *Hook. f.* (Delegate.)	Light olive-brown ppt.	Dark greenish-drab precipitate on standing	No change
77. EUCALYPTUS corymbosa, *Smith*	Olive ppt. in good quantity	Light bronze-green precipitate on standing	Greyish-brown ppt.
78. EUCALYPTUS maculata, *Hook., f.*	Dark reddish-brown ppt.	Reddish-brown ppt. on standing	Very slight brownish precipitate

14 Mercuric Chloride.	15 Ammonium Molybdate in Nitric Acid.	16 Gelatine.	17 Zinc Acetate.
Dirty greyish-drab ppt.	Darkens the liquid.	Deep orange-brown	Dark reddish-brown precipitate
No change.	Ditto.	Light orange-brown	Light reddish-brown precipitate.
Turbidity.	Ditto.	Dull orange	Brown precipitate.
Ditto.	Ditto.	Light lemon	Olive precipitate.
Brick-red precipitate	Ditto.	Reddish-brown	Light purple-brown precipitate.
No change	Ditto.	Dull lemon	Light olive-brown ppt.
Ditto.	Ditto.	Lemon	Slight olive-brown ppt.
Turbidity	Ditto.	Lemon, a little darker than that from Nelligen	Dirty olive precipitate
Ditto.	Ditto.	Orange-brown	Light brown ppt.
Ditto.	Ditto.	Lemon	Dark olive precipitate
No change	Ditto.	Light reddish-brown	Greenish-brown ppt.
Turbidity	Ditto.	Dull orange	Very light reddish-brown precipitate
Slight yellowish ppt.	Ditto.	Light orange	Light olive-brown ppt.
Turbidity	Ditto.	Light lemon	Slight dark olive ppt.
No change	Ditto.	Light reddish-brown, same as that of *E. piperita*, var.	Brown precipitate
Turbidity	Ditto.	Lemon	Olive-brown ppt.
Ditto.	Ditto.	Light orange-brown	Brown precipitate
No change	Ditto.	Lemon	Very slight brown ppt.
Turbidity	Ditto.	Lemon	Slight olive-brown ppt.
Ditto.	Ditto.	Light lemon	Light olive-brown ppt.
Slight greyish ppt.	Ditto.	Orange brown	Brown precipitate
Turbidity	Ditto.	Lemon	Light olive-brown ppt. same colour as *E. Stuartiana*
Ditto.	Ditto.	Dark lemon	Dark olive-brown ppt.
Ditto.	Ditto.	Dull orange	Slight reddish-brown precipitate

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