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JOURNAL OF PROCEEDINGS

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA,

Inaugurated 1st. July, 1897.

Patrons:

THE RIGHT HON. SIR JOHN FORREST, P.C., K.C.M.G.
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JOURNAL OF PROCEEDINGS OF THE

Mueller Botanic Society.

Vol. I. PUBLISHED SEPTEMBER, 1899. No. 1.

EDITORIAL NOTE.

It is with great pleasure we announce the first issue of the "Journal and Proceedings of the Mueller Botanic Society." Hitherto owing to lack of necessary funds the Council has been unable to see its way to the publication of a Journal, but this year through the generous actiou of the Right Hon. the Premier, who has promised to place the sum of £50 upon the Estimates, and owing to a greater public interest in the Society, as evidenced by a large number of members, the Council feels that the time has arrived when it is possible to publish from month to month a small journal of the Societys' proceedings. This new departure will we are convinced, be gladly welcomed by the many Country members who are unable to attend the various lectures given, and are precluded by distance from taking part in the Excursions, and who consequently in the past have uot derived that benefit from their membership which the Council of the Society would have been pleased to have afforded.

It is proposed to embody in the journal full reports of the lectures delivered, notes of the excursions, and short descriptions of the various wild flowers of the Colony, accompanied wherever possible by illustrations. Short notices of questions of general scientific interest will also be included, and each number of the publication will give the syllabus of the society for the ensuing month.

We earnestly commend the Journal to all the members of the Society, and invite their hearty co-operation, as it is only by the active assistance of those interested that the publication can be made a success.

Edited by

JAS. SYKES BATTYE, B.A., L.L.B.

THE HISTORY OF PLANT LIFE.

(By Mr. E. J. Bickford, F.L.S.)

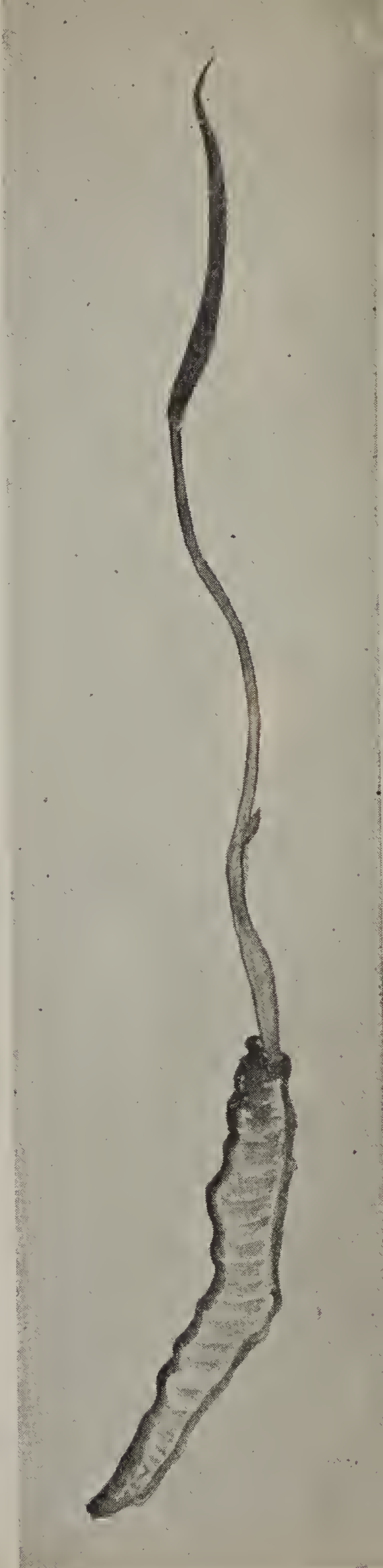
(See Illustrations.)

The following lecture was delivered by the president of the Mueller Botanic Society, at the second annual meeting, when a large number of members and friends were present, the Right Hon. Sir John Forrest occupying the chair. Pictures of Sir Ferdinand Baron Von Mueller, Right Hon. Sir John and Lady Forrest, and James Drummond were illustrated on a large screen by the aid of lime light. The lecturer referred to the Baron as a devotee to Botanical research whose works are found in Botanical libraries throughout the world. Reference was also made to Sir John and Lady Forrest for the valuable assistance rendered in the interests of the study of West Australian Flora and Mr. James Drummond, a Botanist and collector of the forties, having forwarded to Great Britain and elsewhere seeds of the more beautiful of plant life indigenous to this Colony, and doubtless as the result of his labours, many plants are cultivated at home and abroad up to the present day. The history of plant life means an account of facts bearing on the existence of what are known as plants, or in other words, the "vegetable kingdom," the origin of which must date from the creation. In Holy Writ plants are mentioned that are common on the face of the earth to-day. But according to the records of ancient botanical history, comparatively nothing was done by the ancients to compile a systematic treatise of plant life known at that time. The ancient Greek, a true utilitarian, knew only the economic value of everything existing around him. As it is said to-day that necessity is the mother of invention, probably it was this that caused the Greek to cut the tree for firewood and use the shrub for shelter, the herb for medicine, tubers for food, and feed his cattle with the earth's carpet. This state of scientific ignorance endured right up to the sixteenth century. Fossils brought to light from the bowels of the earth tell us of the pre-historic period. In Greenland dwarf willows and birches of to-day indicate that they are the descendants of the maple and birch trees. The bituminous coal of Häing and Tyrol, it is said, should have its origin from the proteacae and myrtaca families, which it is supposed covered the ground at one time. This assumption is based upon the fossils that have been found there. It is interesting to know that our banksias and eucalypts belong to the same botanical order as these fossil remains. In looking up the botanical records of ancient time we find Theophrastus, a celebrated pupil of Aristotle, was the first to write a superficial description of plants which he termed "Natural History of Plants," treating them from an economic standpoint, mentioning 500 species. This was 300 B.C. Dioscorides also described some plants. In 78 A.D. Pliny wrote "Historia

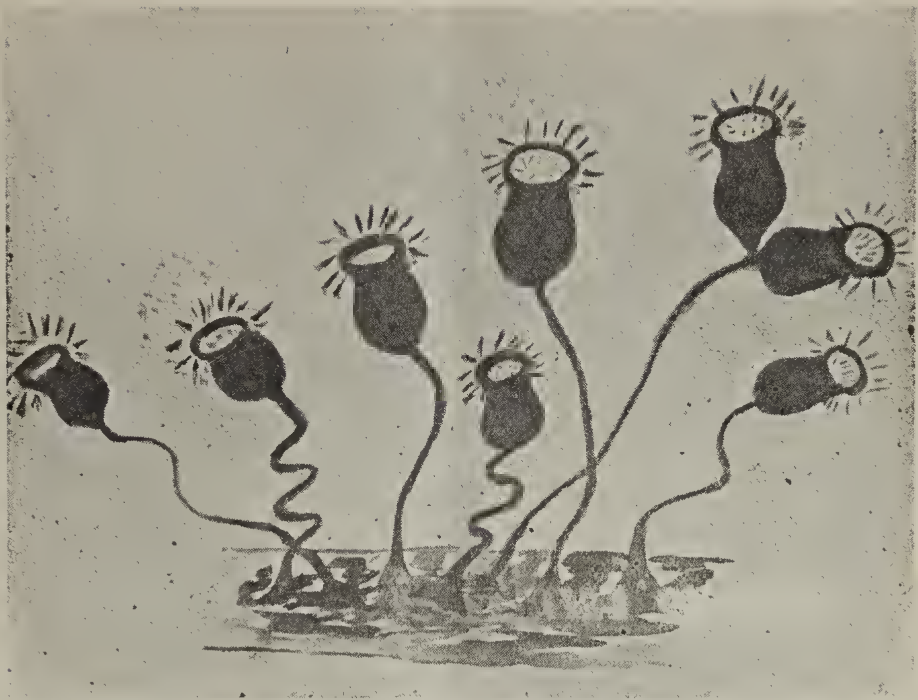
Naturalis," containing 37 books and treating 1,000 species. About this period a desire was created for horticulture and gardening, and this led those more eager for knowledge on the life of plants to observe plants under cultivation with a determination to investigate and, if possible, discover something of their existence. With this also came a remarkable taste for making collections of plants growing outside their own localities which were introduced and an effort made to describe them. This state of things existed up to the time of the Roman Empire, and during the Middle Ages. No one had been successful in describing plants save for their economic value. It was not until art shook from itself the traditions of the Middle Ages and became influenced by a new ideal fixed on the antique, that science roused into activity. Plants of the Mediteranean shore described centuries before by Theophrastus, Dioscorides, or Pliny were the same as their own more inclement countries produced. The German fathers of Botany, Brumfels in 1495, Boch and Fuchs whose names are the best known, applied the old Greek and Latin names without scruple to the species growing in their own localities. It has been said that the yellow pages of the ancient books soon gave way to the green leaves of nature. We find a Belgian De Le Ecluse in 1426, whose name was latinised into Clausis, compiled "Historia Plantarum," abandoning all utilitarian ideas. It was he who first went abroad collecting flowers, which he termed "Hortus Siccus," and later on "Herbarium;" he travelled Europe, Spain, Hungary, from the sea coast to the Islands of Tyrol. It was not until the first decades of the Eighteenth Century that the necessity of bringing botanical order out of chaos became urgent, and it was then the luminary Linnæus, a Swedish naturalist; whose light will ever shine on the botanical universe, established order. Linnæus introduced short names, technical expressions for the various organs and structure of the plant. With the help of botanical terminology it became possible to abridge and recognise by description of groups. He established a basis of classification upon the structure of the flower—systems classes within classes, and orders narrowed into genera. His herbarium consisted of 10,000 species. This, after his death, was sold by the executors to a gentleman in London for £900, and is now the property of the Linnæan Society. In France Rousseau delivered lectures on botany to a society of ladies. Goethe experienced a strong desire for the loveliest of sciences, as botany was called at that day. Further botanical discoveries have been made since the death of Linnæus by eminent botanists, and most of them since the advent of the microscope, which has given scientists the power to look into the architectural structure of the plant. It was about the year 1830 that the marvellous construction of plants was found out by the means of this instrument. The vegetable cell was traced and its functions determined by Brown and Mohl. The plant was as a

NODDING BELL.

BRACKEN FERN.



SPHŒRIA ROBERTSII.



VORTICELLA MICROSTOMA.

SPORE OF CLUB MOSS.

CYPERUS.

magnetic needle attracted towards the light. Jessieu, 1789, and Decandolle, 1813, arranged a natural system of botany based on the lines of Linnæus, with the addition that plants are grouped in their natural orders and classified accordingly and not alone upon their reproductive organs as determined by the great Dane. Linnæus' system is accepted throughout the world as the most complete for the identification and classification of the vegetable kingdom. By the aid of the microscope it has been proved that plants, like animals, are composed of cells and our illustrations show the various structures of the cell. Fig. 1: Vorticelli macrostoma a parasitic algæ. said by some scientists to be the thin line between the two kingdoms, it is a uni-cellular organism. I procured this on a small rush in stagnant water. It has a pronounced movement by contracting in spiral form and extending. The fine cilia to be seen around the cup seem to gather in the food which is digested in the cell and the remains emitted from the same source as that in which it enters. A remarkable thing about this interesting little object is that when the pond dries up, it remains on the hard ground unhurt, but should a long period of dry weather set in it goes into fine powder and blows away, probably falling in a more congenial spot, and awaits the first heavy shower of rain when it immediately comes once more into activity. (2) The Nodding Bell a curious study. (3) Sphôria Robertsii, the spore of this plant falls upon and strikes into the head of a certain làrva or grub, at last taking full possession and converting the grub into a petrified insect, while obtaining all its nourishment from the unfortunate victim. It is well known to all New Zealanders, being indigenous to that island. (4) Tranverse section of Bracken Fern (Pteris Aquilina), Pteris Greek for Wing, Aquila Latin for Eagle. Examined by a microscope with a power of fifty diameters—transverse section shows the epidermis or outer covering in the form of a layer of brown thick matted cells as in diagram, this passes into sub epidermal tissue which is represented by a zone of similar brownish cells. This again merges into the thin matted ground parenchyma This is seen as large thin matted cells in the winter months. These cells store a large quantity granules in the Rhizome or underground stem. In the Rachis or stem like structure of the plant which flourishes only during the warm periods of the year very few starch grains can be detected in the protoplasm of a freshly cut section.

The fibre vascular bundle forms a closed system. Consisting of a xylem enclosed in a layer of Phloêm. It is limited externally by a layer of narrow cells and is termed the endodermis (it is also called the Vascular Bundle Sheath—these do not contain starch—the walls are of a reddish brown color—then we have a layer of slightly elongated cells containing starch and a little larger than those of the bundle sheath. To this the name of innerbast sheath is applied The bast fibres and an inner single layer of wide thin walled lattice cells come next, then a band of thin small-walled cells called the bast parenchyma. The xylem is composed of a number of enormously enlarged cells and vessels with greatly thickened walls exhibiting bordered pits. These are elongated into transverse clefts giving rise to the cell form called scolariform, typical to fern structure. The wood parenchyma of the fibro-vascular system occurs between and surrounds the scolariform and spiral vessels.

(5) Tranverse section of (Cyperus alterni folius) or Umbrella plant of the sedge family, Greek. A typical monocotyledenious plant. Diagram magnified by a power of 400 diameters. What is known as the xylem portion of the fibro-vascular bundle consists of two large vessels situated laterally and partly encircled by cells. Included between them and the under lying layer of thick walled parenchymatous cells are a number of cells and vessels of various shapes and sizes one or two situated centrally are of a superior size and exhibit clearly well defined broad walls. These are spiral and annular. The very large ones are pitted. Then there are the two sub-triangular groups of thinner walled cells which lie on each side of the spiral and annulor vessels, these are found to be parenchymatous wood cells. The epidermis like that of all diectyledens always form the external limitary layer of the young stem. The phlcem portion is the upper part of the limiting layer of the parenchymatous cells. The cortex of the stem in the young plant consists of more or less regular polygonal parenchymatous cells amount of which bast fibres and vessels and greatly thickened cells and vessels sometimes occur. The vascular bundles are seen to lie isolated in the fundamental tissue. The sieve tubes are found in the soft bast and differ from that of diectyledons by being usually devoid of lateral perforations. The fibro-vascular bundles traverse the stem in two principal ways In the vast majority of instances they grow inwards towards the centre of the stem and divide into two parts, one of which pierces the cortex of the leaf stalk and the other continues in its original direction to join the next older bundle. (6) Spore of pre-historic club moss, Lepiderdron harcourtii, taken from the coal measures on coast of England. These diagrams are simply to show the value of the microscope in botanical research. By its use upwards of 100,000 plants have been recorded of both divisions, viz., flowering and non-flowering. Of both 200,000 are mentioned in the botanical nomenclature. The objects of botanical investigation to-day are (1) Why is this function confined within the cell? (2) Why is the cell membrane thickened at a particular spot in a certain manner? (3) What is the meaning of all the tubes and passages which exhibit such great diversity of size and shape, and why do they vary so greatly in shape and distribution in plants, which are subject to different conditions? (4 Why is one organ arrested in its growth and shrivelled up and another developed? (5) Why do plants imitate insects? [6] Is it the color of the flower or perfume that attracts insects to aid in the fertilization of the seed? [7] What is there in the pollen of vegetable life, that fructifies the contents of a carpel? No fact is without significance. Every part has a function to fulfil. The rapid growth of this research is due to Darwin. Many botanists of to-day ask the foregoing questions. In conclusion, let us hope that even in our generation some scientist will rise to shed tne light where at present darkness prevails.

SYLLABUS.

1899.

Sep. 26--An Evening with the Microscope,
H. C. PRINSEP, Esq.

Oct. 17--Lecture: "The Shapes of Leaves,"
FRANK TRATMAN, Esq. M.D.

Nov. 14--A Lecture on Entomology,
R. HELMS, Esq.

Dec. 12--Memoirs of the late Baron Von Mueller,
J. S. BATTYE, Esq. B.A.L.L.B.

RULES OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

1. This Society is named the "MUELLER BOTANIC SOCIETY OF WESTERN AUSTRALIA."

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body the following office-bearers, viz.: Patron, President, two Vice-Presidents and a Council of seven persons, who shall together constitute the General Council of Management of the Society's affairs; and at all meetings of Council, three shall form a quorum.

3 A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be EX-OFFICIO members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary members, (B) Ordinary members, (C) Junior members. (A) Honorary members, who shall be entitled to all the privileges of ordinary members, except that of voting shall be persons not resident in Perth, who are distinguished for their attainments in Botany (B) Ordinary members shall pay an annual subscription of 10s. 6d., and may become life members on payment of Ten Guineas in one sum. (C) Junior members shall be under the age of 16 years. They shall not be entitled to vote and shall pay an annual subscription of 5s.

6. All subscriptions shall become due on first day of July in each year, and be payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the name of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions, any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be ballotted for, and if two-thirds of the members voting shall be in favor of the removal, the member shall be removed from the Society accordingly

11. All the office-bearers and Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of Council failing to attend three consecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to

keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books instruments, specimens, or other property of the Society, and to issue the same for the use of the members subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the correspondence of the Society, attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council. and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year, at which the Council shall submit a report of the proceedings of the past year, and the Treasurer a financial statement duly certified by two Auditors appointed at the previous ordinary meeting.

18. The Annual Conversazione shall be held at such time and place as may be arranged by the Council.

19. The field days may be held on such days as may be determined on by the Council.

20. Should any circumstance arise not provided for in these rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21. Seven ordinary members shall constitute a quorum at a General Meeting

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual Meeting, or Special General Meeting convened by the Council for the purpose, or by a requisition of not less than seven members such proposed alterations or additions to have been submitted to the previous ordinary meeting.

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INAUGURATED 1st JULY, 1897.

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Mueller Botanic Society

OF WESTERN AUSTRALIA.

Rooms—Department of Agriculture,
"West Australian" Chambers, St. George's Terrace, Perth.

.. BUSINESS PAPER ..

FOR MONTHLY MEETING, TUESDAY, 21ST NOV., 1899,

AT 8 P.M.

1.—Minutes of previous Meeting.

2.—Correspondence.

2.—Secretary's Report.

4.—Election of New Members.

5.—Flower Excursions.

6.—General Business.

7.—Lecture on Entomology, R. HELMS. ESQ.

JOURNAL OF PROCEEDINGS OF THE

Mueller Botanic Society.

VOL. I.] PUBLISHED OCTOBER, 1899. [No. 2.

THE ordinary monthly meeting of the Society was held at the rooms of the Department of Agriculture, on Tuesday evening, 26th September, 1899. Mr. T. W. Cockburn occupied the chair, and about forty members and friends were present.

Election of New Members.

The following new members were proposed and elected: Misses Wemyss and Creeth, Messrs. A. F. Abbott, R. H. Duance, J. Cropper Milligan, Wm. Saw and Thos. Cooper.

Flower Excursions.

It was decided to hold a flower excursion to the Peninsula, at the kind invitation of Mr. R. W. Hardey, on Saturday, 30th September. The Secretary was instructed to make the necessary arrangements for the conveyance of members by 'bus to that locality.

Lecture.

A lecture was delivered by Mr. H. C. Prinsep on "An Evening with the Microscope," a full report of which is to be found in this issue. At the conclusion of a highly-instructive and interesting lecture a vote of thanks was accorded to Mr. Prinsep, on the motion of Mr. Taylor. The meeting then terminated.

An Evening with the Microscope.

[By H. C. Prinsep, Esq.]

IN these days when science, up to a certain point, is brought before us at an early age—when advanced civilization has enabled records to be kept of each step in discovery in every branch of it, so that the immense mass of information, which has grown by the researches of thousands of eager votaries, each adding to the work of those who have gone before—such an instrument as the microscope is familiar to most of us, although there may be few who make a study of its mechanism. merely being satisfied with the wonders it discloses, or the settlement of vexed questions by its aid The instrument has, however, long ceased to be a mere toy, as it was even so late as the last century; it is now recognised as necessary to the study of every physical science. Geology, chemistry, mineralogy, anatomy and botany, all require its aid, and every improvement in its construction enlarges the field of each of these studies. Indeed, the improvements in its construction are now so frequent that, except for those who have the time and inclination to master the science of optics, is it advisable to attempt more than the principles of refraction, which will give them a general idea of how it is they are able to peer into the intricacies of God's creation, and thus appreciate how His wisdom and power are found in whatever hidden recesses we may penetrate—as well as in the utmost confines of the great starry realms—whose wonders have been unfolded to us by the telescope, the invention of which was the natural precursor of the microscope, sister instruments, as the common termination of the name implies—for the Greek verb, "skopeo" means "I see," and as "mikros" is Greek for "little," and "tele" for "far," the construction of the words is evident.

Even to those who seek no fame in the world of knowledge it is both an amusing and instructive companion; nor does it require any special powers of travel. Those confined to their chambers, or residing in crowded cities, can find multitudes of specimens for study, and apparently more is added to human knowledge by close study over a small range of objects than over a wide field.

The early history of the microscope, like that of many other scientific instruments, is rather obscure, and we are not certain of the actual time of its discovery or the name of its inventor, if, indeed, it was confined to one person. Its simplest form, as one lens, or what we call a "magnifying glass," some assert to have been known centuries before the Christian era. All we really know is that crystal globes filled with water were used as burning glasses sometimes for cauterization and sometimes for ignition. The celebrated Archimedes, during the siege of Syracuse by the Romans, 212 B.C., among other wonderful machines he invented for the confusion of his enemies, is said to have set fire to their ships by burning glasses, and 300 years before this it seems, from a passage in the writings of Aristophanes, who lived 500 years before Christ, that burning glasses were sold at the shops in Athens. Sir David Brewster, the inventor of the stereoscope, called attention to a piece of rock crystal, ground into the shape of a plano-convex lens, and found by Mr. Layard during the excavation of Sargon's Palace, in the ruins of Nineveh, and suggested that it was a lens used as a magnifying glass. The date of its production could not have been later than about 700 years before Christ. Much discussion has arisen over this unique curiosity, and though every weight must be given to the opinion of such an authority as Brewster, there are circumstances much against his theory. It goes to show, however, that the ancients must have been aware of some of the properties of the convexity of surface in transparent bodies, but failed to reach that discovery, which would in the possession of such great minds, have influenced learning so much and possibly changed all history, for early writings make no mention of any use to which lenses, as magnifyers were put; nor were they used in any way to assist sight until the end of the 13th century of the Christian era. There exists a manuscript dated from Florence in 1299, in which the writer says: "I find myself so pressed by age that I can neither read nor write without those glasses they call spectacles, lately invented, to the great advantage of poor old men when their sight grows weak." Another writer in 1305 says that the invention of spectacles dates back "20 years," which would be about 1285. It is now known that the inventor was a Florentine, Salvino Armato degli Armati, who died in 1317. He kept the secret for his profit, but it was discovered and published before his death. After this no doubt the manufacture and use of spectacles became general, both as double and single glasses. There is a well-known portrait of Pope Leo X painted by Raphael in 1513, and now in the Pitti Palace in Florence. In it the Pope is drawn holding a hand magnifying glass, evidently for the purpose of examining carefully the pages of a book lying before him.

The discovery of the simple lens as a magnifier and useful to those afflicted by the failure of sight from age, is also credited to an Englishman in 1276, namely, Roger Bacon, a Monk, and generally looked upon as the inventor of gunpowder, as far as European Nations are considered—the Chinese are supposed to have known of it long before, Bacon was unfortunate in having many enemies, and spent the latter part of his life in prison and his works had to be concealed, and only came to light in 1733, so that Armato had the glory of the invention, and possibly carried his discoveries further than the poor monk, Roger Bacon.

It has been found a difficult task, if even it is possible, to decide upon the actual individual by whom the compound microscope was discovered. Valuable evidence has, however, been obtained, claiming the invention by that celebrated Florentine Galileo about the year 1610. He has often been credited with the invention of the telescope, but it appears that while holding a professorship at the University of Padua, he heard of its invention by one James Meteus, a schoolmaster of Alkmaar in Holland, in 1609. Galileo, without having seen this instrument, constructed one for himself with which he made several discoveries, amongst others the Satellites of Jupiter. We are told in Vivian's life of Galileo, that this great man was led to the discovery of the microscope from that of the telescope and that in 1612, he sent one to Sigismund, King of Poland.

The transformation of a telescope into a microscope was accomplished by a French spectacle maker, Chorez, in 1625, and it was stated, that with it a mite appeared as large as a pea, so that one could distinguish its head, its feet and its hair, a thing which seemed incredible to many, until they witnessed it with admiration.

But this was not the invention of the Frenchman, for Galileo had found it out in 1610 and announced it to the world, through the publications of one of his pupils, a Scotchman, named John Wodderborn.

The character of the instrument he made, however, is not clearly given, But it seems from a description of the effects to have been like a Dutch telescope used as a microscope. Galileo himself, in a letter to one to whom he had given this new instrument, says, after describing how to fix it up and use it :—" I have contemplated very many animals with infinite admiration, amongst which the flea is the most horrible." (*This was probably known long before the time of Galileo*). He goes on—"The gnat and the moth are the most beautiful, and it was with great satisfaction that I have seen how flies and other little insects manage to walk sticking to the glass and even feet upwards.

The name it went by at first was "occhialino" or "occhiale," and it was re-named "microscope" by Giovanni Faber in 1625, to agree with the name "telescope" which had been given to that instrument by the Academy of the Lincei.

In the 17th and 18th centuries the improvements followed one another fast Thenames of those who contributed most to its perfection, were Fontana, and Dr. Hooke, Divini, and Bonani, and in the 18th century Sir Isaac Newton and Leiberkuhn, by whose work the microscope and microscopic science have since made the most rapid advance.

We may say that it is only during the last 60 years that the microscope has been really useful to science, owing to the great magnifying power attained and clearness of definition by the recent discoveries. Thus, the science of hist'ology, or microscopic anatomy came within the scope of study, and research could be made into the most minute structures, the processes of secretion, nuitrition, generation and even the mysterious action of the brain and the nervous system are now being revealed. Those who use it most are the members of the medical profession, who thus, can contribute not only to science, but to the benefit of their fellow creatures.

An extended microscopic examination, has shewn that animals and plants gradually approach each other as we descend in the scale until they meet in a common centre—the simple or individual cell.

At this point all means of distinguishing between vegetable and animal organism ends, and no feature exists which at present can enable anyone to determine to which of the two kingdoms the individual cell especially belongs.

I have been unable to prepare any diagrams, as I first intended to explain the theory of refraction, on which the whole principle of these optical instruments rests, but no doubt my hearers will feel a relief at not being compelled, this evening, to listen to a subject which involves so much mathematical thought, and would much rather be shewn a few characteristic microscopic lantern slides which are available.

By the aid of the limelight lantern the following objects were throw on the screen: 1. Licomphora; 2. Proboscis of Blow Fly; 3. Feet of Male and Female Blowfly; 4. Tongue of Haliotis (Earshell); 5. Wings of Dragon Fly; 6. Young Larva of Butterfly; 7. Saws of a Saw Fly; 8. Rhingia Rostrata; 9. Slice of Rhinoceros Horn; 10. Sections of Oak; 11. Magnesium Sulphate (Epsom Salts); 12. Chloride of Ammonium; 13. Ferricyanide of Potassium; 14. Salicine; 15. Platinocyanide of Magnesium; 16. Some Sections of Rock from our Goldfields and the Darling Ranges.

SYLLABUS, 1899.

Nov. 21.—A Lecture on Entomology.

R. HELMS, Esq.

Dec. 12.—Memoirs of the Late Baron Von Mueller.

J. S. BATTYE, Esq., B.A., L.L.B.

RULES

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

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INAUGURATED 1st JULY, 1897.

Mueller Botanic Society

OF WESTERN AUSTRALIA.

Rooms—Department of Agriculture,

"West Australian" Chambers, St. George's Terrace, Perth.

JOURNAL OF PROCEEDINGS OF THE

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VOL. I.] PUBLISHED NOVEMBER, 1899. [No. 3.

THE ordinary monthly meeting of the Society was held at the rooms of the Department of Agriculture, on Tuesday evening, 21st. November, 1899. Mr. Chas. Naylor occupied the chair, and about thirty. members and friends were present.

Secretary's Report.

Since our last monthly meeting only one excursion has taken place, viz., to Serpentine. on the 9th November. A most enjoyable outing was spent in that locality, over 300 persons availing themselves of the opportunity. A special train was engaged for the occasion at a cost to the Society of £34, and I am glad to state the undertaking resulted satisfactory. We were fortunate in having glorious weather for the outing. The special train left Perth at 10 a.m., returning to the city at 7.20 p.m. All the arrangements were punctually carried out by the Railway Department, everything passing off without a hitch.

At the last Council meeting of this Society Mr. Prinsep submitted some special grasses, which had been forwarded to him from residents of Kellerberrin. The following is his report thereon :—

"Some of the settlers around Kellerberrin have requested me to lay before the Society samples of two kinds of grass indigenious to the forest lands in that locality and elsewhere. These forest lands cover an immense portion of the Eastern and South-Eastern districts. The peculiarity which attracts attention is the fact that in their ordinary condition, the country in these forest lands is covered by thin forest, with low scrub growing between the trees, but otherwise the ground is quite bare, the surface being of red loam or clay, If, however a few trees die or a patch of country is ring barked it is noticed that in the following wet season the ground is covered with a thick growth of the smaller kind of grass, somewhat resembling chickweed. The next wet season this disappears and is replaced by a heavy growth of the larger kind resembling wild oats, but shorter. It completely covers the ground with a thick pasture, good for stock. I have seen a field of it adjoining a field cultivated for a hay crop, and the sward on the former was far the more luxuriant. The settlers ask from whence oomes this heavy growth, on a land which, from time immemorial, has only exhibited a bare red surface to the sky, except for the scattered trees and bushes upon it.

These grasses were then given to Dr. Tratman, who very kindly submitted the following report:—

"The growth of grasses under ring-barked trees is a subject of very great interest. Of the specimens submitted to me the larger is a true grass—*Bromus arenarius*—a native of this colony as well as of New South Wales, Victoria, and South Australia. The smaller specimen is not a grass, but a *dicotyledonous* annual allied to the English chickweed. I think the explanation of the phenomenon is to be found in the alteration of the condition of the soil in respect of moisture, which occurs slowly in the neighbourhood of ring-barked trees. Ring-barking a tree does not inflict a mortal wound upon, bnt leads to a gradual and lingering death from the exposure of the vascular and living part of the tree to the injurious influence of hot sun in the day and cold air at night. It is very different from the effect of sap-ringing, by which a mortal wound is inflicted and the tree dies at once. The effect of ring-barking is that during the first year, or until the wound in the tree has been exposed to a scorching summer sun, it continues to extract a great deal of moisture from the soil, but not by its more superficial roots, which die first, and only a plant which can get on with a small quantity of superficial moisture can grow. At this time the dwarf annual germinates and grows. In the second year the tree is dead, the soil retains all its moisture, and consequently the strong grass is then able to germinate aud grow. The question of where the seeds come from is not a difficult one to settle, There must be isolated blades or patches of these plants growing about the country, and in fact the whole of that hard, baked up, red land lying between Northam and Coolgardie may be looked upon as ready sown with seed, and as a favourable set of conditions arises, so the seed which corresponds to those conditions immediately germinates."

Lecture.

A lecture was delivered by Mr. R. Helms on "Entomology," a full report of which is to be found in this issue. At the conclusion of a highly-instructive and interesting lecture a vote of thanks was accorded to Mr. Helms, on the motion of Mr. E. J. Bickford. The meeting then terminated.

Lecture on Entomology.

[By Richard Helms.]

When I promised to give a lecture on Entomology I thought of dealing with the interaction that exists between plants and the creatures known as insects, which not only is highly interesting and often very intricate in its manifestations, but has besides an important bearing upon life generally, and the welfare of mankind in particular. On thinking the matter over, however, it dawned upon my mind that the field, as it has such a vast extent, could not be successfully cultivated without first discussing the life and the characteristics of these creatures in order that such a discourse might be the better understood. For this reason I considered it advisable to divide the subject—Entomology— into a series of lectures and begin at the beginning. In this introductory lecture I therefore propose to define what is understood by an insect at the present stage of knowledge, give a historical sketch of the science, and explain the classification of the beings that fall within its scope.

The Definition of Insect.

Entomology is the science embracing that part of natural history which deals with insects. Whoever intends to investigate this branch of knowledge, and wishes to profit by it, has first of all to make himself acquainted with the nature and the characteristics of the animals known by that appellation.

In concrete language, insects are beings with articulated limbs that have no backbone; whose body instead is supported by a more or less solid outer casing of chitin (which is an elastic substance of a leathery or horny nature), and is characterised by three marked divisions, namely, the head, the thorax or chest, and the abdomen, the latter portion consisting of a number of rings (*annula*). They are, however, in their perfect state, always possessed of three pairs of legs and mostly have two pairs of wings, and never more than one pair of feelers. Their respiration is by means of *Tracheae*, which are ramifying tubes of a delicate structure that enter the abdomen at different points.

These characteristics have been decided upon to define the animals to be classed as insects, who on account of them are known also as *Annulosa* or *Tracheata.* Insect, the oldest and best known term, is derived from the Latin verb *insecare*, meaning "to cut into," and indicates the outward appearance of these creatures because the markedly constricted part between the thorax and the abdomen found with a large number of insects has the appearanee of being caused by an incision. Unfortunately this peculiarity is absent with some orders and being also found with the spiders, besides other visible structures, such as feelers, articulated legs &c., being common to crustaceans, centipedes, and similar creatures, these groups in consequence were classed with the insects by naturalists to within comparatively recent times, and popularly are so still.

With the general progress of Science, the consideration given to internal structures, and the more correct study of the developments of living beings, the lines of demarcation between the different classes into which animals are placed could be drawn more correctly, and at present scarcely any material difference exists between the arrangements of the leading systematists in regard to the primary divisions of the Animal Kingdom. Only in few instances some difference exists about some forms amongst the lower types into which class they should be placed. This difficulty of clearly defining every living individual, however, merely supports the philosophical conception that life in its higher phases is the outcome of a gradual development and is still linked at its converging points of deviation.

Historical Sketch of the Science.

Entomology has attained a high degree of merit in our days, but like other sciences it progressed slowly in its beginning, if at all, and again was for a long time neglected, in fact, strictly speaking, it never received much attention till within the last two hundred and fifty years, but since that period has made great strides. The following is a superficial sketch of its history :—

The oldest known attempt to classify animals in groups is that by Aristotle about 330 B.C. In his work on zoology, although not completely systemising therein all animals, he has nevertheless placed the crustaceans in a separate groop from the insects which is a proof of his clear conception of things. Insects he calls *Entoma*, which he divides into winged and wingless groups. Aristotle may therefore not only be called the father of zoology, but in particular the father of entomology also, since from him we have received the name which later became latinised and is retained in both forms.

About 250 years later Plinius died, who during his life had read all books he could lay hands on, good and bad, in accordance with his expressed opinion that there was not a book so bad that it was entirely void of some useful information.—I may here venture to observe that in his days printing had not been invented, and "Police News" and "Penny Horribles" were not then vended on railway platforms.—A great lover of nature and sciences he had compiled a cyclopædia of what had previously been written about natural history, to which he added much from his own study and observations, but it seems that he has not always interpreted Aristotle quite faithfully. His life was sacrificed at the age of 56 during the terrible catastrophy that destroyed Herculanean and Pompeii, 79 A.D., when observing the eruption of Vesuvius from a war vessel of which he was the commander.

Nothing further exists of what the ancients may have written about natural history, nor has during the middle ages anything been done in that direction.

A gap of about 1,800 years since Aristotle, it may be said to have occurred before the description of animals received again attention. About this time Konrad Gesner, a native of Switzerland (born 1516), is justly credited of having resuscitated zoology. He was poor but very industrious, and during his life collected all that was known about natural history, corrected errors, and filled up gaps. He saw a portion of his labours published in five large folios, which however were entirely devoted to Vertebrates. Busily engaged in preparing a history of insects, death surprised him at the early age of 42 (1558). His papers fell into the hands of the well known scientist, Joachim Kamerarius, from whom they were purchased by an Englishman, Dr. Ed. Watton, who sent them for publication to Thomas Penn in London. But Penn did not comply to the commission, and at his death the papers were obtained by Thomas Moffat, who incorporated their contents in his "Theatra Insectorum," and thus after nearly a hundred years (1631) they were communicated to the world.

In the meantime Ulysses Androvandi had paid attention to the hitherto neglected branch of science, and in 1602 he published seven volumes on insects at Bologna, of which a second edition was published at Frankfort in 1618, and a third in 1638 at Bonn. From that time the students of insects increased considerably. The reproduction and anatomy of these small creatures created at the same time much interest. Malphighi's masterly dissection of the silkworm, published 1664, contributed much towards the latter knowledge, and is a monument of painstaking and skill. Swaunnerdamm observed the life history of insects, and according to their habits and transformation compiled a classification, besides making excellent observations on their anatomy. The result of his labours are deposited in the famous opus "The Bible of Nature," first published in 1738, or 53 years after the author's death.

The first systematic arrangement of insects published is that of John Ray in 1705. A "Historia Insectorum" of which he left the complete manuscript behind at his death, which took place in 1707, was published by Martin Lister in 1710 at the command of the Royal Society of London. The "Ray Society," devoted to entomological research, perpetuates the memory of this eminent naturalist. Ray includes besides crustaceans, spiders, and centipedes also the worms in his system.

The famous Linne is the next naturalist of note. When this hero of Natural sciences published in 1735 his "System of Nature" he included in his fifth class of animals—Insecta—also crustaceans, spiders, and centipedes, but placed the worms in a separate class. His system of classifying insects offered many natural advantages, but being based on one leading characteristic only, that of the presence or absence of wings, was too artificial for the reason that animals of totally different structure frequently fell together in the same division. For instance the spiders and the crabs had to go together, and the order *Hemiptera* according to his characterisation of their wings could not include more than half the insects that naturally should be included, and which had to be placed in one or another of quite distinct natural orders. Moreover his order *Aptera* (wingless) embraced a mixture of structurally different creatures, in fact some from nearly every order. But in spite of these serious defects a great deal of his system has survived to the present day, and even his naming of the orders are more often adopted than otherwise, only their meaning has been somewhat modified.

The immediate successors of Linne, who recognised and attempted to remedy the faults of his system, did not really succeed in doing so for the reason that their arrangements were more or less artificial, and consisted to a great extent in rearrangements and subdivisions of the groups established by him. This is practically all that DeGeer, a learned countryman of Linne's did; and Geoffrey, a Frenchman, who instead of the wings made the number of joints in the feet the leading characteristics of his classification. Fabricius, who published his "Systema Entomologica" in 1775 made the structure of the mouth parts the leading characteristics of groups, &c., which has much in its favour, because by this method of classification insects will be placed into natural orders. Although Fabricius has made for himself an immortal name by it, and for the reason mentioned had a considerable following, his system was not readily and generally adopted, and even found many opponents. The main objection to it was the difficulty of examining the mouthparts of the minute species. Illiger, therefore, proposed about a hundred years ago to combine the Linnean and Fabrician system, but this does not appear to have found favour. Others also proposed new systems, but none have survived.

This was the state Entomology had reached towards the end of the last century when the great zoologist, Blumenbach, established a new school of natural history by his attention to comparative anatomy, which was pursued with stiil greater success by the brilliant Cuvier. The importance of this philosophical teaching was readily recognised, and soon made itself felt in the pursuit of biological studies. Oken was the first to apply it to invertebrates, and Dagobert, working together with Cuvier, applied the doctrine to insects, and knowledge was advanced an important step by their justification of forming a distinct class for the crustaceans and thereby separating them from the insects. Latreille in the meantime proposed a new arrangement of the insects, which, however, differed from the Linnean system by scarcely more than some subdivisions of his groups. In the course of 36 years of entomological writing Latreille himself several times modified his arrangements, and added to the number of his groups in order to keep pace with the general progress of science, and with the view of reconciling diverging opinions. Through Lamark's writings directed to the subject he established the group *Arachnidae*, which besides spiders embraced all apterous insects. Lamark, the author of "Animals without a Backbone," which appeared between the years 1815 and 1822, arranged the spiders into a distinct class, and now the old Linnean class Insecta became dissolved into three classes, namely: — Crustacea, Arachnida, and Insecta.

Whilst the German and French naturalists progressed in the indicated direction some English entomologists made also some marked advances in a similar way. Amongst them Leach, Kirby, and McLeay are the foremost. Kirby, together with Spence, published the "Introduction into Entomology" by which he secured a lasting and merited name in science. It is the best known work on the subject printed in English, and universally acknowledged as a classical production.

The names of eminent entomologists have so considerably accumulated since the beginning of this century that it becomes difficult to select even those whose writings are generally appreciated. Amongst every literary nation a number of men were found engaged with the study of insects, and no doubt the peaceful condition of Europe that prevailed for a long period after the Napoleonic wars, conducial as it was to intelectual pursuits exercised its influence also upon this branch of science. It is unnecessary to dwell upon the many progressive innovations that had a direct or indirect influence upon the pursuit of natural sciences which became more and more popularised as the general education of people

Pages might be filled with the names of well known living writers, but having said more on the history of its development than originally was my intention, I will close this subject by just mentioning that entomology is at present one of the most progressive branches of science.

General Classification.

As mentioned in the foregoing naturalists have now fairly well agreed upon the natural classification of animals. The Animal Kingdom is strikingly subdivided into two realms by a very characteristic structural development, one section being invertebrated or having no backbone, and the other being vertebrated or having a backbone. The former are also called the lower, and the other the higher animals. The kingdom has several sub kingdoms, wherein those animals are placed together that are evidently ancestrally related, and these are divided into classes, these further into orders, and so on into families, genera and species, which are the individual insects, and as there occur often variations from the typical individuals these form varieties.

Numerically the class Insecta is probably the largest in the Animal Kingdom. Upwards of 200,000 species have, approximately, been described, and new ones are constantly added. Without a proper arrangement of these numbers it would be impossible to deal with them satisfactorily.

Their structure determines into what order they have to be placed, and for further determination their shape, size, colour, and other distinguishing marks help to overcome the difficulty. Before giving the structural characteristics of the orders, which as the principal divisions of the class are of the foremost importance I think it desirable to refer briefly to the development of insects, as this is not uniform with the whole of them.

All insects emanate from eggs, but as regards their further development the class may be divided into two principal portions. One section has an irregular and the other a regular metamorphosis or transformation. The young in the first section when leaving the eggshell resemble their parents in a marked degree and after several months during their growth gradually attain perfection. On the other hand the egg laid by an insect having a perfect metamorphosis produces quite a dissimilar being from the parent, which after a period of growth assumes a third form distinct from the preceding and the following, which is the perfect insect. These four stages are :—The egg ; the caterpillar, maggot, or grub, as the case may be, and which all are known as larva; the pupa ; and the sexually perfect insect or imago. With insects having an imperfect metamorphosis these four stages are indicated, but they cannot at all times be defined advanced. The admirable German educational methods have been the forerunners in the latter direction, because for many years past there has even scarcely a village school been known at which natural history was entirely neglected. It is no wonder, therefore, that entomological knowledge became more generally appreciated in that country than in any other, and that also a proportionately large number of scientists are found amongst the German nation whose names shine by the thoroughness of their investigations. Thus it comes that "Handbuch der Entomologie," for a handbook rather bulky, as it comprises seven fairly stout volumes and an atlas of plates, although published by Burmeister in 1832 is still one of the most valuable books on the subject, especially since his classification is the oldest quite natural one and has suffered little alteration subsequently.

Since the initiation of comparative anatomy by Blumenbach no other new thought has exercised such an influence in directing the minds towards natural history than the evolution theory propounded by Wallace and Darwin. And although the philosophy of this theory has been the means of solving the most intricate and obstruse problems in nature, I regret that it is not better understood, for it is my opinion that the smajority of people who are not directly opposed to it on account of doctrines ingrafted by education are of the opinion that it is such another theorem, as for instance phrenology and mesmerism are, which, containing ome truths are nevertheless surrounded with a mass of charlatanry.

The controversy for or against Darwinism has long since died, but the effect of directing attention to natural history has remained, and naturalists become more numerous every year. It is my opinion that the popularity of natural history amongst English speaking people dates from the publication of Darwin's works, and I daresay where prior to it ten interested themselves with entomology, botany, or its other branches a hundred are found at present. Together with increased interest came also the constantly increasing facilities of communication and opening up of previously unexplored regions, which were the means of discovering large numbers of species new to science. Entomologists find it difficult to master all the material coming to light, and for many years past it has been found necessary to subdivide the work in order to do it justice according to the advancing state of knowledge. Specialists who devote themselves to one order or even only to one or two families of an order, or to the description of the insects found in circumscribed regions are becoming constantly more numerous. The geographical distribution of insects is also a specially interesting study to some, and economic entomology is becoming generally appreciated.

We come now to the definition of the orders, of which there are eight constituting the class Insecta. Beginning in evolutionary progression they are placed as follows :—

1. Thysanura (Fringetails).—These are evidently most primitive insects, having no metamorphosis, practically. The occasionally occurring additional rudimentary legs indicate their near relationship with the centipedes. The well known "Silver-fish" (*Lepisma*) is a typical representative of this rather limited order.

2. Hemiptera (Halfwings).—The Linnean name does not correctly apply to the whole order, as only the true bugs have the anterior wings half-horny. The *Aphides*, *Cicadae*, &c., have two pairs of membraneous wings with a reticulation of nervures. In this order the *scale-insects* are placed, and altogether the most aberrant groups belong to it. Their metamorphosis is imperfect and considerably diversified. All species agree in the one characteristic of having suctorial mouth-parts.

3. Orthoptera (Straightwings).—Insects with an incomplete metamorphosis, generally with two unequal pairs of wings, the anterior of which are more or less coriaceous, and with jaws adapted for biting. Grasshoppers are typical representatives of this order.

4. Neuroptera (Nervewings).—The insects of this order have membraneous wings with a network of nervures. They have generally biting, but a few have suctorial mouthparts. Their metamorphosis is incomplete, except with some. Typical representatives are the dragon-flies (*Libellu'idae*). They may be divided into sections of those having an imperfect and those having a perfect metamorphosis.

5. Diptera (Two wings).—This order embraces the flies. They have only one pair of wings with radiating nervures. The posterior wings are replaced by a pair of club shaped organs which are considered to act as balancers during flight. Their metamorphosis is perfect. Flies as a rule have mouthparts fit for biting, but with a number they are adapted for piercing and sucking blood, as for instance in the mosquitoes and gad-flies.

6. Lepidoptera (Scalewings).—These are the butterflies and moths. The beautiful colours possessed by many butterflies make them the most attractive creatures of the class. These colours are variously shaped minute scales which gives the insects their name. Their metamorphosis is perfect.

7. Coleoptera (Shieldwings).—Beetles. The Greek name, is given to this order on account of the horny nature of the anterior wings, under which the posterior membraneous wings are folded after flight. With a number the covers are very hard and thick, and with others they are

found to be thin and flaccid. The metamorphosis of beetles is complete except with a few parasitic species who have an abnormal development.

8. HYMENOPTERA (Membranewings).—These creatures have two pairs of naked membraneous wings with radiating nervures. With a number of species the females are apterous, or they lose the wings after migration. Their metamorphosis is perfect, and intellectually they stand undoubtedly highest amongst insects. Bees, ants, and wasps are the best known families of this order.

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Inaugurated 1st July, 1897.

Patrons:

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Mueller Botanic Society.

OF

WESTERN AUSTRALIA.

Rooms--Department of Agriculture,

"West Australian Chambers."

St. George's Terrace, Perth.

Wild Flowers of Western Australia.

BY ERNEST J. BICKFORD, F.L.S.

THE visitor to Sydney invariably has the question asked, Have you seen our harbour? The stranger in Melbourne, What do you think of our city? But on visiting the Golden West, Are not our flowers lovely? It is admitted that all these three colonies can boast of their peculiar attractiveness in the directions indicated. Western Australia's abundant wealth of floral beauty is, to say the least, unique and striking, especially in the Swan River and Southern districts, although the northern portion, near the coast line and the sand plains, can claim a very fair share, and flowers are indeed to be found for the most part throughout the year.

Regarding the wild flowers of this vast territory it is interesting to read some of the journals published in Great Britain during the early stages of the present century. 'Botanists at that time made the best use of the information obtained from all sources, including famous collectors, who visited these and other southern shores. But it is readily recognised that the true value, and extensive distribution of the many genera and variety of species were not brought very prominently before the botanical world, in a comprehensive form, until the advent of the "Flora Australiensis," compiled by George Bentham and Sir Ferdinand Baron von Mueller, comprising seven volumes. Since the issne of these invaluable botanical publications, other discoveries have been made in the various colonies. Doubtless time will yet add many more species to the large number already recorded. It was the late Baron who said, "Australia is a great continent and all its vegetation is yet untold." It is not always necessary to visit what have been hitherto unexplored parts to find new species of a plant. They may be discovered as the gold was in this colony a few years ago, by ardent prospectors bringing to light the precious metal in localities over which it is said many survey parties and others had been known to travel.

In endeavouring to make this article interesting, and probably to some instructive, it will be necessary to illustrate our subject by a few specimens of the plants to be found in the various localities described. Herewith we give seven illustrations, taken from some excellent water-colours executed by Lady Forrest, who kindly lent them for the purpose. Some were painted at the time the late Baron visited Western Australia They are a very correct and true representation of the structure of the plants. We are indebted to Miss E. Owtram for furnishing us with her paintings for reproduction, and to Miss Creeth, who supplied an able painting of an endemic plant. We reproduce on pages 14 and 15 two specimens of

LEUCOPOGON.

Swan River flora by Noel Doyle Kidson, of Cottesloe, painted by him when only 10 years old, and illustrating his undoubted talent in this direction.

According to the late Baron's last census, more than half of the total vegetation of the Australian continent is represented in the West, the number being 9,050 species. Since then, however, the late Baron has furnished the writer with the names of a few more of recent discovery. Of the number mentioned, 2,460 are not to be found elsewhere, a proportion far exceeding that of the endemic plants in any of the other Australian territories. What is more remarkable, these plants are chiefly found within a triangle, taking a liue of demarcation south of Shark's Bay to the west of the Great Bight; within the space named a marked distinction exists between the plants of the humid littoral regions and of the dry inland tracts; the dividing range which separates the water system, marks off also, to a large extent, the constituents of our gum forests and other features manifestly apparent.

HIBISCUS (or Native Tulip).

Of the immense number of plants existing in Western Australia, the largest numercial division is the Leguminosæ consisting of 497 species; this includes the Acacia family, which are embraced in the natural order just mentioned, numbering 128, a species of which is largely grown for its bark (wattle). Mauy species are of great value as fodder plants although some are included in the poisonous realm. The flowers of the various species to be found in this large and diversified order are strikingly beautiful, and are represented in almost every colour, from the bright red and black of the Clianthus Dampierii, or Sturt's desert pea, to the small yellow blossom of Acacia Diptera.

Following the Leguminosæ, the order Myrtaceæ can claim to rank next with 396 species of various genera, the giant eucalypts are included and so are the Melaleuca and Leptospermum, paper bark or ti-tree family Darwinia, and the pretty fringed Verticordia with its lemon cented

BYBLIS GIGANTEA.

foliage, the handsome Bæckoa, and the beautiful Hypocalymma, the two last are to be found in the immediate vicinity of Perth, and rank with the most attractive of the Swan River flowers. The Callistemon with its bright scarlet plumes is another of this order, Beaufortia, Calothamnus and many others of varied interest. Three Illustrations of this order are given.

We now come to the order Proteaceae with its 380 odd species, the genius Banksia (illustrated) or Honeysuckle is well known to all visitors to the colony and is found everywhere in the Swan River, southern and other districts. Our native pear (Xylomelum) grows in the Swan River area, and is of much interest to botanists, the genus Grevillea (illustrated)

GROUP OF ORCHIDS (Mostly Caladenia or Spider Orchid).

is a strikingly pretty plant with its rich scarlet flowers suspending in graceful ferns, called locally the native fuchsia, and is easily recognised in our illustration. The Petrophila growing everywhere, from the coast to the Darling Ranges, is also interesting. Some species of this plant are of great beauty the flowers having the appearance of rich pink velvet.

Then we have the Synaphea, another gen us of this order, which is remarkable for its rich yellow flowers, and peculiarly formed leaves, in some instances resembling a stag's horn. The Smoke Grass, or Conospermum is to be found in the vast tract of country from the north inland to the southern districts, and in viewing large patches of this plant the effect is most pleasing. The genus Persoonia Hakea Lambetia Adenanthos and Isopogon have an extensive range of habitation and possess foliage mostly of a prickly and repellant nature. There are also a few minor genera in this order.

CLEMATIS (or Virgin Bower).

Next in numercial line we find the Compositae claiming 209 species of the various genera. Amongst the most predominant are the (everlastings) Helipterum, Helichrysum, covering the sand plains with a rich carpet of flowers, the (Swan River Daisy) Brachycome as illustrated on page 11, a pretty little annual; that of the pale blue colour is most attractive and like many other flowers of Western Australia is well worth cultivating. The genus Aster grows profusely in the Swan River district

Podolepis, Waitzia, Toxanthus, Angianthos, Calocephalus, Cotula, Gnaphalodes, Centipeda, Senecio, and many other genera having a few species are recorded in this order.

The Epacrideae number 152 species.—The Styphelia, is commonly known as our native heath. The foliage of this plant is generally of a prickly nature, and the flowers are mostly white, tipped with some other colour, and resembling the garden heath. Andersonia is another genus

MARIANTHUS.

Lysinema. The flowers of this plant emit a peculiar odour, not unlike the smell of curry powder. Another pretty flower is produced by the genus Sphenotoma, and was described in 1828 in the " Flora Australasia." Then we have the Coleanthera, Conostephium, one species of Trochocarpa Needhamia, Oligarrhena ; and the Brachyloma Leucopogan included by the late Baron in his last census in the genus Styphelia. These are the most important species in the above order.

[The following six flowers are produced from Miss Owtram's Sketches.]

CROTALARIA (Parrot Plant).

Liliaceae has but 76 species and amongst the most familiar genera are the Burchardia which is commonly khown as the Snowflake Flower of West Australia, probably because when in bloom the ground appears to be covered with a stretch of groups of white flowers, especially in the Swan River district. To all collectors in and around Perth this plant is a great favourite. The flowers being borne on long stems are very effective for table decorations. Then the Thysanotus, or fringed lily is of a remarkable habit, and in most varieties is twining. Some persons call this the satin flower with not a little reason. We have in this order Xerotes, sweet-smelling, Johnsonia, Bartlingia, Baxteria, Borya, Calectasia, Dasypogon, Wurmbsea, Zanthorrhoea (the grass tree), Kingia, which is endemic to Western Australia, the characteristics of the last mamed genus being investigated by eminent botanists of the present time, with its inflorescence in the shape of a a number of flower heads growing from the summit of the stem. There are a few other genera of less importance to those mentioned.

The natural order Orchideae in the venacular Orchids, are well represented, but only those of a terrestrial habit. It is remarkable that the sphere of existence of the Orchid family is limited to the north, inland to York and surrounding districts, and in the southern areas. They seem to grow best in wooded country. They are found in large numbers on the slopes of the hills; we have 75 varieties in

BRACHYCOME.

Goodeniaceae, the various genera of which grow profusely in the Swan River district and on the ridges of the Darling Ranges, contains a total of 130 species. Of this order the genus Leschenaultia is undoubtedly recognised as the most handsome. The beautiful red-flowering variety of the small species finds its native habitat in the north, towards Geraldton. The colours in every instance are particularly rich, and for

ERIOSTEMON (Native Rose).

miles the ground is covered with the pale green foliage, bearing large clusters of flowers of a brilliant hue. From the Darling Range right down to the coast line are choice collecting grounds for this attractive plant. The No. 11 genus, Goodenia, is to be found invariably in close proximity to the Leschenaultia, the flowers are also mostly blue. The Dampiera is another pretty little herbaceous plant. Scaevola. Velleya, Selliera, Calogyne, Catosperma, Anthotium Diaspasis, and one Brunonia constitute this natural order,

BORONIA.

all including 18 genera, the most conspicuous of which is the Caladenia or spider Orchid, of those there are 18 species The very correct picture of a group painted by lady Forrest mostly represents a large number of the species of this genus. Thelymitra, another genus, bears large spikes of a very attractive and peculiarly spotted flower of various colours. Diuris, or the dog's ear Orchid, is another popular little plant, and Prasophyllum with its long spikes, sometimes reaching 18 inches in length, of densely formed small white flowers, is another interesting genus, and Eriochilus is found in the Swan River district; it commands attention by all collectors. Lyperanthus, whose flowers turn black when dried, are a remarkable genus. Drakea (or hammer-headed orchid) a tiny little genus found growing on the margin of the Canning, is found also towards Geraldten and has a peculiar movement in the labellum. So also has the Caleya the movement of which is evidently for fertilising purposes. The flowers of the Glossodia are spotted white, and bear the appearance of having been varnished. The structures of the flower of the Pterostylis resembles a small box and has a movable labellum, which is sensitive and will close in the box immediately it is irritated by an insect, making it a prison at the same time. Corysanthes, Calochilus, Cryptostylis, Epiblema, and Gastrodia are included in the orchid group.

ANIGOZANTHOS (Black Kangaroo Paw).

Rutacae, is the natural order for the genus Boronia. Of this class there are seven

GREVILLIA (Native Fuchsia).

genera embodying 60 species, of these the genus Eriostemon are most conspicuous. Boronia Megistigma has been introduced into most civilised countries, the flower giving off a delightful refreshing perfume making it a great acquisition to any garden. Its home is in the southern corner of the colony, and it is illustrated here. There are other species, but the most striking is the pale yellow variety of the species, Tetarandra, growing in the direction of Geraldton, the flowers of this plant give off also a very sweet odor, the genus Eriostemen has a large range of habitat, from the north to the extreme south. A really handsome variety grows in the locality of Champion Bay. the flowers being purple and yellow and might well be called our native rose, the small nodding species of pale blue flowers are amongst the first and last to bloom during the season, the genus Diplolaena was named after Dampier. It is a most graceful little herbaceous plant and is easily collected on the Darling Range. During the excursion of the Mueller Botanic Society in October last, several members collected specimens of Dampierii, the only species of this genus. Chorilaena, Philotheca, Geijera, are the other genera of this charming group. The pink and white Crowea of Albany district are included in the henus Eriostemon.

NUYTSIA (Christmas Bush or Fire Tree).

Euphoabiaceæ is an order well known to the apothecary for the medical properties of many of its species, of which

LACHNOSTACHYS.
[From a Painting by Miss Creeth].

there are 52 indigenous to Western Australia.

Sterculiacea is an interesting order and comprises 70 species, mostly of the genus Thomasia and Lasiopetalum. We have two Brachychiton and several Commercoma growing in extensive areas reaching far inland.

Labiatae is a natural order taking an active part in West Australian flora. There are 55 species in all. Hemiandra (or snake plant) grows profusely around Perth. Of the genus Mentha (or Mint) we have one Wrixonia, is an endemic genus, Microcroys, Westringia, Tencrium, and Prostanthera complete the genera of this order.

Salsolaceae includes 61 species. The foremost genera are Bassia, Antriplex, Rhagodia, Kochoia, Dysphania, Didymanthus (endemic) and Chenopodium (a noxious plant). There are several other minor genera of this order.

Malvacæ has a total number of 39 species, 13 of which belong to the genus Hibiscus, of which we give a handsome group by Lady Forrest. Many of this family are found on the goldfields and are called by the people living there native tulip. the colours are generally of soft tints of pink, the petals of the flowers are prettily veined, and in some instances almost transparent. Abutilon Sida, Plagianthus, Malvastrum, Gossypium, and Lavatera are the other genera of this order found in the colony.

CALOTHAMNUS.
[From a Watercolour by Master Noel Kidson.]

Umbelliferæ is found to embrace 50 species of 8 genera, the most imposing of which is the genius Zanthosia or Southern Cross, a native of the Albany district. Didiscus, with its large umbells of pale blue flowers growing in the limestone areas is remarkable for its extreme beauty. Trachymere, Hydrocotyle, Erygium, Daucus Apium are others in this order, so also the genius Actinotis (or flannel flower) this grows

BANKSIA (Honeysuckle).
[From a Watercolour by Noel Doyle Kidson.]

in large quantities on the margin of the Helena River and on the borders of the Darling Range; it is an attractive little annual.

In the order Amarantaceæ, Ptilotus leads with 36 species out of a total of 47. In the Eastern colonies it is known in the vernacular as the cat's paw. The flowers are usually pink and white; they retain their colour for a long time after being gathered. This genus is found in an

PETROPHILA (Velvet Plume).

thern districts and sand plains evidently dry localities. Lippia, Spartothamnus, Newcastlia. Physopsis—which is another endemic—Mallophora Dicrastylis, Chloanthes, Hemiphora, Cyanostegia, Clerodendrum, Avicennia, are all of this order.

Solanaceæ has 27 species in all. The genus Solanum (commonly known as nightshade and potato plant. etc.), are included in this genus, Lycium, Datura, Nicotiana (the tobacco family), Anthotroche, Anthocercis, Isindra, Duboisia, all of which are very scattered in their geographical limits. The flowers of most species are not attractive, and the plants of varied economic value,

Of the order Myoporinae the genus Eremophila stands out conspicuously and embraces 40 species. Myosorum nine species. Of the first named a large number are found in the auriferous tracts and arid districts, and when in flower are of striking contrast to the uninviting environments.

Haemodoraceae: This natural order is well known to all West Australians, for the colony can boast of having almost all the known species and, with one or two exceptions they are endemic. The genus Conostylis has 32, Anigozanthos (or kangaroo paw) totals 9. Of this genus we illustrate, Fuliginosus (meaning black), found in the Geraldton district There are also Tribonanthes 5, Phlebocarya 3, all endemic; of Haemodorum 7 species.

VERTICORDIA.

LESCHENAULTIA.

extensive area from the Swan River. Dipteranthemum is endemic, Amaranthus, Euxolus, Polycnemon, Gomphrena, Aethernanthera, and Anchyranthes conclude this order.

Candolleaceae: Out of the 70 species in this order, 64 are of the genus Candollea, and there are six Leewenhockia. The late Baron in his last census of vasculares, has removed what was hitherto recognised in botanical publications as the genus Stylidium from Stylidae, and includes it in Candollea. This little herb is locally known as the trigger plant and grows in abundance in the Swan river district, the colours of the flowers of most species are white and diffused with shades of pink, while some are yellow.

Dilleniaceae: The genera of this order are few, and only one is a native of Western Australia (Hibbertia), representing 46 species. The flowers generally are of a rich yellow, it seemingly introduces the flower season, and remains in full bloom until its close. The species apparently prefer the ironstone of the Darling Ranges, as the flowers found there are by far of the richest colour.

TEMPELTONIA (Order Leguminoseæ).

Verbenaceæ certainly ranks with the most pheuomenal of Western Australian flora. It includes 38 species, all of which are of much interest to collectors. Lachnostachys is illustrated as painted by Miss Creeth. The stem and leaves of this remarkable plant seem to be void of all sap, and have a thick woolly covering, in appearance at first sight resembling an artificial flower. These are found in the nor-

THYSANOTUS (Fringed Satin Flower).

In the order Ranunculaceae the genus Clematis, as illustrated from a watercolour by Lady Forrest, is familiar to all who visit the country districts. We have two species in Western Australia. Both are exceedingly attractive on account of the pure whiteness of the flower which literally covers the trees and shrubs over which the plant climbs. Ranunculus is another genus of the order, and has also three species indigenous to Western Australia.

Of the order Pittosporeae some of the species of which are esteemed for their extreme beauty, the Marianthus claims to be the most attractive. The climbing varieties growing in the north near Champion Bay, illustrated on page 9, by Lady Forrest, is a typical picture. The species of small growing habit are to be found in the Darling Ranges and the southern districts, the flowers mostly are of blue colour, the genus Billardicra, Sollya, Cheiranthera, Bursaria, and one Pittosporum, complete this order.

Droseracea, of which we show an illustration painted by Lady Forrest, the subject being Byblis Gigantea, is a perfect picture of the fly-trap family. The Drosera genus is more easily recognised on account of the glittering tentacles of the leaves being covered with a sticky juicy acid. This is to arrest the in quisitive little insects, doubtless attracted by the dew on the leaf. As soon as these tentacles are touched the leaf

HIBBERTIA.

closes in upon the unwary insect, which is soon absorbed by the juice exuded by the plant. The flower of the Byblis is by far the most attractive and is of a rich salmon pink colour. Probably the brightness of the flower attracts the insect to the stem and leaves, which are covered with the same juice as the Drosera, but in this instance the insect is absorbed on the surface of the plant. There are 36 species of the Drosera, which is known as insectivorous.

As to the Loranthaceœ, we all know the Mistletoe, and the genus Loranthus. In this order Western Australia has 5, but stands alone in in the Genus Nuytsia. There is only one species in existence, namely Floribunda, which we give from Miss Owtram's brush. This plant is known locally as the Christmas-bush, or fire-tree, which is an interesting study as its congener, the Mistletoe parasitie.

The last natural order we will deal with is the Ficoideae, to which the genus Mesembrianthemum belong. There are two species of this genus found in Western Australia and what is known in the Geraldton district as the ice plant, growing on the coast in the hot dry sand, is of the genus Trianthema; there is another Tetragonia, of 3 species; Aizoon, 2; Gunnia, and Zaleya, 1 each; Macarthinia, 2; and Mallugo, 4. These are all the genera in the above order. An interesting little plant grows in the Albany district belonging to the Pepanthacae, and is the only species indigenous to Australia. It is the genus Cephalotus Follicularis. Then we have the Passiflorae, Santalaceae, Portulaceae, Geraniaceae, Violacae, Bignoniacae, Rubiacae, Cycadeae and other minor orders.

In conclusion, it is the intention of the Mueller Botanic Society, when funds are available, to publish monthly, *in fragmenta,* a treatment of the flora of Western Australia, and doubtless the efforts of the Society will be appreciated by all admirers of the vast flora to be found in this colony. The Secretary of the Society is to be congratulated upon the work done by him during the past year and the excellent arrangements made in connection with the many pleasant excursions held during the season, which have been the most successful that have taken place under the auspices of the Mueller Botanic Society of Western Australia.

RULES

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

1. This Society is named the "MUELLER BOTANIC SOCIETY OF WESTERN AUSTRALIA."

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body the following office-bearers, viz:—Patron, President, two Vice-Presidents and a Council of seven persons, who shall together constitute the General Council of Management of the Society's affairs; and at all meetings of Council, three shall form a quorum.

3A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be EX-OFFICIO members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary Members, (B) Ordinary Members, (C) Junior Members. (A) Honorary Members who shall be entitled to all the privileges of Ordinary Members, except that of voting, shall be persons not resident in Perth, who are distinguished for their attainments in Botany. (B) Ordinary Members shall pay an annual subscription of 10s. 6d. and may become Life Members on payment of Ten Guineas in one sum. (C) Junior Members shall be under the age of 16 years. They shall not be entitled to vote and shall pay an annual subscription of 5s.

6. All subscriptions shall become due on first day of July in each year and be payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society, and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the name of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be balloted for, and if two thirds of the members voting shall be in favour of the removal, the member shall be removed from the Society accordingly.

11. All the office-bearers of the Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of the Council failing to attend three consecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books, instruments, specimens or other property of the Society, and to issue the same for the use of the members subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the correspondence of the Society, attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council, and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year, at which the Council shall submit a report of the proceedings of the past year, and the Treasurer a financial statement, duly certified by two Auditors appointed at the previous ordinary meeting.

18. The Annual Conversazione shall be held at such time aud place as may be arranged by the Council.

19. The field days may be held on such days as may be determined on by the Council.

20. Should any circumstance arise, not provided for in these rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21, Seven ordinary members shall constitute a quorum at a General Meeting.

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual Meeting, or Special General Meeting, convened by the Council for the purpose, or by a requisition of not less than seven such members, such proposed alterations or additions to have been submitted to the previous ordinary meeting.

Journal of Proceedings

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

INAUGURATED 1st JULY, 1897.

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HON. SIR GEORGE SHENTON, M.L.C.

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SYLLABUS.

27 February.—LECTURE, "The Sleep of Flowers." E. J. BICKFORD Esq., F.L.S.

20 March.—LECTURE, "Fossils." B. H. WOODWARD Esq., F.G.S., F.I.I.

24 April.—LECTURE. "The Typical Plant Cell." A. W. WEIHEN Esq., M.A.

JOURNAL OF PROCEEDINGS OF THE

Mueller Botanic Society.

VOL. I.] PUBLISHED JANUARY, 1900. [No. 5.

THE ordinary monthly meeting of the Society was held at the rooms of the Department of Agriculture, West Australian Chambers, St. George's Terrace, on Tuesday evening, the 16th January, 1900, at 8 p.m. Mr. E. J. Bickford, F.L.S., occupied the chair, and about 30 members and friends were present.

Election of New Members.

Mr. J. M. Jenkins was elected a member.

Mr. W. V. Fitzgerald, F.L.S., F.S.Sc., London, F.R.H.S., England, read a paper entitled "Notes on indigenous plants new to W.A." a full report of which appears on page 12.

"Memoirs of the Late Baron von Mueller."

A lecturette entitled "Memoirs of the late Baron von Mueller" was delivered by J. S. Battye, B.A., L.L.B. (A full report appears on page 5). At the conclusion of the lecture Mr. Battye was accorded a vote of thanks for his very interesting lecture, on the motion of Mr. Bickford. The meeting then terminated.

Memoirs of the Late Baron von Mueller.

[BY J. S. BATTYE, B.A., L.L.B.]

IT will not, I fancy, be time badly spent to devote one meeting of this society to a short epitome of the life and work of that greatest figure in the scientific history of Australia, after whom our Society is named—Ferdinand von Mueller.

He was born at Rostock on the Baltic sea in 1825. He was educated in Kiel for the mdical profession, but from the beginning his tastes and inclinations were those of a botanist rather than of a doctor. His Ph. D. was gained by a dissectation on the plant *Capsella bursa pastoris* (Shepherd's purse).

He spent the seven years from 1840-47 in the study of botany in Schleswig, Holstein, but chest delicacy forced him in the latter year to seek a warmer climate, and he emigrated to South Australia, being guided there probably by the fact that so many of his fellow countrymen had gone to that colony. On his arrival he continued to follow the same pursuit as he had done at home, and from 1847-52 he traversed most of the settled districts of South Australia. In 1852 Governor La Trobe found employment for him as Public Botanist of Victoria, and Director of the Melbourne Botanic Gardens, although he could not lay the slightest claim to any knowledge of gardening. In this position, however, he developed to an amazing extent the natural resources of the colony, and also supplied the various colonies with economic plants of the greatest value. The acclimatisation of the of the Eucalyptus in India and afterwards in almost every civilised country is almost wholly due to his energies at this time, and at all foreign exhibitions he present to show the possibilities that lay in the development of Australian forest trees. During his directorship of the Botanic Gardens at Melbourne he raised that institution to the rank of being one of the most valuable of the kind in the world. It was in these gardens that he achieved the success of being the first to raise and bring into bloom the great Victoria Regia water lily.

Although first and foremost he was a botanist, yet he was also an explorer of no small distinction. His own journeys and the interest he took in others were chiefly influenced by his desire to obtain botanical knowledge, but still he took a very deep interest in geographical matters, and that interest was much appreciated, as shown by the fact that for many years in succession he was elected President of the Victorian branch of the R.G.S. Several places have also been named after him —mountains in Australia, a peak in Spitzbergen, a cataract in Paraguay, and a glacier in the New Zealand Alps.

His first important trip was into the Riverina, and his next to North Australia in 1855 as scientific member of the party sent out by the Duke of Newcastle, under the leadership of A. C. Gregory, to look for Leichhardt, and to explore the river Victoria and other parts of the northern portion of the continent. The party landed at the mouth of the Victoria River, and made their way overland to the Dawson River in Queensland. Though they did not find the missing explorers they brought back valuable information about what was then practically unknown territory. Dr. Mueller packed both his brains and his baggage with botanical treasures. This was his first visit to Western Australia. He continued the acquaintance in 1867, when he explored the Stirling Ranges and the surrounding country in the neighbourhood of King George's Sound. He paid a third visit in 1877, and went over the ground between Champion Bay and Shark's Bay, and also between Perth and Geographe Bay. In his various travels throughout the different colonies he became acquainted by personal observation with the botanical characteristics of the principal divisions of the continent.

In 1873 he was relieved of the position of Director of the Botanical Gardens, and a practical gardener was appointed in his place. This change was beneficial from a public point of view. Instead of remaining a scientific wilderness the gardens were transformed into a very picturesque show ground. The change was a very severe blow to the baron, whose sensitive nature revolted at the idea of being superseded, and he ever afterwards ignored the very existence of the gardens. His services, however, were continued to the colony in the position of Government Botanist, which he filled to the time of his death. During the period of his reign at the gardens he published the "Fragmenta Phytographiae Australiæ" in several volumes. This is considered one of the priceless botanical works of the times. It contains the definitions of all the new plants that he or his correspondents discovered, It is so far the only work written in Latin in Australia.

This time also saw the commencement of that work which may be considered the most valuable in Australian Botany. Bentham and Mueller's Flora Australiensis. Mueller desired if possible to publish a complete description of the Flora of Australia, but found on attempting it that such a thing was almost out of the question, owing to distance from London, and the impossibility of consulting the necessary authorities and specimens. He therefore sent home his material and notes to Bentham, who had been asked to undertake the work, and the result appeared under the joint names of the two men. For this work more than 100,000 specimens were examined, and the book represents the first publication of the universal flora of any great division of the globe. The story of the publication of this work is a lasting tribute to the generous nature of the baron, and I cannot do better than give it in Bentham's own sympathetic words. He says :—" When indeed it was first contemplated to bring out a general Flora of Australia under Government sanction, Dr. Mueller was naturally looked to as the botanist the best qualified for undertaking the task of preparing it ; and in the hope that it would be entrusted to him, he had devoted his utmost energies to collecting the necessary materials. But there was one indispensable step, the examination of European herbaria, where the published types were deposited, which he was unable to make ; and it is a signal proof of the generosity of his disposition and the absence of all selfishness, that when it was proposed to him that the preparation of the Flora should be confided to me, on account of the facilities which my position here gave me for the examination of the Australian collections I have mentioned above, he not only gave up his long-cherished projects in my favour, but premised to do all in his power to assist me, a promise which he has fulfilled with the most perfect faith. A joint work was at first thought of, but, independently of the ordinary drawbacks attending on joint works, the distance which separates us, requiring four months to obtain an answer to every trivial doubt or query, put this quite out of the question. I alone am therefore responsible for the details of this work, for the limitation given to genera and species, for their character and description. But important observations have been frequently suggested by the published works of Dr. Mueller, or by his manuscript notes, which he has freely communicated ; and a still more essential and generous contribution to the work has been the loan of the very rich herbarium he has amassed for the Australian Flora, which he remits to me in instalments. One beneficial result to science of the course he has thus pursued is that there will be for future reference duplicate authentic specimens, here and in Australia of the great majority of Australian species."

The number of his publications upon Australian botany is considerably over 200. These range in size from a few leaflets, or small articles in obscure magazines, to standard works of imposing size. After those mentioned one of the chief is "Eucalyptographia," containing descriptions and illustrations of about 100 species of eucalypt. This is the standard work on the subject, and is one of a series of valuable works dealing with natural orders, and abounding in detail and in carefully drawn figures. Such works are :-

1. Iconography of Acacias and cognate genera.
2. Iconography of Australian Salsolaceous plants.
3. Descriptions and illustrations of the Myoporinous plants of Australia.
4. Iconography of Candollaceous plants.

In addition to these he published "The Plants Indigenous to the Colony of Victoria," which forms his principal work on that colony. His "Systematic Census of Australian Plants," involving enormous labour in its compilation, is one of the most useful works possessed by the Australian student of botany.

As a describer of plants he has never been surpassed. He knew every species in Australia, and could tell you at once where it grew and what its properties were. Besides making the world acquainted with the properties of the eucalyptus he laboured to introduce the useful vegetation of other countries into the various colonies of Australia. Amongst other plants he has been credited with the introduction into Victoria of the Cape weed—a troublesome weed that has spread all over the continent.

He gave his soul up to botany, and his labours were ceaseless. Between 1870 and 1880 he enriched his collections by large numbers of new plants, travelling about on horse and foot for the purpose. He visited W.A. for the last time in 1881 for the purpose of making a report for the Government on the forest trees of Western Australia, and during his stay here was the guest of Sir John and Lady Forrest.

In the early nineties, when the colony of Victoria had been brought to a state of almost unexampled depression, it was proposed as a means of retrenchment to abolish the office of Government Botanist. This, however, raised great dissension from all quarters, and was also opposed by those even who had not the slightest interest in either the Baron or his researches, but who considered that to dispense with one whose attainments had shed so much glory on the colony would be to show great want of recognition of his services as well as be an act of basest ingratitude.

It was finally decided to retain him in his old position at a somewhat less salary. This decrease was a great blow to the hypersensitive nature of the old gentleman, not because of the natural money loss involved, but because he thought he saw in it some derogation of his dignity. He submitted to the inevitable, but he never got over what seemed to be a snub. Long after he reached the age when he might have retired on a pension, he kept up his observations and his writings. He continued to the day of his death to take great interest in this colony, and amongst the latest matters from his pen were a sketch of the vegetation of Western Australia, and the specific nomenclature of our most popular plants and flowers for the use of the schools. One of the last acts of his life was to nominate our worthy President for the F.L.S..

He died on the 10th October, 1896, at the age of 71, and as Mr. J. G. Luehman, his able assistant, wrote :—" The Baron had at least his one great wish fulfilled, that he should die in harness. His illness lasted only for a fortnight, and for the first week he would insist on getting up and going into his office, though only for a short time. His death was no doubt due to an affection of the brain, brought on by constant study, worry, and insomonia, to which might be added almost total want of bodily exercise. He passed away peacefully, without any apparent pain."

Baron von Mueller was first and foremost a botanist, and may fairly be ranked amongst the leading botanists of the Victorian era. No man has done so much in this respect for Australia, and few if any have added more to the botanical knowledge of the world at large.

He touched on every department of the subject, but descriptive botany, and its application to manufactures and industry received the greatest share of his attention. It is curious to observe the contrast between his occasionally whimsical or capricious ideas of classification and nomenclature and the thoroughly practical aims of his work. The problems of development morphology and plant history had relatively little attraction for him, but in the directions mentioned his labours were truly indefatigable, and their practical nature will render them valuable for generations yet to come. That such a man should have laboured so hard in an Australian colony under circumstances not very favourable and with means the reverse of adebuate, is an achievement which Australia should be proud to recognise with gratitude. At the conclusion of a sketch on the Flora of Australia for the picturesque atlas, Baron von Mueller remarks :—

"A hope is entertained that a history of the local achievements of science in this part of the world will soon be written, when also just tributes can be paid to all furtherers of physologic research, who here among us worked for the credit of the past and the benefit of future generations. But in grand literary efforts for the Australian Flora three stand pre-eminent in never fading lustre ; of whom the plants on almost every square mile of this great southern land will speak in living words for all ages, and with their great names we will conclude, namely, those of Robert Brown, George Bentham, and Joseph Hooker." It is, I think, open to argument whether succeeding generations will not place even above these names the name of the Baron himself as the one who did most service in the field of Australian botany.

In addition to botany, geographic pursuits have been fostered by him incessantly, and in his earlier days, as we have seen, he took an actual as well as an active part in Australian exploration.

As a botanist and a geographer always to the fore in scientific matters, always ready to lend a helping hand to the inquirer after knowledge, he received in abundance those honours, which not only his colleagues, but also kings and princes were able to bestow. He was one of the first to be made a C.M.G., and was one of the first three in Australia to be raised to the dignity of K.C.M.G. In 1861 he was made F.R.S., and in 1871 the King of Wurtemberg raised him to the hereditary degree of a baron. He also received knighthood degrees from the Kings of Spain and Portugal. In 1888 he was awarded one of the Royal medals of the Royal Society. These medals are only awarded to those who have reached the highest grade in scientific research. In addition to these he is honorary or corresponding member of over 200 learned societies in various parts of the world. He was in fact one of the most decorated men on the face of the earth. His appetite for such things was insatiable. This excessive egotism—the result of the hyper-sensitiveness which I have mentioned—would have been considered vanity and folly in a man of less calibre, of less achievement, but in him it was a mere foible, a trifle indeed compared with the great value of his work and the good qualities that endeared him to all with whom he came into contact. As an example of the extreme length to which he carried this desire I may mention that some years ago I wrote him officially for certain information; in reply I received a courteous answer to my request, accompanied by a note drawing my attention to certain extracts which he forwarded me, showing that he had received an extended notice in a Danish newspaper—*The Norden*—and also that he had been appointed President of the Melbourne Liedertafel.

Now just a word or two about the man himself. Of him as apart from his work there is very little to say. His appearance was well known to most of the residents of Melbourne. He was a unique personage—unique in his dress, in his pastimes, in his friendships. He was a man below middle height, not robust, but he must have been possessed of a strong constitution in order to live the close life that he did and yet pass the allotted span of three-score years and ten. His fear of inheriting consumption, from which both of his parents died before he was 21, made him careful of his lungs. He usually wore a thick woollen comforter, and his hands were covered with white cotton gloves, whilst on his feet were sabots—wooden shoes. He was too much devoted to his life work to spend more time or money than was absolutely necessary over dress. He both lived and slept with his specimens, and minutes spent away from them represented so much lost time. He lived the life of a hermit, and his study was also his drawing-room and kitchen. He had a little stove for cooking and for making his favourite drink—coffee. Cups, glasses, etc., were also in evidence in the study, but if you required one for use you probably had to wash it. The Baron did not waste time on washing things not absolutely necessary at the moment.

It is a pity he never married. He was hard to please, and it could scarcely be said with truth that he was fascinating. Marriage would have rounded off all his angularities and prevented him from displaying little eccentricities He was better known to the man in the street by his odd habits and manners than by his vast achievements. The only little finery he allowed himself in the way of dress was to wear his titles and orders at all Government House functions. When properly set up King Solomon in all his glory could scarcely have been a circumstance compared with the Baron. He could make a display of medals and orders that no governor or politician in Australia could rival, and this notwithstanding the fact that a show case containing several of his medals was stolen from the Museum in Melbourne, and some of the medals thrown into the melting pot.

The Baron was continually seen in public, and was most regular in his attendance at various vice-regal functions, and at all Liedertafel concerts, in which he took very great interest.

He was very fond of reading papers and often made speeches. His English, however, was constructed on the German plan, and his sentences were long and involved, and often contained Anglo-German words of his own coining that conveyed very little information to his hearers. This being the case he was hard to follow, and conversation usually edged away from him. His literary style, like his conversation, was peculiar, and took great liberties with the English language. Those who have received letters from him will remember that the Dear Mr. So-and-So" generally appears about half way down the page instead of at the beginning.

He was very kind and sympathetic with young folks, and was always ready to assist in developing any taste they might have for his favourite study.

All these peculiarities, however, are merely the little eccentricities of character of one who was truly great in all respects. Baron von Mueller was great in his interests, in his topics, in his views. At heart he was quite as much an Englishman as a German, and had a great respect for

British institutions. His whole soul was in his work, and all the salary he received he spent in the furtherance of his researches. As a botanist his name and fame will rank amongst the greatest of the nineteenth century, as long as the science of botany endures. Though the man himself has passed away his labour and his achievements will always form the groundwork, and, in fact, the structure of all Australian Botany.

Notes on Indigenous Plants New to W.A.

[By W. V. Fitzgerald, F.L.S., F.S.Sc., London, F.R.H.S., Eng.]

Cakile Maritima (*Scopoli*).—This plant has a very wide range. In Australia, it is indigenous in the whole of the colonies with the exception of Queensland. Is common in Europe. Bentham in the "Flora Australiensi" seems to have in some inexplicable manner overlooked its occurrence in the colonies.

West Australian Localities.—Abundant at Rottnest Island, Cottesloe Beach, Fremantle, Bunbury and doubtless along the whole of the southern coast. As its name implies it is always littoral.

Eryngium Vesiculosum (*Labillardiere*) has been found sparingly at Midland Junction, growing in moist spots. Does not apparently differ from the eastern form, excepting that the flowers are white instead of bluish. Found in all the colonies excepting far north.

Samolus Bickfordiana (W.V.F.)—An erect, rigidly branched perennial, with a tufted stock and numerous swollen fibrous roots, sometimes shortly stoloniferous. Stems seldom simple 1½ft. to 3ft. high, minutely glandular: radical leaves, tufted, petiolate, spathulate, obtuse, membraneous, 1in. to 1½in. or more in length, 4 to 6 lines broad, withering early. Cauline leaves minute, linear, or scale-like. Inflorescence racemose. Flowers pink, 4 lines across; pedicels slender, erect, 4 to 6 lines long with a small bract about the middle, elongating after flowering. Calyx-tubes aduate to about the middle of the ovary, lobes deltoid, soon shorter than the tube. Corolla-tube broad, exceeding the Calyx-lobes. Lobes ovate, obtuse, longer than the tube. Stamminodia, pink or white, filiform, almost exserted, exceeding the stamens. Anthers ovate with a terminal recurved appendage. Fruit half inferior, ovate, slightly emerged beyond the persistent Calyx, purplish. Seeds numerous, angular.

Habitat.—Salt marshes along the banks of the Swan River near Perth.

The systematic position of this plant would be between two widely distributed species—S. Valerandi (Linne), and S. repens (Persoon). The latter species is abundant in this colony, and in fact grows along with the species just described. Baron F. von Mueller in his last "Census of Australian Plants," mentions two species of Samolus as indigenous.

S. Junceus (R. Brown), is described by Bentham in the "Flora Australiensis." He mentioned among other habitats the mouth of the Swan River, and writes that it may probably be an extreme form of S. repens, an opinion shared by Baron F. von Mueller. It seems to differ from the typical form in habit and foliage. As there will probably be a few within this colony who will cavil at my raising the Samolus to specific rank, a few remarks may not be amiss. Species consists of similar individuals which are related by their origin, and which are the unaltered descendants of a common ancestor or a pair of ancestors. In defining individuals that are similar specificially, we take note of optical characters, especially of the arrangement of the floral envelope. the structure and arrangement of the leaves and the habit of the plant. The fact of two plants of the one genus, differing widely in the specific characters as here laid down, and transmitting those characters with little or no alteration to their descendants is quite sufficient for separating them notwithstanding their similarity in other details. Varietal changes are always due to local conditions, therefore there will not be found in a state of nature in one locality plants optically dissimilar from the prevailing species, unless intermediate types exist along with them. The splitting up of plants into untenable species, as well as the including of widely dissimilar plants under one specific heading, is hardly the fault of the systematist but of the collector, who for some reason best known to himself, forwards little or no data and very often fragmental specimens. There often has been instances in which two apparently dissimilar plants have been described as distinct species, they of course being found in different localities, probably thousands of miles apart. Subsequent botanical research would bring to light individuals of an intermediate type, until it became a matter of impossibility to distinguish one of the original species from the other. The characters of the two original forms not being constant it would be correct to merge them into one species, the oldest specific name having the preference. I hold that when two plants grow together, having the specific differences of Samolus repens and S. Bickfordiana, with no intermediate forms in the vicinity, they should both retain their specific ranks until conclusive proof is forthcoming of their being extreme forms of one species.

RULES

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

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1. This Society is named the "MUELLER BOTANIC SOCIETY ON WESTERN AUSTRALIA."

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body, the following office-bearers, viz. : Patron, President, two Vice-Presidents and a Council of seven persons, who shall together constitute the General Council of Management of the Sociery's affairs ; and at all meetings of Council, three shall form a quorum.

3A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be *ex-officio* members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary members, (B) Ordinary members, (C) Junior members. (A) Honorary members, who shall be entitled to all the privileges of ordinary members, except that of voting shall be persons not resident in Perth, who are distinguished for their attainments in Botany. (B) Ordinary members shall pay an annual subscription of 10s. 6d., and may become life members on payment of Ten Guineas in one sum. (C) Junior members shall be under the age of 16 years. They shall not be entitled to vote and shall pay an annual subscription ef 5s.

6. All subscriptions shall become due on first day of July in each year, and be payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the name of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions, any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be balloted for, and if two-thirds of the members voting shall be in favor of the removal, the member shall be removed from the Society accordingly.

11. All the office-bearers and Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of Council failing to attend three onsecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books, instruments, specimens or other property of the Society, and to issue the same for the use of the members, subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the correspondence of the Society. attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council, and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year,at which the Council shall submit a report of the proceedings of the past year,

and the Treasurer a financial statement duly certified by two Auditors appointed at the previous ordinary meeting.

18. The Annual Conversazione shall be held at such time and place as may be arranged by the Council.

19. The field days may be held on such days as may be determined on by the Council.

20. Should any circumstance arise not provided for in these Rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21. Seven ordinary members shall constitute a quorum at a General Meeting.

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual meeting, or Special General Meeting convened by the Council for the purpose, or by a requisition of not less than seven such members, such proposed alterations or additions to have been submitted to the previous ordinary meeting.

Journal of Proceedings

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

INAUGURATED 1st JULY, 1897.

Mueller Botanic Society

OF WESTERN AUSTRALIA.

Rooms—Department of Agriculture,

"West Australian" Chambers. St. George's Terrace, Perth.

SYLLABUS.

June 19.—Meeting of Officers and Members to receive and discuss ideas for the advancement of the work of the Society.

July ~~23~~ 24—"The protection of the Wild Flowers of Western Australia." To be introduced by E. J. Bickford, Esq., F.L.S.

August 21—LECTURE—"Native Orchids," by Alex. Purdie, Esq., M.A.

JOURNAL OF PROCEEDINGS OF THE

Mueller Botanic Society.

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THE ordinary monthly meeting of the Society was held at the rooms of the Department of Agriculture, West Australian Chambers, St. George's Terrace, on Tuesday evening, the 24th April, 1900, at 8 o'clock. Mr. E. J. Bickford, F.L.S., occupied the chair, and about 30 members and friends were present.

An interesting Lecture entitled, "The Typical Plant Cell," was delivered by A. W. Weihen, M.A. (a full report appears herewith). At the conclusion of the lecture Mr. Weihen was accorded a vote of thanks for his very instructive lecture, on the motion of Dr. Tratman. The meeting then terminated.

The Typical Plant - Cell.

[By A. W. Weihen, M.A.]

"WHAT is life?" This tremendous question has seemed to approach nearer solution on the occasion of every great scientific discovery. Hope of unlocking the great secret ran high, when it was discovered that objects could be rendered visible on an enlarged scale by the use of glass lenses, and the microscope was invented. These glasses were expected to yield, not only an insight into the minute structure of living beings, which is, of course, invisible to the naked eye, but also to reveal the processes which constitute life itself. The first discoveries made with the microscope, between 1665 and 1700, profoundly impressed those who made them. The Dutch philosopher, Swammerdam, became almost insane at the marvels revealed by his lenses, and at last destroyed his notes, having come to the conclusion that it was sacrilege to unveil, and thereby profane, what was designed by the Creator to remain hidden from human ken. Later, Leeuwenhoek announced a discovery of minute organisms in infusions of pepper. He was not believed until an English observer, namely Robert Hooke, confirmed his discovery and demonstrated the organisms before a meeting of the Royal Society in London, in 1667. Even then, it was considered wise to have a special document drawn up and signed by all those who were satisfied, on the evidence of their own eyesight, about the existence of these organisms.

The study, by microscope, of the higher plants followed close on the heels of these discoveries, and led to the recognition of the special characters of such structures as leaves and stem, wood and pith.

The *great* fact about the cell, (whether plant or animal), which must be grasped, is that it is the unit, both in point of structure and in point of function. A plant is simply a definitely arranged collection of individual cells—an army, in fact, in which each cell is a Tommy Atkins, and, as such, is very much alive. The complete structure is the result of the structures of the units, and the completed functions, which, taken together, constitute life of the plant, are the grand total of the functions of the microscopic cells.

Hence it appears, that any facts, even of the most trivial kind, as far as the cell itself is concerned, are of first importance as far as the whole plant is concerned; and that a familiar acquaintance with the cell, is a condition of progress in botanical science. In fact, all physiology, or study of function, is unintelligible without anatomy or study of structure, and in botany a knowledge of minute structure especially is essential.

To get a concise idea of the relation of cell to plant let us use this simple analysis:—Each adult body consists of *organs*, each of which does not only its own special work, but acts in harmony with other organs. Each organ is made up of *textures or tissues*, which correspond to the textures (cloth, lining, buttons, &c.) of which one's clothes are made. Each tissue in turn is composed, like the wall of a house, of extremely small living bricks, united together by varying amounts of cement material. Each of these bricks is a *cell.*

The term "cell," then, was first used by botanists. This historic use of the word was justified, because in the vegetable unit there is a definite wall, which encloses something in the same way as the wall of a prison cell. The word cell, since that time, has had its original meaning extended, so much so, that it is now used to describe naked masses of living animal matter (protoplasm) which cannot boast a wall at all. This cell wall is made of a substance (cellulose) which closely resembles starch, and which you will remember better when I mention that it is the substance from which the explosive, gun-cotton—used in torpedoes—is made by the action of nitric acid.

If we take the stem or root of an ordinary herbaceous plant, *e.g.*, the geranium, and cut it across at right angles to its length, we find that it has a central mass of pith, around which is a circle of woody substance, and outside this again, a layer of soft greenish material—the cortex or bark. If we get a thin, transparent section of this last layer (which may be done by taking a shaving with a razor whose edge and surface are wet), and examine it, we readily see, even with a low power of a microscope, that it is made up of little irregularly-shaped bodies, which fit accurately together, and give the specimen the appearance of a mosiac. These little fellows are called parenchyma cells.

I intend to take a parenchyma cell as my type and the following is a short, simple description of its parts, starting from without and working inwards:—

1. Cell well.
2. Cell protoplam, which can be divided into two parts, one a meshwork, the other, a mere fluid portion filling the meshes.

3. Nucleus which shows :—

(*a*) A nuclear membrane.

(*b*) Nuclear protoplasm which is analogous in arrangement to the cell protoplasm.

Put still more shortly, a cell is a mass of protoplasm, with, somewhere near its centre, a nucleus, which controls not only the nutrition but also the reproduction of the whole cell.

To describe Protoplam in detail :—It is an essential part of living matter—life without protoplasm is unknown. In appearance it is a thin, transparent, jelly-like substance, and is a mixture of proteids with water in large quantities, and small traces of mineral salts.

Proteids are chemical compounds, of which albumen, white of egg, may be taken as a type. They are very complicated in structure, so much so, that one of the greatest living chemists has been forced to admit that their constitution is hidden in darkness. They contain five elements, carbon, oxygen, hydrogen, nitrogen, sulphur, which are united in different proportions, though their arrangement is unknown.

Protoplasm, then, is a colorless, semi-transparent substance, like thin jelly, whose most remarkable characteristic is the possession of life (wherein it differs from all other substances), and which is extremely hard to examine, first, because it is always being broken down and rebuilt and, second, because, before you can analyse it chemically, it must be killed.

This description applies to the cells forming the deeper layers of the contex or bark, that is, those nearest the woody layer. The layers nearer the surface show a slight difference in the way of an addition, and it is this: Just under the cell wall, imbedded in the protoplasm, we can see little oval bodies of a very bright green colour. It is in these that starch most commonly is found. These are called chromatophores or chlorophyll-corpuscles, (from the resemblance in shape, I presume, to the corpuscles of one's blood), because they contain the substance chlorophyll, an iron-containing compound, through which, in the presence of light, all *ordinary* assimilation of plant food takes place. From the fact that one of the chief sources of the food of plants is a gas contained in ordinary air, and that it is upon this that chlorophyll acts, it has been called the respiratory pigment; and it is a strange thing that in higher plant and higher animal life, at anyrate, the important thing in respiration, is a pigment or colouring matter; for chlorophyll in plants has its exact counterpart in the blood of animals in the form of haemoglobin, which also is an iron-containing compound, is the oxygen-carrier, and is what gives the red colour to blood, when united with oxygen.

Having now introduced our little plant cell in the fully grown up state, we come naturally to inquire as to how it obtains its livelihood.

Put shortly, what is done is this :—Carbonic Acid Gas (CO_2) exists in the air as a trace about 12 parts in every 10,000. This gas is a compound of carbon and oxygen ; the cell, by means of its chlorophyll, in presence of sunlight, splits this gas into its two parts, fixes the carbon in its own body and lets the oxygen, the all-important thing in the life of animals, go free.

It is a remarkable fact that no plant is known which takes up this gas (CO_2) from the earth. One might reasonably expect that the roots of land plants at any rate, spreading out as they do, in a layer of the earth's crust which is saturated with water containing CO_2 in solution (practically sodawater), would suck up to some extent, so important a food, and that it would be from them conducted to the green foliage leaves. Experiments, as far as they go, indicate that this is not the case.

Water, however, which is composed of hydrogen and oxygen, is got from the ground, and nutrient salts, such as simple nitrates and sulphates in solution, are obtained from this source also. Nitrates contain nitrogen, and sulphates, sulphur. From these simple chemical supplies the plant cell derives carbon, oxygen, hydrogen, nitrogen and sulphur, and by the process of assimilation which forms one of its chief claims to its attribute *living*, protoplasm rebuilds itself from these simple materials.

Having described the personal appearance of the little cell and inquired into its means of livelihood, it remains for us to note that it hands down its precious cargo of vitality, so to speak, to posterity, by dividing up ; and, of this division process, there are, at present recognised, two kinds, the rare direct, and the common indirect, methods.

We have thus, to some extent, seen the extreme complexity of structure shown in cells and their nuclei by the higher powers of the microscope, and to conclude let me quote the late Jeffrey Parker :—"When the constituent cells of the higher animals and plants were first discovered, during the early years of the present century, by Schleiden and Schwann, they were looked upon as the *ultima Thule* of microscopic analysis. Now-a-days, the showing of the cells themselves is an easy matter, the problem, is to make out their ultimate constitution. What would be the result, if we could get microscopes as superior to those of to-day, as those of to-day are to the primitive instruments of 80 or 90 years ago, it is impossible even to conjecture." But, relying on the enormous strides which our knowledge *has* made, we may look forward to the future with the confidence, that the unraveling of our difficulties lies in the lap of the days that are near.

RULES

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

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1. This Society is named the "MUELLER BOTANIC SOCIETY ON WESTERN AUSTRALIA."

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body, the following office-bearers, viz. : Patron, President, two Vice-Presidents and a Council of seven persons, who shall together constitute the General Council of Management of the Sociery's affairs ; and at all meetings of Council, three shall form a quorum.

3A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be *ex-officio* members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary members, (B) Ordinary members, (C) Junior members. (A) Honorary members, who shall be entitled to all the privileges of ordinary members, except that of voting shall be persons not resident in Perth, who are distinguished for their attainments in Botany. (B) Ordinary members shall pay an annual subscription of 10s. 6d., and may become life members on payment of Ten Guineas in one sum. (C) Junior members shall be under the age of 16 years. They shall not be entitled to vote and shall pay an annual subscription of 5s.

6. All subscriptions shall become due on first day of July in each year, and be payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the name of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions, any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be balloted for, and if two-thirds of the members voting shall be in favor of the removal, the member shall be removed from the Society accordingly.

11. All the office-bearers and Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of Council failing to attend three onsecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books, instruments, specimens or other property of the Society, and to issue the same for the use of the members, subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the corre-pondence of the Society. attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council, and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year, at which the Council shall submit a report of the proceedings of the past year,

and the Treasurer a financial statement duly certified by two Auditors appointed at the previous ordinary meeting.

18. The Annual Conversazione shall be held at such time and place as may be arranged by the Council.

19. The field days may be held on such days as may be determined on by the Council.

20. Should any circumstance arise not provided for in these Rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21. Seven ordinary members shall constitute a quorum at a General Meeting.

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual meeting, or Special General Meeting convened by the Council for the purpose, or by a requisition of not less than seven such members, such proposed alterations or additions to have been submitted to the previous ordinary meeting-

Journal of Proceedings

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

INAUGURATED 1st JULY, 1897.

Patrons:

THE RIGHT HON. SIR JOHN FORREST, P.C., K.C.M.G.;
HON. SIR GEORGE SHENTON, M.L.C.

President:

E. J. BICKFORD, ESQ., F.L.S.

Vice Presidents:

FRANK TRATMAN, ESQ. M.D.; H. C. PRINSEP, ESQ.

Council:

MESSRS. J. S. BATTYE, B.A., LL.B.; JAMES COWAN; R. D. HARDEY; E. W. HURSTHOUSE; CHAS. NAYLOR; ALEX. PURDIE, M.A.; F. M. WILKINSON, D.M.D.

Consulting Botanist:

DR. A. MORRISON, GOVERNMENT BOTANIST.

Treasurer and Librarian:

J. A. PEART.

Hon. Secretary:

J. A. PEART.

Ladies' Committee:

LADY FORREST MESDAMES PRINSEP, PURDIE, MISS CREETH.

Auditors:

MESSRS. J. W. LANGSFORD AND M. O'CALLAGHAN.

Mueller Botanic Society

OF WESTERN AUSTRALIA.

Rooms—Department of Agriculture,

"West Australian" Chambers, St. George's Terrace, Perth.

BUSINESS PAPER

For Monthly Meeting, Monday, 24th September, 1900.
at 8 p.m.

1.—Minutes of previous meeting.
2.—Correspondence and Reports.
3.—Secretary's Report.
4.—Election of New Members.
5.—Flower Excursions.
6.—General Business.
7.—Lecture on "Native Orchids," by Alex. Purdie, Esq., M.A.

SYLLABUS, 1900.

23rd October.—Lecture "Second portion of the W.A. Flora." E. J. Bickford, Esq., F.L.S.

FLOWER EXCURSION.

22nd September.—Armadale.
27th October.—Serpentine.
9th November.—Gooseberry Hiil.

JOURNAL OF PROCEEDINGS OF THE

Mueller Botanic Society.

OF W.A.

VOL. I.] PUBLISHED SEPTEMBER, 1900. [No. 7.

THE Third Annual Meeting of the Society was held in the rooms of the Department of Agriculture, on Monday evening, 27th August, 1900, at 8 o'clock.

Mr. E. J. Bickford occupied the chair, and a large number of members and friends were present.

The Chairman in opening the meeting, stated that Sir John and Lady Forrest would attend the meeting at about half-past 8 o'clock, the announcement being received with applause.

Office-Bearers for 1900-1.

The following office-bearers were declared duly elected being the only nominations received.

Patrons:

THE RIGHT HON. SIR JOHN FORREST, P. C., K.C.M.G. ; SIR GEORGE SHENTON, M.L.C.

President:

MR. E. J. BICKFORD, F.L.S.

Vice-Presidents:

MESSRS. FRANK TRATMAN, M.D. ; H. C. PRINSEP.

Council:

MESSRS. J. S. BATTYE, B.A., L.L.B ; JAMES COWAN, ; R. D. HARDEY, E. W. HURSTHOUSE, ; CHAS. NAYLOR, ; ALEX. PURDIE, M.A. F. M. WILKINSON, D.M,D.

Consulting Botanist:

DR. A. MORRISON.

Ladies Committee:

LADY FORREST, MESDAMES PRINSEP, PURDIE, MISS CREETH.

Auditors:

MESSRS. J. W. LANGSFORD, M. O'CALLAGHAN.

The President, in thanking the company for his election, said that he believed that the society would soon be regarded as one of the strongest of its character in federated Australia. Western Australia was in indigenous flowers the richest of the group, and by furthering the technical knowledge of the flora of the colony they were assisting to make this colony an important factor in the Commonwealth. He hoped that the coming year would be their most successful in promoting the knowledge of the flora of the colony. They had many new members versed in botany, and the library, which would contain books from all the best botanists in Australia and many of Europe, would be open in a few days. By means of the library they anticipated that the members would benefit more in technical knowledge than in the past.

Annual Report.

The Hon. Secretary, Mr. J. A. Peart, then read the third annual report for 1899-1900 which was as follows :—

To the Members of the Mueller Botanic Society.

LADIES AND GENTLEMEN.—Your council have much pleasure in presenting the third annual report of the society covering the year ending the 31st of July, 1900. From a perusal of it you will note that the society is in a good position, and is steadily gaining ground.

The membership of the society is 200—196 ordinary and 4 honorary members.

The usual monthly meetings have been held with invariably a good attendance of members.

Council Meetings.

There have been nine meetings of the council during the past year. The following are the number of attendances of the members of the council :—Dr. Tratman, 9 ; Mr. E. J. Bickford, 8 ; Dr. Wilkinson, 5 ; Mr. H. C. Prinsep, 5 ; Mr. J. S. Battye, 4 ; Mr. A. W. Weihen, 4 ; Mr. R. Helms, 3 ; Mr. Milligan, 2 ; Mr. Shotter, 2 ; Mr. R. D. Hardey, 2 ; Mr. F. B. Dalton, 2.

We regret the loss of one of our most enthusiastic members. Mr. R. Helms, lately of the Department of Agriculture, sustained through his removal to Sydney. We heartily wish Mr. Helms every success in his new field of labor.

Flower Excursions.

We cannot be otherwise than gratified at the result of the wild flower excursions held last season. Most of them attracted a very large number of members and friends, especially those to Mundaring, Serpentine and Rottnest. We trust that the season we have just entered upon will prove still more beneficial to those who are fond of botanical research. A large field of labor is open to them, and we hope that whilst they are deriving profit and pleasure by attending the excursions they may also encourage others to do the same, thus furthering the objects of botanical science. The following were the excursions held :—

12 August,	1899,	...	to	... Armadale.
26 August,	,,	...	,,	... Smith's Mill.
9 September,	,,	...	,,	... "The Chine."
16 September,	,,	...	,,	... Armadale.
23 September,	,,	...	,,	... Greenmount.
10 October,	,,	...	,,	Gooseberry Hill.
23 October,	,,	...	,,	... Serpentine.
28 October,	,,	...	,,	... Mundaring.
4 November	,,	...	,,	... Mt. Henry.
1 January,	1900,	...	,,	... Rottnest.

Monthly Journal.

We are pleased to report that the society has now seen its way clear to undertake the publication of monthly journals. Although we are greatly hampered by the want of necessary funds, still we are endeavouring with the exercise of due economy in every way to continue the issue of these publications, as we feel sure that they are not only of great assistance to the society by encouraging new members to join, but that members may derive some aid in their love of botany thereby helping those who help us. Six journals have so far been issued. The following were the subjects dealt with in the magazines :—

(1) "History of plant life," by Mr. E. J. Bickford, F.L.S.

(2) "An evening with the microscope," by Mr. H. C. Prinsep.

(3) "Entomology," (as associated with plant life), by Mr. R. Helms.

(4) "Wild flowers of Western Australia," by Mr. E. J. Bickford F.L.S.

(5) "Memoirs of the late Baron von Mueller," by Mr. J. S. Battye B.A., L.L.B.

(6) "The typical plant cell," by Mr. A. W. Weihen M.A.

In addition to these lectures, the following were the subjects dealt with at monthly meetings :—

"An evening with some floral specimens of W.A." Dr. A. Morrison.

"The sleep of flowers," Mr. E. J. Bickford F.L.S.
"Entomology" (as associated with plant life), Mr. R. Helms.
"The division of W.A. into sub faunal areas," Mr. B. H. Woodward.
"An evening with the microscope," Members of the society.

The secretary has still a few of each issue of "The Journals" on hand, and should any members wish to obtain back numbers, he will be pleased to supply them. The Journals we might mention, are issued gratis to the members.

We desire to express our gratitude to the Right Hon. the Premier, one of the patrons of the society, for the deep interest he has taken and the assistance he has rendered to the society since its inception, also to Lady Forrest who has taken no small part in promoting the welfare of the society.

We recognise with appreciation the subsidy granted to us by the Government without which we feel our financial position would have been embarrassed.

We desire also to express our thanks to the various correspondents who have ably assisted us in the forwarding of specimens to the society, particularly from Mrs Bird of Albany, Mrs. Mills of Gascoyne, Mr. Helms of Sydney, and to the various governments and kindred societies for forwarding their pamphlets and monthly journals, and to Mr. H. C. Prinsep for having brought under the notice of the council two kinds of indigenous grass, and his interesting report on the subject which was published in "The Journal" of November last year. To the daily press for the prominence given to the doings of the society in the reporting of monthly meetings and excursions. Also to the secretary of the Department of Agriculture for his kindness in allowing us the use of the museum for the purpose of holding our meetings and granting us the privilege of placing our library in the room for the convenience of the members.

We have also received from Dr. Goebel, the professor of the Munich University a communication asking us to forward him specimens of the Cephalotus, a plant indigenous only to the south western districts of this colony. We are forwarding to this gentleman the specimens asked for and two species of interesting fungus, which have been found in the Swan river district.

Financial Statement.

The financial statement shows the receipts for the year to be £113 4s. 6d.; expenditure, £131 10s., giving a debit balance of £18 5s. 6d. Since the close of the year, however, a sum of £28 11s. has been paid into the bank, (including a small subsidy from the Government) so that the society's account is now in credit to the amount of £3 5s. 6d.

For the Council of the M.B.S.

E. J. BICKFORD, *President.*

J. A. PEART, *Hon. Sec.*

Perth, 27th August, 1900.

Financial Statement.

The Hon. Secretary on behalf of the Treasurer, read the financial statement for 1899-1900, which was as follows :—

RECEIPTS.

	£	s.	d.
To Subscriptions	34	5	6
Sale of Excursion Tickets	28	19	0
Grant from Government	50	0	0
	113	4	6
Balance	18	5	6
	£131	10	0

EXPENDITURE.				£	s.	d.
By Balance				1	15	4
Petty Cash, (posting journals, cards, etc.) and other communications ...				14	0	0
Caretaker and Liftman, for attendance at Department of Agriculture				7	18	0
Furniture—Coliseum				13	12	5
Expenses incurred for Excursions :						
Matheson & Co. ...	7	10	0			
Railway	18	8	11			
Wright & Ralph ...	1	10	0			
Bateman	4	12	6			
				32	1	5
Crockery—Shenton & Co.				0	11	4
Printing—Posner ...	9	15	0			
Sampson	10	0	0			
Wigg & Son	4	3	6			
				23	18	6
Advertising—						
"W.A." Newspaper ...	5	0	0			
"Morning Herald" ...	4	0	0			
				9	0	0

			£ s. d.
EXPENSES ANNUAL MEETING:			
Harrod—Refreshments. ...	3 15 0		
MONTHLY MEETINGS—			
Frost & Shipham, Lime-light	3 12 0		
			7 7 0
Honorarium to Secretary ...		...	20 0 0
Commission on Banking Account		...	1 1 0
Cheque Book		...	0 5 0
			£131 10 0

F. BLAKELEY DALTON, Hon. Treasurer

Audited and found correct,

M. O'CALLAGHAN, }
J. W. LANGSFORD, } Auditors.

On the motion of Mr. Chas. Naylor, seconded by Mr. R. D. Hardey, the Report and Balance Sheet as read were received and adopted.

The Premier and Lady Forrest arrived at this stage, and were heartily welcomed by the president.

Sir John Forrest congratulated the society on the success which had attended its efforts during the past year, and said that the colony owed a debt of gratitude to the members for their efforts to spread the knowledge of its flora. In a new colony such as West Australia, where people had so much work to attend to, it was gratifying to find so many trying to keep alive a knowledg of the beauties of nature. Such a society as that one should be looked upon as a public benefactor. No studies were so noble, grand or interesting as those of Nature, and West Australia gave as great opportunities as any colony in this direction. He felt that those who took up the study of botany would not stop there, but would be stimulated to search out knowledge in other directions in natural history. One family of plant life would give a person plenty of study. The late Baron Von Mueller and Mr. Fitzgerald had given valuable information in their works, but there was much left for others to take up. These scientists had had to study the flora from dried specimens, and consequently they could not form so accurate an idea as from the fresh and growing flower. Less had been done in other lines of natural history in this colony. A Mr. Campbell, employed daily at the Melbourne Post Office, was bringing out a work on the "Birds and Eggs of Australia," being the result of his observations during holiday trips all over Australia. When published it would be a valuable work, to the cost of which, he was glad to say the Government of West Australia had contributed. (Applause.) In such a society as the Mueller Botanic Society, which attracted men and women anxious for knowledge, they had to seek for the preservation of the gems of the flora, which many passed by indifferently or looked upon as insignificant. He was pleased to know that the society was increasing in numbers and knowledge. Anything that he could do, either personally or as head of the Government, to assist the Mueller Botanic Society, or similar societies which had the same object in view, the preservation of the natural flora of their colony, he would do gladly. (Applause.)

Mr. J. W. Hackett, M.L.C., at the invitatiion of the president, also spoke. He tendered his congratulations to the society for the progress made. These smaller societies were an adjunct to their enlightenment, and they were performing some of the nobler work of the history of th colony. The Paris Exhibition had been suppled with some paintings of the Western Australia flora. With Paris still the centre of art and taste, there was a certain amount of doubt as to how the paintings would fare when criticised by the connoisseurs of art there, but he was glad to say that the paintings were highly admired. (Applause.) Though he did not wish to raise false hopes, he mentioned that the Commissioners of the Exhibition had offered some prizes, about 40,000, and he believed Lady Forrest had been awarded a prize. (Applause.) As the Premier had said, steps should be taken to preserve the fauna as well as the flora of the colony. He explained that very little was known of the habits of birds or animals in Australia, and instanced the case of the albatross, known for a long time as the "shy" albatross until Mr. D. Le Souef, of Melbourne, discovered the bird on land, and found it unable to fly, unless it had the force of the waves or other power to give it the desired impetus. Concerning wild flowers, he said it had been a desire of his to endeavour to propogate them. Some plants, like the boronia, had been reproduced, but all efforts to get similar results in the case of Christmas bush from the parent plant had failed. Gardeners differed in opinion as to how the tree reproduced itself. A gentleman once told him that he had been able to propogate the little lace plant, seen more particularly about Guildford, but when he saw the plant it was not the one he was thinking of at the time. He wished the Government might extend its liberality to a society such as this or to the Zoological Committee, so that something might be done to show how these plants and shrubs reproduced themselves. The money would be well spent, and, if successful, the result would be beneficial to the colony and to the world at large.

The Premier, in introducing Mr. E. J. Bickford to give a paper on "The Protection of the Wild Flowers," agreed that something should be done in this direction. Coming down in the train the previous day, when passing the Darling Range he had been surprised at the beauty of the wild flowers and the waterfalls. As a result, he had that day written to the Commissioner of Lands urging him to reserve a considerable area for use as a national park for all time. (Applause.) It was certainly the prettiest place within 20 miles of Perth.

Mr. E. J. Bickford pointed out that formerly the wildflowers predominated round the capitals of the other colonies, and urged that they should not leave it too late in taking steps to prevent the annihilation of the flora of the country. He believed that the time was not far distant when—unless a law were passed to prevent people from wilfully destroying boronia—he did not mean merely plucking the flowers—the plant would be practically extinct. Six years ago, Perth Park was like a garden, while three years later it was bereft of all its splendor by incursions upon it. Now, after three years' protection, the park had recovered to its former state. If the wholesale cutting-down of small trees around Perth were allowed to continue, the Christmas-tree would soon be relegated to the "missing links." The everlastings and the maiden-hair fern ought also to be protected. He recommended that the burning of the shrubbery along railway lines should be deferred until after the seeds had matured, so that the flowers would be propagated. If judges at wild-flower shows were empowered to disqualify competitors who showed carelessness in the plucking of flowers, it would have the effect of preserving the flora. (Applause.)

Sir John Forrest said that the Government would be glad to assist in preventing the destruction of flowers, and he understood that the law now provided for the protection of plants. It remained for the society to point out what plants or trees it required to be protected, and he could assure them of the assistance of the Government. (Applause.)

A vote of thanks was accorded to Mr. L. L. Cowen, secretary of the Department of Agriculture, for the use of the room. Mr. L. L. Cowen humorously responded, and, after a vote of thanks had been passed to the Premier, the meeting was resolved into a conversazione, and refreshments were served.

A meeting of the Council of the Mueller Botanic Society was held in the rooms of the Department of Agriculture, "West Australian" Chambers, on Friday, 7th September, 1900, at 5 p.m.

Present: Dr. Tratman (in the chair); Messrs. J. S. Battye, B.A., L.L.B.; E. J. Bickford, F.L.S.; Alex. Purdie, M.A.; F. M. Wilkinson, D.M.D.

The following were elected members of the Society. Mr. and Mrs. E. A. Le Souef, Mr. and Mrs. R. Trigg, Mr. and Mrs. W. A. Smythe, Messrs. F. W. Staddon, and Hillier.

Mr. J. A. Peart was elected Honorary Secretary, Treasurer and Librarian for the ensuing year.

At the request of the Committee of the Armadale Flower Show, the patronage of the Society was extended to the Exhibition, which is to be held at Armadale.

The following syllabus was arranged.—24 September, Lecture on Native Orchids, Mr. Alex. Purdie, M.A. October 23, Lecture, second part of the flora of W.A.; Mr. E. J. Bickford, F.L.S.

It was decided to alter the date of the Smith's Mill Excursion, previously arranged for September 22, so as to enable members to attend the Armadale Flower Show on 22nd inst.

Flower Excursions.

It was resolved to hold fortnightly excursions, and the following fixtures were made;—September 8, Armadale; September 22, Smith's Mill: Eight Hours Day, Serpentine, (whole day); and November 9, Gooseberry Hill (whole day).

Lecture on Entomology.

:o:

The Development of Insects.

[By R. Helms.]

As previously mentioned two main differences characterises the development of insects, and accordingly the class *inecta* may be divided into two principal groups; namely, into insects passing through an imperfect or indistinctly marked metamorphosis, and insects passing through a regular metamorphosis of four sharply defined stages. But within each group the phases of development vary considerably in regard to time and other particulars, not only between the different orders but also within them between the genera and even between some species of the same genus though in such instances generally to a lesser degree. Some peculiarities, and deviations from the leading features of the metamorphosis characteristic to typical forms will be amplified as we go along; but as all insects with few exceptions spring from eggs laid by perfect insects and as the egg is therefore the beginning of a new insect we will first proceed by discussing the first stage.

The Egg.

The substance of an egg throughout the animal kingdom is extremely similar in its composition. We may take the best known, a fowl's egg, for an example. Here we have the yolk containing the life germ, the single cell from which, as soon as the impulse of growth is given by the coalescence with a foreign cell, the new creature begins its existence by cell upon cell being added, the material for this complicated multiplication being supplied by the yolk. Surrounding the yolk we see a layer of albumen which later is drawn upon for similar purposes and largely helps to provide the covering of the new being. For the protection of the delicate mass a tenacious skin is provided, and outside of this, as with all birds, a firm calcareous substance still further secures it against damage.

Structurally, an insect egg is the same as a bird's egg. It has a yolk surrounded by an albumenous layer and these are enclosed in an elastic tegument. The yolk and the albumen are not always distinctly marked by colour differences, as is the case with bird's eggs, and the outermost covering instead of being calcareous consists in the majority of cases of a viscid matter which sets in the double capacity for fastening the egg when being deposited, and for protecting it against dessication, as the viscid substance when drying makes the tegument impervious to air.

It will be noticed that the main difference between a bird's egg and that of an insect lies in the outermost covering, and in both cases it is deserving of observation that these are admirably adapted to the requirements. Birds being warm-blooded and lung-respirating, could not develop without a certain amount of oxygen penetrating the egg-shell and they acquire a considerable quantity when nearing the time for escaping from it, which they must do soon after reaching maturity. Insects on the other hand do not acquire much oxygen whilst in their embryological state and may be for a long time dormant within the shell, waiting, so to say, for favourable circumstances to emerge from it. In this manner the insect has an advantage over the bird.

As regards the shape of the egg it is also as a rule very uniform throughout the animal kindom so much so that a definite expression has been derived from it. By far the most eggs of insects are ovate, but many modifications of this form occur as well, and a number of quite distinct shapes are peculiar to certain families.

The principally aberrant shapes deserve enumerating, and in doing this I may observe that the eggs of many insects are not yet known, which leaves scope for extensive observations more particularly in Western Australia.

The eggs of moths and butterflies are best known and amongst them are met forms of considerable difference. As a rule those of *Bombyaidas*—the cocoon-making species are globose, and those of a few butterflies are semi-globose. Conical eggs are also laid by certain butterflies, as for instance by the Cabbage Butterfly (*Pieris brassicae*) and its congeners. The eggs become cylindrical in shape when they are laid close together in large numbers. Flattened lenticular eggs occur amongst the *Noetuidae*, and part-shapped and some resembling a turban (*Lyaaena Betulae*) or a barrel (*Vanessa Urticae*) are met with amongst other lepidoptera. Certain flies lay eggs truncated at the upper end (*Gastrophilus equi*, the Bot fly of the horse) the flattened disk forming a lid, and mosquito eggs have a short swollen neck giving them the appearance of a bottle. Peculiar are the eggs of the Lacewings, for being suspended on a straight or curved filiform stalk; the genera

Chrysopa and Nemoptera of this family are represented in Western Australia. The eggs of some flies which are deposited in faceas are provided with flag-like processes on the upper end to prevent them sinking too deep into the soft moss. And one of the most peculiar form are the crowned eggs of the so-called Water Scorpion (*Nepa Cinarea*)—an insect belonging to the *Hemiptera*—which are provided with a wreath of thorns on the upper end for the reception of the succeeding one whereby the eggs lay together in a string and resemble the stalks of the rush-like water equisetum (*E. Lyemale*) or like short-jointed Phyllodes of our Cosusrinas.

As regards the surface of the eggs, the by far greatest number is smooth, but many are also uneven and variously sculptured. Some are ribbed and others provided with flanges or keels, whilst several are tessellated or scaly and a few may be called scabrous. Again there are some covered with a reticulation of which those of the honey-bee furnish a charming example.

The colour of insect eggs, although subject to exceptions, is very uniform. Yellow, white and green are the predominating colours, but a few are pinkish. Brown and grey eggs occur occasionally and very rarely they are banded. A species of mosquito is said to lay black eggs.

Highly interesting is further, the methods of deposition of the eggs adopted by the different insects. Some are singly distributed over the host plant, which habit is generally pursued by the *Sphingidae* or Hawk-Moths, whose caterpillars grow very large and require much food. Others deposit them in aggregated clusters, as is the habit of many butterflies and insects of nearly all orders. The moths belonging to the genera Gastrophaga and Clisiocampa, lay large numbers spirally round the twigs of trees, forming a solidly agglutinated ring, nearly half an inch long and containing many hundred eggs. The plague locust, *Pathotylus Australis*, excavates a pipe in solid ground by means of two horny sleepers at the anal segment, deposits her pinkish eggs obliquely in a double row together with a frothy substance, which exudes during the set of the ovipositing, and when dying fastens the eggs together. Similary other grasshoppers deposit their eggs on the twigs of trees, and the *Phasmidae* (Stick Insects), make ovate clusters which feel quite spongy when the mass of froth combining and enveloping the eggs become dry. The *Cicadae* and Sawflies, slit with the sawlike prolongation of their ovipositor, the bark of their host-plants and place the eggs in rows in their protecting incision. Some of the woolly moths of the family *Bombyaidae* lay their eggs in clusters and cover them for protection with hairs of their body. Certain dung-beetles are not satisfied by merely depositing their eggs within the substance which is to serve as food for the young, but they roll some of it into a pill and deposit the egg therein and then bury the pill for safety. Many of the *Curculiomidae* bore with their trunks into trees, and the *Scolitidea* and *Longicornia* greatly avail themselves of natural cracks in timber to deposit their eggs in. Amongst the *Hymenoptera* a great number prepare special receptacles for their eggs. These are the Bees, Wasps, Humble Bees, Wood Bees, the *chegaobile* and others. The *chegaobile* makes a cylindrical tube of a leaf and partitions the interior into chambers by circular pieces of foliage marvelously accurately cut to fit the cavity. Similiarly the Wood Bees partition the goleries then cut in trees. Wasps make a paper nest divided into cells, and Humble Bees and Honey Bees make cells of wax. One species of Humble Bee (*Bombus Muscorum*), protects its nest with a coating of moss, whilst the greater number make excavations under a tussock of grass. The Honey Bees build in hollow trees, or attach their nest to overhanging rocks and under limbs. An example of their delicate combs is the well-known made by the domesticated varieties. An Indian variety (*Apis dorsata*) constructs nests sometimes so large as a cartwheel, The *Schneumonidae* deposit their eggs in the larvae of other insects, which habit they share with several other genera of minute *Hymenoptera*, some of which also make the eggs of other insects the repository of their offspring. Certain *Hymenoptera* as well as *Diptera* pierce the surface of leaves and twigs, causing gallo to be formed round the eggs, and quite a number of flies pierce the sweetest portions of fractifications to insert eggs therein. The introduced fruit-fly of Western Australia (*Halterophora Capitata*) and the Queensland fruit-fly (*Tephrytes Tryonic*) are noxions examples. Many flies deposit their eggs in decaying vegetation and animal matter or excreta, and the well-known Blow-fly develops its young within its body and produces living maggots. By far the greater number of insect eggs are coated with a kind of glue to attach them when being deposited, and these eggs are called *ova gummosa*; others, such as those of the fruit-flies, dung-flies and of other species that do not require to be fastened have not got this covering and are called naked eggs (*ova nuda*).

Besides those enumerated, many more different peculiarities in regard to the deposition of eggs by insects might be mentioned, but as these will have to be referred to when dealing with the life histories of special types, their consi er-ation may be deferred till then.

One cannot help wondering how universally and deeply the love for the young pervades all living beings, and when reflecting upon the manifold methods insects adopt to safeguard their offspring, and by depositing them near a supply of food they themselves never partake of, provide for their future sustenance, one feels inclined to believe that there is more than innate instinct displayed by even these low creatures, and that a certain amount of pressiener can scarcely be denied them. Whatever the truth of this may be, it will be admitted that studies amongst the smaller life are highly interesting and are likely to afford more novel and charming surprises than, looking at the surface of it, the appearance would seem to promise.

RULES

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

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1. This Society is named the "MUELLER BOTANIC SOCIETY ON WESTERN AUSTRALIA."

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body, the following office-bearers, viz.: Patron, President, two Vice-Presidents and a Council of seven persons, who shall together constitute the General Council of Management of the Sociery's affairs; and at all meetings of Council, three shall form a quorum.

3A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be *ex-officio* members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary members, (B) Ordinary members, (C) Junior members. (A) Honorary members, who shall be entitled to all the privileges of ordinary members, except that of voting shall be persons not resident in Perth, who are distinguished for their attainments in Botany. (B) Ordinary members shall pay an auuual subseription of 10s. 6d., and may beeome life members on payment of Ten Guineas in one sum. (C) Junior members shall be under the age of 16 years. They shall not be entitled to vote and shall pay an annual subscription ef 5s.

6. All subscriptions shall beeome due on first day of July in each year, and be payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the name of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions, any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be balloted for, and if two-thirds of the members voting shall be in favor of the removal, the member shall be removed from the Society accordingly.

11. All the office-bearers and Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of Council failing to attend three onsecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books, instruments, specimens or other property of the Society, and to issue the same for the use of the members, subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the correspondence of the Society, attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council, and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year, at which the Council shall submit a report of the proceedings of the past year,

and the Treasurer a financial statement duly certified by two Auditors appointed at the previous ordinary meeting.

18. The Annual Conversazione shall be held at such time and place as may be arranged by the Council.

19. The field days may be held on such days as may be determined on by the Council.

20. Should any circumstance arise not provided for in these Rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21. Seven ordinary members shall constitute a quorum at a General Meeting.

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual meeting, or Special General Meeting convened by the Council for the purpose, or by a requisition of not less than seven such members, such proposed alterations or additions to have been submitted to the previous ordinary meeting-

Journal of Proceedings

. . OF THE . .

Mueller Botanic Society

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WESTERN AUSTRALIA.

INAUGURATED 1st JULY, 1897.

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Journal of Proceedings

OF THE

Mueller Botanic Society.

Vol. I.] Published Dec., 1900. [No. 7.

THE ordinary monthly meeting of the Society was held at the rooms of the Department of Agriculture, "West Australian" Chambers, St. George's Terrace, on Tuesday evening, the 24th September, 1900, at 8 o'clock. Dr. Tratman occupied the chair, and about 30 members and friends were present.

An interesting Lecture entitled, "Native Orchids," was delivered by Alex. Purdie, M.A. (a full report appears herewith). At the conclusion of the lecture Mr. Purdie was accorded a vote of thanks for his very instructive lecture, on the motion of Dr. Tratman. The meeting then terminated.

"OUR NATIVE ORCHIDS."

Lecture delivered to the Mueller Botanic Society by ALEX. PURDIE, M.A., on the 24th September, 1900. Illustrated by Lantern Slides.

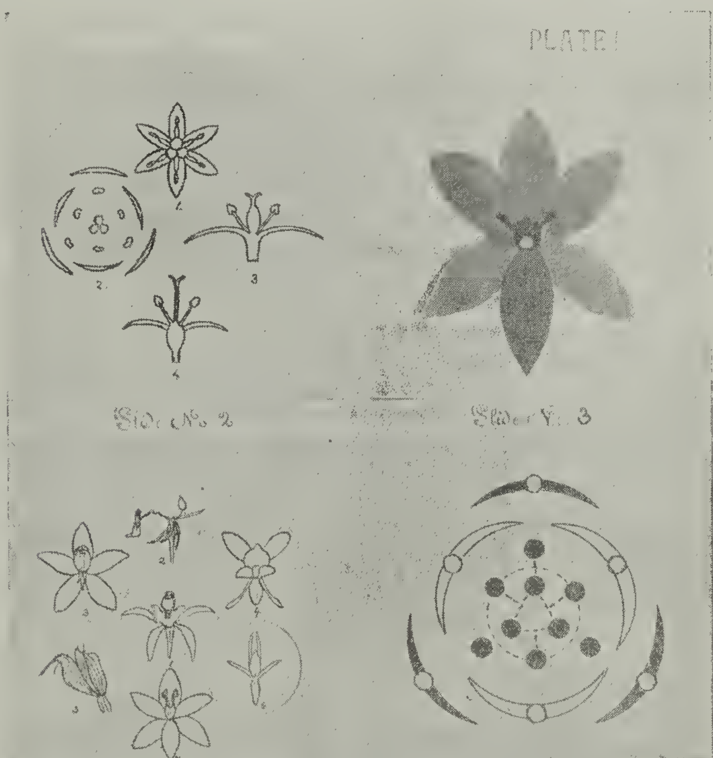
MR. CHAIRMAN, LADIES & GENTLEMEN,—

ONE of the greatest difficulties facing a public lecturer is to determine exactly how simply or how abtrusely his subject should be treated. Many here to-night are familiar with the structure of Orchids, and understand well the technical terms denoting such structure. It is not, however, to these that I am now addressing myself, but to such as desire to begin the study of our native Orchids, having as yet but little botanical knowledge. I must therefore crave the patient indulgence of the experts should some of my remarks touch upon very elementary matters. I assume only a knowledge of the common parts of a flower, and of the functions of these parts, namely of the calyx, corolla, stamens (or anthers) and pistil.

Beginning then with the flower, since that part furnishes the most important characters in classification, we can most easily clear the way to the understanding of the Orchid flower structure by studying first the simpler flower of such a plant as the Burchardia, one of the Lily order. Slide No. 1 (natural size) shows the general appearance of a group of its flowers, while plate I, slide No. 2 shows the parts in diagrammatic fashion. Its flower consists of six white leaves forming the perianth, and these leaves are in two sets of three each, an inner and an

Slide No. 1

outer set. There is a slight difference in size in favour of the outer row, which we may call the sepals, as we shall use this term in describing the corresponding parts of the Orchid flower. The inner row of three may be similarly called the petals. Inside the sepals and petals are the six stamens, capped by their



yellow anthers. The stamens are arranged three opposite the sepals and three opposite the petals, the latter being the inner row. In the centre of the flower is the pistil, showing at its tip a division into three parts. The lowest part of the pistil, which later contains the seed, is called the ovary, and if cut across it also shows three compartments. The ovary in Burchardia (see plate I., slide2, fig. 3) is at the top of the flower, and superior to the perianth and stamens. This arrangement is the typical and normal structure of a Monocotyledonous flower. In many cases, amongst others, in Orchids the ovary, by development of the head of the flower stalk, is no longer superior to the rest of the flower, but broad, and the two lower narrow and curved. Of the three petals the two upper are battledore-shaped, while the lip is deeply three-lobed.

Figure No. 3—Glossodia—is less remarkable in structure. It has three sepals nearly alike, and three petals, two of them like the sepals. The third petal, or lip, is very small and narrow.

In figure 2—The Hammer Orchid—there is a very eccentric development. The three sepals and two of the petals are very narrow and inconspicuous, but the lip fully compensates for this by its monstrous structure. The lip is large, covered with processes, and hinged about the middle of its stalk, being able to move freely on its hinge.

Figure 6—Prasophyllum—has three sepals and two petals, narrow and not conspicuous. The third petal, or lip, on the upper side of the flower, is broader and slightly waved at the edge.

Figure 5—Pterostylis at first view will not fall in line with the others, but on slight dissection the hood resolves itself into one sepal and two petals, lightly attached. The strange two-lobed structure forming the front of the hood consists of two sepals and the small lip, or third petal. The column, as usual, forms the centre of the flower, and is concealed by the hood.

Figure No. 7 is that of Thelymitra, introduced for comparison. As in these seven genera, so in all Orchid flowers with which we have to deal, we shall find that however varying the form, or grotesque the disguise, the parts of the flower can be resolved into three sepals, three petals (one of them the lip) and a central column formed of the reproductive organs (stamens and pistil). In our first comparison of the Orchid flower with Burchardia, it seemed as if the three sepals and three petals of the Orchid naturally represented the three sepals and three petals of the Burchardia, and that our only difficulty would be to trace in the column of the Orchid the representatives of the six stamens and the pistil of Burchardia. There are, however, reasons for thinking that the comparison is not quite so simply made, and that the lip of the Orchid is not a simple petal. The structure of the Orchid flower has been a subject of deep study by many eminent botanists, amongst others Darwin and Robert Brown. Even yet it cannot be said that the matter has been fully set at rest. We may not to-night engage deeply in the discussion of such a subject, and it will suffice for the better understanding of the peculiarities of Orchid flowers to summarise the conclusions arrived at by Darwin and others. It is thought that the Orchid flower agrees with the typical Monocotyledonous flower in consisting of three sepals, three petals, six stamens and a pistil of three carpels (that occupies an inferior position, as seen in plate I., slide 2, figure 4. To compare then with the above simple type of flower, the Orchid flower, we shall begin with the simplest type of Orchid flower, one of the Thelymitras, of which several are common near Perth. The structure of this Orchid flower is seen in this diagram (plate I., slide No. 3). As in Burchardia, the perianth consists of three sepals, the outer row, and three petals, alternate with them, forming the inner row. (The three sepals are generally darker outside than the petals.) Here, however, the evident resemblance to the Burchardia flower ends. In the centre of the Orchid flower is a peculiar structure that does not at first sight bear much likeness to the stamens and pistil of Burchardia. This central organ is a distinctive character of the Orchids, and is called the column. Near the top of the column yellow pollen is seen, showing that the column, in part at any rate, acts as a stamen. In our native Orchids there is but one perfect stamen or anther. The lower part of the column is formed by the ovary (which is inferior to the sepals and petals), so that the column is also in part pistil. The column in Orchids is formed by the combined stamens and pistil, and forms a character by which an Orchid flower can be very readily distinguished from most other flowers. On cutting across the ovary, the fact that it is formed of three parts is easily seen, as in the ovary of Burchardia. On the front of the column is a pad or cushion, for the reception of the pollen, equivalent to the stigma of an ordinary pistil. We have not, however, time to-night to deal in detail with the structure of the column.

Next, to see how far the commoner Orchids agree with Thelymitra, let us look at the outlines of a number of Orchid flowers of different genera. Plate I., slide No. 4 (to various scales) shows seven typical Orchids. The central flower (fig. 1) is one of the Spider Orchids. Here, as in Thelymitra, the perianth consists of three sepals and three petals, one sepal being nearly hidden by the column. The two other sepals appear one on each side of the flower stalk in the figure. The two upper petals resemble the sepals, but the third petal is very different in shape. It is broad, fringed, and covered with peculiar processes. This third petal is called the lip, and henceforth we shall find that one of the petals, either the upper one or the lower one, generally differs from the two other petals in some remarkable fashion. The presence of this lip, equally with the column, forms a special distinguishing character of Orchid flowers. The lip in the Spider Orchids is somewhat three-lobed.

Take next figure No. 4—Diuris, a yellow and brown Orchid flower, not uncommon. Again, though in different guise, we can trace three sepals and three petals. The upper sepal is short and being the name for the segments of the pistil). To explain first a point that is otherwise perplexing, namely, why the lip is sometimes on the upper side of the flower, *e.g.*, Prasophyllum (plate I., slide 4, fig. 6), and sometimes on the lower side, *e.g.*, in the Spider Orchids (plate I., slide 4, fig. 1). The natural position of the lip is on the upper or posterior side of the flower, but by the twisting of the ovary during development of the flower the lip is very often brought to the lower side of the flower. Continuing now with the theoretical structure of the Orchid flower, plate I., slide 5, is an illustration of Darwin's views. Darwin thus explains the structure of the Orchid flower. He looks upon it as consisting of five simple parts, namely three sepals and two petals, and of "two compounded parts, namely, the column and the lip. The column is formed of three pistils (carpels), and generally of four stamens, all completely confluent. The lip is formed of one petal and two petaloid stamens of the outer whorl, likewise completely confluent. . . . . This view of the nature of the lip explains its large size, its frequently tripartite (three-lobed) form, and especially its manner of coherence to the column, unlike that of the other petals." Plate II., Slide 6 shows some remarkable variations in the form of Orchid lips. Fig. A shows a Victorian form of Glossodia ; fig. B, Diuris ; fig. C, Pterostylis barbata ; fig. D, a Caladenia of the Patersoni type, with its four rows of calli ; fig. E, a Victorian Caleya. These are diagrammatically represented.

The existence, although in altered form, of the six stamens or anthers, which ought to be represented in every Orchid, is explained by Darwin in this manner :—"The "three outer, belonging to the outer whorl, are always present "with the upper one generally fertile, and the two lower ones "invariably petaloid and forming part of the lip. The three "stamens of the inner whorl are less plainly developed, especially "the lower one, which, when it can be detected, serves only to "strengthen the column, and in some rare cases, according to "Brown, forms a separate projection or filament. The upper two "anthers of this inner whorl are fertile in Cypripedium, and in "other cases are represented by membranous expansions." We can, "taking this view, understand the existence of the con-"spicuous central column, the large size, generally tripartite (three-"lobed) and peculiar manner of attachment of the lip, the relative "position of the single fertile stamen in most Orchids." This sketch may add somewhat of interest to the study of Orchid flowers ; and we shall next turn to another branch of this study, namely, the methods of distinguishing the different genera of Orchids from each other. The whole of the West Australian Orchids belong to one tribe of the natural order Orchideæ, namely, Tribe 5, Neottieæ, if we except one species—a Gastrodia—of

Tribe 4, Arethuseæ, recorded from West Australia by Baron Von Mueller. In the Tribe Neottieæ there are 24 Australian genera, but as far as I am aware only 17 of these genera have been recorded from West Australia and about one-third of these 17 genera are represented by only a few (often only one) species. Slides 7, 8, and 9 give the names of the common Australian genera of the Tribe Neottieæ, including Gastrodia, which belongs to the tribe before this. The numbers after the names indicate the numbers of Victorian species. The numbers for West Australia are very different in many cases.

Tribe 4. Arethuseæ
Gastrodia 1
Tribe 5. Neotticæ
Drakæa 1
Caleana
or Caleya 2
Epiblema

....

West Australian Orchids } 18 Genera. 77 Species.

Slide No. 7.

Pterostylis 19
Prasophyllum 10
Thelymitra 10
Caladenia 8
Diuris 7
Lyperanthus 2
Eriochilus 2
Dendrobium 2
Microtis 2
Acianthus 2

Slide No. 8.

Chiloglottis 2
Glossodia 2
Orthoceras 1
Cryptostylis 1
Cyrtostylis 1
Sarcochilus 1
Dipodium 1
Calochilus 1
Corysanthes 1
Spiranthes 1

Slide No. 9.

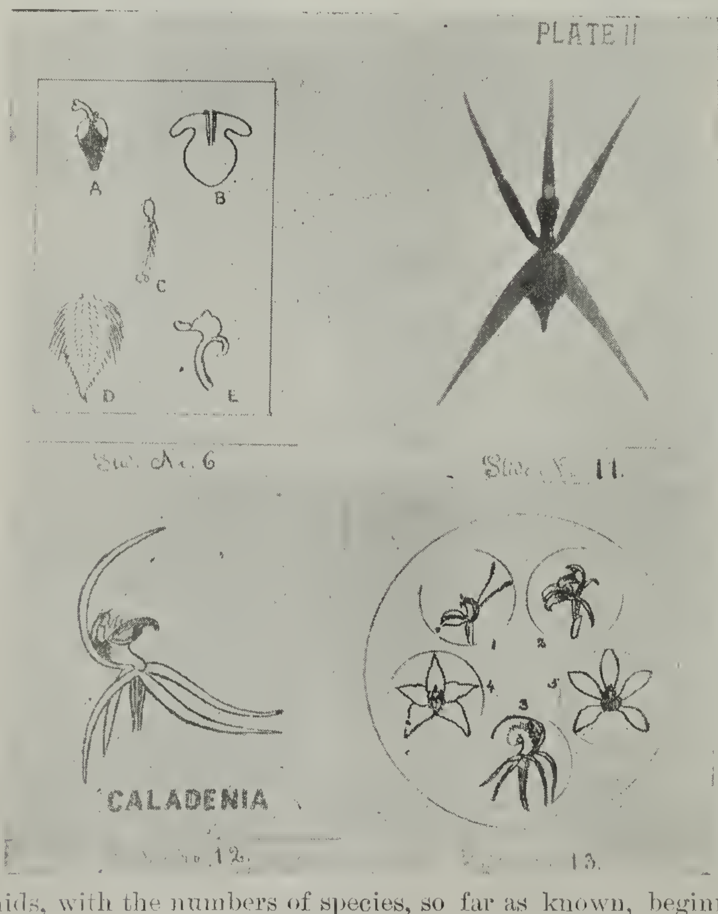
W.A. Genera.

1. Caladenia 18	10. Lyperanthus 2
2. Thelymitra 13	11. Caleana (Caleya) 1
3. Prasophyllum 9	12. Epiblema 1
4. Pterostylis 8	13. Calochilus 1
5. Microtis 5	14. Cryptostylis 1
6. Eriochilus 5	15. Corysanthes 1
7. Diuris 4	16. Acianthus 1
8. Glossodia 3	17. Cyrtostylis 1
9. Drakæa 2	18. Gastrodia 1

Slide No. 10.

With these lists of long names freshly before us, it is perhaps as well to answer those that cavil at the use of such long and hard names, and suggest the substitution of popular and easy English names. The difficulty with popular names is their inexactness, the same name being applied in different districts to plants widely different, *e.g.*, in Perth I have heard the term "Cowslip" applied to the common yellow Caladenia. Names, to be useful, must be exact in their application, so that botanists in different districts can readily understand the kind of plant referred to when a certain name is used. Where popular names are distinctive, and reserved only for one kind of plant, they are welcome, *e.g.*, Spider Orchid. In time, no doubt, as the study of wild flowers becomes more popular, fitting popular names will be given to the common flowers, or, better still, the scientific names by frequent use may be popularised. As for the difficulty of these names, it is to be admitted and regretted that botanists in naming new plants have not always been happy in selecting names at once expressive, and easy to pronounce. Some may be glad of a rule for accenting these long names. The general rule is that the accent in these many-syllabled words falls on the third-last syllable, unless in the original Latin or Greek the second-last syllable happens to have been a long one. In the latter case the accent falls, or should fall, on that syllable—the second-last one. Popular usage, however, often changes the accent from the proper syllable to the third-last one. The Greek words, "cheilos," a lip, and "stulos," a column, are common components of the generic names of Orchids. These two words had in the original their first syllables long.

The following is a list of the West Australian genera of



Orchids, with the numbers of species, so far as known, beginning with the most largely represented genus.—(See slide 10.)

Taking up now the consideration of the genera of Orchids and their distinctive characters, it will be well to begin with the Caladenias, the most popular of which are the well-known Spider Orchids.

Caladenia.—Bentham records 27 distinct species of Caladenia, of which 23 species, *i.e.*, all but four, occur in West Australia. The genus is therefore to be considered as peculiarly a West Australian one. The genus Caladenia is readily distinguished by the rows of glandular hairs or "calli" on the lip, the name of the genus meaning "beautiful glands." These calli are arranged in two or more rows. Plate II, slide 11, gives a diagrammatic representation of a Caladenia. It will be convenient to give names to several of the sepals and petals for quick comparison of different flowers. Thus d.s. is the upper, or dorsal sepal; s.s., the two lower sepals; l.p., l.p. are the two lateral petals; and l. the lip; c equals of course the column. In Caladenia the dorsal sepal is usually erect, or even incurved over the column, while the lateral petals and the other two sepals are somewhat flat and spreading. This is well seen in plate II., slide 12—a form of Caladenia Patersoni, our commonest and largest "Spider Orchid." The genus Caladenia is so large that it is conveniently divided into five sections, most of which are easily remembered. Plate II., slide 13 (to various scales) gives outlines of flowers typical of these five sections of Caladenia. Slide 13, figure 1, shows Caladenia Menziesii, a type of section 1. This species is now in flower, and is easily known by the two lateral petals being long, club-shaped, and erect. Figure 2 shows C. discoidea, a type of section 2. This is somewhat like the typical "Spiders" but differs chiefly in the lip, which is very broad for its length, and slightly, if at all, fringed in this section. Section 3 contains the typical "Spider Orchids." (Plate II, slide 13, fig. 3.) Some of the section have rather shorter sepals and petals than the type. The lip is usually large and three-lobed, with prominent fringes and calli. Section 4 is well represented by Caladenia flava, a bright yellow flower, one of the commonest of our Perth Orchids. The lip is small, but has the characteristic calli of Caladenia. The sepals and lateral petals are much shorter than in the Spider Orchids, still, however, somewhat pointed. Section 5 may have for its type Caladenia gemmata, a beautiful deep blue (gentian blue) flower. The sepals and lateral petals are quite blunt, and the column short. The lip is covered with small calli in many rows.

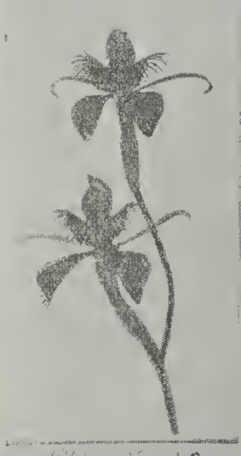
A hurried glance at the following slides may serve to fix the characters of the sections of Caladenia. Plate III., slides 14 and 15, show again the peculiar club-like lateral petals of section No. 1. Slide 14 is a figure of Caladenia Menziesii (about 2/3 natural size). Slide 15 shows C. fimbriata (about 1/6 natural size), the only Caladenia with a smooth lip, otherwise closely related to C.

Menziesii. Slide 16 shows two flowers (about 5/7 natural size) of C. discoidea, a very beautiful orchid of Section No. 2, showing the

PLATE III

Slide No. 14.

Slide No. 15.



Slide No. 16.

Slide No. 17.

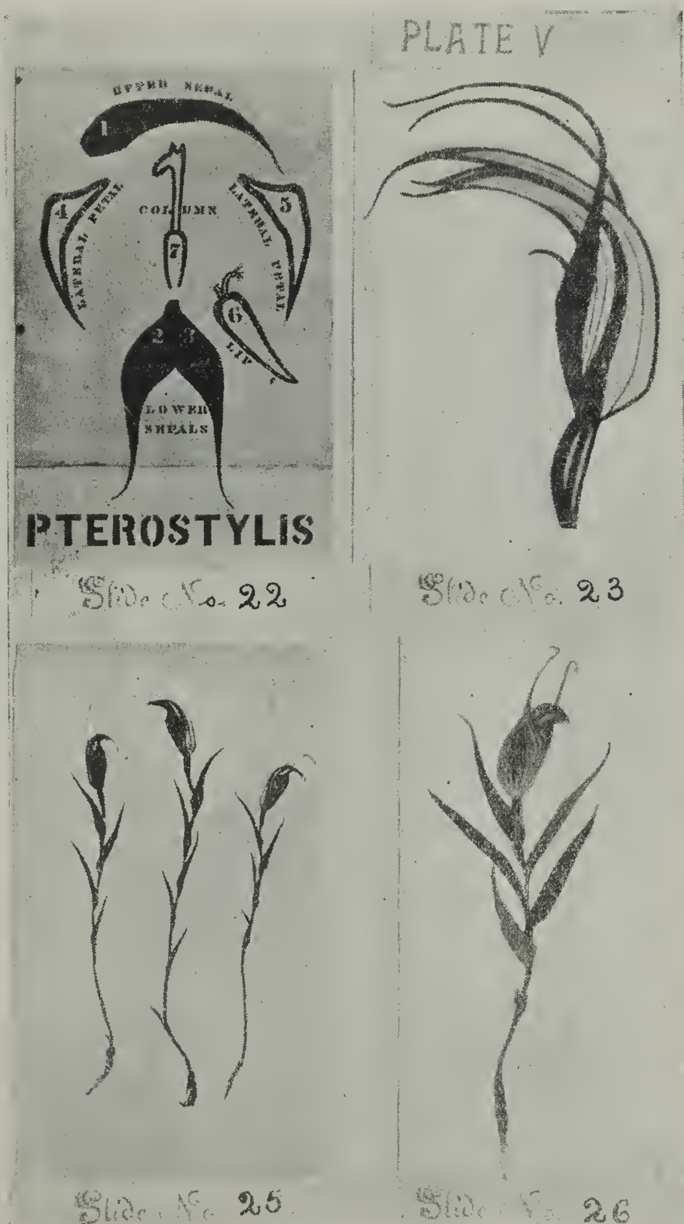
broad, short lip. Plate III., slide 17, shows a very peculiar Caladenia, C. serrata, (about 2/3 natural size), very interesting from its resemblance to a Lyperanthus—a genus to be considered later.

Plate IV., slide 18, shows the type development of Caladenia, in the large and beautiful fringed lip of Caladenia Patersoni (about natural size). Plate IV., slide 19, shows a good view of the flowers of our common yellow Caladenia flava, of section 4 (about $\frac{3}{4}$ natural size).

I have dealt thus at length with Caladenia because it is the largest West Australian genus. The remaining genera will have to be touched upon more shortly. We shall follow no exact scientific order, but take the genera in turn, as seems convenient.

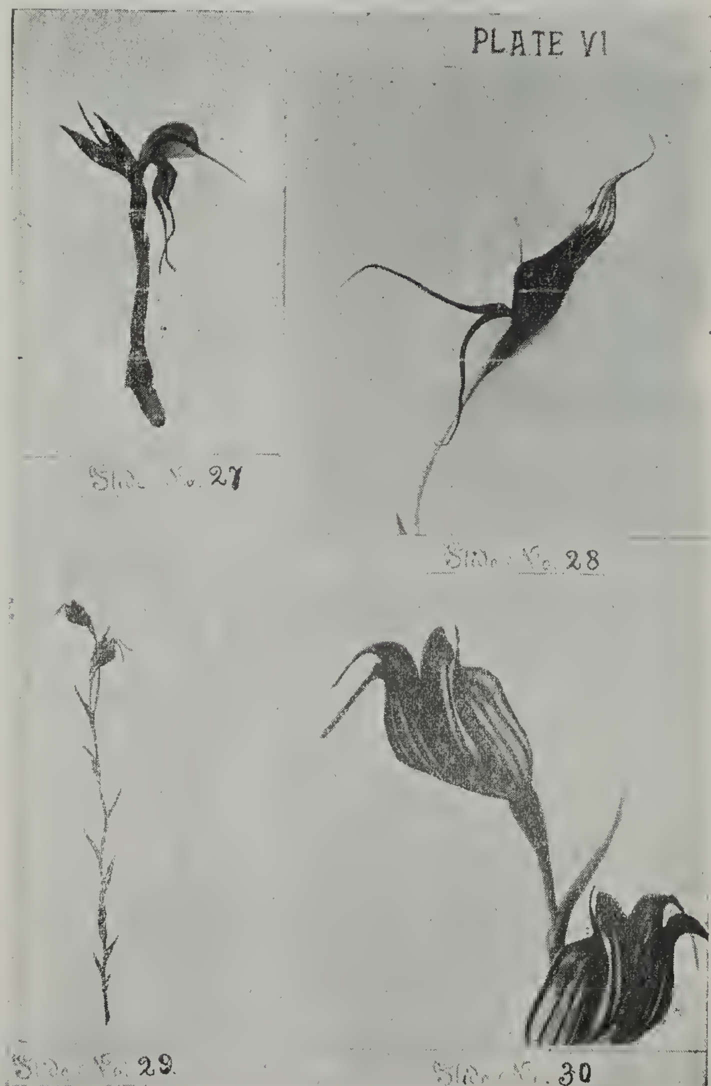
The next genus, Pterostylis, might well be called the "Green Hoods," from the shape and usual colour of the flowers. The structure of the flower is well seen in plate IV., slides 20, 21, and plate V., slide 22. The main part of the hood is formed of the upper or dorsal sepal and the two lateral petals. The two lower sepals are joined to form a kind of forked door to the front of the hood. The lip is generally a small tonguelike structure with a spur at its base, and is placed inside the two joined lower sepals. The column which stands back in the hood is provided with two wings at the top, hence the name Pterostylis, or "winged column." This genus is not so well represented in W.A. as in the Eastern colonies, since only about one-third of the 24 Australian species occur in W.A. The species are very readily distinguished from each other by the shape of the hoods, and the characters of the stem leaves or root leaves. In many of the species the lip is irritable, and, if touched, springs up against the column. The following slides shew some types of Pterostylis. Plate V, slide 23, gives a side view of the hood, somewhat magnified, of P. reflexa, common near the beach at Cottesloe, but the slide was taken from a Bendigo specimen. Slide 24 shows a group about 1/5 natural size of Pterostylis vittata; which seems to be

Slide No 24



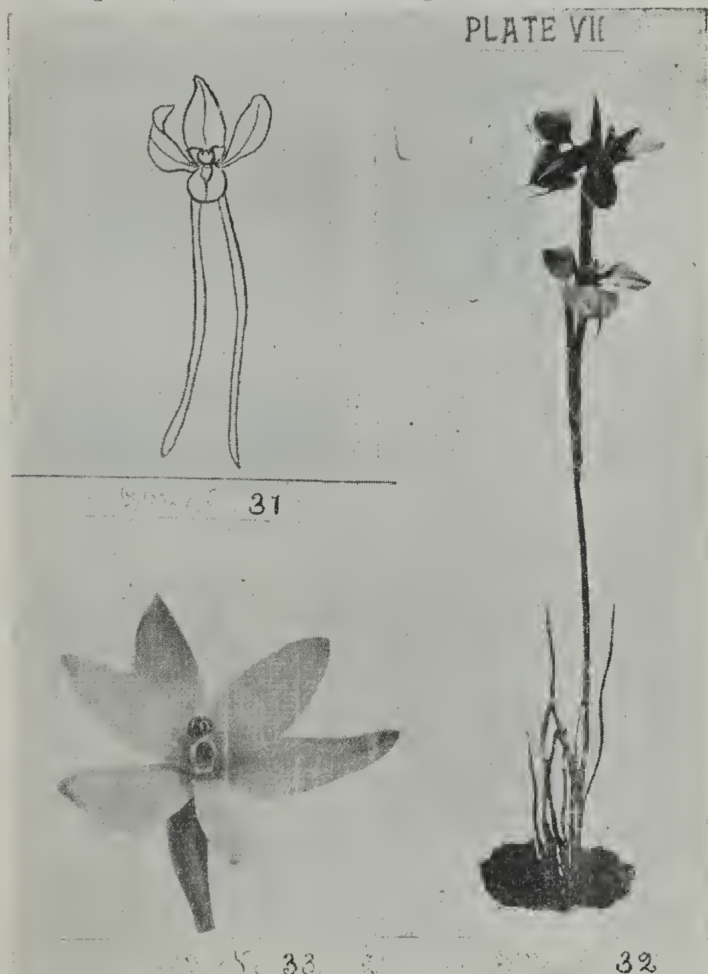
the most widely spread W.A. Pterostylis. Plate V., slides 25 and 26, give further views of P. reflexa ; slide 25, about 1/3 natural size, being from Bendigo specimens, and slide 26, about 2/5 natural size, from a Cottesloe specimen.

Plate VI., slide 27, is P. rufa, distinguished by its elegantly shaped hood (about 2/3 natural size), with the long points of the



two lower sepals. This species occurs in West Australia, but the slide is taken from a South Australian specimen. Slide 28 gives a side view of the hood of P. turfosa (about 5/6 natural size), found at Cannington, while slides 29 and 30 show P. recurva, one of the most distinct and peculiar of the West Australian species. These specimens were found at Canning Bridge. The bold outlines and recurved sepal points mark out this fine species from any other. Slide 30 is slightly reduced, and slide 29 very much reduced.

Taking next the genus Diuris or the "Double-tail Orchids," as the name signifies, an extreme example is seen in slide 31 in



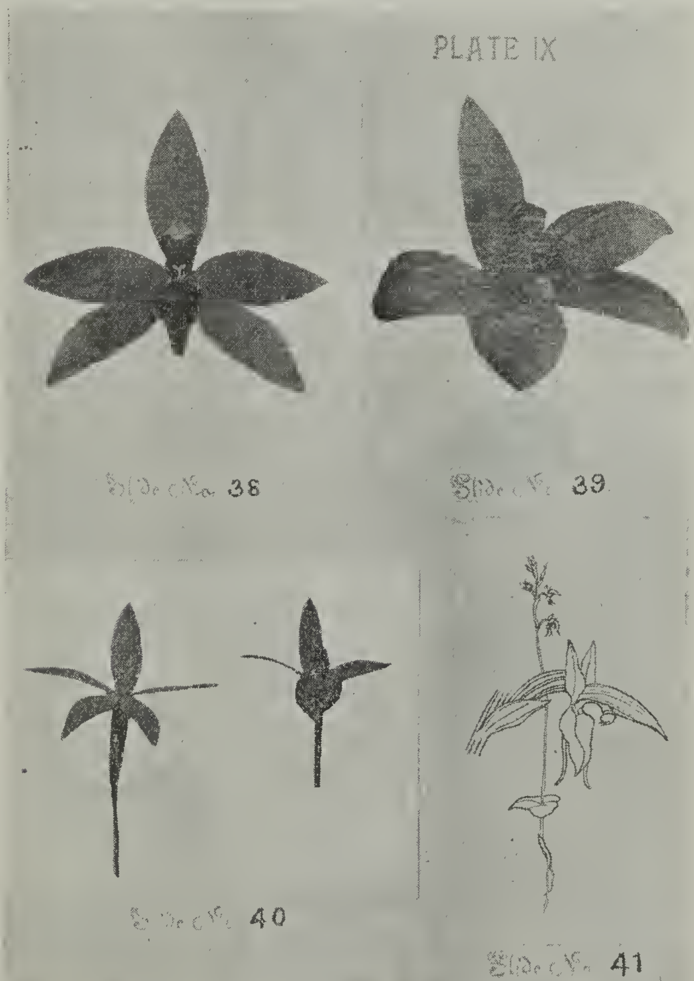
Diuris punctata, not, however, a West Australian species. We have in West Australia four out of the 13 Australian species, and all can be known by the three-lobed lip aud the two narrow, often curved lower sepals (the two tails). Diuris pedunculata grows in

West Australia, and may be taken as typical of our species. (See Plate VII., slide 32—about 3/4 natural size.)

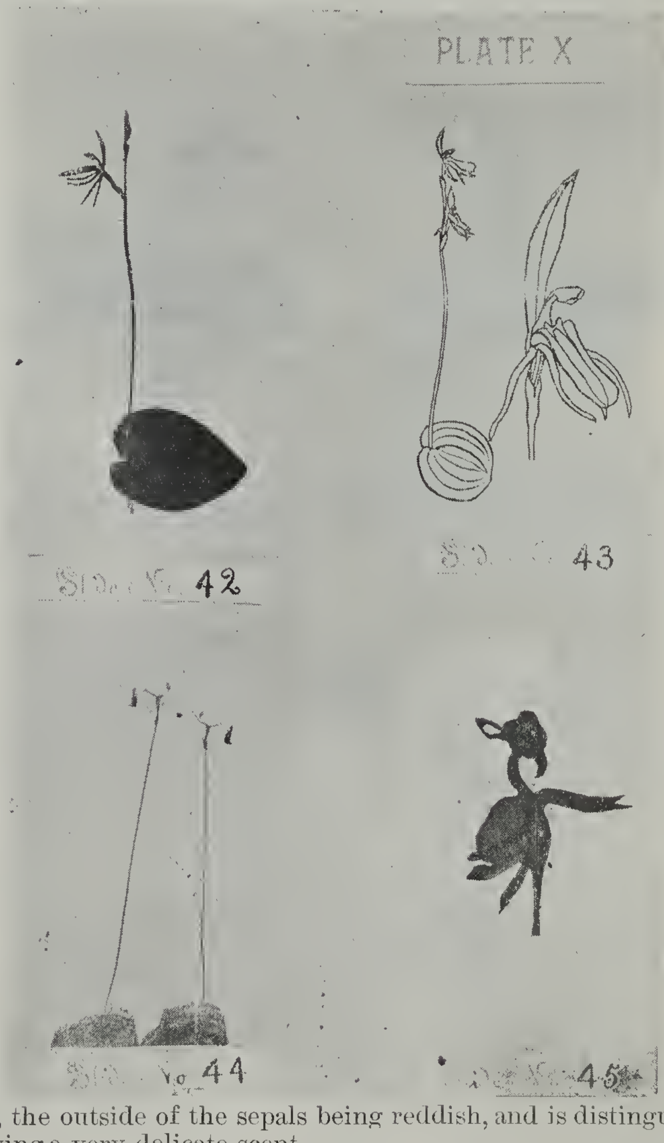
PLATE VIII

Diuris longifolia in West Australia is richly coloured with suffused brown, yellow, and even purple tints. All the West Australian species are yellowish, more or less marked with brown.

The genus that comes next in number of species is Thelymitra, distinguished by its hooded column, supposed to have some



fanciful resemblance to a woman's headdress. The flower of Thelymitra has already been considered. (Plate VII., slide 33 shows one flower of Thelymitra crinita, magnified). Thelymitra differs from all ordinary Orchids, in having the lip exactly like the other two petals, except it may be in size. But for the characteristic column the Thelymitras might readily be passed by as not Orchids. As a type of the genus may be taken T. variegata, a purplish, spotted flower, found near Perth (see plate VIII., slide 34—about 5/6 natural size. Slide 35 shows a group (reduced) of T. antennifera, common at Midland Junction. It has a pretty, yellow



flower, the outside of the sepals being reddish, and is distinguished by having a very delicate scent.

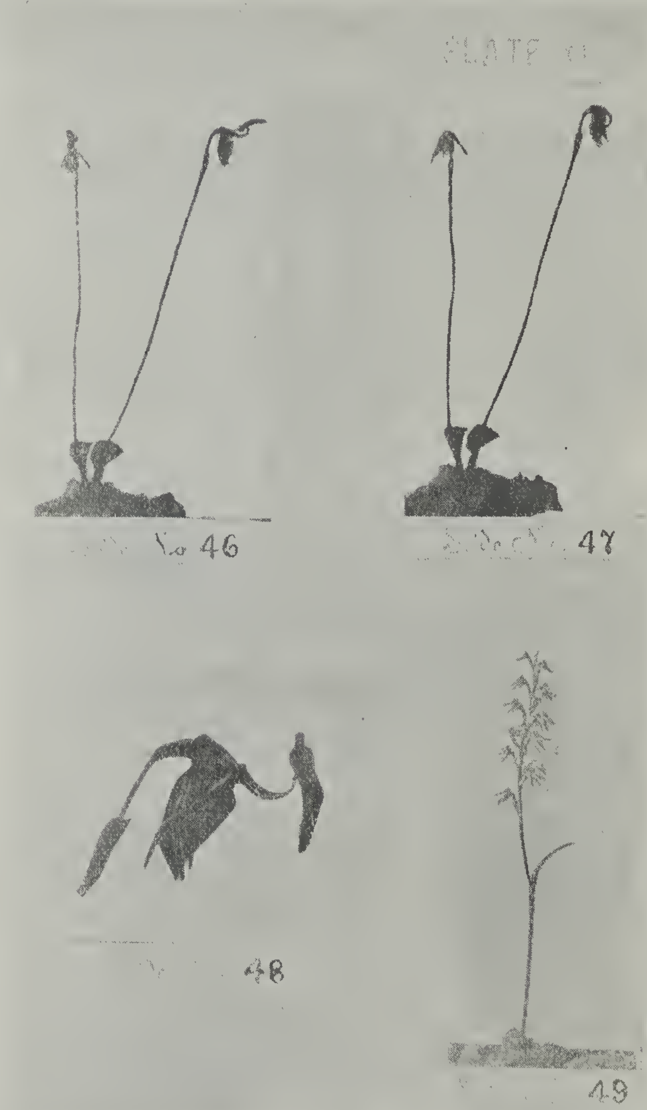
The genera already considered contain most of our conspicuous orchids, and we shall group together as far as possible the remaining genera. Three genera, allied to Caladenia, are Eriochilus, Lyperanthus and Glossodia. Eriochilus is very close to section 1 of the genus Caladenia, as may be seen by comparing plate VIII., slide 36, E. autumnalis, abont 1/4 natural size (a Victorian form), with Caladenia Menziesii. The lateral petals are not long and club-shaped. Eriochilus has its lip covered with hair in place of the coarser calli of Caladenia. The flowers are white or pinkish, and it is our earliest orchid, flowering from April to June, thus being often missed by all but the most persistent and enthusiastic orchid hunters. One pretty species in Perth has quite a number of flowers on each stem. Lyperanthus, as seen in plate VIII., slide 37, about 1/3 natural size, looks like a coarse stout spider orchid, but the lip has no calli, and the upper sepal is broad and hooded. The whole plant turns black on drying. One species is widely spread over the colonies, and appears specially common in West Australia.

Glossodia comes near in appearance to section 5 of Caladenia, having obtuse petals and sepals as seen in plate IX., slide 38, slightly magnified. The lip is however quite smooth, but at its base are two large calli or processes sometimes united into one as in G. major, in slide 38. The W.A. forms have very waxy shining purplish or pinkish flowers, and the processes of the lip distinct and large ; the lip being small compared with that of the Eastern forms. Plate IX., slide 39, shows a single flower of Glossodia emarginata, slightly magnified. Plate IX., slide 40, shows a peculiar and rare malformation of a Glossodia flower, the two lower sepals being spurred and coloured like the lip. To the left is a figure of the normal flower. In both the lip is pinned up to show the two lower sepals.

Next we shall take in one group several small but very interesting orchids agreeing in having at the root a single heart-shaped or ovate leaf, and bearing at the end of very slender stalks one or two small brownish flowers. The genera are Acianthus, Cyrtostylis, Drakæa, and Caleana.

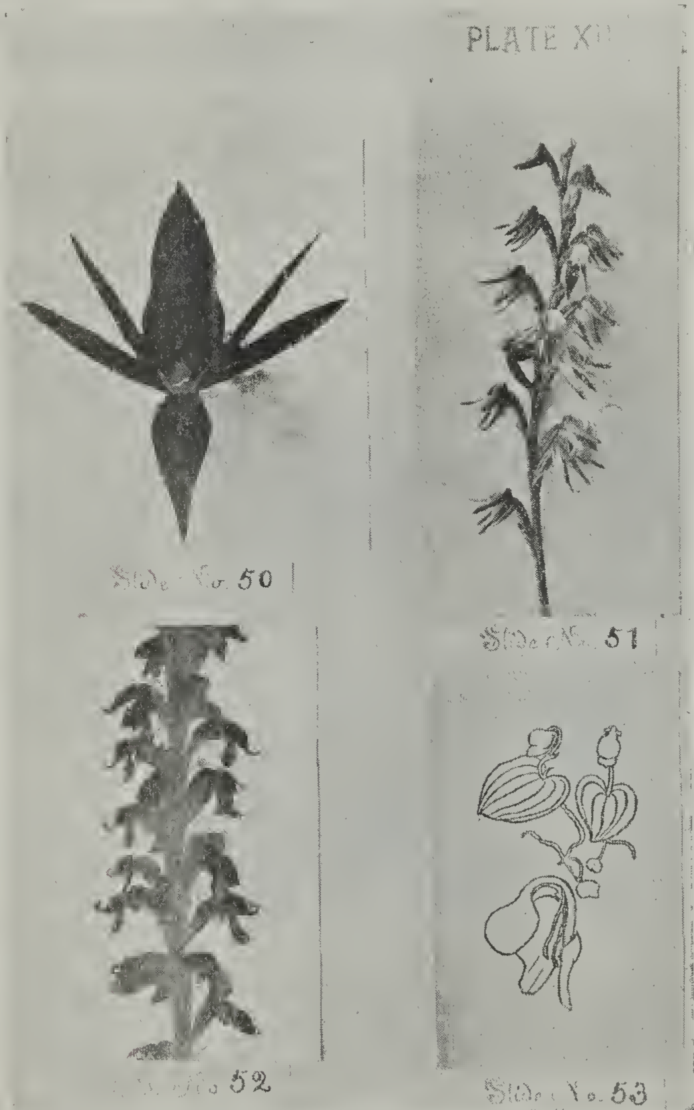
Acianthus (see plate IX., slide 41) and Cyrtostylis (see plate X., slides 42 and 43) much resemble small Caladenias, and present also strong resemblance to one another (slide 42 is about 1/3 natural size). Slides 41 and 43 are taken from Fitzgerald's Australian Orchids. Drakæa and Caleana (or Caleya) are among the most peculiar of our Orchids. Drakæa is the Hammer Orchid (see plate X., slide 44), so-called from the peculiar action of its lip, As already mentioned, the lip is articulated on a hinge or elbow. so that when touched it springs round against the column. Two out of the three Australian species occur in West Australia. These Drakæas are about six inches in height generally. Caleana is similar to Drakæa, except that the column is widely winged, so as to form a sort of dish for which the lip serves as a lid (see plate X., slide 45, slightly rednced), closing sharply when irritated. Compare plate XI., slides 46 and 47—one showing the flowers closed, the other the flowers open. Slide 48 shows a single flower of the West Australian species, enlarged about one-half.

We may here take two large genera that by many wildflower



gatherers are either not recognised as orchids at all, or else are passed over as too inconspicuous and unattractive, having small, greenish flowers. These genera are Prasophyllum and Microtis.

The term leek-leaved Orchids might well be applied to both of them, as their single leaf is sheathing and cylindrical. From this sheath comes the single stem, bearing many small, greenish flowers



(see plate XI., slide 49—reduced). The structure of the Prasophyllum flower is well shown in plate XII., slide 50, and has already been referred to. The lip is uppermost. Plate XII., slide 51 shows an enlarged view of the spike of the Orchid already shown in slide 49—a Prasophyllum not uncommon at Midland Junction. Microtis is even more inconspicuous in its flowers than Prasophyllum, and is chiefly a W.A. genus, all the six Australian species being found in West Australia. About one-third of the 24 Australian species of Prasophyllum occur in West Australia. Slide 52 is a figure of part of a spike of Microtis alba, somewhat enlarged. The lip is on the lower side in this genus.

We have now left only five species of West Australian Orchids belonging to as many genera. These do not seem to fit with any of the preceding groups, and have therefore to come together here. They have nothing, however, in common. These five gènera are Corysanthes, Calochilus, Cryptostylis, Epiblema, and Gastrodia.

Part XII., slide 53, shows the peculiar little Corysanthes, This slide and the two following are borrowed from Fitzgerald's splendid work on Australian orchids. The leaves of Corysanthes are heart-shaped, one inch long or under, and iced or frosted in appearance below. The flower is large, somewhat trumpet-mouthed, and usually purplish-red.

No. 54 No. 55

Calochilus (slide 54) comes near Thelymitra, but differs in its lip. It is easily recognised by its fine hairy lip, which may be at least one inch long. Of the three remaining Orchids Cryptostylis is the only one of which I have been able to secure a slide. It is a fairly large orchid, with a prominent fleshy lip, about one inch or more long, and flowers during the summer (See slide 55).

Epiblema is near Thelymitra, but has a clawed lip. Gastrodia is a leafless parasitic plant with whitish flowers. All the slides, except the few already acknowledged after Fitzgerald, are taken from drawings and photographs by my wife, who has also had a great share in the preparation of these slides.

LIST OF SLIDES.

Plate	—	Slide	1—Burchardia umbellata
,,	I.	,,	2—Burchardia (diagram)
,,	I.	,,	3—Thelymitra (diagram)
,,	I.	,,	4—Typical Orchid Flowers
,,	I.	,,	5—Diagram of Orchid Flower (Darwin)
,,	II.	,,	6—Orchid Lips (5 varieties)
,,	—	,,	7, 8, 9—Australian Genera
,,	—	,,	10—West Australian Genera of Orchids
,,	II.	,,	11—Caladenia (diagram)
,,	II.	,,	12—Spider Orchid
,,	II.	,,	13—Types of Caladenia
,,	III.	,,	14—Caladenia Menziesii
,,	III.	,,	15—Caladenia fimbriata
,,	III.	,,	16—Caladenia discoidea
,,	III.	,,	17—Caladenia serrata
,,	IV.	,,	18— ,, Patersoni (lip)
,,	IV.	,,	19—Caladenia flava
,,	IV.	,,	20—Pterostylis (diagram)
,,	IV.	,,	21—Pterostylis (types)
,,	V.	,,	22—Pterostylis (dissected diagram)
,,	V.	,,	23—Pterostylis reflexa (flower)
,,	—	,,	24—Group of Pterostylis vittata
,,	V.	,,	25—Pterostylis reflexa (3 plants)
,,	V.	,,	26—Pterostylis reflexa (West Australian)
,,	VI.	,,	27—Pterostylis rufa
,,	VI.	,,	28—Pterostylis turfosa
,,	VI.	,,	29—Pterostylis recurva (whole plant)
,,	VI.	,,	30—Pterostylis recurva (flower)
,,	VII.	,,	31—Diuris punctata (diagram)
,,	VII.	,,	32—Diuris pedunculata
,,	VII.	,,	33—Thelymitra crinita
,,	VIII.	,,	34—Thelymitra variegata
,,	VIII.	,,	35—Thelymitra antennifera
,,	VIII.	,,	36—Eriochilus autumnalis
,,	VIII.	,,	37—Lyperanthus nigricans
,,	IX.	,,	38—Glossodia major (diagram)
,,	IX.	,,	39—Glossodia emarginata
,,	IX.	,,	40—Glossodia major (malformed)
,,	IX.	,,	41—Acianthus exsertus (after Fitzgerald)
,,	X.	,,	42—Cyrtostylis reniformis
,,	X.	,,	43—Cyrtostylis reniformis (after Fitzgerald)
,,	X.	,,	44—Drakæa elastica
,,	X.	,,	45—Caleya major (diagram)
,,	XI.	,,	46—Caleya nigrita (open)
,,	XI.	,,	47— ,, ,, (closed)
,,	XI.	,,	48— ,, ,, (flower)
,,	XI.	,,	49—Prasophyllum sp.?
,,	XII.	,,	50—Prasophyllum (diagram)
,,	XII.	,,	51—Prasophyllum sp.?
,,	XII.	,,	52—Microtis alba
,,	XII.	,,	53—Corysanthes unguiculata (after Fitzgerald)
,,	—	,,	54—Calochilus paludosus with flower of Calochilus campestris (after Fitzgerald)
,,	—	,,	55—Cryptostylis erecta (after Fitzgerald)

Perth Technical School.
10th December, 1900.

RULES

OF THE

MUELLER BOTANIC SOCIETY

OF

WESTERN AUSTRALIA.

1. This Society is named the "MUELLER BOTANIC SOCIETY OF WESTERN AUSTRALIA,"

2. The object of the Society is the study of botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones, and field excursions, and the formation of a library.

3. The members shall elect, as hereinafter provided, out of their own body, the following office-bearers, viz.:—Patron, President, two Vice-Presidents, and a Council of seven persons, who shall together constitute the General Council of management of the Society's affairs: and at all meetings of the Council three shall form a quorum.

3A. The Council shall appoint and remove a Treasurer, Librarian and Secretary, who shall be *ex officio* members of the Council.

4. The ordinary meetings for general business, the reading of papers and exhibition of specimens shall be held in the second week in each month, unless otherwise determined on by the Council.

5. The Society shall consist of (A) Honorary Members; (B) Ordinary Members; (C) Junior Members. (A) Honorary Members, who shall be entitled to all the privileges of Ordinary Members, except that of voting, shall be persons not resident in Perth, who are distinguished for their attainments in Botany. (B) Ordinary members shall pay an annual subscription of 10s. 6d., and may become Life Members on payment of Ten Guineas in one sum. (C) Junior Members shall be under the age of 16 years. They shall not be entitled to vote, and shall pay an annual subscription of 5s.

6. All subscriptions shall become due on first day of July in each year, payable in advance.

7. The Council shall have full power to elect members.

8. Members may withdraw from the Society on paying all arrears, returning all books or other property which may have been borrowed from the Society, and giving due notice in writing to the Secretary of the desire to resign.

9. The Council may remove from the Members' Roll the names of any who may owe two years' subscriptions, provided due notice of such intention be given.

10. Whenever it may be deemed necessary to remove a member from the Society for any other cause than non-payment of subscriptions, any member may propose a resolution to that effect, which shall be communicated to the member concerned, and be read at two successive ordinary meetings of the Society, at the last of which the proposition may be ballotted for, and if two-thirds of the members voting shall be in favour of the removal, the member shall be removed from the Society accordingly.

11. All the office-bearers and Council shall retire annually and shall be eligible for re-election at the annual meeting. Candidates for the vacant offices shall be nominated in writing at the previous ordinary monthly meeting. All elections to be conducted by ballot.

12. Should any vacancy in the office-bearers occur, it shall be filled by the Council. The office of any other member of Council failing to attend three consecutive Council meetings without any satisfactory reason may be declared vacant. Vacancies from this or any other cause to be filled up by the Council at their next meeting.

13. The legal ownership of the property of the Society shall be vested in the Council for the time being, in trust for the use of the Society, and the Council shall have full control over the use of the funds and management of the property of the Society.

14. It shall be the duty of the Treasurer to receive all sums of money due to the Society, to pay only such accounts as may be ordered by the Council, to keep an account of such receipts and payments and to produce the same when required by the Council.

15. It shall be the duty of the Librarian to have the custody of all books, instruments, specimens or other property of the Society, and to issue the same for the use of the members, subject to such restrictions as the Council may impose.

16. It shall be the duty of the Secretary to conduct the correspondence of the Society, attend all meetings, take minutes of the proceedings, keep a register of the names and addresses of all the members, also an account of each person's subscription, issue notices of all meetings of the Society or Council, and otherwise perform the usual secretarial duties.

17. The Annual General Meeting shall be held in July in each year, at which the Council shall submit a report of the proceedings of the past year, and the Treasurer a financial statement duly certified by two Auditors appointed at the previous ordinary meeting.

18. The annual conversazione shall be held at such time and place as may be arranged by the Council.

19. The field days may be held on such days as may be determined by the Council.

20. Should any circumstance arise not provided for in these Rules, the Council is hereby empowered to act as may seem to be best for the interests of the Society.

21. Seven ordinary members shall constitute a quorum at a general meeting.

22. The Rules can only be altered by a majority of two-thirds of the members present at an Annual Meeting or Special General Meeting convened by the Council for the purpose, or by a requisition of not less than seven such members, such proposed alterations or additions to have been submitted to the previous ordinary meeting.

..THE..

Mueller Botanic Society

OF

Western Australia.

ROOMS:

The Technical School, St. George's Terrace,

..PERTH..

Journal of Proceedings

OF THE

Mueller Botanic Society

OF

WESTERN AUSTRALIA.

INAUGURATED 1st JULY, 1897.

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Journal of Proceedings

.. OF THE ..

Mueller Botanic Society.

Vol. I.] Published June, 1902. [No. 9.

(The Author of each article is responsible for the facts and opinions recorded.)

Sub-Committees :

The following Sub-Committees have been appointed—

Proteaceæ :

Messrs. E. W. Hursthouse, C.R.P., Andrews and Bruce Hendry.

Epacrideæ :

Dr. Tratman, Mr. Alex. Purdie and Dr. Morrison.

Myrtaceæ :

Messrs. E. J. Bickford, J. B. Allen and J. A. Peart.

"Plant Forms and Climate of Western Australia."

(DR. DIELS.)

N.B.--The Plates are in the possession of the Society.

THE late Baron von Mueller, when sketching the vegetation of Western Australia five years ago, told us that for the extra tropical portion of Western Australia approximately 3700 species stood on record and that of these the almost incredible number of 2500 are not to be found anywhere else. He further pointed out that only very few countries of the globe show an equally large aggregation of plants within an equal area under a similar emulation of peculiarity and beauty of forms.

This peculiarity and beauty of almost every order of the Western Australian flora is well known and well appreciated all over this country so far as the floral appearance is concerned. An equally enormous variety and often strange development, however, is presented by the less prominent organs of vegetation—the foliage, the stems, and indeed the whole habit of our trees and shrubs, so important as creating the total aspect of the scenery.

Moreover, the purely scientific interest of this side of the West Australian flora cannot be over-estimated. In this connection I beg to call your attention to-night to the relations of the prevailing forms of plants in this country to its different climatical districts. Thereby we will be able to admire some wonderful instances of adaptation of these plant-forms to their mode of life, or—we might put it as well—to the nature of their surroundings, because the mode of life of a plant is practically founded on its surroundings. It is a well-known fact that all plants show a definite response in their structure to the conditions in which they live.

Now, water-plants are not so very plentiful in this country, but I may refer to Myriophyllum as giving an instance of the tendency of those aquatic plants to increase their food-absorbing surface. I saw Myriophyllum floating in the Blackwood River, not far from Bridgetown. The leaves are divided into very many fine segments of a delicate texture, not unlike to the assimilatory organs of the aquatic plants of the lower standing, like the green sea-weeds of our coast. Of course one cannot expect to find such an extreme development in any terrestrial plant ; still a similar tendency will be observed wherever plants are allowed to dispose of an abundance of water. It it is in those moist damp places where ferns are to be seen at their best. The majority of ferns have got very large and at the same time most delicate leaves. The lack of permanent moisture accounts for the extreme scarcity of fern-life in this country. The maidenhair-fern of our southern forests, however, gives a sufficient example of the structure prevailing in this large and beautiful order of the vegetable kingdom. As you are aware, ferns are abundant all over the moist regions of the tropical belt, as well as they are frequently to be met with in several more temperate regions distinguished by an abundant and regular rainfall. The south-western portion of South America, New Zealand, and, to some degree, even the eastern States of this continent are able to compete successfully with the fern-adorned countries between the tropics. In all these countries, however, the majority of the ferns are restricted to the moist and sheltered spots of the forest or to the shady, rocky slopes of the hills. All the more exposed localities do not allow the same powerful development of the system. Therefore it will be reduced to some extent, the leaves becoming less delicate and less divided, but keeping, it is true, at the same time a weak texture and a flat expansion. Such is the average adaptation of plants over wide areas of the globe's surface. It is prominent in the old countries of Europe, and in many parts of the other continents. In Western Australia only the more favoured districts of the South-West may have a claim to be counted to this group ; that means small districts along the south coast, and perhaps the creeks and water-courses of the jarrah region.

Considering the plant-life of these localities, I have to refer to shrubs like our common Trymalium Billardieri of the Darling Range, or the delicate Acacia so common in the rich forests of the karri country. Quite a number of lower herbs sheltered by the evergreen shrubbery of our jarrah forests may be mentioned here as giving some evidence of a lasting supply of moisture.

As soon as this supply is checked in some way or the other, either the growth of the system must be restricted, or the risks of an excessive expenditure and a much too active transpiration, be limited by some other measure. Nature seems to be inexhaustible to face these difficulties. I am going to illustrate their principal ways by instances selected from the Western Australian flora.

The most prominent feature of the climate all over this country is the periodical change of the rainy season and the dry summer. It is the struggle against the effects of this rainless summer that presses a marked stamp on nearly every plant-form of our flora.

To avoid any disastrous consequences of the summer time, two principal roads are open, so to speak, to the vegetable organism : the first one means the continuation of all vital processes, however much restricted; the other one results in stopping all vegetative activity during the time of heat and drought.

The majority of the Westralian species are in the first case. They keep their foliage all the year around, adapted as it is in some way or the other to stand the assaults of the dry summer months. So preserving their leaves green these plants can take advantage of the powerful sunshine of the long summer days.

To begin with, the vertically fixed position of the leaves so conspicuous in almost every species of Eucalyptus, Acacia, or Banksia is regarded by many authors as a means of protection to avoid the direct insolation or to minimise its effects.

Still more common instances however are to be found for any degree of reduction of the green surface of the plant. Compared with the vegetation of more favored countries the abundance of small or narrow-leaved shrubs is perhaps the most striking feature of the Western Australian scenery, only equalled in this respect by the floral region of the Cape, where the beautiful genus Erica affords the best known sample of this shape and arrangements of the green organs, the essential character being the small leaves, often more or less appressed to the stem, or covering themselves each other.

Looking at Western Australia's flora we find a very considerable percentage of heath-like shrubs and shrublets almost in every large genus and in nearly all districts of the country. "Ericoides" or "ericifolia" are some of the most frequent specific names of the nomenclature of our flora. Petrophila ericifolia *(Plate I.)* descrves deserves very well its specific name, assuming as it does completely the appearance of some of the Cape Ericas, notwithstanding the long distance between them in the natural classification.

It is not the same with the order of the Epacridaceous plants *(Plate II.)* so largely developed all over Australia, and fairly represented on these two plates of heath-like specimens. Being the nearest relatives to the Ericaceae they seem to be inclined to some similar mode of vegetation. You will find the counterparts to the South African beauties in the graceful Oligarrhena of our southern sand-plains, or Andersonia, its companion on the same localities, and then all the unlimited number of Leucopogon, some of which may compete with the most handsome Ericas. Even more, however, than the Epacridaceae, the large order of Myrtaceae, so essentially West Australian in some of its tribes, provides us with any amount of heath-like shrubs. Nearly all our Calythrix and Verticordias, the Chamaelaucium and Darwinias give striking instances. Some of them appear on this plate: here Calythrix sapphirina, and another rich purple species, both only small members of this well-known and brilliant genus. Nevetheless, one feels inclined to give the prize of beauty to the genus Darwinia. Its distribution is far less general. The specimen of my plate I saw only once on the stony slopes of the Stirling Range. I must admit that if it is similar to some Ericas it certainly surpasses them all in its graceful appearance and elegant colour of the floral leaves.

Every collector and admirer of the native flora will find many more instances of the same sort. It seems to be the most powerful tendency for the formation of the assimilatory system; so powerful indeed that even orders like Umbelliferae join into this form of adaptation, so very exceptional to the usual habit of their natural affinity. In consequence of the decrease of the green parts of the leaf the veins and nerves become as more prominent, and very often being of a strong texture these organs are transformed more or less in spine-like organs. In some districts the resulting prickly bush is not the most agreeable thing of the West Australian vegetation; even quite close to Perth on the limestone country near the beach spinescent shrubs are very plentiful. I give several instances selected from well-known genera on *Plate III.*

Then, in order to diminish their transpiring surface, leaves are to be found very often having rolled back their margins so that they may expose only half of their real surface to the surrounding air. There are hundreds of instances in Western Australia belonging to the most different orders. It is a very effective method, all the more as it is fitted at the same time to prevent some dangers resulting from the anatomical structure of the under-surface of the leaf. As an instance may be quoted one of the most common shrubs of the sandy timber country round Perth and all over the jarrah region, Hibbertia hypericoides A very good sample is also Lachnostachys Walcottii *(Plate IV.)* one of the flannel-flowers of the Northern districts. In the same region you will find a good many Proteaceous plants giving a fair idea of a rolled leaf, as Grevillea obtusa for instance does, represented on the same plate (IV.)

Sometimes the rolling back goes so far as to conceal completely the under-surface of the leaf, giving to it the appearance of a kind of tubular leaf, very like indeed to the unrolled one of many heath-like shrubs. Grevillea oxystigma, for instance, of our plate IV. exhibits a striking resemblance to some terete-leaved species of Grevillea or even of some other family.

The inclination of so many shrubs of the most different affinities leading to the same mode of adaptation results in producing a resemblance of the external appearance very often puzzling even a skilled collector or a botanist. Taking, for instance, Leucopogon gibbosus and Hibbertia microphylla shown on plate V. you will believe that it is a matter of some difficulty to make out these plants, unless they are just in flower or fruit. Some striking examples will be seen on one of the plates I am going to present later on.

The reducing tendency illustrated by all these cases results in some well-known extremes leading to the total suppression of any leaf-blade. Of course there must be som: compensation in order to accomplish the assimilation of nourishment. Thus we find, as a rule, some other organ taking the place of the leaf-blade, and transformed in various directions so as to become able to carry out the functions of a normal leaf.

The terete body of an ordinary stem, for instance, not being sufficient to that purpose, will be found transformed into a flat stripe of green, very unlike to any of the usual organs of plants, I may refer to this stem of Brachysema aphylla, or to Acacia glaucoptera *(Plate VI.)*, both plants being not uncommon in the arid scrub-districts of the interior. Further, the so-called leaves of our wattles and all acacias must be mentioned at this place. They are supposed to be no proper leaves, but the footstalks of suppressed leaves, the reality of this view being proved by thc comparison of the different spccies, as well as by the examination of seedlings. In both cases we meet with the proper leaves, bipinnate, and being of a tender texture. Our common acacia pulchella keeps those leaves all its life, while the majority of acacias, for instance the jam-tree, produce similar leaves only for the very first period of their lifetime, followed later on by spurious leaves, to which the term "phyllodia" has been applied.

These phyllodia are, as I said before, in reality the foot-stalks of the leaves, but transformed to some extent, and assuming very often the shape and appearance of real leaves. Many of our acacias exhibit a strong and surprising resemblance of their phyllodias to the true leaves of various other plants.

Here *(Plate VII.)* you see these organs of Acacia nervosa very like to the genuine leaves of certain Proteaceous plants, and the Acacia urophylla resembling in the same manner to some well-known species of Hakea.

Sometimes it becomes even difficult to make out the identity of these organs, and nobody will deny, for instance, the strong analogy of the phyllodineous organs of acacia colletioides to the leaves of the Daviesia incrassata as shown by *Plate VIII.* It is evident that nothing but a comparative study of their respective affinities will lead to the proper identification of those organs.

Proceeding further to the final step of this gradual evolution, we have to touch upon the total absence of any leaf or leaf-like apparatus. There is a beautiful set of leafless species to be found in Western Australia scattered all over the different classes of our classificatory system: this plate provides five examples out of four natural families. *(Plate IX.)*

Casuarina microstachya is one of the smallest members of the sheaoak family, so conspicuous by their absolute leaflessness. Exocarpus aphylla and perhaps this doubtful shrublet represent another Westralian order containing many common leafless plants, the Santalaceae, to which order the native cherry belongs, whereas the relatives of this Daviesia juncea and Comesperma scoparium are well provided with green foliage. Daviesia juncea will be known, I think, to many of the Perth botanists as adorning the sandy woods in early spring by its profusion of orange-red flowers. Comesperma scoparium seems to be restricted to the drier regions east and north of the Swan River, though mentioned by Drummond to be the "Swan Broom" of the earlier colonists. The numerous green stems are here the only organs of assimilation, as they are in all the other species represented in this plate.

We may be right when supposing that such strong reductions of vital energy mean a serious loss of the attainable amount of products, and it is not at the least surprising, therefore, to notice other plants trying other methods to protect themselves against the dangers of an excessive transpiration during the rainless time of the year. There are some plants, for instance, increasing the external covers of their system just as we will increase our clothing when wanted. Again, there is a wonderful variety of arrangements running all to the same result.

First we have a simple increasing of the external skin, the leaves thus becoming hard or leather-like. It is to be seen very generally in this country, and every collector will know to tell something about it. A good example is this Hakea Baxteri from the stony slopes of the Stirling Range. *(Plate X.)*

Then we find a dense clothing of hairs like a velvety tomentum, This form is not so distributed in this country as it is in some other regions of analogus conditions of the climate ; it is true only few species of the flora could be mentioned, and only one family, the Verbenaceae, as containing a greater number of densely hairy plants. Some of them are known as the flannel-flowers. I am pleased to be able to give a good representation of this adaptation by this Lachnostachys, found by us lately on the dry sand plains east of Northam. The other plant, Pityrodia, belongs to the same natural order, though not very closely related to the flannel-flowers. This species appears as a handsome bush in the scrubby country towards the Murchison River.

Another very interesting feature of some plants of the dry portions of Western Australia is the excretion of a kind of resinous varnish, hardening on the surface, and covering the leaves by an additional and highly effective membrane. This curious way of adaptation is not very usual in plant life, so that the great number of resinous plants of Western Australia is somewhat surprising to the visitor. Most of them are growing in the dry inland region, especially abundant in the hard red soil of the Mallee-country. Four specimens of *plate XI.* come from such localities of the Phillips River goldfield, all presenting very good instances of this peculiar quality. But as even better than these, this Eremophila Fraseri must be taken, which was collected on the Murchison goldfield, not far from Cue. The shrub strikes the traveller at the first sight by the brilliant verdure of its foliage amongst the sombre dreary tints of shrubs and bushes of those lonely regions. The calyx increasing very much after flowering, turns to a bright purple colour, thus rendering the plant perhaps the most ornamental of these "prides of the desert." Unfortunately, all this beauty is lost when dried, but I think you may notice something of the varnish-like excretion even on this poor specimen.

It is a method of adaptation, combining as it were external protection and internal reaction caused by the scarcity of the water-supply, the formation of the resinous oil being something similar to the chemical qualities adopted by the fleshy plants so generally growing on arid places. They are well known as succulents many of them being favourite objects for nurseries. In the South-West corner of Australia they are not very plentiful, becoming much more prominent in the interior of this country, but apparently nowhere as abundant as they are in the dry portions of Asia, Africa or America.

A good specimen of a succulent is Mesembrianthemum. I heard often the name of "pig-face" applied to this common plant of the sandy beach near Perth and Fremantle. It is considered by the majority of botanists as truly indigenous to Australia, but perhaps originally belonging to South Africa, where this genus is abundant of beautiful species of every description, and often conspicuous by the brilliancy of their flowers. Doing well as they do in the most arid localities, one is inclined to suppose that their adaptation is a very successful one as far as protection is concerned. But they are known as growing very slowly, and as being deprived very often of any energetic utterance of life As a fact, that is the usual drawback of all measures of protection so far considered ; they allow all functions to be carried out permanently, but only very slowly.

The second great group of measures of adaptation gives way to the periodical fluctuations of the climate. There the processes of life are conducted in the same periodical turns ; there is a check of almost every action during the dry and hot time, followed by a most energetic activity from the first rainfall to the end of the season.

Thus we find two principal forms of this arrangement : in the first one the dry summer is passed by the plant in the shape of the seed ; in the second one in the shape of some subterranean organ keeping in storage all the essential material ready for the use of the plant when recalled into activity at the approach of a new season.

To the first class belong the scores of annual plants growing up in springtime, apparently out of nothing, and covering the surface by a delightful flower-carpet for the short time of their visible life. The soil is well-watered to grow them, and the leaves are allowed to be tender, and well fitted for the work of assimilation. Often there are only a few leaves at the base of the stem, just sufficient to satisfy the requirements of an ephemerical life. Most of these annuals do not grow very tall—many are dwarf, indeed; they would not waste any time, hurrying only to produce their flowers, and to ripen the seeds so essential to secure the continuance of the species.

The annuals illustrated by *plate XII.* are remarkable for some analogous features in the structure of their system of vegetation, as unlike they may be in other respects, and more particularly in their floral characters.

It is impossible to refer to the annuals without giving attention to our bulb and tuber bearing plants. Like the annuals these will disappear completely from the surface during the months of heat and drought. Like the annuals they save the most of material and energy to build up the floral apparatus preserving the species. A good many Droseras, all our orchids, the well-known Dioscorea of our early spring days, are to be classified into this group. Like the annuals, they are the favourite wildflowers of every admirer of nature, giving to the country this bright and beautiful aspect in springtime so surprising to everybody who did not see it before but in the drier months of the year.

In this respect, however, they are certainly not of the same importance to the different districts of the country, different especially as far as the form of adaptation of their flora is concerned. The physiognomy of the different floras depends a good deal from the distribution of these forms of adaptation and thereby again, as it is well known, from the distribution of rainfall.

Nobody will be surprised, therefore, that plants accustomed to an amplc rainfall are extremely rare in this country, whereas species requiring less water, still not especially protected against drought, are to be met with more frequently. The creeks of the south-west corner, and the sheltered grounds of the jarrah forests all over our hilly country grow a good many of such plants.

It will be easily understood that the species become as more independent from wet or humid underground as larger the rainfall of their localities. In the forests of the southern portion of the Sussex district, for instance, I saw a plentiful number of plants which you will find only in damp creeks in all the other parts of Western Australia.

The great part of our country is inhabited by an half-xerophil vegetation, that means an association of evergreen plants protected in some moderate degree against the risks of the long summer-time. The forest country of the Darling Range and all the hilly districts about as far as King George's Sound, then the western coastal plains from Cape Naturaliste to Perth and northwards, all that makes the dominion of those well-known shrubberies overshadowed by the Banksia trees and the tallest Eucalyptus of the Western half of this continent.

Wherever the amount of the annual rainfall goes down to twenty inches or thereabouts, the reduced structure of the plants becomes more prominent. But the result as far as the total appearance of the scenery is concerned appears to be more varied: so much varied, indeed that climatical reasons alone seem to be hardly sufficient to afford any satisfactory explanation. We may take a glance firstly to the loamy country, as it turns up east of the Darling Range and spreads from there all over the dominion of the Wandoo gum, and further east gradually to the Mallee scrub of the goldfields. The gum-trees have got the leaves thicker and richer in oil than their more western congeners. Banksia becomes very scarce leaving its place to the Wattles and to the Jam-tree. Many of the low shrubby undergrowth are gradually disappearing, and the annual grasses and everlastings come into prominence. Eight months the aspect of the country is highly monotonous, the spring only is often, unfortunately not every year, startling with brilliant flowers.

The composition of the flora of this region is not quite so individual as it is in the West. The number of plants distributed all over Australia is getting larger as more you move to the east or to north. In fact, all the loamy creeks north of the Moore River seem to participate in this system, which approaches the coast in the same degree as the decrease in the rainfall travels westwards.

Everywhere these districts are interrupted by sandy regions of various extent. The adaptation of the flora of these dry sand-plains is a very pronounced one all over the wide area. There is no real tree to be seen, but shrubs and bushes of an endless variety. Animals and bulb-plants seem to me scarcer then one may expect, at any rate they are much less plentiful as in the sandy districts of Northern Cape Colony otherwise not unlike in many respects.

The variety of this sandplain flora is perhaps larger even than that of the coastal district: their floral wealth goes beyond any comparison. The flowers may not be more numerous than here in the South-West, but they are much more prominent owing to the scarcity and smallness of the foliage. It is a fact often pointed out by travellers that the floral wealth of a virgin forest between the tropics is only a poor one and easily beaten by any of the more temperate zones. But it must not be forgotten that its flowers are hidden and concealed by the over-whelming masses of foliage and verdure. Now in the same way our forest flora appears to be poor in floral ornaments when compared with those beautiful sand plains. Still there is left a strong affinity between these two components of the West Australian flora. The most leading genera are common to both; and it is an ever-lasting pleasure to study the relations of the numerous species and the transformation of their appearances in the different climates of the vast area stretching from the Murchison down to the Great Bight. I beg to refer to these four plates presenting some instances of this kind. *(Plate XIII.)* There we have first, Boronia. You notice the tender leaves of the famous Black Boronia growing in the swamps of the wettest portion of our country, or the pink sister-species of the same localities. Then you find Boronia tetrandra of the more northern swamps with leaves smaller and thicker, but still numerous. Boronia coerulescens shows a remarkable reduction of its foliage; it is a native of the sandy places in the drier parts of the south. At last we meet with Boronia spinescens nearly deprived of any leaf at all and showing almost spinescent branchlets. It was found east of Southern Cross, far from the border of the district allowing any culture of wheat.

The other plates, which I will only briefly touch upon, give the same evidence. (*Plate XIV.*) There is Diplolaena, one species of the more humid forest country, compared with a congenerous plant from sandy ground of the north. Then there is a very instructive illustration afforded by Hovea and Trymalium, both genera generally distributed in the South-West division. The largest leaves of Hovea elliptica and Trymalium Billardieri respectively are grown near the moist South coast, or in sheltered spots of the timber country. The medium adaptation belongs to a somewhat drier soil, whereas Trymalium angustifolium and Hovea pungens meet each other on dry gravelly slopes being especially common beyond the Darling Range in the Wandoo districts.

Science is not always in the position to be able to study such an enlightening and instructive series of near related species. Having taken her origin in Europe she formed her ideas in countries where most powerful accidents in the most recent geological periods disturbed every continuance of evolution. Thus it was not before learning the lessons of other continents that Lamerck and Darwin built up the theories of evolution generally adopted at the present day. They abandon the idea of the constancy of natural "species," realising at the same time the important rôle of adaptation for producing new organic forms. It is now settled beyond doubt that whatever was done in the past by the action of climate and by the restless changes of the surroundings is going on even this day in our presence. Few countries of the globe have produced and, I believe, are still producing such an inexhaustible material to study these all-important questions than Australia, and more so her western side. It is to be wished that this country may ever find men to develop its resources on this scientific field yet hardly touched at present. And one may be sure that it will succeed, because it cannot fail to attract that delighted admiration which was the strongest impulse to reveal the wonders of Nature ever since the first day of Science.

ORCHIDEÆ.

Record of Species Collected in the Year 1901.

Collectors.

MESSRS. A. PURDIE, C. R. P. ANDREWS, E. W. HURSTHOUSE, DR. TRATMAN, DR. MORRISON, DR. DIELS, DR. PRIETZEL.

THE field covered by collectors was principally that contained within an area having a 20-mile radius from Perth, though records were obtained from many parts of the State.

Of the 55 species collected all, with the exception of two, were found in the area mentioned, these two being : *Cryptostylis ovata*, found at Donnybrook, Greenbushes and Mt. Barker ; *Caladenia aphylla*, found at Albany and Serpentine. This leaves 32 recorded species yet to be collected.

In addition to the above there were found two new species of *Prasophyllum*, one of which is described elsewhere in this journal.

As several of the species are not very widely distributed, the tabulated list below may be of value to collectors, and save a lot of time in perhaps otherwise fruitless researches :—

Species.	Locality.	Time of Flowering.
Thelymitra stellata.	Darling Range	November.
Epiblema grandiflorum	Bayswater	November, December.
Cryptostylis ovata	Donnybrook, Greenbushes, Mt. Barker	January.
Prasophyllum Muelleri	Guildford	October, November.
Microtis porrifolia	Guildford	Sept., Oct., Nov., Dec.
Pterostylis recurva	Cannington	September.
,, turfosa	Cannington	October.
Eriochilus scaber	Cannington, Guildford	August
Caladenia clavigera	Swan View, Donnybrook	September.
,, barbarossa	Swan View	September.
,, carnea (var. alba)	Kelmscott	October.
,, aphylla	Albany, Serpentine	March, April.
,, sericea	Bellevue, Swan View	September.

It is quite probable that there are other localities in which the above are to be found, and should any of our readers make such discoveries we should be glad of a notification to that effect.

The species yet to be collected are given below, and if any member of this Society should discover any of the following the Society would be glad to receive such information, together with the locality and month of flowering and specimens.

1. Gastrodia, sesamoides
2. Calochilus, Robertsoni
3. Thelymitra, canaliculata
4. ,, aristata
5. ,, tigrina
6. ,, McKibbinii
7. ,, mucida
8. Prasophyllum, macrostachyum
9. ,, gibbosum
10. ,, cuculatum
11. Microtis parvifolia
12. ,, media
13. ,, pulchella
14. Corysanthes fimbriata
15. Pterostylis nana
16. ,, præcox
17. Pterostylis barbata
19. ,, rufa
20. Drakea ciliata
21. Acianthus exsertus
22. Eriochilus tenuis
23. Lyperanthus Forrestii
24. Caladenia Cairnsiana
25. ,, multiclavia
26. ,, Drummondii
27. ,, carnea
28. ,, congesta
29. ,, Roei
30. ,, saccharata
31. ,, ixioides
32. ,, unita

Notes on Two New Species of Plants indigenous to the State of Western Australia

. . . BY . . .

W. V. FITZGERALD, F.S.Sc., Lon., F.R.H.S., Eng.

MELALEUCA SHEATHIANA, N. sp.—

An erect bushy shrub of 12-15ft., with numerous short, twiggy, somewhat corky branches, glabrous except the young leaves and inflorescence.

Leaves scattered, glaucous, terete, very thick, nerveless, 1-1¼ lines long, obtuse, on distinct somewhat appressed petioles, in length not exceeding the diameter of the leaves.

Flowers yellowish-white, in small terminal heads of 5-7, the axis not growing out till after flowering, the rhachis covered with a ferruginous pubescence.

Calyx-tube shortly pubescent, about 1 line long, ovoid, lobes small, deltoid, acute, without scarious margins.

Petals 1 line long, ovate.

Staminal bundles 3 lines long, claw about 1 line, filaments 7-11.

Style thick ; stigma capitate.

Ovules few, in 3 cells, erect on a small axile placenta.

Fruiting calyx urceolate, 1-1¼ lines long, 1 line diameter, immersed, smooth.

Localities.—Lakeside, in fruit, Aug. 1898 ; Black Flag, in flower and fruit, Nov. 1898, W.V.F.

Remarks.—This species, which forms a scrub in moist saline spots, belongs to the sub-series Pauciflorae, its nearest ally being the M. pauperiflora, F.v.M., from which it differs chiefly in the foliage, the hirsute calyx-tube, in the few ovules and in the size and shape of the fruiting calyx. The species is named in honor of Mr. J. Sheath, of Perth, a gentleman who takes more than an ordinary interest in the vegetable resources of the State.

STYLIDIUM CYGNORUM, N.sp.—

Quite glabrous except the inflorescence.

Stock proliferous, branches rooting at the tufts.

Leaves at the base and ends of the branches, densely tufted, linear or linear-lanceolar, about 1¼ inch long, with shorter ones scattered along the branches, all shortly produced at the base below their insertion, mucronate, margins recurved.

Flowers in a head-like raceme; peduncle $\frac{3}{4}$-1 inch long, pedicels $\frac{1}{2}$ line long, the whole inflorescence invested with yellow glandular hairs.

Bracts linear, about 1 line long.

Calyx-lobes free, $\frac{3}{4}$ line long, mucronate, with scarious margins.

Corolla yellow, with pink blotches at the base of the petals, with 5 linear appendages in the throat and none on the labellum.

Capsule oblique, about 4 lines long.

Locality.—In the vicinity of Perth.—W.V.F.—Fl. Oct.-Nov.

Remarks.—This plant forms patches often nearly a foot in diameter, and occurs on sandy scrubby hillocks. In habit it closely resembles the S. repens, R.Br., but differs widely in the racemose inflorescence, much larger flowers, in the shape and size of the capsule. In the form of the latter it approaches S. guttatum, R.Br., but that plant has a different habit, foliage and inflorescence. The discovery of this plant adds another species to the series Peltigerae, all of which are endemic and found in the Swan River district. They are as follows:—S. junceum, R.Br.; S. guttatum, R.Br.; S. cygnorum, W.V.F.; and S. repens, R.Br.

Notes on Stylidieæ.

IT is generally considered that the Stylidieæ are the most unsatisfactory order in the Flora Australiensis. This was admitted by Bentham himself. "The precise form," he says, "of the corolla, the direction of its lobes in the expanded flower, and the small scales or glandular appendages in the throat or at the base of the labellum, may be constant in many cases, and might serve for good specific characters; but these parts are so delicate that there is great uncertainty in describing them from dried specimens. Different botanists have described them differently in the same species, and I myself have found considerable discrepancies in this respect in

Prasophyllum Muelleri, sp. nov. Stem slender, $1\frac{1}{2}$ to 3ft. high. Leaf-sheaf covering quite half the stem; lamina usually as long as or longer than the spike. Flowers in a spike of 4 to 8 inches, not very dense. Bracts broad, acuminate, with scarious edges. Sepals and lateral petals chocolate brown with green transparent edges; lateral sepals connate except at the tips, 6 lines long, narrow lanceolate; dorsal sepal as long, but much broader and saccate in the lower half; lateral petals like the lateral sepals but rather shorter and broader. Labellum 5 lines long, articulate on a short horizontal claw at the base of the column; base cordate; erect for about 2 lines, the rest recurved. Inner plate occupying almost the whole surface, and continuing to the tip; the margins free on the erect portion of the labellum. Edges of labellum thin, green, undulate; inner plate greenish brown. Lateral appendages of the column free, linear-falcate, acute, transparent, longer than the anther. Anther less than two lines long, acuminate rostellum about as long.

This species is nearer to *P. elatum* than to any other, but, according to the present division of the genus, the articulate labellum would place it in quite a different group—a group consisting of species with an entirely dissimilar habit. The free part of the stem is more slender and less firm than in *P. elatum*. Especially when the plants are young, the leaf-lamina continues the line of the stem, and the free part of the stem looks like a lateral branch—a habit quite unlike that of *P. elatum*. The peculiar transparent flowers with the prominent dark stripes give this species an appearance quite unlike that of any other that I have seen.

I found this species growing in great quantity in a large swamp at Guildford, some eight miles north-west from Perth. It flowers in November.

—Cecil R. P. Andrews.

Potamogeton pectinatus. L. This plant is growing in great quantity in the Swan River about Guildford, but, so far as I can ascertain, it has not previously been recorded in Western Australia. It may, perhaps, be a recent introduction; though, as it is ranked as indigenous in Victoria, Tasmania and South Australia, there is no reason except the lack of records why it should not be considered as a native. —Cecil R. P. Andrews.

Ophioglossum vulgatum, L. This little fern was first recorded for Western Australia by Mr. W. V. Fitzgerald in the "Victorian Naturalist" for November, 1901. It has also been found at Kelmscott by Dr. Morrison, at Mingenew by Dr. Diels, and at Guildford by myself. Mr. Fitzgerald's specimens were found near Fremantle. The occurrence of the plant over so large an area shows that it is not a recent introduction: it has evidently been overlooked owing to its inconspicuous habit. I have not seen Mr. Fitzgerald's plants, but I different flowers even of the same specimens; the characters founded on them must therefore not be absolutely relied on. The colour of the flowers is also said to be constant in some species, and has been made use of as a specific character since the time of Brown: but it appears to be variable in other species, and in most cases it is either unknown or only given in vague and contradictory notes of collectors. It is only a botanist resident on the spot that can complete the specific characters in the above respects."

Dr. Tratman and Mr. Alex. Purdie were specially appointed by the Society last year as a sub-committee to deal with Stylidieæ, with a view to completing and correcting the present descriptions. They were joined by Mr. Cecil Andrews.

It is proposed to publish descriptions next year of the Stylidieæ which can be found in the neighbourhood of Perth.

In the meantime a list is given of the species which have been identified during the year, with a few notes.

S. carnosum Benth.
S. reduplicatum R. Br.
S. scabridum Lindl.
S. junceum R. Br.
S. guttatum R. Br.
S. repens R. Br.
S. squamellosum D. C. ?
S. piliferum R. Br.
S. ciliatum Lindl.
S. calcaratum R. Br.
S. perpusillum Hook.
S. amoenum. R. Br. ?
S. diversifolium R Br.
S. Brunonianum Benth.
S. diuroides Lindl.
S. despectum R. Br. ?
S. utricularioides Benth. ?
S. longitubum Benth.
S. brachyphyllum Sond.
S. pulchellum Sond. ?
S. petiolare Sond. ?
S. emarginatum Sond ?
S. streptocarpum Sond.
S. Pycnostachyum Lindl.
S. pubigerum Sond.
S. canuliculatum Lindl.
S. leptophyllum D.C.
S. dichotomum D.C.
S. bulbiforum Benth.
Levenhookia pusilla R. Br.
L. stipitata F. v. Muell.
L. Preissii F. v. Muell.

S. guttatum. This species has been referred to the Peltigeræ on account of the bracts, which are produced below the insertion. Bentham noted that the capsule was narrow oblong, but thought that it would be broader when really ripe. The ripe capsule is, however, quite linear, so that the species should be transferred to the section Nitrangium. The series Peltigerae is then left with only *S. junceum* and *S. repens*, two species utterly dissimilar in every point except the bracts—a very artificial classification.

S. calcaratum and *S. perpusillum.* The labellum in these two species, which form the series Androsaceæ, is said to be long and ascending. This description is due to some unaccountable mistake, as the labellum in both species is minute and reflexed. The series is, however, a good and natural one, distinguished by its stigma from all other series.

am informed by Dr. Morrison and Dr. Diels that their specimens were like mine, *i.e.*, only one to two inches in height, with linear barren fronds. My specimens are exactly like *Ophioglossum lusitanicum L.* of Western Europe and Western Africa. This species appears in Europe in mid-winter, while *O. vulgatum* appears in mid-summer. I found the plant at Guildford in August.

—Cecil R. P. Andrews.

Schizaea fistulosa Sm. This species, which is found in Victoria and Tasmania, was discovered last year at Albany by Dr. Diels and Dr. Prietzel. With the last mentioned plant, it brings the list of Western Australian ferns up to fifteen.

—Cecil R. P. Andrews.

Xerotes hermaphrodita. (N. sp.) Stems tufted, the leafy base exceedingly short. Leaves radical, flat, striate, 2-4 in. long, the old sheathing bases splitting into numerous silky filaments. Scapes thick, terete, shorter than the leaves, only the inflorescence being above ground. Flowers hermaphrodite, numerous (10-50), in a pyramidal panicle about 1 in. long. Peduncles whorled, reddish in the upper part, subtended by dark red lanceolate scarious bracts ; the lower peduncles 3-5-flowered, the upper part reduced to a dense raceme ; all the flowers on short, thick pedicels. Perianth-segments all free ; the outer barely one line long, thin but slightly fleshy, dark red, with scarious margins, obtuse ; the inner longer and broader, concave, very thick and waxy, pale yellow or cream-coloured. Stamens opposite the outer segments with thick, short, terete filaments ; those opposite the inner segments with similar but much longer filaments. Ovary three-celled, with 6 prominent ribs ; stigmatic lobes three, short, recurved ; one ovule in each cell.

The plant has much the habit of *X. suaveolens Endl.* It differs from all other species of Xerotes in being hermaphrodite. Adopting Bentham's classification it would come under Series III, *Sparsiflorae* of Sect. I *Euxerotes*, and would be nearest to *X. caespitosa.*

I found the plant at Guildford in April, 1901, and again at Claremont in May, 1902. It grows in sand in shady places. I have only found it flowering on ground where there has been a fire during the previous summer. The leaves usually have no lamina, but this is probably due to the fire. Occasionally I have found leaves with a lamina of 2-4 inches above ground, and I believe that I have found flowerless plants with more luxuriant leaves on ground where there has been no fire. In its usual form nothing at all is to be seen above ground except the inflorescence ; in one case I have found a perfect inflorescence, with anthers apparently mature, entirely underground. The perianth-segments are so concave that the flowers hardly open at all, and are probably self-fertilised.

—Cecil R. P. Andrews.

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OF

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Journal of Proceedings

OF THE

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OF

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(The Author of each article is responsible for the facts and opinions recorded.)

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Dr. TRATMAN, Mr. ALEX. PURDIE and Dr. MORRISON.

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Messrs. E. J. BICKFORD, J. B. ALLEN and J. A. PEART.

The Epacridaceae or "Australian Heaths."

Lecture delivered before the Mueller Botanic Society on June 9th, 1902, by Alex. Purdie, M.A.

The object of this paper is to assist those already possessing a general knowledge of botany in taking up the special study of the order Epacridaceæ. This order, like the true Heaths (Ericacecæ), belongs to the subclass Monopetalæ, *i.e.*, the petals are more or less united to form a tube. The Australian Heaths are distinguished from the true heaths as follows :—

In Ericaceæ (True Heaths)	In Epacridaceæ
The stamens are usually free from the corolla and twice as many as the petals.	The stamens are sometimes free but generally adnate or joined to the corolla tube, and as many in number as the petals.
The anthers are two-celled, usually opening in terminal pores.	The anthers are one-celled (sometimes two-celled before opening), opening by a single longitudinal slit into two valves.

The general characters of the Australian heaths are as follows :— They are heath-like plants with small needle-shaped or acutely pointed leaves which are usually alternate. The flowers also resemble those of the true heaths, being tubular in whole or in part, in most cases usually white, pink, or reddish. The fruits are less familiar to those that are not botanists. They are of two types, one fleshy or drupaceous. (The cherry is the type of fruit called a drupe, this being a fleshy fruit with a central "stone.") This type is found in the so-called "cranberry" of Australia, perhaps familiar to some of you. The other type of fruit is quite dry when ripe and splits open, like the fruit of the pansy or violet, down the backs of the carpels to scatter the seed. Other more minute characters frequently used in classification are the following :—

1. Structure of the Pistil.—The style is either terminal (Fig. 1 A) or else is sunk in a central pit or depression between the carpels (Fig. 1 D, E.) The seeds in each division of the ovary may be one (Fig. 1 A) or more in number (Figs. 1 D, E and 7 A, B.) Below the ovary is generally a disk or ring of scales varying in shape, sometimes cup shaped (Fig. 3 G and Fig. 6 D) so that the ovary sits like an acorn in its cup, at other times separated into distinct scales (Fig. 5 B and Fig. 7 A.) This organ is called the "hypogynous disk" or "hypogynous scales."

2. The Corolla.—The shape of this often furnishes good characters for classification. In many species the inner side of of the lobes, round the mouth of the corolla tube are covered with fine white hairs. Also inside the lower part of the corolla tube there may be fine scales covered with hair, often forming a

compact ring just above the ovary (Fig. 3 B ht). The corolla lobes and petals are sometimes turned out backwards (Fig. 2 A), sometimes closed together to form a cone (Fig. 4 F, H.)

The Epacridaceæ are divided into two very well marked tribes :—

Tribe I.—STYPHELIEÆ.
Tribe II.—EPACREÆ.

These tribes are readily distinguished for the more part as follows, adopting Bentham's definitions :—

Tribe I.—Styphelieæ.—Ovules solitary in each cell of the ovary, pendulous from the summit of the cavity, style terminal, fruit indehiscent and usually drupaceous (Figs. 1 A, B, and C.)

Tribe II. Epacreæ. — Ovules several in each cell of the ovary, style inserted in a central tubular depression so as to be lateral or basal, capsule loculicidally dehiscent (Fig. 1 D and E.)

Tribe I, Styphelieæ, contains the following genera, the numbers in the first column giving the total number of Australian species and the second column the West Australian, according to Bentham.

Genus.				Total No.	W.A.
1	Styphelia	...	...	11	4
2	Coleanthera	...	...	3	3
3	Astroloma	...	...	18	16
4	Conostephium	...	...	5	5
5	Melichrus	...	...	2	0
6	Pentachondra	...	...	4	0
7	Trochocarpa	...	...	6	1
8	Cyathodes	...	...	8	0
9	Brachyloma	...	...	6	2
10	Needhamia	...	...	1	1
11	Lissanthe	...	...	3	0
12	Leucopogon	...	...	118	81
13	Acrotriche	...	...	8	3
14	Monotoca	...	...	6	1
15	Oligarrhena	...	...	1	1
	Total	...	...	200	118

The numbers for the second tribe are as follows :—

TRIBE II.—EPACREÆ.

Genus.				Total Sp.	W.A.
16	Epacris ...	...	...	22	0
17	Lysinema	...	...	6	5
18	Archeria	...	...	3	0
19	Prionotis	...	..	1	0
20	Cosmelia	...	...	1	1
21	Sprengelia	...	...	3	0
22	Andersonia	...	...	19	19
23	Richea ...	...	...	8	0
24	Dracophyllum	...	...	2	1
	Tribe II.	...	...	65	26
	Tribe I.	...	...	200	118
	Grand Total..		...	265	144

Of the Australian species then 54 % are found in Western Australia. Of the genera 61 % are represented in W.A. ; 25 % are peculiar to W.A., while another 16 % are almost completely West Australian. The above table shows the relative importance of the genera. Of these 24 genera it is fortunately not necessary to characterise more than a few to-night, although I have brought here examples of all the more important genera. The genera selected as sufficient to give a fair understanding of the Epacridaceæ are—

In Tribe I, Styphelieæ—
Styphelia, Astroloma, Conostephium, and Leucopogon.

In Tribe II, Epacreæ—
Lysinema and Andersonia.

Tribe I.—STYPHELIEÆ.

Styphelia.—Of this genus a very beautiful species is now plentifully in flower in the Darling Ranges, and of it there is abundance of fresh specimens on the table. It is Styphelia tenuiflora (Fig. 2, A.E.) Its long white tubular flowers are easily remembered and in it the characteristics of the genus are readily made out, viz. : the petals are rolled back or revolute, leaving the stamens freely exposed. Inside the corolla tube is smooth or glabrous, the tufts of hair being absent in this species although in others they are present.

Astroloma (Fig. 3, A. to G. ; Fig. 4, A–C.)—Of this large genus nearly all are W.A., and some are very pretty with their red tubular flowers. It is distinguished from Styphelia by the petals or lobes of the corolla not being so rolled back, and by the stamens being more or less concealed in the mouth of the corolla tube. The stalks of the stamens are often also much flattened. The flowers are solitary in the axils of the leaves. The hairy tufts inside the corolla tube are rarely absent. Of this genus I have here to-night several dried examples and also several fresh specimens. Of the latter Astroloma macrocalyx (Fig. 3) is fairly common about Perth, A. pallidum everywhere common. Two other species, Astroloma microcalyx (Fig. 4, A) and A. longiflorum (Fig 4, B) would popularly be termed cranberries and are common plants, prostrate, with fine red flowers. The general structure of these flowers can readily be made out from the figures.

Conostephium.—This genus has very peculiar and easily recognised flowers, the largest species, Conostephium pendulum (Fig. 4, D–F) being very common round Perth. It is peculiar as a flower that does not open in the ordinary usage of the term, the tips of the petals being joined together into a conical peak (Fig. 4F), and both the corolla and calyx are closely wrapped up in overlapping bracts or scale-like leaves (Fig. 4 E and G). All the species are peculiar to W.A.

Leucopogon (Figs. 5 and 6).—More than half of the West Aust. Epacrids belong to this large genus. It is generally easily recognised by the white bearded corolla (Fig 5 A) from which the genus is named.

The corolla tube in many of the common species is not very long, and the lobes are spreading, and covered inside with a mat of glistening white hairs. Some of the species, however, like Leucopogon pendulus have flowers rather more like Styphelia, being long and tubular, but the petals are not so rolled back, and the stamens are more or less included in the base of the lobes. The two species figured may be taken as fair types of the genus. Fig. 5 is probably L. tenuis, its woolly mouthed flowers being very beautiful under the microscope, and Fig. 6, L. pendulus, with numerous tubular white flowers ranged along the under side of its branches. Both of these are from the Darling Ranges.

Tribe II.—EPACREÆ.

Unfortunately the most beautiful genus of all, Epacris, the typical or eastern Australian heath, is absent altogether from this State. Some of you have doubtless revelled in the profusion of these white, pink, and red heath flowers of the Eastern States, and of them I have here some dried specimens. Our West Australian genera are not, however, without interest. The first of these,

Lysinema (Fig. 7, A and B) is just now coming into flower behind the Zoological Gardens. Its spikes of creamy coloured flowers are best remembered by their pronounced odour of curry powder in the fresh state. The lobes spread out at right angles to the tube and the petals have a tendency to separate down the sides of the tube. The ovary in vertical section shows numerous ovules. The genus next in size to Epacris is

Andersonia—which is confined to West Australia. One species of this is very common at Midland Junction and in the Darling Ranges. It is easily recognised by its delicate colouring, the corolla being a pretty pale blue and the calyx pink. This is Andersonia sprengelioides (Fig. 8, A, B, C) Its ovary has the style in a depressed central hollow (Fig. 8 A.)

The preceding six genera include 177 out of the 265 Australian Epacrids and all the other genera differ by small characters from these hence the mastery of these six will give a very comprehensive grasp of the classification of the Epacridaceæ Some may be deterred by the smallness of the flowers, but there is no essential character that cannot be made out with a little deftness and the use of a Coddington lens. A microscope is, of course, convenient, but not indispensable. The most difficult characters to make out are those of the ovary and hypogynous disk, but these can be resolved by slitting or cutting across the whole flower with a sharp razor and examining the cut surface with the lens. For microscope work the flowers can best be examined by teasing them apart with forceps and needles mounted on penhandles, then placing the pieces in dilute glycerine and water. The following key quoted from Bentham's "Flora Australiensis" will indicate how the genera can gradually be traced out, and I hope that many hitherto debarred by the cost of Bentham's seven volumes may find this paper and attached key sufficient introduction to the study of our Australian heaths.

Regarding the figures attached to this paper a word of explanation is necessary. They were merely pencil sketches made during a microscopic examination of the plants as memoranda for the blackboard drawings used to illustrate this lecture during its delivery. As the paper would hardly be intelligible without the figures they have been here reproduced, but they are to be regarded as diagrammatic rather than exact botanical illustrations.

Abundance of the following species in a fresh state was distributed among the members of the Society in illustration of the paper :—Styphelia tenuiflora, Astroloma macrocalyx, pallidum, microcalyx and longiflorum, Conostephium pendulum, Leucopogon tenuis (?) and pendulus, Lysinema ciliatum (in bud) and Andersonia sprengelioides. Herbarium specimens of the following were also exhibited :—Styphelia tenuiflora, Astroloma stomarrhena, humifusum, conostephioides and macrocalyx ,Conostephium pendulum, Melichrus urceolatus, Brachyloma daphnoides, Lissanthe strigosa, Leucopogon pulchellus, virgatus, conostephioides, Macraei and microphyllus, Acrotriche serrulata, Monotoca scoparia, Epacris purpurascens, microphylla, impressa and longiflora, Lysinema ciliatum, Sprengelia mucronata, Andersonia sprengelioides, Richea procera.

Key to the Australian Epacridaceae, quoted from Bentham's Flora Australiensis, Vol. IV., p. 143-144.

Shrubs. Leaves usually alternate, rigid and striate. Flowers regular. Stamens as many as corolla-lobes and alternate with them, or rarely fewer. Anthers 1-celled. Ovary superior with 5 or fewer cells. Seeds albuminous.

TRIBE I. **Stypheliæ.**—*Ovules solitary in each cell of the ovary, pendulous from the summit of the cavity. Style terminal. Fruit indehiscent, usually drupaceous.*

Anthers exserted. (Corolla-lobes revolute so as completely to expose the erect summits of the filaments and the anthers)	
Anthers free. Filaments glabrous.	
Corolla-tube long or slender. Fruit a 5-celled drupe	1. STYPHELIA.
Corolla-tube very short. Fruit 5-pyrened and berry-like	6. PENTACHONDRA.
Anthers connate in a cone round the style. Filaments glabrous	2. COLEANTHERA.
Anthers connivent or connate, enveloped with the filaments in a dense wool	3. ASTROLOMA.
Anthers wholly or partially enclosed in the corolla-tube or in the erect base of the lobes, or rarely recurved with the lobes.	
Corolla-tube (usually long) with five tufts of hair or hairy scales or a dense ring of hairs inside below the middle. Filaments usually flat . . .	3. ASTROLOMA.

Corolla-tube short, with five glandular scales inside below the middle. . . . . 5. MELICHRUS.
Corolla-tube conical in the upper portion, with minute erect lobes. Anthers 2-lobed . . . . . 4. CONOSTEPHIUM.
Corolla-tube without scales or hairy tufts below the middle, the lobes spreading at least at the end. Filaments terete or nearly so.
Corolla-lobes more or less imbricate in the bud, glabrous, the throat closed with reflexed hairs or scales . . . . 9. BRACHYLOMA.
Corolla-lobes broadly induplicate in the bud, glabrous . . . . 10. NEEDHAMIA.
Corolla-lobes valvate in the bud, glabrous.
Corolla-tube cylindrical or urceolate.
Drupe with a several-celled hard nucleus, the mesocarp very pulpy. Flowers usually solitary, with imbricate bracts . . . . . 8. CYATHODES.
Drupe with a several-celled nucleus, the mesocarp moderately pulpy. Flowers in spikes or racemes, the bracts and bracteoles distinct . . . . 11. LISSANTHE.
Drupe with 10 more or less separable pyrenes. Flowers in spikes or clusters, the bracts and bracteoles distinct . . . . . . 7. TROCHOCARPA.
Drupe berry-like, very pulpy, with 5 distinct pyrenes. Flowers solitary or in spikes, the bracts and bracteoles distinct . . . . 6. PENTACHONDRA.
Corolla-tube short and campanulate. Flowers very small.
Stamens and corolla-lobes 4 or 5. Ovary 1- or 2-celled . . . . 14. MONOTOCA.
Stamens 2. Corolla-lobes 4. Ovary 2-celled . 15. OLIGARRHENA.
Corolla-lobes valvate, with a reflexed beard at the tip, and reflexed hairs along the throat . . . . 13. ACROTRICHE.
Corolla-lobes valvate in the bud, bearded inside.
Drupe with several-celled, hard nucleus, the mesocarp very pulpy. Flowers usually solitary, with imbricate bracts . . . . 8. CYATHODES.
Drupe with a several-celled, rarely 1-celled, hard or thin nucleus, the mesocarp moderately pulpy or dry. Flowers in spikes or solitary, the bracts and bracteoles distinct . . . . 12. LEUCOPOGON.
Drupe with 10 (or fewer by abortion) separable pyrenes. Flowers in spikes or clusters, the bracts and bracteoles distinct . . . . . . 7. TROCHOCARPA.

TRIBE II. **Epacreæ.**—*Ovules several in each cell of the ovary. Style inserted in a central tubular depression, so as to be lateral or basal. Capsule loculicidally dehiscent.*

Leaves petiolate, sessile or stem-clasping, not sheathing. Placentas sessile or nearly so.
Bracts imbricate on the calyx, passing into the sepals.
Corolla-lobes quincuncially imbricate . . . . 16. EPACRIS.
Corolla-lobes contorted-imbricate . . . . . 17. LYSINEMA.
Bracts or bracteoles at a distance from or scarcely reaching the calyx, and very different from the sepals.
Stamens adnate to (inserted in) the corolla-tube . 18. ARCHERIA.
Stamens hypogynous, free . . . . . . 19. PRIONOTIS.

Leaves with an adnate, sheathing base, which falls off with the leaf, leaving the denuded branches smooth and scarless. Placentas sessile or nearly so.

Stamens adnate to (inserted in) the corolla-tube . . . 20. Cosmelia.

Stamens hypogynous, free. Corolla scarcely exceeding the calyx.

Corolla-tube very short ; lobes very spreading, glabrous, more or less imbricate . . . . . 21. Sprengelia.

Corolla-tube cylindrical ; lobes erect, recurved or revolute, bearded inside, valvate in the bud . . 22. Andersonia.

Leaves with an adnate, sheathing base, which falls off with the leaf, leaving annular scars on the denuded branches. Placentas depending from an ascending recurved stipes.

Corolla circumsciss near the base, calyptriform, the lobes not opening . . . . 23. Richea.

Corolla not circumsciss, the lobes spreading. . . 24. Dracophyllum.

DESCRIPTION OF FIGURES.

Fig. 1.—Diagrammatic representation of the Tribe I., Stypheliеæ (A B and C) and of Tribe II., Epacreæ (D and E) ; Ov., ovary ; St., stigma.

Fig. 2.—Styphelia tenuiflora. A, single flower ; B, ovary, part of style, and hypogynous disk ; C, vertical section of ovary ; D, stigma ; E, mouth of corolla tube and stamens.

Fig. 3.—Astroloma macrocalyx. A, flower ; B, corolla tube opened out ; C, corolla tube complete ; D, ovary in vertical section ; E, stigma ; F, anther ; G, pistil and hypogynous disk.

Fig. 4.—A, flowers of Astroloma microcalyx ; B, A. longiflorum ; C, A. pallidum ; D, anther of C. pendulum ; E, flower of Conostephium pendulum; F, corolla-tube of C. pendulum ; G, flower of C. Preissii ; H, corolla tube of C. Preissii.

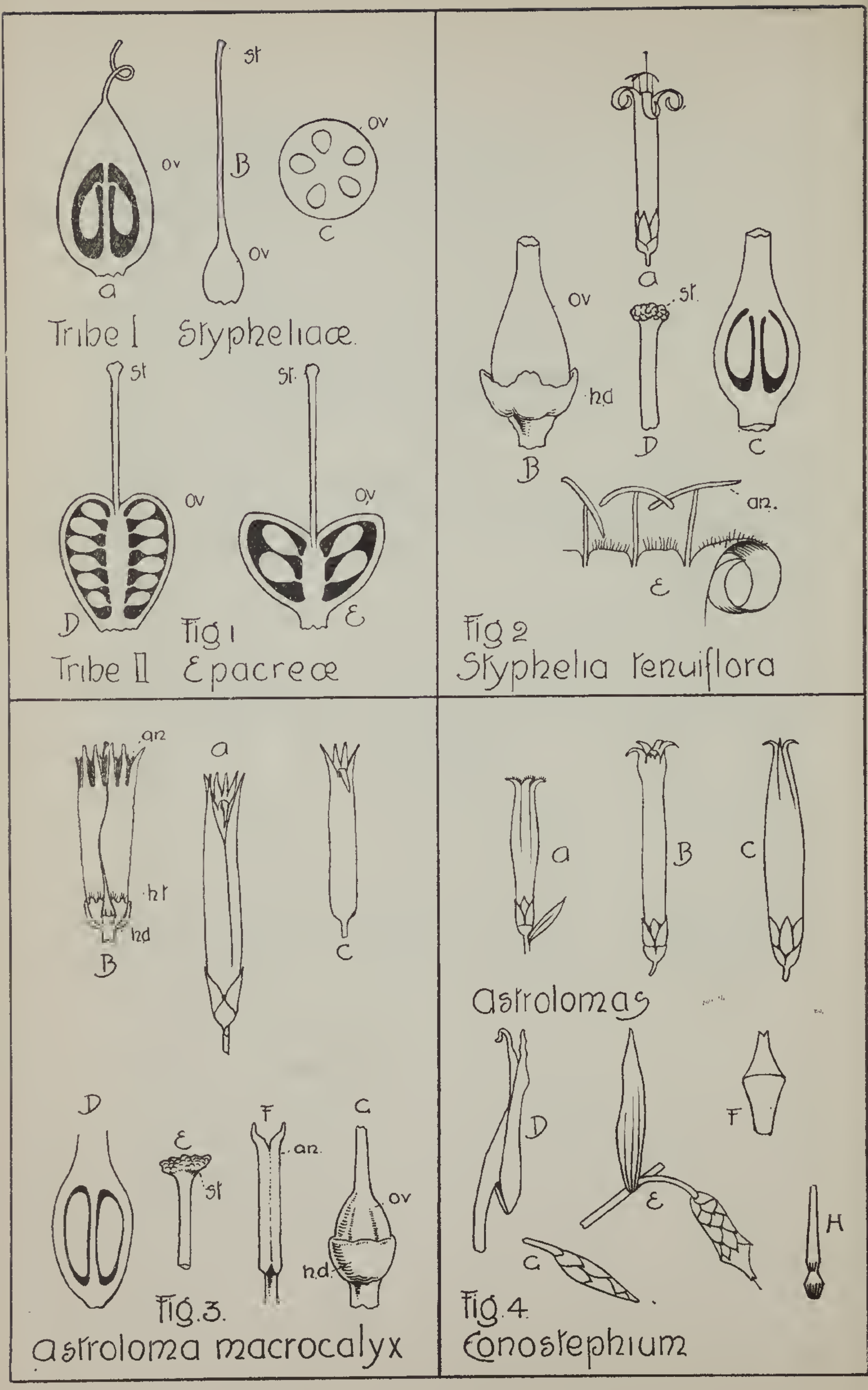
Fig. 5.—A, corolla of Leucopogon tenuis ? B, ovary and hypogynous scales of same.

Fig. 6.—A, anther of L. pendulus ; B, the same ; C, ovary of same ; D, hypognous disk.

Fig. 7.—A, ovary and hypogynous scales of Lysinema ciliatum ; B, section of ovary.

Fig. 8.—A, section of ovary of Andersonia sprengelioides ; B, flower of same; C, hypogynous disk.

Contractions.—ov., ovary ; h.d., hypogynous disk ; an., anther ; st., stigma ; h.t., hair tufts ; h.s., hypogynous scales ; cor., corolla ; s., sepals ; br., bract.



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Tribe I Stypheliaœ
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Fig 1
Tribe II Epacreæ
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Fig 2
Styphelia tenuiflora
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Fig.3.
Astroloma macrocalyx
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Fig.4.
Conostephium

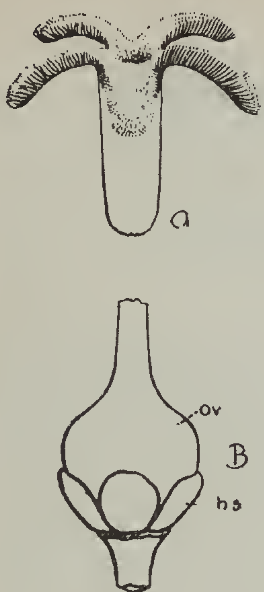


Fig 5
Leucopogon sp.

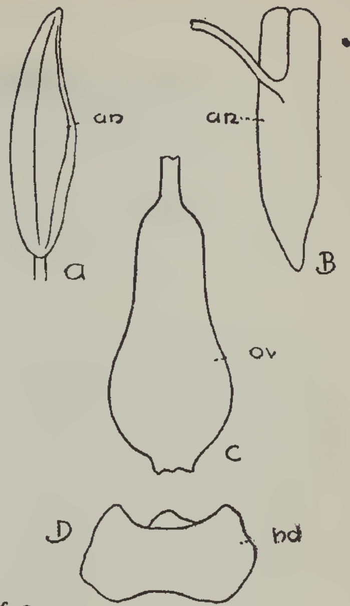


Fig 6
Leucopogon sp.

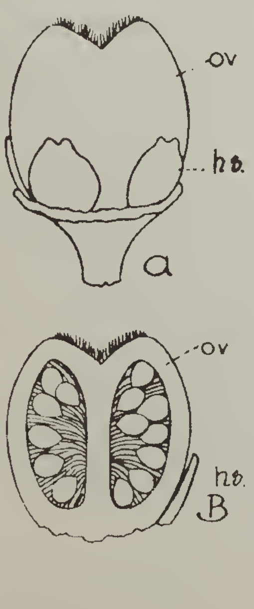


Fig 7.
Lysinema.

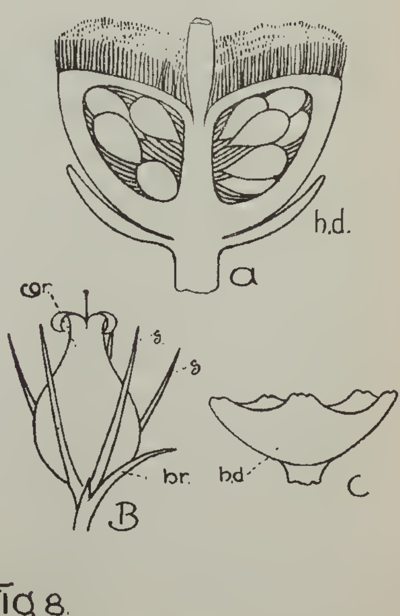


Fig 8.
Andersonia

THE PROTEACEÆ.

A Paper read before the Mueller Botanic Society on July 21st, 1902, by Cecil R. P. ANDREWS, M.A.

The Proteaceæ are spread over the greater part of the southern hemisphere, being found in South America and South Africa, as well as Australia. North of Australia they also extend into the northern hemisphere, through the Indian Archipelago to tropical Asia, and as far as Japan. The order falls into two great divisions, or sub-orders —the Nucamentaceæ, with indehiscent fruits, and the Folliculares, with dehiscent fruits. South Africa possesses representatives only of the former, South America and Asia only of the latter. Australia is the headquarters of the order, for it is only in Australia that the two sub-orders can be studied together. Not only does it possess both sub-orders, but it possesses representatives of all the seven tribes into which these sub-orders are divided.

Within Australia the Proteaceæ are very unevenly distributed. New South Wales contains nearly 120 species, Victoria and Queensland each have about 50, while South Australia and Tasmania have only about 20 each. Many of these species are common to more than one of the States, so that excluding Western Australia just under 200 species are found within the limits of the Commonwealth—and the great majority of them are contained in three genera —Persoonia, Grevillea, and Hakea. Western Australia alone possesses no less than 400 species, so that our country is undoubtedly the best in the world for the study of this order. Nor is the abundance of our material the only remarkable point about our Proteaceæ. Out of the 401 species recorded in the latest list of our flora, only six are certainly known to have been found anywhere else in the world. Three more have been recorded in the other States, but the records are doubtful. Even if we accept these records the almost incredible number of 392 species out of 401 are endemic.

Six out of the seven tribes of Proteaceæ are represented in Western Australia, and our species are divided among fourteen genera. Thirteen of these genera are represented among the specimens which I have here to-night, and 73 species—being rather more than one-sixth of our total number.

The Proteaceae vary very greatly in appearance and habit. It would be hard to find two plants less alike, for instance, than a Banksia and a Stirlingia. The plants of the order are, however, very easily recognised.

The order falls under the Monochlamydeæ—one of the great divisions of the Dicotyledons. The Monochlamydeæ are plants with a single floral envelope, as opposed to those which possess both calyx and corolla. This single envelope is spoken of as the perianth. In the Proteaceæ the lower part of the perianth is united into a tube; the upper part or "limb" splits, when the flower is mature, into four segments. These segments do not overlap one another in the bud, but are "valvate"—that is, they cohere by their edges. The segments are usually divided into a narrow claw and a short lamina or blade, and they vary much in the manner of their opening In some genera the laminæ separate first, and the segment generally rolls back from the top; in others the claws separate while the laminæ still cohere. Opposite the middle of each lamina, and usually sessile upon it, is found an anther; less commonly there is a short free filament. Round the ovary in some genera are four scales; in others a single gland partially surrounds the ovary. The ovary is one-celled, and contains in our genera, only one or two ovules. The fruit is an indehiscent nut, or a drupe, or a follicle, and in some genera is apparently two-celled, as I shall show you later.

Any plant found in Western Australia which possesses a single perianth splitting into four segments, with a stamen opposite and adnate to each of these segments, may be put down at once to the Proteaceæ.

A—Nucamentaceae. The first great sub-order, the *Nucamentaceæ*, consists of those species whose fruit is indehiscent; the flowers are usually solitary within each bract, and are often arranged in cones or spikes. The sub-order is divided into four tribes.

1. *Proteeæ.*—In the first tribe, the *Proteeæ*, the anthers are inserted at the base of the short spreading laminæ of the perianth, and are usually all perfect. The fruit is a dry nut, and normally only one ovule is developed, though two are occasionally found side by side. The four Australian genera of this tribe are all found in Western Australia.

(A.) *Petrophila.*—The first genus, Petrophila, has the flowers in dense cones, one flower within each of the imbricate or overlapping bracts. Some of the lowest bracts are empty, and so form a sort of involucre to the cone. The genus is divided according to the axillary or terminal growth of the cones and the shape of the style. The fact that in some instances the perianth-tube remains entire and falls off in one piece, while in others the segments split to the base and fall off separately, affords a further line of division.

In the first section, Arthrostigma, the perianth segments fall off separately, the cones are terminal, and the style is "thickened or truncate beneath the villous or hirsute brush." (Fig. 1). I have two species of this section, *P. media*, R. Br., from Armadale and Guildford, and *P. linearis*, R. Br., with its large pink woolly flowers, very common on the sand all round Perth. The leaves in this section are undivided.

In the second section, Xerostole, the perianth falls off entire; the cones are axillary, and the styles are "thickened and usually truncate below the nearly glabrous brush." The thickened portion is often less truncate than in the first section, *e.g.*, *P. biloba*, R. Br. (Fig 2.) I have three species of this section, *P. biloba*, R. Br., common in the Darling Range; *P. propinqua*, R. Br., a very pretty plant from a sand patch to the N.E. of York; and *P. striata*, R. Br., which much resembles the last, from between Bellevue and Swan View. The leaves in this section are usually ternately divided.

In the third section, Serrurioides, the perianth falls off entire, the cones are axillary, and the styles are "continuous and fuciform, *i.e.*, spindle shaped. (*v.* Fig. 3.) My example is *P. serruriæ*, R. Br., from Claremont. The leaves of this section are divided.

The fourth section, Symphyolepis, only differs from the last in that the perianth segments fall off separately, and that the leaf-segments are always flat. My example is *P. macrostachya*, R. Br., from Claremont, which has long cones both axillary and terminal.

The fifth section, *Petrophile*, differs from the fourth only in its terminal cones. My example is *P. seminuda*, Lindl., which is common about Guildford and Midland Junction and in the hills.

The sixth section consists of a single species from the Murchison, which I have not seen. The style differs from those of any of the preceding sections.

The bracts harden when the flowering is over, and form closely imbricate cone-scales. When the fruit is ripe these scales open sufficiently to allow the nut to fall out. This is the chief character which separates Petrophila from the next genus, Isopogon. The nuts of Petrophila have long hairs at the base, and usually also on the margins. One face is also often hairy, but one is almost always glabrous. The nuts are flattened.

(B.) *Isopogon.*—In Isopogon the scales of the fruiting cone always fall off either before the nut or with the nut. Although this is the principal point of difference from Petrophila, it is generally possible to distinguish the genera by the flowers without the fruiting-cones. The style of

Isopogon is usually unlike any of the forms which the Petrophila style assumes, as it has a distinct narrow neck between the lower thickened portion and the brush. The brush is often much swollen or "bulbous" at the base (*v*. Figs. 4 and 5). The nut of Isopogon differs from that Petrophila in not being compressed, and in being hirsute all over. In Isopogon the upper part of the perianth usually falls off in one piece, leaving a persistent base, thus differing from both forms of Petrophila.

The genus is only divided into two sections. The cone-scales of the first, Hypsanthus, are acuminate and not very closely imbricate (*v*. Fig. 4), while those of the second, Eustrobilus, have broad ends and are very closely imbricate (*v*. Fig. 5.) The receptacle in the second section is usually more elongated than that of the first. The first section is represented in my specimens by *I. sphaerocephalus*, Lindl., from Armadale, which shows the woolly rhachis of the cone after all the scales have fallen, and by *I. roseus*, Lindl., a very handsome plant, from Guildford. The second section is represented by *I. asper*, R. Br., which is common about Guildford and in the Darling Range, and *I. divergens*, B. Br., from the sand patch near York, which shows the closely imbricate cone-scales.

The stigma in both these genera is very small, at the point of the part of the style which has been called the brush. The actual stigma is therefore above the anthers, which are sessile at the base of the laminae, before the flower opens, and is not likely to be self-fertilized. The brush and the thickened portion of the style-end appear to collect pollen when the anthers burst, and no doubt assist in cross-fertilization by means of insects.

(c.) *Adenanthos*.—The third genus, Adenanthos, is with the exception of one species confined to Western Australia. Its flowers are solitary in an involucre of several —usually 6—bracts. The tube of the perianth usually splits on the upper side. The style is arched and protrudes from the split tube before the limb opens and sets the end free. (*v*. Fig. 6.) The torus has a tuft of hairs round the ovary, and 4 scales or glands outside the hairs. The genus falls naturally into two sections. The first, Eurylaema, has a broad curved perianth-tube, and the lower anther is sterile, being reduced to a narrow thread-like organ. The style-end is broad, flat and ovate or elliptical. The flowers are conspicuous, being bright red, and quite one inch in length. There are only two species in the section—*A. barbigera*, Lindl., which is fairly common in the Darling Range, and *A. obovata*, Labill., which is conspicuous on the railway banks between Bayswater and Guildford, and is also very abundant about Pinjarra. The second section has a narrow straight perianth-tube, a narrow cylindrical style-end, and all the anthers perfect. The flowers in the species which I know are very inconspicuous, although they are about one inch long. They are concealed by the leaves, and are covered with grey hairs — having no bright colour at all. *A. sericea*, Labill., is a common shrub on the sand about Perth, reaching to as much as 20ft. in height. *A. apiculata*, R.Br., is a small procumbent shrub from Albany.

(D.) *Stirlingia*—The fourth and last genus of this tribe is confined to W.A. The flowers are small, in heads, with very small bracts. The anthers, unlike those of the first three genera, are not sessile on the laminae, but are on short thick filaments. Here we first meet with an extraordinary conformation of the anthers, which reappears in the next tribe, but is, so far as I know, quite peculiar to Proteaceæ. The adjacent cells of two different anthers are connate, so as to form one large single cell: when the perianth splits and the segments roll back this cell is torn in half, thus emitting the pollen. The four stamens thus possess only four anther cells between them, though each has a distinct connective (*v.* Fig. 7.) There are only five species in the genus, of which I have two here. *S. simplex*, Lindl., is common about the foot of the Darling range, for instance, at Bellevue and Swan View. Its leaf-segments are filiform, and its long peduncles single-headed. *S. latifolia*, Steud., with its flat leaves and branching panicle, is one of the commonest and, I believe, one of the most widely distributed plants in the country. It is very variable in the size of its leaves, and the ramification of the inflorescence: the two forms which I am showing might well be taken for different species.

2. *Conospermeæ.*—The second tribe, Conospermeæ, consists of two genera only. Both have small flowers, and a very peculiar arrangement of anthers. One anther has both cells perfect; two have one cell perfect and one abortive; the fourth has both cells abortive The perfect cells are like those of Stirlingia, the adjacent cells of different stamens forming a single cell.

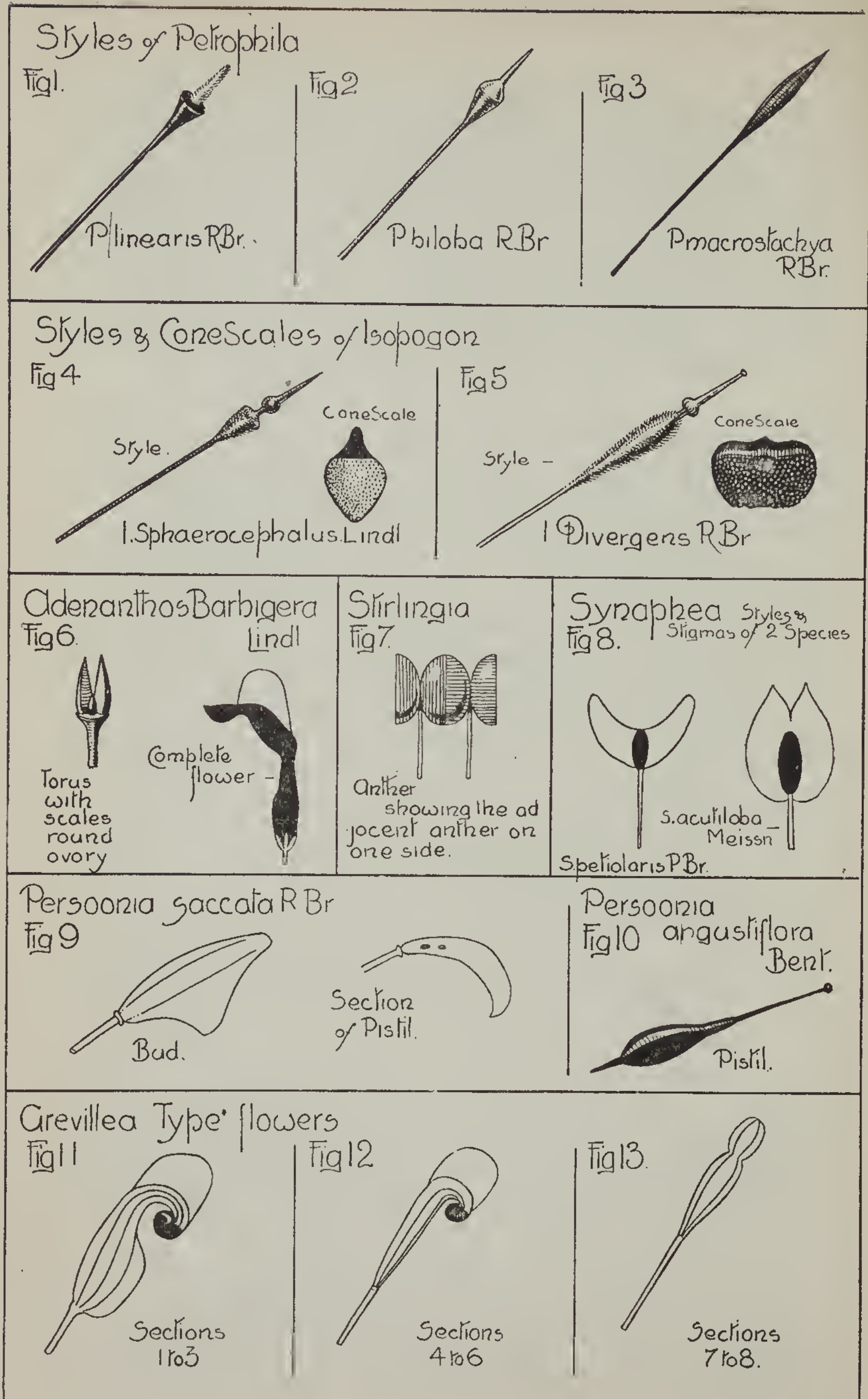
(A.) *Synaphea.*—In the first genus, Synaphea, which is confined to W.A., the stamen with two perfect anther cells is that on the lowest perianth-segment. The upper perianth-segment has the filament, but instead of an anther it has a membrane attached to the lower part of the stigmatic disk. The small yellow flowers in spikes are much alike in all the species.

The first species which I have here is *S. polymorpha*, R. Br., common on the sand about Perth. It differs from all the rest in its elongated leafy stems, with the flower spikes shorter than the floral leaves. The next two species, *S. acutiloba*, Meisn., and *S. petiolaris*, R. Br., are difficult to distinguish except by their styles. The leaves of both are on long petioles, and are variable in shape, but the appendages of the stigma are very distinct. (*v.* Fig. 8). Both come from the Darling Range; the latter also from the sand near Guildford. *S. decorticans*, Lindl., from Bellevue, is easily distinguished by its leaves, as well as by its style.

(B.) *Conospermum.*—The second genus of this tribe, Conospermum, differs from Synaphea chiefly in having its perfect stamen on the upper perianth segment, and the stamen with abortive anthers on the lower segment. The peculiar membrane which joins the abortive anther of Synaphea to the stigma is absent. In the first section, a small one, of which I have no representative, the perianth-lobes are equal and spreading. In the second section the perianth-limb is 2-lipped; the broad upper segment forms one lip, and the other three narrow segments form the other. *C. ephedroides*, Kipp, from the sand patch near York, is a handsome, and, I believe, a rare plant, with many sessile spikes of whitish flowers. *C. Huegelii*, R. Br., with a single terminal spike of blue-grey flowers, is to be found by the streams in the Darling Range. In both these species the flowers are glabrous. The woolly-flowered species are well-known under the name of Smoke-grass. Of these I have *C. stœchadis*, Endl., from Midland Junction, with terete leaves, and *C. triplinervium*, R. Br., with broader flat leaves. This species is very variable. The specimen which I have from the Darling Range at Gooseberry Hill is very different in oppearance from my specimen from the sand at Applecross. The former plant has been distinguished as a species under the name of *C. undulatum*, Lindl., but is not really sufficiently distinct.

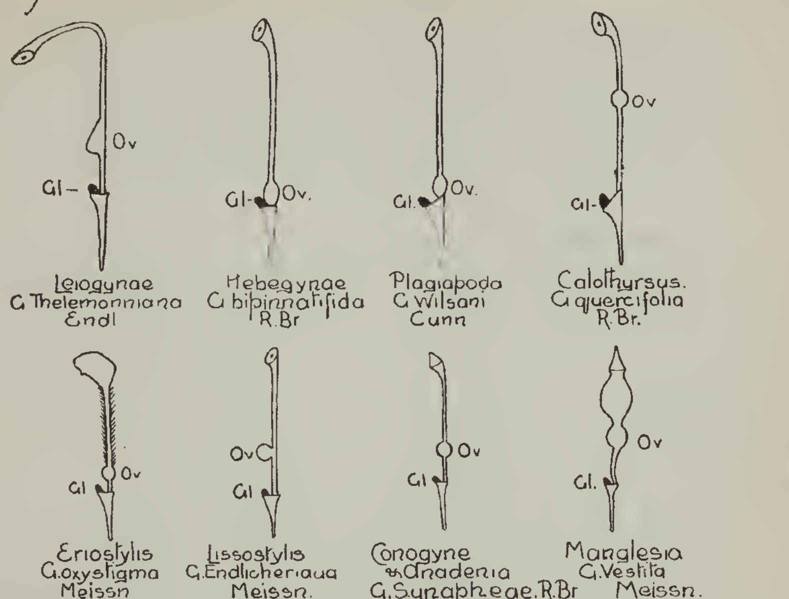
3. *Franklandieæ.*—The third tribe consists of a single genus, Franklandia, which contains only two species. Both are confined to our southern districts, and are unknown to me. The flowers are yellow, and more than an inch long, and the anthers are lower than in any other of our Proteaceæ, being included in and adnate to the perianth-tube.

4. *Persoonieæ.*—The tribe is distinguished by its fruit, which is a drupe. Our only representatives belong to the genus Persoonia, which is better represented on the other side of the continent. We possess 23 out of the 59 species of the genus. Our plants fall almost entirely into two sections. In the first


Styles of Petrophila
Fig1.
P. linearis R.Br.
Fig2
P. biloba R.Br
Fig3
P. macrostachya R.Br.
Styles & ConeScales of Isopogon
Fig4
Style.
ConeScale
I. Sphaerocephalus. Lindl
Fig5
Style
ConeScale
I. Divergens R.Br
Adenanthos Barbigera Lindl
Fig6.
Torus with scales round ovary
Complete flower
Stirlingia
Fig7.
Anther showing the adjacent anther on one side.
Synaphea
Styles & Stigmas of 2 Species
Fig8.
S. acutiloba Meissn
S. petiolaris R.Br.
Persoonia saccata R Br
Fig9
Bud.
Section of Pistil.
Persoonia angustiflora Bent.
Fig10
Pistil.
Grevillea Type flowers
Fig11
Sections 1 to 3
Fig12
Sections 4 to 6
Fig13.
Sections 7 to 8.

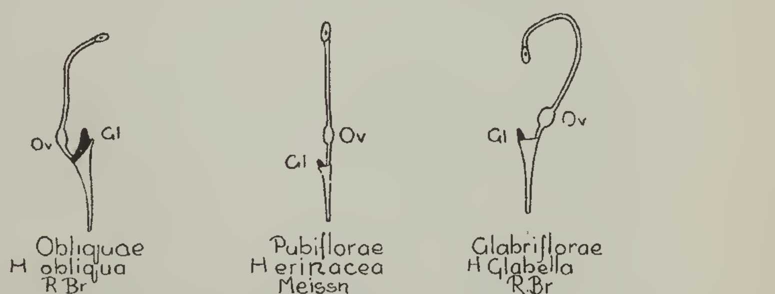
Pistils of Grevillea

Fig 14.



Pistils of Hakea

Fig 15



Typical Seeds

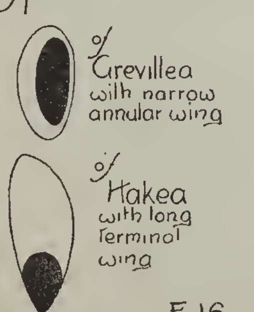


Fig 16

Styles of Banksia

Fig 17.

the short thick style is curved so as to bury the stigma in a cavity of the lower perianth-segment. My specimen is *P. saccata*, R. Br., (Fig. 9) which is common in the sand round Perth. In the second section the style is slender and erect, with a small terminal stigma, and the perianth is not saccate. My specimen is *P. angustiflora* (Fig. 10) from Darlington. Some of our species, *e.g.*, *P. elliptica*, form small trees.

B.—Folliculares. We now come to the second great sub-order, Folliculares, in which the fruit is dehiscent, and the flowers are usually in pairs, with one bract to each pair. The fruit is generally a follicle, that is, a dry fruit formed of a single carpel, and splitting only by the inner suture. Many of these fruits, however, eventually split into two quite separate valves. Out of our 401 species 261 belong to this sub-order.

As far as Western Australia is concerned, the sub-order falls into two tribes only—the Grevilleeæ and the Banksieæ.

1. *Grevilleeae.*—In this tribe the two seeds are not separated b7 any intervening body. The flowers are in racemes or clusters.

(A.) *Xylomelum.*—The first genus, Xylomelum, though its flowers in our species are less than half an inch long, produces remarkably large woody fruits, known as wooden pears. I have not seen the species which I have here, *X. occidentale*, R. Br., nearer to Perth than in the neighbourhood of Mandurah, but I am told it can be found at Kelmscott: these specimens were obtained from Busselton. A species with somewhat smaller flowers and fruits is found in the Murchison district. The flowers in this genus grow in cylindrical spikes, and the anthers are on short filaments. The seed is remarkable for its long terminal wing, nearly three times as long as the nucleus.

(B.) *Lambertia.*—The second genus, Lambertia, is a very anomalous one. The leaves are not alternate but verticillate. Instead of having a single bract to a pair of flowers, like the rest of the tribe, there is an involucre of several bracts containing in two species a solitary flower; in the other species a cluster of seven flowers. My specimens belong to the latter class. *L. inermis*, R. Br., from Cape Riche and *L. ericifolia*, R. Br., from the Stirling Range, were sent to me by Dr. Diels. *L. multiflora*, Lindl., is a conspicuous plant on the slopes of the Darling Range above Midland Junction. Its curious horned follicle is shown on one of my sheets. All the species of this genus have long yellow or red flowers.

(C.) *Grevillea.* — The next genus, Grevillea, is the largest Australian genus of the order. W.A. alone possesses 98 species, while 65 more are found in the rest of the continent. The flowers are mostly in terminal racemes, and the seeds are either wingless, or have a short wing at each end, or a narrow wing all round. The torus usually has a hypogynous gland. Our plants are divided into ten sections. One of these, which only contains two species, is confined to the Murchison district, and unknown to me. Another is wholly tropical or sub-tropical and contains only one W. A. species. But I have representatives here of the other eight.

In the first three sections the perianth-tube is dilated below the middle, and revolute: it opens on the upper side. (Fig. 11).

In the first section, *Eugrevillea*, the torus or receptacle is straight or nearly straight. The racemes have the flowers all turned to one side. The section falls into two series, in one of which the ovary is glabrous and stipitate, in the other villous and sessile. *G. Thelemanniana*, Endl., a pretty red-flowered species from the limestone about Claremont and Cottesloe, is an example of the former: *G. eriostachya*, Lindl., from the Geraldton district, and *G. bipinnatifida*, R. Br., with its large rusty red flowers, common about the foot of the Darling Range, are examples of the latter.

In the second section, *Plagiopoda*, the torus is very oblique, with the gland on the shorter side. The ovary is villous. My example is *G. Wilsoni*, Cunn., from the Darling Range. With its magnificent red flowers it is perhaps the most gorgeous of all our Proteaceae. Its large style shows clearly the oblique stigmatic disk which appears in various forms in all the first five sections: the actual stigma is a small point in the centre of the disk.

The third section, *Calothyrsus*, resembles the second except in the ovary, which is glabrous and stipitate. The racemes are secund as in the first section. With two exceptions the species are all tropical. My example is *G. quercifolia*, R. Br., with purple flowers, from the hills at Armadale and Smith's Mill.

The fourth section, *Eriostylis*, has small flowers, the racemes being reduced to umbels. Flowers, ovary and style are all woolly. In this and the two succeeding sections the perianth tube is narrow, not dilated as in the first three, but still revolute, and the torus is straight. (Fig. 12). My example is *G. oxystigma*, Meissn., common about the hills, with white flowers. The stigmatic disk has a curious thick almost spherical glabrous back. This species is very variable in habit and in the breadth of its leaves, as my specimens show.

The fifth section, *Lissostylis*, has short dense racemes, not umbels, and also differs from the fourth in its glabrous ovary. My example is *G. Endlicheriana*, Meissn., common in the Darling Range. It has the leaves all on the lower part of the stems, and often 4 or 5 ft of leafless stems below the racemes. I have also *G. diversifolia*, Meissn., from Helena Bridge, with curiously varied leaves and inconspicuous flowers. Another specimen of this section, *G. crithmifolia*, R. Br., is somewhat anomalous. Its racemes in the bud are enclosed in an involucre of brown scales, like those of Hakea, and its stigmatic disk is much more conical than that of the rest of the section. It is common about Claremont and Cottesloe. The specimen which I have here shows the tuberculate fruits of this section.

The sixth section, *Conogyne*, has still the recurved perianth, but no longer the oblique stigmatic disk. This is replaced by an erect cone. The flowers in this section are very small. My example is *G. synapheæ*, R. Br., which is common in the Darling Range, and also occurs near Guildford, with yellowish white flowers. The leaves recall those of Synaphea in shape.

The seventh section, *Anadenia*, has the perianth straight and erect. (Fig. 13.) The style with its cone resembles that of the last section. My example is *G. Shuttleworthiana*, Meissn., sent me by Dr. Diels from Southern Cross. Another representative of this section is *G. apiciloba*, sent me by Dr. Diels from Coolgardie.

The eighth and last section, *Manglesia*, resembles the seventh in its erect straight perianth but differs in the style, which is much swollen in the middle, but contracted under the cone. Its racemes are axillary and it therefore resembles a Hakea rather than a Grevillea in habit. My examples are *G. vestita*, Meissn., with white flowers, which grows on the limestone about Claremont and Cottesloe, and also near Busselton, as well as in the Darling Range; and *G. glabrata*, Meissn, also with white flowers, from Lion Mill, in the Darling Range.

To determine a Grevillea seems at first sight a very complicated task but it is generally easy to refer it to its proper section by the help of such a table as this :—

Grevillea.

- Lateral stigmatic disk.
  - Perianth tube dilated.
    - Torus straight *Eugrevillea.*
    - Torus oblique.
      - Ovary villous *Plagiopoda.*
      - Ovary glabrous *Calothyrsus.*
  - Perianth tube narrow.
    - Ovary & style villous *Eriostylis.*
    - O. & st. glabrous *Lissostylis.*
- Erect stigmatic cone.
  - Perianth revolute *Conogyne.*
  - Perianth erect.
    - Style slender *Anadenia.*
    - Style swollen *Manglesia.*

(D.) *Hakea.*—The next genus, Hakea, is again a very large one. W.A. possesses 72 out of the 96 species. It is closely allied to Grevillea, but may be generally recognised at once by its axillary, not terminal, inflorescence. All our Hakeas, except three tropical species, have the racemes enclosed before development in an involucre of imbricate brown scales. This is only found, so far as I know, in one of our species of Grevillea, and therefore is usually sufficient to distinguish a Hakea. But the brown scales fall as the flowers open and will not be found when they are fully out. The seed is distinct from that of Grevillea in that it has a broad, membranous wing at the upper end. (Fig. 16.) For the determination of species it is often necessary to have the fruits—far more so than in Grevillea: and Nature, with rare forethought for the needs of the botanist, has kindly provided that the fruits of the Hakea shall generally hang persistently on, even past the next flowering season, while those of Grevillea generally fall early. Hakea is divided into four sections. The first is very small and entirely tropical or sub-tropical. The fourth section is also very small, so that nearly all our species fall into two sections, which are much sub-divided. The main divisions will be clearly seen from this table :—

Hakea.

Long racemes—no involucre
Grevilleoides (tropical.)

Short racemes—involucre of brown scales.

Oblique stigmatic disk
Euhakea.

Erect stigmatic cone.

Perianth pubescent.

Perianth glabrous
Glabriflorœ.

Perianth revolute
Conogynoides.

Perianth erect.
Manglesioides.

Torus oblique
Obliquœ.

Torus straight
Pubiflorœ.

The divisions of the section Conogynoides are chiefly founded on the shape and venation of the leaves and length of style. The flowers are much alike throughout. In the section Euhakea, the Obliquæ are represented by *H. obliqua,* R. Br., sent to me by Dr. Diels, from Cranbrook. Of the Pubifloræ *H. incrassata,* R. Br., with its thick simple leaves, and *H. erinacea,* Meissn., with its divided prickly leaves, are common in the Darling Range. *H. trifurcata,* R. Br., is common on all kinds of soil near Perth, and is remarkable for possessing entire flat leaves and divided leaves with terete segments mixed together. I have also *H. Preissii,* Meissn., in fruit. The specimen was obtained by Mr. Hursthouse at Northam.

Of the Glabriflorae, *H. amplexicaulis,* R. Br., with its long prickly leaves clasping the stem, is common in the the hills. *H. glabella,* R. Br., is one of our commonest small trees, and is also found prostrate upon the ground.

The latter form has been distinguished as a species under the name of *H. prostrata*, R. Br. *H. cristata*, R. Br., is one of the most conspicuous shrubs in the hills at this season. *H. linearis*, R. Br., I have seen in a swamp at Albany, and *H. ruscifolia*, Labill , grows both in the hills and on the limestone of the coast, flowering in February and March.

In the section Conogynoides, of which the flowers resemble those of section Conogyne, of Grevillea, *H. undulata*, R. Br., grows in the hills, and has large petiolate leaves like those of *H. cristata*. *H. myrtoides*, Meissn., with its small leaves and long racemes, is the only species which I know with red flowers. It is fairly common in the hills. *H. stenocarpa*, R. Br., also a hill plant, has very long narrow ribbon-like leaves, and inconspicuous flowers. *H. varia*, R. Br., common in swampy ground, is remarkable for the different forms of leaf on the same branch, some terete, some flat and entire, others flat and toothed at the end. *H. sulcata*, R. Br., grows on sand near Guildford, and I have also found it near York.

The last section, Manglesioides, in which the flowers resemble those of the section Manglesia of Grevillea, is represented by one of our commonest species, *H. lissocarpha*, R. Br., with masses of white or pink flowers.

2. *Banksieae.*—We now come to the last tribe, Banksieae, which contains two genera only, Banksia and Dryandra. It is distinguished from the last tribe by having its flowers in dense cones or heads. and by the woody plate which separates the seeds. The Banksia cones have no involucre; those of Dryandra have an involucre of many imbricate bracts.

(A.) *Banksia.*—The genus Banksia is a very conspicuous one round Perth, but its comparative rarity is very striking as soon as the hills are reached. W.A. possesses 37 species but I only know of six which occur in this district. Our species fall into four sections readily distinguished by the styles. The dense cones have the flowers in pairs, each pair having a bract and two bracteoles, which are conspicuous in the young cones. The limb usually remains closed long after the tube has split. The anthers are narrow and sessile on the laminae. Though there are many hundreds of flowers in the cones, the number of fruits is small. The fruiting cones are very woody, and the outer coats of the inner faces of the two seeds become consolidated into a woody plate between them, so that the fruit appears to be two-celled. In the first section, *Oncostylis*, the style remains hooked at the end. This is represented by *B. sphærocarpa*, R. Br., a shrub of three or four feet, which grows on the sand near Guildford. In the second section, *Cyrtostylis*, the style is nearly straight, or arched, but not hooked—as in *B. attenuata*, R. Br., a very common species. *B. grandis*, Willd., common about Perth, belongs to this section. In both these sections the stigmatic end of the style is very slightly thickened. The third section, *Orthostylis*, has the lower part of the style curved, and the upper part straight and erect ; it differs from both the other sections in its angled and furrowed stigmatic end. As examples I have the beautiful *B. coccinea*, R. Br., from Albany ; *B. Menziesii*, R. Br., our commonest species ; and *B. prionotes*, Lindl., which seems to be very local in this district, but is abundant north of Subiaco, and all round Herdsman's lake. The last section, Isostylis, contains only one species, *B. ilicifolia*, R. Br., which is common about Perth. It has depressed heads instead of cones, and looks like a Dryandra, but lacks the involucre of that genus. The style is quite straight, and the stigmatic end narrow.

(B.) *Dryandra.*—The last genus, Dryandra, is confined to W. A., and consists of 47 species, but I only know of three in the neighbourhood of Perth. Its flowers are in heads on a flat receptacle, and are much alike all through the genus. The style is quite straight, with the stigmatic end furrowed. *D. armata*, R. Br., is a shrub of 2 or 3ft., very common in the hills. *D. floribunda*, R. Br., is one of our commonest shrubs near Perth, and grows any height from 3ft. to 30ft. or more. Bentham describes it as 4-8 ft. high, and says that the arborescent form mentioned by Mueller is Banksia ilicifolia. I do not know how the confusion arose, but there is no doubt that Dryandra floribunda over 20ft. high is extremely common.

My other specimens are *D. polycephala*, Benth., sent me by Dr. Diels from Mogumber, and *D. nivea*, R. Br., a most abundant little shrub everywhere, with its long narrow leaves white underneath.

The Proteaceæ are typically an Order belonging to a hot dry climate. The leaf surface in many species is greatly reduced by a division into terete segments, or the whole leaf is reduced to a simple terete and usually pungent organ. Where the leaves are broad they are generally hard and leathery, as in the Banksias and our common Hakea glabella. Transpiration is prevented by the thick hard outer skin. Not only are the leaves hard, but they are generally prickly: in a country where prickly shrubs are everywhere conspicuous the Proteaceæ are undoubtedly the worst order in this respect. Woolly or hairy leaves are very uncommon in the order, though Adenanthos supplies some notable examples.

I have tried to ascertain, as far as possible, the relation of our Proteaceæ to the geological conditions. For this purpose I have taken the 61 species which I know to occur in the neighbourhood of Perth. I have divided our district into—(1) The Darling Range, with its granite, ironstone and red clay, extending to Guildford; (2) the intermediate belt of sand, roughly from Guildford to Subiaco; (3) the limestone belt of the coast: (4) swamps. My observations have extended only over a short period and no doubt will need much correction later. The only species which seems to me to be confined to swampy ground are Hakea varia and Banksia littoralis. Of the other 59, 6 are found on all three belts, 2 on the hills and sand, 4 on the sand and the limestone, 2 on the hills and the limestone. The last class is interesting as these species appear to jump the sand altogether and reappear on the coast: they are Hakea ruscifolia and Grevillea vestita. Of the remaining 45, 33 seem to belong to the hills alone, 10 to the sand and 2 to the limestone. The classes, of course, overlap at a place like Guildford, where clay and sand meet, but I do not consider that a hill plant has a right to a place in the sand list if it only grows on the borderland. I was surprised in making this classification, to find that I have not seen a single Grevillea really on the sand.* A few hill species, *e.g.*, G. bipinnatifida and G. synapheæ come just on to the sand border but no further. On the limestone belt, however, there are three species of this genus. Probably further observation will rather increase the hill class at the expense of the sand: for I have counted to the latter 2 species which I have only seen on the border. As no information with regard to soil is given, in most cases, in the "Flora Australiensis," I feel sure that lists of this kind, if made up by comparison of the observations of many members of the Society, would prove most interesting and valuable.

* Since writing the above, I have seen Grevillea Thelemanniana on salt moist sand-plains close to the hills near Cannington.

Common to Hills, Sand and Coast.

Stirlingia latifolia
Hakea trifurcata
H. glabella
H. lissocarpha
Banksia grandis
Dryandra nivea

Common to Hills and Sand.

Synaphea petiolaris
Conospermum triplinervium

Common to Hills and Coast.

Grevillea vestita
Hakea ruscifolia

Common to Sand and Coast.

Grevillea Thelemanniana
Banksia Menziesii
B. attenuata
Dryandra floribunda

Confined to Sand.

Petrophila linearis
P. macrostachya
Adenanthos obovata
A. sericea
Synaphea polymorpha
Persoonia saccata
Hakea sulcata
Banksia sphaerocarpa
B. prionotes
B. ilicifolia

Confined to Coast.

Petrophila Serruriae
Grevillea crithmifolia

Confined to Hills.

Petrophila media
P. biloba
P. striata
P. seminuda
Isopogon sphaerocephalus

CONFINED TO HILLS.	CONFINED TO HILLS.
I. roseus	G. oxystigma
I. asper	G. Endlicheriana
Adenanthos barbigera	G. diversifolia
Stirlingia simplex	G. synapheae
Synaphea acutiloba	G. glabrata
S. decorticans	Hakea incrassata
Conospermum Huegelii	H. erinacea
C. stoechadis	H. cristata
Persoonia angustiflora	H. undulata
P. elliptica	H. cyclocarpa
Lambertia multiflora	H. amplexicaulis
Grevillea bipinnatifida	H. stenocarpa
G. quercifolia	H. myrtoides
G. Wilsoni	Dryandra armata.

Key to the Australian Proteaceae, quoted from Bentham's Flora Australiensis, Vol. V.

Trees and shrubs, rarely undershrubs. Leaves alternate, or rarely opposite. Perianth-segments 4, valvate. Stamens opposite the perianth-segments and inserted on them. Carpel 1. Albumen none. Radicle inferior.

SUBORDER I. **Nucamentaceæ.**—*Fruit an indehiscent nut or drupe. Flowers usually solitary within each bract.*

TRIBE I. **Proteeæ.**—*Anthers all perfect or very rarely the upper one abortive, with 2 parallel cells adnate to the connectivum, inserted at the base of the short spreading laminæ of the perianth. Ovule 1 or rarely 2. Stigma terminal. Fruit a dry nut.*

Flowers in dense cone-like spikes or heads with imbricate scale-like bracts, with few or many outer empty bracts forming an involucre. Anthers free.

Cone-scales firmly adhering to the rhachis and opening for the emission of the more or less flattened nuts . 1. PETROPHILA.

Cone-scales either very deciduous or remaining closely imbricate after flowering till they fall off with the nuts which are not flattened . . . . . . 2. ISOPOGON.

Flowers solitary within an involucre of 4 to 8 bracts . 3. ADENANTHOS.

Flowers in small heads, with very small bracts. Anthers cohering round the style and the adjoining cells of two different anthers applied face to face in the bud forming a single cell . . . . . . 4. STIRLINGIA.

TRIBE 2. **Conospermeæ.**—*Anthers, one with 2 perfect cells, two with one perfect and one abortive cell, the fourth abortive, the perfect cells broad, concave, erect, without any connective, the adjoining ones of distinct anthers applied face to face in the bud forming a single cell, all on very short thick filaments at the base of the laminæ or at the summit of the tube of the perianth. Ovule 1. Fruit a dry nut.*

Upper anthers abortive replaced by a short membrane connecting the filament with the disk-shaped stigma. Nut ovoid or oblong. Leaves mostly divided . . 5. SYNAPHEA.

Lower anther abortive. Stigma raised above the stamens on the beak-like end of the style. Nut turbinate, flat and comose on the top. Leaves entire . . . 6. CONOSPERMUM.

TRIBE 3. **Franklandieæ.**—*Anthers all perfect with parallel adnate cells enclosed in and adnate to the slender perianth-tube. Ovule 1. Fruit a dry nut, with a pappus-like cone.*

Single genus . . . . 7. FRANKLANDIA.

TRIBE 4. **Persoonieæ.**—*Anthers all perfect, with parallel cells adnate to the connective, the stamens inserted at or below the middle of the perianth-segments. Ovules 2 or sometimes 1. Fruit a drupe or rarely a dry nut or membranous.*

Leaves divided or lobed. Flowers in interrupted spikes or racemes. Ovules 2. Fruit dry, indehiscent

Filaments inserted on the perianth, converging and united in a ring round the style. Fruit a nut . . 8. SYMPHYONEMA.

Stamens free at the base of the perianth-segments. Fruit membranous, flattened . . . . . . 9. BELLENDENA.

Leaves entire. Flowers in interrupted axillary spikes. Ovule 1. Fruit a 3-winged nut . . . . 10. AGASTACHYS.

Leaves toothed. Flowers in interrupted axillary spikes. Ovule 1. Fruit a drupe . . . . . 11. CENARRHENES.

Leaves entire. Flowers axillary or rarely forming a terminal or infra-terminal raceme by the abortion of the floral leaves. Ovules 2 or 1. Fruit a drupe . . 12. PERSOONIA.

SUBORDER 2. **Folliculares.**—*Fruit dehiscent, follicular or 2-valved, rarely (in the first two genera), drupaceous and indehiscent. Flowers usually in pairs, with a single bract to each pair, rarely (in* Carnarvonia, Lambertia *and* Stenocarpus), *the inflorescence anomalous.*

TRIBE 5. **Grevilleeæ.**—*Ovules 2 or 4, collateral. Seeds without any intervening substances, or separated by a thin lamina or mealy substance. Flowers in racemes or clusters, with deciduous or abortive bracts or with an involucre of imbricate bracts.*

Ovules 2. Perianth regular or nearly so, small (under ½in. except in one species), the anthers on short filaments attached below the laminæ. Style cylindrical or clavate at the end.

Flowers pedicellate, in pairs, in racemes. Fruit with a thick woody indehiscent pericarp or putamen.

Leaves alternate. Ovules ascending . . . 13. HELICIA.

Leaves verticillate. Ovules descending . . . 14. MACADAMIA.

Flowers sessile, in pairs, in cylindrical spikes. Fruit thick and woody, tardily dehiscent. Leaves opposite . . . . 15. XYLOMELUM.

Flowers solitary or clustered on irregularly branched peduncles. Fruit a follicle. Leaves alternate, compound . . . . 16. CARNARVONIA.

Flowers sessile or nearly so, in pairs, in cylindrical or oblong spikes. Fruit a follicle. Leaves alternate . 17 ORITES.

Ovules 2. Perianth long and narrow. Anthers linear. Flowers solitary, or seven together in an involucre of persistent imbricate bracts. Leaves verticillate . 18. LAMBERTIA.

Ovules 2. Perianth revolute in the bud, or rarely straight and regular. Anthers short and sessile within the concave laminæ. Leaves alternate.

Ovules orthotropous pendulous. (Fruit a drupe ?) . 19. ADENOSTEPHANUS.

Ovules amphitropous, laterally attached. Fruit a follicle.

Seeds without wings or the wings short at both ends or annular. Inflorescence terminal, rarely also axillary . . . . 20. GREVILLEA.

Seeds winged, chiefly or entirely at the upper end. Inflorescence axillary . . . . 21. HAKEA.

Ovules 4, collateral. Perianth revolute in the bud or straight and regular. Anthers short and sessile within the concave laminæ. Fruit a follicle. Leaves alternate.

Perianth revolute in the bud. Hypogynous gland unilateral or semiannular. Follicle short and broad . 22. BUCKINGHAMIA.

Perianth straight Hypogynous glands 4. Follicle oblong, recurved . . . . 23. DARLINGIA.

TRIBE 6. **Embothrieæ.**—*Ovules several, imbricate in 2 rows. Seeds usually separated by thin laminæ or a mealy substance.*

Flowers in short compact racemes. surrounded by an involucre of imbricate coloured bracts . . . 24. TELOPEA.

Flowers in loose racemes. Bracts small or deciduous.

Hypogynous glands 3. Ovules imbricate upwards. Seeds winged at the upper end . . . . . . 25. LOMATIA.

Hypogynous glands 4. Ovules imbricate downwards. Seeds with narrow wings all round . . . 26. CARDWELLIA.

Flowers in umbels, without bracts . . . . . 27. STENOCARPUS.

TRIBE 7. **Banksieæ.**—*Ovules 2, collateral. Seeds separated either by a hard usually woody substance or by a membrane rarely wanting. Flowers in dense cones or heads.*

Flowers in ovoid or cylindrical cones, without any involucre . . . . 28. BANKSIA.

Flowers in heads surrounded by an involucre of imbricate bracts and floral leaves . . . . . . 29. DRYANDRA.

NOTE.—In Tribes 4, 5 and 6 only the following genera are represented in W.A. :—Persoonia, Xylomelum, Lambertia, Grevillea, Hakea.

KEYS TO NATURAL ORDERS.

The keys for the Natural Orders Myrtaceæ, Epacridaceæ and Proteaceæ have been reprinted from Bentham's valuable work on the Flora of Australia in the hope that the possession of these keys may lead many members of our Society to begin the study of these orders, being aided also by the introductions now being published. It is known that the want of some such guide has deterred many from making a beginning in a study which all its devotees find fascinating. The members of the various sub-committees will also always be willing to render further aid to enquirers by identification of their botanical specimens or explanation of any points of difficulty in these publications.

Key to Natural Order Myrtaceae, quoted from Bentham's Flora Australiensis, Vol. III.

Trees or shrubs, very rarely undershrubs. Leaves opposite or alternate, without stipules, usually dotted. Flowers regular or nearly so. Calyx-lobes usually imbricate. Petals imbricate. Stamens indefinite or rarely definite ; anthers opening in longitudinal slits or rarely in terminal pores. Ovary inferior, two- or more-celled, with two or more ovules in each cell, or rarely one-celled with one placenta. Style undivided. Seeds without albumen, cotyledons flat or folded, not convolute.

TRIBE I. **Chamælaucieæ.**—*Ovary 1-celled, with a single placenta. Fruit indehiscent, dry, with 1 or rarely 2 seeds. Shrubs often heath-like. Leaves small, Flowers solitary, or very rarely two together in the axils of the leaves or bracts. scattered along the branches, or forming a terminal head.*

Stamens definite, in a single series, more or less united in a ring at the base, and often alternating with staminodia.
- Stamens 8, without staminodia. Flowers 4-merous, the outer ones of the head enlarged and sterile . . 1. ACTINODIUM.
- Stamens 10, alternating with as many staminodia (very minute or wanting in one species of *Darwinia*, and one of *Verticordia*).
  - Calyx-lobes 5, subulate, entire . . . . . 3. HOMORANTHUS.
  - Calyx-lobes 5, broad, entire or shortly ciliolate.
    - Anthers globose or didymous, opening in terminal pores or short slits. Style usually long . . 2. DARWINIA.
    - Anther-cells parallel, opening in longitudinal slits. Style short . . . . 6. CHAMÆLAUCIUM.
  - Calyx-lobes 5 or 10, deeply divided into subulate, plumose, or hair-like lobes . . . . . 4. VERTICORDIA.
- Stamens 20, without staminodia. Calyx-lobes 10, entire 5. PILEANTHUS.

Stamens indefinite, without staminodia, numerous, or, if few, not regularly alternate or opposite to the calyx-lobes.
- Calyx-lobes persistent, or rarely falling off with the upper portion of the tube. Ovules 2, on a filiform placenta attached both to the base and summit of the ovary.

Calyx-lobes terminating in a long bristle, or rarely in a short point . . . . 7. CALYTHRIX.
Calyx-lobes truncate or retuse, not pointed . . . 8. LHOTZKYA.
Calyx-lobes short, deciduous. Ovules 2, the placenta basal, or adnate to one side of the ovary . . . . 9. HOMALOCALYX.
Stamens 5 or 10, regularly alternate with or opposite to the calyx-lobes, quite distinct and without staminodia.
Ovules 2 or more, ascending or attached to a lateral placenta. Stamens, when 5, alternate with the petals 10. THRYPTOMENE.
Ovules 2 or 4, pendulous from the summit of a filiform placenta. Stamens, when 5, opposite to the petals 11. MICROMYRTUS.

TRIBE II. **Leptospermeæ.**—*Ovary divided into 2 to 5, or rarely more cells. Capsule opening at the summit in as many valves as there are cells, or very rarely indehiscent, with 1 or two seeds.*

Stamens in a single row, definite or indefinite, shorter than or rarely shortly exceeding the petals, free or united in bundles, alternating with the petals. Leaves small or narrow.
Leaves opposite.
Ovules 2 in each cell, superposed or solitary. Flowers small, in axillary cymes, or rarely solitary . . 12. SCHOLTZIA.
Ovules several in each cell, in two rows or in a ring round a peltate placenta, or if 2, collateral. Flowers axillary, solitary or rarely few, on a common peduncle.
Stamens free, rarely exceeding 20, and usually much fewer. Flowers small . . . . . 13. BÆCKEA.
Stamens united in bundles, alternating with the petals. Flowers small . . . . . . 14. ASTARTEA.
Stamens numerous, often united in a ring at the base . . . . 15. HYPOCALYMMA.
Stamens numerous, free. Calyx large, red, urceolate . . . . 16. BALAUSTION.
Leaves alternate.
Stamens free, definite, or if indefinite none opposite the centre of the petals. Flowers in globular sessile heads . . . . 17. AGONIS.
Stamens numerons, in a continuous series. Flowers solitary or crowded but not in heads . . . 18. LEPTOSPERMUM.
Stamens exceeding the petals, indefinite, either free or united in bundles, opposite the petals. Leaves small or narrow, or rarely large and many-nerved. Flowers closely sessile (except in some species of *Kunzea.*)
Anthers versatile, with parallel cells, opening longitudinally.
Stamens free (almost in five bundles in 1 species of *Callistemon.*)
Calyx-lobes usually persistent. Ovary 2- to 5-celled. Seeds pendulous. Flowers in heads or solitary, or rarely in short spikes . . . . . . 19. KUNZEA.
Calyx-lobes usually deciduous. Ovary 3- or 4-celled. Seeds ascending. Flowers in spikes, terminal or crowned by the year's shoot . . . . . 20. CALLISTEMON.
Stamens united in 5 bundles opposite the petals (almost free in one species of *Melaleuca.*)
Staminal bundles united high up in a tube . . . 21. LAMARCHEA.
Staminal bundles distinct or scarcely united at the base.
Ovules several in each cell. . . . . . 22. MELALEUCA.
Ovules solitary in each cell . . . . . 23. CONOTHAMNUS.

Anthers erect, attached by the base. Stamens united in bundles opposite the petals, or nearly free in some species of *Eremœa* and *Phymatocarpus*.

- Ovules 1 to 4 in each cell, peltate and laterally attached.
  - Anther-cells opening at the top in transverse valves. Ovules 1 in each cell . . . . . . 24. BEAUFORTIA.
  - Anther cells placed back to back, and opening in outward longitudinal slits. Ovules 4 in each cell 25. REGELIA.
- Ovules 2 or more in each cell, erect or ascending, linear or cuneate.
  - Anthers obovoid, the cells back to back, opening in outward transverse valves. Ovules 2 to 4 in each cell. Leaves small, opposite . . . 26. PHYMATOCARPUS.
  - Anthers oblong or linear, the cells parallel, turned inwards, opening in longitudinal slits. Ovules several. Leaves long, alternate. Flowers lateral. 27. CALOTHAMNUS.
  - Anthers obovoid, the cells back to back, opening in outward longitudinal slits. Ovules several. Leaves small, scattered. Flowers 1 to 3, nearly terminal . . . . 28. EREMÆA.

Stamens numerous, free or obscurely united at the base. Petals attached by a broad base, free or consolidated into an operculum. Leaves usually large. Flowers in umbels heads or cymes, rarely sessile on the stem.

- Calyx-teeth distinct, distant. Petals free . . . 29. ANGOPHORA.
- Calyx truncate, entire or with four minute teeth. Petals united in an operculum . . . . 30. EUCALYPTUS.

Stamens exceeding the petals, indefinite, free, or rarely united in bundles opposite the petals. Leaves large or myrtle-like, penniveined. Flowers in pedunculate heads cymes or corymbs, or rarely solitary and pedicillate.

(Stamens scarcely exceeding the petals in some species of *Tristania*.)

- Stamens united in 5 bundles. Leaves alternate or in one species opposite. . . . . 31. TRISTANIA.
- Outer stamens with reniform sterile anthers. Leaves opposite, narrow . . . . 33. LYSICARPUS.
- Flowers in globular pedunculate heads. Leaves opposite. Stamens of *Metrosideros* . . . . 32. SYNCARPIA.
- Flowers in cymes. Stamens free, all perfect.
  - Ovules numerous, horizontal or ascending, covering the placenta. Leaves opposite . . . . . 34. METROSIDEROS.
  - Ovules in a ring round a club-shaped or peltate placenta. Leaves alternate . . . . . . 35. XANTHOSTEMON.
  - Ovules pendulus or recurved. Calyx-lobes almost petal-like. Leaves opposite. . . . . . 36. BACKHOUSIA.

Stamens indefinite, free. Fruit dry, indehiscent. Ovary perfectly or imperfectly 2-celled or 1-celled by abortion

- Calyx-lobes almost petal-like. Petals 4, shorter than or scarcely exceeding the calyx-lobes. Flowers in cymes heads or umbels . . . . 36. BACKHOUSIA.
- Calyx-lobes 8. Petals none. Flowers solitary, sessile 37. OSBORNIA.
- Calyx-lobes 5, narrow. Petals 5. Flowers solitary, pedicillate . . . . 40. FENZLIA

TRIBE III. **Myrteæ.**—*Ovary divided into 2 or more cells, or very rarely 1-celled, with 2 parietal placentas. Fruit an indehiscent berry or drupe.*

Ovary 1-celled, with 2 parietal placentas. Leaves 3-nerved . . . . 40. RHODAMIA.

Ovary 2-celled (or 1-celled by abortion), with 2 or 3 superposed ovules in each cell. Leaves white underneath . 41. FENZLIA.

Ovary with 2, 4, or 6 rows of superposed ovules, separated by vertical septa, the ovules themselves separated by transverse septa (1-, 2-, or 3-celled, with double rows of ovules in each cell, all separated by spurious septa.) Leaves sometimes 3-nerved . . . . 38. RHODOMYRTUS.

Ovary 2- or 3- celled, with several ovules in each cell, without spurious dissepiments.

Embryo long and narrow, curved, circular, or spiral, with small cotyledons. Flowers, 5-merous or rarely 4-merous, solitary or racemose . . . . . . 39. MYRTUS.

Embryo thick and fleshy, either indivisible or with 2 thick fleshy cotyledons and a short radicle. Flowers 4-merous or rarely 5-merous, solitary or in trichotomous cymes or panicles . . . . . . 43. EUGENIA.

Ovary 5- or rarely 4-celled, with 2 to 6 ovules in each cell. Embryo of *Myrtus.* . . . . 42. NELITRIS.

(One species of *Kunzea* has the fruit succulent and pulpy).

TRIBE IV. **Lecythideæ** (SUBTRIBE **Barringtonieæ.**)—*Ovary divided more or less completely into 2 or more cells. Fruit indehiscent, hard and fibrous or fleshy. Leaves alternate or crowded at the ends of the branches, large, not dotted. Calyx often merely valvate.*

Stamens all perfect. Fruit angular, fibrous with a single seed . . . . 44. BARRINGTONIA.

Outer or inner stamens, or both without anthers. Fruit ovoid or globular, not angular, fleshy, with several seeds enveloped in pulp .. . . 45. CAREYA.

(*Bartlingia*, Ad. Brongn., referred by Schauer to *Chamælaucieæ*, proves to be *Pultenæa obovata*, described above, Vol. II., p. 123, having been originally examined in a state of very young bud, before the irregularity of the petals was developed.)

Notes on New Species of West Australian Plants

. . . BY . . .

W. V. FITZGERALD, F.S.Sc., Lond., F.R.H.S., Engl.

XEROTES BENTHAMIANA, N.Sp.—(X. cæspitosa, Bentham, partly)

Stems densely tufted on the rhizome, leafy base short. Leaves long-linear, semi-cylindrical, straight, rounded at the apex, striate, 1-2 feet long, the pale-brown sheaths usually with entire membranous margins. Scapes compressed (including the inflorescence), 2-4 inches long. Inflorescence $\frac{1}{2}$-$1\frac{1}{2}$ inch long, simply spicate, rarely (in the males) verticillately-branched at the base; flowers scattered along the rhachis, solitary and closely sessile within the bract. Bracts much exceeding the flower, hyaline, with a broad base and fine points, or lanceolate from the base, $\frac{1}{4}$ to fully $\frac{1}{2}$ inch long.

Male fl. :—Perianth-segments free, broadly ovate, $1\frac{1}{4}$ lines long, the outer ones hyaline, the inner very thick, concave, yellow, slightly longer and narrower than the outer ones. Stamens 3, attached to the inner perianth segments, and 3 at their base and alternate with them. Rudimentary ovary minute.

Female fl. :—Perianth-segments similar to the male. Flowers fewer in the spike, the sub-tending bracts often larger and herbaceous. Ovary acutely triangular. Fruit not seen.

Locality.—Not uncommon between Perth and Fremantle, usually in shady sandy spots.

Remarks.—Flowers in September. Is dedicated to the memory of Mr. George Bentham, F.R.S., etc., who did so much for Australian Botany.

XEROTES ANDREWSII, N.Sp.—(X. cæspitosa, Bentham, partly.)

Stems tufted, leafy base usually short. Leaves long-linear, flat or slightly concave, straight or more frequently flexuose or twisted, abruptly pointed, striate, 6-18 inches long, the brown sheathing bases splitting into numerous filaments. Scapes rather stout, slightly compressed, 2 inches long, the greater part occupied by the inflorescence.

Male flowers in a racemose panicle of 1-$1\frac{1}{2}$ inch long, peduncles and pedicles verticillate or scattered along the rhachis, conspicuous. Peduncles on lower portion of the inflorescence, several-flowered, upper portion simply racemose. Bracts lanceolate, acuminate, scarious and colored, about as long as the pedicel. Perianth-segments free, outer ones ovate, thin, dark-colored, 1 line long, the inner almost orbicular, concave, thick, yellow, and slightly longer than the outer. Stamens 3.

attached to the inner segments and three at their base alternate with them. Rudimentary ovary rather prominent, trigonous.

Female inflorescence much stouter than the male, usually simply racemose, pedicels recurved, 2-2½ lines long, sub-tended by a lanceolate, acuminate bract, nearly as long as the pedicel. Perianth-segments ovate 2 lines long, dark-colored, rigid, inner slightly exceeding the outer ones. Fruit dark-purple outside, obliquely ovate, 4 lines long, triangular and slightly transversely rugose. Seeds trigonous-ovate, testa pale-colored, foveolate.

Locality.—Common between Midland Junction and Fremantle, usually growing in shaded, sandy spots.

Remarks.—Flowers from April to June.

To the male plant of this species belongs the X. hermaphrodita, Andrews, described in the Journal of this society for June, 1902 It is named in compliment to Mr. C. R. P. Andrews, M.A., Principal Training College, Claremont, and one of our few energetic botanists.

Included in Bentham's X. cæspitosa are the male and female plants of two species. The former agrees with the male of my X. Benthamiana, the latter with the female of X. Andrewsii. The female of my first species and the male of the second were apparently not examined by Bentham.

An Addition to the West Australian Flora.

. . BY . .

W. V. FITZGERALD, F.S.Sc., Lond., F.R.H.S., Engl.

GREVILLEA PIMELEOIDES, N. sp.

An erect compact shrub of 5-8 feet in height, branches closely hairy. Leaves simple, shortly petiolate, broadly lanceolate or elliptical, mucronate, flat or with slightly refracted margins, 1-2 inches long, of thin texture, scabrous-pubescent, faintly three-nerved and obliquely penniveined above, pale green and glabrous beneath, the margins closely invested with long white silky hairs. Racemes many-flowered, comparatively broad, shortly pedunculate, one or few together, usually terminating the short lateral branchlets, mostly reflexed. Rhachis 3-6 lines long and along with the pedicels and perianths loosely invested with spreading white hairs. Pedicels 1-2 lines long. Perianth orange-red, bearded inside near the top with a transverse line of reflexed hairs, the tube rather broad, very oblique at the base, slightly contracted and revolute under the oblique globular limb, about 3 lines long, longitudinally ribbed. Torus oblique. Gland semi-annular. Ovary densely villous, shortly stipitate on the upper margin of the torus. Style sparingly hairy, not very long, thick and slightly dilated beneath the prominent concave lateral stigmatic disk. Fruit nearly glabrous, about ¾-inch long.

Locality.—Rocky spots on hill-side between Smith's Mill and Helena River. July, 1901. W.V.F.

Remarks.—In aspect this species bears a remarkable resemblance to forms of Pimelea argentea, R. Br., and when in flower is one of the most showy members of the genus. It closely approaches G. aspera, R. Br., but can be easily distinguished from that species by the ribbed perianth and villous ovary.

Incidentally it may be remarked that since the publication of the late Baron von Mueller's list in 1896, the following members of this genus have been recorded as indigenous in West Australia :—

G. nematophylla, F. v. M. (near Mt. Churchman and Murchison district), R. Helms—this species forms a small tree of 30ft. in height ; *G. Helmsiana*, F. v. M. and Tate (near Fraser Range), R. Helms : and *G. Jamesoniana*, described by me last July and found near Lakeside.

Two New Species of Western Australian Plants.

BY CECIL R. P. ANDREWS, M.A.

SOLLYA ERECTA, n. sp.

An erect much branched shrub of 2–3 feet, glabrous except for a minute pubescence on the pedicels. Leaves alternate, rather crowded, coriaceous, varying from linear-lanceolate (1-2 inches in length and 2-3 lines broad) to obovate (about 1 inch long and ½ inch broad), entire, obtuse or scarcely acuminate, on very short petioles. Cynics terminal or leaf opposed, drooping, with 3-8 flowers ; pedicels slender. Sepals lanceolate, acute, 1 line long, purplish, with a distinct midrib. Petals elliptical, acute, 2½-3 lines long : the outer ones dark blue or purple—the inner ones much paler, of a dingy greenish purple with conspicuous veins. Filaments very short or entirely wanting. Anthers 2-2½ lines long, 1-1½ lines broad at the base, and tapering to a point, connivent in a cone round the pistil. Ovary silky pubescent, 2 celled. Berry slightly pubescent, cylindrical, ½-inch long or rather more, obtuse at the base but gradually tapering into an acute point formed by the base of the style. Seeds numerous, closely packed in two rows in each cell.

Localities.—On ironstone gravel in the Darling Range at Smith's Mill, 17 miles east of Perth, and Greenmount, 12 miles east of Perth. Flowers in June and July.

This species is very distinct from the two previously-known species of Sollya in its erect bushy habit: the other two being twiners. Its flowers are smaller and much less attractive than the bright blue ones of S. heterophylla. The anthers are much larger than those of S. heterophylla, and are remarkable for the almost entire absence of the filament. The berry resembles that of S. heterophylla in its base and its numerous seeds, that of S. parviflora in its tapering point. In the neighbourhood of Perth S. heterophylla flowers in midsummer; I have no record of the flowering period of S. parviflora. The new species flowers in midwinter.

CALADENIA PURDIEANA, n. sp.

A slender species, six inches high or less, hirsute with long spreading hairs. Leaf lanceolate, 2-3 inches long, 3-5 lines broad in the upper part. Flowers generally two or three. Sepals and petals nearly equal and spreading, 5-6 lines long, lanceolate, acute—the petals rather narrower than the sepals,—white and glabrous above, more or less covered with short rusty brown hairs below. Labellum 3-4 lines long, divided nearly half way into three lobes; the claw with a narrow longitudinal plate, at first entire, then bordered by two rows of thick linear divergent calli; the upper part of the recurved middle lobe fringed with shorter calli, the end with a sinuate margin; lateral lobes shorter, erect, broad, obtuse and entire. Column 2½ lines long, incurved, very narrowly winged; the point of the anther rather long.

Habitat.—On ironstone gravel on the slopes of the Darling Range at Kelmscott—Oct. 1902. Mr. A. Purdie found the plant in the same neighbourhood in 1901. Mr. W. V. Fitzgerald collected specimens at Pinjarrah in Nov. 1899, and five miles north of Midland Junction in Nov., 1902.

This plant was recorded in the June number of this Journal as Caladenia carnea, R.Br., var. alba. It bears considerable resemblance to this Eastern plant in general appearance, though the leaf is much broader, the indumentum very different, and the dorsal sepal less erect. The lip is also quite distinct, and the tuft of erect calli, which appear near the base of the claw in C. carnea var. alba, is absent. It bears a still closer resemblance in habit to C. reptans, Lindl., but is clearly distinguished by the lip. (In C. reptans the middle lobe of the lip is not recurved, and the calli are arranged in two converging rows across the disk.) It falls under the section Eucaladenia, and should come next to C. reptans, Lindl. The plant is named after Mr. A. Purdie, M.A., Director of Technical Education of W.A., who found it last year near Kelmscott.

Halophila ovalis Hook. f.—An Addition to the Flora of Western Australia.

BY CECIL R. P. ANDREWS, M.A.

This submerged marine herb (Order Naiadeae) is stated by Bentham to be common on the shores of the Indian and Pacific Oceans, often above low water mark at the mouths of large rivers, or brought up from depths of seven fathoms or more. It has been recorded from all the other states of Australia and from Tasmania, but has not hitherto been noted in Western Australia. I found fragments of this plant washed up on the shores of the estuary at Mandurah in April last. After stormy weather in July it was washed up in considerable quantities on the shores of the Swan River, all round Freshwater Bay, together with two other plants of the same order, Cymodocea antarctica, Endl., and Posidonia australis, Hook. f. The former is recorded in Fl. Aust. from Western Australia, but no locality is given; the latter is recorded from King George's Sound.

Ferns in the Perth District.

By CECIL R. P. ANDREWS, M.A.

The only ferns recorded from "Swan River" in the Flora Australiensis are Pteris aquilina L., Adiantum Æthiopicum L., and Lindsaea linearis Swartz, while Cheilanthes tenuifolia Swartz is stated to be very abundant throughout all the States. Three of these ferns are well known in the neighbourhood of Perth. Lindsaea linearis grows in the Darling Range, but I do not know of its occurrence nearer than Jarrahdale. Last year Ophioglossum vulgatum, L., was recorded for several stations in the Perth district. I believe that it is not generally known that three other ferns occur within a few miles of Perth.

Grammitis rutaefolia, R.Br., is apparently widely spread. It is recorded in the Fl. Aust. from York, Stirling Range, and between Fraser's Range and Esperance Bay. It also occurs in the desert interior. I have seen this species in considerable quantity at Swan View, Darlington, and Kelmscott. It grows in the clefts of granite rocks—generally where there are great masses of rock on a southward-facing slope. It would probably be found in similar situations in many parts of the Darling Range. The fronds are generally from 3-6 inches long, and very hairy.

Grammitis leptophylla, Swartz, is a commoner fern near Perth. I have found it wherever I have seen G. rutaefolia, also on the clay banks of a stream in the hills at Kelmscott, on clay banks by a spring at Guildford, and on shady limestone rocks at Claremont. It is a very delicate little fern, only 1-2 inches high, and is probably often overlooked in the hills owing to its general resemblance to a small plant of Cheilanthes tenuifolia. It is recorded in the Fl. Aust. for Western Australia, but no locality is given.

Notholaena distans, R. Br., is recorded in the Fl. Aust. from York. I have found it in the chinks of low granite rocks on an exposed northward-facing slope at Darlington. The fronds are very narrow, 2-6 inches long, hairy above, and covered with dense brown bristles beneath.

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Trees of Western Australia, with Notes on their Uses and Distribution.

By W. V. FITZGERALD, F.S.Sc., F.R.H.S.

FROM the State of Western Australia there have been recorded over 5800 species of flowering plants, of which at least 3800 are indigenous to the southern half. Of this vast assemblage fully 170 species attain arboreal dimensions. Many of these are unknown in the industrial world, and even to botanists the area of distribution of the majority and the characters of a few are only partially known. Of course, we have indisputable evidences of the character of soil and the conditions under which the majority will grow ; but we should not rest at that. Our aim should be the bringing before the notice of the manufacturing communities the fact that we have within our confines one of the best assortments of hard and ornamental woods known.

The first step towards giving data in regard to trees of a country would be a statement of details having regard to the geographical limits of species, the chances of their being brought into industrial use, along with methods for their proper preservation and propagation. No data are available from official sources, and the obtaining of such being much too costly for the average individual to undertake at his own expense will account for the briefness of information given with regard to many well known species. The terms tropical and extra-tropical allude to species having a natural habitat north and south respectively of the Tropic of Capricorn.

TROPICAL.

The forest vegetation of this region can with a certain degree of correctness be termed Austral-Malayo-Asiatic, as fully 30 of the 75 species extend to Southern Asia and the interjacent islands, many of them, especially in India and Burma, forming a not inconsiderable proportion of the timber-trees of those countries. Of species that were considered Australian, within the last few years at least a dozen have been discovered in British New Guinea. In the whole of the tropical area there have only been discovered three endemic species, none of which are of particular economic value; one, the Livistona-palm, however, would be a great acquisition to scenic horticulture. The single representatives of the genera Adansonia and Erythrophlœum have congeners in tropical Africa, the first in the "Baobab," and the second in a couple of poisonous species known as "Red-water trees."

SUB-TROPICAL.

In this portion of the State it is possible to create three divisions or zones, viz.: a coastal, intermediate, and an Eremian or desert, the mean annual rainfall being adopted as a basis, and it is to be hoped that some writer having command of sufficient leisure and data, will in a future work define the limits of such zones. In the more southern portions it may be said that, as in other regions having a similar clime socialism of trees prevails, therefore, it is only natural that our most valuable timber-trees are those which form forests. In the interior, owing to hydrostatic influences, arborescent species are comparatively rare, but even then, as in coastal districts, the genus Eucalyptus predominates. Unlike the tropics, the majority of species are endemic, and these include, without exception. those of greatest importance.

In the following pages it should be understood that by a tree is meant that section of vegetable life comprising plants of perennial duration which rise from the ground with a clear trunk, the term shrub being applied to any plant of which the perennial or woody portion forms the greater part and which branches from or near the base.

In the compilation of much of the data I must express my obligations to the various authors who have written on Australian and Asiatic vegetation.

I.—PITTOSPOREÆ, R.Br., (1814.)

10 genera, 90 species. Natives of Australia, with the exception of some members of the genus Pittosporum and the monotypic South American Cholepoa.

Pittosporum, *Banks*, 1788 (viscid matter usually surrounding the seeds).—It comprises 50-55 species, of which 12 are indigenous in Australia, 16 in New Zealand, the remainder being scattered over the Pacific islands, and the tropical portion of Asia and Africa. One of the Australian species extends to Southern Asia, the rest are endemic.

P. phyllyrœoides, *De Cand*, 1824 (having a fancied resemblance to some species of Phillyrea).—Attains a height of 30 feet with a stem diameter of 1 foot, and notwithstanding its variations cannot be confounded with any other member of the genus. Leaves oblong and short or narrow-lanceolate and rather long, with mostly a hooked point; flowers of moderate size, yellow, sweet scented, solitary or few together in clusters; fruit of moderate size, almost ovate, flattened, orange colored without, bright yellow within : seeds orange red and sticky. It is sporadic, and has a wider range than any other purely Australian congener, being distributed over the whole of the interior. On the eastern goldfields it attains its maximum perfection, and extends from thence to the west coast and the adjacent islands, having been recorded from as far north as the Gascoyne River. Some good examples are growing in the Perth Government gardens ; it also exists in a shrubby state, but sparingly, along the banks of the Swan River, especially in the vicinity of Osborne.

Remarks.—Wood firm and pale-colored. Stock will eat the foliage, and a bitter medicinal principle pervades the whole plant. In South Australia it is known as the "Apricot or Poison-tree," the latter term being applied on account of the supposed poisonous properties of the bitter orange-red fruit. The seeds are often eaten by aborigines.

II.—MALVACEÆ, Adanson (1761.)

57 genera, 700 species. Scattered over all but the coldest portions of the earth. The whole order possesses more or less mucilage, some genera, such as the Mallows, being of some importance as demulcents and emollients. Nearly all yield fibre from their inner bark, which is extremely tough. A few bear edible fruit. None of the species are of particular value as timber trees.

(A.) *Adansonia, Linné,* 1753 (named in honor of Michael Adanson, an eminent French botanist).—This genus, which comprises some of the biggest trees in the world, consists of two species only, the Australian A. Gregorii, F. v. M., and the Baobab tree of tropical Africa (A. digitata, Juss.), the latter being in cultivation in India.

A. Gregorii, F. v. M., 1857 (in honor of Gregory, the explorer).—A tree with a large gouty stem attaining from 30-60 or more feet in circumference, and owing to being much contracted beneath the lower branches of the compact bushy crown bearing some resemblance to a huge soda-water bottle. It is never tall. The leaves are finely hairy, divided into 5-9 long and rather narrow leaflets. Flowers pale yellow and very large. Fruit much larger than an emu's egg, gourd-shaped, rusty red and covered with fine hairs outside, exudes a dark-red gum. It is confined to Australia, extending from the Northern Territory to inland within a hundred miles south of Wyndham, and near the coast to south of the Glenelg River, but is nowhere abundant. As a rule there are a few trees growing together, forming a clump as it were, the clumps being a considerable distance apart.

Remarks.—The acidulous pulp of the fruit is edible and has a rather pleasant taste. Analysis has proved this pulp to consist of gum starch, sugary matter and malic acid. It is reputedly of great value for scorbutic complaints when boiled with sugar. The seeds have a nutty flavor, and are much sought after by the aborigines. The species constitutes the "sour gourd," "cream of tartar tree," or the "bottle-tree" of the Kimberley districts. It is apparently very long-lived, we having no recorded instance of any being seen dead.

(B.) *Bombax*, *Linné*, 1753 (from Greek name for cotton, the capsules containing a fine silky substance like cotton).—Consists of about 10 species, mostly tropical American, with one tropical African and two Asiatic, one of the latter being identical with the Australian plant.

B. Malabaricum, *De Cand.*, 1824 (alluding to a habitat). This is often a large forest tree, attaining a height of 60 feet, with a clear trunk of 40 feet and a stem diameter of 4 feet, the trunk and branches being covered with hard conical prickles: bark smooth and greyish, the digitate leaves deciduous; flowers large, clustered, from almost white to bright scarlet, and produced before the leaves appear; fruit large, the seeds enveloped in abundance of fine, silky cotton. It has been recorded from the vicinity of Port Nelson, Careening Bay. In 1896 I observed examples near the Annan River in northern Queensland, also during the same year gathered specimens near Port Moresby in British New Guinea.

Remarks.—Timber is light (28lbs per cubic foot), white or pale-yellow, loose-grained, brittle and not durable. In India and Burma it is principally used for coffin-making and packing cases. The plant furnishes the brown "müchi ras" resin, and in the latter countries sometimes the young flower-buds are used as a vegetable. The silky cotton furnished by the fruit is of considerable value for stuffing cushions and like purposes. Many futile attempts have been made to spin this material into thread. The want of success is stated to be due to an entire absence of roughness or adherence. It constitutes the "Simool" or "Malabar silk-cotton tree" of India, the "Deedo" or "Tetpan" of Burma.

III.—STERCULIACEÆ, Ventenat (1804.)

40-45 genera, 400-500 species. Abundantly represented in tropical Africa and Australia, with a few members scattered over nearly every portion of the earth. Nearly every species contains abundance of mucilage. Some yield gum, many fibre, and the Cacao from which chocolate is made belongs to it.

Sterculia, *Linné*, 1747 (referring to the bad scent of the flowers of some species).—Consists of 60 species, most of which are tropical.

Numerous representatives occur in Southern Asia, Africa, and America. The Australian species total 14, of which 5 extend to this State. All the Australian species are endemic and include the 12 considered by the late Baron F. von Mueller as referable to the genus Brachychiton. This genus was established by Schott and Endlicher in 1832 but the differences between it and Sterculia proper are considered more of a sectional than of a generic character by the majority of systematic botanists.

1. *S. ramiflora, Benth.*, 1863 (from the flower-clusters).—A tree of 20-25 feet high with a stout trunk, the branches and leaves covered with star-shaped hairs; leaves broadly heart-shaped and nearly entire; flowers few, large, bright red, clustered near the ends of the branches. It has been recorded from Brunswick and Vansittart Bays and Prince Regent's River.

Remarks.—One of the "Flame trees" of which little is known.

2. *S. incana, Benth.*, 1863 (from the white woolly vestiture).—A woolly, hairy tree of 30 feet in height, with large deeply cut leaves, flowers undescribed; fruit stalkless, hairy outside. Recorded from Cambridge Gulf and vicinity.

Remarks.—Economic properties unknown.

3. *S. trichosiphon, Benth.* 1863 (hairy staminal column).—Of similar height to the last species, with a bottle-like trunk, quite glabrous and entirely devoid of leaves when in flower; leaves large, about as long as broad and deeply divided into 5-7 lobes; flowers yellowish, arranged in racemes; fruit shortly stalked and smooth. This "Currajong" or "Bottle tree" has been recorded from Nichol Bay, Fortescue, Upper Ashburton and Lyons Rivers.

Remarks.—It is stated that the roots of young plants of this species, also the young roots of old plants, are used by the aborigines as food. The seeds of several, if not all the species, are eaten by the aborigines.

4. *S. Gregorii, F. v. M.*, 1857 (as a Brachychiton) (in honor of C. Gregory).—A tree frequently attaining a considerable height, with a bushy crown; leaves long stalked, of thin consistence, equally divided into 3-5 narrow lobes, seldom entire; flowers in axillary panicles, pale-yellow with often reddish margins, bell-shaped, deeply lobed, hairy without, glabrous within: fruit rather large, thick and smooth. It extends from near the Fitzroy River to the vicinity of Joanna Spring, thence south to between Fraser Range and Esperance and beyond the South Australian border.

Remarks.—Bark like that of the majority of the species is smooth and brown, yielding strong fibre. The inner portion of it and that of the roots is extensively chewed by the inland aborigines. Wood is pale-colored, light, soft but tough, and should be excellent for xylographic work. On parts of the goldfields the stems or boles are utilised as windlass-barrels. This species is the well-known "Currajong" of the goldfields, is apparently gregarious and confined to inland districts. Some good examples occur near Edjudina, many of them attaining a height of 40 feet with a stem diameter of at least 3 feet, the branches long and sweeping. Examples of this plant were first collected by Gregory, in the vicinity of the Murchison River. They were doubtfully referred by Bentham to the Eastern S. diversifolia, G. Don, as a variety under the name of "occidentalis."

5. *S. caudata, Heward* (long tapering points of the leaves). —A tree of 30 feet in height, quite glabrous except the flowers; leaves entire, broadly heart-shaped, with long tapering points; flowers pale-colored and small. It has been recorded from Careening and Roebuck Bays, Carson's River, and King Sound.

Remarks.—This "Currajong" exudes large quantities of a colorless gum. Nothing is known of its timber. Incidentally it may be stated that this species was named in A. Cunningham's herbarium, he having been the first to collect examples. A description was first published by Bentham in 1863.

IV.—TILIACEÆ, A. L. de Jussieu (1789.)

50 genera, 450 species. Scattered over the whole earth, excepting the very cold regions. The sap of the majority of species is mucilaginous, some are valuable timber trees, many yield strong fibre, an example being the well-known jute, and one genus (Grewia) bears fruit having a not unpleasant acid taste.

Grewia, Linné, 1735 (in honor of Dr. Nehemiah Grew).—This tropical genus consists of about 60 species, none of which occur in America. There are 9 species in Australia, 4 of which extend to Southern Asia.

G. breviflora, Benth., 1863 (short inflorescence).—Varies from a tall shrub to a small tree of 25 feet in height, with spreading branches; leaves stalked, of moderate size, ovate; flowers small, pale-colored or yellow, not numerous; fruit globular, flat-topped, juicy and containing a hard stone which readily separates into two parts. It has been recorded from King Sound, Collier and Roebuck Bays, thence to the Northern Territory.

Remarks.—Economic properties unknown.

V.—BURSERACEÆ, Kunth (1824.)

16-18 genera, about 160 species. A tropical Order comprising plants yielding myrrh and frankincense, all species containing a fragrant resinous juice. Many furnish a very heavy and durable timber. In Australia there are 28 species.

A. *Garuga, Roxburgh*, 1819 (native name for one of the species).—It consists of 8-10 species and extends over tropical Asia, America, and Australia.

G. floribunda, Decaisne, 1834 (having reference to the abundance of flowers).—A small tree usually under 30 feet in height, with stout branches marked with the scars of fallen leaves; leaves on long stalks, crowded at the ends of the branchlets, pinnate with many opposite bluntly toothed leaflets; flowers small, yellow, finely hairy, in broad panicles at the ends of the leafless branches. This species is abundant in the East Indian Archipelago and among other Australian localities it has been recorded from the vicinity of Port Nelson. It is closely allied to the Indian and Burmese G. pinnata, Roxb., a species which attains a height of 40 feet, and bears a fruit not unlike a damson in size and color.

Remarks.—Wood is greyish or yellowish and very heavy.

B. *Canarium, Rumphius*, 1741 (from Canari, a Malayan name for one of the species).—About 50 species dispersed over the Malayan Peninsula, tropical Asia, and Africa, and the Australian States. The seeds of a few species are edible.

C. Australianum, F. v. M., 1860 (Australian).—This often attains a height of 35 feet, the stout branches marked by the scars of fallen leaves; leaves shortly stalked and pinnate, the leaflets being of a leathery texture; flowers white, small, and numerous in narrow panicles; fruit a rather large ellipsoid drupe, with a hard stone. Vicinity of Port Nelson,. Careening Bay, and

Remarks.—Nothing is known of its economic properties. In the "Flora Australiensis" this species is erroneously referred to as C. Australasicum. The C. commune, of India, is an allied plant with an olive-colored fruit. The kernel of the nut has a taste resembling a sweet chestnut, and is used for a variety of purposes.

VI.—MELIACEÆ, Ventenat (1799.)

38 genera, 500 species. Is chiefly confined to tropical regions. Bitter, tonic and astringent properties prevail in the order, the bark and roots of some species being in use medicinally. Various species produce valuable timber such as mahogany, satin wood, and the toon or cedar. In Australia there are 11 genera with 36 species.

(A.) *Melia*, *Linné*, 1737 (derived from a Greek term for the Ash, and refers to a resemblance in the leaves).—This is a small genus of about 5 species, all natives of tropical Asia, one of which is identical with the single Australian species. Several members have the term "Bead-tree" applied to them on account of the seeds being used for rosary beads.

M. Azedarach, *Linné*, 1753 (from Azadaracht, the name under which Avicennes speaks of a poisonous tree).—This species often forms a tree of 40 feet in height, with short, erect trunk, and broad crown; leaves deciduous, bi- or tripinnate; flowers lilac, fragrant, in loose panicles; fruit a pale-yellow, ovoid drupe. Besides occurring at King Sound and other portions of tropical Australia, it is abundant in Southern Asia extending northwards to Persia and China. Leafless during the hot season.

Remarks.—Timber is striated, pale-brown or slightly reddish, light, with a loose grain, and takes a good polish. In India and Burmah it has been used for furniture, but is apt to split and warp. The seeds are often used as beads for rosaries for which purpose they are well adapted on account of their having a natural perforation through the centre. The bitter bark contains purgative and anthelmintic properties, and the leaves are insecticidal. The species is much in cultivation, being extensively planted for street ornament. Numerous examples occur in the streets of Perth, it being here vernacularly referred to as the "White Cedar," or "Cape Lilac." In Asiatic countries it is known as "Arbor Sancta" and "Pride of India." The M. composita, Willd., is referred to, in the "Flora Australiensis," as the Australian species, but now M. composita is regarded as a synonym for M. dubia, Cavan. As already indicated by Bentham and Mueller, the differences between the Australian plant and the typic M. Azedarach, are not of specific importance.

(B.) *Owenia*, *F. v. M.* 1857 (in honour of Professor Owen).—Comprises 5 species, all of which are confined to Australia. The genus differs from our other native genera in bearing globular drupaceous fruits, which are commonly known as "Sour" or "Native Plums." The reddish pulp is very acid and is frequently eaten and used medicinally by the aborigines. The two species here alluded to form small trees of not more than 30 feet in height.

1. *O. vernicosa*, *F. v. M.*, 1862 (from the varnished appearance of the leaves).—Glabrous, with stout branches marked with the scars of fallen leaves, young shoots sticky; leaves on flattened stalks, and consisting of several, sometimes many 1-nerved lanceolate leaflets; flowers white, small, numerous, in a large panicle; fruit, a drupe, rather

large, globose, fleshy, with a hard 3-celled stone. Almost exclusively confined to coastal districts, it has been recorded from Cambridge Gulf, King's Sound, Prince Regent's River, and Glenelg River.

Remarks.—The purple or crimson-colored fruits are largely used by the aborigines.

2. *O. reticulata*, *F. v. M.*, 1857 (prominently veined leaves).—Glabrous, leaves rather long, on a slightly flattened or angular stalk, and consisting of few broadly ovate, prominently veined leaflets; flowers small, white, in clusters on the branches of a large panicle; fruit, a drupe, large, globose, purple or crimson, fleshy, with a hard, wrinkled 2-3 celled stone. Is coastal, and occurs at King Sound, Collier and Nichol Bays.

Remarks.—Fruit of similar use to first species.

VII.—CELASTRINEÆ, R. Br., (1814).

40 genera, 400 species, which are scattered over the tropical and temperate regions of the earth. It is represented in Australia by 11 genera and about 18 species, very few of which can be regarded as of economic importance.

(A.) *Celastrus*, *Linné*, 1737 (Kelastros, the old Greek name for the Privet).—It consists of 15 species, which are distributed over the hotter portions of Asia, China, Japan, North America, and Australia, about one-fifth being natives of the latter.

C. Cunninghamii, *F. v. M.*, 1859 (after Allan Cunningham).—This small tree or tall shrub which is not uncommon in the north-eastern portions of Australia, has been recorded from the Hammersley Range and vicinity.

Remarks.—Economic properties unknown.

(B.) *Denhamia*, *Meissner* (after Capt. Denham, an African explorer).—A small genus of not more than 3-4 species, which are almost entirely confined to tropical Australia.

D. obscura, *Meiss.* (obscure).—A tall shrub or small tree of not more than 30 feet in height, with frequently weeping branehes; leaves of moderate size on long stalks, leathery, lanceolate to ovate, margins entire or with prickly teeth; flowers small, white, often in small panicles, near the ends of the branches; fruit nearly globose, rather large, whitish, opening in woody valves. Cambridge Gulf and York Sound are recorded localities for this species.

Remarks.—Economic properties unknown.

VIII.—SAPINDACEÆ, A. L. de Juss. (1789).

75 genera, 600 species. Scattered over nearly the whole of the earth, being most abundant within the tropics. The Australian representatives consist of 14 genera, with fully 100 species. Several members (not Australian) bear edible fruit, the litchi being an example. Some contain saponaceous and astringent principles, while again others are poisonous. Many yield excellent timber, while one (Acer saccharinum) of North America yields sugar.

(A.) *Erioglossum*, *Blume*, 1829 (in reference to the flower). —A small tropical genus of which only 2-3 species are known, they being confined to North Australia, East India and Senegal.

E. edule, *Blume*, 1829, a tree of 35 feet in height.—Very little is known of this species in Australia, it only having been recorded from Brunswick Bay.

Remarks.—It is a common evergreen timber-tree of India and Burma. The timber is white or pale-yellow with a pink or chocolate heart-wood, and is strong and durable.

(B.) *Atalaya*, *Blume*, 1847 (Asiatic name for one of the species).—Consists of 6 species which are confined to Australia, with the exception of one which extends towards Southern Asia. All are tall shrubs or small trees.

1. *A. salicifolia*, *Blume*, 1847 (from willow-like leaves). —This is the only species extending beyond Australia, it being first recorded from Timor. It occurs in the vicinity of Port Nelson.

Remarks.—Nothing is known of its properties.

2. *A. hemiglauca*, *F. v. M.*, 1863 (the leaves are lighter in color on one side than on the other).—A tree of 21 feet in height, or oftener a shrub, of a bluish color ; leaves large on a cylindrical or hinged stalk, with few broad or narrow long leaflets, seldom entire or lobed ; flowers small, pale-colored, hairy, forming panicles ; fruit hinged, hairy, of moderate size. This species is very widely distributed throughout the tropical portion of the State, having been recorded from King Sound, Nichol and Roebuck Bays, Hammersley Range, Carson's Valley, Fitzroy River, south of the junction of Margaret Creek towards Joanna Spring, between La Grange Bay and De Grey River, Glenelg River and other localities.

Remarks.—Reputedly of no economic importance.

3. *A variifolia*, *F. v. M.*, 1863 (referring to the foliage). —This variable species extends from the Northern Territory to King Sound and Roebuck Bay.

Remarks.—Economic properties unknown.

IX.—ANACARDIACEÆ, R. Br. (1818).

50 genera, 450 species. The members of this tropical order are all woody, and besides possessing balsamic and caustic principles, the juice of many is poisonous. As an order producing timber-trees it does not rank very high. A few species produce varnish and bark for tanning, others yield edible fruit, one of the principal being the Mango. There are 6 genera with 9 species indigenous in Australia.

Buchanania, Roxburgh, 1816 (in honor of Dr. Buchanan Hamilton).—Consists of about 20 species which are distributed over tropical Asia, the Pacific Islands, with 2-3 in Australia.

B. augustifolia, Roxburgh, 1816 (narrow-leaved).—This is a tree of 40 feet in height, with rather long narrow leaves; flowers small, white, scented and numerous; fruit drupaceous, not large, with a very hard stone. The species has a very wide range, extending from south-eastern Asia to the northern portions of Australia and has been recorded west to the Glenelg River.

Remarks.—Wood soft, light, and of no particular use.

X.—LEGUMINOSÆ, Haller, (1742.)

This constitutes the second largest Order amongst flowering plants, Compositæ ranking first in respect of genera and species, the approximate numbers being, Compositæ 830 genera, with 10,200 species, Leguminosæ 430 genera with 7,000 species. Leguminosæ is one of the most cosmopolitan of Orders, its members being scattered over nearly the whole surface of the globe; moreover, it is one of the most useful to man, containing many splendid timber-trees; the seeds of some species are eaten, peas and beans being among the principal; some furnish dyes—indigo, saffron, logwood, and many others are obtained from various species. The fibre of some is very strong, one being the "Sun" or "Bengal hemp" of commerce. The bark of others, particularly of the Acaciæ, is useful for tanning. Gum arabic, African copal, and balsam of copaiva are produced by members of the Order. The seeds of some species yield oil, others bear edible fruit, while many are of considerable medicinal value. Many of the members of the Order indigenous in this State are of importance, some yielding timber, a few gum, others bark for tanning, whilst many furnish excellent fodder. One species contains saponin, whilst members of a few genera contain poisonous principles, among the chief being Oxylobium, Gastrolobium, Lotus, Canavallia, and Erythrophlœum. The Australian representatives comprise at least 100 genera with 1,070 species.

(A.) *Sesbania, Scopoli*, 1777 (from Sesban, an Arabic name for S. Ægyptiaca).—Consists of about 20 species, widely spread over the tropical portions of the earth. 5 species are recorded from Australia.

S. grandiflora, *Persoon*, 1807 (large-flowered).—A small tree frequently attaining a height of 30 feet, with a corky bark, leaves pinnate, flowers large, white with often a faint greenish tinge, pod very long and narrow. The following are West Australian localities for this species: King Sound, Nichol Bay, Prince Regent's, Fortescue, De Grey, Upper Ashburton, Minilya, and Lyons Rivers.

Remarks.—Wood is very light (32lbs. per cubic foot). The bark yields a powerful tonic and in some countries the young pods and shoots are cooked and eaten as a vegetable. Although almost strictly a tropical plant, it grows and flowers freely in Perth. Although both the red and pale-flowered varieties are abundant in India and the Mauritius, yet the former seems absent from Australia. Is often vernacularly referred to as the "Cork-tree."

(B.) *Erythrina*, *Linné*, 1737 (having reference to the colour of the flowers).—Comprises 25-30 species which are chiefly confined to the tropics. There are two species indigenous in Australia, one of which extends to Southern Asia.

E. vespertilio, *Benth.*, 1848 (term derived from the bat-like appearance of the leaves).—This species frequently reaches a height of 40 feet with a stem-diameter of 2 feet, the bark being of a corky texture, the stem and branches covered with stout prickles; leaves divided into wedge-shaped leaflets; flowers, red, large; pod, 4in. long with few bright, red seeds. It is scattered throughout the hotter central portions of Australia. It has been recorded from King Sound, Prince Regent's, Fortescue, De Grey, Lyons, and upper portion of the Gascoyne Rivers.

Remarks.—Wood is very tough, and frequently used by the aborigines for making their shields. This remarkable plant is often quite deciduous, and is variously known as the "Batswing tree," "Coral tree," or "Cork tree."

(C.) *Bauhinia*, *Plumier*, 1703 (in honor of John and Caspar Bauhin, two noted botanists of the 16th century).—Comprises about 130 species, which are scattered over the tropics. There are 6 indigenous in Australia, and of these one extends to Asia; the rest are endemic.

B. Cunninghamii, *Benth.*, 1864 (in honor of Allan Cunningham).—An erect tree of 20-30 feet in height, with very slender branches, which are occasionally short and almost spiny; leaves divided into two leaflets; flowers not large, finely hairy, few together; pod about three times as long as broad. This endemic Australian species occurs at Careening, Vansittart, Nichol and

Roebuck Bays, Oakover, Fitzroy and Glenelg Rivers, and between La Grange Bay and De Grey River.

Remarks.—Reputedly of little value.

(D) *Erythrophlœum*, *Afzelius*, 1818 (from Erythros, red, and phloios, bark, in allusion to the red sap which flows from the bark when cut.) Besides the endemic Australian species, the genus only comprises 2 or perhaps 3 from tropical Africa. The African species are termed " Red-water trees," one, E. Guineense, yielding a very poisonous bark.

E. Laboucherii, *F. v. M.*, 1864 (in honor of Henry Labouchere). A hardwooded tree of 40 feet or more in height, with smooth branches and pinnate leaves, flowers small, greenish-yellow, usually woolly-hairy, in dense almost stalkless spikes; pod large, leathery, about 4 times as long as broad. Examples of this species have been observed at Careening and Vansittart Bays; it also occurs sparingly at La Grange Bay and De Grey River.

Remarks.—Besides yielding a very hard wood, the bark contains a very poisonous principle. It is stated to be identical with the plant mentioned by Leichardt as the " Leguminous Iron-bark tree." The species was originally described by Mueller from specimens collected in the Northern Territory during Gregory's Expedition. He first named it Laboucheria chlorostachya, transferring it ultimately to its present genus.

(E). *Acacia*, *Tournefort*, 1700 (from ac, a point in Celtic, or from akazo, to sharpen, in allusiion to the spinescent character of some species).—This constitutes one of the largest known genera of flowering plants, is polymorphous and cosmopolitan over the warmer portions of the earth. Fully 430 species are known, of which two-thirds, comprising the great phyllodineous series, are almost entirely restricted to Australia. The foliiferous groups attain their greatest perfection in tropical regions, but in Australia are represented by comparatively few species, one of which (A. Farnesiana, Willd.,) extends beyond our boundaries, all other members of the genus being endemic. Fully half of the Australian species are indigenous in this State, the great majority being peculiar. A. myrtifolia alone is recorded from all the States, but seems to be absent from the far north. The genus contains many timber trees of special value, the south-east Australian " Blackwood " (A. melanoxylon) and the indigenous " Raspberry Jam wood " (A. acuminata) being among the best known. A. Peuce, from Central Australia, yields a dark-colored wood, which is reputedly one of the hardest and heaviest in existence. Acacia is absent from New Zealand.

1. *A. Sentis, F. v. M.*, 1854 (bramble like habit).—A straggling prickly shrub of 10-15 feet to a much-branched tree of 25 feet in height; phyllodes (leaf-like organs which perform the functions of true leaves) rather narrow, flat, more or less curved, 1-nerved; flowers in globular heads; pod flat, broad, not long; seeds mottled. This is the "Prickly Acacia" of South Australia, and has been recorded from all the States of the mainland In Western Australia it has been observed at Barrow Range and Shark's Bay, thence to Nichol Bay and King Sound.

Remarks.—Wood dark-colored and very hard. Aborigines of the interior use the seeds as an article of food; stock feed freely on the foliage, and a gum similar in properties and color to the lighter forms of gum-arabic is exuded by the species.

2. *A. microbotrya, Benth.*, 1842 (from the bunch-like flower-heads).—An erect shrub or tree of over 40 feet in height, with a stem-diameter of nearly 18 inches; phyllodes long-lanceolate, or lanceolate 1-nerved, slightly curved; flowers in globular heads, pods narrow-linear. This endemic species extends from the Stirling Range to the Murchison River, but has not been recorded from the eastern goldfields nor in close proximity to the coast.

Remarks.—Bark contains a considerable amount of tannic principle. Wood is not in commercial use, but would be of value for staves and turnery. The species has the property of exuding annually large quantities of gum. The plant was first described from specimens of Drummond's collecting. In the vicinity of York it is associated with the "Jam-wood," and according to Preiss, who collected in that district during 1840, was termed by the aborigines "Menna." It is also known as the "Badjong" or "Wattle gum."

3. *A leiophylla, Benth.*, 1842 (referring to the smoothness of the phyllodes).—A bushy shrub or tree of 25-30 feet in height, with a stem diameter of 1 foot or more; phyllodes very long, flat, more or less curved, one nerved; flowers in globular heads; pod narrow, long and straight. Endemic, and extending from the South-West portion of the State to near the South Australian border, and penetrating a considerable distance inland.

Remarks.—Analysis of the foliage has proved the presence of a quantity of lime-sulphate; bark contains 30 per cent. of mimosa tannic acid, and the wood is hard and close-grained. The species was described after an examination of the specimens collected by Baxter, in the vicinity of Albany. It is extensively cultivated abroad, especially in South Africa and Algeria, where it furnished a considerable amount of the wattle bark of commerce.

4. *A. cyanophylla*, *Lindley*, 1835 (bluish colour of foliage).—A tall, erect, much-branched, handsome shrub or small tree of not more than 35 feet in height, with a stem-diameter of one foot; phyllodes very long and comparatively narrow, flat and often twisted, with one nerve; flowers in globular heads; pod narrow, long, and flat; seeds black. It is endemic, being abundant near Perth and northwards, also along the banks of streams in the Darling Ranges, extending South to at least as far as Busselton.

Remarks.—Bark contains 30 per cent. of tannic principle, and the wood is light-colored, hard, and tough. This plant is vernacularly known as the "Black Wattle," and is cultivated largely abroad not only for ornamental purposes, but also on account of the large percentage of tannic principle in the bark. The branches frequently become pendulous, and like the last species it possesses the property of readily throwing up suckers from the stumps and roots. This is evidently the species referred to in the "Forests of Western Australia and their Development" under the name of A. leiophylla.

5. *A. salicina*, *Lindley*, 1838 (resembling a willow).—From a tall shrub to a tree of 35 feet in height, with occasionally weeping branches; phyllodes flat, rather thick, broadly linear but not long, the central nerve not very prominent; flowers in globular heads; pod narrow, contracted between the seeds. This species is found over nearly the whole of the interior portions of Australia, appearing on the West coast near the entrance of the Murchison River, Dirk Hartog's Island, and Shark's Bay, but apparently does not penetrate the tropical portions of the State.

Remarks.—Camels feed freely on the foliage. The bark is sometimes used by bushmen for tanning skins, and is repeatedly used by aborigines for poisoning fish. Timber is close grained, very hard, tough, and of a dark colour. On the Eastern goldfields the species frequently covers the slopes and summits of sand ridges. It is frequently subject to the attacks of caterpillars, and as a result individual plants are denuded of foliage. It constitutes the "Cuba" or "Native Willow" of the inland tracts of New South Wales.

6. *A. translucens*, *A. Cgh.*, 1837.—A small tree of 20-25 feet in height, with a bushy crown; phyllodes small, almost obovate, flexuose, flat, several nerved; flowers in globular heads; pod thick but flattened, woody, narrow and short with a hooked apex, the seeds separated from each other by thin transverse partitions. Among the recorded localities for this tropical species may be mentioned Montague, York, and King Sounds, Bay of Rest and Roe's River.

Remarks.—Nothing is known of its economic properties.

7. *A. bivenosa*, *De Cand.*, 1825 (two-nerved phyllodia).—A tall, erect shrub or small tree frequently attaining a height of 40 feet, with a stem-diameter of 15 inches; bark dark-colored, rough; phyllodes of a bluish color, lanceolate; ovate, not large, with two prominent nerves; flowers of a golden yellow, in large globular heads; pod long, and narrow; seeds dull-black. Endemic and purely coastal, being confined to limestone formations. Extends from Fremantle, north to the Admiralty Gulf, and in numerous interjacent localities.

Remarks.—Wood is dark-colored, hard, close-grained, and would be suitable for inlaying and turnery.

This is one of the most beautiful members of the genus, the golden-yellow globular flower heads being larger than is usual in members of the section, and forming a striking contrast with the bluish hue of the foliage. It is well worthy of horticultural attention. Some good examples are to be seen growing along the bank of the Swan River, near Osborne, and at Fremantle.

8. *A. hemignosta*, *F. v. M.*, 1858.—Varies from a tall shrub to a tree of 25 feet in height, the herbaceous portions of a bluish or whitish colour; phyllodes more or less wedge-shaped, rigid, with 3-5 nerves; flowers in small globular heads; pod rather large, broad linear, flat with very acute edges. The limits of range of this tropical species are by no means fixed. It has been recorded from Cambridge Gulf, Yule and Prince Regent's Rivers.

Remarks.—Economic properties not recorded.

9. *A. cyperophylla*, *F. v. M.*, 1864 (resembling leaf of a cyperus).—Usually a small tree of 30 feet or more in height, with a stem-diameter of 1 foot; bark dark-brown and very curly; phyllodes cylindrical, greyish from fine appressed

hairs, very long with usually fine hooked points; flowers in oblong, short, stalkless spikes; pods slightly hairy, long, narrow, and almost straight. This extra-tropical species is not un common in the eastern interior, especially from Mt. Malcolm, northwards towards Peak Hill, and thence to Warman Rocks near the South Australian border.

Remarks.—Wood is dark-colored, heavy and extremely hard. Is largely used by the aborigines in the manufacture of their weapons. The species frequently lines the banks of water-courses, and is easily recognised by the peculiar bark. Flowers profusely during July and August.

10. *A. aneura, F. v. M.*, 1853 (from the apparently nerveless character of the foliage).—A shrubby or arborescent species, in favourable localities attaining a height of from 30-40 feet; phyllodes narrow-linear, rather thick, greyish with closely oppressed hairs, not very long, with often a hooked point; nerves very fine; flowers in a dense, shortly stalked spike; pod flat, four times as long as broad, edges more or less winged. It extends from the Gascoyne River to the Eastern goldfields, thence to the South Australian border, the localities being numerous.

Remarks.—The foliage is of value as a fodder for pasturing animals, is freely eaten by camels, and as it contains much starch and gum is very nutritious. An analysis made by J. H. Maiden, of the perfectly dried bark determined the percentage of mimosa-tannin to be 8·62. Wood is excessively hard, durable, and of a dark-brown color. It is largely used by the aborigines of the eastern interior for kylies, digging sticks, etc. This plant constitutes the well-known "Mulga" of inland districts, growing in the most arid localities, but seems to be absent from the tropical portions of the State. The so-called "Mulga Apple" is one of the galls which occasionally form on plants of this species. "Mulga" furnishes the principal host plant for Loranthus Quandong.

11. *A. cibaria, F. v. M.*, 1882.—Often a small tree of 20-25 feet in height, with hairy branches; phyllodes rather narrow, long, with a hooked point, thick but flattened, striate and covered with fine greyish hairs; flowers in short dense stalked spikes; pod narrow, straight, and rather long. This species has been recorded from Shark's Bay and the Gascoyne River.

Remarks.—According to Sir John Forrest it is the "Worung" of the Shark's Bay aborigines, they using the seeds for food.

12. *A. Doratoxylon, A. Cgh.*, 1825 (Spearwood).—A tree of 30-35 feet in height, with a stem-diameter of 15 inches, the whole plant appearing more or less ashy-white in color; phyllodes flat, long and narrow, slightly curved, and with many fine nerves; flowers in shortly stalked spikes; pod almost cylindrical and slightly flexuous; seeds small, of a shining black. The species occurs sparingly in the eastern interior and has been recorded ar far north as Derby.

Remarks.—Timber is light, hard, scented, and of a handsome appearance. Is much used by the aborigines for making spears and other arms. It constitutes the "Spearwood" or "Currawang" of parts of New South Wales.

13. *A. acuminata, Benth.*, 1842 (from the foliage).—A small tree of 30-40 feet in height, with a stem-diameter of one foot; phyllodes narrow, flat, curved, often above a foot long, with fine parallel nerves; flowers in shortly stalked spikes; pod narrow, nearly straight, nearly flat, and often somewhat constricted between the seeds. This endemic species extends from the south coast, north to the Gascoyne River, thence to the eastern interior.

Remarks.—Wood is dark-colored, very hard, dense, and durable, and is stated to be not attacked by white ants. Its adaptability for inlaying, turnery, and generally work of an ornamental character is well known. It is pervaded by an essential oil, distillation yielding at the rate of 1lb. of oil to 1 ton of wood. This oil has a raspberry-like scent and flavour. Sheep will eat the foliage. The species is the well known "Jam-wood," or, according to Dr. L. Preiss, the "Mangart" of the natives in the vicinity of York. It was described from specimens collected by Drummond and Baxter.

14. *A. tumida, F. v. M.*, 1858 (having reference to the valves of the pod). A bluish looking tree of about 30 feet in height; phyllodes large, 4-5 times as long as broad, somewhat curved, with numerous fine nerves: flowers in slender spikes; pod nearly cylindrical, curved, valves swollen, leathery, divided transversely between the seeds. A tropical species recorded from Lacrosse Island, Roebuck Bay, and Fitzroy River.

Remarks.—Economic properties unknown.

16. *A. pallida, F. v. M.*, 1858 (referring to the appearance of the plant).—A tree of 40 feet in height, of a whitish or bluish aspect; leaves rather large, twice pinnate, with

numerous small oblong paired leaflets ; stipules often spiny ; flowers numerous in solitary stalked, globular heads. This tropical species has only been recorded from a few localities principally in the Northern Territory. Recently it has been discovered at Carson's River in this State.

Remarks.—Little is known of the species, and the fruit is as yet undescribed.

(F.) *Albizzia, Durazzini*, 1772 (after Albizzi, an Italian.)—This genus is spread principally throughout the tropics of the Old World and consists of 25-30 species of which at least two are West Australian.

1. *A. lophantha, Benth.*, 1864 (having reference to the crest-like appearance of the inflorescence)—Usually a tall shrub, but occasionally a small tree of 20-25 feet in height, the herbaceous portions more or less finely hairy ; leaves twice pinnate ; leaflets small, in numerous pairs ; flowers pale-yellow often with a greenish tinge, in conspicuous axillary stalked spikes ; pod about six times as long as broad, flat. This well-marked species is endemic and restricted to the south-west portions of the State, the habitat being from the south coast to at least as far north as Jarrahdale.

Remarks.—Analysis of the dried root has proved it to contain fully 10 per cent. of saponin. The species is much cultivaled for ornament, and is one of the easiest of plants to raise from seed.

2. *A. canescens, Benth.*, 1864 (hoary appearance of the foliage).—This forms a beautiful tree of 30-40 feet in height, with spreading branches, the young growth and foliage hoary with close fine hairs ; leaves large, bipinnate, leaflets not numerous ; flowers yellow, finely hairy, in dense globular shortly stalked heads ; pods flattened, about four and a half times as long as broad. This species is confined to the tropical portions of Australia, it having been originally discovered in Queensland, and latterly at Prince Regent's River in this State.

Remarks.—Of its economic properties nothing is known.

XI.—RHIZOPHOREÆ, R. Br. (1814.)

17 genera, 50 species. All are tropical, many sharing with other arborescent species the muddy shores and estuaries of rivers. The bark of many of the Rhizophores is astringent and of value for tanning purposes ; it can also be used for dyeing black. The timber is usually hard and durable. The first two genera represent the true Mangroves, and are maritime.

(A.) *Ceriops, Arnott*, 1838 (having reference to the fruit).—The number of species do not exceed 2-3, all inhabiting the tropical shores of the Old World. The Australian species is a common Asiatic one.

C. Candolleana, Arnott, 1838 (after De Candolle).—A small tree, frequently much dwarfed; leaves very broad, leathery and not toothed; flowers small, numerous; fruit club-shaped or conical. It occurs along the northern coast of Australia to as far west as Port Nelson and vicinity.

Remarks.—Wood is very hard, of a red color, and weighs about 63 lbs per cubic foot when dry. It is abundant in India and Burma, also in the East Indies, where it forms large tidal forests. In those regions the bark is often used for tanning.

(B).—*Bruguiera, Lamarck*, 1796 (after J. C. Bruguieres).—A genus of about eight species, all confined to the tropics of the Old World, the four species which represent the genus in Australia being all common to Southern Asia.

B. gymnorrhiza, Lamarck, 1798 (naked-rooted).—This is often a tree of 60 feet in height, with a clear stem of 30 feet and a stem-diameter of two feet; evergreen; leaves very large, leathery and shining, usually oblong and on a very thick stalk; flowers large, solitary, green or purplish; fruit top shaped and leathery. A not uncommon species on the north coast of Australia, extending west to Roebuck Bay.

Remarks.—Wood close-grained, fibrous, hard, heavy and durable; the sap wood is pale-colored, that of the heart reddish or yellowish-brown. In India and Burma the bark is considered good for tanning.

(C.) *Carallia, Roxburgh*, 1814 (from Karalli, a name by which one of the species is known to the Teliugas).—The genus consists of about seven species, distributed over tropical regions, extending from Madagascar to tropical Asia throughout the East India Archipelago. The Australian species extends over the whole range of the genus.

C. integerrima, De Cand., 1828 (leaves entire).—A tree of 50-70 feet in height, with a clear stem of 25-40 feet and a stem-diameter of 1½-3 feet; bark greyish, rather rough, thin and brittle; leaves large, usually obovate and entire, but variable; flowers rather small and white; fruit red, succulent, globose, rather small. Occurs along the north coast of Australia, west to Brunswick Bay and York Sound.

Remarks.—Timber is of a variegated reddish-brown color, close-grained and heavy, weighing when seasoned 60lbs. per cubic foot. It is of considerable value for planks, furniture, etc. The species forms a not inconsiderable constituent of the forests of India and Burma.

XII.—COMBRETACEÆ, R. Br. (1810.)

18 genera, 240 species. Its members are distributed over the tropical portions of the whole world, with the exception of a few North Indian and South African species. In Australia there are four genera (one endemic) with 27 species. Owing to the astringent properties which prevail in some species the bark is often used for tanning. The fruits of many furnish a black dye.

(A.) *Terminalia*, *Linné*, 1767 (from terminus, in allusion to the leaves being bunched at the ends of the branches).—The members of this genus arc distributed over the tropics of the whole world, being most numerous in America. They number about 80, one-fourth of which are indigenous in Australia, all but one being endemic. The species referred to here are of between 25-30 feet in height.

1. *T. volucris*, *R. Br.*—Branches spreading; leaves broad, almost oval, thin, on rather long stalks; flowers whitish and finely hairy; fruit a drupe, with two prominent wings. Extends from the Northern Territory west to Cambridge Gulf and interjacent localities.

Remarks.—This little known species was first collected by R. Brown, and although named by him a description was not available until 1864.

2. *T. circumlata*, *F. v. M.*, 1862 (in allusion to the fruit being entirely surrounded by the wing).—Leaves and inflorescence invested with soft silky hairs; leaves oblong or elliptical, not large, with few spreading veins; flowers pale, hairy; fruit a drupe, entirely surrounded by a membranous wing. It is indigenous in the Northern Territory, extending to this State, penetrating for a considerable distance inland and thence slightly south of the Tropic. The following are recorded localities:—Cape Pond, Depüch Island, Nichol Bay, Fortescue, Upper Ashburton and Lyon's Rivers.

Remarks.—This is the only spccies recorded south of the Tropic in W.A.

3. *T. microcarpa*, *Decaisne*, 1834 (small-fruited).—Young growth more or less hairy; leaves rather large, ovate, slightly leathery and much dotted; flowers small, pale, in long spikes, invested with reddish hairs; fruit a drupe, in shape and color resembling an olive. This species has been recorded from Prince Regent's River.

Remarks.—Examples of this plant were first obtained from Timor.

4. *T. petiolaris, A. Cgh.* (in reference to the proportionately long leaf-stalks).—Closely resembles the last, species, but the leaves are smaller. The veins and dots are hardly perceptible, and the stalk is at least two-thirds as long as the blade. It appears to be endemic and confined to the hotter portions of the State, having been recorded from Point Cunningham, York Sound, Cygnet and Roebuck Bays.

Remarks.—The drupe is edible, and is used by the aborigines in the vicinity of Roebuck Bay for food. It has a pleasant, slightly acid flavor. Bentham described the plant during 1864 from specimens already named in Allan Cunningham's herbarium.

(B). *Gyrocarpus, N. Jacquin*, 1763 (term from the winged appendages causing the fruit to gyrate when falling from the tree). —A monotypic genus. The solitary species is common in the tropical portions of America, Asia, and Australia.

G. Jacquini Roxburgh (after N. Jacquin, a distinguished botanist).—A tree often attaining a height of 60-70 feet, with a clear trunk of 40 feet, and a stem-diameter of six feet; branches stout; leaves bright green, turning black in drying, deciduous, very large, ovate and entire or three-lobed, on long stalks, clustered at the ends of the branches; flowers greenish-yellow, small, numerous, forming branched heads; fruit a drupe, ovoid, rather large, and crowned by the two wing-like calyx lobes. It extends from the coastal districts of Queensland to the tropical portions of this State, King Sound, Roebuck Bay, Fitzroy River, and between La Grange Bay and De Grey River being some of the localities.

Remarks.—The wood is of a pale colour, very light and soft. This variable plant was first described from American specimens as G. Americanus by Jacquin in 1763. In 1814 Roxburgh combined this form with the subsequently named G. Asiaticus of Willdenow, G. acuminatus, of Meissuer, and the G. sphenopterus and rugosus of R. Brown, applying to the combination its present specific name.

XIII.—MYRTACEÆ, Adanson (1763.)

76 genera, about 1800 species. This Order is distributed over the tropical and sub-tropical regions of both hemispheres. In Australia there are 44 genera with about 670 species, these including nearly the whole of the capsular fruited forms, and comprise what are probably the loftiest trees in the world. On account of the astringent

principle prevalent in the Order, the bark of some species is used for tanning. Fragrant, aromatic, and volatile oils pervade nearly the whole of the genera. Ordinary cloves are the dried buds of one species, and allspice and Pimento pepper are derived from another. Several furnish good dessert fruits, such as the Rose-apple, Jambo and Guava. Many species yield splendid timber. The arborescent species indigenous in Western Australia are confined to eight genera.

(A). *Agonis*, *De Cand.*, 1828 (literally—without angles).—Of the 13 species known, 11 are confined to our southern districts, whilst 2 are natives of North East Australia.

A. flexuosa, *De Cand.*, 1828 (flexuose branches).—From shrubby to arborescent, frequently attaining a height of 60 feet, with a stem-diameter of 2½ feet; branches often pendulous; bark rough, greyish; leaves dark-green on both sides, narrow, with 3 more or less conspicuous nerves; flowers white, numerous, forming small clusters along the branchlets. Its natural habitat is the South West portions of the State, usually not far distant from the coast. It is abundant from Albany to the Swan River District.

Remarks.—This plant often exudes a kind of kino; leaves contain a large percentage of an almost colorless antiseptic oil. Wood is light-colored, hard, dense, durable, and used for a variety of purposes. The species is well adapted for avenue planting in humid climates. It often lines the banks of water-courses. When of shrubby habit it occasionally forms almost impenetrable thickets. Several good examples are growing in the Perth Government Gardens. Vernacularly known as the "Peppermint," "Native Willow," or "Myrtle Willow."

(B). *Lamarchea*, *Gaud.*, 1826 (in honor of A. M. Lamarche, who was a lieutenant under Captain Freycinet, during his expedition of 1810). It is monotypic and endemic, only differing from Melaleuca in the stamens being arranged in one bundle. [The stamens collectively are vernacularly termed flowers, and in this sense the latter term is applied to this and the two following genera.]

L. Hakeaefolia, *Gaud*, 1826 (foliage resembling that of some species of Hakea). Often becomes a tree of 25-30 feet in height, with a greyish bark; leaves alternate, rather narrow, stiff, with three prominent nerves; flowers rather large, dull-red or purplish, without apparent stalks and growing singly from the previous year's wood; stamens very long, in bundles, which are contracted into a tube at the base. It has only been noticed at Shark's Bay and vicinity.

Remarks.—This endemic and little known species has a very constricted range. In its solitary habitat it is confined to the sand-ridges in close proximity to the sea.

(c.) *Melaleuca, Linné*, 1767 (referring to the black trunk and white branches).—This genus is distributed throughout the whole of the Australian States and consists of fully 105 species, of which one extends to Southern Asia and a second one to British New Guinea. Fully three-fourths of the species are indigenous in this State, the vast majority being endemic within the exra-tropical moiety of our boundaries. All its members possess an aromatic and not disagreeable oil. The bark of our native arborescent members of the genus is of a corky or spongy texture, peeling off in paper-like sheets, hence the general term "Paper-bark." This bark is hardly inflammable and contains antiseptic properties. According to experiments made with that of one species it is of value for fruit packing. It has been proved that when packed in this material lemons will keep 5, oranges 4, and apples 3 months. The timber of all the species is hard, fissile, and durable, especially when used underground. That of most species is almost impervious to the attacks of white ants.

1. *M Leucadendron, Linné*, 1767 (the Malayan term for this species is Caju-Puti, which signifies "white tree," hence the origin of the specific appellation).—Is usually a tall tree, frequently attaining a height of 80 feet, with a stem-diameter of 4 feet, branches pendulous, or when of stunted habit stiff and erect ; bark thick, of a corky or spongy texture, peeling off in paper-like sheets : leaves rather long, broad or narrow, with 3-7 nerves ; flowers small, white, few together in a long much interrupted spike ; fruit almost globular. The West Australian localities are numerous and include the following:—King Sound, Roebuck and Beagle Bays, Fitzroy, Fortescue and other tropical rivers, and between La Grange Bay and the De Grey River.

Remarks.—The leaves of some varieties of this variable species yield Cajaput oil to the extent of 2%, the best being obtained from the variety minor. It has been used in India for centuries, is rich in Cineol, and closely allied to Eucalyptus oil. Cajaput is a limpid, very volatile oil of a pale, bluish-green color, its properties are diaphoretic, stimulating and antispasmodic when used internally, and rubifacient when applied externally. Bark has been successfully experimented with for fruit packing. Timber is hard, close-grained, easily split, almost imperishable underground, and is used for a variety of purposes, including ship-building and piles. This is the only member of the genus extending to Asia, and is chiefly, but not always found growing in spots subject to tidal influences. In the Northern Territory, and also in the hotter portions of this State it often penetrates a considerable distance inland, in the majority of instances lining the banks of watercourses. It constitutes the "Cajaput" of the North-West, of other parts of Australia, and of Southern Asia, and is also known in parts of Eastern Australia as the "White or Swamp tea-tree."

2. *M. lasiandra, F. v. M.*, 1862 (referring to the flowers). A tree of 25-30 feet in height, the young growth finely hairy, becoming smooth and bluish when full-grown; bark peeling off in paper-like layers; leaves not large, flat, narrow and stiff, with 3-5 nerves; flowers white, small, softly woolly-hairy, in interrupted spikes; fruit ovate, truncate. This species has been recorded from the Fitzroy and Margaret Rivers and a few other localities in the hotter portions of the State.

Remarks.—Nothing is known of the character of the timber. This plant is closely allied to the "Cajaput," but unlike that species, it usually inhabits arid districts.

3. *M. parviflora, Lindl.*, 1839 (in allusion to smallness of flowers.)—Frequently attains a height of 40 feet, with a stem diameter of 3 4 feet, and stout tortuous branches, the greyish bark peeling off in layers; leaves crowded, almost flat, stiff, more or less lanceolate, with 1-3 indistinct nerves; flowers small, pale yellow, in a loose but not long spike; fruit longer than broad. In West Australia it extends along nearly the whole of the south coast, thence north to the Murchison River and Dirk Hartog's Island. It also occurs at Gnarlbine and other portions of the eastern interior.

Remarks.—Bark is similar in character to that of the "Cajaput" tree. Timber is very hard, fissile, durable, and of a reddish color. This species is indigenous in all the States of the mainland, and attains its maximum perfection in swampy localities not far distant from the coast, but in dry situations, such as the eastern interior, it is mostly of shrubby habit, and then frequently forms small thickets. It constitutes one of the "Paper-barks" so common in the vicinity of Perth, and to this species or M. rhaphiophylla should be referred the specimens of wood and bark labelled M. Leucadendron now in the Museum of the Forestry Department. Bentham, in the "Flora Australiensis," describes this species under Schauer's name of M. Preissiana. As already pointed out by Mueller, this should be a synonym of M. parviflora, as Schauer's description was not published until 1844.

4. *M. rhaphiophylla, Schauer*, 1844 (referring to the leaves).—Similar in stature and bark to M. parviflora ; leaves almost cylindrical ; flowers small, pale yellow, in a cylindrical spike ; fruit globose, with a thick base. The species extends from the south coast north to the Murchison River.

Remarks.—Bark and wood similar to last species. This endemic "Paper-bark" is common in the vicinity of Perth, growing usually in swampy spots, being often associated with other members of the genus. It is chiefly restricted to coastal districts, but according to Schauer specimens were collected by Dr. Preiss at the Avon River, near York, during March, 1840.

5. *M. cuticularis, Labill.*, 1806 (referring to the lamellar bark.—A small shrub or tree of 25-30 feet in height, with very crooked, stout branches ; bark greyish or brown, and peeling off in sheets ; leaves narrow lanceolate, but slightly keeled and all opposite ; flowers few, pale colored, one or few together at the ends of the branchlets, closely surrounded by bracts ; fruit of moderate size, campanulate. It has been recorded from Albany to the Swan River District.

Remarks.—Bark of this species, along with that of others, should furnish good material for the manufacture of the coarser kinds of paper. Wood similar in character to that of other members of the genus. The species differs from all other Western Australian "Paper-barks" in having always opposite leaves, and in growing more frequently in dry situations. It is endemic, and purely coastal. Good examples are growing at Bayswater, and it is the principal species in the immediate vicinity of the Canning River bridge.

6. *M. uncinata, R. Br.*, 1812 (uncinate leaves).

Remarks.—The above can hardly be called a timber tree of this State, as so far as observed it is always of shrubby habit, frequently forming small thickets. Examples of this mode of growth can be observed at Midland Junction, Cunderdin, etc. This extratropical species has a very wide range, it being recorded from all the States of the mainland. In its Eastern localities, especially in New South Wales, it is recorded as reaching a height of 60 feet with a stem-diameter of 4 feet. There it is termed "Tea-tree," and yields a hard, close-grained durable wood. This species is referred to here for the purpose of drawing attention to its supposed medicinal properties. According to Mr. Tepper, of South Australia, the foliage of this species furnishes an excellent remedy for catarrhal affections.

He writes that he and others had derived great relief from chewing a few of the leaves together at irregular intervals: after two days the accompanying stiff neck, cough, and difficulty in swallowing had entirely disappeared, while the catarrh itself had so far abated as to have given no inconvenience.

(D). *Eucalyptus*, *L'Heritier*, 1788 (from eu, well, and kalypto, to cover, as with a lid, having reference to the concreted sepals covering the stamens and falling off in one piece on their expansion, in the form of a lid).

This genus contains our most noted timber trees, and for that reason a brief reference to its principal characters is given. The floral envelope or calyx consists of two parts, a lower persistent portion termed the tube, and an entire upper portion, which forms a lid or covering, and falls off as the stamens expand. When in bud the line of junction between the persistent tube and the lid is sometimes very marked, in other instances not clearly visible; in the latter case the lid separates from the tube in an irregular fashion, tearing off as it were. When this occurs the lid remains attached to one side of the tube until the flowering has considerably advanced. Good examples of this will be observed in flowering specimens of "Red-gum" (E. calophylla) and the "Red-flowering gum" (E. ficifolia). No corolla or inner floral envelope is apparent, unless represented by the thin separable membrane lining the inside of the lids of a few species. The stamens, which are commonly referred to as the flowers, are very many, free and in several rows, or combined at least at the base so as to form four bundles. Fruit is enlarged, very hard and woody, with 3-6 cells, the seeds very numerous in each cell, only one or very few in each cell being fertile. Leaves of most species are vertical, or nearly so, the flowers variously arranged, but seldom solitary.

This genus consists of about 150 species, and with the exception of one or two they are all natives of the Australian States. One species (E. Alba) extends to Timor, 3 species (E. tereticornis, E. tessellaris, and E. terminalis) extend to British New Guinea, and the same may be said of another species (E. clavigera) should the E. Papuana prove to be not specifically distinct. Of the total known species fully half are indigenous in this State, the majority being peculiar to extra-tropical districts. Eucalypti are both sporadic and gregarious, and constitute by far the largest proportion of Australian forests, its members comprising some of the loftiest plants known. Many species furnish timber that for strength and durability has few equals. All contain more or less of an astringent gum, and the well-known Eucalyptus oil is the product of several different species. The vast majority of species are easy of reproduction, of rapid growth, and in many instances can be grown from cuttings. In the Eastern States most of the species are known vernacularly as "Gum-trees," "Box-trees," or "Bloodwoods." or by terms having reference to the character of the bark. In Western Australia the terms used in reference to many species are largely of native origin, the principal being Jarrah, Karri, Tuart, Yate, and Wandoo.

As a genus Eucalyptus is one of the most marked, but at the same time it must be admitted that some of the species comprised within it are in their characters most unstable. The foliage, as well as the size and shape of other organs are frequently very divergent in memhers of what is admittedly a single species. As cross-fertilisation of the flower is easy artificially, and as it is known to occur at least imperfectly in nature, much of the diversity in the character of individuals may be recent, and traceahle to this source. It may be stated that the French botanist, L' Heritier, established the genus on Tasmanian specimens of "Stringy-bark" (E. obliqua.)

1. *E. sepulchralis*, *F. v. M.*, 1882.—A small tree with weeping branches and smooth nearly white bark; leaves small, rather narrow, bright green; flowers pale-yellow, few together, lid wrinkled; fruit large truncate-ovate or almost urn-shaped and much constricted at the top. From the vicinity of the Thomas River.

Remarks.—This is one of the rarest of endemic West Australian Eucalypti, it only having been recorded from the one locality. It was discovered by Campbell Taylor, who remarked on its similarity in habit to the "Weeping Willow." Its usual height has not been recorded. The specific name was chosen on account of the adaptability of the species for cemetery planting.

2. *E. marginata*, *Donn*, 1800 (leaves margined).—A small or large tree attaining a height of 125 feet or more, with a stem diameter frequently exceeding 4 feet; bark greyish, rough, fissured and persistent; leaves of moderate length, lanceolate, tapering gradually to a point; flowers of moderate size, white, few to many together; stamens wavy before expansion; fruit semi-globular, hard and smooth. It extends from near Albany north to the Moore River.

Remarks.—Timber is red, close-grained, fairly heavy and one of the most durable known. It is extensively used for wood-paving, piles, railway-sleepers, etc., turnery and other purposes to numerous too detail here. It takes a good polish. When green weighs from 71-76 lbs. per cubic foot and about 64 lbs. when thoroughly seasoned. The species constitutes the principal forest tree of Western Australia, being endemic and almost entirely restricted to those districts subject to the influence of the moist winds of the South-West. With the exception of a small patch at the head of the Buckland River and one or two other localities, it is not found more than 50 miles inland. Although the native term "Jarrah" or more seldom "Native mahogany" is applied to this species, according to some authorities the aborigines also termed it "Jerrile." Examples have been met with having a stem-diameter of 8 feet, with a maximum height of 200 feet, but they are not numerous. The best timber is obtainable from trees affecting iron-stone ridges. Its durability seems to be attributable to the presence of the substance kino-red, of which it contains 15-17 per cent., and kino-tannin 4-5 per cent. The former, which is allied to Phlobaphen, is insoluble in water, but not in alkaline preparations. When the wood is of a very deep color it is a sign of the presence of more than an ordinary quantity of kino-red. The fact of the peculiar acid principle being present in the wood accounts for its immunity from the attacks of wood-boring animals. Even in the most favorable situations the species is a slow grower, it requiring from 45-50 years to obtain a stem-diameter of 2 feet. It is not a suitable species for cultivation in dry localities. The term marginata was first applied to this species by Donn. Bentham and other authorities cite Sir James Smith. In 1801 Smith published a description of the plant and doubtfully referred it to Donn's species, but he gave Port Jackson as its habitat. W. T. Aiton gave the specimens to Smith in 1798, mentioning that the seeds were gathered by Archibald Menzies, the botanist who accompanied Capt. Vancouver in 1791. During the course of this expedition King George's Sound was discovered. This was the only portion of Australia on which the members of the expedition landed, so there can be little doubt as to where Menzies gathered his seed.

3. *E. Todtiana, F. v. M.*, 1882 (after Emil Todt, a botanical artist).—A tree of 30 feet or more in height, with a rough, fibrous, persistent bark ; leaves small, stiff, shining, rather narrow ; flowers pale-yellow, not numerous ; inner stamens inflexed ; fruit large, almost globular, streaked, of a

greyish color; the pale-brown fertile seeds with a lateral wing-like expansion. This species occurs in the vicinity of the Moore, Arrowsmith, and Greenough Rivers.

Remarks.—Nothing is known of the timber. The plant is endemic, of limited distribution, only growing so far as observed on sandy ridges. The original specimens were collected by Baron F. von Mueller and Sir John Forrest.

4. *E. gracilis, F. v. M.*, 1854 (referring to the habit). Varying from shrubby to arborescent and often attaining a height of 30 feet, frequently with several stems from the one root-stock; bark silvery-grey and smooth; leaves small, narrow, shining and rather thick; flowers small, white; few together, the outer stamens without anthers; fruit obconical or narrow urnshaped. This species has been recorded from Fitzgerald and Salt Rivers, and Phillips Range, and also from the vicinity of Yilgarn.

Remarks.—The timber is not in use, but the foliage is of value for oil distillation. 1000lbs. of the leaves yielding 54oz. of oil. This "Mallee" has a very wide range, flourishing in either clayey or sandy soil, preferably the latter.

6. *E. pruinosa, Schauer*, 1843 (having reference to the whitish-grey color of foliage).—A tree of 50-70 feet in height, with a persistent rough or wrinkled greyish bark, the branchlets and foliage usually of a whitish grey color; leaves of moderate size, stiff, almost heart-shaped, stalkless, and nearly all opposite; flowers whitish, numerous, in a corymb; fruit of moderate size, semi-ovate or shortly cylindrical. This plant extends from the source of Sturt's Creek to the Ord River.

Remarks.—This tropical species throughout nearly the whole of its habitat is almost confined to arid districts. Its abundance in localities of this nature tends to show the facility with which the seeds germinate. It would be well worth growing in warm dry districts for the purpose of creating a firewood supply.

6. *E. microtheca, F.v. M.*, 1858 (in reference to the small fruits).—A tree sometimes attaining a height of 80-100 feet, with a stem-diameter of 4 feet; bark dark or ashy-grey, quite or almost persistent; leaves from short and broad to long-lanceolate, of a light greyish-green color, the veins scarcely visible; flowers small, scented, pale-colored, from few to many in the inflorescence, with very short stamens; fruit semi-ovate, very small, with protruding valves. The West Australian localities are numerous, among the prin-

cipal being Murchison and Gascoyne Rivers, Shark's Bay, Dampier's Archipelago, Cambridge Gulf, etc.

Remarks.—Wood is reddish-brown, very hard, elastic, heavy, and does not split readily. Not only does this species furnish excellent lumber, but the timber would be of considerable value to the cabinetmaker. It is known to the aborigines of the Murchison district as the "Callaille" or "Yathoo," and is often associated with E. rostrata, growing on hills and sandy plains. This species forms one of the largest of desert trees, flourishing in the most arid districts. According to Professor Naudin, it has grown wonderfully in parts of Southern France and Algeria, especially in the dry districts of the latter country. It is without doubt one of the best indigenous species for experimental culture on the Eastern goldfields. The roots yield considerable quantities of drinkable water, which is largely availed of by the aborigines of the northern interior, as much as a quart being obtainable within an hour. Bentham in the "Flora Australiensis" referred this species to E. brachypoda, Turcz., but it is apparent that the latter is identical with E. rudis, Endlicher. Turczaninow published his description in 1849, the specimens being obtained from Drummond's Fourth Collection. As already pointed out by Mueller, this collection was made in the southern districts of the extratropical portions of the State, and only the sixth actually in the Murchison district. Bentham, under Turczaninow's name, described the true E. microtheca, but as the former was founded on specimens of E. rudis, it must become a synonym of that species, and E. microtheca be restored to its original position.

7. *E. decipiens*, *Endl.*, 1837.—Usually a tree of 40-70 feet in height, with a soft spongy or rough and persistent bark; leaves of moderate length, firm, ovate-lanceolate; flowers creamy-white, numerous, in heads, the stalk almost cylindrical; fruit rather small, top-shaped or pear-shaped. Sparingly distributed from the south coast to the Swan River district.

Remarks.—Timber is stated to be of little value. The species is endemic and constitutes one of the trees known vernacularly as "Flooded gum." Its usual habitat is along the banks of watercourses, on flats and limestone ridges in close proximity to the sea-coast.

8. *E. concolor*, *Schauer*, 1844.—A tree of 30-50 feet in height, with a smooth bark, in appearance closely resembling

the last species; leaves not long, firm and stiff, broadly-lanceolate; flowers pale-colored, numerous, in heads, the stalk thick and much flattened; fruit not large, globose-truncate. Extends from the south coast to Fremantle and Point Irwin.

Remarks.—Nothing is known of the economic properties of this species. It is endemic and so far as observed confined to coastal tracts. Schauer described the species from specimens collected by Dr. L. Preiss, at Fremantle, in 1838.

9. *E. cæsia*, *Benth.*, 1866 (from the whitish or lavender color assumed by the species).—A small tree attaining a height of 25-30 feet; branches, foliage, and fruit greyish-white; leaves small, thick, more or less lanceolate; flowers white, few together, the common stalk recurved: fruit rather large, ovoid-truncate. This plant has been recorded from the Murchison River and Mount Stirling, and is not uncommon north of Fraser Range and other portions of the eastern interior.

Remarks.—Nothing is known of the wood. This endemic species was described originally in the "Flora Australiensis" from fruiting specimens, collected by J. Drummond in the vicinity of the Murchison River. In the eastern interior it attains its maximum height.

10. *E. oleosa*, *F. v. M.*, 1859 (from the oily nature of the foliage).—A shrub or tree, never tall in the type, but in one variety attaining a height of 120 feet; bark on old trees rough and persistent or corky and shedding in patches, on young plants pale and smooth; leaves not very long, thick, light-green, narrow to lanceolate; flowers white, comparatively not numerous; fruit small, almost semi-globular. Extends from the south coast to beyond Coolgardie, thence west to the upper tributaries of the Swan River.

Remarks.—With regard to the type, the timber is of no value, but the foliage yields large quantities of oil. This in the cold state readily dissolves Indian rubber and amber. This along with E. gracilis, E. uncinata, and E. incrassata, with its form E. dumosa, are indigenous examples of the "Mallee" scrubs of Australia. The form longicornis or longirostris of Mueller is purely Western. It is truly arborescent, sometimes attaining a height of 120 feeet, with a clear stem of 60-70 feet; bark dark, persistent, and rough; leaves and inflorescence, also the fruit, similar to that of the type, but the calyx-lid is often very long and slender, ending in a horn-like beak. The fresh foliage contains a high percentage of oil, 1000 lbs. weight yielding 62 ozs. Its timber is of a reddish colour, very hard and dense, but splits readily. It is very heavy, sinking readily in water even when thoroughly seasoned. This form is vernacularly known as the "Morrell," and does not seem partial to any particular kind of soil, its natural habitat extending from the upper tributaries of the Swan River to beyond Northam and Newcastle. The exhibits in the museum of the Forestry Department labelled E. longicornis belong to this form.

11. *E. salubris, F. v. M.*, 1876 (refers to sanitary importance of plant).—A slender tree sometimes attaining a height of 120 feet, with a stem-diameter of 2 feet, with a small crown; bark shining with a brownish tinge and has broad often twisted longitudinal ridges; leaves of moderate length, thin, much dotted, narrow-lanceolate; flowers small, pale-colored, not numerous, common stalk flat; fruit small, semi-ovate. It is distributed from the eastern slopes of the Darling Range, along the Midland Railway to a few miles south of Arrino, then inland to Victoria Spring, but intermittently, and usually associated with "Salmon-gum."

Remarks.—This species exudes kino, and the foliage contains a very large percentage of oil. The wood is hard, tough and heavy, yet easy to work, in color slightly paler than that of "Morrell." It sinks in water even when well-seasoned. Is an excellent timber for xylographic work, and would probably prove equal to that of Xylomelum. The plant is endemic, and vernacularly known as "Gimlet-wood." It is almost entirely confined to soil of a poor character.

12. *E. salmonophloia, F. v. M.*, 1878 (in reference to the bark). A tree rarely exceeding a height of 100 feet, with a stem-diameter of 3 feet; bark smooth, shining, greyish with a purplish tinge, or sometimes blotched; leaves of moderate length; thin and much dotted, narrow-lanceolate; flowers small, yellowish-white, often many together; fruit small, semi-ovate or nearly so. The area of distribution of this species is from the upper tributaries of the Swan River to near Fraser's Range, and for over 150 miles east of Victoria Spring.

Remarks.—Large quantities of oil could be distilled from the foliage of this species. The timber is largely used on the eastern goldfields for firewood and mining purposes. It is of a reddish color, heavy, hard and durable. This endemic species is the well-known "Salmon-gum" of the goldfields.

It is gregarious and grows in the most arid localities. According to Mueller some of Drummond's specimens, referred by Bentham to his E. leptopoda, belonged to E. salmonophloia.

13. *E. Doratoxylon, F. v. M.*, 1860 (spear-wood).—This plant varies from a tall shrub to a small or sometimes a large tree of 80 feet in height with a stem-diameter of over 3 feet; bark greenish-white; leaves usually opposite, lanceolate, not long; flowers pale-colored, not numerous. the main stalk almost or quite cylindrical and recurved; lid with a very long beak; fruit not large, ovoid. It has been recorded from Lucky Bay, Cape Arid, Russell Range, to Stirling Range, and from Mount Lindsay to the upper tributaries of the Swan River.

Remarks.—Wood is firm, hard and elastic, and was much used for spears by the aborigines. This endemic species bears some resemblance to the "Salmon-gum" and "Gimlet-wood" in habit and in having comparatively a small crown. It usually affects good soil, is a very pretty tree, but of slow growth, attaining a height of 40 feet in 20 years.

14. *E. decurva, F. v. M.*, 1863 (having reference to the inflorescence).—Shrubby to arborescent, and often upwards of 30 feet in height, with a smooth bark; leaves narrow to lanceolate, gradually tapering to a point; flowers pale-colored, not numerous, common stalk usually erect, stalklets recurved; fruit not large, ovoid. Extending from near Busselton to east of Albany.

Remarks.—Nothing is known of its technical properties. The species is endemic and usually grows in good soil. It was originally described from Maxwell's Perongerup specimens.

15. *E. diversicolor, F. v. M.*, 1863 (reference to foliage).—A tree sometimes attaining a height of fully 300 feet, with a clear stem of 160 feet and a stem-diameter of 10 feet or more: bark smooth, whitish or yellowish, decorticating in layers; leaves of moderate length, rather thick, dark-green above, pale beneath, lanceolate and often sickle-shaped; flowers pale-colored, not very numerous; fruit of moderate size, ovoid-truncate. Is distributed from near Albany west to Cape Hamelin.

Remarks.—Timber is reddish, tough, hard, elastic and not so liable to warp as the majority of Eucalyptus woods. According to tests the transverse strain is equal to English oak, while it is 50 per cent. stronger in regard to vertical crushing strain. The evidence as to its durability is very conflicting. This endemic and gregarious species constitutes the "Karri," and ranks next to the "Jarrah" as an important forest tree of the State. It is much more restricted in range than its congener, and is chiefly confined to coastal tracts, penetrating in a few instances not more than 30 miles inland. Abroad it has been experimented with chiefly in the hilly districts of Ceylon and at Algiers. Mueller received his specimens from Oldfleld, who referred to the plant as the "Blue-gum." The late Conservator of Forests for Western Australia wrote of this species as furnishing the tallest trees in Australia, but he had evidently not examined E. amygdalina or its variety regnans in their native habitat. This species and particularly the variety often exceeds a height of 400 feet, with a corresponding stem-diameter. There is on record a height of 470 feet for a tree of the variety regnans. In many localities in Tasmania E. globulus often exceeds a height of 300 feet.

16. *E. patens*, *Benth.*, 1866 (term evidently derived from the fine spreading veins of the leaves).—A tree of 140 feet in height, with a clear trunk of upwards of 60 feet and a stem-diameter of 6 feet; bark rough, persistent, deeply fissured, somewhat resembling that of E. calophylla; leaves short to moderately long, rather thin, lanceolate, gradually tapering to a point, the veins numerous and spreading; flowers pale-colored, rather numerous; fruit medium sized, globular-truncate and slightly striate. This plant has been proved to extend from near Swan River to the Harvey, Blackwood and Tone Rivers, also grows near Cape Arid.

Remarks.—Timber is of a pale color, durable and tough, being very difficult to rend or burn. It lasts well underground. Experiments with the timber as a fire-resistant have been made abroad with satisfactory results. This endemic species is known as the "Blackbutt," and usually attains a maximum perfection on rich loamy slopes and ridges.

17. *E. rostrata*, *Schlecht.*, 1847 (from usually beaked apex to the calyx-lid).—A tree in favorable localities frequently attaining a height of 200 feet, with a stem-diameter of 8-10 feet; bark smooth, ashy-grey or finally of a brown color through losing the outer layers early; leaves often of considerable length, moderately thin, broad or narrow, sickle-shaped and gradually pointed; flowers pale-colored, not numerous; fruit small, almost globular, with a broad conical rim and protruding valves. This widely distributed

species extends from the Murchison River intermittently throughout the interior to Skirmish Hill, and thence throughout the tropical interior and coastal districts, the recorded localities being numerous.

Remarks.—Timber is dark-reddish brown, strong, dense, hard, extremely durable, rather heavy, with a flexuous grain, and takes a good polish. It is of great value for sleepers, which, if properly selected, will last for at least a dozen years; it is on record that sleepers of this timber were quite sound after being in use on the Victorian Railways for 24 years. Is reputedly impervious to the attacks of boring animals, but it is doubtful if its resistant power in that direction equals Jarrah timber. It is much stronger than the latter, and when seasoned not quite so heavy, a cubic foot varying from 53½-62½ lbs. Experiments have proved the strength to be equal to American white oak. The fresh bark contains from 7-8 per cent. of kino, and air-dried wood 4.38 per cent. of kino-tannin and 16.62 per cent. of the Phlobaphenic substance known as kino-red, in the large percentages of these two principles being only equalled by the Jarrah. The seeds are very small and easily germinate, over 60,000 young plants having been raised from 1 lb. weight. Of comparatively rapid growth, next to E. globulus it is the most extensively grown abroad, great success having attended its culture in California, Algeria, India, Mauritius, etc. The species grows readily in saline spcts, and in general is not particular as to soil, it being well adapted for acclimatisation purposes in regions not subject to severe winters. It is the "Red Gum" of the East and the "Flooded Gum" of the Murchison River. It may be noted that the allied E. exserta, F. v. M., was recorded by Bentham in the "Flora Australiensis" as occurring in the Murchison River district, but evidently in error. Up to the present time this species has not been discovered in Western Australia.

18. *E. rudis, Endl.*, 1837 (having reference to the commissural line between the calyx-tube and lid).—This species often attains a height of 80 feet, with a rough persistent or sometimes decorticating dark or iron-grey bark; leaves of moderate length, rather thin, lanceolate, often sickle-shaped; flowers white, often numerous; fruit not large, top-shaped, valves protruding when open. This species has been recorded from Salt, Gardner, Vasse, Shaw, and Moore rivers, and many interjacent localities.

Remarks.—Foliage is rich in oil. Hardly any authentic information is available in regard to the properties of the timber. The plant is endemic, and termed vernacularly the "Flooded Gum" or "Swamp Gum." It is almost entirely restricted to the coast, being principally confined to low-lying ground.

19. *E. fœcunda, Schauer*, 1844 (in allusion to the profusion of bloom borne by the type.—Varies from a small shrub to a tree of from 80-100 feet in height, with a stem-diameter of 3 feet ; bark in the type dark and smooth, in arborescent forms, ashy-grey or dark, persistent, fissured and cnnsisting of strap-like pieces ; leaves of moderate length, rather thick, lanceolate ; flowers pale-yellow, often numerous, in dense umbels ; fruit not large, nearly ovoid or obovoid-truncate. The recorded range is from the Salt to the Shaw River, thence to Shark's Bay.

Remarks.—This species is endemic, and a variable one, the form described by Schauer being always a shrub, growing in soil possessing an abundance of lime, and seldom far distant from the coast. The type is particularly abundant on the calcareous hills round Fremantle, and at the entrance to the Murchison River. In the last-named locality it is termed by the aborigines "Oragmandee," and used preferentially by them for spears, the wood being hard and elastic.

Variety *loxophleba* differs from the type chiefly in being arborescent, in the longer more prominently veined leaves, with the intramarginal vein rather more distant from the edge.

Remarks.—The leaves contain a good percentage of oil. Wood is of a reddish color, tough, hard and heavy, even sinking in water when thoroughly dry. Owing to its durability and tough character, it is in great requisition for wheelwrights' work. The plant occasionally exudes a melitose manna.

This form of E. fœcunda was described by Bentham in in the "Flora Australiensis" during 1866 as a distinct species, he bestowing on it the specific appellation of loxophleba. It is known vernacularly as the "York gum," and extends from near Albany to York and Northam, thence to the vicinity of Geraldton and the Murchison River. At York and Northam it is abundant, forming a main constituent of the forest vegetation The western limits are the eastern declivities of the Darling Range. It does not seem partial to any particular kind of soil, and should be well worth experimenting with in forest plantations. On the Murchison River it attains a height of 50 feet, and is termed by the aborigines "Yandee."

20. *E. redunca, Schauer*, 1844 (from the calyx-lid).—A small or large tree, sometimes attaining a height of 120 feet, with a stem-diameter of 3-4 feet; bark smooth, whitish, more or less blotched, giving off a pale coloration when rubbed; leaves not long, thick, lanceolate; flowers pale yellow, many together; fruit not large, usually nearly obovoid. This species extends from near Cape Riche to Albany, thence to the Murchison River. It has been observed at Knutsford, near Lake Deborah, and other portions of the interior.

Remarks.—Wood is of a pale yellow, hard, durable, tough and heavy, seasoned timber weighing 70lbs. per cubic foot. It is one of the best timbers for wheelwrights' work. The species is usually referred to as the "Wandoo" or "White gum." It usually grows in flats of poor soil and, although fairly common in many localities, can hardly be said to form true forests. On the whole it is a variable species, penetrating from the coast to the interior, where it seldom exceeds a height of 30 feet.

Variety *melanophloia* differs from the type in having a smooth black bark, and larger more prominently veined leaves. It has been recorded from the Murchison and Hutt Rivers.

Variety *angustifolia* is a narrow-lanceolate or linear-leaved form from the Stirling Ranges.

Variety *elata* is the "White gum" of the Kalgan River and vicinity. It becomes a very large tree, being buttressed or cushioned at the base of the trunk and often attains a diameter of over 15 feet; bark smooth and white, coming off in sheets. The calyx lid is shorter than in the type, and the fruit less contracted at the top. Apparently it does not otherwise differ.

21. *E. megacarpa, F. v. M.*, 1860 (refers to the fruit).—Often a tree of 80 feet in height, with a stem-diameter of 2-3 feet; bark salmon-colored or greyish, deciduous; leaves of moderate length, rather thick, lanceolate, sickle shaped; flowers white, large, very few together, without stalks, the common stalk very flat; fruit large, depressed-globular, somewhat broadly top shaped. The principal localities are

Cape Leeuwin, Mt. Burrabunup, Wilson's Inlet, Mt. Elphinstone, Gordon River and Stirling Range.

Remarks.—Leaves and fruit have a pleasant scent and an almost colorless oil. Nothing is known of the character of the timber. This endemic species is commonly known as the "Blue gum," and is of restricted range. Although it is not abundant, where it does grow it forms small forests. According to Mueller specimens of this plant were first gathered by R. Brown in 1802, during Flinders' expedition; nearly 50 years afterwards it was re-found by James Drummond.

22. *E. gomphocephala*, *De Cand.*, 1828 (name derived from the apparently swollen lid))—Attains a height of 120 feet, with a clear trunk of 75 feet and a stem-diameter of 6 feet; bark rough, dark-colored, persistent and not stringy on old trees, smooth and greyish on young ones; leaves rather long, bright green, lanceolate, sickle shaped; flowers white, few together, the common stalk broad and very flat, the lid almost globular and much broader than the tube; fruit rather large, top-shaped. It extends from Geographe Bay to Fremantle, thence to the Arrowsmith River.

Remarks.—Wood is of a pale-yellow color, remarkably hard, dense, with a close or curly grain, thus making it very difficult to rend. It is one of the strongest known, whether tried transversely or otherwise. Is subject to very little shrinkage in seasoning, even after being exposed for nearly a dozen years. Exposure to all weathers seemingly has little effect on it, and where great strength is required it can hardly be surpassed. Does not resist the attacks of boring animals. The species yields a melitose manna. This is the "Tuart," and botanically is the most marked of West Australian Eucalypts. Often in appearance it bears some resemblance to the Jarrah, but the branches are more ramifying than in other native members of the genus. Is endemic and gregarious, being confined to coastal districts, and then always growing on later Tertiary limestones and sands. The plant is easily cultivated but is not a fast grower. There should be little difficulty in acclimatising it in any temperate climate, especially where there exist littoral limestone formations. Abroad its cultivation has been attended with a considerable amount of success, especially in France, where it has been planted extensively. Tuart grows in abundance between Perth and Fremantle. Near the last locality are individual specimens with a stem-diameter of over 5 feet, but with numerous elongated branches and clear stems of not more than 50 feet.

23. *E. cornuta, Labill.*, 1799 (from the horn-like calyx-lid).—Frequently a heavily topped tree of 100 feet in height, with a stem-diameter of 4 feet; bark on the lower part of the trunk is dark, rugged and persistent; on the upper portion and branches it is of a pale color and smooth through annular shedding; leaves of moderate length, rather thick, lanceolate; flowers yellow, numerous, almost forming heads; lid very long, cylindrical, straight or curved; stamens very long, almost straight in bud; fruit not very large, bell-shaped or depressed-globose It is distributed from Geographe Bay eastward to as far as Cape Arid and inland to Stirling Range.

Remarks.—Wood is hard, heavy, elastic and tough, being considered equal to that of the common ash. When perfectly dry it sinks readily in water, being one of the heaviest of West Australian woods. Weight in this as in other heavy woods is attributable to the thickness of the cells of woody fibre. This species is the "Yate," is endemic, and is a most suitable plant for acclimatisation purposes, being not partial as to soil, although in its native habitat it prefers humid localities. Grows rapidly in tropical countries, as has been proved at Algiers and in India, where it grew from 8-10 feet during the first year. According to Mueller, the E. Lehmanni, Preiss, 1844, is simply a variety or form of the Yate. The only marked difference is in the globose concrescence of the calyx-tubes. This character, though apparently well marked, is one of degree only. The E. annulata, Benth., 1866, only differs from the Yate in the raised staminiferous disk, a character not furnishing good grounds for specific separation, especially when referring to other members of the genus.

24. *E. occidentalis, Endl.*, 1837 (Western).—A tall shrub or tree of 120 feet; leaves from short to moderate length, thick and often stiff, lanceolate, generally sickle-shaped; flowers pale-colored, few to many together, the common stalk short, flat, and frequently recurved; lid cylindrical; stamens straight before expansion; fruit variable in size, usually urn-shaped or semi-ovate. Among recorded localities are from Tone River to Cape Le Grand and vicinity, 40 miles north of Edicup and Stirling Range, where it usually forms a principal constituent of the scrubs; Warangering and other localities in the interior.

Remarks.—The heartwood is dark-colored, becoming gradually paler towards the circumference; hard and strong, and is in all probability equal to that of the Yate—The "Flat-topped Yate." It is endemic, growing in clayey, sandy, or wet soil, and flowering for nearly half a year, or at any rate from February to June. It is of very rapid growth. E. spathulata, W. J. Hooker, 1852, and E. macrandra, F. v. M., 1866, are referred to E. occidentalis.

25. *E. miniata, A. Cgh.*, 1843 (referring to the color of the flowers).—A tree of 70 feet or more in height, with a stem-diameter of 3 feet; bark on the stem persistent, greyish-brown or yellowish, brittle, but separable in flakes, on the branches smooth and whitish, branchlets and inflorescence often covered with a whitish bloom; leaves of moderate length, thin, lanceolate, with spreading not numerous veins; flowers large, orange-colored, not very numerous; fruit very large, urn-shaped, longitudinally ridged, wrinkled between the ridges. The recorded localities are York Sound and Glenelg River.

Remarks.—Nothing is known of the timber. Baron von Mueller has remarked that seeds of this species germinated 13 years after being gathered. This highly ornamental plant is confined to the tropical portions of Australia. It usually grows on sandy or stony ridges or table-lands and open scrubby country.

26. *E. clavigera, A. Cgh.*, 1843 (from the clavate form of the flowerhead and its stalklet).—This is usually a small tree of not more than 30 feet in height, with a crooked stem and a pale-colored bark, the young branches often hairy; leaves of moderate length, opposite or nearly so, quite or almost stalkless, wavy, of a greyish color, from broadly heart-shaped to broad-lanceolate, veins much spreading; flowers pale-colored, few to many together, pear-shaped in bud; lid short and flattened; fruit not very large, somewhat globular or ovoid-oblong. Its recorded habitat in this State is from Careening to Roebuck Bays.

Remarks.—This indigenous tropical Australian species is probably identical with the E. Papuana, F. v. M., of British New Guinea. In no locality is E. clavigera far distant from the coast, and always grows in soil of the most barren description.

27. *E. tessellaris, F. v. M.*, 1858 (in allusion to the appearance of the bark).—This tree frequently attains a height of 200 feet and a stem-diameter of 3½ feet, the

ultimate branches drooping; bark of the lower part of the stem dark-colored, persistent, longitudinally and transversely fissured, forming small angular separable pieces, that of the upper portion of the stem and branches ashy-grey; leaves rather long, thin, narrow-lanceolate, often sickle-shaped, the veins numerous and much spreading; flowers pale-colored, few or many together, the lids much flattened; fruit rather small, almost ovoid or oblong. The recorded localities are Careening and Vansittart Bays.

Remarks.—The species exudes much kino; the wood, is of a brown color, strong, elastic, durable, not very hard, and is easily worked. This plant is indigenous in all the States of the mainland with the exception of Victoria, and is one of the few species extending to British New Guinea. It occurs in Central Australia, in the hottest and driest localities often attaining a height of 150 feet, with a stem-diameter of 3 feet. In some of the Eastern States it is known as the "Moreton Bay Ash." The plant would be of value for experimental culture on the Eastern Goldfields.

28. *E. ptychocarpa, F. v. M.*, 1858 (having reference to fruit).—A tree of from 60-80 feet in height, the young leaves and inflorescence often covered with a whitish bloom; bark dark, persistent, greyish, wrinkled and somewhat fibrous; leaves large and long, pale or dull-colored beneath, broadish-lanceolate, often sickle-shaped, margins slightly recurved, veins spreading; flowers large, crimson, few or many together, the lids shortly hemispherical; fruit very large, woody, slightly urn or bell-shaped, with 8 conspicuous ribs. The species has been recorded from Welcome Creek, Roe's River, Drysdale River and tributaries.

Remarks.—Nothing is known of the timber. This highly ornamental tropical species is found chiefly growing along the banks of watercourses, but occasionally in rocky localities.

29. *E. terminalis, F. v. M.*, 1858 (referring to the inflorescence).—This varies from a small to a tall tree, frequently attaining a height of 150 feet, with a stem-diameter of 3-4 feet; bark persistent, fissured, pale or of a bluish color; leaves of moderate length, rather thick, lanceolate, veins much spreading; flowers rather large, pale-colored, few or numerous; lid bluntly hemispherical; fruit moderate to rather large sized, narrow urn-shaped, without or with scarcely any neck. The extratropical localities are Cavenagh and Barrow Ranges, and Mount Augustins. In the tropics it is common, having been observed at Careening,

Roebuck and Nichol Bays, Depüch Island, Prince Regent's River, Fitzroy River, towards Joanna Spring and other places.

Remarks.—Wood is dark-red in color, extremely hard, tough and does not warp or crack readily. This is another of the few species extending beyond Australia, it being truly indigenous in New Guinea. Its principal habitat is the central and northern portions of Australia, where it resists a shade temperature of over 120 degrees F. It is well worthy of culture in warm arid localities, as naturally it flourishes in regions whose annual rainfall is as low as 2 inches. This species constitutes one of the "Bloodwoods," and it should be referred to E. corymbosa, Smith, from which it only differs in the longer seed-wing. E. pyrophora, Benth., has been referred to E. terminalis.

30. *E. ficifolia, F. v. M.*, 1860 (resembling the leaves of a Ficus).—This usually forms a small tree of not more than 40 feet in height, but often flowers as a shrub; bark persistent, dark-grey and fissured; leaves of moderate length, rather thick, dark-green above, paler beneath, lanceolate, the veins much spreading; flowers rather large, scarlet, few or numerous, the buds pear-shaped, lid thin and flattened; fruit rather large, slightly streaked, urn-shaped, more or less constricted below the top. The recorded habitat of this species is from Irvine Inlet to the Shannon River.

Remarks.—Nothing is known of its economic value beyond the fact of the wood and bark yielding a kino of similar value to its allies. The seeds are of considerable value as an article of trade. This beautiful plant is one of the most showy among the genus, chiefly on account of the brilliancy of its flowers, and of Eucalypts is the most extensively cultivated abroad for ornamental purposes. It is endemic, and in its habitat forms small forests not far distant from the coast, but not becoming truly littoral. The original specimens were collected at Brookes' Inlet by Maxwell, he mentioning that the plant was referred to as "Blackbutt." They were forwarded to Mueller, who described the species from them. Flowering specimens were not known till some years later. It differs most essentially from E. calophylla in the winged seeds. This plant is often referred to as the "Red or scarlet-flowering gum."

31. *E. calophylla, R. Br.*, 1831 (from the resemblance of the foliage to that of the tropical Calophyllum inophyllum, and literally means beautiful leaves).—A shady tree with

spreading branches, attaining a maximum height of 150 feet with a stem-diameter of 10 feet, but often flowering as a shrub of 4-6 feet in height; bark dark, rough, corky or hard and decorticating in irregular pieces; leaves of moderate length, almost horizontally arranged, coriaceous, usually lanceolate, veins spreading almost at right angles to the mid-rib; flowers large, white to pale-yellow, rarely pink, few to numerous; lid very flat and much narrower than the tube; fruit large and hard, urn-shaped, usually much constricted below the top and forming a distinct neck; seeds the largest in the genus, black and not winged. The species extends from Albany to the Hill River.

Remarks.—Bark and seed-vessels contain a good percentage of tannic principle. Wood is tough, hard, light and durable when used for constructive purposes above ground, but is reputedly of little value for underground work. The bearing strength is inferior to that of "York gum." Its value is often detracted from through the presence of numerous gum-veins. Of the many arborescent species of West Australian Eucalypts this is the only one yielding large quantities of a fluid treacle-like kino. This hardens, and is of considerable medicinal value, possessing healing and astringent properties of a high degree, and is also of account for tanning purposes. This endemic species is known vernacularly as the "Red gum." Its distribution is more of a sporadic than of a gregarious character, being associated with most of the coastal forest trees, less freely with Karri and York gum, and not extending to the interior. It is not partial to any particular kind of soil, but it has been observed that when growing in poor ground the gummy nature of the timber is very pronounced; in fertile spots this character almost disappears. Is one of the most useful for avenue-planting on account of its spreading branches and almost horizontally-disposed leaves. Blooms profusely for nearly half the year and is therefore of great value to bee-keepers. This is one of the species that has been successfully grown on the hills of Ceylon and also is cultivated to some extent in Algeria. Preiss, who gathered the plant near Perth, gave "N'gumbat" as the aboriginal name. R. Brown first collected the seeds near Albany during 1801, and described the species in 1831 from flowering specimens taken from a plant grown at Kew.

32. *E. tetradonta*, *F. v. M.*, 1858 (referring to the prominent calyx-teeth).—A tree of 30-40 feet in height, with a slender stem; bark whitish, fibrous, persistent on the stem

and branches; leaves opposite or nearly so, rather long, of a leathery texture, lanceolate and often sickle-shaped; flowers pale-colored, rather large, not numerous, with a pair of rather large almost deciduous bracts at the base of the common stalk, calyx-tube provided with 4 prominent teeth below the margin; fruit of moderate size, oblong-cylindrical and angular. This species has recently been recorded from the Prince Regent's River.

Remarks.—Besides occurring in this State, this tropical species has been recorded from the Northern Territory and Queensland. In the last named State it is known vernacularly as the stringy-bark. The bark, which is very tough, is much used by the aborigines for troughs. Leaves of young trees are bruised in water until the latter becomes thick and green, in which state it is drunk by the aborigines as a specific in cases of malaria. The species usually grows in sandy localities.

33. *E. eudesmoides, F. v. M.*, 1860 (Eudesmia-like).—Varies from a shrub to a tree of 30-40 feet in height, with a smooth bark; leaves opposite or nearly so, of moderate length, stiff, lanceolate and often sickle-shaped; flowers not large, pale-colored, few together; calyx tube with 4 small teeth; fruit of moderate size, somewhat ovate-lanceolate. It extends from the Murchison River intermittently through the eastern interior to the Barrow Range.

Remarks.—Whatever economic properties this species may possess are at present unknown. It is endemic, and usually grows in poor sandy soil. During the Elder Exploring Expedition examples of this plant were observed and referred to as "Desert-gum." They varied from 30-45 feet in height.

(E.) *Tristania, R. Br.*, 1812 (in honor of Jules M. E. Tristan).—About 17 species are known, they being distributed as follows:—7 in India, Burma, Malayan Peninsula and Islands; 2 in New Caledonia; 8 in Australia, 1 of which extends to British New Guinea.

T. psidioides, A. Cgh. (fancied resemblance of the plant to the Guava).—A tree of slender habit, usually not above 25 feet in height, with the smaller branches and flowers woolly-hairy; leaves not large, stalked, alternate, ovate-elliptical, woolly-hairy beneath; flowers not large, yellowish, numerous; fruit small, almost globular. It has been recorded from Brunswick Bay and Prince Regent's River.

Remarks.—A. Cunningham collected examples of this plant near Prince Regent's River during October, 1820, and described the species in 1837.

(F.) *Xanthostemon, F. v. M.*, 1858 (having reference to the yellow flowers).—A genus consisting of 12 species, 2 being indigenous in Australia, 1 of which extends to British New Guinea. The remaining 10 are natives of New Caledonia.

X. paradoxus, F. v. M., 1858.—This is usually a tree of 25 feet in height, with a rugged persistent bark, the under portion of the leaves and the flowers woolly-hairy or smooth and of a a bluish hue; leaves of moderate length, almost elliptical and stalked, some often turning yellowish when dying; flowers conspicuous, yellow and numerous near the ends of the branchlets; fruit not large, more or less oval, with rather few flattened greyish-yellow seeds. It has been recorded from Montague Sound and Prince Regent's River.

Remarks.—But little is known of this tropical species.

(G.) *Barringtonia, R. & G. Forster*, 1776 (in honor of Hon. Daines Barrington).—This genus comprises about 20 species, which are distributed over tropical Asia, Africa, Australia, and Polynesia. The 3 species indigenous in Australia are rather common Asiatic ones.

B. acutangula, Gærtner, 1791 (referring to the angular fruit). —A very handsome tree attaining a height of 40-50 feet, with a clear trunk of 15-25 feet, and a stem-diameter of 2 feet; bark dark-brown, rough, thick; leaves rather large, oblong-wedge-shaped, blunt or pointed, shortly-stalked, the margins entire or finely-toothed; stamens red; flowers in long pendent racemes, red and, although conspicuous, not large: fruit large, oblong, with 4 broad rounded angles. Among the West Australian localities for this species may be mentioned Fitzroy and Prince Regent's River, and King Sound.

Remarks.—Bark is good for tanning. Wood is whitish or reddish-brown in colour, shining, hard-grained, and when seasoned weighs about 45lbs. per cubic foot. Besides being of value for ordinary constructive work it furnishes good material for the cabinet-maker. This tropical plant is abundant in Southern Asia and the adjacent islands, usually inhabiting swampy localities or the banks of water-courses. It constitutes the so-called Indian Oak of India. In that country is a closely allied species which furnishes a considerable proportion of the railway sleepers.

(H.) *Careya, Roxburgh*, 1816 (in honor of Rev. Wm. Carey). This small genus comprises 4 species, 1 being indigenous in Australia, and 3 in Southern Asia and adjacent islands.

C. Australis, F. v. M. (referring to the habitat).—Varies from a tall shrub to a glabrous tree of 30 feet in height; leaves of moderate length, thin, more or less ovate, blunt or pointed, the margins smooth or with small teeth; stamens white or slightly red; flowers white or slightly red, large and not numerous at the ends of the branchlets; fruit a dry berry, large and almost egg-shaped; seeds slightly flattened, brownish. Brunswick Bay, Prince Regent's River and King Sound are among West Australian localities for this species. It is not uncommon between La Grange Bay and De Grey River.

Remarks.—Bark is useful for tanning. Timber is of a red-brown color, heavy, close-grained, tough and strong, and takes a good polish. It should be valuable for cabinet work. The pulped leaves are reputedly efficacious in cases of ulcer. Bentham doubtfully alluded to the species as a variety of the Indian C. arborea, Roxburgh. The Australian plant is endemic and usually inhabits fertile tracts, being seldom found growing in sandy localities. Besides its West Australian localities, it is rather common in the Northern Territory and Queensland. Baron von Mueller described the species in 1866 as Barringtonia Careya.

XIV.—RUBIACEÆ, A. L. de Jussieu (1789).

337 genera, about 4000 species. There are in Australia 30 genera with 127 species. The order is chiefly tropical and subtropical, and is of great importance, including not only remedial agents acting as tonics, febrifuges, emetics and purgatives, but valuable dyes and formidable poisons. Cinchona, the Quinine tree, is a plant largely cultivated by the Indian Forestry Department, and grows freely, especially in moist hilly localities. Gambier is the product of one member of the Order, Ipecacuanha of another, Randia, and is a powerful emetic, and the bruised roots are used for poisoning fish. Coffee and madder dye plants are members of the family. Few produce edible fruits.

(A.) *Sarcocephalus*, *Afzelius*, 1824 (having reference to the fleshy heads of fruit).—This comprises about 8 species, distributed over tropical Africa, Asia and Australia.

S. cordatus, *Miguel*, 1856 (from the heart-shaped leaves of a non-Australian form).—A handsome tree of 40-60 feet in height, a clear trunk of 25-30 feet and a stem-diameter of 18 inches to 2 feet; bark dark-grey, smooth, longitudinally fissured and peeling off in small sheets; leaves large, wedge-shaped to broadly ovate, or in the Asiatic form broadly heart-shaped and shedding during the hot season; stipules very large and falling early; flowers yellow, fragrant, numerous in dense globose heads; fruit a large globular mass. As far as I am aware this species has only been observed along the Glenelg River.

Remarks.—Wood extremely bitter, brown, close-grained, and said not to be attacked by insects. When seasoned it weighs about 50 lbs. per cubic foot, and is good for building and furniture. This species is abundant in Southern Asia and Polynesia, also in the Northern Territory and Queensland, it being the "Leichhardt-tree" of the latter.

(B.) *Paretta, Linné*, 1735-37 (the name in Malabar).—Consists of about 60 species, confined to the tropics of the Old World. It was combined by Bentham with Ixora.

P. Indica, Linné.—A small tree, not exceeding 25 feet in height, with glabrous or tomentose broad leaves, showing white flowers and black globular berries. It has been recorded from Careening and Roebuck Bays.

Remarks.—The Ixora Paretta, Roxb., and I. tomentosa, Roxb., have been referred to P. Indica.

(C.) *Timonius, Rumphius*, 1743 (from a native name for a species in Amboyna)—A tropical genus, comprising about 20 species, principally Asiatic and Oceanic.

T. Rumphii, De Cand., 1830 (after G. E. Rumphius).—A tree sometimes attaining a height of 40 feet, with a white bark; leaves leathery, large, from almost ovate to oblong-lanceolate; flowers not numerous or large, white, fragrant; fruit oblong or globular, of moderate size. Among the Australian localities for this species may be mentioned Careening and Roebuck Bays and vicinity.

Remarks.—Wood is pale-colored and durable. This, the only species, is very common in Asia. It usually grows in open places and on hill sides.

XV.—SAPOTACEÆ, A. L. de Jussieu (1789).

24 genera, 320 species, distributed throughout the tropics of the whole world. Many species of the order yield hard and valuable timber, whilst the bark of others is astringent and febrifugal. Some of its members, principally American, furnish good dessert fruits. Milky juice of a few species forms a gutta percha. The Australian representatives are comprised in 6 genera, with 19 species.

Mimusops, Linné, 1747 (from a fancied resemblance in the flowers of some species to the face of a monkey).—This genus is distributed over the tropics of both hemispheres, and consists of 30 species, 2 of which occur in Australia, 1 of these extending to Asia.

M. parvifolia, R. Brown, 1810 (leaves small)—A tree often attaining a height of 30-40 feet; dark-grey; the young growth and inflorescence rusty hairy; leaves rather small, on long stalks; ovate or elliptical; flowers pale, not very large or numerous; fruit almost globular. Recorded localities are Careening and Roebuck Bays.

Remarks.—Wood white and durable. The species is endemic in Australia. and is not uncommon from Queensland west to Roebuck Bay and vicinity.

XVI.—APOCYNEÆ, A. L. de Jussieu (1789.)

This order comprises about 900 species which are mostly tropical, the Australian members comprising 13 genera with 47 species. Poisonous principles predominate, the ordeal nut being one of the most prominent in this respect. Several are used as emetics, narcotics, and cathartics, others are febrifuges. A form of caoutchouk is supplied by some of the climbing members. Few yield edible fruit, and the timber in general is valueless.

Alstonia, *R. Br.*, 1809 (in honor of Dr. Alston).—This genus is distributed over tropical Asia, Australia, and Polynesia. It comprises about 30 species of which 6 occur in Australia, 4 being endemic.

A. verticillosa, *F. v. M.*, 1868 (referring to whorled leaves).—A strong growing tree, attaining a height of 35 feet, with an abundance of milky sap; leaves not very large, long-lanceolate, in whorls of 4-7; flowers numerous, white, small, in small cymes. It ranges from Queensland to as far west as Montague Sound.

Remarks.—The bark and wood is extremely bitter. A closely allied but smaller species is the A. linearis, Benth., 1869. It is endemic to Western Australia, and is known to extend from Brunswick Bay to Prince Regent's River.

XVII.—BORAGINEÆ, Lindl.

68 genera, 1200 species. The members of this Order are distributed throughout the world and contain but few timber trees. The Australian representatives are comprised in 12 genera with 52 species.

Ehretia, *P. Brown*, 1756 (after D. G. Ehret).—This consists of about 50 species, all tropical and chiefly confined to the Old World. There are 5 species in Australia, of which 2 extend to Southern Asia.

E. saligna, *R. Br.*, 1810 (willow-like).—A small tree of about 30 feet in height, glabrous and often glaucous; leaves narrow, rather long and thick; flowers numerous and small; fruit small, reddish, globular. This species occurs at La Grange Bay and vicinity.

Remarks.—Nothing is known of the character of the pale-colored wood. It is rather common in Queensland and the Northern Territory.

XVIII.—SOLANACEÆ, Haller (1742.)

66 genera, 1250 species. This is distributed over the warmer parts of the earth. In Australia there are 9 genera with about 80 species. Although of no particular importance in forestry, this family is of great value, it containing such plants as tobacco, potato, and tomato. The fruits, or in many cases the whole plants, of some species are particularly poisonous. Such narcotics as the Datura or Thorn-apple, Henbane, Atropa, and other introduced species are well known to the medical faculty. Well-known native plants possessing

poisonous properties are Anthocercis, Native Tobacco (Nicotiana suaveolens) and Duboisia. Some species yield pungent fruits, the Chili being an example; others edible fruit, such as the Cape Gooseberry. With reference to the Duboisia Hopwoodi, it may he stated that this species is scattered throughout the Eastern interior, extending as far South as Eucla. It is very poisonous, and constitutes the Pitury of the aborigines.

Anthocercis, Labill., 1806 (from anthos, a flower, and kirkos, a ray).—This genus is purely Australian and consists of 17 species, of which at least ten are indigenous in this State, all being endemic. Incidentally it may be observed that A. Odgersii, F. v. M., 1876, was found at Victoria Spring by Young, and has not been recorded from North Australia. In the late Baron's last Census of Australian Plants he accredits the species to the latter region.

A. viscosa, R. Br., 1810 (clammy nature of plant).—Often a small tree of 20 feet in height, glabrous and very viscid; leaves ovate with finely toothed margins, and more or less dotted, not large; flowers large, white, with green streaks within; fruit ovate-globose, separating in 2 valves at the end. Occurs on the south coast, principally in the vicinity of Albany, Torbay Inlet, etc.

Remarks.—It is reputedly very poisonous. Another species of similar dimensions but with tortuous branches and clustered narrow leaves occurs in the Murchison River district.

XIX.—MYOPORINEÆ, R. Br. (1810).

5 genera, about 79 species. Its members are distributed over Australasia, South Africa, Polynesia and Asia. 3 genera with 76 species are indigenous in Australia, one of which (Myoporum) is widely spread, both Pholidia and Eremophila being endemic. The genera existing outside of Australia are as follows:—Oftia, Adanson, a South African genus of 2 species, and the monotypic shrubby Bontia, Linné, of East India.

(A.) *Myoporum, Banks & Solander*, 1786.—A genus of 20 species, of which 16 are indigenous in Australia, only one of these extending to Polynesia. There are 2 endemic Asiatic species, another in the Sandwich Islands.

M. platycarpum, R. Br., 1810 (reference to the fruit).—Attains a height of 35 feet with a stem-diameter of considerably over a foot, more or less sticky, the branches pendulous; leaves of moderate length, narrow, with a few teeth; flowers numerous, clustered in the axils, small and white; fruit small, with acute edges. In Western Australia the species has been recorded from Fraser Range and in several localities northwards.

Remarks.—The timber is sometimes referred to as sandalwood. When dry it is brittle, has a fine grain and is nicely scented. Owing to the amount of resin in the wood it is highly inflammable. According to several writers this resin on exuding is similar to pitch. On exposure it hardens, sometimes in pieces of half an inch in diameter, and then falls from the tree. By melting it with fat the aborigines make a kind of wax, which they use in fastening the heads of their stone tomahawks to the handles; also for other purposes. It is also stated that during the hot weather another substance is exuded from the trunk and branches. When fresh this resembles a thick froth; but becomes solid on exposure. It forms large lumps, but sometimes is stalactitic in form. It is then of the consistence of sugar, and has a sickly sweet taste.

(B.) *Eremophila*, *R. Br.*, 1810 (from many species growing in sandy localities).—This genus as originally defined consists of about 62 species, of which at least 52 are indigenous in this State. Commonly termed "Native Fuchsia." Along with Acacia they constitute a large proportion of the inland shrubby or semi-arborescent vegetation; growing in the most arid localities, they greatly relieve the monotony of the greyish green appearance of the vegetation with their brightly colored flowers.

E. longifolia, *F. v. M.*, 1856 (derived from the long leaves).—From a tall shrub to a small tree of not more than 25 feet in height, with the branches occasionally pendulous; leaves narrow and long, sometimes with a hooked point, in drying often turning quite black; flowers brick-red, tubular, finely hairy outside, 1 or few together in the axils of the leaves; fruit greenish-yellow, globose, fleshy outside, with a hard 4-celled stone. The West Australian habitat extends from the upper tributaries of the Swan River to near the Tropic, thence throughout the whole of the Eastern interior to the South Australian border.

Remarks.—A tar-like substance is exuded by the species, it being abundant and easily obtained from the wood. Nearly the whole of the genus yield beautifully marked and close-grained wood, which doubtless would be of value for cabinet-work and engraving.

XX.—VERBENACEÆ, Adanson (1763).

59 genera, 700 species. This Order is chiefly tropical and includes many good timber trees, one of the principal being the Teak. The Australian genera number 22, with at least 82 species.

Vitex, *Tournefort*, 1700 (ancient name applied to some plants of the Osier tribe, as the branches of some Vitex are flexible).—A genus of 60 species, represented in all tropical and warm temperate regions, but principally Asiatic or African. There are 4 species in Australia, of which 3 are endemic.

V. acuminata, *R. Br.*, 1810 (leaves acuminate).—A tree of 60 feet in height, with a smooth bark; leaves divided into 3-5 rather large ovate-oblong leaflets ; flowers white, fragrant, or in one form blue, small and rather numerous ; fruit red, globular and irregularly sulcate. Among West Australian localities are Vansittart and Careening Bays.

Remarks.—Wood yellow and durable. The smaller V. glabrata, R. Br., 1810, extends from New South Wales, west along the coast to Port Nelson and vicinity.

XXI. –PHYTOLACCACEÆ, R. Br. (1818).

20 genera, 60 species. It is distributed over the tropical and temperate portions of the earth. In Australia there are 6 genera with 11-12 species. Acrid properties prevail in the Order, but besides possessing some poisonous and medicinal properties, the species are next to valueless from a forestial point of view.

Cadonocarpus, *A. Cgh.*, 1830 (having reference to the bell-shaped fruit).—This purely Australian genus comprises 3 species only.

C. cotinifolius, *F. v. M.*, 1862 (supposed resemblance of the leaves to those of the Wig-tree or Venetian Sumach).—This is often a tree of 40 feet in height, of a pale or glaucous-green ; leaves ovate or almost lanceolate, not large, on a long stalk ; flowers greenish-white, small, not very numerous near the ends of the branches ; fruit obconical or obovoid, not large, with numerous parts. Extends from the South Australian border, intermittently throughout the Eastern interior north to the Tropic.

Remarks.—Bark is exceedingly brittle, by no means thick, and contains a peculiar bitter. This remarkable species has a more extensive range than any other member of the genus, it being known from the inland portions of all the States of the mainland, being scattered sparsely over the most arid tracts. It is variously known as the "Native Poplar," "Quinine-tree," or "Medicine-tree." Another member of the Order, which sometimes attains arboreal dimensions, is the Gyrostemon ramulosus, Desfont, which is endemic and common throughout coastal districts. Near Cottesloe it often attains a height of 25 feet, but is more often of shrubby habit.

XXII.—MYRISTICEÆ, R. Br. (1810).

Species about 80, of which 1 is Australian, a few African, the vast majority being confined to tropical Eastern Asia. The Order consists of a single genus, in the members of which aromatic properties prevail. Their bark abounds in a sticky acrid juice, which stains red. The nutmeg and its mace is the produce of Myristica fragrans.

Myristica, *Linné*, 1742 (name in allusion to the odor of the fruit).—Character of the Order.

M. insipida, *R. Br.*, 1810 (Insipid).—A fine looking tree of 60-70 feet in height or sometimes more, the young growth rusty-hairy ; leaves ovate to oblong, rather long and prominently veined ; flowers pale, few or many, not large; fruit on very short axillary stalks, of moderate size, ovoid or ovoid oblong, invested with rusty hairs. From Brunswick Bay and adjacent localities.

Remarks.—A species rather common in British New Guinea is probably identical with this.

XXIII.—LAURINEÆ, Lindley.

34 genera, about 900 species. A difficult Order, abundant in the tropics with few in extra-tropical regions. All the species are more or less fragrant and aromatic, and include such plants as the true camphor. It yields some valuable timbers, the Borneo Ironwood (which is probably the hardest and heaviest known), the Greenheart of Demerara and the Sweet-wood of Jaimaca being examples.

Cryptocarya, *R. Br.*, 1810 (alluding to the fruit being covered by the perianth tube).—The species are all tropical or sub-tropical, and mostly Asiatic. It comprises 40 species, of which 9 are in Australia, all being endemic.

C. glaucescens, *R. Br.*, 1810 (leaves often greyish beneath).—A tree of 40 feet or more in height; leaves oval-elliptical or oblong, of moderate size, prominently veined, the under surface usually whitish; flowers pale-colored, very numerous, not large; fruit black, globular, or nearly so, and rather large. This has been recorded from Brunswick Bay and a few other localities.

Remarks.—Nothing is known of its economic properties.

XXIV.—PROTEACEÆ, A. L. de Jussieu (1789).

50 genera and about 950 species. Chiefly Australian and South African, none in North America, Europe or North Asia. In Australia there are 33 genera with about 600 species.

(A.) *Persoonia*, *Smith*, 1798 (in honor of C. H. Persoon).—With the exception of a New Zealand species, the genus is confined to Australia. It numbers about 62 species, of which nearly half occur in Western Australia.

1. *P. falcata*, *R. Br.*, 1809 (leaves sickle-shaped).—A small tree of 30 feet high, closely resembling the South Australian "Golden-wattle" (A. pycuantha); leaves very narrow and long, sickle-shaped, with a prominent midrib; flowers yellowish, in long racemes; fruit ovate-globose, ½ inch long. It has been recorded from Cygnet and Roebuck Bays, King Sound and Prince Regent's River.

Remarks.—Besides the localities mentioned, this tropical species occurs in the Northern Territory and Queensland.

2. *P. longifolia*, *R. Br.*, 1809 (long-leaved).—A small tree of 20-25 feet, with pendulous branches: leaves very long and narrow, blunt, not thick, with the midrib rather

prominent; flowers yellow, almost forming racemes; fruit obliquely ovate and yellowish outside. It ranges from the south coast to the Swan River district.

Remarks.—It is endemic, and does not extend for any considerable distance inland. The species is very common on the declivities of the western slopes of the Darling Range, being particularly abundant east of Jarrahdale. Usually attains its greatest perfection in sandy or heathy spots, and then bears a remarkable resemblance to some forms of Pittosporum phillyræoides.

3. *P. articulata*, *R. Br.*, 1809 (probably from the prominently jointed stalk to the ovary).—Often a tree of 25-30 feet in height, closely resembling the last species; leaves lanceolar and rather long, straight, with numerous veins; flowers yellow, slightly longer than in the last species, but similarly arranged, the stalk of the ovary prominently jointed; fruit purplish or yellowish outside, broadly oblique. The habitat ranges from the south coast to the Vasse River.

Remarks.—It is endemic, and of more restricted range than other arborescent extra-tropical species.

4. *P. elliptica*, *R. Br.*, 1809 (refers to the form of the leaves).—Varies from a shrub of 15 feet to a small tree of 30 feet in height; bark greyish outside, deep-red within, of a corky or flaky texture; leaves from obovate to elliptical, not long, with an abrupt, usually thickened point; flowers yellow, solitary, but sometimes forming apparent racemes as in other species; fruit obliquely ovate, yellowish outside. Is distributed from the south coast to the Swan River district.

Remarks.—According to Dr. L. Preiss, who collected specimens of this plant in the southern districts during 1839-40, the aborigines used the fruit as an article of food. The species is endemic, and is abundant on the western slopes of the Darling Range, being sometimes associated with P. longifolia, but, unlike that species, more frequently grows on ironstone gravel ridges.

(B.) *Xylomelum*, *Smith*, 1798 (referring to the form and character of the fruit).—A genus restricted to the Australian mainland, and consisting of 5 species, 2 of which occur in Western Australia, only one attaining arborescent proportions.

X. occidentale, *R. Br.*, 1830 (western).—Usually a tree of 25-30 feet in height, with a stem-diameter of over 1 foot, branches stout; bark rugose, dark-grey; leaves ovate to oblong, of moderate size, margins more or less wavy, with prominent sharp teeth; flowers in a terminal panicle, numerous, rather small, white and sweet-scented; fruit large, woody, pear-shaped, densely woolly.

hairy. It extends from near Albany to north of Swan River, the interjacent localities being numerous.

Remarks.—Timber of a dark color, finely marked, but with a rather coarse grain. It takes a very good polish, is easy to work, and is of undoubted value for inlaying and other ornamental work. This endemic species does not extend very far inland, and is most abundant along the western slopes of the Darling Range. Is sporadic, and in habit and appearance bears a remarkable resemblance to Banksia ilicifolia, and when in bloom is a remarkably handsome plant. Vernacularly it is known as the "Native Pear."

(c.) *Grevillea, R. Br.*, 1809 (in honor of C. F. Greville).—This genus is the largest in the Order and the most diversified in habit and foliage: moreover it is one of the few extra-tropical West Australian genera represented outside of Australia, some 7 species having been recorded from New Caledonia. Roughly, the genus contains about 170 species, of which at least 100 are indigenous in the extra-tropical portion of the State, all but 10 being endemic.

1. *G. nematophylla, F. v. M.* 1859 (in allusion to foliage).—Shrubby or arborescent, in this State attaining a height of 30 feet, finely hairy or quite glabrous; leaves not divided, very hard and stiff, narrow and rather long, with a rather sharp point: flowers very small, in a stalked raceme or panicle at the ends of the branches; fruit not described. The West Australian habitat is from Mount Churchman to the Murchison Districts.

Remarks.—Nothing is known of its economical properties. The original specimens were collected by J. Dallachy, in the vicinity of the Darling River in New South Wales.

2. *G. annulifera, F. v. M.*, 1864 (evidently having reference to the thick annular gland).—This varies from a tall shrub to a small tree of 25 feet, but often much less, quite glabrous; leaves deeply divided into 5-7 linear, stiff, spreading, pungent-pointed segments with recurved edges; flowers numerous, white, in a loose terminal panicle; fruit very large, woody, almost globular, brown outside, red inside, with thick valves; seeds ovate, semi-globular and very large. It extends from the Murchison and Hutt Rivers to Shark's Bay, thence to the Gascoyne River.

Remarks.—The species is a very ornamental one, not only on account of its bushy habit, but from the fact of it bearing a showy inflorescence. The large seeds have an almond-like flavor, are palatable and nutritious, and as the fruits are produced abundantly, the plants flourishing in very sandy, dry districts, they are well worthy of the attention of nurserymen. Would be certain to grow in the eastern interior, where there are many localities having a soil and climate totally unsuited to the Queensland Nut-tree (Macadamia ternifolia). The species is endemic and abundant on the sand-plains throughout its habitat. Vernacularly the seeds are referred to as "Native Almonds."

3. *G. Chrysodendron*, *R. Br.*, 1809 (golden-tree, in allusion to the color of the flowers).—A tree of about 20 feet in height with a stout trunk; bark dark-brown, rough; leaves divided into numerous long narrow segments; flowers bright yellow, rarely white, finely woolly-hairy in long dense erect racemes, ovary stalkless, style persistent; fruit woody, large, broadly and obliquely oblong. From various tropical localities and extending south to the Minilya River, thence to the vicinity of Shark's Bay.

Remarks.—Timber durable. Foliage is considered an excellent material for mattress stuffing.

4. *G. heliosperma*, *R. Br.*, 1809.—Of similar habit to the last, the foliage once or twice divided into blunt, flat, oblong-lanceolate segments, the whole leaf often a foot long; flowers reddish, in long racemes; fruit nearly globular, with very thick hard valves. Recorded from Prince Regent's River.

Remarks.—Besides the above-named locality this species has only been observed in the Northern Territory.

5. *G. refracta*, *R. Br.*, 1809.—A tall shrub or a small tree not exceeding a height of 25 feet; leaves mostly divided into 3-11 long narrow-lanceolate, marginally refracted segments, the midribs prominent; flowers pale-colored, small, in a terminal panicle; fruit large, very hard and almost globular. The West Australian localities for this species include the following:—Cambridge Gulf, Cygnet and Roebuck Bays, Prince Regent's, Glenelg, and Fitzroy Rivers, Derby, nnd between La Grange Bay and De Grey River.

Remarks.—A variable species, with the leaves sometimes undivided. It is entirely confined to the tropics, extending to the Northern Territory and Queensland.

6. *G. Leucadendron*, *A. Cgh.* 1830.—A shrub or tree of similar height and habit to the last species; bark black, deeply longitudinally ridged; leaves often glaucous, mostly divided into 3-11 long linear, flat 3-nerved segments, which are sometimes again divided, the whole leaf rarely entire; flowers white, very small, numerous, usually forming a small terminal panicle; fruit rather large, broadly oblique and flattened. The West Australian localities as recorded are Cambridge Gulf, Enderby Islands, Dampier's Archipelago, and the Sherlock River.

Remarks.—Purely tropical and extending to the Northern Territory.

7. *G. striata, R. Br.*—A small form of this species occurs near Shark's Bay and the Gascoyne River. It differs from the type in having 5-nerved leaves.

8. *G. mimosoides, R. Br.*, 1809.—A tree of not more than 30 feet high, the foliage of a bluish color; leaves long, lanceolate, sickle-shaped, blunt, the nerves usually numerous; flowers pale-pink, small, numerous, and usually forming a terminal panicle; fruit broadly oblique, flattened and large. Careening and Roebuck Bays and Derby are recorded localities.

Remarks.—When in leaf only indistinguishable from some Acaciæ.

(D.) *Hakea, Schrader*, 1797 (in honor of Baron Hake).—This is an Australian genus having numerous representatives in all the States, but as in several allied genera the species are distributed in the greatest profusion over the south-western portion of the continent. It is polymorphous, not only in the character of species but of individuals, particularly as regards foliage. It is one of the few Proteaceous genera having arborescent representatives in the eastern interior. Hakea comprises about 100 species, of which over three-fourths are indigenous in Western Australia. Fully 67 are endemic to the extra-tropical portion of the State. The species can be propagated by cuttings.

1. *H. Cunninghamii, R. Br.*, 1830 (after Allan Cunningham).—A small tree of from 20-30 feet in height, with a stem-diameter of 1 foot; bark rough; leaves stiff, cylindrical, very long; flowers pale-yellow, in a long silky-hairy raceme, growing from the old wood; fruit ovate-lanceolate, very large and thick. This species extends from the Bay of Rest and Nichol Bay, south to the Gascoyne River.

Remarks.—This ornamental plant has long been in cultivation in Europe.

2. *H. lorea, R. Br.*, 1830 (fancied resemblance of the leaves to a thong).—A tree up to 40 feet in height, with a a stem-diameter of 1½ feet; branches short and stout; bark corky, deeply furrowed, often nearly 3 inches thick, of a dark color; leaves cylindrical, glabrous or hoary, usually entire and very long; flowers bright-yellow, numerous, in a densely hairy terminal or axillary raceme; fruit thick, over an inch long, beaked. Scattered throughout the eastern interior, chiefly north of Mount Malcolm, extending east to the South Australian border and west to near Shark's Bay, but apparently does not penetrate the tropics.

Remarks.—Little is known of the character of the wood. This species constitutes the "Cork-tree" of the eastern goldfields, and is found throughout the hotter temperate portions of the Australian mainland, occurring in small clumps, covering considerable tracts of country or lining the banks of dried watercourses. It is common in the vicinity of Mt. Malcolm, Tuckanarra, and other goldfields centres, growing usually in granitic areas, and among many prospectors has the reputation of denoting the proximity of fresh water. The flowers are produced during July and August. The Eastern goldfields' form of this species has been recently described as a distinct species, under the name of H. suberea, by Moore. Having examined specimens of the typical H. lorea and compared them with the goldfields plant, I failed to observe any combination of characters of sufficient importance to justify the creation of a new species.

3. *H. macrocarpa*, *A. Cgh.*, 1830 (large-fruited).—Usually a small tree of not more than 25 feet in height, with a stout stem and bushy crown; bark rough, fissured, somewhat corky, dark-grey; leaves flattened and thick, narrow, rather long, more or less silky-hairy; flowers yellow, in long cylindrical finely-hairy racemes; fruit large, ovate-lanceolate. This species extends from the upper portion of the Murchison River to beyond the Tropic, the principal tropical localities being Sturt's Creek, Cygnet and Roebuck Bays, Glenelg and Fitzroy Rivers.

Remarks.—Wood is of a light color, firm and tough. It grows in the most barren localities, and is abundant on the stony ridges and plains north of Peak Hill, where I saw it in flower during December. The roots reputedly contain large quantities of water, which is made use of by the aborigines during dry stages.

4. *H. arborescens*, *R. Br*, 1809 (tree-like).—A tall shrub or a tree usually not exceeding a height of 25 feet; leaves flat, narrow, rather long, often sickle-shaped, finely-hairy; flowers yellowish, small, often in globular clusters, and frequently growing on the old wood; fruit very large, thick, with a short beak. Among West Australian localities for this species may be mentioned Prince Regent's River, Derby, Roebuck Bay, and localities between La Grange Bay and De Grey River.

Remarks.—This plant is apparently confined to the tropics.

5. *H. Preissii*, *Meiss*, 1845 (in honor of Dr. L. Preiss).—A shrubby or arborescent species, sometimes attains a height of 30 feet, and a stem-diameter of 1 foot, branches rigid; bark rough, greyish; leaves short, thick, cylindrical, stiff and sharp-pointed; flowers yellow, small, many in axillary clusters; fruit not very large, blunt, with a more or less prominent horn in the back of each valve. Its proved habitat is from a little south of York, west to the Darling

Range, and thence to the Irwin and Murchison River, and probably to Shark's Bay.

Remarks.—Wood is dark-colored, firm and hard, and should be of value for inlaying and cabinet-work. This endemic plant in no locality seems partial as to soil.

6. *H. laurina*, *R. Br.*, 1830 (from a fancied resemblance in the foliage to that of the Laurel).—Varies from a shrub of 10 feet to a tree of 30 feet in height; leaves of moderate length, oblong or oblong-lanceolate, long-stalked, and with 3 conspicuous nerves; flowers pale to bright-red, small, numerous, and forming globular clusters in the axils of the leaves; fruit rather large, shortly beaked, and with a crest along the upper line of junction between the valves. Its principal habitat is along the south coast, chiefly on hills east of Albany.

Remarks.—Of the wood nothing is known, but the species is a highly ornamental one, being largely cultivated and sold by nurserymen under the name of H. eucalyptoides. It is endemic. It may be stated that the name "eucalyptoides" was given to this species in 1845 by Meissner, after an examination of specimens gathered by Dr. L. Preiss, at Konkoberup Hills during November, 1840.

(E). *Stenocarpus*, *R. Br.*, 1809 (alluding to the fruit being narrow).—This genus comprises about 14 species of which 11 occur in New Caledonia, and 3 in Australia.

S. Cunninghamii, *R. Br.*, 1830 (in honor of Allan Cunningham).—A tall bushy shrub or tree of not more than 25 feet in height; leaves of moderate length, lanceolar, indistinctly 3-5 nerved; flowers not large but numerous in a distinctly stalked axillary umbel; fruit a narrow coriaceous follicle, the winged seeds overlapping downwards in 2 rows. It has been recorded from Vansittart Bay and Prince Regent's River.

Remarks.—This ir, I believe, the only representative of the Embothrieæ recorded from Western Australia.

(F.) *Banksia*, *Linné fils*, 1781 (in honor of Sir Joseph Banks).—This genus consists of about 48 species of which one occurs in British New Guinea, the remainder being restricted to Australia. Of the Australian species all but ten are entirely restricted to the extra-tropical portions of this State, whilst one (B. dentata) extends from the shores of Queensland to a few localities in the North-West. Generally, the genus is a littoral one, only the most recent addition (B. Elderiana) being recorded from the eastern interior. Its members not only furnish good timber and shelter, but comprise many highly ornamental plants. Bark of most species contain up to 10 per cent. of tannic acid.

1. *B. littoralis*, *R. Br.*, 1809 (referring to habitat).—A tree usually attaining a height of 40 feet or more, with a stem-diameter of 3 feet and a clear trunk of 25 feet; bark rough,

greyish ; leaves usually scattered, sometimes whorled, rather long and narrow, with or without distant teeth, dark-green above, white beneath ; flowers yellow, silky, in long cylindrical spikes ; fruiting-cones finely hairy, capsule prominent, not thick and finely hairy. It extends from east of Albany to the Swan River district.

Remarks.—Wood is pale-red, firm, tough, and rather prettily marked, and should furnish excellent material for gun-stocks, furniture, etc. The species is vernacularly known as the "River" or "Swamp Banksia" on account of it usually inhabiting the banks of watercourses and swamps. Some good examples are growing in the swamps at Bayswater and in the vicinity of Perth, largely contributing towards the firewood supply of that city. The specimens of timber on exhibition in the Forestry Museum, marked B. verticillata or "River Banksia," probably belong to this species. B. verticillata is closely allied, but is seldom, if ever, more than a large shrub of 15-20 feet in height, and is almost entirely restricted to the south coast.

2. *B. attenuata, R. Br.*, 1809 (probably having reference to the spike).—This sometimes forms a tree of 40 feet in height, but usually less, and a stem-diameter of 1½ feet; bark greyish ; leaves narrow-lanceolate, not very long, dark green above, pale and finely hairy beneath, netted veins numerous ; flowers yellow, glabrous, in long hairy cylindrical spikes ; fruiting-cones stout, with scarcely prominent silky-hairy capsules ; capsules broad, with a scar at the right-hand edge. The species extends from the south coast to Shark's Bay.

Remarks.—Wood is of similar character to preceding species. The species is abundant in the vicinity of Perth, usually growing in sandy or sandy-heathy localities, and forms a constituent in the firewood supply. The bark is rougher and more fissured than that of the "Swamp Banksia," but owing to their similarity in foliage they are often confounded. It is one of the most abundant of the endemic members of the genus. According to Dr. Preiss, who collected specimens of the plant near Perth over 60 years ago, it was known to the natives as "Mangeit."

3. *B. Solandri, R. Br.*, 1830 (in honor of Daniel Charles Solander).—Usually forms a small tree of 30 feet in height with a stem-diameter of 1 foot, and finely hairy stout branches ; leaves three times as long as broad, divided to the midrib into several pairs of triangular lobes, above dark-green, beneath silvery white and much veined ; flowers yellow, upper portion glabrous, lower hairy, on long cylindrical or short oblong spikes, capsules thick and glabrous Grows usually on hills along the south coast.

Remarks.—Nothing is known of the timber, but it is doubtless similar to that of the "Swamp Banksia." The usual habitat of the species is in sandy soil. Incidentally it may be stated that the species extending towards the eastern confines of the State are two only, i.e., the coastal B. media and the desert B. Elderiana, both of which are shrubby or semi-arborescent. Of Eastern species only the widely-spread B. marginata (Honeysuckle of Victoria and Tasmania) approaches our eastern border, it being recorded from Marble Range in South Australia.

4. *B. grandis, Willd.*, 1797 (having reference to foliage or inflorescence).—A tree often of 40 feet in height, with a stem-diameter of between 1 and 2 feet; branches stout and tortuous, finely-hairy; bark dark-grey; leaves long, leathery, divided to the midrib into numerous almost triangular segments, dark-green above, pale-colored and much netted beneath; flowers yellow, the upper portion glabrous, lower hairy, in long and thick cylindrical spikes; fruiting spike or cone thick, with smooth broad capsules. The habitat is from the south coast to the Swan River district.

Remarks.—Wood of a reddish color and of similar character to that of its congeners. This is one of the most ornamental members of the genus, the dimensions of the foliage and inflorescence being equalled by no other species. It usually grows in sandy or heathy soil, frequently lining the banks of watercourses. Examples occur in the vicinity of Perth, but they, along with other species, are rapidly disappearing, principally through the instrumentality of the firewood cutters. It will be noted as being the first of our extratropical species to receive a specific designation.

5. *B. dentata, Linné fils*, 1781 (leaves toothed).—A small tree of about 20 feet in height; leaves four times as long as broad, wedge-shaped to oblong, with numerous irregular teeth, dark-green above, pale-colored and much veined beneath; flowers yellow, silky, with a glabrous base, in oblong or rather long cylindrical spikes; fruiting cones oblong or cylindrical, capsules not very broad, half-immersed. It has been recorded from the Glenelg and Prince Regent's River.

Remarks.—This is the only tropical and non-endemic species in Western Australia, it being rather common along the hotter coasts of Queensland and of the Northern Territory.

6. *B. Menziesii, R. Br.*, 1830 (in honor of Archibald Menzies).—A tree of 30-40 feet in height, with a stem-diameter of 1-2 feet and stout tortuous woolly-hairy branches; bark verrucose, greyish; leaves long, narrow, prominently

toothed, dark green above, invested with reddish woolly-hairs and much veined beneath ; flowers silky-hairy, upper portion yellow, tube and style pale to bright-red, in a thick, rather stout, more or less hairy spike : fruiting cones in the young state marked spirally with lozenge-shaped divisions, capsule thick and finely-hairy. Extends from the Swan River district to Greenough and Murchison Rivers.

Remarks.—Wood is tough, of a reddish color, firm, prettily grained, and takes a good polish. Along with that of the first 2 species, it furnishes the principal portion of the "Banksia" firewood supply. It is abundant throughout the Swan River district, forming along with B. attenuata the secondary forest vegetation in open sandy scrubby areas. The B. dentata referred to in the "Forests of Western Australia and their Development" is either B. Menziesii or B. attenuata.

7. *B. prionotes*, *Lindley*, 1839 (from the serrated leaves).—This constitutes a tree of 25-30 feet in height, with stout crooked, finely woolly-hairy branches ; bark greyish ; leaves long, narrow, blunt, regularly and rather deeply divided into flat, acutely pointed teeth, dark-green above, pale and much veined beneath ; flowers yellow, densely hairy, in a moderately long and very thick spike ; fruiting cones thick, with broad woolly-hairy capsules. This species is distributed from the Upper Gardner to Swan and Murchison Rivers, thence to near Shark's Bay.

Remarks.—Wood of similar character to that of most congeners. In habit and appearance this species bears a remarkable resemblance to some forms of B. Menziesii in the vicinity of Perth, being often associated with that plant. In some localities, particularly near Shark's Bay, B. attenuata is solely the associated species. Examples of B. prionotes have been observed as far inland as 140 miles north-east of Geraldton.

8. *B. ilicifolia*, *R. Br.*, 1809 (resemblance of foliage to that of the Holly).—A tree frequently attaining a height of 40 feet, with a clear straight trunk of 15-20 feet and a stem-diameter of nearly 2 feet ; bark dark-colored, rough ; leaves very harsh, not large, from ovate-oblong to wedge-shaped, wavy and usually prickly-toothed ; flowers rather large, yellow or reddish, glabrous or nearly so, with a silky-hairy base, not numerous, in a very short spike, appearing head-like among the last leaves ; fruiting cones very small, with 1-2 ovoid, thick woolly-hairy capsules. The proved habitat is from near Albany north to above the Swan River.

Remarks.—Wood is harder than that of most species, and is prettily marked. This is the "Prickly Banksia," and forms the connecting link with the endemic Dryandras, to one species of which it bears a remarkable resemblance in foliage. It is common in the vicinity of Perth, usually attaining its greatest perfection when growing in moist sandy spots.

XXV.—LORANTHACEÆ, A. L. de Jussieu (1808).

13 genera, about 500 species. Chiefly tropical, with a few genera confined to temperate regions. The Order is of little value, the majority of the species, on account of their parasitical habit, are injurious to other vegetation. The fruits of some furnish birdlime. In Australia there are 5 genera with 27 species, 2 of which are monotypic and comprise the only members of the Order having a terrestrial habit.

Nuytsia, *R. Br.*, 1831 (in honor of Peter Nuyts, a Dutch navigator).—This genus consists of 1 species, which is endemic and the only member of the Order attaining arborescent proportions. The second terrestrial species is the monotypic Atkinsonia ligustrina, F. v. M., of New South Wales. This forms a bushy shrub of 2-6 feet in height. The other West Australian members of the Order belong to the parasitical genus Loranthus.

N. floribunda, *R. Br.*, 1831 (in allusion to the abundance of flowers).—A tree of 20 or occasionally 40 feet in height, with a basal diameter of 2 feet; branches thick and often tortuous; bark dark-grey; leaves not large, narrow, flat but thick, dark-green; flowers reddish-yellow, showy, numerous, in long racemes, which are crowded at the ends of the branches; fruit dry, brown, with 3 broad longitudinal thickened wings. It ranges from near Albany north to the Murchison River.

Remarks.—Wood pale-colored, very soft, of a spongy character and of no known commercial value. It exudes a white or pale-colored gum, which in the fresh state is very adhesive. This remarkable and highly ornamental plant does not seem partial to any particular kind of soil, nor does it extend inland far distant from the coast. The flowers are produced during December, attaining their greatest perfection about the end of that month, hence the origin of the vernacular name of "Christmas tree." According to Dr. Preiss, who collected specimens near Perth in 1838, it was termed by the colonists "Cabbage-tree." The radical portion of the stem thickens considerably immediately below the surface of the ground and often throws up white scaly shoots, which gradually ascending to the surface develope into new plants. The roots are few, very watery and spongy. The species is reputedly difficult of reproduction but I have seen numerous seeds that have germinated after they had fallen on the surface of the ground and then perished, evidently from the effects of the direct rays of the sun; therefore, it is apparent that the reproduction of the species from properly ripened seed should not be attended with any great difficulty. Reproduction by means of the stolon-like shoots should be attended with reasonable success.

XXVI.—SANTALACEAE, R. Br. (1810).

28 genera, 220 species. This is distributed over the temperate and tropical regions of the earth. In Australia there are 7 genera with 43 species.

(A) *Santalum*, *Linné*, 1742 (from the Persian Chandal, the name of the tree).—A genus of about 8 species, natives of Southern Asia, the Pacific Islands, and Australia. The Australian species number 3, only 1 of which is West Australian.

S. lanceolatum, *R. Br.*, 1810 (reference to the leaves).—A shrub up to 15 feet or a small tree of 25 feet in height, the branches often pendulous; leaves not large, mostly lanceolate, shortly pointed and tapering into a conspicuous stalk; flowers large, reddish, in short trebly branched panicles at or near the ends of the branchlets: fruit a reddish or black large obovoid globular drupe. The West Australian localities for this species are Rawlinson and Cavenagh Ranges, near Mt. Bates, Gascoyne River, Hammersley Range, Fortescue River, between La Grange Bay and De Grey River and other tropical localities.

Remarks.—Not known to be of any particular value. Belonging to the same genus is the true sandalwood of India (S. album, Linné). This is a tree of 30-40 feet in height, with a clear trunk of 8-15 feet, and a stem-diameter of 12-15 inches; leaves lanceolate, of a leathery texture; flowers rather large, at first pale-yellow, then turning purplish or blood-red; fruit black, about the size and shape of a cherry, with a hard, shortly 3-ribbed stone. The wood is white or pale-yellow, the young trees furnishing the former, old trees the latter. This is burnt as a perfume, or ground into powder and used as a cosmetic, being in much request by Burmese ladies. In India the wood is sometimes used for trunks, cabinets, walking-sticks, etc. A valuable oil is also distilled from it.

B. *Fusanus*, *R. Br.*, 1810 (from the French for the "Spindle-tree.")—This genus consists of 5 species, 4 occurring in Australia and one in New Zealand. Three species occur in Western Australia, of which one is endemic.

1. *F. acuminatus*, *R. Br.*, 1810 (alluding to the leaves.)—From shrubby to arborescent, sometimes attaining a height of 30 feet, with often pendulous branches; leaves not large, opposite, lanceolate; shortly stalked, with a straight or hooked point, thick and somewhat leathery; flowers greenish-white or pale-yellow, very numerous and small, forming a short panicle at the ends of the branchlets; fruit a large globular drupe, bright-red outside, succulent, and containing a hard deeply pitted stone. This species extends from the extra-tropical portion of the west coast, throughout the interior to beyond the South Australian border.

Remarks.—The timber has been found to be suitable for wood engraving and carving, it being handsome and close-grained. It is often used by the aborigines for producing fire by friction. Stock freely eat the foliage. The fleshy portion of the fruit and the kernel are both edible, the former having a pleasant sub-acid flavor, and the latter a taste resembling almond. A very good jelly can be made from the succulent portion. A shrubby form is abundant, growing on sandy hills in the vicinity of the sea north of and close to Cottesloe, where it produces quantities of ripe fruit, vernacularly known as "Native Peaches" or "Quandong."

2. *F. persicarius*, *F. v. M.*, 1854 (derived from the fruits being known as "native peaches.")—A tall shrub or small tree of 25 feet in height; leaves narrow to narrow-lanceolar, usually with a hooked point, and somewhat resembling those of the last species; flowers small, pale-yellow, forming short panicles in the axils of the upper leaves; fruit a moderate sized globular drupe, brownish-red outside, hardly succulent, of a bitter taste, the stone slightly pitted. The proved habitat is from the south-west interior intermittently to Shark's Bay, thence to the South Australian border.

Remarks.—With regard to its timber nothing definite is known. Sometimes in the Eastern States it is called the "Native Sandalwood," and often the "Native Peach."

3. *F. Spicatus*, *R. Br.*, 1810 (referring to the inflorescence).—Usually a small tree of 25-30 feet in height, and a stem-diameter of about 15 inches; branches spreading; leaves not large; oblong to almost lanceolate, coriaceous, with a blunt point and short thick stalk; flowers small, greenish-white or yellowish, in short spike-like panicles, from the axils of the leaves; fruit a rather large globular drupe, yellowish outside, not fleshy, the stone smooth. This species ranges from the south coast to Shark's Bay, and thence throughout various portions of the interior.

Remarks.—Wood is of a pale color, not very heavy, firm, takes a good polish, and is often utilised for inlaying, etc. It is scented, and constitutes one of the sandalwoods of commerce. Fully 2 per cent. of oil is obtainable by distillation. It is of a pale-yellow, and is reputedly better in fragrance than that of Santalum album. This sandalwood is endemic and sporadic, and like the rest of the genus, is slow in growth.

(c.)—*Exocarpus*, *Labill.*, 1798 (referring to the fleshy pedicel resembling a fruit).—This genus comprises 12 species, and extends to New Zealand, Malayan Archipelago, Norfolk and Sandwich Islands, and Madagascar. In Australia there are 10 species, all but 1 being endemic.

E. latifolia, *R. Br.*, 1810 (leaf broad).—A small tree of 25 feet or often less in height; leaves not large, broadly-ovate-oblong, blunt, leathery; flowers very small, white in slender short spikes or racemes; fruit small, ovoid, on a thick top shaped fleshy, reddish-colored stalk. This widely distributed species has been recorded from Prince Regent's River and Roebuck Bay.

Remarks.—Besides occurring in the Northern Territory, Queensland and New South Wales, it is generally distributed over the East Indian Archipelago to the Philippines.

XXVII.—EUPHORBIACEÆ, A. L. de Jussieu (1789).

200 genera, about 2000 species. Mostly confined to tropical countries. The Australian members comprise 39 genera with 226 species. This large Order is more closely allied to the Tiliaceæ than to any Order amongst the Apetalæ. Poisonous principles predominate, being present chiefly in their milky juice. The roots and seeds of various species furnish emetics and purgatives. Several Cactus-like Euphorbias yield gum-resin, other yield deadly poisons, such as the manchineel and the African arrow-poison. The bottle Indian-rubber or Caoutchouk is produced by the Hevea Guianensis. Ricinus or Castor-oil plant, sweet and bitter cassava, etc., are members of the Order. Many yield valuable timber.

(A.) *Bridelia, Willd.*, 1805 (after Professor Bridel).—About 30 species distributed over tropical Africa, Asia and Australia. The Australian species number 4, of which 2 are endemic.

B. tomentosa, Blume, 1825 (tomentose).—A small evergreen tree, usually under 30 feet in height, with very slender branches; bark corky; leaves thin, not large, oblong to ovate, elliptical, with 7-15 nerves on each side of the midrib; flowers inconspicuous, in small clusters; fruit rather small, globular, of a blue-black color. Recorded from Prince Regent's River and adjacent localities.

Remarks.—Wood pale-greyish brown, heavy, close-grained, but soft. Besides being a native of Queensland and the Northern Territory, the species extends to India and South China.

(B.) *Petalostigma, F. v. M.*, 1857 (referring to the broad, petal-like stigmatic branches).—This genus consists of a single species, endemic in Australia.

P. quadriloculare, F. v. M., 1857 (having reference to the usually 4-celled fruits).—Mostly a tree of 25-30 feet in height, with rather slender, finely-hairy branches; leaves ovate, not very large, glabrous above, finely hairy beneath; flowers pale-colored, small, woolly-hairy, several together; styles in the female flowers expanded into wedge-shaped, bluntly-toothed wings; fruit of a reddish-yellow, globose, fleshy, with a hard stone-like centre, which separates into three or four pieces. This plant occurs at Prince Regent's River and adjacent localities.

Remarks.—This is the "Quinine-tree" of the Northern Territory and North-East Australia. The powdered bark has the reputation of being efficacious in cases of low or intermittent fever. It has been stated that the intensely bitter ripe fruit is of considerable value as a febrifuge for horses.

(c.) *Antidesma, Linné*, 1747 (named from the use made in India of some of the species).—A most difficult genus of about 60 species, distributed over tropical Asia, Africa, Australia and the Pacific Islands. There are 7 species in Australia, of which 5 are endemic.

A. Ghæsembilla, Gært., 1788.—Often a tree of 20-25 feet in height, with a trunk of 6-10 feet and a diameter of nearly 1 foot; bark not very thick, fissured longitudinally, black-brown; leaves of moderate size, ovate or nearly orbicular, rounded or heart-shaped at the base, shining above, rusty-hairy beneath, nerves in 5-6 pairs, shortly stalked; flowers very small, numerous, in short spikes; fruit a small sub-globose drupe, red, then dark-purple, sappy, kernel flattened and pitted. Occurs at Port Nelson, Careening Bay and vicinity.

Remarks.—Wood rather heavy, fibrous, close-grained, brittle, of a whitish color. The species is usually leafless during the hot season. A common species from Ceylon to Southern China, also abundant in the East Indian Archipelago, and not uncommon in the Northern Territory.

XXVIII.—URTICEÆ, Ventenat (1799).

108 genera, 1500 species. The members of the order are chiefly confined to tropical regions In several genera causticity prevails, this character being very pronounced in the nettle and the Laporteas or tree-nettles, one species of the latter being called by the Malays "doun Seitan" (Devil's leaf.) Endlicher has stated that this stinging character is caused by the presence of bicarbonate of ammonia. Many species contain extremely poisonous properties, examples being the juice of the Upas-tree of Java (Antiaris toxicaria) and the milk of some fig-trees (such as Ficus toxicaria, F. dæmona, etc.)—Rubber is obtained from several species of Ficus, also from a few other genera The cow-tree of South America yields a plentiful supply of wholesome milk. Numerous species yield strong fibre, such as hemp and rhea; paper is manufactured from the bark of another species. Of other economic plants in this Order may be mentioned the following fruit trees:—Figs, Jack, Breadfruit, Mulberry, etc. In general the timber is not good, in many instances that of large trees being quite worthless. However, there are a few exceptions. In Australia the Order is represented by 19 genera, containing 65 species.

(A.) *Celtis, Tournefort*, 1700 (a classical name for the Lotus).—Consisting of about 50 species distributed over temperate and tropical regions, chiefly in the Northern Hemisphere. In Australia there are 3 species, 1 being endemic.

C. Philippinensis, Blanco, 1837 (of the Philippine Islands).—Varying from a tall shrub to a tree of 25 feet or more; leaves from moderate to large sized, leathery, green, broadly-ovate, with 3 prominent nerves; flowers small, numerous in small cymes; fruit a small ovoid drupe with a hard slightly rugose stone. The following are amongst Western Australian localities :—Vansittart and Careening Bays and King Sound.

Remarks.—This species is very closely allied and perhaps identical with the Indian C. Wightii, Planch.

(B.) *Ficus*, *Tournefort*, 1700 (old Latin name for the common Fig-tree).—This genus consists of about 600 species, most of which are tropical. There are 40 species recorded from Australia, 12 of which extend to Asia.

1. *F. nesophila*, *Miquel*, 1867 (from being found on several islands).—A glabrous tree of 30 feet in height, with a smooth pale bark ; leaves very large, leathery and shining above, ovate or oblong, principal veins prominent beneath, conspicuously stalked; fruits globular, under ½-inch diameter, solitary or in pairs in the axils of the lower leaves or lateral from the joints of the previous year's growth. It has been recorded from Cambridge Gulf, Enderby Islands, King Sound, Nichol and Collier Bays.

Remarks.—Extends to Northern Territory and Queensland.

2. *F. eugenioides F. v. M.*, 1866.—A small or large tree sometimes attaining a height of 100 feet, but fruiting when a shrub, quite glabrous ; leaves rather small, leathery, lanceolate to elliptical-oblong, veins not prominent, conspicuously stalked ; fruits globular, about the size of a pea, yellow to reddish, sessile in pairs in the axils or on the joints below the lower leaves. York Sound and Prince Regent's River are recorded localities.

Remarks.—Occurs in Queensland, New South Wales and New Guinea.

3. *F. puberula*, *A. Cgh.*, 1847.—A tree of 25-30 feet in height ; leaves variable as to size, leathery, often slightly hairy, ovate and blunt or narrow and tapering to a point ; fruits globular, smooth, about the size of a large pea, on densely puberulous stalks of about ½-inch, usually in pairs in the axils of the leaves. Occurs at York Sound and Port Walcott.

Remarks,—An extremely variable plant.

4. *F. platypoda*, *A. Cgh.* (referring to the flattened leaf-stalk).—A tree not exceeding a height of 25 feet, of robust growth, glabrous or more or less hirsute ; leaves of moderate size, ovate and blunt, rounded or wedge shaped at the base, of a leathery texture, veins numerous, the stalk more or less flattened ; fruit globose, of the size of a large pea, smooth, with or without stalks, in pairs in the axils of the leaves. As follows are some of the localities for this species :—Extra-tropical : Shark's Bay, Gascoyne River, south of Lake Carnegie, Warburton Range and vicinity, etc. Tropical : York Sound, Nichol and Vansittart Bays,

Prince Regent's River, Mt. Pyrton (at a height of 2500 ft.) etc.

Remarks.—The timber of this variable species is of no value. It does not occur in Victoria or New South Wales.

5. *F. hispida*, *Linné fils.* 1781.—A tree of 30-40 feet in height, with a clear stem of about 12 feet and a diameter of $1\frac{1}{2}$ feet, the branches often hollow and contracted at the joints, they and the leaves more or less stiffly hairy; leaves opposite, very large, oblong-ovate, rounded or heart-shaped at the base, the edges entire or shallowly toothed; fruit varying in shape from almost pear-shaped-ovoid to globose-ovoid, whitish in color, about the size of a cherry, usually 2 together, each on tawny greyish-pubescent stalks and then arising from the axils of the lower leaves, or more often forming a rather long scaly leafless raceme at the base of the stem, the latter being in reality adventitious roots. It occurs at Brunswick Bay and other localities.

Remarks.—Also recorded from the Northern Territory and Queensland, extending to Southern Asia.

XXIX.—CASUARINEÆ, Mirbel (1809).

Consists of a single genus.

Casuarina, *Rumphius*, 1743 (supposed to be derived from the pendent branches resembling the plumage of the Cassowary).—A genus extending to Asia and East Africa, and represented in Australia by 24 species, all endemic but one.

1. *C. quadrivalvis*, *Labill.*, 1806 (having reference to the fruit).—A tree sometimes attaining a height of 40 feet, with pendulous branches; bark dark-colored, rough; teeth in whorls of 9-12, male and female flowers on separate plants; male spikes at the ends of branchlets or on old wood, 2-4 inches long; cones often very large and ovoid, valves much protruding, broadly triangular, with a prominent ridge on the back. The species is sparingly distributed from the South Australian border towards Victoria Spring.

Remarks.—Timber is strong, durable, easily worked and beautifully marked and much used in the Eastern States for shingles, also for cabinet work and inlaying. The foliage contains a very acid principle, and is greedily eaten by stock, it being one of the best stands-by in time of drought. Owing to their indigestible character the hard winged seeds of this and other species are fatal when eaten by poultry. This species usually grows in rocky or sandy soil and easily withstands a dry climate. It occurs in all the States with the exception of Queensland, and in no instance has it been recorded as penetrating the tropics. In the East it is variously termed "Oak," "'Forest,' 'Swamp,' or 'She-Oak.'"

2. *C. glauca*, *Sieber*, 1826 (from the hoary-grey appearance of the plant).—Usually a tree of 25-30 feet in height, with spreading branches; and a rough dark-colored fissured bark, the whole

often of a greyish appearance ; teeth in whorls of 9-16, male and female flowers on separate plants ; male-spikes rather short and thick, the sheath teeth rather acute and usually ciliate ; cones small, flat-topped, almost globular, valves prominent, often finely hairy, ridged on the back. Ranges from the Swan River district, to throughout the eastern interior.

Remarks.—Timber is hard, tough, durable, and strong, is prettily marked and much used in the Eastern States for shingles, staves, etc. Like most of the genus, furnishes good firewood when used in the dried state. The foliage is eaten by stock. Experiments have proved that saw-dust of the wood of Casuarinæ turns water reddish, and imparts to it a bitter and not unpleasant taste. When the liquid is partaken of it produces a laxative effect. C. glauca extends to all the States of the mainland, being variously known as "Bull," "Black," or "River" She-oak. It is rather common in the eastern interior, forming strong patches over stony or sandy localities, some good examples occurring in the vicinity of Broad Arrow, Bardoc, etc., the character from which the specific name was derived being most pronounced. Examples have been observed in the interior of South Australia, of a height of 80 feet, with a corky bark and rather long male-spikes. The form named C. obesa by Miquel is common near Perth and furnishes the principal host plant for Loranthus linophyllus.

3. *C. Huegeliana*, *Miquel*, 1845 (honor of Baron Hügel, who visited the Swan River and King George's Sound during 1833).—A tree of 25-30 feet in height, with a rough bark, branches slender, erect or pendulous, male and female flowers on separate plants ; male-spikes resembling those of C. glauca, but more slender, the sheath teeth 8-12 and not ciliate ; cones rather long, cylindrical or sometimes ovate-globose, with closely packed small valves, which are slightly rough and hairy on the back. Ranges from the southern portions of the State north to the Murchison River, and has been also observed at Ularing and Victoria Spring.

Remarks.—The timber is not much used, but as it closely resembles that of C. glauca, it could doubtless be utilised for similar purposes. This species is endemic, and closely resembles C. glauca. It is common in the vicinity of Serpentine, where it grows on stony ridges.

4. *C. distyla*, *Ventenat*, 1800.—This varies from a low shrub to a small tree of 25-30 feet in height, with a stem-diameter of 1 foot or more, teeth short, usually 7-8, male and female flowers usually on separate plants ; male-spikes moniliform, rather long, on small deciduous or persistent branches ; cones rather large, almost or quite stalkless, ovate or oblong, valve not large, with a smooth protuberance on the back. This occurs at Swan River and the south coast, with numerous interjacent localities.

Remarks.—Timber is light, tough, strong, and much used in the Eastern States for shingles and staves. It is often termed "Oak." The species is indigenous in all the States, with the exception of Queensland. Arborescent examples are not uncommon in the neighborhood of Perth.

5. C. *Fraseriana*, *Miquel*, 1848 (in honor of Charles Fraser, a former Colonial Botanist of New South Wales, who in 1827 visited the Swan River district).—A tree of 30-40 feet in height, very much like the arborescent forms of C. distyla, the teeth usually in whorls of 6, sometimes rather long, acute and ciliate; male-spikes similar to those of C. distyla, cones large, very hard, almost globular; valves not very prominent, the backs warty or tuberculate, glabrous or finely-hairy. The range of this species is from Albany to the Swan River district.

Remarks.—Timber is hard, very handsome, strong and light. Is of considerable value for staves, cabinet work and inlaying. The species is endemic, and is probably the most abundant of the arborescent species, and, like all others, not partial as to soil. Is common round Perth.

6. C. *Decaisneana*, *F. v. M.*, 1858 (in honor of Joseph Decaisne).—A tree of 30-40 feet in height, with a clear trunk of 20 25 feet, the branches stiff and cylindrical; teeth of a chaffy texture, rather long, with fine erect points, in whorls of 4; male-spikes stout, about $\frac{3}{4}$ inch long; cones 2-2$\frac{1}{2}$ inches long, ovoid, woody, covered with short, dense, woolly hairs, the thick valves not protruding. This species is confined to the far interior, it having been observed at Lake MacDonald, between Petermar and Robinson Ranges, Mt. Barrow, and many other localities.

Remarks.—Timber is stated to be very hard, resisting the attacks of "white ants" and fungi. It is of straight grain and easy to split. The foliage is eaten by camels. This species is found throughout the whole of the central hotter portions of Australia, being absent from Victoria and New South Wales. It is probably the largest of the genus, and only flourishes in the most arid localities.

XXX.—CONIFERÆ, Haller (1747.)

33 genera, about 300 species, chiefly confined to cold regions. uncommon in tropical Africa and America, and absent from the Malayan Peninsula and the plains of India and Ceylon. In Australia there are 11 genera with 29 species. The Order is one of the highest importance, the majority of the arborescent forms furnishing valuable timber. Some species attain enormous proportions, an example being the mammoth-trees of California. Some of these attain a height of 400 feet or more, with a diameter of 30 feet. Various members of the Order furnish balsams, resins, pitch, oil of turpentine, etc.

Callitris, *Ventenat*, 1808 (probably altered from Kallistos, most beautiful).—A genus of 14 species, ranging over Australia, Africa, Madagascar, and New Caledonia. In Australia there are 10 species.

C. Verrucosa, *R. Br*, 1826 (referring to the warty cones).—Forming either a bushy shrub or a tree of 40 feet in height, the slender branches crowded, and often of a bluish color; scales small and acute; cones from moderate to large sized, nearly globular and generally covered with tubercles. Sparingly dispersed over nearly the whole area of the State.

Remarks.—Timber is very strong and durable, is of a light color, rather hard, with a pleasant scent, and would make excellent furniture. It is obnoxious to insect-life in general. When dried its specific gravity is about 0.691, a cubic foot weighing 43 lbs. It exudes a quantity of sandarac. Excellent veneers for cabinet work can be obtained from the root-stock. This species ranges over the whole of the Australian continent, sometimes in the East attaining a height of 80 feet. In the Swan River District it seems to have a partiality for limestone rocks and sand dunes, generally in close proximity to the sea.

XXXI. CYCADEÆ, L. C. Richard (1807).

9 genera, about 80 species. The members of this Order are natives of the tropics and southern temperate regions. Almost the whole of the species contain quantities of a nauseous mucilaginous sap, which in some is mixed with a considerable amount of starch, which is often utilised by natives as food. In Australia there are 3 genera, with 14 species.

(A) *Cycas*, *Linné*, 1737 (Greek name for a palm).—A genus of about 15 species, distributed over tropical Australia and Africa, Polynesia and Asia, extending as far north as Japan. There are 4 species in Australia, 1 or more of which doubtless extend to New Guinea.

C. media, *R. Br.*, 1810 (of medium size).—Attains a height of 20 or more feet, trunk stout, cylindrical, simple, rarely branched at the summit, and bearing a head of large elliptical lanceolate pinnate leaves of 3-5 feet in length; pinnæ many, narrow, the lower ones passing into spines; male and female flowers in separate plants; male flowers in rather large terminal ovate cones; female flowers terminal; the inflorescence apparently consisting of small pinnate leaves, which are surrounded at the base by a tuft of woolly hairs; fruits rather large, glabrous, yellowish. This species occurs at Prince Regent's River and other localities along the north-west coast, extending for some distance inland.

Remarks.—This highly ornamental species is in cultivation. It is not uncommon in the Northern Territory and the hotter portions of Queensland, and if my observations are correct it is not uncommon along parts of the southern and south-eastern coast of New Guinea.

(B) *Macrozamia*, *Miquel*, 1844 (from Makros, long and Zamia, an allied genus.)—This genus is entirely Australian, and

and consists of 9 species. Subsequent to 1844, Miquel transferred the members of the above genus to Encephalartos, an African genus established by Lehmann in 1834.

All Macrozamias are pervaded by an active poisonous principle, which becomes inoperative on the application of heat. The genus differs chiefly from the Cycas in the pinnæ having no midrib.

M. Fraseri, *Miquel*, 1844 (in honor of Charles Fraser).—Stem several feet in circumference, erect, cylindrical, simple, woody, covered with the scars of old leaves, attaining a height of 10 feet, but usually much less; crowded at the summit by harsh, bright or dark-green long pinnate leaves, the linear pinnæ forming a joint at the base, and tapering to a spiny point; male and female flowers on different plants, both forming terminal ovoid cones, surrounded at the base by a quantity of wood; fruit or nuts rather large, with a tough, brownish coating. Its proved habitat extends from Stokes' Inlet to beyond the Irwin River.

Remarks.—This highly ornamental species is endemic and so tenacious of life that it can be transported for long distances for replanting purposes. It exudes a pale-yellow gum. The fruit contains an abundance of starch; in a raw state it is poisonous, but when macerated in water or roasted can be eaten. By many the leaves as well as the fruits are regarded as poisonous to stock, the symptoms being that of rickets. As the young foliage is very fibrous, and therefore indigestible, death or sickness, if it does occur from eating it, is probably not due to the presence of a poisonous principle. Examination of the stomach has shown it to contain invariably quantities of fibre, along with the remains of the nuts, the active principle being evidently derived from the latter. The fruits of the rarer endemic M. (Encephalartos) Dyeri are stated to possess similar properties.

XXXII.—JUNCACEÆ, Endlicher (1841).

14 genera, about 200 species. Widely scattered over the earth. In Australia there are about 10 genera, with 65 species.

(A.) *Xanthorrhœa*, *Smith*, 1798 (from xanthos, yellow, and rheo, to flow, in allusion to the resin which exudes from the species).—This is an entirely Australian genus of about 12 species, all of which are long-lived plants, with usually a thick woody stem, many of the species attaining arborescent dimensions. It comprises, with perhaps one exception, the so-called "Black-boys."

X. Preissii, *Endl.*, 1846 (in honor of Dr. L. Preiss).—A fibrous rooted plant with a thick stem, which often attains a height of 10-12 feet, simple, or occasionally divided near the summit, and crowned by a dense tuft of spreading, brittle, flat or angular leaves; flowers small, white, in a long terminal cylindrical spike, often occupying nearly its whole length. It extends from the south coast to a considerable distance north of the

Swan River district, thence to the interior, it having been recorded from Boorabbin and a few other localities.

Remarks.—The stem of this species, in common with that of many other, exudes a dark-yellow gum or resin in considerable quantities, of the character of what is known as "Black-boy gum" or Ascaroid resin. This gum has the reputation of being a good preservative; can, and has been used in the manufacture of sealing-wax, and contains abundance of Picric acid. It may not be generally known that in 1854 a Capt. Wray, R.N., submitted to the West Australian authorities a report on the manufacture of gas for illuminating purposes from this Grass-tree. Besides giving a detailed description of the method to be adopted in obtaining the gas, and notes on the bye-products, he stated that the illuminating power was superior to that of coal gas, and that the cost of lighting would be one-third the expense of candles or oil. The pith of the stem is edible, and contains fully 10 per cent. of sugar. Owing to their inflammable nature portions of the dried stems are used for kindling purposes. The plant is endemic, and grows abundantly in poor soil, forming one of the most conspicuous objects in open forest country.

(B.) *Kingia, R. Br.*, 1827 (in honor of Capt P. G. King). —This genus consists of a single species, endemic to extra-tropical Western Australia.

K. Australis, R. Br., 1827 (Southern).—Of similar habit and appearance to the last species. The trunk sometimes attains a height of 20 feet; the terminal tuft of linear leaves are finely toothed, or apparently invested with white silky hairs along the margins; the broad leaves silky-hairy; flowers numerous, small, pale-colored, in dense globular heads on stout bracteate stalks. It is distributed from Albany to above Swan River.

Remarks.—Along with Xanthorrœa Preissii this constitutes a most striking object in West Australian vegetation. It is particularly abundant in the vicinity of Midland Junction, in that, as in most other localities, being associated with the Xanthorrhœa, and passing under the general term "Black-boy" or "Grass-tree." It is usually of latter habit, but not so robust, and can be distinguished at a glance by the resemblance of the inflorescence to drum-sticks.

XXXIII.—PALMÆ, Ray (1703).

130 genera, and about 1100 species. The members of this Order are chiefly tropical. The family is of great economic value, members producing sago, sugar, dragons-blood, oil, wax, flour, fibre, etc. Of notable species there may be mentioned the Cocoa, date and betel-nut. In general they are of little use in forestry, the wood, though elastic, being coarse and perishable. It is represented in Australia by 10 genera and about 25 species.

Livistona, R. Br., 1810 (in honor of Patrick Murray, of Liviston).—A genus of about 14 species, distributed over tropical

Asia and Australia, the latter containing 4 endemic species.

L. Alfredi, F. v. M., 1891 (in honor of Prince Alfred).—Erect, with an annulate trunk of 40 feet in height; leaves terminal, fan-shaped, divided into numerous segments, which are split at the apex; stalks long, with spiny margins and sheathed at the base in a mass of netted fibres; flowers small, pale-colored, paniculate. This species has been recorded from the Hammersley Range, Fortescue River and its tributaries, from the source of the Robe River and Caves Creek.

Remarks.—This tropical "Fan Palm" is endemic, and for a considerable time was considered identical with the Central Australian L. Mariæ, F. v. M.

XXXIV.—PANDANEÆ, R. Br., (1810.)

2 genera, with nearly 80 species. This order is widely distributed over the tropics of the Old World, chiefly adjacent to the sea-coast. Pandanus and Freycinetia are the only genera, both of which are represented in Australia, by 7 and 4 species respectively. The Order is not of much importance, the wood being usually coarse and fibrous, becoming hard outside with age.

Pandanus, Rumphius, 1750 (from Pandang, the Malayan name for the genus).—Comprises 50 species which are natives of the tropical regions of the Old World. They constitute the screw-pines. The leaves of many species are used in the manufacture of mats, cordage, etc.

P. odoratissimus, Linné fils, 1781 (very fragrant).—A slender tree of 15-20 feet high, with spindle-shaped roots; branches divaricate from the summit of the trunk; leaves in drooping tufts at the ends of the branches, linear and very long, whitish-green, the midribs and margins invested with straight white or purplish pointed spines; fruits fleshy and scarlet outside, woody fibrous within, and forming a large oblong-elliptical drooping head. It occurs at King Sound, Beagle Bay and numerous other coastal localities in the North-West, penetrating for some distance inland.

Remarks.—A scent much valued in Java is extracted from the flowers, likewise the Keora oil of India. The pulpy portion of the fruit is edible, while from the roots are manufactured baskets, mats, etc. This screw pine is indigenous in the Northern Territory and Queensland, extending thence through Polynesia to Tropical Asia.

Although the species referred to here are numerous, yet they do not comprise all attaining arborescent dimensions, but doubtless enough has been written to show that there are within the State trees yielding not only hardwoods, but oils, gums, tannic material and other products. When we take into consideration the diversity of our flora, and in many instances the area of distribution of some of the species outside our boundaries, one cannot help being dissatisfied with the paucity of information with regard to their distribution and probable value to the State. I allude particularly to the tropical districts. Since the labors of Sir John and the late Mr. Alex.

Forrest we have heard but little of the vegetation of our tropical hinterland. It was hoped that the recent Kimberley exploring expedition would have furnished much material, but it must be confessed the results were disappointing. According to the Government Botanist only about 100 species were collected, and as no report has been published regarding them, it may be assumed that all were referable to known plants.

It may be stated that all Eucalypti yielding timber of little value furnish good material for dry distillation. Wood of this character on being subjected to heat in a vacuum yields a fair percentage of wood spirit, acetic acid and tar. Tests made in Melbourne with the wood of some of the common Eucalypti gave the following results :—Crude wood-vinegar, 44 per cent.; tar, 6 per cent.; and uncondensible gases, 21 per cent., the residue being charcoal. The amount of spirit in wood-vinegar ranges from 4-5 per cent. According to Mueller's deductions, from 100 lbs. of air-dried wood, there can be obtained nearly two gallons of vinegar of proof strength, easily transferrable into acetic acid. The spirit is a good solvent. The tar is an excellent material as a protection against atmospheric influence, and as its production is nearly as cheap and as easy as ordinary charcoal, it would possibly furnish an avenue for the disposal of at least part of the 50-60 per cent. of waste now occurring at our timber mills.

A considerable proportion of the State affords ample scope for the creation of forests of timber trees. There can be no doubt, whatever may be said to the contrary, that the creation of forests where there are none tends to increase the rainfall of a country, and therefore the fertility of the soil, and that the destruction of living forests without adequate replacement has a contrary effect. With regard to the latter such statements as that natural production will always equal consumption are opposed to the fact, and therefore not worthy of serious consideration.

Experiments are being made in the growing of hardwooded exotics as timber trees, those responsible ignoring the existence of many species of Australian timber trees more deserving of culture. I refer to members of the genus Eucalyptus What better plant could we have for inland culture than the South-East Australian "Blue Gum" (E. globulus)? It would appear that Professor Edward Cooper had West Australia in his mind when he wrote—"Whilst in other lands Australian trees are considered of so much importance as to have been dignified with the title of trees of the future, does it not seem strange that in Australia they should be held comparatively of little value?"

In conclusion, it may be stated that on hygienic and utilitarian grounds it is necessary to at once undertake the proper conservation of our forests, and the creation of plantations in suitable localities throughout the present almost treeless interior.

[Note.—Since this paper has been in print a Royal Commission has been appointed to deal with the Forestry Question. Mr. Fitzgerald, the author of this paper, has been appointed a member of the Commission.—Ed.]

Two New Species of Orchideae from Western Australia.

BY *Dr. L. DIELS (Kgl. Botan. Museum, Berlin.)*

DIURIS PURDIEI, Diels, n. sp.

A small species, about 6-8in. high, with two hyaline sheathing scales at the base of the stem. Leaves from a somewhat widened base narrow-linear, filiform, $2\frac{1}{2}$-3 inches long. Bracts lanceolate-linear, shorter than the pedicels. Dorsal sepal shorter than the lateral petals ; lateral sepals pointed, longer than the labellum. Lateral petals with a long claw, elliptical, yellow with purple veins. Labellum tripartite with two short raised lines ; middle lobe large, almost rhomboid, much longer than the small half-ovate lateral lobes, which are deeply cleft on the outer side.

Collected near Cannington on October 7th, by Alex. Purdie, M.A. —This new species is easily recognised by the narrow leaves and by the labellum very different from that of D. setacea, our other narrow-leaved Diuris.

[NOTE.—This species was referred to in the JOURNAL for June, 1902, as Diuris pedunculata, R. Br. The true D. pedunculata has not been recorded from this State.—ED.]

NOTE ON DIURIS.—The arrangement of the genus in Bentham is by no means satisfactory ; I rather prefer Lindley's descriptions. After having studied the papers of R. Brown, Lindley, and Endlicher, I think Bentham has mixed together anything he liked. Take for instance, Diuris setacea of Bentham (Fl. Austr. VI. p. 329). There you find D. setacea R. Br., D. filifolia Lindl., and D. carinata Endl. supposed to be one species. I am quite sure now, however, that there are three different species resembling each other in foliage, but very different in flower. The D. carinata Endl. I believe to be the shorter stouter plant found in the Darling Range, near Perth. The D. Purdiei is different from any other I have seen, in the structure of the labellum. I have found no description anything like it in Brown's or Lindley's papers.

MICROTIS GYMNADENIOIDES, Diels, n. sp.

Stem slender with one basal scale, 10-18 inches high. Leaf rather long, the free part about 4-7 inches long. Raceme 2-3 inches long, narrow cylindrical. Flower white. Dorsal sepal broad, ovate, concave, with a small point at the summit ; lateral sepals spreading, not recurved, rather blunt, much like the lateral petals, but a little broader. Labellum quadrangular-oblong, sub-emarginate at the summit and crisped in the middle part ; the disk of the labellum marked at the base by two small appendages, and bearing a small thickening towards the end.

Collected by myself close to Albany towards the North in wet sandy flats with Restioneæ and Epacrideæ, flowering in November, 1901.—This species seems to be related to M. pulchella R. Br. unknown to me ; it is different, however, from the description

(Bentham, Fl. Austr. VI. 349) in the longer leaf, the dorsal sepal wider and more concave, the crisped margin of the labellum, and the larger flowers.

The following note an the subject of one of our Orchids occurs in a letter from Dr. Diels to Mr. Purdie.—"The little pink Caladenia found by us near Albany has turned out to be C. nana Endl., collected in the early days in just the same locality, by Preiss (cf. Plantæ Preissianæ). It is supposed to be identical with C. reptans Lindl., but I am satisfied that this is a blunder of Reichenbach fil.

Two New Species of Plants Indigenous to Western Australia.

BY CECIL R. P. ANDREWS, M.A.

HIBBERTIA TRIANDRA, n. sp. **Nat. Ord Dilleniaceæ.**

An undershrub of 6-10 inches, much branched from the base; the branches covered with short stiff hairs. Leaves alternate, $\frac{1}{2}$-$\frac{3}{4}$ inch long, linear-cuneate, the base enlarged into a small stem-clasping sheath, the tip 3-4 toothed, the margins bordered with stellate hairs, and the midrib prominent. Flowers yellow, solitary on hairy axillary pedicels about $\frac{1}{2}$in. long. Calyx glabrous; sepals acute, 2-2$\frac{1}{2}$ lines long, with green midrib and scarious margins. Petals narrow, entire, scarcely as long as the sepals, obtuse or almost acute. Stamens 3 with elliptical introrse anthers. Carpels 3, alternating with the stamens, glabrous, 1-ovulate.

The leaves are much like those of Candollea Preissiana Steud. in shape, but the stem-clasping sheath is much less prominent than in that species.

The most remarkable point about the new species is that the stamens are constantly 3, regularly alternating with the three carpels. Hibbertia, as defined by Bentham, is a genus with "stamens indefinite, rarely fewer than 12, and then usually all on one side of the carpels." I have found no trace of staminodia. The genera in which the stamens are definite -Adrastæa and Pachynema—have 10 stamens in a complete ring round the pistil. In Adrastæa the filaments are connate: in Pachynema the leaves are reduced to minute scales. In Candollea the stamens are in bundles. The new plant does not, therefore, agree well with any of the genera forming the tribe Hibbertieæ, and I have been doubtful whether I should not describe it as a new genus. On the whole, however, I have thought it best to consider it as forming a new section of Hibbertia—Oligostemon.

I found the plant flowering in a swamp near Middleton Beach, two miles from Albany, in December, 1902, and January, 1903.

Though I searched many other swamps in the surrounding country, I failed to find it anywhere else.

DROSERA HAMILTONI, n. sp. **Nat. Ord. Droseraceæ.**

Stock not bulbous, the upper part covered with the remains of old leaves. Leaves all in a radical rosette, spathulate, narrowed into a petiole, $\frac{1}{2}$-$\frac{3}{4}$ in. long in all. No stipules. Scape leafless, 8-15 in. high, with a one-sided raceme of 6-12 flowers on pedicels of 2-4 lines. Scape, pedicels, and calyx all clothed with short reddish glandular hairs. Sepals 5, about 2 lines long, obtuse: petals 5-6 lines long, broadly obovate, of a rich red-purple. Stamens 5; anthers very large. Styles united almost to the top, where they separate into three fringed stigmatic lobes.

This species comes under the section Rorella. It is distinguished clearly from all other species by its style. This is about $1\frac{1}{2}$ lines long, and apparently quite simple, the stigmatic lobes being separable only for about $\frac{1}{4}$ line.

I found this plant, in December, 1902, flowering in good quantity in a large swamp, about $1\frac{1}{2}$ miles North of Albany, in company with Dr. Diels's new species of Microtis. I followed the swamp for about $1\frac{1}{2}$ miles, and saw plenty of the Drosera everywhere, but I did not see it in any other swamp. It is remarkable that a tall species with such conspicuous flowers, growing so close to Albany, should have escaped notice so long.

I have named the species after Mr. A. G. Hamilton, a New South Wales botanist, who has done much valuable work in connection with the methods of fertilization of Australian plants. Mr. Hamilton was with me when I first saw the Drosera.

Notes on some New Species of West Australian Plants

. . . BY . . .

W. V. FITZGERALD, F.S.Sc., Lond., F.R.H.S., Engl.

PHYTOLACCACEÆ.

GYROSTEMON SHEATHII, Sp. nov.

Erect, shrubby, branches thick, somewhat succulent, scars of fallen leaves numerous and prominent. Leaves rather crowded at the ends of the branches, elliptical to broad-linear, entire, sessile, flat though thick and succulent, obtuse, prominently grooved above, 1-$1\frac{1}{2}$ inches long. Flowers small, reddish-green, axillary, solitary, on very short patent or recurved pedicels. Male flowers unknown. Female flowers deeply 6-9 lobed, 2 or 3 inner ones smaller than the others, the open perianth about 1-line diameter. Ovary of 5-7 carpels, angles prominent. Stigmas ovate, flattened, radiating from a disk-like column. Fruit on thickened pedicels of 1 line long, depressed-turbinate, succulent, reddish outside, fully 2 lines diameter, the carpels when mature separating at both the outer and inner angles and on falling off leaving the central column with the stigmas persistent. Seeds strophiolate, reniform, $\frac{3}{4}$-line diameter: testa brown, rugose.

Locality.—Torbay Inlet (H. E. Sheath), December 1902.

Remarks.—Approaches G. brachystigma, F. v. M., differing chiefly in habit, in the more numerous broader leaves, and in the pedicellate flowers.

According to Mr. Sheath, the new plant is not more than a couple of feet high, and only grows in close proximity to the sea. When fresh the specimens have a peculiar musty odor, a considerable proportion of which is retained after drying.

AMARYLLIDEÆ.

CONOSTYLIS DIELSII, Sp. nov.

Rhizome creeping, stems short, the whole plant, excepting the perianths, invested with white, woolly, simple hairs. Leaves numerous, of soft texture, distichous, with broad sheathing leaves, the outer ones much reduced, 3-6 inches long, about 1 line broad, margins entire, sometimes showing striæ. Scapes as long as or slightly longer than the leaves, slender, bearing besides the floral bract a single linear-lanceolate one of $\frac{3}{4}$-$1\frac{1}{2}$ inches in length above the middle. Flowers pale-yellow, not numerous, in a slightly branched terminal cyme Pedicels very short, subtended by linear-acute herbaceous bracts, equalling or slightly exceeding the perianth-tube. Perianth campanulate, 5-6 lines long, closely invested outside with a short plumose tomentum, glabrous or slightly hairy within. Segments lanceolate-linear, the 3 inner ones slightly shorter than the outer, about twice as long as the free part of the tube. Anthers linear, on very short, slender filaments. Placentas in the adnate portion of the ovary, dilated, with few reflexed ovules on the under-side. Style very slender. Ripe fruit not seen.

Locality.—Mingenew (Dr. L. Diels), August 1901.

Remarks.—The species is allied to C. Drummondii, Benth., differing chiefly in foliage and inflorescence. It is named in honor of the discoverer, Dr. L. Diels, Ph.D., of the Botanical Museum, Berlin, who, accompanied by Dr. E. Pritzel, spent a considerable time in collecting examples of our flora.

FILICES.

PTERIS LONGIFOLIA, Linné.

A fern was recently brought under my notice by Messrs. S. J. Randell and J. Sheath. It occurs at the Yallinup Caves, where the fronds attain a height of 3 or occasionally 4 feet. It proved to be the above-named species, which has hitherto not been recorded as indigenous in this State.