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THE

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OF THE

Field Naturalists' Club of Victoria.

VOL. XXXIV.

MAY, 1917, TO APRIL, 1918.

Hon. Editor: MR. F. G. A. BARNARD.

The Author of each Article is responsible for the facts and opinions recorded.

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ILLUSTRATION.

ERRATA.

Page 43, line 4 from bottom should read—"I suppose that's how."

Page 131, line 29—For "*Crowea (Eriostemon) saligna*" read "*C. exalata*."

Page 131, line 30—For "*Brachyloma depressa*" read "*Leucopogon rufus*."

Page 162, line 25—For "above from" read "from above."

The Victorian Naturalist.

Vol. XXXIV.—No. 1. MAY 10, 1917. No. 401.

FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 16th April, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about forty members and visitors were present.

THE LATE MR. J. G. O'DONOGHUE.

The president referred to the great loss the Club had sustained by the death of Mr. J. G. O'Donoghue, who had occupied the position of hon. secretary for the last three years. He said that Mr. O'Donoghue had shown great interest in his work, and had never spared himself when he could be of service to the Club. He had also been an excellent field worker, and had contributed several valuable papers to the Club's proceedings. His illness had been a serious one from the commencement, but it had been hoped that with skilful attention and nursing he would have been restored to health.

Messrs. Barnard, Hardy, St. John, Rosenhain, and Wisewould spoke feelingly with regard to the late Mr. O'Donoghue, and recounted his many good qualities, especially as a companion in the field.

The president moved—"That this Club places on record the great and lamentable loss it has sustained by the death of its highly esteemed and respected hon. secretary and active field naturalist, Mr. J. G. O'Donoghue, at Malvern, on Good Friday, 6th April, 1917, and that the resolution be conveyed to his aged mother and relatives, together with an expression of the deepest sympathy, on behalf of the members of the Club."

The resolution was seconded by Dr. C. S. Sutton, and passed in silence, all standing.

CORRESPONDENCE.

From chairman Hawthorn Tramways Trust, stating the Fisheries and Game Department had agreed to proclaim the land near Burwood, purchased for park purposes, a sanctuary for native birds and animals.

REPORTS.

A report of the excursion to the Tramway Park, near Burwood, since named Wattle Park, on Saturday, 24th March, was made by the leader, Mr. F. G. A. Barnard, who said that, favoured by a fine day, there was a very good attendance of members and friends. A fair amount of the land was found to

be almost in its original state, and especially the eastern portion should afford good shelter for native birds. The little Autumn Orchid, *Eriochilus autumnalis*, was blooming freely, but necessarily wild-flowers were scarce. He suggested that the Club should consider the question of endeavouring to get a small area set aside to which native shrubs, &c., might be introduced from other districts.

A report of the excursion to the Dee Valley on Saturday, 7th April, was given by the leader, Mr. C. A. Nethercote, who said that owing to the very bad weather only four members left town for Millgrove. Owing to the sodden state of the ground it was found impossible to ascend Ben Cairn as had been intended. The party therefore returned to West Warburton, and spent the following day in the Britannia Creek district.

ELECTION OF MEMBERS.

On a ballot being taken, Miss G. V. Buchanan, D.Sc., Biology School, University, was duly elected an ordinary member; Mr. Wm. D. M'Phee, State school, Rochester, a country member; and Mr. Dudley Dickison, Rock Brook-road, East St. Kilda, an associate member of the club.

GENERAL BUSINESS.

The chairman stated that, as president of the Club, he had been invited to attend the opening of Wattle Park, Riversdale, on Saturday, 31st March, and plant a memorial tree. He stated that Acacias had naturally been selected for the purpose, and some fifty specimens, comprising about eighteen varieties, had been planted.

Mr. St. John suggested that the land offered a good opportunity for the formation of a suburban forest on similar lines to those of France.

Mr. St. John read a letter from Mr. Geo. French, of Queen-street, Melbourne, with regard to the destruction of palms, more especially the seedlings, at Cabbagetree Creek, East Gippsland. The reservation was made at the instance of the Club many years ago.

It was resolved, on the motion of Messrs. Barnard and Rosenhain, to forward a copy of the letter to the Lands Department, with a request that steps be taken to secure the protection of the seedling palms.

Mr. St. John read a newspaper paragraph stating that some persons had been fined at Benalla for shooting quail out of season.

Mr. J. Shephard stated that he had recently been along the Donnabuang track, and spoke enthusiastically of the splendid forest growth in the vicinity of Cement Creek. He mentioned

that he had seen three Lyre-birds crossing the track. He also suggested that a Club excursion should be made to the O'Shannassy Weir

PAPER READ.

By Mr. O. W. Rosenhain, entitled "A Thousand Miles on the River Murray."

The author recounted some of the incidents of a steamer trip from Echuca to Murray Bridge, giving many interesting particulars regarding the timber along the banks, the effects of floods, &c. He also gave some details of the scheme for locking the river, the works for which are now in progress at Blanchetown.

His remarks were illustrated by an excellent series of nearly one hundred lantern slides.

EXHIBITS.

By Mr. J. W. Audas, F.L.S.—Specimens of the Autumn Orchid, *Eriochilus autumalis*, collected at Nar Nar Goon, 16th April.

By Mr. C. J. Gabriel.—Marine shells, *Murex tenuispina*, Lam., Ceylon; *M. palma-rosa*, Lam., Ceylon; and *M cervicornis*, Lam., North Australia.

By Mr. P. R. H. St. John.—Herbarium specimens of *Eucalyptus maidenii*, F. v. M., Spotted Blue Gum, collected by Dr. W. H. Green at Phillip Island, 7th April; also sample of crude oil distilled from *Eucalyptus fastigata*, Deane and Maiden, at Laboratory, Botanic Gardens, Melbourne, 14th April, 1917.

After the usual conversazione the meeting terminated.

EXCURSION TO RIVERSDALE.

A PARTY of about forty, including several members of the Microscopical Society, journeyed to the terminus of the Riversdale tramway line on Saturday, 24th March, in order to visit the land recently secured by the Hawthorn Tramways Trust for park purposes. This land, having an area of about 137 acres, has a frontage to Riversdale-road of nearly three-quarters of a mile, with a depth along Boundary-road and Elgar-road of rather more than a quarter of a mile, and thus affords ample space for the intended purpose. Approaching the park from the terminus, it is seen to be intersected by a deep valley, which offers great possibilities to the landscape artist for improvement by tree-planting, &c., as it is now very bare. On the further side of the valley, and extending through to Elgar-road for a distance of nearly half a mile, the land is well timbered with its

original vegetation in the shape of eucalypts of several species, which, though not large trees, are very picturesque. The highest portion of the land, which, according to the military survey map (Ringwood), is slightly over 300 feet above sea-level, has been cleared and put under crop at some earlier date. The gums met with on first entering the park were chiefly *E. amygdalina*, Common Peppermint Gum, but as the soil changed from loam to a more sandy character on the eastern slope of the hill, *E. viminalis*, Manna Gum, became the predominant species. Here and there odd specimens of *E. melliodora*, Yellow Box, *E. macrorrhyncha*, Red Stringybark, *E. cinerea* var. *multiflora*, Silver-leaved Stringybark, and *E. ovata* (*E. paludosa*), Swamp Gum, were met with. Acacias were represented by *A. armata*, Kangaroo Thorn, probably spread by birds from an originally planted hedge; *A. mollissima*, Soft-leaved Black Wattle, of which young seedlings were coming up in many places; and an odd plant or two of *A. oxycedrus*. A single specimen of Casuarina, and two or three small *Exocarpos cupressiformis* were also noted. Of other shrubs, *Bursaria spinosa* and *Leptospermum scoparium* were the most prominent. Of course, it was not the season for a display of wild-flowers, still a few plants were found in bloom, among them the first orchid of the season, *Eriochilus autumnalis*, which occurred in considerable numbers near the Elgar-road (eastern) boundary. The other plants noticed in bloom were *Convolvulus erubescens*, *Minuria*, sp., *Bursaria spinosa*, and *Erythræa australis*. A few plants of the Maiden-hair Fern were seen in a small gully near Elgar-road. The eastern portion of the land should prove a good sanctuary for numbers of our smaller birds, and on Saturday last the following species were noted:—Rosehill Parrakeet, Kookaburra, White-shafted Fantail, Black-and-White Fantail, Superb Warbler, Yellow-tailed Tit-Warbler, Sordid Wood-Swallow, Magpie Lark, White-backed Magpie, Yellow-breasted Shrike-Tit, White-plumed Honey-eater. For the names of the eucalypts noted, and the birds seen, I am indebted to Mr. St. John. From the highest part of the land a fine view is afforded of the Dandenong Ranges, and on Saturday the positions of Olinda and Sassafras could be easily made out, but southerly and westerly the view was somewhat obscured by haze; however, Arthur's Seat, near Dromana, and, due west, the long, level ridge of the Brisbane Range, were just discernible. Through a break in the trees Mt. Monda, near Healesville, and, further round, the Warburton ranges, were visible. Those members desirous of securing pond-life specimens and microscopic material went further afield, as there is at present little water in the park suitable for their requirements. Unfortunately, the party got separated, and thus returned from Burwood at different times.

The pond-life devotees report that the park contained very little water, and that very muddy, and did not look very promising in the way of specimens, but examination showed that many of the well-known forms were present. The list included :—*Euglena oxyuris*, (?) *Holophrya*, *Asplanchna* sp., *Notops clavulatus*, *Triarthra* sp., *Monostyla* sp., *Synchcta* sp., *Brachionus* (2 spp.), *Simocephalus gibbosus*, *Moina australiensis*, *Pseudomoina lemnæ*, *Chydorus* sp., *Alona* sp., *Cyclops albidus*, *C.* (?) *fimbriatus* var., *C.* (?) *strenuus* var., *Cypridopsis minna*, *Cypris* sp., also the larger forms of life, as Water-bugs and Beetles. Seeing that it is the intention of the Tramways Trust to beautify the land by tree-planting, &c., and, if possible, to use only Australian trees, it might be suggested that these should be planted in masses rather than single specimens, which often fail for want of mutual protection. However, little can be done in this way if grazing is allowed on the land ; even the young gums and wattles now springing up will speedily vanish before the cows and horses which were seen there on Saturday, 24th. It is gratifying to learn that the land has been proclaimed a sanctuary under the *Game Act*, and it would be well if members of this Club would take upon themselves the duty of acting as honorary guardians of the place. In fact, it might be a further inducement to members to take an interest in the park if an acre or so of the eastern portion was set aside and enclosed, in which members could plant shrubs, &c., brought from other parts of the State.—F. G. A. Barnard.

The Quail Season.—A letter appeared in the *Age* of 3rd or 4th of April, signed "Preston," complaining that quail-shooting had started too soon, as there were great numbers of young birds and brooding hens about. I was out on the opening day (2nd April), and got a nice bag of birds, and had the opportunity of examining five others. These six bags contained about sixty brace of quail, and among them there was not one immature bird. All these birds were obtained in the neighbourhood of Preston. I consider our Club is entitled to some credit for its efforts during the past fifteen years to protect the birds until April. If there are young birds in April, surely shooting should not commence in March, as so many of our opponents desired. Possibly this season is somewhat later than usual, but birds are unusually plentiful all over the State. A friend in the Goulburn Valley says birds are plentiful there. That is one of the districts from which birds were said to depart before the end of February.—G. A. Keartland. Preston, 16th April, 1917.

THE POND AND ITS INHABITANTS.

By J. SEARLE.

(*Read before the Field Naturalists' Club of Victoria, 15th Jan.*, 1917.)

To the student of nature, whether he be a botanist or a zoologist, there is nothing that affords so much interest as a well-filled pond shaded by a few trees, or perhaps overhung by a willow. The variety of living things that spend the greater part of, if not their entire existence, in such places is very great, and their life-histories and transformations are most wonderful. It is this fact that makes pond-hunting such a fascinating pursuit. The expectation, so often realized, of finding something new, makes the pond-hunter visit again and again, at all seasons of the year, some favourite pool, and its inhabitants afford him a never-ending course of instructive study and recreation.

The pond-hunter's implements are very simple. All that he requires for the collecting and carrying home of his specimens is a small net made of fine muslin and a few wide-mouthed bottles or corked tubes. For the examination of most of his captures a pocket lens is all that is required, but for the smaller organisms or for the finer details of larger specimens a microscope is needed: but such a lot of useful work can be done, and such a store of information gathered, with the aid of a good pocket lens that the non-possession of a microscope need not deter anyone who is a stranger to the charms of pond-life study from making an excursion into this entrancing realm.

For the guidance of those about to take up this study, the following hints will be useful, and may save disappointment at the earlier stages of their work; and the apparatus described, though simple and sometimes even crude, will be found just as serviceable and effective as the most elaborate outfit procurable from the shops of dealers in natural history stores—indeed, the whole of the collecting work of the writer has been done with similar apparatus.

The most indispensable part of the outfit is the net. To make this, take a piece of stout wire (brass is best, as it does not rust, but ordinary galvanized fencing wire does very well), twenty-two inches in length; at one inch from each end bend this at right angles; the length between these bends is then formed into a ring, bringing the two-inch pieces parallel to each other (see figure). These may be soldered to a metal socket, made to fit over the end of a walking stick, or they may simply be bound tightly to the stick. A cone-shaped bag of fine muslin is then made, six inches in diameter and seven inches in depth; this is sown to the wire ring, and a glass tube

or small vial fastened at the apex of the net completes it. In use the net is moved backwards and forwards through the water a few times, then raised up out of the water; the water will escape through the meshes of the muslin, and anything captured by the net will remain in the tube at the bottom, and can be transferred to a bottle for future examination.

Often it is desired to examine weeds growing at the bottom of a pond or beyond our reach from the bank; these can readily be secured by the aid of a pond hook, easily made as follows:— Take two pieces of wire, about 14 gauge, one nine inches in length, the other four inches. Double the longer piece in half, like a hairpin, making a loop in the middle about $\frac{1}{4}$-inch in diameter, place the short length against the doubled wire, see that the ends are even, and twist the three together just below the loop. Around the twisted part cast a lump of lead, just as you would in making a sinker for an eel line. When cold trim the lead to an oval shape and then bend each of the projecting wires into a hook. A strong line attached to the loop completes this handy addition to our outfit. Glass bottles with screw metal tops, such as vaseline and boot creams are sold in, are generally to be found in most households: these, when thoroughly cleaned, are very useful for bringing our captures home in, while one or two small preserving jars with similar tops serve well for larger specimens. A box or bag to hold these various items completes our outfit (a waterproof camera bag is very useful for the purpose). Thus equipped, and with our lens in our pocket, we are ready to investigate any pool in our vicinity with the certainty of securing in half an hour enough specimens to provide material for many an evening's study.

Melbourne is particularly favoured with respect to ponds of easy access for an afternoon excursion. On either side of the River Yarra, from Richmond to Heidelberg, there are numerous pools that delight the heart of the pond-hunter. Some of these, particularly those at Heidelberg, near the bridge over the river, have been visited by naturalists for many years, and are still yielding new specimens in response to our closer investigations and thirst for knowledge. The ponds at Willsmere are also famous, but I am afraid they are doomed for destruction to make way for a Chinese vegetable garden. Nearer town the Albert Park Lake is well worth a visit, while the numerous pools on the heath grounds of Cheltenham and Sandringham afford rare material when at their best.

I will now endeavour to describe some of the inhabitants of these ponds, together with their habits and life-histories and such other information as may be of interest to the student who takes up this subject, and enable him to identify

some of his captures—not always an easy thing to do, owing to the absence of literature on the subject.

WATER FLEAS.

One of the commonest inhabitants of our ponds is the water flea. It received this name not because it was related in any way to the lively insect which at times proves so irritating to man, but because of the jerky manner in which it progresses through the water. The water flea belongs to that division of animals called Crustacea, of which the shrimp and crayfish are familiar examples, and is placed in that group of the Entomostraca called Cladocera. The water fleas were among the first of the pond animals in Australia to receive the attention of naturalists, several forms being described and figured by the Rev. Robt. L. King as early as 1851. One of these, which he named *Daphnia carinata*, is of great interest to biologists on account of the variability in the form of its carapace. Seven distinct varieties have been recognized by specialists, one of which, var. *lamellata*, possesses the additional distinction of being the largest known Daphnia, its measurements being 8.3 mm. in length and 7 mm. across the cephalic part of the carapace. It is accordingly nearly twice as large as *D. magna*, which hitherto has been considered as the largest of all Daphnias.

For the microscopist there is no more beautiful object for examination than Daphnia. It is so beautifully transparent that we are able to examine through the carapace every function of its existence. We see the rhythmic beat of its leaf-like legs drawing fresh streams of water into its carapace so that the blood is aerated and regenerated by the oxygen dissolved therein; and it might be said with truth that Daphnia breathes through its feet. Its heart, placed in the middle of its back, can be seen in rapid pulsation; we can see the slit-like valve open and close as the blood is drawn into and forced out of that organ, and by observing the corpuscles floating therein we may follow its course as in turn it bathes the brain, stomach, respiratory organs in the legs, circulating through the carapace, and flowing back to the pericardial cavity to be again drawn into the heart, and once more sent circulating through its body.

Furthermore, if we have the patience of a true lover of nature, we can watch with interest the formation of the eggs in the ovary, and study the development of the young Daphnia from the segmentation of the egg to the expulsion of the fully-developed young from the brood chamber of the mother.

Daphnia, in common with the rest of the Cladocera, possesses a single eye, of a compound nature, placed in the front of the

head. In shape it resembles a blackberry, having a number of lenses surrounding a mass of black pigment. It is well supplied with muscles, and is connected by an optic nerve with the ganglia, or brain.

Not the least remarkable feature in the life-history of Daphnia is the mode of reproduction. In the ovary of the female parthenogenetic eggs are formed—that is, eggs that have the power of segmentating and developing into a new animal without having first been impregnated and fertilized by spermatozoa from a male. These eggs develop into female Daphnias, and they in turn produce parthenogenetic young; and the process may go on for quite a number of generations without ever a male being seen. Then through some unknown cause—it may be through food becoming scarce—some males are hatched, and copulation between the sexes takes place. The eggs resulting from this union differ in a remarkable way from the parthenogenetic eggs. These latter were numerous, perhaps twenty or thirty being laid at a time, and these were carried about in the brood chamber of the carapace of the mother until the young were hatched. On the other hand, the fertilized eggs—two only in number—are enclosed in the ephippium, or saddle, of the carapace, which gradually thickens around them, and remain there until the next moult, when the ephippium with its embedded eggs are cast off. These ephippial or resting eggs, as they are called, are enclosed in a horny shell, and possess remarkable vitality. They may be dried up for years, and be blown about by the wind during long periods of drought; and yet, when the wet season returns, and the pools again fill with water, these eggs hatch out as female Daphnia, and the life-cycle is again carried through.

As a recorded instance of the vitality of these eggs, it may be mentioned that some years ago a number of Daphnia eggs were gathered up with the dry sand on the shore of Lake Burrumbeet, and stored in a glass bottle fitted with a screw metal top. Every year a portion of this material was placed in a vessel filled with clean water, when a number of the eggs would hatch out. These hatching operations were repeated with success for five years. The following year the remaining portion of the material was divided into two parts. One of these was sent to a scientist in Norway, while the other was placed in a vessel of water, as on previous occasions. From both of these samples young Daphnia were hatched. The experiment proved that the eggs of Daphnia could remain dried for a period of at least six years, withstand a voyage through the tropics, and still retain their vitality, so that when placed in water they hatched out as young Daphnia at the

other side of the world. A number of aquatic animals produce resting eggs, or have resting stages, wherein they retain their vitality for lengthy periods, and this explains why pools that have been dry for a considerable time, on again being filled with water are soon swarming with animal life.

There are a great many species of Cladocera in the pools around Melbourne, and all are objects of extreme interest. Some, like Daphnia, are found in open water; these belong to the genera Ceriodaphnia, Moina, Pseudomoina, Bosmina, &c. Others are found amongst the water weeds; these are Simocephalus, Chydorus, Alona, &c., and all are parthenogenetic.

The Whirligig Beetles—Gyrinidæ.

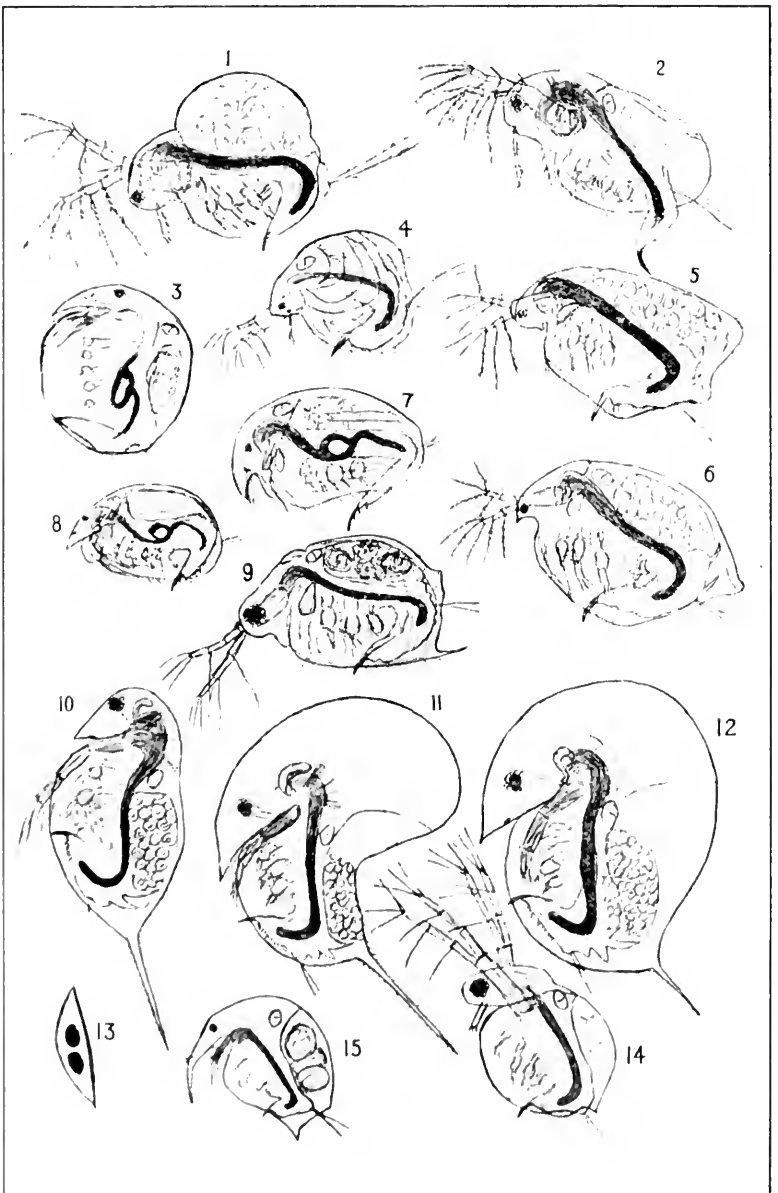
Anyone who has visited a pond or a quiet nook on a stream must have seen the Whirligig Beetles engaged in their amazing dances, making all manner of curves and crossing each other's course without ever a collision, rushing madly in and out in a very frenzy of excited movement, full of complexity and grace. But, make an attempt to sweep some of them into your net, and they scatter in an instant, diving and swimming out of reach of danger, assembling again when all is quiet to resume their surprising evolutions. Members of this remarkable family are found all over the world, from sea-level to snow-line, and all indulge in these peculiar gyrations.

A most remarkable feature in this beetle is its eyes. These are large, and nearly spherical, but are each divided by a ridge of chitinous material into two, so that the beetle appears to have four eyes, an arrangement of great use to the insect, for, as it swims about, two of the eyes are searching for food below the water, while the other two keep a lookout above. Their food consists of dead insects, which they find in the water, or disabled ones that happen to fall on the surface of the pond.

In leaving the pond for nocturnal flight, this beetle has to climb out of the water up the stem of some plant a few inches before it can use its wings. It flies with a rapid, whirring flight, and often to a great distance from water, as may be observed from their presence around the electric light globes of the city. Though such excellent swimmers and capable fliers, when they come to earth they are anything but graceful insects. Their first pair of legs are long, and are used for climbing out of the water, while the other two pairs are very short, and while they are admirably adapted for swimming, are not of great service for walking on earth: their motion is a series of hops and wriggles, and, unless they can climb to an elevation, they are not able to again take to flight, so many perish by being crushed under foot on the sidewalks.

The female beetle lays her eggs on the leaves of a water plant; they are placed end to end in parallel rows. The eggs

PLATE I.



J. SEARLE, *del.*

WATER FLEAS.

are small and cylindrical in shape, and in about eight days the young larvæ are hatched.

The larvæ are long and narrow, provided with a strong pair of jaws, and three pairs of legs of equal length; the other nine segments of the body are provided with branchial processes, or gills, well supplied with air tubes, which connect with tracheæ that pass right along the body. Though the larvæ must be very numerous in our ponds, they are not often observed; being long and thin, and whitish in colour, they easily escape notice. I do not remember ever taking a whirligig larva in a pond, though on rare occasions I have captured them on the long ribbon-like leaves of the Triglochin, floating at the surface on the River Yarra.

When mature the larva leaves the water, and, selecting a safe resting-place on some water plant, several inches above the water, it spins a cocoon in which it pupates, and from which, in due course, the perfect beetle is hatched. Fully 300 species are known; they are generally distributed, though wanting in most of the islands of the world, except those of large size.

DESCRIPTION OF PLATE.

PLATE I.—1, Moina australiensis; 2, Pseudomoina lemnæ; 3, Chydorus globosus; 4, Ilyocryptus sordidus; 5, Simocephalus gibbosus; 6, Simocephalus acutirostratus; 7, Camptocercus, sp.; 8, Alona pulchella; 9, Scapholeberis kingi; 10, Daphnia carinata, forma typica; 11, Daphnia carinata, var. cephalata; 12, Daphnia carinata, var. lamellata; 13, resting eggs of D. carinata; 14, Ceriodaphnia, sp.; 15, Bosmina, sp.

(*To be continued.*)

CHILDREN'S ROOM IN THE NATIONAL MUSEUM, MELBOURNE.

ON Tuesday, 8th May, in the presence of His Excellency the Governor and Lady Stanley, the first Children's Room in connection with a National Museum in Australia was opened by Miss Adelaide Stanley. The very first Children's Room of this kind was organized about the year 1900 by Dr. S. P. Langley, the distinguished secretary of the great Smithsonian Institution. Speaking on behalf of the children, and as one of them, he said:—"I should say that we have never had a fair chance in museums. We cannot see the things on the top shelves, which only grown-up people are tall enough to look into, and most of the things that we can see and would like to know about have Latin words on them which we cannot understand. Some things we do not care for at all, and other things which look entertaining have nothing on them to tell us what they are about." He goes on to say:—"I entirely agree with my small friends so far, but I will add something that they only dimly understand, and that some of their instructors do not understand at all. It is that to interest the young minds in such things is to lay the foundation for more serious study in after life."

The object of this Children's Room is to bring together a little collection of things, some beautiful and some curious, which will arouse the interest of children and make them wonder, because, as some philosopher once said, knowledge begins in wonder.

The Room as at present arranged is only a beginning. It is not proposed to make it any larger or to exhibit more things at any one time than are now shown, but when funds are available we hope to make it more attractive by decorating the walls and ceiling, and also to add a small room, furnished with desks and blackboard, so that teachers who wish to make use of it can bring their classes here and have talks with the children, which can be illustrated by specimens in the Museum.

The specimens now on view have been chosen so as to include different kinds of animals, some of them Australian, and others, such as humming birds and birds-of-paradise, that are well known by name to children. The cases are all made low, so that nothing is out of sight, and the descriptive labels have been written as simply as possible. No Latin name or scientific term is used.

The centre of the room is occupied by a special exhibit of a reindeer sledge from Siberia, drawn by two animals, beautifully stuffed, with their harness, and the costumes of the peasants correct in every detail. In other cases a gorgeous peacock and a sparrow, side by side, show vividly their contrast in plumage, while an emu and an emu-wren show contrast in size. At one end of the room there is shown a series of copies of drawings of wild animals made by the savage bushmen of South Africa. These are just the kind of drawings made by children, and will appeal to them, because they are so simple and life-like.

As time goes by the exhibits will be changed. The present collection contains only animals, but the place of some of them will, later on, be taken by examples of beautiful and interesting minerals and fossils. Also, during the wild-flower season, it is proposed to have a special exhibit of these, and the Director hopes to have the assistance of members of the Club in contributing specimens, which will be of interest to the children. In fact, as the Children's Room develops, it may be possible to have on view continuously a series of native flowers characteristic of the different seasons.

As compared with the older countries, such as Europe, and even America, Australia suffers from the fact that it is too young for the children to have given more than a few popular names to native animals and flowers. This makes it difficult to name and describe them in a Children's Room.

However, a beginning has been made, and any suggestions that members of the Club can make, in order to render the room more useful and attractive, will be welcomed. W. B. S.

The Victorian Naturalist.

Vol. XXXIV.—No. 2. JUNE 7, 1917. No. 402.

FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 14th May, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about thirty-five members and visitors were present.

CORRESPONDENCE.

From Miss O'Donoghue, thanking the Club for the resolution of sympathy passed at the last meeting, and also for the kind remarks of appreciation made by many of the members regarding her brother's efforts on behalf of the Club.

From Dr. Freda Bage, Brisbane, saying how much she appreciated the *Naturalist* every month.

REPORTS.

In the absence of the leader, Mr. J. Shephard, Mr. J. Searle gave a brief report of the excursion to Beaumaris on Saturday, 28th April. He stated that there had been a good attendance of members, but the day turned out boisterous, and interfered with the objects of the excursion. However, some interesting microscopic forms of marine life were secured, which he briefly detailed.

In the absence of the leader, Dr. G. B. Pritchard, F.G.S., Mr. A. L. Scott gave a report of the excursion to the Royal Park cutting on Saturday, 12th May. The day turned out bleak and boisterous, consequently the party numbered only twelve, including one lady: however, the leader brought a contingent of a dozen or so from the School of Mines. The cutting itself was first visited, when the stratigraphical, litho-logical, and palæontological features which make the exposure so interesting to the geological student were clearly explained. A number of fossil casts, including *Turbo etheridgei*, Modiola, sp., *Cerithium flemingtonensis*, *Conus ligatus*, *Cypræa*, sp., *Magellania garibaldiana*, and *Haliotis nævosoides*, were collected. Leaving the cutting, a descent was made into the valley of the Moonee Ponds Creek, where the physiography of the district was pointed out, and the relationships of the forces now at work with those of bygone ages were considered. He regretted that more members had not availed themselves of such an excellent opportunity to gather facts relating to the geology of Melbourne, and said that those interested who were unable to attend should read up chapter viii. of Dr. Pritchard's "Geology of Melbourne."

ELECTION OF MEMBERS.

On a ballot being taken, Miss C. C. Currie, 23 Rushall-crescent, North Fitzroy, was elected an ordinary member, and Mr. Alex. Borthwick, Dulwich Hill, Sydney, N.S.W., a country member of the Club.

ELECTION OF AUDITORS.

Messrs. F. Keep and J. Wilcox were elected to audit the accounts for the year ending 30th April, 1917.

NOMINATION OF OFFICE-BEARERS, 1917–18.

The president, Mr. F. Pitcher, expressed his desire that the customary practice of re-electing the president for a second period be departed from on this occasion, and nominated Mr. A. D. Hardy, F.L.S. (vice-president), for the position. Mr. Hardy protested: he appreciated Mr. Pitcher's desire, and hoped that members would support him in his nomination of Mr. Pitcher as president for a second year. At the unanimous request of the members, Mr. Pitcher agreed to withdraw from the position he had taken up, and allow himself to be nominated for president. The following nominations were then made:—President, Mr. F. Pitcher; vice-presidents, Mr. A. D. Hardy, F.L.S., Mr. J. Gabriel; hon. treasurer, Mr. G. Coghill; hon. librarian, Mr. P. R. H. St. John; hon. editor, Mr. F. G. A. Barnard; hon. secretary, Mr. E. S. Anthony; hon. assistant secretary and librarian, Mr. W. Glance; committee, Mr. F. Chapman, A.L.S., Mr. C. Daley, F.L.S., Mr. T. S. Hart, M.A., B.C.E., Mr. J. A. Kershaw, F.E.S., Dr. C. S. Sutton, and Mr. J. Searle (five to be elected).

GENERAL BUSINESS.

Mr. J. A. Kershaw, F.E.S., drew attention to the recent announcement of the death of Mr. A. J. North, C.M.Z.S., ornithologist to the Australian Museum, Sydney, who was one of the "original" members of the Club, and a member for a great number of years, while he had contributed many times to the Club's proceedings. He moved that a letter of condolence be sent to his widow. Seconded by Mr. F. G. A. Barnard, and carried unanimously.

REMARKS ON EXHIBITS.

Messrs. Pitcher, St. John, Daley, Searle, and Gabriel called attention to points of interest in relation to their respective exhibits.

PAPERS READ.

1. By Mr. R. A. Keble, entitled "Aboriginal Plant Names."

The author remarked that it was very difficult to deal with a language or dialect which was not a written one. His remarks were based on some lists of names of plants which were forwarded to the late Baron von Mueller from Coranderrk and other aboriginal stations some forty years ago. The lists were accompanied by specimens which had been identified by the

Baron, so there could be no doubt as to the identity of the plants. He showed that the native name, generally composed of several syllables, usually relied upon some characteristic of the plant, or to the uses to which it might be put, for its composition, and it was singular that often the same characteristics had been chosen by botanists when bestowing the specific names by which they are known.

The chairman said the paper had broken new ground. The subject was a very difficult one, and, he hoped, would encourage others to put on record observations of a similar character.

Mr. A. D. Hardy, F.L.S., congratulated the author on having begun a very important investigation. The diversity of tribal dialects made it undesirable to give aboriginal names to plants other than those species which were restricted in their habitat to the district in which the name was used. He regretted the authorities were allowing the aboriginals at Coranderrk and other stations to forget their own language, while the faulty phonetic rendering of the native language by different authorities made the task the author had set himself extremely difficult.

2. By Mr. T. S. Hart, M.A., B.C.E., entitled "Notes on the Distribution of the Eucalypts about Creswick and Clunes."

The author described, firstly, the geographical and climatic features of the district, and then dealt with the soil characters of the bluestone, bedrock (Silurian), and granitic areas, and the distribution of the eucalypts, of which seventeen species had been recorded. Brief mention was also made of other trees in the area under notice. Suggestions were offered as to the causes determining the situations occupied by the several species, and comparisons made with his own observations and the records of others elsewhere, especially with occurrences in familiar localities near Melbourne.

Owing to the lateness of the hour the remarks on the paper had to be curtailed.

EXHIBITS.

By Mr. C. Daley, F.L.S.—Teeth and eggs of Queensland Crocodile, *Crocodilus porosus*, from Alligator Creek, North Queensland. The eggs formed portion of a nest of about eighty.

By Mr. C. J. Gabriel.—Specimens of *Teredo bipennata*, Turton, in a piece of oregon timber from Port Adelaide.

By Mr. T. S. Hart, M.A., B.C.E.—Specimens of *Eucalyptus consideniana*, from near Clunes.

By Mr. F. Pitcher.—Flowering specimens of *Correa speciosa*, *C. speciosa* (red variety), and *C. alba*, also of *Acacia discolor*, Willd., Sunshine Wattle, from plants growing in Melbourne Botanic Gardens.

By Mr. J. Searle.—Stages in the life-history of Obelia, a hydroid zoophyte.

By Mr. J. Stickland.—Specimen of a rare freshwater alga, Monostroma, sp., from Burnley Quarries.

By Mr. P. R. H. St. John.—Herbarium specimens of Tasmanian trees and plants, collected by Mr. O. Römcke and exhibited April, 1917, including *Eucryphia Billardieri*, Spach., Leatherwood, Hellior Gorge; *Aristotelia peduncularis*, Hook., *Cyathodes acerosa*, R. Br., Crimson-berried Heath, *Hymenophyllum rarum*, R. Br., Rare Filmy Fern, *Olearia stellulata*, De Cand., *Phyllocladus rhomboidalis*, Rich., Celery-topped Pine; also specimen of timber, *Trochocarpa disticha*, Spreng., from Guildford Junction: *Eucalyptus amygdalina*, La Billard., Black Peppermint, typical form, from Burnie; *E. phlebophylla*, Mignet, Drooping or Weeping Gum, from Sheffield; and, collected by Mr. J. Overall, Sulphur Creek, near Burnie, *Blechnum* (*Lomaria*) *discolor*, Forster, var. *cristatum* (var. nov.), Crested Fishbone Fern, and *Microcachrys tetragona*, Hook., Strawberry-fruited Cypress.

After the usual conversazione the meeting terminated.

EXCURSION TO ALTONA BAY.

To this excursion the Fates were kind. The afternoon of Saturday, 20th January, was all that could be desired—cool and pleasant, following a hot spell and thunderstorm. Moreover, the tide was favourable, for when, after the rather long and tedious walk from North Williamstown, the party of eleven members—field naturalists and Melbourne microscopists—reached the shore at Altona Bay, the tide was well on the ebb. Conchologists and seekers after smaller fry were soon busy, and several bottles of sand from the shallows, which gave some promise of living foraminifera, were taken for home examination. As far as the leader's results went these were disappointing, as all the foraminifera—and they were numerous—were apparently dead, probably through the collecting being done amongst the too shallow pools, where the sun's rays had killed them. However, the samples of the sea water taken yielded one of the most interesting sights possible for the microscopist to witness, for the water was crowded with the well-named diatom, *Bacillaria paradoxa*, whose bunches of rod-like frustules were ever on the move, sliding over one another, first towards one end and then to the other, and again folding up into a bunch curvily twisted out of plane so as to resemble a fan pivoted from near one end, with its ribs gliding out from a centre. Samples of the tidal or brackish water taken from the Kororoit Creek showed the same Bacillaria, but having the tendency to "slow down." However, this feature may be overlooked in a unicellular body, though reprehensible in higher life. We may ask, by the way, whether this peculiarity

has been noticed in regard to these or other aquatic forms of life living in brackish water. A fair number of molluscan shells, forty-nine in all, were gathered from the shore, a list of which, collected by the members, is appended. The interesting mixture of marine, estuarine, and fluviatile forms on this shore, due to the influence of the Kororoit Creek, is worthy of special note from a geological point of view, for similar mixtures are met with in past periods, and may be due to conditions like that at Altona Bay. Many foraminifera were also seen in the sands of the tidal pools, and, for the convenience of members interested, there is given here a list of twenty-four species, and a variety previously recorded by the leader from this locality. On returning, two of the more ardent geologists made a detour to visit the Altona Bay colliery, with the result that some material with smaller fossils was gathered for subsequent cleaning and examination. The old railway cutting near the racecourse was examined, the evidence of which, as part of a wide-spread and slightly uplifted coastal plain, is quite clear. In this connection it was noted that there is an absence of detrital or wind-blown material, such as would be found in storm-driven and æolian deposits, the foraminifera and small mollusca being corroded *in situ* rather than polished or abraded.*

The following is a list of the mollusca collected on the excursion :—

MARINE.—Bivalves.—*Arca* (*Anadara*) *trapezia*, Deshayes (old shells, apparently washed from underlying platform), *Arca* (*Barbatia*) *fasciata*, Reeves, *Pteria papilionacea*, Lam., sp., *Ostrea angasi*, Sow., *Modiola albicosta*, Lam., *Chamostrea albida*, Lam., sp., *Rochefortia donaciformis*, Angas, sp., *Cardium tenuicostatum*, Lam., *Venus* (*Chione*) *scalarina*, Lam., *Venus* (*Chione*) *strigosa*, Lam., *Tellina deltoidalis*, Lam., *Macoma mariæ*, T. Woods, sp., *Soletellina biradiata*, Woods, sp. Chitons.—*Acanthochites exilis*, Torr and Ashby, (?) *Ischnochiton* sp. Gasteropods.—*Haliotis nævosa*, Martyn (in fragments), *Subemarginulina rugosa*, Quoy and Gaimard, sp. (juv.), *Astralium aureum*, Jonas, sp., *Astralium fimbriatum*, Lam., sp. (juv.), *Phasianella australis*, Gmelin, sp., *Monodonta* (*Austrocochlea*) *constricta*, *Diloma odontis*, Woods, sp., *Euchelus scabriusculus*, Angas (juv.), *Risella melanostoma*, Gmelin, sp., *Natica conica*, Lam., *Natica plumbea*, Lam., *Diala pagodula*, A. Adams, *Diala picta*, A. Adams, *Diala monile*, A. Adams, *Diala lauta*, A. Adams, *Diala translucida* (?), Hedley (deformed), *Rissoa petterdi*, Brazier, *Vermetus novæ-hollandiæ*, Rousseau, *Bittium cerithium*,

* See G. B. Pritchard, "The Recent Shell-Beds of Williamstown," *Vict. Nat.*, vol. xxvi., 1909, pp. 20–24.

Q. and G., sp., *Bittium granarium*, Kiener, sp., *Bittium lawleyanum*, Crosse, *Lotorium cburneum*, Reeve, sp., *Columbella angasi*, Brazier, *Cominella lineolata*, Lam., sp., *Nassa pauperata*, Lam., *Nassa fasciata*, Lam., sp., *Conus anemone*, Lam., *Bulla australis*, Gray, *Siphonaria diemenensis*, Q. and G.

Estuarine.—Bivalves.—*Erycina helmsi*, Hedley.* Gasteropods.—*Truncatella marginata*, Kuster, *Assiminea brazieri*, T. Woods, *Salinator fragilis*, Lam., sp.

Freshwater.—Gasteropod.—*Bythinella*, sp.

List of Foraminifera found at Altona Bay†:—

Miliolidæ.—*Spiroloculina grata*, Terquem., frequent; *Miliolina oblonga*, Montagu, sp., common; *M. bosciana*, d'Orb., sp., common; *M. rotunda*, d'Orb., sp., very rare; *M. circularis*, Bornemann, sp., very rare; *M. subrotunda*, Montagu, sp., very rare; *M. seminulum*, L., sp., common; *M. vulgaris*, d'Orb., sp., very rare; *M. cuvieriana*, d'Orb., sp., rare; *M. venusta*, Karrer, sp., rare; *M. contorta*, d'Orb., sp., rare; *M. boueana*, d'Orb., sp., very rare. Nodosariidæ.—*Polymorphina lactea*, W. and J., sp., frequent; *P. communis*, d'Orb., frequent; *P. oblonga*, d'Orb., frequent; *P. elegantissima*, Parker and Jones, very rare; *P. regina*, Brady, Parker, and Jones, common. Rotaliidæ.—*Discorbina dimidiata*, J. and P., very common; *Rotalia beccarii*, L., sp., very common; *R. calcar*, d'Orb., sp., very rare. Nummulinidæ.—*Polystomella striatopunctata*, F. and M., sp., frequent; *P. macella*, F. and M., sp., frequent; *P. macella*, var. *limbata*, Chapman, frequent; *P. crispa*, L., sp., common; *P. subnodosa*, Münster, sp., rare.—F. Chapman.

[The publication of this report has been overlooked.—Ed. *Vict. Nat.*]

Late Breeding of Yellow-tailed Thornbill, *Acanthiza chrysorrhoa*.—On 10th February I found a nest of these birds in one of the Pepper-trees, *Schinus molle*, in my garden. On inserting my finger into the entrance I found that it contained three young ones nearly fledged, and on the 14th they left the nest, and were following the old birds about the garden. Although I have seen a great many nests of these birds in my rambles, I never found one with either eggs or young ones later than November. It is one of the early breeders, and a few years ago a nest containing eggs was found in a neighbour's garden on 8th August.—G. A. Keartland. Preston, 16th April, 1917.

* For the determination of this species, as well as of several other small forms, I am indebted to Mr. C. J. Gabriel.

† From "Recent Foraminifera of Victoria: Some Littoral Gatherings," *Journ. Quek. Micr. Club*, 1907, ser. 2, vol. x., pp. 117–146, pls. ix., x.

THE POND AND ITS INHABITANTS.

(*Continued.*)

BY J. SEARLE.

(*Read before the Field Naturalists' Club of Victoria, 15th Jan.*, 1917.

AQUATIC INSECTS.

THE water flea already described spend the whole of their lives in the water, but there are other inhabitants of the pond which, though they are born there, and spend their early lives swimming in its waters or crawling over the water-plants, end their existence as inhabitants of the air. Among these may be mentioned the water-beetles, dragon-flies, water-bugs, caddis-flies, may-flies, mosquitoes, &c. All these are hatched from eggs laid in or on the water, or attached to water-plants near the surface. Some of these insects, like the dragon-fly, on reaching maturity leave the water for all time, spending their lives in the air "hawking" after smaller insects. Others, like the beetles and some of the bugs, spend most of their time in the pond, preying on the other inhabitants, leaving the water at night-time only, to indulge in flight, courtship, or migration to another pool. They are often attracted by the light of the electric street-lamps, and on summer nights may be collected in great numbers around the base of the poles supporting these.

The largest of these insects is Hydrophilus, a dark olive-green beetle one and three-quarter inches in length. The female beetle constructs a cocoon in which she encloses fifty or sixty eggs. This cocoon, though thin, is perfectly water-tight, so that the eggs, which would be killed by submersion in water, are kept dry and warm, though the cocoon may be attached to the under side of a leaf of a water-plant. In order that the eggs and the newly-hatched larvæ may be supplied with air, the beetle constructs a tube, or ventilating shaft, at one end of the cocoon; the end of this tube is bent upwards, and projects above the surface of the water. Thus provided for, the eggs are left to hatch out, which they do in three or four weeks (in an aquarium). When hatched, the young soon break through the cocoon and begin their predatory existence. Though rather slow of movement, having a fleshy, tapering body and short, thin legs, they levy a heavy toll on the smaller creatures of the pond, especially the small water-snails, whose shells are readily crushed by the formidable-toothed jaws of the larva. When fully grown they measure about $2\frac{3}{4}$ inches, and are dark brown in colour. Though living and feeding in the water, these larvæ breathe air, which they obtain by elevating their bodies so that the two short, hair-like breathing tubes by which it is terminated are above the surface of the water. These tubes convey the air to the tracheæ which

ramify the body of the larvæ. The mature larvæ leave the water, and, burrowing into the bank of the pond, make a cocoon-like cell in which to pupate, and from which they finally emerge as perfect beetles.

Another water-beetle, Cybister,* is also a common inhabitant of our ponds, and its larvæ, which are erroneously called Dytiscus larvæ, is perhaps the most bloodthirsty marauder in the pond, and seems to kill for the love of killing. It is absolutely devoid of fear, and will attack any living creature in the pond that comes near it. One afternoon at Cheltenham I saw one of these larvæ, and a half-grown one at that, attack and kill in rapid succession three large tadpoles. Like the larvæ of their relative, Dytiscus, which they closely resemble, they possess a pair of enormous sickle-shaped jaws, which they drive into their victims. These jaws are hollow for about two-thirds their length from the base, the remaining third being the solid point. Just at the base of the solid point, the inner side of the curve, there is a small opening which leads into the hollow part of the jaw, and through these the blood and body juices of the victim is sucked. At one time it was thought that this was the only opening into the alimentary canal, and that the larva did not possess a mouth; but it really has a very large and peculiarly-shaped mouth, which closes so tightly that it is difficult to see, but is readily made apparent if the head is subjected to lateral pressure. It is stated by some writers that Dytiscus inject a poison into their victims which causes them to liquefy. I do not know whether Cybister is possessed of such a means of offence, but, from the rapidity with which their victims die after being bitten by the larvæ, one would think they did: this is a point that needs investigation.

Beetles, though they dive and swim freely in the water, breathe air, and must come to the surface at intervals to renew their supply. Some imprison this air supply between the elytra and the abdomen, and as the spiracles, or openings to the breathing tubes, are placed along the back of the abdomen, are able to breathe this air while they are under water. Others, in addition to this, take a further supply of air entangled among the hairs on the under-side of the body, and as the beetle darts about in the water these air bells shine like burnished silver.

Another insect whose whole life is spent in destroying its weaker fellows is the dragon-fly. The female insect lays her eggs just below the surface of the water on the leaves and stems of water-plants. When newly hatched, the young larvæ appear to be all legs and a pair of eyes, and creep about on

* This beetle is now called *Homaedytes scutellaris*.

the plant on which they were born in search of other creatures upon which to feed. Unlike the larvæ of the beetles just described, who have to come to the surface at intervals to breathe, the larva of the dragon-fly is able to extract the oxygen needed for respiration from the water, much in the same manner as a fish does, but with this difference, that the gills of the larva are in the end of its abdomen, the leaf-like blades in which the abdomen terminates also probably acting as external gills in many species. Being voracious feeders, their bodies soon fill out, and after their first ecdysis, or moult, the increase in size is very noticeable. It is provided with a very remarkable organ for the capture of its prey. From its position when at rest it is called a mask, as it covers the mouth and front part of the head of the insect. Anatomically, it is the lower lip of the insect, which has been modified into a prehensile organ. It is jointed in such a manner that part of it folds back under the chin, while the end with its claw-like appendages fits closely over the front of the head. But should some unfortunate insect come within striking distance, the joints straighten out with lightning rapidity, and the insect is clasped in its pincer-like extremity. The joints are then folded back, and the larva, at its leisure, feeds on its prey.

When describing the water-beetle we saw that its metamorphosis was complete—that is, that the full-grown larva changed into an inactive pupa, from which in due time the perfect beetle emerged. But in the dragon-fly the metamorphosis is incomplete—there is no resting stage in its life-history, the nymph, or pupa, being just as active and rapacious as the larva, the difference in appearance being the gradual growth of the wing-cases enclosing the rudimentary wings of the future dragon-fly. When the time comes for the insect's final change, the pupa creeps up the stem of a plant out of the water, and, clasping the stem (nearly always the under side) firmly with its legs, rests in this position until the outer skin becomes dry and brittle, and soon, helped probably by the muscular contraction of the insect, the skin splits down the back, and through this opening the head, with its large compound eyes, is drawn. The thorax and legs are next freed from the pupa skin, and the newly-born insect, with soft, limp body and crumpled wings, hangs head downwards from the pupa case. Presently it begins to move its legs about, and grasping the stem creeps up an inch or so, thus detaching the rest of the abdomen from the pupa case, for which it has no further use. While in this position the wings straighten out, dry, and harden, and probably other most important changes are taking place at the same time.

We must remember that while the nymph was a pond-

dweller it breathed by means of gills, but the dragon-fly has now become a creature of the air, and will now breathe through spiracles placed along the sides of its body. At what period of its history this change in the breathing tubes occurs is still obscure. Its body having dried and its four beautiful wings thoroughly hardened, the insect essays its first flight, and soon after it may be seen darting swiftly through the air, capturing and devouring its prey without pausing in its rapid flight. After a brief courtship the female visits a pond, and, resting on a water-plant, thrusts her abdomen under the water and attaches her eggs to the stem or leaves of the plant, her life-work being then accomplished.

Moss Animals.

The term "moss animals" has been applied to that group known to the zoologist as Polyzoa (Gr. *polus* many, *zoon* animal)—compound animals that spread themselves over the surface of stones, roots, and stems of water-plants, the most familiar example, perhaps, being the sea-mat, found in rock pools around our coasts. Relatives of these, to which no common name has been given, are to be found in many of the ponds and streams in the vicinity of Melbourne, and, though well known to the initiated, who know where and how to look for them, are never seen by most people, though they are particularly well adapted for nature study. Only two fresh-water genera have been found in Victoria up to the present, though it is quite probable others exist here waiting discovery by the observant pond-hunter. The known genera are Plumatella and Fredricella.

Plumatella is the more common of the two, and is found in many of the pools that abound along the valley of the Yarra. A favourite place for it was the lagoon on the left-hand side of the bridge over the Yarra at Heidelberg, where the submerged branches of the old willow trees were thickly covered with this beautiful animal. The individuals of the colony are quite large enough to examine with a pocket lens, and in a young colony are transparent enough for the process of digestion, &c., to be observed within. If we place a small colony of Plumatella in a watch glass with some water and examine it under a pocket lens, or better, a dissecting microscope, we will be able to learn much about its structure and habits. The shock of moving the colony to the watch-glass has caused all the polypides to retract within their cells, which, we see, are oval-shaped bodies attached to a stem of leathery consistency. This stem is called the cœnœcum (meaning "common house"), and unites the whole colony. If the watch-glass is allowed to remain still for a few moments the animals recover from

their shock, and one by one emerge their beautiful plumed crests. Selecting an individual best placed for observation, we notice that the crown of plume-like tentacles is attached to a horseshoe-shaped disc called the lophophore (meaning "crest-bearer"). Each tentacle is fringed on both sides with hair-like processes called cilia, which are kept in constant vibration. The motion of the cilia is all in one direction, so that their combined action produces a vortex, bringing fresh streams of water for respiration, and drawing particles of food down to the mouth, situated between the arms of the lophophore. Over the mouth is placed a finger-like process, which may help in the selection of food or in the rejection of objectionable matter that might be whirled into the vortex. This organ is called the epistome (Gr., "upon the mouth"). The mouth opens into the alimentary tube, consisting of œsophagus, stomach, and intestine, and is bent back upon itself so that the vent opens at the back of the tentacles near the mouth. As the food particles pass in through the mouth we can observe the process by which nutrient parts are absorbed and the refuse matter ejected. Their food consists of diatoms, desmids, protozoa, rotifers, &c. When the food particle reaches the stomach it is tossed up and down by muscular contractions and dilations of the stomach until the digestible portion has been absorbed, when the waste material is packed into the intestine. When this waste matter has to be discharged the orifice of the intestine is protruded, and when the operation is over it is withdrawn again.

Plumatella is a very timid creature, and the slightest shock, such as the jarring of the table, causes it to withdraw its tentacles. This action is effected by long muscles, which, by contraction, pull the animal into its cell: similar contractions of the muscular neck of the cell, which is attached to the animal just below the lophophore, is the means by which the tentacles are protruded. Attached to the part of the stomach where the intestine bends round is a long twisted organ called the funiculus ("a little rope"), which goes to the bottom of the cell. Attached to the funiculus is the testis, or male generative organ, while in the internal tube, attached to a short peduncle, or footstalk, the ovary is placed. In these ovaries true eggs are developed, from which are hatched ciliated larvæ. These swim about rapidly for a time, and then attach themselves to some flat surface and develop and bud into two polypides, which soon grow into a new colony. But they have another and highly interesting mode of reproduction; this is by means of asexual resting bodies, called statoblasts, or stationary germs. These are produced from the funiculus, and are never hatched in the colony when they are produced,

but seem to be a reserve of propagative force to keep the animal from extermination through stress of adverse circumstances. The contents of the statoblasts give rise to simple non-ciliated animals, which possess, when they are hatched, all the parts of the adult animal: these at once become attached, and produce new colonies by budding.

A great many species of Plumatella have been described in Britain and Europe, *P. repens* being the best known. In Victoria we have at least two species, one of which agrees very closely with the European *P. repens*; the other, as far as I know, has not yet been determined.

Our second genera, Fredricella, is the most graceful and elegant of all the fresh-water polyzoa. Unlike Plumatella, which attaches itself closely to the stone or stick on which it is growing, the branching stems of Fredricella are only partly attached to its support, the rest of the colony being free; thus it much resembles the roots of the willows on which it is mostly found, as it loves the shade such as this tree affords. Its corona or crown of tentacles differs from that of Plumatella in that it forms a complete circle, its shape much resembling the flower of the cactus. The tentacles are much more slender than those of Plumatella. Only one species of Fredricella has been described in Europe; it is named *Fredricella sultana*. Our species differs from *F. sultana* in having a greater number of tentacles in its crown, and in the shape of its statoblasts. Those of *F. sultana* are bean-shaped and few in number, while our species has round statoblasts, and they are fairly numerous in the cænœcium of the colony. It should be looked for among the roots of water-plants, especially those of the willow, growing on the banks of the Yarra and other streams.

In searching for fresh-water polyzoa every submerged branch should be carefully examined, and any material you are doubtful about placed in a flat-sided glass trough and examined with a pocket lens for any trace of a specimen. A drag hook attached to a stout line is very useful for securing such material as sticks, also for getting samples of weeds and water-plants from the deep water of a pond, living on which it may be your good fortune to find Lophopus or Cristatella, neither of which has as yet been recorded for Victoria. Another species which should be searched for in shady nooks, such as Fredricella delights in, is Paludicella; indeed, in Europe it is frequently found living commensally with that species, though not nearly so numerous. In general appearance it resembles Fredricella, but its tentacles are much longer, and it does not possess an epistome, so is easily distinguished from that species.

The Victorian Naturalist.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The thirty-seventh annual meeting of the Club was held at the Royal Society's Hall on Monday evening, 11th June, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about forty members and visitors were present.

CORRESPONDENCE.

From Mrs. North, thanking the Club for the expression of sympathy on the death of her late husband, Mr. A. J. North, C.M.Z.S.

REPORTS.

A report of the excursion to Langwarrin and Frankston on King's Birthday, 4th June, was given by the leader, Mr. T. S. Hart, M.A. who stated that unpleasant weather was experienced; however, a number of interesting observations on the manner of growth of Mistletoes were made, and the party was interested in a visit to Mr. Mann's garden, which contains a number of native shrubs, &c., under cultivation. It was decided that a letter of thanks be sent to Mr. J. S. Mann, of Frankston, for the hospitality extended to the members of the excursion by himself and family.

The president extended a cordial welcome to Mr. Hardy, a visitor from Tasmania, and a member of the Field Naturalists' Club in that State, who was present, and Mr. Hardy briefly replied.

ANNUAL REPORT.

The acting hon. secretary, Mr. A. D. Hardy, F.L.S., read the thirty-seventh annual report for the year 1916–17, which was as follows:—

"To the Members of the Field Naturalists' Club of Victoria.

"Ladies and Gentlemen,—Your committee have much pleasure in presenting for your consideration a brief review of the activities of the Club for the year ended 30th April last, the thirty-seventh in its history.

"Considering the serious outlook and the many distractions which have existed throughout the year by reason of the tremendous conflict still raging in Europe, it is gratifying to find that the Club has maintained its position satisfactorily, both numerically and financially.

"Though thirty-seven years have elapsed since this Club was founded, in May, 1880, there still remain among its members some who were present at the inaugural meeting

and have been fairly constant attendants at its meetings ever since.

"Commencing the year with a membership of 218, consisting of 6 honorary, 2 life, 150 ordinary, 57 country, and 3 associate members, 29 ordinary, 8 country, and 3 associate members were elected during the year. Resignations, deaths, and arrears accounted for 23 ordinary and 10 country, leaving at the end of the year a membership of 5 honorary, 2 life, 155 ordinary, 57 country, and 5 associate members, or a grand total of 224.

"By the death of Dr. E. P. Ramsay, formerly Curator of the Australian Museum, the Club lost one of its earliest honorary members. But the most serious loss which the Club has sustained by death for some time was that of our honorary secretary, Mr. J. G. O'Donoghue. The loss is so fresh in our minds, and his efforts on behalf of the Club have so recently been recalled in the pages of the *Naturalist*, that little more can be said now beyond the fact that to his colleagues on the committee his deplorable death was a great shock. Little did they think that the ordinary meeting held on 13th November last would be his last official connection with the Club. Since that date the duties of hon. secretary have been shared by several members of the committee, who have endeavoured to keep its affairs straight until such time as a permanent appointment could be made. The late Mr. O'Donoghue left no stone unturned in his efforts to advance the Club in every way possible, and his loss is likely to be felt for some time to come.

"Your hon. treasurer reports that the ordinary receipts for the year were £175 16s. 6d. and the expenditure £172 1s. 10d., thus adding £3 14s. 8d. to the credit balance of the Club. Notwithstanding the small credit balance, your committee felt that it was incumbent on them to spare something for the War Loan; and the suggestion having been approved of at an ordinary meeting, the sum of £20 was duly invested in that way.

"The exhibition of wild-flowers held on 28th September, 1915, having proved such a success financially, enabling £54 4s. 11d. to be handed over to the Sick and Wounded Soldiers' Fund, your committee were emboldened to make an even bigger effort during the year just closed. Consequently, the Melbourne Town Hall was engaged for 3rd October for the same purpose, with a splendid result. The Y.M.C.A. national appeal was chosen as a worthy object, and, country members and friends entering whole-heartedly into the proposal, the result was a splendid exhibition, and a magnificent success financially. The exhibition was a revelation to those of the community

who were unacquainted with the aims and objects of the Club, and resulted in the addition of several of the delighted public to our ranks. Your committee is deeply grateful to the members of the excursion party to the Grampians, which, headed by members of the Club, helped so materially in providing exhibits. To the members of the Microscopical Society of Victoria credit must be given for having made probably the finest and most interesting display of microscopic objects ever seen in Australia. The final financial result of the exhibition was the handing of a cheque for £131 6s. 10d. to the Y.M.C.A.

"The interest of the monthly meetings has been well maintained, and the papers read have been quite up to the standard of previous years. Fourteen papers were read, three of which were illustrated by lantern views. The authors and titles were as follow:—Mr. J. W. Audas, 'A Botanist in the Portland District'; Mr. F. G. A. Barnard, 'Some Account of Dr. Neumayer's Journeys in Victoria'; Mr. C. Daley, F.L.S., 'Alpine Gippsland' (illustrated); Mr. H. W. Davey, F.E.S., 'Upsetting the Balance of Nature'; Mr. J. H. Harvey, A.R.I.V.A., 'A Holiday Trip to Jenolan Caves, New South Wales' (illustrated); Mr. G. A. Keartland, 'Bird Life on Fraser Island, Gippsland Lakes'; Misses Nethercote and Johnston, 'Notes on a Trip from Walhalla to Baw Baw'; Mr. O. W. Rosenhain, 'A Thousand Miles on the River Murray' (illustrated); Mr. J. Searle, 'The Pond and its Inhabitants'; Mr. P. Sharman, B.Sc., 'The Internal Structure of Some Australian Orchids'; Mr. Eland Shaw, M.R.C.S., 'Australian Blattidæ, Part II.'; Mr. P. R. H. St. John, 'Notes on the Growth of *Eucalyptus viminalis*'; Dr. C. S. Sutton, 'A Sketch of the Flora of Keilor Plains'; Mr. C. A. Topp, I.S.O., M.A., 'Impressions of the Wild-flowers of South-Western Australia.' In addition to these, Mr. A. S. Kenyon, C.E., of State Rivers and Water Supply, gave an illustrated lecture on the Mallee and its characteristics, on which he is undoubtedly a recognized authority. Classifying the papers by their subject-matter, they may be grouped as follows:—Relating to zoology, 2; ornithology, 1; entomology, 1; botany, 5; trips or excursions, 4; and general, 1. One of the papers—by Mr. H. W. Davey—attracted the attention of the Acting Chief Inspector of Game and Fisheries, and led to some correspondence in the *Naturalist*. There are many subjects on which papers even of a very simple character would be extremely welcome, and we trust during the coming year some of our more recently elected members will place their experiences before the Club.

"An attractive list of excursions was drawn up at the commencement of the year, the greater number of which have

been carried out, with varying success. Unfortunately, two had to be cancelled owing to the late Mr. O'Donoghue's illness and no other leader acquainted with the localities being available. Wet weather, of course, interfered with a certain proportion. Your committee would again urge loyal support to those members who give their services as leaders, and if intending excursionists would notify the respective leaders of their intention to be present it would tend to remove that feeling of doubt which often arises in a leader's mind as to the probable attendance. Two char-a-banc trips were arranged, and proved very enjoyable; but this mode of travelling entails a certain amount of anxiety and risk in securing the necessary number to fill a car, and so reduce the expense to a minimum, and cannot be adopted as often as the committee would desire.

"Some valuable excursion reports have appeared in the *Naturalist*, and it is hoped that the members attending have derived some benefit from the outings, both from a natural history point of view and from a health standpoint.

"The thirty-third volume of the Club's magazine, the *Victorian Naturalist*, has been completed and issued to members. Its contents have been of a varied nature, and we think quite equal to any similar publication in any part of the world. The thanks of the Club are again due to the hon. editor, Mr. F. G. A. Barnard, for the pains he has taken in producing such a creditable publication. Several requests to be put on the exchange list have been received from societies in different parts of the world, and recently a newly-elected country member ordered a complete set for his library. Unfortunately, owing to the many engagements of those who undertook the work, the compilation of the card index to the *Naturalist* is not yet finished; however, you will be pleased to learn that some progress has been made, and that it will be available for use in a few months.

"The librarian reports that 130 volumes and parts have been added to the library during the year. The thanks of the members are due to him for giving up the fourth Monday evening of the month to attend the library for the purpose of receiving and issuing books, and it is gratifying to learn that a larger number of members are availing themselves of the library than in previous years.

"Feeling that it was only right that those members of the Club who felt the call of duty on behalf of the Empire in the present crisis in our nation's history, your committee decided to provide for an honour board, which Mr. Joseph Gabriel kindly volunteered to make, while Mr. P. R. H. St. John offered to do the necessary writing. This has now been prepared, and a preliminary list of twelve names was published in the *Naturalist*

for April last. As many members are past the age for active service, or for other reasons could not enlist, it was decided to publish also the names of the sons and daughters of members who had entered on active service. These names numbered twenty-eight and two respectively, though it is possible all have not yet been received. It is our sad duty, however, to record that six sons of members have laid down their lives in the Empire's cause, and the sympathy of the Club is extended to the bereaved parents.

"Among other matters of interest which have had the attention of the committee during the year, it may be mentioned that, at the request of the head teacher of Ferntree Gully school, Mr. P. R. H. St. John visited the district, and conducted a nature study excursion of the children, which proved a great success. The recent purchase of 137 acres of land near Burwood for park purposes prompted a member to bring it under the notice of the Club, with the suggestion that the authorities should be requested to have any tree-planting confined to Australian trees and shrubs, and that it be proclaimed a sanctuary for native game. This was done, and the Hawthorn Tramways Trust took the necessary steps to have the land proclaimed a sanctuary, and has expressed itself as willing to meet the Club's wishes as far as possible. The removal of seedling palms from the reservation at Cabbage-tree Creek, East Gippsland, having been brought before the Club, a letter was written to the Secretary for Lands on the subject, and an answer received that steps would be taken to prevent further damage.

"Though little has been heard publicly of the National Park at Wilson's Promontory recently, your committee is pleased to learn from Mr. J. A. Kershaw, F.E.S., hon. secretary to the trustees, that steady progress in various directions is being made, and some notes which he has furnished will appear as a separate article in the *Naturalist*.

"The work of the Plant Names Committee has been further advanced during the year. The sixtieth meeting has been held, and the provisional printed list is now undergoing final revision.

"The outdoor reunion of members, which has become an annual fixture, was held at the Botanic Gardens on Saturday, 10th February, when, in perfect weather, about fifty members and friends were entertained at afternoon tea by the committee.

"The best thanks of the Club are due to Messrs. Coghill and Haughton for allowing the committee to use their office for its monthly meetings, and to all who, by their help in various ways, have assisted in the work of the Club.

"Finally, your committee would urge each member to take a share in the advancement of the Club by every possible

means. Our work here should be more than a pastime. The health and pleasure obtained in the field or in the study are only incidental. Our efforts as a club are, in the main, directed to a career of usefulness. The demand for the Club's journal by the scientific branches of public departments, and by universities and kindred societies, bears witness to the success which the effort has achieved. Nor does this support of the Club mean neglect of the great cause which at present occupies the attention of the whole civilized world. A fair proportion of our members have taken on the risks of war, while a larger proportion is experiencing anxiety, bereavement, or sorrow just as fully as those in other walks of life. Your committee trusts that the Club as a whole will, in the coming year, by organization and work, be able to repeat its successful entertainment of the public and further assist in augmenting those funds which contribute so largely to the comfort and support of our defenders abroad.

"On behalf of the committee,

"F. PITCHER, *President.*

"*30th May*, 1917." "A. D. HARDY, *Acting Hon. Secretary.*

On the motion of Mr. H. Whitmore, seconded by Mr. E. Cox, the report was adopted.

The president referred to the work of the Plant Names Committee, and said that copies of the third portion of the "Vernacular Names of Victorian Plants" were available for members.

Dr. C. S. Sutton stated that the list was being submitted to Mr. J. H. Maiden, Government Botanist of New South Wales.

FINANCIAL STATEMENT.

The hon. treasurer, Mr. G. Coghill, read the financial statement for 1916-17, which was as follows:—

RECEIPTS.

To Balance, 30th April, 1916							£49	4 8
,, Subscriptions—								
Ordinary Members ...	£118	10	0					
Country Members ...	27	19	0					
Associates	0	18	0					
				£147	7	0*		
,, *Victorian Naturalist*—								
Subscriptions and Sales	19	4	5					
Advertisements ...	3	15	0					
Reprints	1	14	3					
				24	13	8		
,, Sales of Badges, Photographs, &c.				2	3	0		
,, Interest, Savings Bank and War Loan				1	12	1		
							175	16 0
Carried forward							£225	1 2

*Subscriptions: Arrears, £28 15s.; 1916-17, £113 6s. 0d.; 1917-18, £5 6s.—total £147 7s. 0d.

Brought forward			£225 1 2
To Exhibition of Wild-Flowers—			
Admissions	110 10 0		
Sales of Flowers	35 5 7		
Refreshments	21 1 11		
		166 17 6	
		£391 18 8	

EXPENDITURE.

By *Victorian Naturalist*—			
Printing	£88 14 3		
Illustrating	3 2 7		
Free Reprints ...	4 14 9		
Reprints charged ...	3 0 9		
	£99 12 4		
,, Stechert and Co., refund	1 1 11		
,, *Victorian Naturalist*—			
Wrapping and Posting	13 6 2		
,, Rooms—Rent and Attendance	13 10 0		
,, Library—Periodicals 6 0 0			
Insurance 0 7 0			
	6 7 0		
,, Hire of Lantern	4 10 0		
,, Printing and Stationery	7 0 0		
,, Postages, &c.	5 11 0		
,, Stechert and Co.—Cheque returned ...	1 3 5		
,, War Loan	20 0 0		
		172 1 10	
,, Wild-flower Exhibition—			
Hall and Attendance	21 4 11		
Expenses	14 5 9		
Cheque to V.M.C.A. Fund	131 6 10		
		166 17 6	
,, Balance in Savings Bank	15 2 11		
,, ,, London Bank	37 16 5		
		52 19 4	
		£391 18 8	

G. COGHILL, *Hon. Treasurer.*
12th May, 1917.

Audited and found correct.
F. KEEP, } *Auditors.*
J. WILCOX, }
23rd May 1917.

The following statement of assets and liabilities was also read:—

ASSETS.

Balance—Savings Bank and London Bank	£52 19 4	
War Loan Scrip	20 0 0	
Arrears of Subscriptions (£58), say...	45 0 0	
Library and Furniture (Insurance Value)	150 0 0	
	£267 19 4	

LIABILITIES.

Subscriptions paid in advance	£5 6 0

A hearty vote of thanks was tendered to the hon. auditors, Messrs. Wilcox and Keep. Mr. F. Wisewould expressed appreciation of the work of the various officers during the past year, to which Mr. Pitcher responded.

ELECTION OF OFFICE-BEARERS, 1917–18.

The following office-bearers, being the only nominations received, were declared duly elected :—President, Mr. F. Pitcher ; vice-presidents, Mr. A. D. Hardy, F.L.S., Mr. J. Gabriel ; hon. treasurer, Mr. G. Coghill ; hon. librarian, Mr. P. R. H. St. John ; hon. editor, Mr. F. G. A. Barnard ; hon. secretary, Mr. E. S. Anthony ; hon. assistant secretary and librarian, Mr. W. Glance.

On a ballot being taken for five members of committee, the following were duly elected :—Messrs. F. Chapman, A.L.S., C. Daley, F.L.S., J. A. Kershaw, F.E.S., J. Searle, and Dr. C. S. Sutton.

NOTES ON EXHIBITS.

Messrs. F. G. A. Barnard, J. Searle, C. J. Gabriel, and T. S. Hart, M.A., drew attention to their various exhibits.

PAPER READ.

By Mr. C. Daley, F.L.S., entitled "Notes of a Visit to Mallacoota Inlet."

The author gave a detailed account of a recent visit, *via* Eden, to Mallacoota, returning by way of Orbost, and described in detail the fauna and flora of the district, as well as the natural features of the surrounding country, illustrating his remarks by means of photographs and maps.

Messrs. E. Pescott, J. Kershaw, F. Barnard, and E. Cox spoke in terms of appreciation of the paper, and made inquiries on various points therein, to all of which Mr. Daley satisfactorily replied.

EXHIBITS.

By Mr. F. G. A. Barnard.—Growing plant of fern, *Botrychium ternatum*, Swartz, "Moonwort," with infertile and fertile fronds. Plant obtained near Oakleigh more than twenty years ago.

By Mr. C. J. Gabriel.—Marine shell, *Turbo petholatus*, Linn., from Great Barrier Reef, North Queensland.

By Mr. T. S. Hart, M.A.—Specimens of Mistletoe, *Loranthus celastroide* , showing aerial roots, collected on Langwarrin excursion ; young plants of Loranthus with aerial roots on *Casuarina suberosa*, and on *Acacia armata*, from Scoresby (these are, no doubt, also *L. celastroides*) ; germinating Mistletoe seeds on *Acacia armata* and on *Loranthus celastroides* and *L.*

pendulus, from Scoresby; fasciated branch of *Acacia suaveolens*, bearing flowers, collected near Mount Eliza, on Langwarrin excursion.

By Mr. J. Searle.—Ova, larva, and cercaria stages in the life-history of Bilhazia — a fluke parasite affecting human beings; fossil jawbone (human) found near Swan Hill, Victoria.

After the usual conversazione the meeting terminated.

EXCURSION TO LANGWARRIN AND FRANKSTON.

OWING to rough, boisterous weather, Monday, 4th June, the King's Birthday holiday, was unfortunately quite unsuited for a field excursion; however, nine members journeyed to Langwarrin by train, and were met at the station by Mr. J. S. Mann, a member resident in the district. Going south to a lane, we followed it in a westerly direction to the Hastings road. The uncleared land here carried *Eucalyptus amygdalina*, Common Peppermint, and *E. cinerea multiflora*, Mealy Stringybark, with *Casuarina suberosa*, Black Sheoak, and *Exocarpos cupressiformis*, the Native Cherry or Cherry Ballart, with a varied undergrowth, among which *Hakea acicularis* and *H. nodosa* were in flower, and two Cassythas or Dodder-Laurels, *C. glabella* and *C. pubescens*, were seen parasitic on the native shrubs. On the Hastings road we found on a Peppermint the two Mistletoes, *Loranthus celastroides* and *L. pendulus*. Aerial roots were noticed on *L. celastroides*, but were absent from *L. pendulus*. Continuing southward along the Hastings road and the three-chain road that goes to Mooroodue station and to Dromana, we found both mistletoes abundant, and aerial roots on all samples which were definitely identified as *L. celastroides*, but never on one definitely recognizable as the other species. In consequence of the aerial roots and leafy branches arising from them, *L. celastroides* spreads along the tree on which it is growing, and presents an appearance of starting from many points, whereas the other species is localized at one point of attachment, which commonly appears in the case of a large plant of the mistletoe as the swollen end of a branch, though closer examination reveals usually the weak growth of the host plant beyond the point at which the mistletoe is attached. There may be, of course, many independent clumps of either or both species on the one tree. A specimen of *L. celastroides* is exhibited to-night cut into sections to show the invasion of the tissues of the host plant by the outgrowths from the aerial roots, and others which clearly show that the aerial roots are produced quite early in

the growth of the mistletoe. Though these young plants do not carry any flowers or fruit to assist in their determination, one of them, which was about seven inches in length of shoot, with an aerial root thirteen inches long, was taken from a Swamp Gum, *E. ovata*, under a Mealy Stringybark on which was *L. celastroides*, and the invariable absence of aerial roots from recognizable *L. pendulus* justifies the view that all these small plants with aerial roots are referable to *L. celastroides*. In addition to the species mentioned as hosts, *L. celastroides* was found on *Casuarina suberosa* and *C. quadrivalvis* (the latter near the coast), on *Acacia mollissima*, Black Wattle, and a young plant of a Loranthus with aerial roots on a hawthorn hedge on the Mornington road south of Frankston. In one instance this Mistletoe had extended its aerial roots along eight or nine feet of the trunk of a tree. Mr. C. C. Brittlebank, Government Vegetable Pathologist, has told me that aerial roots are known to occur on a Mistletoe in New South Wales, but was not able to name the species. In Brandis's "Indian Trees" it is mentioned that aerial roots occur on some species of Loranthus. On some of the plants the larvæ of the Mistletoe Butterfly, *Delias harpalyce*, Don., were observed, while some were pupating. Following the suggestion of Mr. Mann as to our route, we left the three-chain road and ascended the north slopes of Mount Eliza to Humphries-road, passing through fine heath grounds on the way, with abundance of flowers, and stopped for lunch on the edge of a clearing, from whence we had fine views over Western Port Bay, with French Island and Phillip Island, the upper end of the bay merging into the low lands of the Koo-wee-rup Swamp, and the hills beyond forming a background. At the first house reached on Humphries-road we noticed, planted in the garden, Scarlet-flowering Gums, Callistemon, *Hakea laurina*, *Agonis flexuosa*, and a fine tall Golden Wattle. On this road we passed an abundance of *Eucalyptus coriacea*, White Sallee, and noticed Swamp Gums on high and not obviously wet land. Flowers were seen on the Swamp Gums. The Manna Gum, *E. viminalis*, was soon the predominant species, and as we reached the coast *Casuarina quadrivalvis*, the Drooping Sheoak, now in full flower, took the place of the other species. A third Cassytha, of stronger growth, also occurs here—*C. melantha*. Other flowers noted include *Acacia suaveolens*, a fasciated branch of which is exhibited, *Correa speciosa*, *Hibbertia stricta*, *H. fasciculata* and *H. densiflora*, *Astroloma humifusa*, and *Banksia marginata*. Mr. Mann had very kindly sent to me previously an invitation for the party to come to his residence for afternoon tea, and to see his garden, in which he has planted many native plants, several of which were noticed

on the way to the house. After a very acceptable rest and refreshment we again went through the garden, where numerous Australian plants had been placed among the natural growth, and some experiments on pruning the native plants tried. The progress of the native plants and the success of suitable cutting were of much interest. Ornithology had not been very prominent during the day, the wind being very high and few birds about; but here we were shown by Mr. Mann several interesting items, including the nest of a pair of Bronzewing Pigeons which had just reared a second brood, and other nests close by in the tea-tree, as well as collected specimens of nests. A possum's nest was also pointed out. Bandicoots still occur, and come to the garden. After the president and the leader had expressed our thanks to Mr. and Mrs. Mann for their very kind hospitality and guidance, we left for the train at Frankston, Mr. Mann having further kindly arranged for our conveyance. —T. S. Hart.

The Bunyip.—Australia possesses few fabled animals—in fact, the only one of any importance coming under this heading is the Bunyip. Little or nothing has hitherto appeared in the *Naturalist* about this monster, so prominent in the stories of early colonists. Some notes by Mr. Dudley Le Souëf, C.M.Z.S., Director of the Melbourne Zoological Gardens, which appeared recently in the press, may therefore be worth quoting for the benefit of future readers. He says the Bunyip was nothing more than the well-known seal, *Arctocephalus fosteri*, specimens of which form such an attraction by the tricks they perform at the Melbourne Aquarium. It is sometimes known as the Sea Bear, and at one time abounded on the Australian coast in great numbers. Sir Joseph Banks records that 30,000 skins were sent to England from Australia in a single consignment. It was not unusual for the animals, especially the females just before the birth of their young, to find their way far up the River Murray, and no doubt they came into the Hopkins, Barwon, Yarra, and all the larger southern streams, often getting into the lagoons and swamps, which, before the country became settled, covered much larger areas than at present. The call of the female seal is rather like that of a cow, while the bleating of the pups can hardly be distinguished from that of a lamb, being perhaps a little sharper. The aboriginals, who were easily frightened, attributed such noises to the Bunyip, but could never be persuaded to go in search of the creature. This seal still occurs on the Victorian coast at Julia Percy Island, and at the Seal Rocks, near the Nobbies, Phillip Island, &c., and now enjoys the protection of the *Game Act*.

THE NATIONAL PARK, WILSON'S PROMONTORY.

SATISFACTORY progress continues to be made in the National Park at Wilson's Promontory in opening up, by bridle tracks, some of the more inaccessible gullies and beauty spots and improving the tracks already established. The erection of guide boards in prominent position along the various tracks has been much appreciated by visitors, who now have little difficulty in finding their way to the various points of interest.

The want of funds has unfortunately prevented the committee of management putting in hand several improvements of special importance to the general public. These include the erection of an accommodation house for tourists, which it is proposed to establish in the vicinity of the Darby River; the erection of a bridge over the river suitable for vehicular traffic; and a large enclosure near the main entrance, where representatives of the various kinds of native animals established in the Park may be seen in their natural state.

The number of native animals and birds introduced is now 102. These include Kangaroos (three species), Wallabies (four species), Wombats (two species), Opossums (three species), Echidna, Emus, Lyre-birds, Mallee-hens, Satin Bower-birds, and Tortoises, none of which, with the exception of the Echidna, were previously represented. With the addition of the common Black-tailed Wallaby, which was previously well established, there are now five species of Wallabies in the Park.

The Red and Grey Kangaroos have increased, while two pairs of Emus, which have long made the Darby their home, have reared twelve young ones during the last two years. It is hoped that the Platypus will be introduced during the year, and an endeavour is being made to obtain some Rock Wallabies, which are becoming very scarce.

Owing to the protection afforded them, the Native Bears have increased so largely in certain favoured localities that it has been found necessary to thin them out. An extensive tract of forest at Oberon Bay, consisting chiefly of Swamp Gums, *Eucalyptus ovata*, has been to a large extent destroyed by them, necessitating their immigration to other parts. With the object of replacing these trees, seeds of *Eucalyptus Gunnii*, *Eucalyptus vimmalis*, and *Eucalyptus cladocalyx* are being sown.

Portion of the sand-dunes on the north-west corner of the Park, together with a rather serious sand-blow, were planted with marram grass nearly two years ago, and the results have been so satisfactory that it has been decided to continue the planting each year.

Fortunately, there is now little chance of rabbits obtaining a footing on the Promontory, the only serious pest being the fox, which, however, is being kept well in check by systematic poisoning. J. A. KERSHAW.

IMPRESSIONS OF THE WILD-FLOWERS OF SOUTH-WESTERN AUSTRALIA.

By C. A. TOPP, I.S.O., M.A., LL.B.

(*Read before the Field Naturalists' Club of Victoria, 12th March*, 1917.)

DURING October last year, and a few days at the end of September and the beginning of November, I visited Western Australia, and spent most of my time at Bunbury, a seaport 115 miles south of Fremantle. While staying there I made several excursions for about 20 miles on the railway line towards Perth, for 12 or 15 miles inland from the coast, and about 50 miles south, also along the coast to Yallingup Caves.

While on this visit the great beauty and novelty of the flora impelled me to collect and dry some of the most conspicuous of the wild-flowers, and I have brought them here to-night, and propose to make a few remarks on them and on the flora of this part of Western Australia. I was at a great disadvantage from the fact that no local flora (in the book sense) was obtainable, and that there was no copy of the "Flora Australiensis" to which I could refer. My newly-made friends at Bunbury were very good in taking me to localities where an abundance of material was to be obtained, and in Perth I was helped in identifying some of my specimens by comparing them with some admirable water-colour drawings by a lady residing near Perth, and in a very hasty visit to the University by Professor Dakin's assistant (Mr. Kayser) in regard to the plants also found near Perth. Since my return to Victoria Professor Ewart kindly arranged for Mr. Audas, of the National Herbarium, to look over and name my specimens.

I may explain that, though nearly the whole area over which I collected was not above 20 miles square, and, indeed, though the bulk of my specimens were gathered within a few miles of Bunbury, they seem to be quite typical of the celebrated flora of the south-west, or, to be more exact, of plants flowering in mid-spring in that region.

My interest in the south-west corner of our island-continent as a botanic region had long ago been awakened by the notice of it in Sir Joseph Hooker's famous introduction to the "Flora Tasmaniæ," and I may revive your recollections of that essay by a few quotations. He says:—"There is a greater specific difference between S.W. and S.E. Australia than between Australia and the rest of the globe. . . . The most marked characteristics of the Australian flora are concentrated at that point which is geographically most remote from any other region of the globe. . . . In studying the extra-tropical flora of Australia the first phenomenon which

attracts attention is the remarkable difference between the S.E. and the S.W. quarters; the amount of difference I believe to be without a parallel in the geography of plants. . . . About one-third of the S.W. species are endemic; about 180 genera out of 600 in the S.W. are not found at all or are represented by very few species in the S.E." Bentham, again, seventeen years later, speaks of the "remarkable isolation and highly differentiated character of the flora of the S.W. corner of Australia." Mr. J. H. Maiden, F.L.S., in his interesting essay on the vegetation of Australia, written in 1914 for the information of the members of the British Association for the Advancement of Science visiting Australia in that year, gives details of the number of species in many Australian genera and their distribution in the various States. His figures fully support the remarks of Hooker and of Bentham. Though the vegetation of the S.W. thus differs widely from that of the south-east of Australia, it must not be supposed that, owing to the great number of shrubs and herbaceous plants, and even of trees, of species and genera not occurring in Victoria and New South Wales, a visitor from either of these States would have any doubt as to whether he were still in Australia. The presence of such characteristic Australian trees and plants as the Banksias, the Hakeas, the Xanthorrhœas, the Eucalypts, and the Melaleucas at once assures one that he has not left Australian shores.

The country round Bunbury and along the coast, both north and south, is flat, in places only a few feet above sea-level, cut off from the sea by sand-dunes, sometimes of considerable height—50 feet or more. It is intersected by creeks, which, at the time of my visit, had a good flow of water, and there are many swampy hollows in the spring. Where the land has not been cleared it is either open forest and grass land, or, in the light sandy loam near the coast, is covered with fairly dense scrub. The rainfall is about 40 inches, and the latitude about that of Newcastle, New South Wales.

Proceeding by rail from Perth to Bunbury, perhaps the first peculiarity which strikes one is the stretches of coarse grass and sedge land, whose shrub and tree vegetation consists of Banksias, with erect spikes of pale yellow flowers, looking like the candles on a Christmas tree; of Xanthorrhœa (*X. preissei*), called in the West "Black-boys," with very stout black stems, generally branched, and in some places of Kingias, with similar stems and leaf-tufts to the Xanthorrhœas, but bearing several scapes with globular flower-heads. As one proceeds further south the eye is delighted with the wide stretches of bright blue, due mainly to the abundance of the lovely *Leschenaultia biloba*, and again the aspect of the roadside is changed by the

numerous queer-looking red and green flowers of the Kangaroo-paws, *Anigozanthus Manglesii*, rising one or two feet above the grasses and sedges. Patches of the pink flower-stalks of tall-growing Candolleas and deep red pea-flowers add variety to the floral scene.

One of the most striking differences noted between a Victorian heath or grass land and one in the neighbourhood of Bunbury was the predominance of blue, pink, and red flowering plants over the yellows and whites so common in our part of Australia. The blues are contributed by the lovely bright-blue corymbs of *Leschenaultia biloba*, the rather darker blue of the flowers of the scarcely less beautiful *Scævola striata* and of *Dampiera linearis* (all Goodeniaceous plants), and by the purplish-blue of *Platytheca golioides*, a close relative of our Tetratheca. Besides the lovely blue Platytheca I found a white variety; this is not mentioned in Bentham's "Flora." Leschenaultia is almost confined to Western Australia. It numbers fourteen endemic species, while four only are found in other States. This beautiful genus is more than usually varied in the colouring of its flowers. In some species the flowers are described as red or scarlet: in others as yellow, white, lilac, or pale green. I saw only the one species—with the brilliant blue flowers. I was told that it could not be grown in gardens. This, however, is a mistake; it is now grown near Melbourne, and it was cultivated in England in 1840. *Scævola striata* is confined to Western Australia, where it is abundant, though the genus is widely distributed throughout Australia. Both flowers and foliage are handsome, and it is well worthy of cultivation. Dampiera is mainly Western Australian, though there are a few species in all the other States. The Western Australian species are endemic in the State.

Anigozanthus is a genus exclusively Western Australian, as are four out of the five Australian genera of the family (Hæmodoraceæ). Eight species are given in the "Second Census," and Mr. Maiden states that eleven species are now known. I collected three which were abundant,—*A. Manglesii*, with red and green perianth; *A. viridis*, with the perianth entirely green; *A. rufa*, with the flowers on short-branched stalks, so as to give it the appearance of a head of flowers, coloured creamy and slightly pink. I should have mentioned a plant found along with the "Black-boys"—the Fern Palm, *Encephalartus Fraseri*, whose curious, spirally-twisted, pinnate leaves and central yellow cone are pretty frequently seen scattered through the bush. The species is endemic in the West, but the genus is found in all the States but our own.

Perhaps the next most striking feature in the plant landscape after the predominance of the blue colouring of the herbs

and low shrubs is the frequency of tree Banksias of various species, of Paper-barks and other Melaleucas, of the Xylomelum (locally called "Prickly Pear"), and of the Agonis (locally called the "Peppermint"). Eucalypts near the coast were comparatively rare, and I saw no Acacias except one small spiny shrub, *A. pulchella*, very much flattered by its specific name and by Bentham's description—"an elegant shrub." I suppose it is variable in height and habit. The Paper-bark Tree, *Melaleuca leucodendron*, is much stouter and taller than our swamp tea-trees, and grows in grass country, though possibly its roots may be in underground water. It is often 40 or 50 feet high, with a stem one or two feet in diameter, and with stout, more or less horizontal or pendent and twisted branches, not unlike those of the common oak, though not so wide-spreading. Its outer bark consists of many layers of fibrous, papery sheets. This tree is remarkable as having the widest distribution of the Melaleucas, being found in New South Wales, Queensland, North Australia, in the Indian Archipelago, and the Malay Peninsula, and as being the only Australian Melaleuca found outside our continent. The Willow Myrtle, *Agonis flexuosa*, known as Peppermint, is a particularly graceful tree, and is abundant round Bunbury. It attains the height of 50 or 60 feet, and is endemic in south-west Australia. Its branches droop and carry willow-shaped leaves, and bear on the outer side abundant clusters of small white flowers. These give the trees the appearance of having received a fall of snow. This tree bears flowers when only two or three feet high. For some reason Mueller considers it one of the best of evergreen trees for cemeteries. I am glad to say that I could admire its graceful form without thinking of graveyards and tombstones.

On the grass lands and among the scrub I saw many Droseras and Candolleas (Stylidium), several species of Hibbertia, Tetratheca, and Pimelea new to me, endemic in Western Australia, and probably confined to the south-west of that State. The most remarkable Drosera was *D. gigantea*, which rises three or four feet above the ground, has a slender but stiff woody stem, with numerous horizontal, slender branches terminating in panicles of small white flowers. It takes one by surprise to find that this erect, slender shrub is a Sundew. Other Droseras had large crimson flowers. This genus is very largely represented in Western Australia, about 45 species (Maiden) being found there. The "Second Census" gives 28 as endemic out of 43 then known in Australia.

The "Prickly Pear," *Xylomelum occidentalis*, derives its substantive name from the fruit, which somewhat resembles an inverted pear, and the adjectival qualification from the

sharp points of its leaves. The Western species is almost identical with that found in New South Wales—*X. pyriformis*.

The most striking and novel Hibbertia was *Hibbertia stellaris*, a slender, much-branched shrub, which well deserves its name. It is three or more feet high, with linear leaves and very numerous, rather small flowers on slender stalks of all shades of orange and brown. It will be seen that it differs widely in habit and coloration from our Victorian Hibbertias, three of which—*H. densiflora*, *H. stricta*, and *H. acicularis*—are found in the south-west. *H. stellaris* is not as widely distributed as other Hibbertias, but where it is found is very gregarious. Tetratheca is well represented in species, there being eleven endemic in Western Australia and only three elsewhere ("Second Census"). It was rather sparsely represented in individuals in the localities I visited. *T. virminea* bears handsome flowers, larger than those of our species, *T. ciliata* and *T. ericifolia*. I have already mentioned the beautiful Platytheca, belonging to the same family, and which I met with in several localities.

The taller scrub consists of Melaleucas, Beaufortias, Astarteas, Hypocalymnas, Grevilleas, Dryandras, Isopogons, Petrophilas, Adenanthus, various shrubby Leguminosæ, and a bushy Hibbertia. The Melaleucas (Swamp Tea-trees) and Beaufortias (the latter genus endemic in Western Australia) resemble one another in habit, foliage, and inflorescence of the bottle-brush or spherical shape. *M. pungens* is a tall shrub with a creamy-white spike of flowers. *M. thymoides* has short spikes of bright yellow flowers. Hypocalymna is a beautiful endemic genus. *H. angustifolium*, locally called "Native Heather," is a slender shrub three or four feet high, with rather distant linear leaves and a tiny cluster of pink or white flowers in each axil. *H. robustum* is a stronger-growing shrub, and the axillary flowers are a deep pink. Petrophila is a genus mainly confined to Western Australia. *P. linearis* (locally called the "Flannel-flower"), is a beautiful low shrub bearing abundant flowers in what appears to be a head, the perianth, covered with delicate silky hairs, giving it a velvety, not a flannel-like, surface, with white or pale pink coloration. Adenanthus is a south-west Australian genus. The two species which I found (*A. barbigerus* and *A. obovata*) have single dark red flowers in the axils of the leaves. I collected only one Grevillea—a straggling shrub with much-dissected leaves and magnificent racemes of pink and cream-coloured flowers—*G. pinnatisecta*. Dryandra is another exclusively Western genus, with the flowers enclosed in an involucra, as in the South African genus Protea. I noticed two species—*D. nivea* and *D. cuneata*. The base of the perianth appears to contain much honey, and I found a good-sized beetle feasting in one flower.

I may mention as a rather surprising fact that, though blue, purple, and red flowers were so common, I noticed no bees or butterflies—insects which are, or were, supposed to be specially attracted by these colours. Another Proteacean genus, Synaphea, is confined to south-west Australia. I collected one of the four species, a low shrub occurring pretty commonly, with stiff, much-dissected leaves and spikes of small yellow flowers. I noticed two species of Isopogon—a genus familiar to us. One, *I. roseus*, had rather handsome cones of red flowers. Of course, many pea-flowering plants occurred in the bush, but not so many, I think, as on some of our heaths. I gathered specimens of Kennedya, Bossiæa, Eutaxia, Pultenæa, Isotropis, Daviesia, Gompholobium, Oxylobium, and Bartonia. *Bartonia scabra*, which I found only at Albany, is a handsome shrub with large lilac and purple flowers. *Oxylobium callistachys* is a fine shrub with silvery leaves and dense terminal clusters of orange flowers. I must not omit to mention a Thomasia (*T. macrocalyx*)—a member of an almost exclusively Western Australian genus (there is one Victorian species), a shrub with abundant lilac flowers.

The plants growing on the sand-dunes were chiefly *Hemigenius pungens*—a prickly-leaved, rather tall shrub of the Labiate family, with large blue flowers, forming dense thickets; *Anthocercis littorea*, a good-sized shrub of the family of Solanaceæ, with yellow flowers, rather glossy green leaves, and petals almost linear: a shrubby Hibbertia, *H. obcuneata*, with broad leaves and large yellow flowers; and *Pultenæa aciphylla*, a bushy shrub with pungent leaves and very sparse flowers, orange-coloured. There were, of course, other shrubs not in flower. I was nearly omitting mention of the large genus Pimelea, represented in Western Australia by some very handsome species. *P. rosea* is a low shrub with numerous heads of rosy-pink flowers. *P. spectabilis* has a very large head of creamy flowers.

In describing the flowers of South-West Australia, I shall no doubt be expected to give an account of the beautiful genus Boronia, *B. megastigma*, largely cultivated in our gardens on account of the delightful fragrance of its flowers, being well known to be a Western plant. However, I only noticed two species of this genus about Bunbury. I believe the neighbourhood of Albany is famous for the abundance of its Boronias, one of its show places being Boronia Gully.

Having dwelt on the striking differences between the south-west flora and that of the south-east, I may refer to some resemblances which I noted. I was pleased to find many old Victorian friends among the orchids. Among these are *Gastrodia sesamoides*, many Thelymitras (there are actually

seven identical species, and only two Victorian ones absent), one Diuris, several Prasophyllums, Caladenias, and Glossodias, though the last-named are not of the Victorian species. In fact, the "Census" shows that only two Victorian genera of Australian orchids are absent from south-west Australia (Dipodium and Orthoceras), and only one Western Australian genus (Epiblema) is not represented in Victoria. The common Victorian liliaceous plants, such as Dianella, Wurmbea, Burchardia, Bulbine, Thysanotus, Chamæscilla, Stypandra, Arthropodium, are found in the south-west: but, being early spring flowers, only odd examples were in bloom in October. A large number of the grasses are common to the south-west and south-east of Australia, but these I did not collect.

SILVER WATTLES.—Mr. F. Wisewould reports early flowering of the Silver Wattles, *Acacia dealbata*, at Pakenham Upper, many blossoms being fully out on 18th June. It may be mentioned that *Acacia Baileyana* was noticed in bloom in the eastern suburbs on 1st June.

NATURE AND WAR.—In the "Science Notes" in the *Australasian* of 30th June, "Tellurian" gives a few notes which show that Australians abroad have an eye for nature study. Is this the result of their early training in our schools? He says in a letter recently received from Palestine, written by a soldier during a lull in an engagement, the writer describes the battlefield as "beautiful green fields, with blood-red poppies. There were larvæ of all descriptions crawling in the grass, and swarms of butterflies, just emerged. These did just what other butterflies do on such occasions. No matter where you stooped you saw a pendant chrysalis flipping its tail, or a butterfly just emerged clinging to a stem, its wings not unfurled, or a perfect insect with wings fully expanded, but yet too weak to face the world." . . . "The funnel traps of the ant-lion larvæ were all over the place, and one of our wounded pointed out to me a small grasshopper gripped and held in the bottom of the pit by one of the ant-lions, and just as the poor grasshopper was taking things as a matter of course, so were our poor chaps taking the machine-gunfire, shrapnel, high explosives. I don't say for a moment that either enjoyed the situation, but, with the men, until one is cracked, he always reckons it will be the other fellow who will get it. I can't speak for the grasshoppers, but that's how they feel about their chances with the ant-lions." These notes were written in the neighbourhood of Gaza, that ancient city of Palestine, which has had many masters in its time.

TOURIST MAPS.—During the last few months several tourist maps have been issued by the Lands Department which have not been noticed in these pages. One of the most comprehensive is that of Ballarat and Creswick, which embraces a large tract of country from Lake Burrumbeet on the west to Ballan on the east, and from Clunes in the north-west to Lal Lal in the south-east—about 1,000 square miles in all. All the main roads are marked, and those suitable for motor traffic indicated. In addition to numerous illustrations and descriptive letter-press, an inset map on a larger scale is given of the Creswick Forest Nursery and Plantation. The area covered contains many beauty spots in the way of lakes, streams, falls, and mountains, and visitors will now have no difficulty in reaching their objective, whatever it may be. The map will serve as a help when studying Mr. T. S. Hart's paper on the eucalypts of the Creswick district, read at May meeting of the Club. The map of Daylesford and District is on the same scale (1¼ miles to the inch), but does not cover so much ground. As Leonard's Hill railway station, in the Wombat Forest, occurs on both, they can be read together. Here, again, numerous beauty spots for tourists are indicated, such as the magnificent extinct crater of Mt. Franklin, the impressive Trentham Falls, and mineral springs in every direction. Another map, entitled the Castlemaine and Kyneton Districts, takes in Mt. Franklin, Mt Alexander, Redesdale, and Woodend, and in the centre, about Elphinstone and Metcalfe, embraces some pretty rural country. On this sheet again letterpress and illustrations serve to direct attention to many beauty spots well worthy of tourists' attention The map of Geelong and District, which is also accompanied by attractive illustrations and descriptive letter-press, introduces the tourist to country of a different character. Here the way of approach to numerous seaside resorts, each vying with the other in offering attractions to visitors, is distinctly shown. For those who prefer inland country, the Moorabool Valley and the Barrabool Hills will provide many pleasant outings, the roads to which are plainly indicated. The last map to which attention is now drawn is that of Colac and the Red Rock Reserve (near Alvie). The view from the Red Rock is considered one of the sights of Western Victoria. From its summit some thirty lakes, large and small, are in view at the one time, the huge Corangamite, like an inland sea, stretching north and south for many miles, while the rich pasture lands of Cororooke lie between it and its smaller neighbour, Colac. Away to the south may be seen the forest-clad hills of the Otway Peninsula. Any of these plans can be obtained on application at the Tourist Bureau, Collins-street.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 9th July, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about sixty members and visitors were present.

CORRESPONDENCE.

From Mr. J. S. Mann, of Frankston, conveying appreciation of the thanks of the Club for hospitality shown to excursionists.

From Miss Hornby, requesting assistance by decorations of wild-flowers at a Y.M.C.A. entertainment on 7th August.

The president stated that the committee had considered the matter, but, owing to the early date, it was considered inadvisable to make a Club display, but individual members who could assist were urged to do so.

From Mr. T. Patterson, of East Malvern, asking that the Club bring before its members the reported ravages of insect pests having their natural habitat in the wattle among Australian primary products. He requested that the Club investigate the subject, as the promotion of Australia's producing industries is of paramount importance.

A lengthy discussion took place, of which the following is a condensed report :—

Mr. C. French, jun., through whose remarks at a public lecture Mr. Patterson's attention was attracted to the subject, amplified the statement credited to him—that the wattle, as a host for insect pests, was decidedly a menace. He instanced at least nine native Australian insect pests attacking the wattle that are now serious orchard and ornamental tree pests, giving the following particulars :—Apple-root Borer (Leptops), native host, wattles ; now one of the worst, if not the worst, insect pest of fruit trees in Victoria. Elephant Beetle Weevil (Orthorrhinus), native host, wattles ; now the Orange and Lemon Weevil, attacking citrus trees and vines, also elms, planes, and tamarisks. In Mildura this weevil is a serious vineyard pest. Wattle bugs—native host, wattles, &c. Quite a number of these insects destroy fruit and fruit trees. The Holy Cross Bug (Mictis) is very destructive to orange and lemon trees ; native pest of wattles, &c. The Painted Apple Moth (Teia), native host, wattles. The larvæ of this moth are now amongst the worst pests we have in Victoria. They attack apple and other

fruit trees, garden plants, such as lupins and geraniums, tree lucerne hedges, and other trees. Cherry Borer (Maroga), native host, wattles. The grubs bore into apricot, cherry, and other fruit trees. Uracanthus Borer, native host, wattles. This small longicorn beetle has recently attacked cherry and plum trees. Apricot Beetles (Belus).—These weevils have become pests of apricot trees; native host, wattles. Amongst other wattle tree pests which have become orchard and garden pests are looper caterpillars, Pinara Apple Moths, and many others.

Mr. D. Best defended the wattle, but stated that the breaking of branches, &c., allowed openings for these pests to deposit their eggs.

Mr. J. Gabriel stated that when looking for fishing bait he invariably went to the wattle trees for it.

Mr. G. A. Keartland corroborated the last speaker, and added that the blue gum proved also a suitable host for many of the pests referred to.

Mr. J. Cronin was given a warm welcome on his first appearance at a Club meeting, although a member of many years' standing. In many points he agreed with Mr. French, but could not condemn the wattle wholesale. He said a great many of our wattles were immune from pests, and mentioned that, in the Goulburn Valley, where no wattles had probably ever grown, as soon as orchards were established the pests were as prolific as elsewhere. While he thought the Black Wattle was not worth growing near cultivation, especially in such districts as Wandin, Lilydale, Doncaster, &c., yet the destruction of every wattle in the country would not eradicate the evil. It was too late. They were too firmly established—not only on our native plants, but on the numerous introduced exotic weeds and other vegetation. Clean cultivation was the only remedy.

Mr. G. F. Hill agreed that the wattle was a great factor in propagating pests, but there was little hope of coping with the trouble by the destruction of the wattles. The only means was to fight them with the recognized methods.

Mr. E. E. Pescott, F.L.S., referred to the habits of adaptation of these pests, where the balance of nature had been upset by the destruction of the natural enemies, the birds. No methods of combating them were of any use but spraying and similar means.

Mr. F. G. A. Barnard expressed the opinion that the destruction of their natural food was the reason for these insects attacking garden and orchard growths.

Mr. J. Stickland instanced the scarlet gum as having proved a very suitable host for the pests in question, in addition to the wattle.

The president, in closing the debate, said he thought Mr.

Patterson was fully justified in bringing the question before the Club.

On the motion of Mr. Keartland, seconded by Mr. Robertson, the matter of sending a suitable reply was left in the hands of the committee.

ELECTION OF MEMBERS.

On a ballot being taken, Mrs. Stanley Eaves, Teslar-grove, Caulfield; Miss J. F. Sincock, Barkly-street, East Brunswick; and Mr. J. Van Cooth, Wattletree-road, East Malvern, were elected as ordinary members; and Mr. D. O. Southby, Royal-parade, Parkville, as an associate member of the Club.

GENERAL BUSINESS.

The president announced that it had been decided to hold an exhibition of wild-flowers on Tuesday, 2nd October, and the Melbourne Town Hall had been secured for the occasion. He trusted members would endeavour to make an even better display than on the last occasion.

Mr. C. Daley, F.L.S., intimated that the Tourist Bureau intended to repeat in September the trip to the Grampians. This had been arranged to take place during the week preceding the wild-flower exhibition. Particulars would be obtainable from the Tourist Bureau at an early date.

It was decided to appoint a ladies' committee in connection with the exhibition of wild-flowers, and Miss G. Nethercote was requested to act as convener.

NOTES ON EXHIBITS.

Miss G. Nethercote and Messrs. F. Pitcher, E. E. Pescott, F.L.S., C. J. Gabriel, G. F. Hill, and F. G. A. Barnard called attention to points of interest in their exhibits.

PAPER READ.

By Mr. D. J. Paton, entitled "The Buffalo Plateau in January."

In the absence of the author, a country member, the paper was read by Mr. F. G. A. Barnard. The author called attention to the more prominent plants and shrubs to be found blooming in the high altitudes of the Buffalo Mountains in midsummer, and also to some of the scenic beauties of the district.

Several members endorsed the author's remarks, and urged the claims of the Buffalo Plateau from a naturalist's point of view.

EXHIBITS.

By Mr. C. J. Gabriel.—Marine shells—*Fistulana grandis*, Desh., from New Caledonia; *F. clava*, Lam., from Singapore; and *Aspergillum pulchrum*, Desh., from Singapore.

By Mr. G. F. Hill.—Insects from the Northern Territory, including a number of rare or recently-described species. Among them were the beetles *Leptops inermis*, Lea; *L. latipennis*, Lea; *L. laticollis*, Lea; *Laius purpureicollis*, Lea (collected at low tide on the shores of Port Darwin); and *Diphobia myrmecophila*, Lea (inhabits the nests of the Green Tree-ant); eight species of diptera (Tabanidæ): three species of Lepidoptera, including *Maroga leptopasta*, Turner, bred from mangrove branches, and *Anthela ochroneura*, Turner, a very handsome Lymantriid, also a rare Pentatomid bug, *Eumecopus mimicus*, Distant: several large specimens of scorpions—three of these were shaken out of an aboriginal's bedding after the owner had risen from a night's undisturbed slumber.

By Mr. J. A. Hill.—Specimens of orchid, *Pterostylis reflexa* from Galton South (Wimmera).

By Miss G. Nethercote.—Flowers of *Epacris impressa*, *Hakea nodosa*, &c., from Wandin.

By Mr. D. J. Paton.—Dried specimens of *Helichrysum Stirlingii*, *Prostanthera Walteri*, &c., from Buffalo Mountains, also photographic views, in illustration of paper.

By Mr. E. E. Pescott.—Operculum of *Eucalyptus erythrocorys*, F. v. M.; flowering specimens of orchids, *Pterostylis concinna*, R. Br., and *P. nutans*, R. Br.; opercula of shells from Northern Territory, resembling opals.

By Mr. F. Pitcher.—Specimen of a mistletoe (Loranthus, sp.) being strangled by the growth of its host (Ecualyptus, sp.), obtained by Mr. E. J. Dunn, F.G.S., near Taylor's Reward mine, Clarence River, N.S.W. A remarkable example of a tree ridding itself of a troublesome parasite, for in a short time the Loranthus would have been completely killed. The eucalypt was upwards of 200 feet high.

After the usual conversazione the meeting terminated.

Map of Melbourne and Suburbs.—An excellent map of Melbourne and suburbs, showing all the tram and train routes, has just been issued by Osboldstone and Co. It is on the scale of 1 inch to 1 mile, and folds into a cover 4 x 5½ inches, handy for the pocket. The municipalities are in different colours, while as only the main streets and roads are shown the map is saved from a plethora of names. It will be found very handy for lovers of the open air in taking cross-country jaunts, say, from one tram terminus to another. An outline of the tram time tables, with fares, is given on the back of the map.

A THOUSAND MILES ON THE RIVER MURRAY.

By O. W. ROSENHAIN.

(*Read before the Field Naturalists' Club of Victoria, 16th April,* 1917.)

EIGHTY-SIX years ago that great Australian explorer, Charles Sturt, explored the Murray waters and opened up to the world the largest river system in Australia. In that wonderful boat journey from the mouth of the Murrumbidgee to the sea and back, Sturt and his gallant companions rowed no less than 1,600 miles—the longest boat journey on record. What a wonderful journey that must have been, gliding down this glorious river in all its virgin beauty, before the ruthless hand of the white man had begun its work of slaughter, crime, and destruction! Hardly any of the scenes observed by Sturt in his memorable journey are to be seen to-day. On the whole length of the Murray not one pure native is to be seen; his canoes have gone; his burial-grounds have been desecrated; the only records are a few large eucalypts, at intervals, from which bark canoes have been cut.

The desire of my life has been to make a journey on the Murray, but circumstances never seemed to fit in until the 31st of August, 1916, when I left Echuca on board the good passenger steamer *Ruby* for a thousand miles' run to Murray Bridge. Comparatively few people have any idea or are aware of the many attractions which the Murray offers to the traveller and tourist. In the Murray Australia possesses an asset which her legislators from the very earliest stage have failed to grasp or realize. From Albury to the Murray mouth, at Goolwa, the river has a length of 1,366 miles, and practically the whole distance on both sides of the bank the land is nearly level, and lends itself easily for channelling and irrigation. During the distance from Echuca to Murray Bridge it passes between what is known in Victoria as the Mallee, and on the New South Wales side as the Riverina. These districts are known more or less as dry and rainless areas; but when the Murray overflows large tracts of country are inundated; inland lakes, creeks, and water-holes are filled, and presently everything is green, luxurious, and beautiful. To my mind the Murray can be compared to the Nile, as it overflows practically every year, and had our legislators in the early days spent money in utilizing this water for irrigation purposes and cultivating the lands, by the building of dams, locks, and weirs, millions of acres would be under crop—either wheat, maize, lucerne, or fruit; but now, with the exception of Mildura, Renmark, and a few small settlements, the whole of this thousand miles is practically waste country. The squatter in the early days

set about in a ruthless fashion ringing trees, without let or hindrance—to do this work must have cost many thousands of pounds; and now you see these dead monarchs of the forest for hundreds of miles on the river front, and extending back as far as the eye can reach, one mass of white, dead timber. In places the fallen timber is so thick that cattle cannot penetrate. The waste of money in this destruction, estimating the value of a tree at only 1s., must run into several millions of pounds sterling. When the eucalypt has been rung it seems to effectively kill every sap, fibre, and particle of life in the tree, so that you seldom see a young eucalypt spring up in a forest whose trees have been rung.

There is a charm in a holiday trip on the Murray which is peculiarly all its own. For a restful, health-giving change, a lazy, luxurious lounge, there is no resort in Australia to compare with the voyage along this zigzag track. The Murray is a slow-flowing river, and, although at the time of my trip it was in flood, and in many places had overflowed its banks and caused large inland seas, yet the flow of the stream was at the rate of from one to one and a half miles per hour. The fall in the Murray from Echuca to Wentworth (distance about 540 miles), where the Darling junctions with the Murray, has an average of about 5 inches per mile; from Wentworth to the Murray mouth at Goolwa (distance about 518 miles), about 3 inches per mile. The width of the Murray at Echuca is, I should estimate, about 300 to 400 feet, and it gradually widens until below Wentworth, where it varies from about 500 to 800 feet; beyond that towards the South Australian border it becomes somewhat wider—perhaps to 1,000 feet. There are several streams that flow into the Murray. The first one which is met with after leaving Echuca is the Edward; this is some distance beyond Swan Hill. A little further on is the Murrumbidgee, and about 200 miles further on the Darling (about 540 miles from Echuca). The waters of the Edward and the Murrumbidgee are very clean, but that of the Darling is of a thick, muddy character, and for at least 200 miles the waters of the Murray are still turbid as the result of contact with the Darling. There is very little evidence of native life to be seen on the Murray flats, although in the early history of Australia these places must have been teeming with native population, as evidence is not lacking, which can be seen from some of the remaining large eucalypt trees, where the bark has been stripped for canoes. I also found traces of kitchen middens. The murder of natives in the early history in some parts along the Murray has been appalling. Simpson Newland, in his popular novel, "Paving the Way," describes how, near Rufus Creek (the waters of which flow

into Lake Victoria), the natives were massacred in great numbers—to such an extent that the waters of the creek were said to have run red with the blood shed on one occasion. It is stated that the creek obtained its name "Rufus" from this bloody battle.

As regards the trip itself, we were a happy party of nineteen tourists. Leaving Echuca at 6 o'clock in the morning, we very soon settled down to making each other's acquaintance and the routine of the ship as regards hours for meals, &c. I feel personally indebted to the Gem Co. and its chairman, Mr. Drew, who, I was informed, in the face of much opposition, succeeded in getting the company to inaugurate the trips. Everything was done to make tourists feel comfortable, happy, and contented. The ship was clean; the cabins (all two-berth deck cabins) were large and well ventilated; the beds were comfortable and bedding clean; electric light throughout the ship; hot and cold plunge or shower baths; ladies' saloon, gentlemen's smoking room, and large diningroom. The meals were good, well cooked, and nicely served, and quite a number of courses at every sitting. Besides the usual chief three meals, there were extra appetizers at 11 a.m., 3 p.m., and 9 p.m., so we were well looked after in that respect. The crew consisted of one captain, two mates, one purser, two engineers, two stewardesses, six deck hands, one cook, one "slushey." The cook was a Chinaman. His pantry and kitchen was a model of good order and cleanliness; he was an epicurean artist. The steamer has three decks the full length of the vessel (140 feet). I can absolutely recommend this trip to everyone who desires a week or fortnight's real rest and enjoyment second to none in Australia. The scenes from the top deck were most inspiring—gliding along in perfect spring weather, fine stately red gum eucalypts lining each side of the river as far as one could see, a few ducks, swans, and pelicans now and again skimming along the water or flying overhead. From both sides of the river came the songs of the various birds which have their habitats there. On the whole, there was not much bird-life on the river. The Murray has very few long stretches—it continually turns and zigzags; in fact, the captain, when appealed to on one occasion after we had made a long detour of about three miles, which could have been covered on land by about 100 yards or less across, said it would break a snake's back to try and navigate the river.

Our first stopping-place after leaving Echuca was about mid-day, when we had to take in wood for fuel. This allowed us about an hour ashore, and enabled us to penetrate inland a little. After taking in sufficient fuel, a start was made for Barham Sawmills. This is a large mill on the New South

Wales side, owned by the Barham Sawmilling Co. On account of the river being very low for many months previously, a fairly large stock of timber had accumulated, and they estimated there were about 1,000,000 superficial feet of timber stacked there. The manager told me that timber was becoming very scarce, and it hardly pays now to do the cutting. The nearest trees that can be felled are about ten miles from the mill, and it takes the men all their time to take the bullock teams out and bring the logs in to the mills. The Government supervision is very thorough. The minimum measurements are :—The tree must have a girth of 8 feet 6 inches 20 feet from the ground—anything less than that must not be felled ; there is a fine if trees are cut less than these measurements. The price the mill-owners have to pay the Government is 15s. per 1,000 super. feet in the log. It costs 8s. 6d. per 1,000 super. feet for felling the tree, and 25s. per 1,000 super. feet for hauling the log to the mills. We stayed at Barham overnight, and got a start early the next morning. The water at Barham was within three inches of overflowing the banks. It was steadily rising, and when I questioned some of the residents whether they were not afraid of being flooded out during the night they were quite unconcerned, and were not afraid of anything of that sort happening, as it would mean a tremendous volume of water to raise the level over the banks ; but when once over the banks there was very little hope of the settlers escaping being washed out. At one small settlement a little further up the river, which we passed coming along, the water was just coming over the banks, and the inhabitants were busily putting up a mound about 12 inches high along the banks and around the buildings. This seems to be very effective in keeping the water off.

Our next stop was at Koondrook, about ten miles further down. This is a township on the Victorian side, and there are fairly large irrigation works here. On the opposite side of the river is Barham. A very fine lift-bridge crosses the Murray at this point ; but with this bridge, as with a lot of buildings made by the Government, there is no provision made for any abnormal rise in the river, the result being that, in order to pass under this lift-bridge, we had to put on a lot of extra cargo to lower the steamer, take down the funnel, and take off the top railing, and it was then by the merest scrape and squeeze that we managed to successfully get under, and this was not accomplished until we had made several unsuccessful attempts. This lift-bridge, as well as one further down the river, seems to have been made for barges, and not for passenger steamers. When passing under this bridge I counted nineteen Swallows' nests. Leaving Barham, we next passed

Campbell's Island, 123 miles from Echuca. On this island, formerly, wild pigs were very numerous, but soon after that became known the pigs were shot out for market. There are no pigs there now. The next important point is Pental Island, 34 miles further on. During this stage some very fine scenery is met with. This island is now cut up into small irrigation farms. Formerly, wild pigs were numerous.

The next point is Swan Hill, 192 miles from Echuca, which we reached at 6 p.m. on Sunday, 3rd September, 36 hours after leaving Echuca. At Swan Hill the lift-bridge and wharf were crowded with people. There was great excitement at seeing so large a steamer as the *Ruby*. It created quite a stir; in fact, all along the river from Echuca, at the little villages which we passed, there were eager sightseers, lots of whom had never seen such a large steamer before. The mosquitoes here were as thick as bees in swarming-time. For miles on either side of the river the country was flooded. Lots of homesteads were only a few inches above the water. We passed numbers of small fruit gardens and orangeries. The banks of the river at these irrigation plots had been raised so as to keep out flood waters.

We left Swan Hill at 4 a.m. on Monday, 4th September. Twenty miles further is Nyah, a new Victorian irrigation settlement, chiefly orange culture. A little further on we passed a hut, outside of which a half-caste woman and five children were standing—Mrs. Allnations. She has Chinese, Afghan, black, and white children; hence her name. We soon pass Tooley sheds, on the New South Wales side. The first wool ever shipped on the Murray went from here to Goolwa, in South Australia. From this point to Wakool junction—40 miles—the Murray winds considerably. The River Wakool flows into the Murray at a most picturesque spot. We took fuel on board here. Thirty miles further on we pass Murrumbidgee junction. The water from this river is nice and clear. A flight of about 150 to 200 Native Companions hovered over the steamer at this point. The Murrumbidgee is not a very large river, but is navigable for a considerable distance. The weather up till now had been absolutely perfect. The river being fairly wide and straight after passing the Murrumbidgee, we steamed all night. At 6 a.m. on Tuesday, 5th September, we made fast opposite a survey camp on the Victorian side to land provisions. The banks at this point were about 20 feet high, and it was with some difficulty we got the cargo on shore. From here the river makes a 90-mile bend, which is only 17 miles across on land. This survey camp is 406 miles from Echuca and 111 miles from Mildura. At 9 a.m. we made fast to the 717-mile tree at Kulkyne landing, close to Chalka

Creek. I might mention the mile trees commence from Albury. Chalka Creek had a special interest to me, as it flows into Lakes Mournpool, Lockie, Brockie, and others. Two and a half years ago the late Mr. O'Donoghue and myself walked along the bed of this creek for several miles—it was then dry; now it is a fine creek full of nice, clear water. We took in fuel and landed a little cargo for the one fisherman, his wife, and four children. They were all very shy. People who can live in these places year in and year out are real heroes. The only vegetation was stinging nettles and lignum bushes, besides some fine eucalypts; otherwise the country is dry and parched. The nearest neighbours were at Ouyen, 18 miles away. Mosquitoes were troublesome during our stay of 1½ hours. The dwelling showed little comfort, and the weather was hot. We bought 68 lbs. of fine live fish here; cost, 6d. per lb. One Murray perch weighed 9 lbs.; half the fish were perch and the other half cod. The fisherman told me he gets 6d. a lb. there for all he catches. The fish are caught in nets and kept in enclosures in the Murray. Buyers come from Ouyen in carts, take the fish away, and send it to Melbourne. Left here at 10.30 a.m. Next stop was Bonnie Doon Junction, near Caradoc Hut, about 6 p.m. Took about 60 bales of wool on board under difficulties; left at 7.45 p.m. The mosquitoes here were awful. At 10 o'clock that night we reached Mildura. All of you know of Mildura, so I need not dilate on it. We left again 1½ hours later. Much grumbling was occasioned by the tourists at the captain losing time in taking in cargo en route, so that we arrived in Mildura 12 hours late.

Wentworth was our next stop. We discharged most of our cargo. Here the Darling junctions with the Murray. The Murray water is now dirty and thick; this is caused by the Darling waters, which are always dirty—in fact, the Darling is unlike its name—it is an uninteresting stream as far as scenery is concerned. Wentworth is one of the oldest towns on the Murray. In the palmy days of pastoral industry, and before the advent of railways, a big business was done here. High rivers have more than once threatened to submerge the town. From Wentworth down-stream the sheep-runs are noted for the excellence of the wool produced. Many large stations or runs are passed on either side of the river. At Ned's Corner woolshed, 625 miles from Echuca, we took in 178 bales of wool. This station has a frontage of 80 miles to the River Murray, and is the property of the Barr-Smith family, of South Australia. It is noted for its merino wool, the annual clip running into about 1,500 bales. There was a strike on at the station at the time of our visit. The homestead is about 20 miles from here. We next pass Rufus Creek, which flows into Lake

Victoria, in New South Wales—so named after bloody conflicts with the blacks at this point. The blacks were practically exterminated in these encounters. They were very numerous about this part of the Murray in the early days, and it is said were a source of great danger to stockmen and early settlers.

Lake Victoria plays a very important part in the scheme for the conservation and locking of the Murray River waters. Situated in a natural basin some four or five miles from the Murray, it occupies an area of 25,600 acres. It is filled from the river by means of Rufus Creek and Frenchman's Creek, and at flood level is said to hold a volume of 22,000 million cubic feet of water. By the terms of the inter-State "Murray waters" agreement, the lake, which is situated 35 miles from the South Australian border by water and about 18 miles by land, is ceded by New South Wales to South Australia, to be used by the latter State as a storage basin. By means of the proposed locks it will be possible to fill the lake even in periods of low river flows.

We next come to the Devil's Elbow, one of the sharpest turns in the river, the navigation of which is always a source of anxiety to river masters, especially at low water. The curious cliff formation is very striking, and it was a pity we did not land here. Further on we pass some very fine willows growing on the edge of the water. Then we come to Pollard's Cutting. Here the river cuts across the bend, and thereby causes the river proper to silt up, forming an intricate and difficult channel, the navigation of which at times tests the skill of river captains. A great many of these cuttings have occurred in the course of the Darling and Murray Rivers, and it is said that within the last 50 years the lengths of the rivers have been materially shortened thereby. They are not an unmixed blessing. While they shorten the journey for the steamers, they increase the rapidity of the river's flow and shorten the period of navigation. One of these cuttings in the South Australian territory, known as Daly's Cutting or Goat Island cutting, a few miles above Renmark, has come into much prominence lately. During the very low river of 1914–15 the Renmark Irrigation Trust constructed a dam across the mouth of this cutting in order to raise the level of the river to the pumping station. The flow of the river was diverted into the old channel round the island, with the result that the level of the water at Renmark, three miles up stream, was raised by three feet, and navigation was made continuous between the railhead at Paringa and Renmark. The next point of interest is Linsay's Cliffs. This is in the Cal Lal district, on the extreme verge of settlement in western New South Wales. All this district originally formed part of the

Lake Victoria Station, which had a frontage of some 50 miles to the river and ran back from the river for 70 miles.

A little after sunset we passed the South Australian border. The boundary fence between South Australia and Victoria can easily be seen. The boundary between New South Wales is nearly eight miles further up the river, and South Australia contended for many years that the Victorian boundary was wrongly fixed, the real boundary-line being the 141st parallel of longitude, along which the New South Wales fence runs. The dispute was finally settled by the Privy Council in favour of Victoria. The boundary fences are designed to be vermin-proof. A little way on is the old Customs House, which, before federation, was the crossing-place between Victoria and South Australia. The river from this point onward flows only through South Australian territory. The first place of importance is Renmark, the great South Australian irrigation settlement, 710 miles from Echuca. It is not nearly as large as Mildura, the irrigated area being 5,300 acres, while that of Mildura is over 30,000 acres. Renmark is chiefly known for the very fine oranges that are grown there. At Renmark we stayed four hours, and drove around the settlement in motor-cars. From this point onward there are quite a number of small settlements, the first one being Berri, which has an irrigable area of about 3,000 acres. Loxton and Pyap are also small irrigation settlements. Overland Corner, which is 800 miles from Echuca, was the famous crossing and camping place in the old overlanding days.

The next place of importance was Morgan, which is 105 miles by rail from Adelaide and 150 miles from Murray Bridge. At this point the Murray makes an abrupt bend. Morgan was formerly known as North-West Bend. We had several hours on shore at Morgan. There are most peculiar cliffs in the neighbourhood, rising very abruptly, and extending for some distance. I managed to pick up quite a number of fossils, such as fossilized shells, bones, &c., &c. I handed these specimens to Mr. F. Chapman, of the Melbourne Museum, who has kindly classified them as follows:—Among the Miocene period were Coral, Polyzoa, Bivalves, Gasteropod, Crustacean, whilst the Lower Pliocene contained only the one class of Bivalve, *Ostrea sturtiana*.

The river now becomes very wide, and is probably about one-third to half a mile across. Our next point of interest, and practically the last one on the trip, was Blanchetown. This place is of peculiar interest, as the William Randall lock is being built here. In the old times this was a busy centre. The old telegraph line from Adelaide to Sydney and the mail coaches for Wentworth crossed the river here. This lock that

is now being built is the first of the great engineering works that are to be undertaken by South Australia on behalf of Victoria, New South Wales, and South Australia. The whole scheme comprises nine locks and weirs, six of which will be situated between Blanchetown and the South Australian boundary and three between the South Australian boundary and Wentworth. No. 9 Lock will act as a diverting weir to direct the water into Lake Victoria, which will be converted into a huge storage lake, containing 22,000 million cubic feet, for the regulation of the flow of the river. This will ensure a supply of water for irrigation as well as water for the lock system, and it may be well to state here that the water required to maintain a locked and permanently navigable river is a mere fraction of that necessary to provide for navigation in an open river, thus rendering a much larger volume of water available for irrigation purposes than would otherwise be the case, without injury to navigation. The weir will consist of two parts —viz., the "navigable pass" and the "sluices." The former, which is 199 feet in width, will be entirely removed during high river periods, and remain open for navigation. The stop logs, which in low periods are placed between the sluice piers to form the weir, will also be removed, the only obstructions left in the river being the piers themselves and the lock walls. In low river periods the navigable pass and sluices will be closed, and navigation will be carried on through the locks. Very careful consideration has been given to the matter of determining the size of the lock chamber with a view to meeting present and future requirements, and a size 56 feet wide and 275 feet long between the gates has been adopted. It is anticipated that when the river is made permanently navigable boats of the most modern design for both passenger and freight traffic will replace many of the older vessels now in use.

From the Murray locking system a great deal is expected in connection with the future welfare of the States of New South Wales, Victoria, and South Australia. The last State will most probably derive the greatest benefit from these locks, although it is difficult to foresee at the present time all the benefits and advantages to the other States. The immense districts that can be reclaimed all along the Murray from Echuca to Lake Alexandrina opens up an area of wealth-producing lands beyond the dreams of imagination, and, if used to its full extent, these lands would be capable of carrying more than the whole present population of Australia. A rough estimate puts the reclaimable and irrigable land at over 3,000,000 acres. The possibilities are enormous. Although the Murray lands in some districts seem poor, they are wonderfully fertile provided sufficient water is available for irrigation pur-

poses. It is a pity that the States concerned did not come to a determination or agreement thirty years ago to put the Murray waters to the use it was intended in developing the States through which it flows, so that each State shall be benefited therefrom to the utmost. It is to the everlasting credit of the Labour party—viz., the New South Wales Labour Government, the South Australian Labour Government, the Federal Labour Government—and the Victorian Liberal Government, who put this matter of allocating the waters of the Murray into definite shape and agreement, which the other side were never able to accomplish, in spite of many conferences since 1887. This scheme may well be said to be national, and in that we have the keynote of the future success of this great undertaking. I can see in the time to come new provinces springing up and the waste lands of to-day converted into wheat lands, verdant pastures, and flourishing orchards, teeming with a prosperous and progressive people, providing unforeseen circumstances do not arise that will interfere with the financing of the scheme or that other causes will indefinitely postpone the work.

[The paper was illustrated by a large number of lantern slides.—ED. *Vict. Nat.*]

THE DR. HALL MEMORIAL FUND.—Friends of the late Dr. T. S. Hall, M.A., will be interested to learn that a brass tablet to his memory will be unveiled at the Biological School, University, on Wednesday, 8th August, by the Chancellor of the University, Sir John Madden, G.C.M.G. It is announced that the sum of £305 has been invested for the purposes of the fund.

"THE GUM TREE."—The June number of *The Gum Tree* is to hand. In the notice of the first number of this publication, in the April *Naturalist*, by an oversight it was announced as the official organ of the Australian Forest League, whereas it is issued by the Victorian branch of the League. The present number opens with a fine picture of Beeches and Blackwoods, taken near the Duck River, North-West Coast of Tasmania. Other illustrations show the progress of the Red Ironbark plantation at the You Yangs, Victoria, and Red Gums at Mildura. The literary matter is of a more useful character than in the first issue. A condensation of the address given by the Victorian Conservator of Forests, Mr. H. R. Mackay, at the recent Forestry Conference contains words that should be carefully weighed by all who have the future prosperity of Australia at heart. He points out that, whereas the principal timber-producing countries of the world have from 22 to 52 per cent. of their area covered with forest, Australia can boast

of no more than 4 per cent., while even this is not secure, and its reservation may be revoked by the whims of Parliaments. No great reserves of timber now exist. In Victoria the one-time Otway Forest, and the South Gippsland forest, have been so encroached upon by selectors that they have practically ceased to be. Instead of providing that selectors should thoroughly till land fairly approachable by road or railway, they have been allowed to penetrate into the natural forests with which parts of the State were once clothed, and, under the heading of "improvements," have been allowed to clear the timber off their holdings by the quickest means in their power—fire. The conservator says:—"It is a remarkable fallacy to believe that grazing, even for dairying, or the ordinary rough cultivation pursued in forest clearings, gives a better profit, or a more sustained yield, if controlled with ordinary care, than such timbers as Cedar, Silky Oak, Blackwood, Beech, Blackbutt, and Tallow-wood, let alone the ordinary hardwoods of Southern and Eastern Australia. Good hardwood forest, with a rotation of 60 to 90 years, bears a present value of £100 to £500 per acre." The writer clearly pointed out in no uncertain terms the timber famine with which the world is faced, and advocated that, with the high and rising cost of labour, an Australian is wise to confine his timber-growing for ordinary purposes to a rotation not exceeding 40 years. He considered that for many years to come attention to the planting of soft woods would be the most profitable for Australia. Mr. E. G. Ritchie, M.I.C.E., of the Melbourne and Metropolitan Board of Works, supplies some remarks on "Forests: Their Effect on Climate," which again show how important it is that the timber on our higher ranges should be preserved at all hazards. An abstract is given of Prof. A. J. Ewart's paper on "Seasoning," also read at the Forestry Conference, from which it appears that considerable data is yet needed regarding the treatment Australian trees require in their conversion from the standing tree to marketable and usable timber. At the annual meeting of the Victorian branch, held on 17th May last, Prof. Ewart was elected president for the current year. New members for the League will be gladly enrolled by the hon. secretary, 57 Swanston-street, Melbourne.

Rabbits.—"F.R.," in his "Bush Notes" in the *Australasian* of 21st July, has some remarks about the introduction of wild rabbits into Victoria. He says that the usual story is that the Austins of Barwon Park, near Winchelsea, were responsible for the introduction, though it was recently stated in the *Geelong Advertiser* that in 1854 a man at Ballan was engaged in breeding rabbits for the Melbourne market, and may have been responsible for a few escapes. "F.R." inclines to the

belief that the Austin origin is true, for he remembers that the wave of rabbits which spread over the Western District in the early seventies seemed to come from the direction of Winchelsea. This is to a certain extent confirmed by a paragraph which appeared in the *Richmond Australian* of 31st December, 1859, and is quoted by Mr. F. G. A. Barnard in a paper, "Gleanings from the *Richmond Australian*, 1859–61," read before the Historical Society of Victoria in June, 1912. It reads as follows:—"The *Lightning* has brought an excellent addition to the live stock of the colony—viz., 66 partridges, 4 hares, and 24 wild rabbits. They are for Mr. Thomas Austin, of Barwon Park." At the time the paper was read a gentleman in the room confirmed the statement by saying that he was present when the rabbits were liberated.

The Melbourne Zoological Gardens.—A number of recent additions to the Melbourne Zoological Gardens are figured in the *Australasian* of 7th July; they include specimens of the Livingstone Eland from East Africa, the Duiker (deer family) from South Africa, White-fronted Capuchin (monkey) from South America, Kolbe Vultures (Africa), Coyote (North America), European Wolf, and a pair of young Camels from Mildura. In a recent note the director, Mr. W. H. D. Le Souëf, C.M.Z.S., says:—"Several Tiger Cats have been obtained from Tasmania lately. These animals are now very scarce in Victoria; they seem to have decreased in numbers like the Native Cats, but it is difficult to assign a cause. A Tasmanian Devil is also on view that has three young ones in her shallow pouch. The little ones can be seen when the mother is lying on her side, as they are not fully enclosed like the young in the pouch of the Kangaroo. The newly-arrived pair of Wapiti Deer, from America, are growing fast. It is many years since these animals have been exhibited in Victoria. The Elephant house is being improved, and visitors will soon be able to see this popular animal without any intervening fence, as a ditch is being made in its place. Two Canadian Lynxes have also been added. Australia is fortunate in not having such animals wild, for they are even more destructive to game than domestic cats gone wild, and that is saying a good deal. The collection of Australian parrots has received several notable additions, and the flight aviary is well filled with honey-eaters, especially the Lunulated. These birds bred last year, as well as the White-plumed."

"Made in Germany."—This legend was found branded on the stock of a rifle captured on Gallipoli by an Australian soldier. When carefully examined, it was found to be made of Australian stringy-bark!—Mr. R. T. Baker, F.L.S., of the Sydney Technological Museum, at the Forest League meeting.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 13th August, 1917.

[The report of the meeting will appear in the October *Naturalist*.—Ed. *Vict. Nat.*]

ABORIGINAL PLANT NAMES: THEIR ETYMOLOGY.

By R. A. Keble.

(*Read before the Field Naturalists' Club of Victoria, 14th May, 1917.*)

More than eighty years have passed since the white man first occupied what was then the Port Phillip Settlement but is now the State of Victoria. That period of kaleidoscopic changes incidental to the evolution of a settlement of a few pastoralists into a State of over a million inhabitants has not been conducive to the welfare of the aboriginal race nor the preservation of any of its antecedents. The sober emigration of the first few decades presented unbounded opportunities to study their habits, customs, and language, yet it must be admitted that the few facts gleaned are for the most part meagre and imperfect, and were recorded long after they were actually obtained. Always misunderstood, the blackfellow had been subjected to a series of cruelties inspired more by ignorance than by wilfulness, which reached its climax in the hysteria of the golden fifties and precluded all possibility of preserving any unit of the race in its entirety. By contact with the white population the few survivors lost their individuality, and, as regards the Victorian blacks, we are entirely dependent on the early workers for what is known concerning them and their language. As to the latter, papers* have been contributed by Green, Parker, Thomas, Bunce, Hartmann, Bulmer, Hagenauer, Howitt, and others,† which contain lists of words from various Victorian tribes. These lists have usually been regarded as unsatisfactory, and few attempts have been made to analyze them. The following attempt concerns a few plant names ascribed to the Wurunjerri-baluk, one of the many Victorian tribes, and has recourse only to the syllabic components of words attributed to that people.

* Brough Smyth, "The Aborigines of Victoria," vol. ii.

† See also Rev. John Mathew, "Eaglehawk and Crow," &c., &c.

The Wurunjerri-baluk belonged to the Kulin nation, which was of considerable geographical extent, and was so designated from the circumstance that in all its dialects the word "kulin" is used to signify "blackfellow." The territory occupied by the Wurunjerri is stated * to be east of the Saltwater River from its confluence with the Yarra to Mount Macedon, south of the Main Divide between Mount Macedon and Mount Baw Baw, the head waters of the Yarra to the Dandenong Mountains, and thence by Gardiner's Creek and the Yarra to the Saltwater River—an area of over 700 square miles. It will be noticed that this area exactly coincides with the Yarra drainage system. The tribe, however, was again subdivided into clans and lesser groups, each of which had their specific tracts of country allotted to them as food grounds. The true Wurunjerri ("white gum country"†), with their headman, Jakka-Jakka, occupied the Yarra flood plain,‡ and that portion of the drainage system which empties into the trunk stream, the Yarra, on its south bank.

The Wurunjerri dialect comes within the second subdivision of the geographical classification proposed by the Rev. John Mathew.§ This subdivision, referred to as the Victorian Region, comprises Victoria, part of Riverina and the Murray basin in New South Wales, and the south-east corner of South Australia. Like other Australian dialects, they are mainly characterized by imperfect suffix agglutination and included particles. That the Wurunjerri were likewise possessed of a gesture language is well known, and many examples of which are given by Howitt.‖

As far back as 1878 the late Baron von Mueller, Government Botanist of Victoria, identified specimens of a number of trees, plants, and shrubs collected and preserved by Messrs. Green, Hartmann, and Shaw, of the Coranderrk, Lake Hindmarsh, and Lake Condah aboriginal stations, and labelled by them with the native names. The collection forwarded by Mr. Green (assisted by Mrs. Green) consisted of sixty-nine specimens, the double identification of which is the basis of this etymological analysis.

* A. W. Howitt, "The Native Tribes of South-East Australia," p. 70.

† Howitt gives the meaning of wurunjerri as wurun, white gum tree (*Eucalyptus viminalis*), and jerri, a grub found in that tree; jerri, however, can also be interpreted "scrub," "bush," "forest," "wood," a meaning which it has probably derived from association, the grub being an article of diet occurring over tracts of country well known to the blackfellow. Compare jerrin, p. 66 *post*, and kulk, p. 68 *post*.

‡ The contrast afforded by the white, smooth bark of the "white gums" of the Yarra flood plain and the dark, rough bark of the gums on the highlands is most marked.

§ Rev. John Mathew, "Eaglehawk and Crow," p. 150.

‖ "The Native Tribes of South-East Australia," pp. 727 to 735.

It will be apparent at the outset that a potent source of error in an investigation of this nature disappears with the scientific identification of the specimens by a botanist of Baron von Mueller's standing, especially when some morphological characteristic is reflected in the native name. It is, however, beset with peculiar limitations, for the recorded vocabularies of a race that had not passed the picture-writing stage are merely conventional representations of the sounds heard. Green made syllables to express himself, but it is doubtful whether he appreciated those subtleties of sound peculiar to the language. It is fortunate, therefore, that we have three vocabularies of the Wurunjerri dialect with which to compare the plant names—one by Green himself, another by William Thomas, and a third by Daniel Bunce.* Although beyond the scope of this paper to enter into details of the peculiarities of each vocabulary, it is interesting to note that each vocabulist stressed some inherent characteristic, and usually a different one to his colleagues. The outcome of this is a closer approximation to the true phonetic expression. Bunce, for instance, gives cool en th, man ; Thomas, koo lin (kool in) ; and Green, kool in or kol in—all forms of kul in as expressed by Howitt The dental "th" was strictly recorded by Bunce, but its existence was scarcely realized by Green and Thomas. Green was disposed to lengthen certain syllables, as in "man eep," wood ashes, which is given by Bunce as "man ip," embers, or "mun nip," ashes.

A student of the written language is at a marked disadvantage when it is a dead language, for, as Prof. Tucker says, language is speech, and, according to W. von Humboldt, "the outcome of the eternal striving of the human spirit to make the articulated sound equal to the expression of the thought." Some years ago I had the advantage of noting the accents of natives who were related, I believe, to the Kulin nation, of which the Wurunjerri were part. The impression given may be of little value, but I was struck with the prevailing long vowels and traces of rudimentary sibilants. Some of these may be rescued from the imperfect records that have been preserved, but the majority have been irretrievably lost. In recording the sounds heard by them, much depended on the care, training, and receptivity of the vocabulist. There are some striking differences in the lists which suggest that they were lacking in some or one of these essentials, and that the languages of more than one nation are commingled.

The method pursued in the present analyses is to examine all words with the same root, and by process of elimination to

*Brough Smyth, in "The Aborigines of Victoria," vol. ii., gives the three vocabularies.

work out a group meaning. The tendency of the roots is to group themselves in various shades about a common meaning, which, I presume, is the primitive one. Working with such reliable identifications as those provided by Baron von Mueller, the native words so analyzed seldom fail to explain a morphological characteristic, habit, habitat, or use to which the plant, shrub, or tree has been put by the natives. It will be observed that in the first place the native name is akin to the scientific, and some striking coincidences occur where the same meaning is expressed by both. "Bin in tir ba twe bin" (ter ba touit bin), Narrow-leaved Peppermint, *Eucalyptus amygdalina*, Labill., might be just as well expressed by the Latin *fissilis*, that which is cleft, split, or cloven. It is relevant that Baron von Mueller recognized for a long time this eucalypt as *E. fissilis*. "Boe boe," the Twiggy Aster, *Olearia ramulosa*, Benth., means very small (note the repetition to express intensity), and may be a reference to the small twigs, expressed by the Latin adjective *ramulosus* (full of small twigs). "Errie nellam," ensnaring hairs, is indirectly expressed by the Greek *droseros*, dewy, in *Drosera auriculata*, Backhouse, the Tall Sundew, sometimes also called the "Catchfly," on account of the sticky fluid exuded from the bases of the hairs—a snare for insects. "Ngaring," Snake Orchid, *Diuris pedunculata*, R. Brown, has a synonym—"karn," a snake. "Burny burny" means "side by side," and is equivalent to Diuris (two-tailed), the generic name of the Leopard Orchid.

The majority of the names have, however, a reference to a portion of the plant that satisfied the native appetite or contributed to the efficiency of his offensive or defensive weapons. Others imply that the plants they represent had a fibre value, or were medicinal. Those referred to as seasonal are full of interest as showing that the great event of the year was when the countryside burst into flower. There are, too, plants for ornamentation, playthings, drinking utensils, fish spears, fire sticks, &c., &c. They fall under one of the following headings :—

Edible Plants, in which the root, tuber, pith, fruit, tender shoots, or some other part was eaten.—

Kom ba dik, bur um beet, koo d rung, terr at, eep a eep, gag ga war, wye bo gag ga war, po eet, nareen gnan, kaa nung, mud rurt, kool in, burny burny, ngaring, naring arnik, tal lak tal lak, da lurp, tooli merin, bal lang in, mul lang, pike, yar ra nil lam, morr, mer wan.

Fibre or Basket Making.—

Min am ber ang, kur ran ung an, tabe rup, tool im, ner ing ner it, kar ra wang, pim pat.

Fire Stick.—

Co ran derrk, nan gert.

Medicinal.—
Bur um kul will, kal ert i wan, war ra wor up, tang nan.
Weapons.—
Bur gan bur gan, bur gil bur gil, pan ar yle, tool i merin, woor un, berry yung, tir ba twe bin.
Utensil.—
Woor un.
Honey Plant.—
Woor ike.
Plaything.—
Wy ett.
Seasonal.—
Weto mel len, gen in ee moon goon.
Ornamental.—
Kan berr.
Doubtful.—
Daal, tre tal, tabun gin, waar, boe boe, pooi booy, mori yoke, murr e yuke, kadse kadsek.

Where two or more names for the one plant are given, it will usually be found to apply to specific uses of it.

The syllables of the several plant names are comparatively few and simple, and are for the most part variations of the following:—

bo be ba mo wo we wa
ber bal mer mol wil
pim
bik
bin wan
ko
kom kur kul
kad (?)
gen ngarn
de ta ne
tal ter nel ner
tang nan
ra
rum reep lup
ruk luk lang
ran
yurt
yep
yang

Apart from the absence of sibilants, there is little unusual in this collection of sounds. They are the simple sounds common to all languages, and fairly representative of the restricted range of speech. If, however, language is, as Tylor

has it, "the expression of ideas by means of articulate sounds habitually allotted to those ideas," that of the Wurunjerri is rich in them. One significant feature is the relative absence of the monosyllables as individual words. The monosyllabic words recorded in the vocabularies, together with those disclosed in the analyses of the several plant names, are, I believe, the substratum of a much earlier and more primitive language which was highly onomatopœic.

A curious uncertainty surrounds the origin of the general name of many European plants, trees, and shrubs or their useful products. Oak, beech, weed, beer, leek, thistle, clover, wormwood, rye, bean, ash, birch, alder, aspen, bramble, reed, and other simple everyday words are common to English, Danish, Dutch, Icelandic, Swedish, Gothic, or some of them, which is perhaps explained by their wide range; but why should their origin be more or less in doubt? The intensive study of a language like the Kulin Wurunjerri may, perhaps, suggest the principles underlying them.

The native conception of plant life is expressed by three words—*ruk*, *curt*, and *kulk*. *Ruk* is spelt in several ways, but most commonly as rook or rung, or in an elided form as rk. In its common, general meaning this monosyllable means an arm, projection, prominence, &c. It occurs in ter ruk, an arm (of the body), kul bul ling ur rook (kul bal lang ruk), the stone tomahawk, named from its make-up—kul, a gash; bal, to strike; lang, stone (axe); ruk, the handle bent round the stone axe-head. Oow ruk, the flint of a gun—from oow, flint; ruk, the trigger. K ruk wor rum (Ko ruk wa rum), snipe—from ko, long; ruk, wings; wa, water; rum, lively. Ter run mur ruk, a centipede; du rooke lark, rainbow, &c. In its application to a tree, plant, or shrub, or any part of these, it is found in ter rung (*cf.* derrk), a tree; wee eu rook, or wer rook, root of a tree; ter ru (k) galk, a branch; kurn b(o) rook, blossom of a tree; mur rer mur rook, venation; jer rang (yer rang), leaf of a tree; yer rin (yer rang), shrub; and other words in which branches, root, trunk, blossom, cone, and practically the whole tree economy is expressed by the one word ruk. Derrk is an elided form of the syllables de ruk—from de, from; ruk, a tree. Exceptions to this general application of ruk are mur rum (mur rum), a leaf, which also means the human body, and is derived from mer, within, and rum, life; wee reep, trunk (bark)—from wee, small; reep, thread which was made by pounding a bark into fibres and rolling it on the thigh; tourn der ry (ter rum de reep), bark—from ter, to; rum, to enliven; de, from; reep, fibre—probably refers to a medicinal practice of pounding bark and mixing it with ochre (*cf.* wer re rup, a doctor) and tun un no or doo a no, sap—from doo en, sweet—are self-explanatory and have a utilitarian origin.

Several listed plant names have ruk as a syllable. *Woor ike* (wa ruk), Common Honeysuckle Tree, *Banksia marginata*, Cavanilles (the war rak of Thomas), is derived from wa, water, and ruk, the cone, which was soaked by the natives in water to "obtain therefrom a pleasant drink" (Taplin). Dik, in *koma ba dik*, Common Tree Fern, *Dicksonia antarctica*, Labill., is, I am disposed to think, an elision similar to derrk. Kom means to be inside, covered, buried, as in koom on eit, to bury; kom per ka wang or kum bra kow an, hat; kam kam koor, insect; kooim, a kangaroo; kam bo duk, a carrot; kum ba deek, cabbage or grass tree (Thomas); and others. Ba or bo, small. The pith "within the tree" was roasted in the ashes and eaten (F. von M.) *Koo d rung* (ko de ruk), Rainbow Fern, *Davallia dubia*, R. Brown, comes from ko, from (*cf.* koor, a seed); deruk, an elided form of de ruk, from the roots. The roots of this and other small ferns were eaten. *Min am be rang* (min nam ber ruk), Greater Clematis, *Clematis aristata*, R. Brown, is derived from min, round, oval, bent, flexed, curved, reflected, as in be min, ring-tailed possum; min e jee rim e ring, deformed; myng, eye; woor un dul min, looking-glass; myn, cam, moon, &c., &c.; nam, above; ber, to wander; ruk (rang), stem. The roots of this word are for the most part descriptive, but min suggests that it may have been used as a fibre or for basket-making. *Co ran derrk* (ko rum derrk), Christmas Bush, *Prostanthera lasianthos*, Labill., comes from ko, from; rum, to make lively; derrk, from a branch. The wood of the Christmas Bush was used for the fire stick, which was twirled (wer gar rk) in the hands. Note the signification of the syllable rum in the rendering "to produce fire by twirling a stick."

Eurt or *Yurt*, another general name for plant life, differs from ruk in that it is an individual word, as, for instance, in eurt, a dwarf wattle tree—in fact, dwarf or diminutive is suggested in many examples. It is represented by shortened forms in wea eu ruk, root of a tree; murr ur mer ruk (mer eurt mer ruk), venation; eur look, peppermint; wy gout, cedar; bo urt (bo eurt), rush; bo eurt, grass; boo yeat, a vegetable; bourt deet (bo eurt), a vegetable; tal le rup (tal eur(t) rup), vegetable (swamp plant); yepp ere (yep eurt), a small, sweet bulb. In the list of plant names it occurs in *Poo cet*, Prickly Tree Fern, *Alsophila australis*, R. Brown, as simply bo eurt, a vegetable, bo meaning small. The heart of the fern was eaten by the natives (F. von M.)

Mern derrt (no flower nor fruit) and *mu drurt*, Blue Squill, *Chamæscilla corymbosa*, F. von M., come from mern or merrim, deep, below the surface; derrt and drurt, an elision of de eurt,

from de, from, and eurt (by association), tuber, which was eaten by the natives. *Terr at*, Cut-leaved Geranium, *Geranium dissectum*, Linné, is an elided form of ter, from, and eurt, root. The roots were eaten by the Tasmanian aboriginals, and doubtless by those of Australia (Maiden).

Nan gert (nan yurt), Twining Glycine, *Glycine clandestina*, Wendl., comes from nan, above, above the surface. This syllable occurs in myng nin, forehead (from myng, eye, and nin, above—*i.e.*, above the eyes), and in nin nin e bourt, lungs (above the belly—bourt—*i.e.*, above the belly). The native word refers to some upper portion of the Twining Glycine, probably the stems, which are tough and fibrous, and may have been of value to the natives as a fibre.

Kulk, the other name for tree, and also wood, forest, stick, &c., &c., occurs as part of ter ru galk, a branch of a tree ; bun ger look (bin kulk or bin kul luk), stringy-bark ; and several words ending in luk or look. Kul luk, boomerang or throwing stick, is, I believe, the key to kulk, the latter being simply an elided form of the former, which is derived from kul, sharp or pointed, and luk, a form of lup, strong. Kulk was a word to refer to those timbers suitable for weapons.

Ruk, *eurt*, and *kulk* throw a light on the psychology of the Kulin blackfellow that was little suspected. Ruk, with all its variations, seems to have been a wide and general term for a tree or any part of one. It never occurs by itself, and it is probably very primitive. Eurt or yurt occurs by itself as well as a dissyllable, and it is, too, more applicable to a shrub than a tree, although attached to bo, small, it signifies a vegetable. It is also very primitive, and, like ruk, is onomatopœic. Later than either of the preceding is kulk, a word for those trees that provided suitable timbers for the natives' offensive and defensive weapons.

Kul is one of the most familiar roots in the Kulin dialects. It means pointed, sharp, edged ; hence to cut, wound, gash, &c., &c. Its syllabic synonyms come under one of two groups —namely, (*a*) pointed, to pierce, thrust, enter ; hence a pointed instrument or weapon, as the mon gile (mon kul), double-barbed spear ; kul lap, a needle ; kul lup, fork ; lan geel (lan kul), a pointed club ; wil gul, hawk (beak) ; kul in, man (das männliche glied) ; bru gl bru gl (ber kul), a thistle, &c., &c. (*b*) Edged, sharp, bladed, to cut, gash, &c., &c., as in kul pen kul pen gee up, a knife ; kul luk, a wooden sword, &c. ; kul bul ling ur rook, native tomahawk, &c., &c. It occurs as *kool in* (kul in), Common Spider Orchid, *Caladenia Patersoni*, R. Brown, as a

reference to the conspicuous long petals (more than three inches long—Pescott) in some specimens, which greatly enhance the orchid's beauty. It is significant that, although the tuber was eaten, and undoubtedly provided an inviting morsel, the blackfellow allowed his appreciation of the fantastic to overcome his utilitarian tendencies. He did not, as in mern derrt, refer to it as growing "below the ground," or, as in nan gert, "above the ground."

In *bur um kul will* (ber rum kul wil), a word warranting extended comment, kul means a wound, thrust, or gash. A leaf only was forwarded for identification, yet it is obvious that the unknown plant was used as an astringent or scarifier. *Ber* means to encircle, to move from side to side, backwards and forwards, heave, throb, or any double or circular motion; it was at first probably an articulate sound, identified with the motions of the kur ruk or spear thrower, or the throwing of the boomerang. Compare ber ring, bosom (to throb), palm of the hand (to grasp); bur dan, knee-cap; ber pip, eagle (soar); ber buk, belt round the stomach to keep off hunger; til bur nine, apron made of emu feathers; burn nar look, blackwood, and *bur gan* (bur gan), *Kunzea peduncularis*, F. von M., two woods used for the kud ger ong, or club or waddy; yeam berrn, a club; bur gon eit, to spear—*i.e.*, with the kur ruk; barn geet (ber rum eurt), the war boomerang. A pertinent use of ber is in *burny burny*, Leopard Orchid, *Diuris maculata*, Smith, the tuber of which was eaten. In this name it means "side by side" or "double," as in the Greek generic name *Diuris*, double-tailed—a reference to the opposite, long, narrow, tail-shaped sepals. The remaining syllables in bur um kul will are rum, which means to make healthy, and *will*, bark, a covering, protection, as in wil lum, a miam or shelter made of bark; yel lert bee (wil eurt be), to cover, hide, deposit, screen (note the association between this and the preceding comparison); wal ler wal lert, possum rug; yel ler ne bre, a blanket; wyl gul ter, wide, &c., &c. The bur um kul will was one of several plants known to the medicine man (wer re rup), who "scarified to make healthy a wound with bark or fibre (wee reep)."

The *kal ert i wan*, Hazel Pomaderris, *Pomaderris apetala*, Labill., comes from kal, a point or blade; ert, tree; wan (*cf.* yang, to throw), from, and may be translated "wood for spear." The i has been drawn by ert and wan. *Bur gil bur gil* (ber kul ber kul), Green Ground Berry, *Acrotriche serrulata*, Labill.—from ber, to scarify; kul, a wound—would suggest that this plant has a febrifugal or astringent value. The *pan ar yle* (parn kul), River Mint, *Mentha australis*, R. Brown, comes from parn, water, and kul, a wound. The natives had doubt-

lessly discovered the antiseptic properties of Mentha, which it possesses in addition to its anæsthetic effect.

Rum, with its variations ram, ran, run, &c., has the somewhat psychological meaning of to give life, make healthy, besides its more ordinary meaning—to enliven, agitate, stir up, or any idea in which life or sustained action is implied. It is interesting to compare Codrington's note on the significance of this syllable in the Pacific Islands. It is found in mur rum, the human body; ko rum din in, well (not ill); ter rum ber lin, stomach; nar rum ble (ne or nier, not; rum, life; bal or ble, to pound), white ochre, the mourning pigment; wa reen, sea (from wa, water, reen or rum, lively), and many others. *Kur ran ung an*, Dwarf Rice Flower, *Pimelea humilis*, R. Brown, is from kur, long; rum, to make lively, hence to weave; ung, to move, direct; an, adjectival ending. The meaning is "to use quickly a long fibre"—a reference to the bark, "an excellent fibre of great strength." Compare kur ra wan, a flag split with the nail for weaving baskets and mats.

Bur um beet (ber rum bik), Common Flat Pea, *Platylobium obtusangulum*, Hooker, comes from ber, to wander; rum, to live; bik, earth and water. The meaning given by Chauncy for a word consisting of the same syllables in the same sequence is "muddy water"; it refers to Lake Burrumbeet and belongs to one of the Ararat languages. As showing how the monosyllables group themselves in their various shades about a general meaning, it is worthy of note that in its application to the Common Flat Pea, bur um beet means "to wander growing on the ground"—a reference to its procumbent habit; but that, in the same language, if applied to a lake, it would have exactly the same significance as that given by Chauncy. Be et may, in some cases, be an elision of bo eurt, as be et, a box (eucalypt), seemingly is.

Lup, with its variations lurp, lourk, luk, lak, leet, &c., &c., means strong, to give strength to, grow hardy, tough, &c., &c. It occurs in lourk, calf of the leg; tal luk ar nup, industrious; kal lup, a fork (from kal, a point, and luk, strong); tou lup, proud (*i.e.*, a warrior); and *woo lerp* (wil lup), Woolly Tea-Tree, *Leptospermum lanigerum*, Smith, the wood of which was commonly used for weapons, especially the mongile or double-barbed spear, which required a "hard, tough timber." Wool or wil means, in this case, a protection, and suggests that the wood of the Woolly Tea-Tree was also used for shields.

Tal and its variations, dal, daal, tool, &c., &c., signify a swamp, and, in its botanical sense, the sedges and all plants living in or near water or on a wet or peaty soil. *Tal lak tal lak*, Trailing Eryngium, *Eryngium vesiculosum*, Labill., and *da lurp*

(dal lup), Sow Thistle, *Sonchus oleraceus*, Linné, come from tal and lup, and may be rendered "hardy water plants." The stems and roots of the da lurp were eaten (Hooker), and made an excellent vegetable (Leichhardt); it was the thal lak of the East Gippsland tribes. *Daal*, Musk Aster, *Olearia argophylla*, F. von M., signifies the Musk Aster's preference for damp localities. *Tre tal*, Golden Goodia, *Goodia lotifolia*, Salisbury, is a difficult word, tre being unusual. Tal seemingly has its general significance, yet it cannot be said that the Golden Goodia is restricted to damp localities, although perhaps at its best there. *Tool im*, Pale Rush, *Juncus pallidus*, R. Brown, typically represents the general meaning of tal, this rush being restricted to damp localities. It was used for basket making. *Tool i merin* comes from tal, "rush-like"—the Small Grass-tree, *Xanthorrhœa minor*, R. Brown. The grass-tree was one of the most useful native plants. They obtained honey from its flowers (Taplin), ate its young shoots, bases of its leaves, young flower stalk, and spike. A part cut out of the stem at the base of the leaves made a refreshing food (Brough Smyth). The gum was largely used as a resin, and the peduncle, if long, as a shaft for the tir rer, or eel spear.

Tabun, another word for damp, occurs twice—namely, in *tabun gin*, an unnamed root eaten by the natives, and *tab e rup* (tab rup), Yellow Marsh Flower, *Villarsia reniformis*, R. Brown. Rup means thread, as in pee reep, thread; bee rip, tendon. Possum rugs were sewn together with the tendons of animals and a thread made from the bark of fibrous plants.

Wa, water, occurs in several listed plant names. The *Waar* or wa may have been derived from either waar, a thorn, or wa, water, as the leaf sent was indeterminate. *War ra wor up* (wa worap), Late Black Wattle, *Acacia mollissima*, Willd.—the war our e rup of Thomas—is derived from wa, water, and woorap, red ochre. The association is singular, and refers to a native remedy for a certain skin disorder called bub bu rum. The treatment consisted in applying red ochre saturated with a decoction of wattle bark soaked in water (*cf.* wer re rup, doctor). *Woor un*, Mountain Ash Gum, *Eucalyptus regnans*, F. von M., Narrow-leaved Peppermint, *E. amygdalina*, Labill., comes from woor or wa, water, and un, adjectival ending. When Baron von Mueller referred woor un to *E. amygdalina*, *E. regnans* had not been separated as a species from it. These trees afforded, I am inclined to think, the elbows and gnarls from which the blacks made their tarnuks or water vessels; hence the native name. For other uses of the wood see under tir ba twe bin.

Yang, meaning the flight of a spear or boomerang, and

related to yang (g)ow lan eit, to go away, occurs in *moe ang* (mo yang), Blackwood, *Acacia melanoxylon*, R. Brown, and *berry yung*, Straight-leaved Acacia, *A. stricta*, Willd. Moe is a variation of mer, within, and with yang means "out of, to throw"—a reference to the kur ruk, or throwing stick, which was made of blackwood. The ber ry yung was widely used for spears, hence ber, backwards and forwards, a *résumé* of the effort in throwing a spear with the kur ruk, and yang, the flight of one. Ry has been drawn in by the last syllable.

Tir ba twe bin (ter ba touit bin), Narrow-leaved Peppermint, *E. amygdalina*, Labill., comes from ter, to add, hence to apply; ba, small; touit, a fish; and bin, to split. *Bin* occurs in bun dike, to chip, cut in pieces; bin duck, cut, carve, hew; beaum bean, a chisel; num bem on, axe; pin de bul lup, a saw, &c., &c. The Narrow-leaved Peppermint was a favourite wood for fish-spears (*cf.* woo lerp, woor un, moe ang, and berry yang).

Mo am bill had no name attached, but its syllables are suggestive. It comes from mo, behind (*cf.* mer wan); am, adjectival ending; and bill or bal, to strike; hence the wood of a tree used for the mulga, a shield to ward off the blows of the waddy, or the geeam, a shield for protection against spears.

Bal and its variations bul, bil, pel, &c., &c., mean to strike, pound, macerate, &c., and is often associated with lang, a stone —the pounding agent. *Bal lang in* represents both Cymbonotus, *Cymbonotus Lawsonianus*, Gau., and Rough Fire Weed, *Erechtites arguta*, Candolle, and is simply a general word for those edible plants that needed pounding. Bal, in one or another of its forms, is found in pel lin, flint of a gun; pal rurt, with vigour; beel meek, pus (to express); bel eer rer, a spade; beal, red gum, used for the kud gee run, or waddy; bowl, a fowl (to peck); bal lee, one of the woods used for the kur ruk or throwing stick (cherry tree); bal ee, mistletoe, some part of which was seemingly eaten; bul gan ner, bullock; kul bul ling ur rook, stone tomahawk (*vide* p. 66); and numerous others.

Mul ling (mul lang), a root eaten by the natives, no name of which appears in the list, comes from mul, after, above, as kul mul, blood, from kul, a wound, and mul, after—*i.e.*, "after a wound"—and lang, a stone. The root was evidently pounded with a stone.

Boe boe, Twiggy Aster, *Olearia ramulosa*, Benth., and its other form, *pooi booy*, Shrubby Everlasting, *Helichrysum ferrugineum*, Lessing, come from the primitive bo or ba; oe, oi, and oy are virtually the o in no, the e, i, and y being caused by closing the nasal passage. It is identical with the world-wide root pa, to protect, support, nourish, and occurring in most languages as the word for father or mother, as pa, papa,

ba, baba, paba, bapa, abba, bab, baab, book, bar pan, par ppe, pap pi, and in the Kulin as ba boop, pa pa, pa pun, par bine, &c., &c. As a pure labial sound like this can be uttered by a toothless infant, it is very interesting and suggestive to find the child referred to by the Kulin people as boo pup, bo pup, boo boop, boo poop, &c., &c. It also occurs in wye boo, little ; gan bo, one ; bo eurt, grass, &c. ; kuan boo, smaller kind of flying squirrel ; bo yung, bandicoot, &c., &c. The reference in the case of the Twiggy Aster may be to the small twigs alluded to by its specific name, *ramulosa*, or in both to their small flowers.

Pike, Common Yellow Lily, *Bulbine bulbosa*, Haworth, comes from beek, bik, &c., "earthy." It was eaten by the natives. *Wy ett*, referred to in the list as a young species of Eucalyptus—a meaning implied by its roots—wy, small (*cf.* wye boo, small) ; and ett or eurt, a shrub or tree. The weet weet thrown by the natives, and consisting of a double cone at the end of a pliable shaft about twenty-one inches long, was probably made by shaping a rooted sapling.

The Yarra tribes had as their harbingers of summer and winter two seasonal plants—*wet o mel len*, Greater Clematis, *Clematis aristata*, R. Brown, and *gin in ee moon goon*, Common Heath, *Epacris impressa*, Labill. At first sight wet, weet, or wy ett would seem to mean a small shrub (*supra cit.*) ; but on mature consideration I am inclined to ascribe it to weing, fire. Mel len comes from the same root as mul in mul loko, and means to defer, put off ; as, too, in kul mul, blood (kul, a wound, mul, after) ; mol ong mol ook, afternoon ; weet mul leen, tempest ; weet mul lin, hot wind ; win malee, north ; and nger vein (nger weing, evening, nger, after, weing, heat). Note how weet mul lin, the hot wind, has by circumstance and familiarity come to mean north (win malee), the hot north wind being the summer wind. It is to be noted, too, that wattee mullen, is the sarsaparilla. *Gen in ee moon goon* is gan un un un gan, in which only one root—*gan*, first—is significant. The repetition of un is a comparative process similar to that given by Green for wor brin un, tired, which is compared by repeating the last syllable, as wor brin un un un, excessively tired. The reference is to the "first" bloomer, the common heath being one of the first winter flowers. In this connection it may not be out of place to quote ber ring, midwinter, as well as wattle —a winter flowerer. That the native marked out seasons by the germination, growth, flowering, and seeding of the plants, trees, and shrubs about him is shown by those words which interpret spring, summer, autumn, and winter. Moodee e ram (mort rum), spring, comes from mortt, a seed, and rum, life, meaning life from a seed ; mer rim nger wein, summer, comes

from mer, within, rim or rum, life, nger, after, wein(g), warmth, or "life within after warmth"; moo dee nger wein, autumn, means "seed after heat"; and per rig nger wein, winter, "cold (per ring) after heat." This grasp of the plant economy has for the most part arisen by force of circumstances, those plants and their products which constituted staple articles of food compelling attention. The fruits of some Epacridæ were eaten.

A psychological word displaying observational powers of some order is *er rie nel lam* (yar ra nil am), Tall Sundew, *Drosera auriculata*, Backhouse. Er rie or yar ra, hair, and nel lam or nil am, ensnaring (a somewhat free rendering), refer to the sticky fluid exuded by the glandular hairs on the leaves of this insect-eating plant.

The monosyllabic *Morr*, Prickly Coprosma, *Coprosma Billardieri*, Hooker f., signifies fruit, seed, &c., &c. It occurs as mortt, scrotum, and in moodee e ram, spring, and moodee nger wein, autumn. The fruits of the Prickly Coprosma are edible. *Mor i yoke* or *murr e yuke* (mer yuk), "Bidgee-widgee," is derived from mer, inside, and yuk, a covering—a reference to the Bidgee-widgee's burry test. *Mer*, mur, mir, mourr, &c., have undoubtedly come from moort, a seed, and, by association, inside, behind, deep, below, &c. (*cf.* morr, *supra*). Compare mur ri kle from mer, beneath, kul, das männliche glied, a dress made of strips of possum skin; mur rum, human body, from mur, within, and rum, life; mourr ut, bladder, from mourr, within, and yuk, skin; merri wan (mer yang), a throwing stick, from mer, out of, and wan, to throw. Yuk means generally a protection, covering, skin, shell, &c., and occurs in mur yoke, a cockle; morr uk, skin; ber yuke, kangaroo rat (pouch); binn uk, a basket; bo ut, a basket; tarn uk, a water vessel; mourr ut, bladder, &c., &c. *Mer wan*, Snake Orchid, *Diuris pedunculata*, R. Brown, comes from the same roots as merr i wan (*supra*), the reference in this case being to the edible tuber "from below."

Ngarn, *karn*, *kourn*, &c., means long. It occurs in karn, the general name for snake; kourn, the neck; and innumerable instances; long, however, seems to have been one of the first meanings, if not the original one. *Ngaring*, as a name for the Snake Orchid, *Diuris pedunculata*, R. Brown, is apt in having as a synonym karn, a snake. Bunce records several words with the guttural ng, the same words elsewhere being recorded with k. *Naring garn ik* (ngarn ngarn uk), Tall Diuris, *Diuris longifolia*, R. Brown, comes from ngarn, long, "very long" being implied by the repetition; uk, a tuber. The tubers of both of the preceding orchids were eaten.

Nareeng in *Nareeng nan*, Smooth Cat's Ear, *Hypochæris glabra*, Linné, is identical with ngarn, long; nan means above. The meaning "long above" refers to the peduncle. The roots were eaten by the natives. Nering ner (probably ngarn ngarn) means "very long"—a reference to the stem, which, I believe, was used for weaving. As regards this plant, it is interesting to compare pooi booy, "very small"—a reference presumably to the twigs or flowers.

Kan berr, Prickly Bush Pea, *Pultenæa juniperina*, Labill., comes from kourn, the neck, and berr, to encircle. Some portion of the Prickly Bush Pea was used as a necklace—possibly the seeds or seed-pods. The association of the two syllables in words that refer to ornamentation occurs in kourn burt or kourn but, a necklace made by threading pieces of reed; kan berr bay, to deck, dress.

Koon a de ang, Tall Panax, *Panax dendroides*, F. von M., comes from ngarn or karn, long; de or ter, to; ang or yang, to throw; hence "long to throw away." The first syllable is embodied in the vernacular name. This tall shrub or tree has a very tough wood (Guilfoyle).

Kaan ung, an unnamed root eaten by the natives. Its meaning — kaan, long, and ung or yung, to throw—would suggest that it was also used for weapons. The kan nan, or digging stick, was, at a pinch, used as a weapon, but was, as far as I can learn, not thrown. *Kur wan*, Sweet Bursaria, *Bursaria spinosa*, Cavanilles, from kur, long, and wan, out of, from—suggesting, possibly, that this wood as well as acacia was used for the throwing stick. Compare in this connection kur ruk, throwing stick (from kur, long, and ruk, an arm); kur nile, tall: kur run, wattle tree; kar ran, privet (shrub, possibly another name for the Sweet Bursaria); kur ra wan, a kind of flag. In *kar ra wang*, Solid Apple Berry, *Billardiera scandens*, Labill., ra, possibly an elision of rum, means long and pliable, as in ter ree dee, upright as a stick; yar ra, hair; tur ror, worm; tir rer, eel spear (a wooden prong attached to a reed); kur ra wan, split with the nail for weaving. The other roots are in kur wan (*supra*). The implied meaning is "long and straight for weaving"—a purpose for which it may have been used by the natives.

Gag ga war (ka ka wa), Soft Water Fern, *Lomaria capensis*, Willd., comes from *ka* or *ge*, near; wa, water—a meaning embodied in the vernacular name. Parts of this fern were roasted and eaten. *Wye boo gag ga war*, Fishbone Fern, *Lomaria discolor*, Willd., is the "little" (wye boo) gag ga war.

Kad se kad sek, pronounced kad the kad thek (the "s" being almost inaudible), is the Swamp Dock, *Rumex Brownii*, Camp. I have been unable to run down this word.

Tang nan, Hedge Hyssop, *Gratiola Peruviana*, Linné, obviously modern, but none the less interesting, comes from tang, edible. Tang is in many words, as tung an eit, to eat; tany a goon, taste; tang arr bea, taste; tang ar be, feast; tang er boon, dinner; taong gan, famine; tang er borun, feed, &c., &c. Nan (nin) means above. The reference "edible above" is to a portion of the Hedge Hyssop which has purgative properties.

Pim pat, Big Billy Buttons, *Craspedia Richea*, Cassini, and Swamp Daisy, *Brachycome cardiocarpa*, F. von M., probably comes from pim, supple, pliable, as in be min (bem min), ring-tailed possum, &c., &c. Pat is difficult, and I can ascribe to it no satisfactory meaning.

Eep a eep (yep yep), Small-leaved Bramble, *Rubus parvifolius*, Linné, would at first sight excite suspicion, especially as euep means sheep and eeup mutton. I have, however, little doubt that it is geniune, and comes from a root, yep, to eat. It is found in yepp ere (yep eurt), a small, sweet bulb; qeeap, food; quee up, meat; geerp, to introduce. The fruit of the Small-leaved Bramble was eaten by the natives.

Further research, especially into the bird names, will undoubtedly restrict the meanings assigned to several of the syllables given here, and reveal others of poignant interest; but I feel sure that the general conclusions arrived at will be found to be substantially correct.

My thanks are due to Miss Beryl Major and Messrs. F. Barnard and A. D. Hardy, who assisted me in various ways, and also to the Herbarium, where I was permitted to inspect many of the plants, shrubs, and trees mentioned in this paper.

THE "HOME GARDENER."—Most naturalists, whatever may be their principal hobby, take some interest in plants, either in pots or in the open ground. In this new monthly paper something of interest outside strictly horticultural topics will generally be found. In the July number Mr. E. E. Pescott, F.L.S., gave some notes on the water requirements of pot plants, in which he detailed some experiments in growing plants with a maximum amount of water, quite contrary to the usually accepted ideas. He is, however, taken to task on the subject in the current (August) issue. A lecture by Mr. F. Pitcher, dealing with Victorian plants suitable for suburban gardens, also running through the July and August numbers, contains much information of a practical nature, in the way of lists of plants grouped under about a dozen headings according to their suitability for various purposes or positions. A large number of these are easily procurable at no great distance from Melbourne. Some of them can also be successfully cultivated as pot plants.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 13th August, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about 50 members and visitors were present.

CORRESPONDENCE.

From His Excellency the Governor-General, regretting his inability to open the exhibition of wild-flowers on 2nd October, owing to his projected absence from the State.

REPORTS.

The hon. secretary reported that, owing to inclement weather, the excursion to South Morang on Saturday, 28th July, had been abandoned.

A report of the visit to the National Museum on Saturday, 14th July, was given by Mr. J. A. Kershaw, F.E.S., who stated that a large party of members and friends had been present. The afternoon was devoted to the Australian collections, special attention being given to the marsupials. The two egg-laying mammals, the Platypus and the Echidna, were exhibited, and specimens of the young in different stages of growth examined. Information was given on the construction of the burrows and the formation of the ball-like nests. Skulls of the kangaroos were examined, and the development of the cheek teeth, on which the determination of the species depends, was explained. A general inspection of the specimens in the Australian Hall was made, attention being directed to recent additions. Finally, the recently-opened Children's Room was visited, and the methods by which natural history objects are brought within the understanding of children were pointed out.

GENERAL BUSINESS.

The president said that Miss O'Donoghue had presented a set of bound volumes of the *Naturalist* to the library as a memento of her late brother's association with the Club. A vote of thanks was unanimously accorded to her for the gift.

A hearty welcome was extended to Mr. E. H. Ising, a member of the Field Naturalists' Section of the Royal Society of South Australia, who was on a holiday visit to Victoria. Mr. Ising briefly responded, expressing his appreciation of the chairman's kindly remarks.

The congratulations of the meeting were accorded to Mr.

F. Spry, one of the earliest members of the Club, on his appointment as entomologist to the National Museum.

Mr. P. R. H. St. John read an extract showing the strict measures taken by the South African authorities for the preservation of the indigenous flora.

Miss G. Nethercote, convener of the ladies' committee in connection with the exhibition of wild-flowers, appealed to the lady members for all the assistance that could possibly be given, in order to make the exhibition a success.

LECTURETTE.

By Mr. G. F. Hill, F.E.S., entitled "A Naturalist in the Northern Territory."

The lecturer, with the aid of a fine series of lantern slides, gave a description of his experiences with the Barclay Exploring Expedition in Central Australia and the Northern Territory, a visit to Melville Island, and also on a trip from Darwin to the Gulf of Carpentaria. The aboriginal life, the scenery, and the natural history features of the parts traversed were dealt with in an interesting and instructive manner.

Mr. J. A. Kershaw, F.E.S., said that Mr. Hill had made a large and valuable collection of entomological and zoological specimens during his journeys, which he had presented to the National Museum, Melbourne.

NATURAL HISTORY NOTES.

Mr. F. Chapman, A.L.S., read a newspaper cutting stating that the Broadmeadows Shire Council had decided that the Onion Weed, *Romulea cruciata*, Ker-Gawl., is useful as a fodder plant, and should be removed from the list of noxious weeds.

Mr. J. P. M'Lennan said that most of the peach trees at the Burnley Gardens were bursting into bloom, some even a fortnight previously. This early flowering he considered to be due to the fact that the trees are affected with a species of aphis, which has caused an excitation of the sap, this movement resulting in the buds swelling and developing flowers.

EXHIBITS.

By Mr. E. S. Anthony.—Ethnological specimens from Northern Territory.

By Mr. F. Chapman, A.L.S.—Specimen of wood and sub-aerial roots of *Hakea laurina*. This dwarf tree, about ten years old, was recently blown down in the exhibitor's garden at Balwyn, where it had attained the height of 12 feet, and a stem diameter of 5 inches. It had been growing in a dry situation, and in endeavouring to obtain moisture had from its main divergent roots thrown up curious tangles of sub-aerial roots, by which it obtained moisture from the surface during slight showers.

By Mr. E. Cox.—Wolfram from Marysville district.

By Miss C. Currie.—Moss, *Dawsonia polytrichoides.*

By Mr. C. French, jun.—Flowering branches of the Mudgee Wattle, *Acacia spectabilis.*

By Miss Fuller.—Flowering specimen of *Bambusa japonica*, var. *metake.* These bamboos flower only once in their lifetime, dying when the flowering is completed.

By Mr. G. F. Hill, F.E.S.—A large series of insects injurious to vegetation, from the Northern Territory.

By Mr. J. P. M'Lennan.—Galls on the roots of the White Mulberry, caused by the Root-knot Eel-worm, *Heterodera radicicola.*

By Mr. D. J. Paton.—Wild-flowers from the Bendigo district, including *Grevillea rosmarinifolia, Eriostemon obovalis*, and *Hovea longifolia*, from South Mandurang, and *Hybanthus floribundus*, from Kangaroo Flat.

By Mr. E. E. Pescott, F.L.S. — Twin leaf of *Eucalyptus rostrata*, Schlec., River Red Gum—a paired leaf with only one leaf-stalk. Flowers of *Acacia Baileyana*, var. *aurea*: in this variety the young foliage is of a golden colour.

By Messrs. E. E. Pescott, F.L.S., C. French, jun., and E. H. Ising.—Flowers of the terrestrial orchids *Corysanthes pruinosa*, R. Cunn., from Mentone; *Cyrtostylis reniformis*, R. Br., from Cheltenham; *Pterostylis concinna*, R. Br., from Black Rock; *P. vittata*, Lind., *P. pedunculata, P. nutans*, and *P. curta*, from Sandringham.

By Mr. F. Pitcher. — Blooms of *Phebalium* (*Eriostemon*) *trilobum*, Lindley, Two-lobe-leaved Mountain Myrtle (Victoria, South Australia, and Tasmania): *Trymalium Billardieri*, Fenzl., Labillardiere's Trymalium (Western Australia); also 15 species of Acacias from the Melbourne Botanic Gardens, many of the species not being as a rule fit for exhibition until the September meeting, viz.:—*A. acinacea, A. cardiophylla, A. decora, A. diffusa, A. discolor, A. juniperina, A. leprosa, A. longifolia, A. montana, A. nereifolia, A. pravissima, A. prominens, A. venulosa*, and *A. verniciflua.*

After the usual conversazione the meeting terminated.

THE ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 10th September, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about 60 members and visitors were present.

The chairman said that members would be grieved to learn that since last meeting the Club had lost a fellow-member by

the death of Mr. O. W. Rosenhain, while on a business trip to Japan. During his comparatively brief membership Mr. Rosenhain had exhibited great interest in the Club, and only a few meetings ago had entertained the members with a very interesting illustrated paper dealing with a trip down the River Murray. He also desired to offer the sympathy of the members to two old members, Messrs. J. H. Gatliff and F. G. A. Barnard, who had recently suffered severe bereavement by the loss of their sons while fighting for King and country in the terrible conflict still raging in Europe.

CORRESPONDENCE.

From His Excellency the Governor-General, saying that, owing to an alteration in his engagements, he would be very pleased to perform the opening ceremony at the forthcoming exhibition of wild-flowers on the 20th prox. The intimation was received with applause.

From the Microscopical Society of Victoria, stating that about twelve microscopes would be available, under the direction of members, at the wild-flower exhibition. The Society to be thanked for its interest in the exhibition.

REPORTS.

In the absence of the leader, Mr. P. R. H. St. John, a report of the char-a-banc excursion to Greenvale and Wildwood, on Saturday, 25th August, was given by Mr. E. Cox, who stated that there had been a good attendance, and that the principal object of the excursion, to see the golden wattles at Greenvale in bloom, had been attained. The excursion had proved most enjoyable, the country passed through presenting a very pleasing aspect.

A report of the visit to "Merriwa," Toorak, the residence of Mr. A. Rutter Clarke, a fellow-member, on Saturday, 8th September, was given by the leader, Mr. P. R. H. St. John, who said that a party of about forty members and friends had the privilege of spending a couple of hours rambling through the grounds of Mr. Clarke's residence and admiring his collection of Australian trees and shrubs, comprising more than a hundred species. A number of Acacias were in bloom, such as *Acacia spectabilis*, *A. pulchella*, *A. saligna*, *A. macradenia*, and *A. calamifolia*, and excited considerable admiration, also several Grevilleas, Melaleucas, Eriostemons, &c. An invitation to afternoon tea was accepted, and at its conclusion the president (Mr. F. Pitcher) tendered the thanks of the party to Mr. and Mrs. Clarke for their hospitality and kindness in allowing so many the opportunity of seeing such a beauty spot, under such favourable circumstances.

ELECTION OF MEMBER.

On a ballot being taken, Mr. Henry Exley, Male-street, Brighton, was duly elected a member of the Club.

GENERAL BUSINESS.

The chairman announced that the arrangements in connection with the exhibition of wild-flowers were progressing satisfactorily. The committee would be glad of all the help possible at the Town Hall early on the morning of the 2nd prox., and members were urged to ask their country friends to forward as many flowers as possible.

The chairman said that Mr. F. Keep had generously donated a complete set—twenty-two volumes—of the Naturalists' Library to the Club's library. A hearty vote of thanks was accorded to Mr. Keep for the donation.

PAPER READ.

By Mr. F. Chapman, A.L.S., entitled "A Sketch of the Geological History of Australian Plants : Part I.—The Palæozoic Flora."

The author said that he had found his subject too extensive for one paper, and therefore proposed to deal only with the Palæozoic flora on the present occasion. He pointed out the paucity of undoubted plant remains until the Devonian period, the earlier forms being largely represented by the limestone-forming algæ. From the Devonian to the Permian, appropriately named the Cryptogamic period, the flora developed by leaps and bounds, the predominance of the Lycopodiales, the Ferns, and the Cordaitales being well represented in Australian rocks. Although Lepidodendron was remarkably dominant, the Sigillariæ of the northern hemisphere were conspicuously absent ; whilst the Horsetail group—Equisetales—is moderately represented by remains of Phyllotheca and some rare Calamitean forms. The importance of the Glossopteris flora was especially noticed, and the geological reasons given for the formation of vast storage areas of carbonaceous deposits, which are so necessary for the welfare of Australia's population at the present time. A corollary of the evidence shown by the various types of plant life in these older rocks is that the well-worn dogma of distinct stratigraphical breaks in the geological record is crumbling away, in view of the continuity of life forms, both vegetable and animal.

The paper was well illustrated by lantern slides, some of which depicted specimens only recently described.

In answer to questions, the author stated the remains of Lepidodendrons—the ancient representatives of the modern club-mosses—gave an estimated height of about 50 feet.

EXHIBITS.

By Mr. A. Rutter Clarke.—Flowering specimens of *Acacia verticillata*, var. *ruscifolia*, a low, spreading form found on the Otway coast and in South Australia; and *Melaleuca micromera*, from Western Australia.

By Mr. G. Coghill.—Bunch of wild-flowers from Mooroolbark.

By Mr. C. Daley, F.L.S.—Photographs of the crater lakes at Mount Gambier, South Australia.

By Miss G. Nethercote.—Flowering branches of *Micromyrtus microphylla* (*Baeckea plicata*).

By Mr. D. J. Paton.—Wild-flowers from Bendigo district, including *Boronia polygalifolia*, *Eriostemon obovalis*, *E. difformis*, and *Dillwynia cricifolia*; also flowers of Common Buttercup, *Ranunculus lappaceus*, measuring 2¼ inches in diameter, showing result of cultivation.

By Mr. F. Wisewould.—Flowering specimens of *Acacia stricta*, *A. diffusa*, *A. myrtifolia*, *A. pycnantha*, *A. lincaris*, *A. verticillata*, and *A. melanoxylon*, from Pakenham Upper.

After the usual conversazione the meeting terminated.

THE LATE O. W. ROSENHAIN.—The announcement of the death of Mr. O. W. Rosenhain, at sea, on 4th September, a few days' sail from Japan, will come as a shock to his many naturalist friends. He was elected a member of the Club in November, 1910, and exhibited considerable interest in its work, especially when any movement was afoot for extending the protection of birds or the proclamation of sanctuaries. He was a keen lover of nature, and took part in the Baw Baw trip in January, 1914, and the Wilson's Promontory trip in December of the same year, on each of which he made many friends by his genial companionship. As the result of opportunities availed of during a business trip to Java in the early part of 1915, he gave an interesting illustrated paper entitled "A Naturalist in Java" at the December meeting of the Club (*Vict. Nat.*, xxxii., p. 159). In April last he contributed another illustrated paper, "A Thousand Miles on the River Murray," but did not live to see it in print in the August *Naturalist*. It is sad that he and his fellow-member, Mr. J. G. O'Donoghue, companions during those interesting "Wanderings on the Murray Flood-Plain" in September, 1914 (*Vict. Nat.*, xxxii., p. 7), should so early pass away from the scenes they loved so well. Mr. Rosenhain served as a member of the committee for the year 1915-16. His health was somewhat impaired when he left Melbourne some weeks ago by the anxieties of an importer's life, especially at such a time as the present; but his death from heart failure was quite unexpected, and must have come as a great shock to his wife, who was accompanying him on the trip.

NOTES ON THE DISTRIBUTION OF THE EUCALYPTS ABOUT CRESWICK AND CLUNES.

By T. S. HART, M.A., B.C.E.

(*Read before the Field Naturalists' Club of Victoria, 14th May,* 1917.)

DURING a time of residence at Creswick I made a number of observations on the distribution of various species of eucalypts and other trees in the district, and, though many points still remain to be examined, it seemed that these notes might be of interest both with regard to the district itself and for comparison with occurrences elsewhere.

The district, being mainly composed of bedrock (Ordovician) ranges and volcanic plains, is to that extent analogous to some parts near Melbourne, but differs in its inland situation on the north of the Main Divide, and in its elevation from 900 to over 2,000 feet above sea-level, with consequent differences in climate, some of which are seen in the amount and seasonal distribution of the rainfall, and in the temperature and its variations. Geographically, the locality presents features of interest with regard to plant distribution. The wooded ranges of east and central Victoria are practically continuous to Creswick, but immediately to the west a strip of volcanic country a few miles wide passes over a low part of the Divide and connects a northward projection of the Western District plains with the largest area of similar country on the north. Apart from the conical hills, the plains here only reach a little over 1,500 feet in elevation close to the Divide, and sink to about 1,360 on the Divide at Learmonth. North Creswick railway station, on the plains, has an elevation of 1,421 feet; Clunes, 10 miles to the north-west, 1,081 feet. From north of Creswick the volcanic country extends eastward with increasing elevations—1,800 at Newlyn; thence southward it crosses the Divide again, but at elevations over 2,000 feet, and further south, as the Bungaree Plateau, has still an elevation of 1,940 feet at Wallace, on the main Ballarat railway.

The tourist map of Ballarat and Creswick, recently issued by the Tourists' Bureau, forms a useful guide to the district, and on it will be found most of the places mentioned in this paper.

The north-westerly fall of the open plain from Newlyn and Creswick to Clunes gives it a warm aspect, but exposes it to bleak north and north-west winds in winter, as the hills to the north-west are not high enough to be any shelter. At the same time the low part of the Divide exposes the plain to the sweep of cold south-westerly winds. Elevation and exposure contribute to more severe climatic conditions.

The bedrock country at Creswick occupies the space between

the two volcanic areas of the Main Divide. Its highest point south-east of Creswick is over 2,000 feet above sea-level; from here it falls north and west. South of Creswick the valleys are often deep and the slopes steep; north-west of the town the elevation is less and the slopes more gentle, at places merging gradually into the plains. Alluvial deposits occur in the valleys, and there are also numerous terraces and patches of older gravels, the most evident of which is the terrace on which the Creswick station stands, at 1,438 feet above sea-level.

The north-west end of the Creswick bedrock area is crossed by the railway about four miles from Creswick at an elevation of 1,276 feet. Beyond this the next area of bedrock country is at a distance of about five miles, and lies to the west of Clunes. It rises little above the adjacent volcanic country, and its slopes are gentle. The railway crosses its northern end at an elevation of 1,066 feet. This area is sheltered from the west by the granitic hills of Mount Beckworth. North-west of Clunes, and separated from the last area by volcanic plains, commences a considerable stretch of bedrock country. Only the south end of this has come under my observation. A few small exposures of bedrock in the valleys are not important.

Climate. — Through the courtesy of the Commonwealth Meteorological Bureau, figures have been obtained as to the rainfall of several localities in the district and temperature records for Clunes and Talbot. These figures may be best understood by means of a comparison with Melbourne.

The average annual rainfall at Creswick, from seventeen years' observation, is 27.58 inches. This is about two inches above the Melbourne average, but the seasonal distribution differs. Melbourne shows its highest monthly average in October, and an autumn maximum in April; Creswick, and all the places for which there are long records in this district, show the maximum in June. From October to February inclusive the average monthly rainfall is less at Creswick than at Melbourne. Owing to the rapid evaporation and the uncertainty of the summer rain, Melbourne has practically a dry summer; the rain is not to be relied on; native plants must be able to do without it at this season.

Wilson's Reservoir, just south of the Divide, on the high volcanic country south-east of Creswick, has an average rainfall of 31.89 inches (twenty years' records). This is at an elevation of about 2,000 feet. The summer rainfall is almost the same as that at Melbourne, but the elevation here must mitigate the summer conditions.

Average annual rainfalls of other places are as follows (the number of years is given in parentheses):—Newlyn Reservoir,

30.04 (39 years), Allendale, 24.26 (14 years); Clunes, 21.35 (37 years); Talbot, 21.34 (32 years). The rainfalls from December to March inclusive for these places are :—Melbourne, 7.97. Wilson's 8.05, Newlyn 6.85, Allendale 6.05, Clunes 5.11, Talbot 5.08.

The temperature records of Clunes and Talbot are just what we might expect from the elevation and inland position. The mean temperatures are about 3 degrees lower than those of Melbourne for the year as a whole, but the mean temperatures of the hottest month are a shade higher and those of the coldest month about 5 or 6 degrees lower than Melbourne. The daily variations are also more severe than at Melbourne—in the summer to a considerable amount, but in winter little. Clunes shows greater changes of temperature than Talbot, which is probably due to its situation in the open plain.

The considerable difference in rainfall between Clunes and Creswick is in agreement with the difference in situation. Creswick is not only higher, but is on the edge of hilly country exposed to the north-west and west, and even the Main Divide, to the south-west, is little shelter. Clunes is lower, in plain country, and well below the levels of the lowest part of the Divide. Its rainfall is possibly further reduced by the shelter of Mount Beckworth, for it will be noticed that the Clunes rainfall is practically identical with that of Talbot, whereas we would have expected it to be slightly but perceptibly greater.

The Soil Conditions in the Volcanic Country.—The soil of the volcanic country is very clayey, and in the open plains it is poorly supplied with humus, and that supply only to a shallow depth. On the high levels about Newlyn and Dean there was forest, and the soil conditions were much improved : but the first condition here also would have been clay soil, poor in humus.

We may consider first the typical open volcanic country below about 1,500 feet elevation. When thoroughly wet the clayey soil becomes very difficult for water to pass through, and the surface over large areas is nearly flat, with small inequalities, so that the water lies about in winter. The aeration of the soil for a considerable part of the year is very poor, the excessive retention of water preventing proper aeration. In such stiff clays it is possible for air to be to some extent excluded even when the soil is comparatively dry. In the summer the soil dries, shrinks, and cracks deeply. Owing to the power of clay to hold considerable water from the plant, the available soil water is still further reduced. Light summer showers, if they sink in, have little chance of passing the grass roots ; if the water runs into the cracked hollows

it can penetrate at once below the roots of the smaller vegetation. The run-off of summer rain is very low, as is shown clearly in the experience of the Ballarat Water Supply, of which the catchment was, before recent additions, nearly all volcanic country, and the water caught in a very dry year only a small proportion of the rainfall. Summer rain, in an ordinary season, added very little to the water running in the streams.

It must be noticed also that the water which sinks in is not all available to be raised again by capillarity to the soil. Water easily travels through the cracks of the bluestone rock below, except in so far as these cracks are closed by damp clay from the weathering of the rock. Water which reaches clean or dry cracks in the bluestone will descend to the natural water-level: in one old shaft at North Creswick this was found to be 77 feet below the surface. No capillary action can return the water by these cracks, as such action depends on the passages being small. Water which reaches clean bluestone may be regarded as lost to the vegetation: its only possible effect is to keep the air moist in the cracks of the rock, an effect which might perhaps reach the deeper soil-cracks. Mining experience in the basalt plains amply establishes this easy passage of water through the cracks of clean bluestone, while at the same time surface holes in clay and water-courses continue to hold water in spite of pumping out the water from the rock below. The absence of a useful supply of water below the soil is not due to impenetrability of the soil and rock below, but to a kind of penetrability which prevents the storage of water at a level from which it can return, except in the clay, which is not deep, and can withhold water from the plant to an important extent.

The soil character makes the wetness of wet periods more pronounced than in freer soils, and the dryness of dry periods also more effective: it intensifies the seasonal effects in which summer drought is already serious.

Reviewing the seasonal conditions in the plains, once the plain is dry and cracked in summer very little advantage is received from the summer rain, and on this the grass has first claim after any deficiency in what the clay itself can withhold from vegetation is supplied: shrubs might be worse off than a tree, which could thrust its roots deeper. The cracks close as the moisture increases in autumn, but an autumn growing season is precarious. It may be late in the year before there is ample water, with days already shortened and temperatures falling. (A favourable autumn may produce a considerable response in the vegetation, as was seen in some districts in the profusion of the flowers of Wahlenbergia in the autumn of

1911.) Winter in the plains is cold and bleak, and the soil in very bad condition for any root activity. Spring growth is delayed by the fact that much water must be got rid of by evaporation, but the date at which summer conditions cause a shortage of moisture is probably little delayed. The experience of cultivation confirms this: the first requirement is aeration of the soil. Skilful treatment attains this, and secures better root conditions.

Bowman, in his "Forest Physiography," dealing with the treelessness of the plains and prairies, says that the fundamental condition is deficiency of rainfall, in spite of the fact that there a large portion of the rainfall occurs in the growing months. Fineness of soil particles is also given as an important cause. Almost all forms of vegetation require an aerated soil, and this is especially true of all but a small number of forest trees. The prairie soils, being fine and compact, keep the rainfall near the surface longer than coarse soils, and a larger proportion is re-evaporated. Deeper-lying tree-roots are thus deprived of rainfall, and grass roots further deprive them of what is left available. Evaporation is hastened by high summer temperatures and continued sunshine, and by wind. He says further that heavy clay lands carry luxuriant forest where rainfall and temperature conditions are normal, but when conditions of rainfall are critical the balance of power is held by otherwise feeble influences. The prairie plains can be made to grow trees almost anywhere.

This is applicable to our volcanic plains, without claiming identity of soil or climate. The soil is clayey—that is, mainly of fine particles—and the rainfall is barely adequate for forest: just inadequate, we may say, for this soil in its present condition. But close by, on clay soils of similar origin, but with a greater elevation, a higher rainfall, a milder summer, and the proximity of woodlands, with their mitigating effect on the extremes of climate, forest had established itself on the high volcanic country. The existence of this forest improves both soil and climate, and would result, under natural conditions, in the continual extension of the forest on to lower volcanic plains, and no doubt also in the gradual introduction in the forest of species such as *E. obliqua*, which avoid the plains in their unforested condition. The forested areas of the high volcanic country, where nearest to the open plains, carried the same species as occur on the plains.

It needs to be remembered that the soil of the bluestone plains is not always of purely volcanic origin. Waste from the adjacent country has often been carried on to the plain, as is noticed especially where hills meet the plain without an intervening valley. Such addition of other material would have

been commoner in the earlier stages of the history of the plains, before even the present imperfect drainage system had been established. On the bluestone there also occur shallow basins of some extent, of which Lake Wendouree, at Ballarat, and the Eglinton Swamps, north of Clunes, may be taken as examples. These will silt up in time or be drained by the cutting of an outlet. The deposits formed in them and exposed later may be purely of basaltic origin or in part carried from some other source, but are likely to be mostly clayey. Such an explanation would fit an extensive wet and clayey flat a couple of miles north-west of Clunes.

The Trees of the Volcanic Country.—The volcanic country may be considered in three parts—the plains about Clunes and to the north and north-west, below 1,100 feet elevation; the plains about North Creswick, at a higher elevation (up to over 1,500 feet); and the high volcanic country about Newlyn and Dean, which reaches to elevations at its highest parts of over 2,000 feet, and was forest country in its natural condition. The boundaries are not, of course, sharp.

The characteristic tree of the plains about and beyond Clunes is *Eucalyptus rostrata*, the Red Gum. *E. leucoxylon*, Yellow Gum, and *E. hemiphloia*, Grey Box, also occur, but are relatively few in numbers. The Blackwood, *Acacia melanoxylon*, is also present. These trees also occur off the plain in suitable situations in the vicinity. Yellow Gum and Grey Box are evidently much commoner off the plain.

South of the Stony Creek school, about seven miles north-west of Clunes, there is a strip of volcanic country at about 1,050 feet elevation. The trees on the plain are here all Red Gum on the part which is purely volcanic, but on the north side, where detritus from adjacent bedrock hills has spread out at the edge of the plain, Yellow Gum appears in abundance, and there is a rapid transition as we leave the basaltic soil from purely Red Gum to predominant Yellow Gum, very soon without any Red Gum. On the south side of the same volcanic area Yellow Box is common on the lower slopes of granitic hills, and mixes with the Red Gum towards the valley, but it was not seen on the plain. I mention this as Yellow Box appears on the plain at North Creswick; here it has evidently every opportunity of access from both sides. So also Grey Box is close by on the north without occurring on the basalt here.

At another place, nearer Clunes, Yellow Gum occurs on the plain, but the soil is not purely volcanic, and on wetter ground close by Red Gum occurs without Yellow Gum. But both Yellow Gum and Grey Box do occur in small numbers on undoubted volcanic country with basalt outcrops in the soil.

Immediately to the south-east of Clunes there are very few trees remaining on the basalt, and the change of species noticed may have been originally not quite so abrupt. The three eucalypts just mentioned are absent from the higher plain and also from the bedrock areas about Creswick. (The eucalypts of the valley above the State Nursery at Creswick may be all regarded as planted.)

In the plains about North Creswick the following species occur :—*E. ovata* (*E. paludosa*), Swamp Gum, *E. coriacea*, White Sallee, *E. rubida*, Candlebark, *E. melliodora*, Yellow Box, *Acacia melanoxylon*, Blackwood, *Banksia marginata*, Silver Banksia. A few miles to the north there are also *Acacia mollissima*, Black Wattle, and *Casuarina quadrivalvis*, Drooping Sheoak. Except the last two, these are also found near Creswick off the bluestone, but the Banksia is not common, and White Sallee appears to occur in these bedrock areas only just off the volcanic country, a couple of trees in the valley above the nursery being no doubt planted. The trees on the parts of the plain hitherto dealt with are scattered and wind-beaten.

The high-level, volcanic country east of Creswick, about Spring Mount, Newlyn, and Dean, was closely forested in its natural condition, as seen by the tall, straight stems of some trees still remaining. Swamp Gum, Candlebark, and White Sallee occur, the same species as on the lower level at North Creswick, but of better growth. *E. obliqua* occurs on Spring Mount, a volcanic hill. The trees of Mount Warrenheip, south of the Divide, are mostly *E. obliqua*, *E. viminalis*, and Blackwoods. The Silver Wattle, *A. dealbata*, also occurs on the high volcanic country. All the trees of this area are also found on adjacent bedrock or alluvial areas, with the limitation as before —that White Sallee extends only just off the volcanic soils so far as noted. The Yellow Box, present on the basalt at North Creswick, does not occur on these higher areas, but neither does it ascend above about 1,500 feet in the ranges. In passing, it may be noticed that the success of the Ballarat Water Commissioners in growing pines on volcanic soil was obtained on the high-level lands on the south side of the Divide at elevations over 1,700 feet and with a rainfall over 34 inches.

The Bedrock Country.—The soil of the bedrock country is derived from the waste of the sandstones and slates which form the underlying rocks, with quartz fragments from the veins. Where the slopes are steep the lighter plant *débris* and finer soil particles are easily moved down the hillside, and the soil is, as a rule, deeper, richer, and more retentive of moisture on the lower slopes and in the valleys, except where

running water removes it or the ground is too steep for its retention. On these slopes the water quickly runs off, being delayed more or less according to circumstances by the forest litter and smaller vegetation. A slope with a south aspect, being more shaded, does not allow so rapid drying or so rapid decay of plant waste as the sunnier slopes; hence the conditions found low on the hills rise higher on these shady slopes, the more abundant vegetation further lessening the rate of run-off of rain and the washing down of soil and light *débris* to the lower levels. On the gentler bedrock hills the run-off is slower, and light material is not so readily moved, so that more uniform conditions will result on the lower and upper parts of the hillside, a point which is illustrated in the way *E. rubida* keeps mostly to the lower slopes in the steeper ranges, but sometimes extends right over a low, gentle hill. The associated alluvial deposits may be taken with the bedrock. No different species of trees have been noticed on them, and often their boundaries are ill defined. The present alluvials in the valleys give the extreme of wet situations in the bedrock country.

To the south and east of Creswick the forest is mainly formed of *E. obliqua*, Messmate or Messmate-Stringybark, *E. Stuartiana*, Apple Box, *E. dives*, Broad-leaved Peppermint, and *E. amygdalina*, Common Peppermint, the relative prominence of the species varying in different localities. There are also, mostly in the valleys, *E. rubida*, Candlebark, *E. ovata* (*paludosa*), Swamp Gum, and *E. viminalis*, Manna Gum. In addition, *E. macrorrhyncha*, Red Stringybark, occurs in two places, the chief locality being south-west of the railway station, at the west end of certain suburban blocks known as Hyde Park, and the other a short distance outside the north-east corner of the Plantation. *E. melliodora*, Yellow Box, also occurs close to and in the township. It is abundant near the railway at Cobbler's Gully, between Bald Hills and Creswick, and from there northerly. It is also found on the flanks of the hills and in the valleys on the east of the township, and as it is seen on this side on first reaching the timber it might seem to be commoner than it really is. It does not seem to penetrate far into the forest except up Cobbler's Gully and its branches, nor does it seem to reach above 1,500 feet elevation.

To the north-west of Creswick the bedrock country is lower, and often with gentle slopes. With deeper soil it is not always easy to say whether a particular soil is derived from the underlying rock only, or from a thin cover of alluvial material. The same species occur, with the exception probably of Common Peppermint, but the proportions and local distribution differ from those observed in the steeper ranges. The

top and bottom of a hill slope do not here differ so much in character.

Yellow Box is common near the lower parts of Cobbler's and other neighbouring gullies. One paddock on the Ascot road is now occupied mainly by Candlebark, extending to the higher parts of the low hill. With it occurs *Casuarina suberosa*, Black Sheoak, a tree which was once commoner in the district. There are also a few Black Wattles, but careful examination shows that these are planted, the few trees remaining being remnants of rows of trees. On the opposite side of the road, across a small creek, a similar but slightly lower hill carries very little besides low, spreading Messmate. There is, of course, a chance in paddocks long in private hands of some artificial alteration, but there is no evident indication of this except in two patches of planted wattles. The extreme north-west end of the Creswick bedrock area carries Yellow Box and Candlebark, each separately predominating in patches, and a few White Sallee also occur.

Passing then to the north-west across more than five miles of volcanic plain, we reach bedrock hills again in the west end of the parish of Clunes, and the difference in the trees is at once noticeable. The slopes are gentle and the timber of the low and less dense character seen north-west of Creswick. In this West Clunes area are seen *E. cladophora*, Long-leaved Box, *E. melliodora*, Yellow Box, *E. leucoxylon*, Yellow Gum, *E. dives*, Broad-leaved Peppermint, *E. obliqua*, Messmate, *E. rostrata*, Red Gum, with *E. hemiphloia*, Grey Box, at least in the northern part. In addition, there are a few trees best referred to *E. viminalis*, Manna Gum, and one tree from which I have shown specimens to Mr. P. R. H. St. John, which is a form of *E. Considineana*, Yertchuk. This tree occurs on a low rise with Yellow Gum and Yellow Box in a paddock which has been mostly cleared. Red Gum occurs in the valleys, and Yellow Gum rather prefers the lower slopes of the hills and where they meet the valleys and the plains, but it extends also on to higher ground, and the tops of low hills. So far as observed, *E. Stuartiana*, *E. amygdalina*, *E. rubida*, and *E. ovata* are absent from this bedrock area, nor have they been noticed further north.

Northward from here, across some volcanic country, we come to another bedrock area. The slopes are in part gentle, but a considerable valley runs to the north, and is followed by the main road. Some of the gullies entering this valley from the east side are steep-sided. The railway and the main road enter the south-west corner of this area at a crossing marked "99.49." Near here is a paddock timbered almost purely with Yellow Gum, on a soil probably derived from the

bedrock. On the hill a short distance further north, where the road enters the head of the northward valley, there occur *E. polyanthemos*, Red Box, and *E. sideroxylon*, Red Ironbark. A very few Ironbarks are just on the southward slope. The other trees here present are the Boxes—Grey, Yellow, and Long-leaved—Broad-leaved Peppermint and Yellow Gum, and *E. Consideniana*, Yertchuk, and probably *E. macrorrhyncha*, Red Stringybark. Messmate is not common, but probably occurs. *E. Consideniana* occurs close to the road on the east side, near the top of the hill: at 300 paces eastward along the ridge it is present in quantity. This is a dry situation, and with it are Red Box, Red Ironbark, Long-leaved Box, and Broad-leaved Peppermint, and some Golden Wattles and Cherry Ballart. *E. Consideniana* extends a little down the south slope, and was also noticed on a hill to the north, though on the very highest and driest part of this hill Red Box and Red Ironbark were the chief trees.

(*To be continued.*)

OUR HONOUR ROLL.—The month of August was fatal to two of those sons of members whose names appear in the Honour Roll published in the April *Naturalist*. Both died while serving King and country in France, or perhaps Flanders, particulars not yet being to hand. On 6th August Captain Frank E. Gatliff, 54th Field Artillery, third son Mr. J. H. Gatliff, made the supreme sacrifice, and on 11th August Lieut. Norman F. W. Barnard, 1st Pioneer Battalion, only son of Mr. F. G. A. Barnard, was reported killed in action. Both were promising young men, whose lives could ill be spared in the present crisis, and we extend our readers' sympathies to their sorrowing parents.

FLYING-FISHES.—Our fellow-member, Private C. L. Barrett, of the Camel Brigade Field Ambulance, A.I.F., writes:—"At Sea, 26th May, 1917.—From the deck of our boat I have just been watching some flying-fishes, and I thought that a note might be of some interest to members of the F.N.C. Some observers have declared that these fishes vibrate their large pectoral fins when skimming through the air—in fact, that they use them as wings. My observations to-day, and on a previous occasion when I was voyaging in the Pacific Ocean, convince me that the fins are held rigid all the time that the fish is in the air. However, I did see one to-day strike the water with its tail; it did not rise cleanly and rapidly in the first place, and the flip of the tail gave it the necessary impetus for the *flight*. Another fish I observed made an aerial journey of at least fifty yards. The flying-fishes have been of special interest to me, as we have seen no other form of animal life for some days."

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 8th October, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about sixty members and visitors were present.

CORRESPONDENCE.

From the secretary State schools flower show, asking for the assistance and co-operation of the Club at the forthcoming show to be held in the Melbourne Town Hall on the 19th inst., more especially with regard to the wild-flower exhibits.

Miss Nethercote, Miss Carter, and Mr. H. B. Williamson volunteered their aid, and the meeting endorsed the representation of the Club by these members.

From Mr. A. Rutter Clarke, stating, with regard to the report of the recent visit of the members to his Australian garden appearing in the current *Naturalist*, that the number of species cultivated had been considerably underestimated. He had tried more than 400 species, and had at the present time well over 300, with, in many cases, several specimens of the same species.

REPORTS.

A report of the excursion to the You Yangs on Saturday, 15th September, was given by Mr. C. Daley, F.L.S., one of the leaders, who stated that an enjoyable day had been spent. The eastern side of the range was drier than expected, but on the southern slope many species of flowers were noted. Birds also were fairly numerous, while the extensive view from Flinders Peak was greatly admired.

A report of the excursion to Noble Park on Saturday, 22nd September, was given by the leader, Mr. J. W. Audas, F.L.S., who stated that a large party took advantage of the fine afternoon to see the spring-flowering plants at their best. Owing to the locality being a little further from town (16 miles) than the usual scenes of excursions, the suburban builder is not so much in evidence, consequently, during the three-mile ramble to Springvale, a large number of species—between seventy and eighty—were collected. Among these may be mentioned the orchids *Lyperanthus nigricans*, *Caladenia Patersoni*, var. *dilatata*, *Glossodia major*, *Pterostylis nutans*, *Prasophyllum australe*, and *Thelymitra flexuosa*. Of other species seen, *Pultenæa dentata*, *Sphærolobium vimineum*,

Sprengelia incarnata, Comesperma ericinum, Utricularia lateriflora, were perhaps the most uncommon. The countryside was gay with the flowers of such species as *Ranunculus lappaceus, Pultenæa stricta,* var. *Gunnii, Acacia myrtifolia, Epacris impressa,* and *Ricinocarpus pinifolius,* which gave colour of various hues to the scene, and afforded ample opportunities to members to pluck for home decoration selections of their bush friends.

A report of the excursion to Diggers' Rest and Sunbury on Thursday, 27th September (Show Day), was given by Dr. C. S. Sutton, one of the leaders, who said that he had been prevented by indisposition from attending, but his co-leader, Mr. A. L. Scott, had reported that the attendance had been very meagre, and thought that, from experience on previous occasions, the arrangement of excursions for Show Day should be abandoned. Owing to the strong flow of water in Jackson's Creek, the Diplograptus beds were unapproachable. A fair number of botanical specimens was collected, while birds of many species were numerous and far from shy. The ramble disclosed some very picturesque country, which in early spring presents a very pleasing appearance.

ELECTION OF MEMBER.

On a ballot being taken, Mr. Gerald J. Morris, Tunstall, was elected an associate member of the Club.

GENERAL BUSINESS.

Mr. G. A. Keartland drew attention to the extensive use of bird-lime by bird-trappers around the metropolis, and deprecated the practice very strongly, especially during the breeding season. He thought an endeavour should be made to have the use of bird-lime prohibited. His remarks were supported by Messrs. Blake, Keep, Currie, and others. It was resolved, on the motion of Messrs. J. A. Kershaw, F.E.S., and F. G. A. Barnard, to bring the matter under the notice of the Fisheries and Game Department, and ask that, if possible, regulations be framed dealing with the practice.

Mr. F. Chapman, A.L.S., said that he was wrongly credited in a recent *Naturalist* with bringing forward a note on the Onion Weed. The hon. editor explained that no name was attached to the newspaper cutting in question, but from the handwriting he judged it to have been handed in by Mr. Chapman. He took the opportunity of asking members to assist him in producing a true record of the Club meetings by paying more attention to the way in which notices of exhibits, &c., are made out.

The president referred to the gratifying success of the wild-

flower exhibition held the previous week, and desired to express the Club's thanks to the many members and friends who had contributed time, labour, and exhibits, and so materially assisted in bringing the exhibition to a successful issue. A unanimous vote of thanks was passed to a lengthy list of persons, metropolitan, country, and inter-State, for their very valuable co-operation on the occasion.

The hon. treasurer, Mr. G. Coghill, read a progress report on the financial result of the exhibition, which was considerably in advance of the previous attempt, and would probably amount to about £200.

Mr. F. Keep asked if a census of the wild-flowers exhibited had been made. Dr. Sutton replied that, with the limited time available, it was quite impossible to make out a complete list, but an attempt was being made to give a good report of the exhibition in the next *Naturalist*.

NOTES ON EXHIBITS.

Mr. J. A. Kershaw, F.E.S., called attention to his exhibit of a specimen of a young male of the Red-crowned Fruit-Pigeon, *Ptilinopus swainsoni*, Gld., which was shot at Mallacoota, south-eastern Victoria, on the 21st August last by Miss E. Dorran, who forwarded it to the National Museum in the flesh. He said that although this species occurs in Queensland and north-eastern New South Wales, and is by no means uncommon on the Richmond and Tweed rivers, it does not appear to have been previously recorded south of the Hunter River. He also referred to the recent discovery of the Top-knot Pigeon, *Lopholaimus antarcticus*, and the Flinders Cuckoo, *Eudynamis cyanocephala*, in the same district, specimens of which were exhibited at the January meeting by Mr. C. Daley, F.L.S.

PAPER READ.

By Mr. E. E. Pescott, F.L.S., entitled "Notes on the Reproduction of Orchids" (first paper).

The author, by means of a fine series of lantern slides, demonstrated the general appearance of the various parts of the flowers of several Victorian orchids, and pointed out how they might be fertilized by the agency of insects. He said, however, that practically no observations were on record as to what insects effected the fertilization. His experiments with regard to the germination of the seeds had been failures, and he doubted if many of our orchids produced fertile seeds. In his opinion, most of our orchids owed their increase and spread to the production of new tubers.

Owing to the lateness of the hour, the discussion on the paper was held over till the next meeting.

EXHIBITS.

By Mr. E. Cox.—Slag wool manufactured from basalt at Footscray; may be used in place of cotton wool for certain purposes.

By Mr. C. J. Gabriel.—Marine shells—*Spondylus Americanus*, Lam., from West Indies; *S. Wrightianus*, Crosse, from North Australia.

By Mr. E. R. Hammet.—Native axe-head (polished) from Fiji.

By Mr. J. A. Kershaw, F.E.S.—Specimen of a young male Red-crowned Fruit-Pigeon, *Ptilinopus swainsoni*, Gld., from Mallacoota, south-east Victoria.

By Mr. J. P. M'Lennan.—Flower of Belle Siebrecht rose, with buds growing through the bloom, from Burnley Gardens.

By Miss G. Nethercote.—Photographs of the transportation of cases of wild-flowers for the recent exhibition across Fyans Creek, Grampians.

By Mr. F. Pitcher.—Blooms of *Acacia salicina*, Lind., var. *Wayæ*, Maiden, syn. *A. ligulata*, A. Cunn., "Shrubby Cooba," South Australia, from Botanic Gardens.

By Mr. J. Searle.—Fresh-water mollusc, Ancylus, sp., with developing eggs.

By Mr. H. Whitmore.—Highly-coloured mudstone (Silurian), from Camberwell railway cutting, and sample of pigment prepared from same.

By Mr. H. B. Williamson.—Dried specimens of *Acacia Bynoena*, Benth., from Murrayville, N.W. Victoria—unrecorded for Victoria.

After the usual conversazione the meeting terminated.

EXCURSION TO THE YOU YANGS.

Only four members met at Spencer-street station for the excursion to the You Yangs on Saturday, 15th September. It was a beautiful morning as we left Little River and passed over the basaltic plain country towards Station (or Flinders) Peak. Nearing the range, the volcanic soil gradually gave place to the coarse, sandy soil marking proximity to the granite hills from which it came. We found the approach from the east unusually dry, and there were very few flowers in bloom. The Snowy Mint-bush, *Prostanthera nivea*, on this side was just beginning to flower, and the introduced Tree Tobacco, *Nicotiana glauca*, was further advanced. The fine plantation of Golden Wattles, *Acacia pycnantha*, along the foot of the range was about to burst into bloom. The ridge continued dry right to the summit, but there are some good specimens of *Acacia implexa*, *Casuarina quadrivalvis*, *Exocarpos cupressi-*

formis, and several eucalypts — *E. globulus* (var.), rather dwarfed and with gnarled branches; *E. sideroxylon*, Ironbark, rather unusual on granite country; and *E. obliqua*, Stringybark. *E. polyanthemos* was in full bloom. *Acacia mollissima* and *A. armata* were in bloom, the former very slightly but giving a promise of profuse flowering, the latter full; also *A. melanoxylon*, rather dwarfed, except on the more sheltered slopes. All of these trees grow well among the boulders. Although the horizon was hazy, from the peak we had an extensive view to Mount Macedon to the north-east, Buninyong north-west, Blackwood to the north, the Anakies to the west, and to the south over Corio Bay and the Bellarine peninsula past Geelong to Swan Bay. The dial-face, showing direction and distance, is a useful institution. We found that some vandals had been firing bullets at the bronze plate commemorating Flinders's visit in 1802, bullet marks being visible, whilst names had been freely scratched on the surface by thoughtless and brainless visitors without any regard as to the fitness of things. We lunched and rested on the summit. Flinders Peak is 1,154 feet in height, and, standing as it does on a plain of low elevation (perhaps about 300 feet), apart from other ranges, is a very prominent landmark, appearing higher than it really is. The range extends to the north-west for about seven miles. Its composition is a porphyritic granite of quartz, felspar, and biotite. Prof. Skeats, who has carefully studied its petrological character, calls it an alkali-granite. The range stands like an island, being surrounded on every side by the lava plains, which exhibit so extensively the bygone volcanic activity once prevalent in the south and west of Victoria. To the south-west, near Duck Ponds Creek, denudation has disclosed the Ordovician measures underlying the basalt. Right in front of the peak are the limestone deposits of Lara, probably of the Pleistocene period, originally deposited in a fresh-water lacustrine area extending right across Corio Bay to the east of Geelong. Leaving the peak, we went down the steep southern slope, which was found to be much moister, with a good depth of humus, carrying rich herbaceous growth, in marked contrast to the northern and eastern slopes. Here some well-grown trees of Red Box Gum, *Eucalyptus polyanthemos*, were much beset with galls. The Kangaroo Apple grew well, but was not yet in bloom. The Lesser Clematis, *Clematis microphylla*, festooned some of the rocks with its feathery fruitlets. The Sweet Bursaria, *Bursaria spinosa*, showed its clusters of brown seed-cases. On this side the gums, acacias, and exocarps are of much larger and finer growth, with a profusion of grass, bracken, and meadow vegetation, among which were the Anagallis, Wahlenbergia, *Anguillaria* (*Wurmbea*) *dioica*, *Erodium cygnorum*, *Bulbine*

bulbosa, Eutaxia empetrifolia, Chamæscilla corymbosa, Pimelea linifolia, and a solitary *Diuris sulphurea,* with the composite *Brachycome exilis. Prostanthera nivea* was here in much better bloom, acacias more forward, and conditions of growth in every way better. It was noticed that the acacias, as a rule, were but little affected with the borer, as is so frequently the case. Passing the huge granite mass to the south-west, we reached the residence of the curator, Mr Kelly, on the edge of the forest reservation. Mr. Kelly kindly conducted us over the plantation, where a forest, principally of eucalypts and conifers, has been planted many years. A good deal of *Pinus insignis* is at present being cut down. The area is a very dry one, with a comparatively scanty rainfall, militating against rapid growth. We noticed beneath a Red Box a profusion of blossoms on the ground. On approaching we ascertained that it was caused by the activities of a flock of Gang Gang Cockatoos, which flew off noisily at our coming. In feeding on the flowers, they nip the flowering twigs, which fall in great abundance. The caretaker informed us that the beautiful Bronze-winged Pigeons, which are numerous at the You Yangs, nested preferably in the pines, and, whilst these trees were being cut down, sat closely and confidently on their nests in neighbouring trees, which were left intact until the broods had flown. Birds were only incidentally observed, but were numerous and varied in species, the well-wooded slope on the south side and the plantation to the west giving food and shelter. The Skylark had welcomed us on the plains, and other birds noted were the Red-capped Robin, Flame-breasted Robin, Black-and-white Fantail, Pallid Cuckoo, Harmonious Thrush, Rosella, Striped Brown Hawk, Magpie, a fine Eagle, Blue Wren and family, Acanthiza, Little Falcon, and two or three unrecognized birds of a kindred species. Starlings were numerous on the plains. The warmth of the sun tempted several lizards from their seclusion, a family of three basking contentedly but warily on a lichen-clad boulder near us, whilst two or three Blue-tongued Lizards momentarily showed themselves. Although this area is a sanctuary, two youths with pea-rifles were out to shoot anything that moved. One had killed an unoffending lizard, about 10 inches long. I said, "What did you shoot it for? It is a harmless thing." "Yes, it seems a waste of life, doesn't it? But I had to shoot it," was the reply. It is a pity that such thoughtless persons are entrusted with firearms. After going through the reservation, we made our way to Lara railway station, after a very pleasant and enjoyable outing, of which we were sorry a greater number had not taken advantage.—C. Daley.

[Reports of previous excursions to the You Yangs will be found in the *Naturalist,* vols. iii., p. 99, and xxv., p. 125.—Ed.]

NOTES ON THE DISTRIBUTION OF THE EUCALYPTS ABOUT CRESWICK AND CLUNES.

By T. S. HART, M.A., B.C.E.

(*Continued from page 92.*)

(*Read before the Field Naturalists' Club of Victoria, 14th May, 1917.*)

The Trees of the Granitic Hills.—Mount Beckworth, to the south-west of Clunes, rises to an elevation of 2,087 feet, but only a small area is near this height. It consists of granites, with the lower slopes made up of granitic detritus. The upper parts are rocky, soil being very variable in amount and often absent. From Mount Beckworth granitic country extends a few miles north-west to the vicinity of the Maryborough Reservoir, with one small break where a strip of basalt crosses it. On the summit of Mount Beckworth the trees are stunted forms of *E. obliqua* and a tree best referred to *E. viminalis*. There are also on the upper parts *Acacia melanoxylon*, *Banksia marginata*, and Casuarina. *Acacia mollissima* is also common both on the upper and lower parts of the hill. At places *Exocarpos cupressiformis*, the Cherry Ballart, is abundant, and very healthy-looking. On these rocky hills, where all deep roots must follow the natural cracks, it is evident that this tree will be in a position to gain all it can from its root parasitism, as the roots of neighbouring trees are forced into proximity to its roots.

On the detrital area springs are not uncommon, but the amount of water reaching different parts is very variable; evidently the supply of water from the higher ground, which makes a spring, means that there is so much less to soak into other parts. Swamp Gum, *E. ovata*, was observed at a spring, but on the east slope of the northern spur of the mount *E. elæophora*, Long-leaved Box, is prominent. Near the west end of the granitic country Yellow Box and a few Yellow Gums occur on the lower slopes, with Red Gum close to the creek; but on the upper rocky part of a hill it was noticed that eucalypts were absent, the trees being *Acacia mollissima*, Black Wattle, *A. melanoxylon*, Blackwood, *Banksia marginata*, Silver Banksia, and *Casuarina quadrivalvis*, Drooping Sheoke. The summit of this hill, however, would not reach the levels at which Messmate occurs on the north of Mount Beckworth. I have not examined the east side of Mount Bolton, south of Mount Beckworth, where it is possible that Long-leaved Box occurs further south than any observed by me.

The outstanding feature in the distribution of the eucalypts is the strong contrast between the species present at Creswick and those at and beyond Clunes. This is not due simply to

the plains forming an obstacle to migration, for it is seen even in those species which grow most freely on the plains.

To sum up the differences, *E. Stuartiana, E. amygdalina, E. coriacea,* and *E. rubida,* which are found near Creswick, disappear as we go to the north-west; besides these, *E. ovata* was not noticed on the bedrock or volcanic country about Clunes, but only at a spring on Mount Beckworth. Its absence from the plains about Clunes is a striking feature. Even the Messmate becomes much less prominent and absent from much of the bedrock country. On the other hand, Yellow Box, which is limited in its occurrence about Creswick, becomes more general. Red Stringybark is probably commoner, and there appear also other species not present at Creswick—Grey Box, Long-leaved Box, Yellow Gum, Red Gum, Yertchuk, Red Box, and Red Ironbark. The Messmate–Peppermint–Apple forest of Creswick gives place to the Box forest about Clunes.

The explanation of the appearance and disappearance of so many species within such narrow limits is to be found in the conformation of the country and the climatic changes connected with it. If a line were to be drawn from the south-east of Mount Beckworth in a north-easterly direction, passing south of Clunes, it would mark the boundary, approximately, of several species; very closely that of Red Gum, Yellow Gum, and Long-leaved Box on the north-west, and of Swamp Gum, White Sallee, and Candlebark on the south-east. Along this line the country would be all open plains, rising to higher levels to the south-east, and its exposure causing the winter conditions to be intensified. The land quickly reaches an elevation at which it has no shelter from the north and north-west, a quarter from which much of the winter wind comes. It is also not protected from the south-west, a quarter from which much rough and wet weather comes, for the Main Divide in this direction is lower than much of the plain to the north-east. Mount Beckworth is certainly a shelter to the country immediately to the east of it, but this only affects a moderate extent of country. The shelter it gives may cause a reduction in the Clunes rainfall, thus also allowing the drier climate to extend further south, but increasing the rapidity of the change in climate as we rise to the south-east. Thus the general rise of the land, assisted by the effect of Mount Beckworth and of the low part of the Divide, cause the conditions to change more rapidly within a narrow belt of country.

Notes on Some of the Species.—It must be remembered that notes on the soil, aspect, and other conditions favoured by each species in one district are not necessarily exactly applicable in other districts, in which climatic and other features may differ.

In considering the trees of the plains, the matter of competition is of slight importance; the trees are not sufficiently numerous to prevent the occurrence of a species from this cause. Some advantage will be gained by trees adapted to stand water-logged soils over considerable periods, by those adapted to activity at a low temperature if they are able to be active in spite of the bad root conditions, by those able to stand drought and exposure to the wind and to a wide range of temperature, including both frosts and strong summer sun. If a tree has to be inactive in summer for lack of water, it is an advantage to be able to continue active longer into the winter or to start earlier in spring. The eucalypts include as typical of the plains Red Gum and Swamp Gum, two characteristic wet-place trees, and White Sallee, a tree which stands the exposure of high mountains.

E. ovata, the Swamp Gum, may be regarded as the most characteristic tree of the plains at North Creswick, as it is also to the west of Ballarat (1,350 to 1,500 feet elevation), and in the neighbourhood of Ballan, at about 1,600 feet. The same species is mentioned by Dr. Sutton as occurring on the volcanic plains near Melbourne. He gives a locality of more abundant occurrence as Bolinda, which would be over 1,000 feet elevation. On the railway from Ballarat to Geelong this species is common on the relatively high part of the plain above Meredith. Off the plains it is almost always a tree of distinctly wet localities, as in the valleys of the ranges at Creswick, and is well known in wet places near Melbourne, as at the Carrum Swamp and the Scoresby Flats. When we remember that trees are more easily injured by excessive wetness of the soil for a relatively short period than by excessive dryness for a longer time, it is not surprising to find a wet-place tree the chief tree of the plains, the wetness of the soil in winter being the most severe condition to be overcome at these elevations on the plain. This species flowers freely in the winter. It may be regarded as a tree adapted to stand such conditions of a soil-wetness as would prevent the occurrence of many other species. At Bragg's Flat, in the ranges south-east of Creswick, it occupies the wet flat, apparently too wet for *E. rubida*, which ceases at the edge. Occasionally this species is met with in what appear to be drier situations. Its occurrence on the plains implies power to stand summer dryness, but it would be well to look carefully at the soil conditions wherever it appears to occur in a dry situation.

As we go further north the summer conditions are perhaps becoming too severe.

E. coriacea, White Sallee, may be regarded as a typical tree of the plains north of Creswick. It is not abundant, as a rule.

A group of about eighteen trees occurs in the valley of Bullarook Creek, near Kingston, and a patch of about sixty trees, with a very few Swamp Gums and Yellow Box, may be seen about five miles north-west of Creswick, east of the Clunes road. This was the last place at which I found it and the Swamp Gum in this direction. From its power to ascend to the tops of high mountains, and to occur there alone, it is evidently able to stand cold and wind and strong sunshine at least under mountain conditions. The trees on the plains often show fine examples of the repair of breakages. In its high level situations it is also at times no doubt liable to excessive soil wetness. It is, therefore, a not unlikely species for the plains. It occurs just off the plains, but it seems to be alone among the plains species in this district in the extent to which it avoids the closer-timbered bedrock country. A couple of trees which came under my observation growing close to a Candlebark and a Yellow Box suggest strongly that the White Sallee would not stand the competition of these species on the bedrock country. In the forest of the high level volcanic country it has grown with Swamp Gum and Candlebark, but here the conditions of soil and climate probably suit it better than in the bedrock country. Where I have noticed it in lower country, as at Mentone and Dandenong, it was not subjected to severe competition. The open plains seem to suit it, and it is said to reach to the neighbourhood of Portland.

E. rostrata, Red Gum, while a typical tree of the plains, occurs at lower elevations than the Swamp Gum in this district, reaching about 1,150 feet, and on the south side of the Divide, near by, probably 1,250 feet. Swamp Gum runs freely to much higher levels.

Some occurrences of Swamp Gum and Red Gum near Melbourne suggest that *E. rostrata* is less tolerant of overlong wetness if associated with too much humus and lack of oxygen in the soil, though it will stand flooding, and even long-standing water, as in the swamp north of Clunes. As we go north from Dandenong we see at first Red Gum country, but on the wet flat near the creek at the police paddock Swamp Gum has taken its place, though Red Gum occurs near the creek a little higher up. On the Scoresby Flats (200 feet above sea-level) there is Swamp Gum and no Red Gum. Southward from Dandenong Red Gum seems to give place to Swamp Gum at the edge of the Carrum Swamp, but the low rise at Wells-road, Carrum, carries Red Gum. About Brighton, Red Gum is the typical tree of the valleys, but it appears to be absent from the peaty hollows to the south-east above the heads of these valleys near Cheltenham. Swamp Gum occurs with Red Gum on a flat on Bay-road, east of Sandringham. South of the

railway near Murrumbeena the Red Gums showed—at least lately—as a ring, which no doubt once surrounded an area too wet and peaty for them. This was formerly a swamp.

About Creswick we would expect, then, that the increased rainfall and longer wetness of the soil would give an advantage to Swamp Gum as compared with Red Gum, whereas on the lower levels of the volcanic plain about Melbourne the advantage would be with the Red Gum. Local variations occur in the soil, and the determining cause is suitability of soil and climate for each independently, for, as already noticed, competition is not severe in the plains. It is probable that at Creswick we are passing the climatic limit for Red Gum as a naturally occurring tree; it grows there in the bedrock valleys where planted.

As regards the other trees of the plains, Sheoke is common on some parts of the plains near Melbourne, and may be regarded as more characteristic of the low and warm volcanic plains. It possesses well-marked dry country features in its switch form and furrowed branchlets. On the low plain power to resist drought gains in importance; on the high plain the chief difficulty is the water-logged condition in winter. The Blackwood is one of the commonest and most widely-distributed trees of the plain, and survives often as a hedgerow tree on lands otherwise cleared. It is, of course, stunted as compared with its growth in the forest. A point of interest in the dispersal of its seeds came under my notice on a grassy flat. The loosely-coiled cluster of pods is easily rolled along the ground by the wind with the seeds hanging loosely in the pods. Evidently the seeds of the tree may be spread over a considerable area of the surrounding plain. The Banksia, like many Proteaceæ, may be regarded as drought-resistant.

As to detail of distribution of the species on the bedrock country, the two Peppermints behave much as described by Howitt in Gippsland. *E. dives* prefers the sunnier situations, and is very prominent on some of the spurs close to Creswick; it occurs on the top of the Divide south of Creswick. *E. amygdalina* prefers the shadier situations and the higher country. It reaches to the township by way of Spring Gully from the east, and is abundant in the shady gullies falling east to Slaty Creek from the Ballarat road.

E. obliqua shows great variation in its form and size, according to its situation, as may be seen also about Melbourne, contrasting the trees of the Dandenong Ranges with those of the sandy soil near Clayton, for instance. Far the best trees are to be found in the denser forest of the shadier slopes and the higher levels, though nothing can be seen to compare with the large trees elsewhere. These are the best timber coming

on in this forest. It extends on to the tops of ridges, accompanying *E. dives* on this dry ground after *E. Stuartiana* has almost ceased, but it is not here of the same growth. It occurs on dry, high-level gravels on the summits of some of the hills south of Creswick, but is stunted. In the lower country to the north-west of Creswick there are low spreading trees of this species, and it is found in the same form with *E. elæophora*, of somewhat similar habit, west of Clunes. Further north it seems less common. The summer conditions are, no doubt, gradually becoming too severe for it.

An interesting comparison seems possible with a description of its occurrence about Adelaide, where it is said to occupy the highest parts of the Mount Lofty Ranges, and, according to another account, especially on sandy soils. The analogy to the occurrence on Mount Beckworth is evident, for there it keeps the highest levels—at least on the north slopes—and the granitic soil would possess the easily permeable and easily penetrable character of sandy soils. It would appear, then, that even with rainfalls quite moderate, and in warm country, it can continue on the higher lands, the "sandy soil" suggesting assistance from a good deep root-run.

E. Stuartiana avoids the driest situations in the ranges about Creswick; it does not extend to the volcanic plains, nor have I noticed it on the high level volcanic country. It does not appear to be present on the bedrock country near and beyond Clunes.

The occurrence of the Red Stringybark to the south-west of the Creswick railway station has been examined and its limits traced. A count of trees was made on a strip; the growth was nearly all coppice, but each clump of stems was counted as one. In the central part of the line on the middle elevations of the ridge, and with a north-east aspect, the clumps once reached a frequency of over 700 to the acre, and of these over 90 per cent. were Red Stringybark. From this place it became less common, till it ceased to occur. It reached the top of a ridge at moderate elevation for a short distance, and continued a little way down the south-west fall. Around the Stringybark area was the usual mixture of *E. obliqua*, *E. Stuartiana*, and *E. dives*, and these trees also occurred with it. If the Red Stringybark had not been there, these species could have been thoroughly at home on the area it occupies. Red Stringybark has practically complete possession over part of the area, but it is a situation where we would expect *E. Stuartiana* to be conspicuous. The occurrence is strongly suggestive of a not very old invasion by a strong competitor. There are, of course, other alternatives; some detail of past history or undetected soil peculiarity may have given this tree the advantage.

Yellow Box reaches its limits on the flanks of the hills at about the one level, and in the adjacent valleys. It has been said to like good soil, but it occurs at some places where the soil has no appearance of being good. Now, in the ranges, to a great extent, better soil, deeper soil, and soil less liable to become overdry are likely to be identical. It may, then, appear to like good soil when it really prefers a deeper or a more retentive soil. It is no doubt a more sun-loving tree than some of those in the ranges, but this does not, of course, prevent some specimens from growing among the denser timber. It occurs on the plain at North Creswick, but it would seem to dislike the plain further north. The best trees seen on the volcanic country were in the open and well-soiled valley of Glendonald Creek, and at the place where it is most numerous on the plains the soil is probably not purely volcanic. In the country beyond Clunes it prefers the valleys and lower flanks of the hills. This might be compared with its occurrence on the Ferntree Gully road, where it occurs on the lower part of Wheeler's Hill, and again on the low rises east of the Dandenong Creek. It is also of interest to notice that on Wheeler's Hill it occurs below the level of *E. macrorrhyncha*, which is on the higher slope. At Creswick it does not meet *E. macrorrhyncha*; this species occurs in a near valley, but largely on higher parts of the slopes than the usual position of Yellow Box.

The distribution of *E. rubida*, Candlebark, in the bedrock country at first sight suggests a preference for the valleys. When, however, it is observed to occur not only some distance up the slopes, but also all over some of the lower and gently-sloping hills, to extend to parts at least of the plains, and even to occur on gravel terraces with Broad-leaved Peppermint, we need a different explanation.

Then it appears that under the climatic conditions of Creswick *E. rubida* will occur where there is a deeper run for its roots, where more soil has accumulated, and the run-off of water is less, and the power of the soil to hold water greater. These conditions are obtained mostly on the lower slopes of the steeper ranges, but more generally over gentle hills; and on the gravel banks the more penetrable material and the flatter surface, lessening run-off of water, are an advantage. Such banks are usually, but not always, well drained.

In warmer climates this species is more distinctly a mountain form; more moisture and cooler root conditions in summer are conditions we would expect it to favour. On the other hand, at an extensive wet flat in the ranges, at the junction of Back Creek and the Adekate Creek, the Candlebark keeps off the wettest ground, leaving it to the Swamp Gum, and where

Candlebark occurs on the bluestone plains it is sometimes at least on slopes where the soil would not be so long water-logged in winter.

E. rubida often accompanies Yellow Box in this district, but, while they seem to like similar conditions of soil, the Candlebark extends from these localities into higher and moister parts of the district, the Yellow Box to lower and warmer places. We find beyond Clunes the common association of *E. sideroxylon* and *E. polyanthemos*, with the latter more widely distributed. We might compare with the occurrence of these species at Hurst's Bridge, where the Ironbark is seen on the high and dry ridge near the station. There is a marked contrast between the situations favoured most by *E. sideroxylon* and *E. leucoxylon*, which is the more worth attention on account of the confusion which has taken place in these species. They may be found close together at the margins of their respective habitats; nevertheless, their typical positions are different.

E. sideroxylon begins near the summit of the hills south of Talbot and north-west of Clunes, and extends north. Here it prefers the north or sunny slope, few trees occurring on the south, and then not far from the top of the hill. The soil round it has often a barren aspect. This may also be noticed in a more familiar locality in the Ironbark country close to the railway west of Bacchus Marsh.

E. leucoxylon prefers the lower parts of the hillsides and places where the slopes meet the flatter ground, and places where deeper soil is likely, occurring thus to the tops of some of the hills. It extends to the volcanic plains, but does not seem to like the worst of the wet places on the plains, which it leaves to the Red Gum. Where it is commonest on the plain the soil is probably not purely volcanic. The ground about the Yellow Gums is often well grassed.

In Studley Park, Kew, the occurrence on the higher ground is on well-soiled and often gently sloping land and on gravels. It occurs on the steep slopes to the river and on the narrow ridge above the Johnston-street bridge, but it must be remembered that such a ridge is favourable to the deep weathering of the rock, and that stones help to keep some soils open. The rock below may be easily penetrable along its cracks, and there may be a thoroughly good root-run and quite sufficient power to hold moisture. It can be seen also on a well-drained hillside south of Talbot, and is said to be characteristic of rocky slopes below the highest levels of the Mount Lofty Ranges. It is a tree of wide distribution in South Australia. The highest levels at which I noticed *E. leucoxylon* near Clunes would be not much over 1,150 feet;

E. sideroxylon, about 1,100 feet, but the occurrence of this species west of Bacchus Marsh would be a little higher.

The question presents itself whether the low part of the Divide west of Creswick has allowed passage of northern species to the south, or *vice versâ*. The Divide might be an obstacle either on account of its elevation or of the existence of its own type of forest, with which some other species might not be able to compete. However, a considerable part of the Divide between Creswick and the Pyrenees is rather low, and the bedrock ranges east of the Pyrenees, and sheltered by them from the west, would need to be included in considering this question. These I have not examined. At Creswick the occurences of Yellow Box and of Red Stringybark do not seem to mark their line of migration to the south. Yellow Gum might be expected to follow the junction of the ranges and the plains, and can grow on the plains, but it does not reach to the elevations of the lowest part of the Divide. In the past, with a lower level of the land it might have crossed, but it is far more likely that it has travelled from the west along both flanks of the central ranges. Red Gum is also abundant on lower country on both sides of the Divide, and might easily have reached the vicinity of the Divide from both sides independently, but it may also cross at places further west, for its highest levels are not far from the Divide.

On the other hand, the Swamp Gum and White Sallee would be assisted to spread across the Divide by the volcanic strip, not, however, because it is low, but because the competition of other species is removed. The Swamp Gum could spread across by the valleys in the ranges also, and no doubt has done so. For the White Sallee the parts of the Divide with volcanic soils would appear a distinct advantage at these levels, if it is correctly considered to dislike close competition under the conditions here. Near those high levels at which it is the chief or only tree it is evidently in no need of facilities to cross the Divide.

In conclusion, I would acknowledge my indebtedness to Mr. P. R. H. St. John for many pleasant discussions of points which have arisen and for identification and confirmation of some species. I would also refer to the usefulness of Howitt's paper on the eucalypts of Gippsland. When we read that paper and find that we can follow each species in spite of the fact that what we regard as species were in many cases regarded then as varieties within a species, we recognize the value of the precision and clearness of his observations. A caution may be necessary to look carefully at his use of the term "littoral," clearly defined by him, but not always clear in quotations from his work.

Exhibition of Wild-Flowers.—It has not been possible to complete the report of the recent wild-flower exhibition in time for this *Naturalist*.

Honour Roll.—It is our sad duty to record the death of another of those sons of members whose names were included in the list published in the April *Naturalist*. On 27th September Sergt. Thomas M. Hall, eldest son of the late Dr. T. S. Hall, was killed in action in Flanders. He was an engineering student at the Melbourne University at the time of enlistment.

The late Mr. E. A. Petherick, C.M.G.—Mr. Petherick, who had been a member of the Club for some years, but had attended few meetings, owing to failing health, passed away on the 17th September, at the age of 70. In August, 1912, he interested a Club party in an examination of some of the volumes of early voyages to Australia, containing the foundations of the natural history of this continent. His knowledge of books, documents, maps, &c., relating to Australia was unrivalled, and some years ago he presented his collection to the Commonwealth.

The "Austral Avian Record."—No. 4 of vol. iii. (21st July, 1917) is to hand. Mr. Gregory M. Mathews publishes additional new sub-species of Australian birds, together with a number of corrections, additions, and deletions of his original list, of which little can now be left. The final correction is *Keartlandia flaviventris* in place of *Acanthiza flaviventris*, Ashby. Why our old friend Mr. G. A. Keartland is not treated to a trinomial like his contemporary ornithologists is a puzzle. An interesting account is given, with a portrait, of Silvester Diggles, the well-known Queensland ornithologist, whose great work, "The Ornithology of Australia," is a fine monument to an ardent observer.

Gossamer Spiders.—While driving from Murtoa to Kewell one afternoon late in the autumn I beheld a sight which, to me at any rate, was unique, though my life has been a fairly long one. Everywhere spiders' webs were glistening in the sunlight, and the ground had the appearance of the sun shining on water. As I passed along the road I could see the webs covering the paddocks for half a mile on either side, and reflecting the sun's rays. Years ago, when ploughing, I frequently noticed that the last furrows turned over would soon be spanned across by spiders' webs, but I could not detect any spiders, although carefully searched for at the time. Now, to supply such an amount of web as seen by me on that afternoon there must be countless numbers of spiders. I will be glad if any reader can explain the phenomenon. James Hill. Westell Farm, Kewell.

The Victorian Naturalist.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 12th November, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about fifty-five members and visitors were present.

REPORTS.

A report of the excursion from Croydon to Wonga Park on Saturday, 13th October, was given by the leader, Mr. E. E. Pescott, F.L.S., who said that, owing to the illness of Mr. C. French, jun., Mr. P. R. H. St. John had kindly acted as co-leader. A large number of members had attended, and, in addition, a number of pupils from the Church of England Grammar School had been present, in charge of Mrs. A'Beckett. An enjoyable ramble had resulted. The outing had been arranged principally for the study and collection of orchids, of which sixteen species were noted either in foliage, flower, or seed. The plants were not as numerous as had been anticipated, and contained no species of particular rarity.

A report of the excursion to Heidelberg on Saturday, 20th October, was given by the leader, Mr. J. Searle, who said that the party included several members of the Microscopical Society. The object of the outing was aquatic zoology, and the excursionists had not been disappointed, for the ponds were found to be in splendid condition and teeming with life of all descriptions. One of the most noticeable captures was a colonial form of a protozoan, globular in shape, and about the size of a large pea, the zooids dwelling in tubes formed in the gelatinous mass. On these was feeding a rotifer, probably a species of the genus Proales.

A report of the excursion to Belgrave and Sherbrooke Falls on Saturday, 27th October, was given by the leader, Mr. F. Pitcher, who reported a very good attendance, and that the excursion was made specially memorable by the fact that His Excellency the Governor-General, Sir Ronald Munro Ferguson, G.C.M.G., had availed himself of the opportunity of seeing some of the nearest forest country to Melbourne. Six species of eucalypts were noted, and Mr. A. D. Hardy, F.L.S., had given a demonstration of the methods of measuring the height of trees. One of those selected for the demonstration gave a height of 184 feet, with a stem diameter of 9 feet at five feet from the ground. The day was unfavourable for birds and

insects, and only the usual flowering shrubs and plants of the ranges were seen.

A report of the excursion to Labertouche on Tuesday, 6th November (Cup Day), was given by the leaders, Messrs. C. Daley, F.L.S., and P. R. H. St. John, who said that the outing had been well attended, and proved very enjoyable. The party had been met at Longwarry station by the Messrs. Currie and others and driven out about six miles northwards to what is known as "the Boronia country." Here a beautiful sight was presented by the masses of *Boronia pinnata* in bloom, the colour of the flowers varying from white to moderately deep pink. A number of other plants, usual in such a locality, were seen, but nothing of particular interest was noted.

A vote of thanks to the Messrs. Currie for their hospitality was carried unanimously, on the motion of Messrs. C. Daley and P. R. H. St. John.

A report of the excursion to Ricketts Point (Beaumaris) on Saturday, 10th November, was given by Mr. F. Chapman, A.L.S., the place of his co-leader (Mr. J. Shephard) being taken by Mr. J. Searle, owing to Mr. Shephard's inability to be present. He said that a good party assembled for the outing, and, the weather being fine and pleasant, an enjoyable afternoon resulted. The geology of the cliffs, &c., proved of greater interest than many of the party expected, and they returned home well satisfied with the knowledge gained. Mr. J. Searle reported that unfortunately no boat was available, so the use of the tow-net had to be abandoned; however, plenty of material was found in the numerous rock-pools to interest those wishing to study marine life, and many bottles were filled with specimens for home examination.

ELECTION OF MEMBERS.

The chairman reported that, in view of the interest His Excellency the Governor-General, Sir Ronald Munro-Ferguson, G.C.M.G., had displayed in the Club by his remarks at the opening of the exhibition of wild-flowers, and by his attendance at the Belgrave excursion, opportunity had been taken on the latter occasion to ask him to become an honorary member of the Club, to which he had consented. In accordance with the rules, the committee had approved of the nomination of His Excellency as an hon. member of the Club, and he was formally nominated by Dr. Sutton and Mr. A. D. Hardy, F.L.S. The latter, in seconding the resolution, said that the rule relating to honorary members required them to be non-resident in Victoria, and to be distinguished for their attainments in natural science. He considered His Excellency fulfilled both these conditions, for as Governor-General he is a resident of

Victoria, and, in fact, of Australia, only for the term of his office. His standing as an authority on forestry was sufficient to meet the second requirement, while the interest he had recently displayed in the aims of the Club warranted the proposal to elect him as an hon. member. Messrs. J. A. Kershaw, F.E.S., and F. Wisewould briefly supported the nomination, and on the ballot being taken the election was unanimous.

On a ballot being taken, Miss J. M'Grath, 630 Station-street, Carlton; Miss Grace Nokes, 411 Collins-street, Melbourne; Mr. H. Coney, 337 Rathdown-street, Carlton; Mr. Basil Hodgins, Victoria Nursery, Moreland-road, Essendon; Mr. Curtis C. Plante, Glassford-street, Armadale; and Mr. Wm. Robertson, Dalny-road, Murrumbeena, were duly elected ordinary members; and Mr. A. J. Maher, Cann River, *via* Orbost, and Mr. Wm. Reese, State School, Edenhope, as country members of the Club.

GENERAL BUSINESS.

The hon. treasurer, Mr. G. Coghill, reported that, though the final returns for the recent exhibition of wild-flowers could not yet be given, he felt sure the net proceeds would amount to £210. The announcement was greeted with applause, the chairman remarking that before the exhibition he had hoped to see £200 realized, and had encouraged members to keep that aim in view. Mr. F. Wisewould considered the result excellent, and any idea of the indifference of the public to the Club's efforts had been dissipated.

NOTES ON EXHIBITS.

Dr. C. S. Sutton called attention to a growing specimen of *Ruppia maritima*, Lin., Sea Tassel (N.O. Naiadaceæ), and read some notes descriptive of the flowering and germination of the plant. Later in the evening lantern photographs of the flower-development, &c., were shown.

Mr. E. E. Pescott, F.L.S., drew attention to his and Mr. C. French, jun.'s, exhibit of herbarium specimens of seven species of terrestrial orchids, comprising one new species, *Chiloglottis Pescottiana*, Rogers, from Tallangatta, and three species new for Victoria.

Mr. C. J. Gabriel called attention to his exhibit of live specimens of five species of Victorian land snails from Healesville, which included a pair of the black snails, *Paryphanta atramentaria*, Sttlwth., found in the higher fern-gullies.

Mr. P. R. H. St. John called attention to a sample of crude oil of *Boronia pinnata* which he had distilled from material obtained at Labertouche (Gippsland). He thought that it would prove of distinct commercial value. He had also

distilled an oil from *Eriostemon myoporoides*, a sample of which was on exhibition.

PAPER.

By Mr. C. Daley, M.A., F.L.S., entitled "The Victorian Grampians."

This took the form of a lecturette descriptive of a fine series of lantern views depicting some of the scenic wonders of the Grampians. Some of the weathering of the sandstone was most remarkable, and for fantastic shapes will compare favourably with occurrences in other parts of the world.

NATURAL HISTORY NOTE.

Mr. F. Chapman, A.L.S., said that one of our commonest fossils is the tooth of the shark hitherto known as *Oxyrhina hastalis*, Ag. This must in future be known as *Isurus hastalis*, the name Oxyrhina having been found to be preoccupied by a genus of dipterous insects.

EXHIBITS.

By Mr. C. J. Gabriel.—Living Victorian land snails from Healesville, viz.:—*Paryphanta atramentaria*, Shuttleworth, *Rhytida ruga*, Cox, *Helicarion Cuvieri*, Ferrussac, *Flamulina subdepressa*, Brazier, and *F. Fordei*, Braz., var. *M'Coyi*, Petterd.

By Mr. D. J. Paton.—Wild-flowers from Bendigo, including *Cheiranthera linearis*, Cunn., *Helichrysum obcordatum*, F. v. M., *Melaleuca Wilsonii*, R. Br., &c.

By Mr. F. Pitcher.—Flowers of *Eucalyptus torquatus*, Luehmann, "Coolgardie White Gum," Western Australia, and *Melaleuca gibbosa*, Labill., "Swollen-leaved Tea-tree," Victoria, South Australia, and Tasmania, grown at Melbourne Botanic Gardens.

By Mr. E. E. Pescott.—Dried specimens of orchids—*Thelymitra grandiflora*, Fitz., from Marcus Hill, near Queenscliff, collected by Mr. W. Wallace—new for Victoria; *T. luteo-cilium*, Fitz., from Golton South, Wimmera, collected by Mr. J. A. Hill, new for Victoria; *T. Macmillani*, F. v. M., and *T. antennifera*, Hook, f., red form, for comparison; *Chiloglottis Pescottiana*, Rogers, from Tallangatta, North-East Victoria, collected by Mr. A. B. Braine, new species; *Cyrtostylis reniformis*, R. Br., Yellow-green flowered form; *C. Muelleri*, Fitz., unrecorded for Victoria; also growing plants of *Thelymitra fusco-lutea*, R. Br.

By Mr. P. R. H. St. John. Sample of crude oil distilled by exhibitor from *Boronia pinnata*, Smith, material obtained from Labertouche, Gippsland; oil from *Eriostemon myoporoides*, De C., material obtained from Melbourne Botanic Gardens; also herbarium specimen of *Boronia pinnata* with variegated leaves, collected at Labertouche, 1/11/17.

By Dr. C. S. Sutton.—Dried specimens of the orchids *Caladenia clavigera*, A. Cunn., collected at Blue Range Creek, near Mansfield, in November, 1906, and *Thelymitra grandiflora*, Fitz., a flesh-coloured specimen collected at Wilson's Promontory in October, 1909; another from an unknown Victorian locality, and a third, which, though it does not conform with any recorded species, is considered by Dr. Rogers a variety, from Flinders Island, in November, 1912.

By Mr. H. B. Williamson.—Flowers of *Chieranthera linearis*, Cunn., from Chiltern, North-East Victoria.

After the usual conversazione the meeting terminated.

EXCURSION TO BELGRAVE.

On the occasion of the Club's exhibition of wild-flowers at the Melbourne Town Hall on 2nd October last, His Excellency the Governor-General, Sir Ronald Munro Ferguson, G.C.M.G., after performing the opening ceremony, expressed a wish to be allowed to join one of the ordinary Club excursions. As Sir Ronald is interested in forestry, it was thought that the excursion to Belgrave on the programme for Saturday, 27th October, would be a suitable occasion, and he was accordingly invited to take part in it. About thirty members left town by the early train, reaching Belgrave, 26 miles, about half-past eleven. His Excellency, with the leader, motored from town, reaching Belgrave shortly after the train contingent. After the usual introductions the Monbulk road was taken, and the picturesqueness of the locality was soon a topic of conversation, the many fine Blackwood trees, *Acacia melanoxylon*, being greatly admired. Our visitor was soon busy making inquiries as to the respective values from a timber point of view of the different trees seen alongside the road, where the Starry Aster, *Olearia stellulata*, var. *lyrata*, and the Musk-tree, *O. argophylla*, decked with their white flowers, grew in profusion. About three-quarters of a mile from the township the party left the road, taking the tourist track to the Sherbrooke Falls. Shortly after, at one of the rustic bridges over a minor creek, a photograph of the party was taken, a copy of which is on view to-night. The walk was then continued through the forest, the usual vegetation, such as Hazel, Musk, Christmas-tree, Silver Wattle, Blackwood, Native Mulberry, lining the track on either hand, interspersed with tree-ferns, smaller ferns, and other plants. In about two miles the camping-ground at the Falls was reached. Here rustic tables and seats, also fireplaces for billy-boiling, are provided for visitors. A halt was made for lunch, which was enjoyed in perfect weather and ideal surroundings. After lunch the president of the Club, Mr. F.

Pitcher, who was also leader for the day, conveyed to His Excellency the Club's gratitude at the interest he had displayed in its objects and work, and the members' appreciation of his having joined them in the outing, and in conclusion asked him to allow himself to be proposed as an honorary member of the Club. This was done by Dr. Sutton and Mr. A. D. Hardy, F.L.S., in suitable terms, and the proposal unanimously endorsed. In responding, and signifying his acceptance of honorary membership, the Governor-General pointed out the value of individual enthusiasm and individual action in matters of natural science. The Club's badge was then presented to His Excellency by Miss G. Nethercote. Before resuming the ramble, Mr. A. D. Hardy, F.L.S., was good enough to make some remarks on the methods of ascertaining the heights of trees. This, he said, to be correct, should be done by means of a theodolite and steel tape, but the former was somewhat weighty, and could only be used by an expert. The ordinary tourist has, therefore, to be satisfied with the result ascertained by the use of the clinometer. He pointed out the unreliability of the "pencil" method, and then demonstrated by the clinometer and tape method the approximate height of a Mountain Ash, *E. amygdalina*, standing close by. This was shown to be 166 feet. Later, specimens of giant gums, *E. regnans*, were ascertained to be 170 and 184 feet respectively. Mr. P. R. H. St. John briefly referred to the distinguishing characters of the half-dozen species of eucalypts to be found in the immediate neighbourhood. A start was then made for the "Giant Tree"—a fallen monarch of the forest situated towards the Sassafras road. After a close inspection of this reminder of what the forest had been, a return was made towards the Falls, and the creek crossed to the southern side. Following a new tourists' track, the gully vegetation was soon left behind, and, emerging on a hillside, fine panoramic views of Western Port Bay, with French and Phillip Islands, Mount Martha, Arthur's Seat, Port Phillip, &c., were obtained. On reaching the Upwey road the Governor-General's car and a char-a-banc were waiting for the tourists, and conveyed them to the pavilion at the National Park, Ferntree Gully, where all partook of a very pleasant tea, after which His Excellency expressed his great pleasure at having had an outing with the Club, and bade good-bye to each of the party, leaving for town about 6 o'clock amid three ringing cheers. The rest of the party left by the 7 p.m. train, having had, as each one asserted, a most enjoyable day. The plants noticed during the day were neither striking nor rare. The Golden Bush-Pea, *Pultenæa Gunnii*, and the Yellow Rice-flower, *Pimelea flava*, gave colour to the bush in places. The Acacias were nearly over, *A. stricta* and *A. verticillata*

still retaining a few flowers. The Striped Helmet Orchid, *Pterostylis reflexa*, and the Common Bird Orchid, *Chiloglottis Gunnii*, represented the Orchideæ. The rare filmy fern, *Trichomanes parvulum*, was pointed out on the stem of a tree-fern. I am indebted to Mr. P. R. H. St. John for the list of the birds seen, which includes the Spotted Pardalote, Rose-breasted Robin, Scarlet-breasted Robin, Yellow-breasted Shrike-Robin, Black-faced Cuckoo-Shrike, Pallid Cuckoo, Pilot-Bird, White-shafted Fantail Flycatcher, White-throated Thickhead, Crimson Parrakeet, Rosella, King Parrot, Silver-eye, and Crescent Honey-eater. Mr. A. N. Burns, who devoted his attention to entomology, reports that, as the result of recent heavy rains and boisterous weather, insects were rather scarce. Only three species of butterflies were seen—the blue-spotted Painted Lady, the Australian Admiral, and the Imperial White—all common species. The latter was seen flying round a plant of mistletoe (Loranthus) on a Blackwood. The outing is one that can be easily taken by anyone desiring to see a sample of our forest scenery, and it was gratifying to see how, in many places, the young forest growth of *E. regnans* is asserting itself. Many of these young trees, though only about ten years old, are quite forty feet high, with stem diameters of from four to nine inches.—F. PITCHER.

EXHIBITION OF WILD-FLOWERS.

FOR the 1917 exhibition of wild-flowers the Melbourne Town Hall was again secured, and again a patriotic purpose—the Y.M.C.A. National Fund—was chosen as the object to which the profits should be devoted. Governed somewhat by "Show Week," Tuesday, 2nd October, was fixed for the display. Fortunately, the weather during the preceding days was almost all that could be desired, consequently many fine exhibits were received from all parts of the country, and even the distant States of Western Australia and Queensland were represented in the exhibition. His Excellency the Governor-General, Sir Ronald Munro Ferguson, G.C.M.G., in opening the exhibition, referred to the efforts that are being made in the various States to protect the native flora, and said that Australians possessed great advantages over many other parts of the world, for, the seasons not being so sharply divided, some plant was to be found in bloom almost any day in the year, while an all-pervading love of wild-flowers would greatly assist in the desire for the preservation of our timber, which was so essential to the progress of the country. The exhibition was well patronized by the general public, and it was with difficulty that many of the tables could be approached by those interested.

The large attendance means that the public, in increasing numbers, is becoming familiar with the beauty and sweetness of our native plants. In particular, the nurserymen, horticulturists, and florists—who, with few exceptions, have been slow in realizing the possibilities of so many singularly attractive flowers—were again given an opportunity of correcting their past mistakes by seeing some of the best flowers our bush can produce. One can only hope that they did profit by the lesson, and will devote some of their attention to the serious cultivation of them, and, now that our exhibitions are on a larger scale and more effectively advertised, this is more likely to happen than ever before, and our plants in increasing numbers will be listed in the nurserymen's catalogues.

The wild-flower exhibitions serve several purposes: money is raised for patriotic objects, interest is created and fostered in our plants, leading to their cultivation, and our society is advertised. It may, however, be asked whether some still further advantage might not be reaped from the expenditure of so much energy by those engaged in the effort to make the exhibitions a success. At present we are still sadly lacking in exact knowledge of the range and distribution of many species. Though at first sight this may seem a somewhat unimportant matter, it is highly desirable, for scientific reasons, that the range of many of our flowers should be definitely recorded. It cannot be expected, except, perhaps, in a very few instances, that those sending flowers will also send lists of the species with the parcels. Those of our members who are familiar enough with our flora to identify the flowers rapidly and with certainty are still, unfortunately, too few, and, in the rush of unpacking and staging the flowers, have time to label only a small proportion of them, and no time at all to record the species from each locality. It has been suggested that in future collectors might, with very little extra trouble to themselves, send with each parcel of flowers an "index" bunch—that is, one specimen of each species sent, these to be properly tagged with the name of the exhibitor and the locality, these "index" bunches to be set aside for subsequent examination and record by competent authorities, and thus each year would add valuable information to our present incomplete records.

The recent display was hardly as spectacular as the previous one. It was, however, more interesting, on account of the greater number of flowers from other States. Western Australia, South Australia, New South Wales, and Queensland all contributing specimens more or less unfamiliar to Victorian plant-lovers. From the West a great mass of colour was made by the everlastings, mainly Helichrysums and Helipterums, which had been obtained through the efforts of Miss Fuller.

The Waratahs, Flannel-flowers, Boronias, and Grevilleas, not forgetting *Epacris longiflora*, were the chief features of the New South Wales exhibit.

The contribution of cultivated flowers from the Melbourne Botanic Gardens was federal in character, containing the fine *Anopterus glandulosa*, from Tasmania; *Brachysema lanceolata*, Chorizemas, and *Calothamnus quadrifidus*, from Western Australia; *Epacris longiflora*, *Callistemon lanceolatus*, and many Grevilleas, from New South Wales, with others from our own State. Mr. A. Rutter Clarke, well known as an enthusiastic grower of Australian plants, exhibited blooms of *Chamælaucium uncinatum*, *Verticordia fontainesii*, *Eutaxia myrtifolia*, from Western Australia; *Prostanthera Sieberi*, from New South Wales, and many other attractive species.

Apart from the inter-State collections, seeing that floral attractiveness is the principal consideration with collectors, it was not surprising to find but few rarities. One of these was the Alpine Marsh-Marigold, *Caltha introloba*, a sod being received from Mount Buffalo containing several plants, with white flowers streaked with purple. As this charming species occurs only on our highest mountain-tops, and blossoms at the edges of snow-drifts, or even underneath the snow itself, it was a novelty to almost everybody, though several collectors have secured the plant itself later in the season. Another rarity was a plant of the Rosy Bush-Pea, *Pultenæa rosea*, a plant restricted to one peak in the Grampians. The plant, which was just coming into bloom, had been raised in a pot by Mr. D'Alton, of Hall's Gap, and had been brought to town by Miss Nethercote. One of our most beautiful twiners, *Marianthus bignoniaceus*, also made its appearance in a fresh state for the first time from the Grampians, the eastern limit of its range, and from the same locality, to which it appears to be confined, came *Pultenæa Benthami*. Other species not often seen in Melbourne were *Pomaderris lanigera*, *Grevillea floribunda* (from the Brisbane Range), *Prostanthera cuneata*, *Clematis glycinoides*, *Sowerbæa juncea*, and *Calectasia cyanea*.

Nearly all the flowers were old friends, and, as usual, a few, without which any display would be incomplete, dominated the show. Thus *Tetratheca ciliata*, "Pink-eyes," came from all directions, and, in its varying shades from white to deep magenta, charmed everyone. *Boronia pinnata*, var. *floribunda*, from Gippsland, was also in abundance, and a great favourite, as was also the smaller *B. pilosa*, from the Grampians and other western localities. *Thryptomene Mitchelliana* also had no lack of admirers. This plant, now becoming familiar to many owing to its cultivation in our gardens, was prominent in the Grampians collection, which was perhaps the most imposing section of the

display, owing to the energy and enthusiasm of Miss G. Nethercote and her friends. Other Grampian flowers worthy of note were *Banera sessiliflora*, *Calytrix Sullivani*, *Conospermum Mitchelli*, *Grevillea aquifolium*, *Astroloma* (*Styphelia*) *conostephoides*, and *Stypandra glauca*. The beginning of October is rather late for the best of the Acacias, hence this characteristic genus was but poorly represented.

There were many other species which compelled attention, though not in such quantity as some of those mentioned; for instance, there was nothing more charming than the colour of *Bæckea diffusa*, a delightful rosy-pink, and it is to be hoped that it did not escape the attention of nurserymen. For the same reason also *Leschenaultia biloba*, *Epacris longiflora*, and *Calectasia cyanea* must be noted. Other attractive flowers were *Lhotzkya genetylloides*, *Micromyrtus microphylla*, *Calytrix tetragona*, and *Prostanthera aspalathoides*, from the Mallee; *Sowerbæa juncea*, *Tecoma australis*, *Eriostemon obovalis*, *E. difformis*; *Cheiranthera linearis*, from Bendigo: *Prostanthera melissifolia*, *P. cuneata*, *P. rotundifolia*, *Grevillea alpina*, and *Clematis aristata*.

A collection of nearly forty species of orchids on Messrs. E. E. Pescott's and C. French's table made that order more representative than any other. The most notable were *Pterostylis barbata*, *P. Torevana*, *Chiloglottis Pescottiana*, *P. trapeziforme*, and the usually epiphytal species, *Dendrobium speciosum* and *Sarcochilus parviflorus*.

The Club was indebted to Mr. J. Cronin, Curator of the Melbourne Botanic Gardens, for palm leaves and other foliage used in the decoration of the platform; to Mr. F. Wisewould, who again forwarded a large quantity of gum saplings, &c., from Pakenham, which helped largely to introduce the flavour of the bush into the heart of the city; to Miss Stephens, Healesville; Mrs. A. Forster, Hawthorn; Mr. W. G. Piper, Belgrave; and to other friends for smaller contributions of a similar character.

To record particulars of each individual exhibit of flowers is impossible—it would take a larger staff of helpers than is available; but from letters, &c., received the Club is indebted to those named below for the interest they displayed in sending flowers, in many cases from very long distances. From New South Wales.—Sydney. Mr. J. H. Maiden, I.S.O., Director of the Botanic Gardens (representative New South Wales flowers); Mr. A. Hamilton; Mr. C. C. Lance; N.S.W. Naturalists' Society, per Mr. D. C. Shiress (Waratahs and Flannel-flowers); Mr. C. Robinson, Gosford (Waratahs and Boronia); Mr. H. A. Pile, Gosford (Waratahs, &c.); Mr. W. Trantum, Manly (Waratahs); Mrs. A. A. Weeks, Gosford; Miss Halland, Mulwala; and Mrs. W. L. Hawke and R. Hughes, Broken Hill (Sturt's Desert Pea). Queensland. Dr. Freda Bage, Brisbane; Mr. E. W. Bick, Bris-

bane. South Australia.—Mr. A. G. Edquist, Adelaide. Western Australia.—Mr. C. Grasby, *Western Mail* Office, Perth; Miss Babington, South Perth; Mrs. Butt, Northam; Mrs. Bardwell, Geraldton; Mrs. S. Walton, Darlington; Mrs. A. C. Gull, Serpentine; and Miss Neimke, Laverton. Tasmania.—Mr. W. M'Gowan, jun., Launceston.

The collections from the home State represented a widespread area. A few (marked by an asterisk) came from State schools, but the date fixed did not suit many of the schools, as the previous week was the spring vacation, and unless the distant parcels were sent early on Monday they would be too late for the display. Among the places represented were:—Wail (J. B. Conn), Kiata (Misses P. and A. Brookes), Dimboola (E. Malesky), Yearinga * (Miss E. Rich), Grampians (Mrs. C. D'Alton, — Palmer), Stawell (Miss L. Thomas, H. Rowe), Golton South, *via* Lubeck (Mrs. A. M. Howard), Wedderburn (Miss E. Gray), Korong Vale * (A. Sublet), Bendigo (D. J. Paton, R. Eskdale), Castlemaine (Mrs. Newell), Maldon (A. M'Arthur, M. A. Williams), Elmore * (A. Vroland), Warrnambool (H. J. Hanschildt), Laver's Hill (R. Nicholas), Colac (Mrs. Smith), Carlisle River (T. Lucas), Point Lonsdale (Miss V. Gill), Beaufort (G. Coghill), Brisbane Range (C. S. Sutton), Bell's Flat, Yackandandah * (A. A. Paull), Mount Buffalo (Miss Royce), Wangaratta (Miss C. Mason, Mrs. Home), Lima East (Mrs. A. S. Evans), Kilmore (Rev. A. J. Peck), Strathallan (Mrs. Loader), Kangaroo Ground (Miss V. Twyford), Panton Hill (— Hollenyer), Marysville (Miss K. Keppel), Officer (C. Dunham), Bunyip (Mrs. A'Beckett, Miss Botterell), Longwarry (Miss E. Wallace), Lardner (R. Currie), Korumburra (Mrs. F. Wright), Meeniyan (Mrs. J. J. Blundell), Narracan (T. Savige), Thorpdale (Mr. G. Cornthwaite), Darlimurla * (head teacher), Heyfield (Miss Fitzpatrick, Mrs. S. Best), Sale (Miss A. F. M'Kerrow), Bairnsdale (Mr. T. S. Hart, M.A.), Blackburn (A. Lyell), Wonga Park (C. Whale), Croydon (Mrs. Platt), Evelyn (C. Oke, F. G. A. Barnard), West Warburton (— Grainger), Sandringham (Miss A. W. Faram), Frankston (J. G. Mann), Bayswater (H. T. Chandler), Healesville (J. W. Audas, F.L.S.) Cultivated Australian flowers were sent by Melbourne Botanic Gardens, Mr. A. Rutter Clarke (Toorak), Mr. J. Robinson (Ormond), Mr. J. P. M'Lennan (Burnley Gardens), and Mr. S. Keep (Canterbury).

The exhibition of microscopical objects was not the least successful feature of the proceedings, owing to the united efforts of several members of the Club, members of the Microscopical Society of Victoria, teachers from the Training School, Carlton, and the assistance given by the University Histological department. In the afternoon twenty-eight microscopes were in use, and in the evening thirty-seven. The exhibits comprised

a variety of subjects, though naturally vegetable preparations predominated. Keen interest was exhibited by the public in the wonders revealed under the microscopes, and their owners were besieged with questions on various points, and it would seem that by means of microscopes alone a considerable sum might be raised for patriotic purposes. The display was under the charge of Mr. F. Chapman, A.L.S., F.R.M.S., who was ably assisted by Messrs. R. E. Luher, B.A., P. J. Sharman, B.Sc., and W. J. Owen.

Paintings of wild-flowers were exhibited by Miss Amy Fuller and Miss Effie Baker, and were much admired, also illuminated lantern slides of native flowers arranged by Mr. E. E. Pescott.

The Club was deeply indebted to Miss Levy and her orchestra for instrumental music. The sale of flowers and plants was undertaken by a ladies' committee, and brought in nearly £75.

Miss Wells, for the Y.M.C.A., undertook the management of the refreshment stall, which realized £10 17s.

The receipts from admissions amounted to £124 11s. cash at the door, and £38 6s. by sale of tickets, but the latter total is not final. These amounts would indicate a total attendance of about 3,250. The expenses amounted to about £40, including £16 for rent of hall, showing a profit up to the present time of about £210.

The thanks of the Club are due to many members who gave freely of their time, also to the Royal Horticultural Society and the Carnation, Dahlia, and Sweet Pea Society for the loan of flower-glasses, and to the Melbourne Steamship Co. for carriage of flowers from Western Australia.

"The Gum Tree."—The third (September) number of this publication is to hand. It contains several articles of more than passing interest. Some extracts from Prof. D. E. Hutchens's recent work on Australian forestry show that, during the next thirty years, the amount to be paid by Australia for imported timber, and the loss to the Commonwealth by neglected forestry, will more than equal the value of the whole of the gold raised to date.

Questioning Nature. A well-written article under this heading, appreciative of the work of the Field Naturalists' Club, appeared in the *Argus* of 10th November, and should, with the reports of the Wild-flower Exhibition (3rd October) and the visit to the Dandenong Forest (20th October), help to remove the prevalent idea that field naturalists are poor, harmless cranks.

NOTES OF A VISIT TO MALLACOOTA INLET.

By CHAS. DALEY, B.A., F.L.S.

(*Read before the Field Naturalists' Club of Victoria, 11th June, 1917.*)

Two years ago, having started on a walking tour from the Lakes to Mallacoota, we reached Orbost, on the Snowy River, where an abnormal rainfall of many inches effectually prevented further progress eastwards. However, in January last I again essayed the journey, but decided to go by steamer to Eden, on Twofold Bay (New South Wales), and thence come back to Mallacoota by coach and motor-boat.

With this project in view, I proceeded by the steamship *Sydney*, which includes calls at two Tasmanian ports *en route*, the first of which is Stanley. The town nestles on the sheltered side of "The Nut," a towering mass of basaltic rock rising abruptly from the ocean's verge at Circular Head to a height of several hundred feet. Stanley is an old town, with an English look about it, and has a picturesque old barracks as a relic of the early penal days. The scanty vegetation along the sandy coast behind "The Nut" presented no new features, acacia and tea-tree prevailing, with the usual undergrowth of bracken, &c., similar to Victorian shores. On the sward was an abundance of introduced weeds, the English daisy being in bloom on every moist spot, and the sweet-briar in profusion.

The next port of call was Devonport, on the Mersey. Prettily situated, with a rich agricultural and mineral district behind it, this town has made steady progress of late years. It has a good port, and does considerable trade with Victoria. We took the opportunity of a day in port to take a motor-boat up the Mersey to Latrobe, a thriving country town some miles up the river. At low tide the river shows a large extent of shallow flats frequented by Waders. Part of our journey was a drive through the bush, offering again no features different to the mainland. Leaving Devonport, we pursued a placid course eastward through Bass Strait, within sight of the picturesque mountain ranges and outline of Northern Tasmania. Outside of the strait the Victorian coast-line, with the long extent of the Ninety-mile Beach, was skirted, Capes Conran and Everard, with Ram Head and Little Ram Head, being prominent features. Nearing Cape Howe, Genoa Peak (1,611 feet in height) is a conspicuous land-mark. A few miles distant is Gabo Island, with its warning light, and beyond it the low, sandy extremity of Cape Howe, marking the eastern border-line between Victoria and New South Wales. Disaster Bay, the scene of the *Ly-ee-moon* wreck, a commodious inlet, comes in view, the Cape Green lighthouse denoting its

dangerous reef. Farther on to the north, along the wooded coast, the outline of Red Bluff indicates proximity to the fine and well-sheltered harbour of Twofold Bay. A quaint square tower of massive build stands on the south headland at the entrance. It was originally erected for the purposes of a light-house by Ben. Boyd, an early pioneer of great enterprise; but, owing to inability to satisfy the conditions as to permanent lighting, permission to use a light was refused, and the tower remains to-day as a fit memorial of its builder.

Coming into the bay, we see the town of Eden, situated on a promontory dividing two circling bays of large extent, second only to Sydney Harbour in length of coast-line. The position of the town at first sight is striking, resembling somewhat a verdure-surrounded, castled town on the heights of some old-world river. The blending of colour reminds one of amethyst and emerald. To the south-west the bold peak of Mount Imlay dominates the landscape. A fleecy cloud rests on its summit, and the scarlet and gold of a setting sun gloriously define its outline, and make a striking and beautiful picture. Forest-clad hills extend almost to the water's edge, and the setting of the town is a very charming one. Mount Imlay was named after Dr. Imlay, a colonist of the "forties," a station-holder who dealt largely in stock as far inland as the Wimmera River, where in 1843 he had a station called "Decameron."

Eden is a settlement of historic interest, famous in former days as a chief station of the whaling industry, which is still occasionally carried on in open boats when whales resort to the shelter of the harbour or are driven into it by the "killers" for which Twofold Bay is noted. The harbour entrance is one mile and a half wide, with a minimum depth of 42 feet. The old settlement at Boyd Town, with its quaint church and substantial buildings, is situated on the inner harbour, near the Kiah or Towamba River, and is full of interest. The "trying-out" station of the whaling industry is placed near the Kiah estuary. Eden has a population of about 350 persons, and will at some future day, with railway communication, be an ideal seaside resort, as it possesses a salubrious climate, good facilities for bathing and fishing, and an environment of great natural beauty. A daily mail service connects it with Bega to the north, and regular ocean communication is maintained with Melbourne and Sydney, from which it is distant 350 and 210 miles respectively.

At 6 a.m. I left Eden by coach for Genoa River, 45 miles distant. For some miles up and down hill the road skirts the bay, the intervening valleys being covered with thick growth of ferns, climbers, and myrtaceous plants, gums and acacias, banksias, hazel, musk, sassafras, and "lilly-pillies," whilst

sheokes grow on some ridges so thickly as to account for the statement of a gentleman at Eden, who had told me of the "pine" forests, the sheokes (to those unfamiliar with Australian flora) being easily mistaken for pines. The chief species of forest trees forming the "great pillared cathedral, tremulously green," through which we passed were Stringybark, *Eucalyptus obliqua*, Blood-wood, *E. corymbosa*, and the "Apple-tree," *Angophora intermedia*. Occasionally patches of the Mealy-leaved Eucalypt, *E. cinerea*, with its greyish appearance, gave a contrast to the darker shades of other gums.

In the undergrowth, amid the bracken, the most noticeable plants in bloom were the Holly-leaved Lomatia, the widely-diffused Cassinia or Dogwood, Blue Fringe-Lilies, blue Dampieras, *Thrasymene Billardieri*, *Stackhousia linarifolia*, *Scævola suaveolens*, *Bæckia Gunniana*, *Lobelia purpurascens*, a few late spikes of Epacris, and frequently flowers of the Spotted Orchid, *Dipodium punctatum*, two feet in height, and varied in colouring. The stimulative effect of a copious summer rainfall was seen in the beautifully-tinted young leaves put forth by the gums, from a delicate amber to a rich red shade, through the veined transparency of which the sun's rays richly enhanced the colour scheme. The soft green leafage of the flowering Angophoras, the lighter green of the sheltering Native Cherry, the full whitish bloom of Cassinia, and the rich clusters of creamy flowerets on the Bursaria relieved the more sombre eucalyptian foliage, beneath which the blue and gold of humbler scrub-flowers blended harmoniously with the varied greens in mosses, grasses, and bracken, giving an unusually bright and pleasing effect to the forest scene. The bush road leads through well-shaded country, the vegetation being in its pristine state except near the watercourses, where there is usually some settlement with maize and orchard cultivation.

The first stream crossed was the Nullaga, sometimes difficult to negotiate at high tide. The Kiah River, an unbridged stream, is frequently an obstacle to travellers. The depth of water at our crossing was two feet and a half. In wet weather it is sometimes impassable. The construction of a bridge, for which tenders had been called, will render the road generally available for motor travelling. At a convenient accommodation house at Narrabarba Creek we had lunch, another stopping-place being at Timbillico, near the Wallagaraugh River, only a few miles from the border-line, which runs from Cape Howe through Mount Carlyle and Mount Buckle on to Forest Hill.

Approaching the Genoa River, the country is granitic in character, most of it previously passed through being either

Ordovician or granitic. The descent to the river is very abrupt, over a rough stretch of road down to the bridge. The Genoa River is a clear mountain stream with thickly-wooded banks. We proceeded down its course in a motor-boat. There is good maize land along the stream, and dairying is successfully carried on. Near Genoa the blackberry brambles have become a very great nuisance. After a short distance through granite country, the formation changes to Ordovician or auriferous measures on the eastern side, and Pliocene or a comparatively recent formation on the western side of river and lake. The river-banks were lined with reeds, rushes, ferns, mosses, and water plants, above which were Acacias, Bursarias, Boobyallas, "Lilly-pillies," tea-tree, and Cassinia, with Blood-wood, Silver-top, Apple-tree, and Ironbark overhead. The Bursaria bloom, here called the "Christmas Bush," was very fine. So calm was the water that every detail in the vegetation was perfectly reproduced by reflection in the mirror-like surface of the stream, adding much to the beauty of the scene. We passed a snake with head upraised, swimming across the river, which, gradually widening, receives first the Maramingo Creek, then the chief tributary stream, the Wallagaraugh, from the north-east. Just before entering the Top Lake the river is 200 yards wide. Between the Top Lake and the Inlet proper is a channel called "The Narrows," a mile long and 300 yards wide. The banks of the stream and the bays and reaches of the lakes offer a succession of fine vistas of timbered slopes and head-lands.

Crossing the Top Lake, a storm threatened, but we arrived safely at our destination, the Lake View Hotel, 20 miles from Genoa. This comfortable hotel is on a ridge commanding a splendid view of the Inlet and the ocean. On the western side is Mallacoota West, where a township has been surveyed near Captain's Point.

The physical features of Mallacoota are interesting. The geological formation generally is Ordovician, with Pliocene to the west of the Inlet, in contact with a strip of Ordovician country, in its turn resting against the granite. The Pliocene also extends eastwards for a short distance towards Cape Howe, meeting granite to the east, and to the north the Ordovician which forms the eastern boundary of the Inlet. The contour is broken up by numerous bays and reaches extending sometimes for miles, and into which streams like the Dowall and the Little Rivers, Howe and Harrison Creeks, find their way through typical jungle growth. The headlands, fringed with tea-tree on the shore, and well wooded, are gently sloping, sometimes almost precipitous, frequently symmetrically rounded. Behind is a background of thickly-timbered hills and mountains,

Genoa Peak, to the north-west, with its sharp pinnacle at one end, being a predominant feature. The table-topped Mount Nadgee is to the north-east, and the Howe Range, the extreme coastal spur from the main range, lies a few miles east of the Inlet.

The view from the entrance is a very fine one. Near the western side the current sweeps through the shifting and tortuous channel. There is a sand-bar near the mouth, with only three or four feet over it at low water, and off Captain's Point an inner bar with even less depth of water at low tide. This obstruction makes navigation difficult. A long barrier of sand-dunes, with tea-tree, Acacia, Banksia, rushes, and grasses, extends eastwards towards Cape Howe, below a ridge leading to the Howe Range. Three flat islands—Rabbit Island, Goat Island, and Horse Island—lie just within the entrance. At the western side of the entrance the stratified rocks, upturned at right angles to the plane of deposition, are scored by the tidal action, the Bastion Point showing, in its weathered appearance, conclusive evidence of the mighty disintegrating power of wind and wave. About eight miles distant is the syenitic granite mass of Gabo Island, with lighthouse, and the low coast-line of Cape Howe, the small island of Tullaberga intervening between the entrance and Gabo. Looking westward from Bastion Point along the coast, Little Ram Head bounds the view. Just within the entrance the first settlement was made about 1842 at Captain's Point by an ex-whaler from Twofold Bay—John Stevenson, previously with the adventurous Benjamin Boyd. The Lands Office records in 1847 show the location at Mallacoota of two cattle stations, also the holding of James Allan, son-in-law of Captain Stevenson.

Mallacoota, like the inlets along the Pacific coast, is an example of a drowned river valley, and the scenery on the eastern side reminds one of the famous reaches of the Hawkesbury River. An extensive sand-bank or shoal, known as the Goodwin Sands, part of which, when uncovered at low tide, is a favourite haunt of wild-fowl, has been formed within the Inlet, the main current in general trending down the western side of the lake. The Inlet is nearly six miles long by three miles wide. There are numerous delightful arms and recesses, many of which can be explored with a boat some distance into a tangled jungle of luxuriant vegetation, where tea-tree, tree-ferns, Myrtle, Sassafras, Musk, Hazel, and Blanket-wood, entwined with creepers and lianas, grow above the dense scrub and fallen timber, wattles, gums, and Angophoras forming a leafy canopy overhead. It is here the marvellous notes of the shy Coachwhip-Bird are heard at their best, amid the tuneful melody of the Bell-Miners and the full-throated song

of the Harmonious Thrush. Lyre-Birds still haunt these shaded glades and fern gullies.

I was very pleased to meet a fellow Club member in Mr. E. H. Lees, C.E., F.R.A.S., whose courtesy and hospitality, so freely tendered, were alike acceptable. The residence of Mr. Lees, "Fairhaven," is delightfully situated on an isthmus behind a headland commanding extensive and charming views of the scenery of the Inlet. Both garden and orchard fully exhibit the fertile nature of the soil and the abundance resulting from its culture under skilful direction.

Most of the adjoining country is auriferous. East of the Inlet the "Spotted Dog" mine has been worked with fair results, and other places prospected, but the quartz lodes are patchy in character, and the difficulties of working satisfactorily are very great.

Mallacoota abounds in fish—bream, salmon trout, flounders, flathead, ludrick, skipjack, schnapper, whiting, gar, yellow-tail, &c., giving excellent sport. Rock oysters are obtainable near the entrance, an extensive aboriginal kitchen midden being in the vicinity, as was usually the case wherever shell-fish were abundant near the coast. Black Duck and Teal were just beginning to come into the Inlet; Swans and Coots were numerous, but wild-fowl were not so plentiful as I expected to find them, the season being rather early.

In the forests and scrub kangaroos and wallabies are still fairly numerous. Koalas and an occasional Echidna are met with; opossums and platypi in fair numbers. Emus are sometimes seen. Reptiles are well represented. The Carpet Snake, *Python variegatus*, is found in Eastern Gippsland, sometimes of very large size, and I was credibly informed that its congener, the Diamond Snake, supposed to be confined to Queensland and New South Wales, was also sometimes met with. The Copper-head frequents the swamps, and the Black, the Tiger, and the Brown Snakes are widely distributed in Gippsland. The most noticeable lizards are the "Goannas," or "Lace Lizards," *Varanus gouldii*, which are numerous, and often from four to five feet in length, and the "Water Dragons," *Physignathus lesueri*, frequenting the banks of the creeks.

Mallacoota is a favoured haunt for birds, all the smaller Warblers, Robins, Tits, Wrens, Flycatchers, Cuckoos, &c., being numerous, whilst birds of special interest, such as the Emu-Wren, Spotted Ground-Bird, Bristle-Bird, and Ground Parrot, only found in restricted areas, can be seen. The Wonga Pigeon, the Bronzewing, and the Peaceful Dove are numerous. Migratory visitants, tempted by the genial climate, extend the limits of their usual habitats southwards, and so strange birds are sometimes noted which appear nowhere else in Victoria—

e.g., the Topknot Pigeon of the Pacific slope and the beautiful large Flinders Pigeon of Queensland, skins of which I exhibited a few months ago.

(*To be continued.*)

THE NATIONAL MUSEUM, MELBOURNE.

THE H. L. WHITE ORNITHOLOGICAL COLLECTION.

AT the invitation of the Hon. Director, Sir Baldwin Spencer, a large and representative gathering of Melbourne ornithologists met at the National Museum on Friday evening, 12th October, to inspect the valuable collection of Australian bird-skins recently presented to the museum by Mr. H. L. White, of "Belltrees," Scone, New South Wales. The donor, who is well known as a keen enthusiast in all matters pertaining to Australian ornithology, and whose excellent collection of Australian birds' eggs is probably the most complete of its kind, succeeded in bringing together at considerable expense and labour an exceedingly valuable collection of bird-skins by sending out collectors from time to time to more or less remote parts of Australia. In so doing he was the means of bringing to light many rarities and of contributing very considerably to our knowledge of the distribution of Australian birds.

The collection, which is contained in six large cabinets, is in an excellent state of preservation, and is arranged and labelled in accordance with Mr. Gregory M. Mathews's "List of the Birds of Australia." It comprises over 4,900 skins and 1,100 species and sub-species, as enumerated in Mathews's "List," including 22 types and co-types. It is Mr. White's intention to add to the collection from time to time, with the object of making it as complete as possible.

In presenting the collection to the National Museum, his chief object has been, while ensuring its permanent preservation, to make it available for reference to scientific workers, and, with a view of encouraging the study of ornithology, to members of the Royal Australasian Ornithologists' Union in particular, to which body he has presented his duplicate specimens, besides giving practical evidence of his earnestness in other directions. In order to forward Mr. White's desire in this direction, the Trustees of the Museum have arranged that the collection will be available for reference purposes to members of the R.A.O.U. one evening each month, in addition to the usual official hours.

Special arrangements were made by Mr. White for the

removal of the collection from his residence at Belltrees, near Scone, N.S.W., to Melbourne, and every possible precaution was taken to ensure its safety. The skins were carefully packed in the cabinet drawers, and the cabinets themselves thickly padded to prevent jarring. From Belltrees it was taken on a bullock waggon to the railway at Scone, and thence by rail in special trucks provided by the New South Wales and Victorian Railway Departments to Melbourne. The removal was carried out under the personal supervision of Mr. S. W. Jackson, who has had the care of Mr. White's collections for some years, and who accompanied the collection to Melbourne, while the whole of the expenses were borne by Mr. White. This important acquisition to the Museum collections is highly appreciated by the Trustees of the Museum, who, together with ornithologists, generally, applaud the public spirit which prompted Mr. White to place the results of many years' work at the disposal of present and future workers.

The visitors spent a couple of hours very profitably in an examination of the collection, and were much impressed with the excellent condition and careful labelling of the specimens. Quite a number of rare species were seen for the first time by many of those present. Light refreshments, thoughtfully provided by the Director, terminated a very enjoyable and instructive evening.

Change of Name for a Shark.—One of our commonest Victorian fossils is the shark's tooth known as *Oxyrhina hastalis*. This genus name is unfortunately preoccupied by a similar name given by Meigen for a dipterous insect (see "Systematische Beschreibung der Bekannten Europäischen Zweiflügeligen Insekten," vol. vii., 1838, p. 366, pl. lxxiv., figs. 36–38), for Agassiz did not name the shark *Oxyrhina* until 1843 ("Poissons Fossiles," vol. iii.) By the rule of priority, therefore, the shark loses its well-known name. Now as to the name for the shark. Rafinesque, in 1810, described certain sharks' teeth under the genus name of *Isurus*. These, according to Müller and Henle, may either belong to *Oxyrhina*, Agassiz, or to *Lamna*, Cuvier. However, David Starr Jordan (Univ. Calif. Publ. Geol. Bull., vol. v., No. 7, 1907, p. 107) has already accepted *Isurus* for *Oxyrhina* on other grounds namely, that *Isurus* is valid, in his opinion, and pre-dates *Oxyrhina*, Agassiz. The only alternative left us appears to be to accept Jordan's ruling, and to now refer our Beaumaris shark and its congeners to *Isurus*, the common Victorian species being *Isurus hastalis*, Agassiz, sp.—F. Chapman, A.L.S. National Museum, Melbourne.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 10th December, 1917.

The president, Mr. F. Pitcher, occupied the chair, and about fifty members and visitors were present.

CORRESPONDENCE.

From Chief Inspector of Fisheries and Game, asking for the Club's views on a proposed extension of the quail season. It was decided to consult the ornithological members of the Club before forwarding a reply.

REPORTS.

A report of the excursion to Pakenham on Saturday, 24th November, was given by the leader, Mr. F. Wisewould, who reported a good attendance of members. After driving north about three miles a ramble was taken through the bush to some more elevated country, from which fine views of Western Port Bay and the Strezleckie Ranges were obtained. The Blue Pincushion, *Brunonia australis*, was the most conspicuous flower seen on this portion of the outing. After a rest, during which refreshments were partaken of, the ramble was resumed towards the Deep Creek; the beautiful Fringed Lily, *Thysanotus tuberosus*, occurred here in numbers. Presently the Coachwhip-Bird gave evidence of its presence, also the Bell-Minah. A Ring-tailed Opsosum's nest was pointed out in a sapling. Getting into the granite country, a rocky tributary of the Deep Creek was explored, in which were some rather fine tree-ferns. A fairly steep hill, which has an elevation of about 900 feet, was then ascended, from which a more extensive view, embracing the Warburton ranges and the Baw Baws, was obtained. Tea was taken in the open, and afterwards on the way to the conveyances bunches of flowers and gum-leaves were gathered. The members returned to town by the 8.30 p.m. train, and, though at times somewhat warm, an enjoyable day was spent.

A report of the visit to the Emerald Nurseries on Saturday, 8th December, was, in the absence of the leader, Mr. E. E. Pescott, F.L.S., given by Mr. F. Pitcher, who said that a large party had gone up from town, the Club members being joined by a number of students from the Burnley School of Horti-

culture. Arriving at the nursery soon after mid-day, the party was met by Mr. Nobelius, who cordially welcomed the members. Before proceeding to the inspection of the nursery it was decided to have lunch. This was partaken of in a beautiful fern-gully, carefully preserved when the estate was being laid out. After lunch a ramble of about three miles was taken through the grounds, the visitors being astonished at the immense numbers of trees, &c., of various kinds ready for despatch to any part of the world, such kinds as Copper Beeches, Purple-leaved Plums, Golden and Silver Poplars, being greatly admired. A large area has been planted with New Zealand Flax, *Phormium tenax*, which, it is hoped, will prove a profitable crop at an early date. Before leaving the leader conveyed to Mr. Nobelius the thanks of the members for the privilege of inspecting the nursery.

EXHIBITION OF WILD-FLOWERS.

The hon. treasurer, Mr. G. Coghill, said that, owing to the dilatoriness of ticket-holders, he was still unable to give a final statement as to the financial result of the recent exhibition of wild-flowers in aid of the Y.M.C.A. National Fund. There was, however, nearly £213 in hand.

ELECTION OF MEMBERS.

On a ballot being taken, Miss Alice M. Hislop, High-street, Mentone; Mr. F. Erasmus Wilson, "Jacana," Ontario-street, Caulfield; Mr. Wm. Taylor, "Gowar," 95 Finch-street, East Caulfield, were duly elected ordinary members; and Master Ronald Bainbridge, University, Carlton, and Master Cecil Le Souëf, Royal Park, Parkville, as associate members of the Club.

REMARKS ON EXHIBITS.

Mr. C. French, jun., drew attention to his and Mr. E. E. Pescott's exhibit of the rare orchid, *Drakea Huntiana*, F. v. M., previously recorded from New South Wales; the new Pterostylis from Ferntree Gully approaches *P. obtusa*, but there are several morphological characters as well as the blooming time which differentiate it from that species.

PAPER.

By Messrs. J. Shephard, J. Searle, and J. Stickland, entitled "A Year's Collecting of the Micro-Fauna in the Botanic Gardens Lake."

The paper, which was read by Mr. J. Shephard, gave the results of a periodical survey undertaken by members of the Microscopical Society of Victoria during the twelve months ended June, 1916. The records of Protozoa, Rotifera, and

Entomostraca obtained were extremely interesting, and the prevalence or otherwise of the different species was demonstrated by means of a blackboard chart.

Several members expressed their appreciation of the work accomplished, and in reply to questions the authors amplified some of the statements made.

The president referred to the paper as an excellent record of interesting work, which he hoped would act as an incentive to members in other lines of research.

A large number of the species referred to were on exhibition under microscopes.

EXHIBITS.

By Mr. C. Daley, F.L.S.—Fruit specimens of Dagger Hakea, *H. ulicina*, Furze Hakea, *H. pugioniformis*, and Flexile Hakea, *H. flexilis*; also an aboriginal scraper (flaked) obtained at Pakenham excursion.

By Mr. C. French, jun.—Flowering specimen of epiphytal orchid, *Sarcochilus parviflorus*, obtained at Healesville by Mr. H. A. Brown.

By Miss Fuller.—Growing specimen of Western Australian Pitcher-plant, *Cephalotis follicularis*.

By Mr. W. Glance.—Growing specimen of *Marchantia polymorpha*, from Emerald (very fine).

By Mr. F. Keep.—Flowers of *Callistemon phœniceus*, *C. lanceolatus*, *C. linearis*, *C. coccineus splendens*, Bæckea, sp., *Agonis flexuosa*, and *Leptospermum flavescens*, grown at Canterbury.

By Mr. D. J. Paton.—Wild-flowers from Bendigo, including *Goodenia gracilis*, *Pterostylis rufa*, var. *Mitchelli*, *Melaleuca gibbosa*, *Crowea* (*Eriostemon*) *saligna*, *Microtis porrifolia*, *Brachyloma depressa*, and *Eucalyptus viridis* (*acaciaoides*).

By Messrs. E. E. Pescott, F.L.S., and C. French, jun.—Fresh specimens of orchids—viz., *Drakea Huntiana*, F. v. M., from Tallangatta, new for Victoria, collector A. B. Braine, one of our rarest orchids; *Orthoceras strictum*, R. Br., from Grampians, collector J. A. Hill; *Pterostylis falcata*, Rogers, from Dandenong Creek; and a new Pterostylis, unnamed, from Ferntree Gully. The latter is being described by Dr. Rogers.

By Mr. F. Pitcher.—Fasciated bloom of introduced False Dandelion, *Hypochæris radicata*; flowers of "Burgan," *Kunzea peduncularis*, and fruits of Solid Apple-berry, *Billardiera scandens*, obtained on Emerald excursion; also flowering branches of Victorian Olive-berry tree, *Elæocarpus cyaneus*, from Melbourne Botanic Garden.

By Mr. P. R. H. St. John.—Fresh specimen of flowers and foliage of *Eucalyptus macrocarpa*, Hook., "Blue-bush" or "Desert Gum," Western Australia, grown by Mr. R. Prenzel, Black Rock; also dried specimen of *Prostanthera cineolifera*,

R. T. Baker, from Kildary, New South Wales, collected by Mr. W. R. A. Baker, 7th October, 1917.

By Mr. J. Stickland.—Under microscope, *Thuricola operculata*, a tube-building protozoon with a trap-door in its tube; also Plumatella, sp.

By Mr. H. B. Williamson.—Dried specimen of *Eremophila crassifolia*, F. v. M., Thick-leaved Emu-bush, collected near Murrayville, Victoria, December, 1916—a South Australian species not previously recorded for Victoria.

By Mr. F. Wisewould.—Examples of the wild-flowers seen or collected during the Pakenham excursion.

The president wished the members the season's greetings, and the meeting terminated with the usual conversazione.

EXCURSION TO HEIDELBERG.

THE excursion to Heidelberg on Saturday, 20th October, for the study of aquatic zoology, was well attended, and included several members of the Microscopical Society. The day was heavy and threatening, but the rain kept off until our party was entrained for the home journey: then it poured down in torrents, obliterating the landscape from view. The storm lasted about twenty minutes, but had all cleared off before we reached the city. We found the ponds at Heidelberg in splendid condition, and teeming with specimens, most of the well-known forms of aquatic fauna being present, while one or two rarities were captured, one of these being a colonial form of Protozoa, globular in shape and about the size of a large pea, the zooids dwelling in tubes formed in the gelatinous mass. Feeding on these were a number of rotifers probably one of the Proales resembling a species of that genus found parasitic in Volvox. The movements of the rotifers, as viewed under the microscope, were interesting to watch. They would crawl over the surface of the colony till they found a tube-opening, when they would suddenly dive into it and devour the unfortunate inhabitant, issuing forth again in search of another victim. When first observed it was thought that the colony was that of a new species of rotifer, and that the individuals were alternately protruding themselves from the tubes and as suddenly retracting therein, and it was not until examined closely that the true state of affairs was determined. The specimens identified, some of which were determined by Mr. J. Stickland, include the following: Protozoa.—*Arcella vulgaris*, *Astasia tricophera*, Volvox, sp., *Vaginicola crystallina*, *Epistylis plicatilis*, *E. flavicans*, *Stentor roeselli*, *Ophryoglena atra*, *Ophrydium sessile*, *Carchesium polypium*,

Vorticella, sp. Worms.—Chætagaster, Naais, Nematoids, Planaria. Rotatoria. — Monostylis, Synchæta, Conochilus, *Megalotrocha alboflavicans, Lacinularia socialis, Melicerta ringens, Cephalsiphon limnias,* Limnias, sp. Hydrozoa.—*Hydra viridis.* Polyzoa.—*Plumatella repens.* Crustacea : —Cladocera.—*Simocephalus gibbosas,* Ceriodaphnia, sp., Chydorus, sp. Copepoda.—*Boeckella oblonga, B. minuta, Cyclops australis, C. albidus, C. arnaudi, C. serrulatus* (?), *Attheyella australica.* Amphipoda.—*Chiltonia subtenuis.* Isopoda.—*Janirella pusilla.* Hydrachnidæ.—Large red mites, and smaller blue mites with legs covered with close-set hairs. Insecta.—Larvæ of Chironomus, Tanypus, Dragon-fly, Caddis-fly, Homocodytes, and other beetle larvæ.—J. SEARLE.

EXCURSION TO LABERTOUCHE.

A PARTY of fifteen members and friends journeyed to Longwarry (51 miles), on the Gippsland line, by the first train on Cup Day (6th November), in order to visit Labertouche, some six miles north of that township. At the station they were kindly met by the Messrs. Currie and other friends and driven to their destination. The Tarago River, which flows into the Bunyip, was crossed early in the journey, the country hereabouts being sandy and in places peaty, very absorbent and retentive of moisture. Scrub vegetation, with bracken, Melaleuca, Goodenia, and tea-tree for the most part, prevailed, and there were not many plants in bloom. The main object of the excursion was to visit the scrub country favoured by the graceful *Boronia pinnata.* Approaching the ranges, Boronia plants were occasionally seen. A camp was made near the Labertouche Creek, beset with a dense tangle of vegetation typical of such streams, and from here, in the saturated ground and near the watercourses, the delicately fragrant Boronia grew abundantly, bearing masses of dainty white and pink blossoms, forming a most pleasing sight. Some of the shrubs were seven or eight feet high. Following a dismantled tram route, once used for sawmilling purposes, the party passed up the stream to a pleasing cascade or series of falls in a small gorge between granite hills. Owing to the jungle growth making progress difficult, no further ascent was made. The geological features of the district are not in any way remarkable. The country between Longwarry and the foot of the range is a Tertiary formation, recent in origin, consisting of sandy soil of considerable depth, formed from the disintegration of the granitic range, the granite being somewhat close-grained in texture. The plain lying east of the basin of the Bunyip River

is crossed by several creeks, but apparently there is no exposure of any underlying rock surface. A point of interest about half a mile east of the camp was a dry watercourse with well-defined banks of what had presumably at one time been a fairly large stream, in the old bed of which a small creek has cut its course several feet deep, but seems too small a stream to account for the formation of the ancient channel. It is probable, especially as there is an intrusion of the Older Volcanic in the range to the north-east, that the course of the original stream may have been diverted elsewhere, or a main affluent captured by some other stream, leaving the old bed dry, in which a creek much diminished in size and volume has carved its narrow channel below the old bed. Time did not permit of much investigation to determine the question. Other than the Boronia the plants noticed call for little comment, and almost all are to be found much nearer Melbourne. The same remark applies to the ferns met with; in some cases the latter were of very luxuriant growth. Before leaving, the opportunity was taken to thank most heartily the Messrs. Currie and other friends for their hospitality and active co-operation in making the excursion such an enjoyable one.—C. Daley, P. R. H. St. John.

"Journal of Agriculture, Victoria."—The December number of this periodical contains at least two articles of interest to naturalists. The first, "Fluke in Sheep," is dealt with by Dr. Georgina Sweet, Mr. H. R. Seddon, B.V.Sc., and Mr. W. A. N. Robertson, B.V.Sc., the first-named taking the structure and life-history of this insidious menace to our flocks. The life-history is, as well known, a most intricate one, and there are many steps in it when disaster may overtake the individual, but, seeing that one adult fluke is capable of producing 45,000 eggs or more, there is likely to be always a fair number of individuals on the way to maturity. In a short article, Prof. A. J. Ewart, Government Botanist, gives some account of the Algaroba tree, which has been frequently recommended as a valuable stand-by for cattle in dry seasons, but he shows that there are many other trees or plants which would be far more profitable to grow for the purpose. Mr. J. W. Audas, F.L.S., of the National Herbarium, in an instructive article on Victorian grasses, points out the distinctive features of a number of our grasses and their value from the stock-raiser's point of view. He remarks that the well-known Kangaroo Grass, *Anthistiria imberbis*, produces very few fertile seeds, hence, if too closely eaten down during seeding time, there is a chance of this valuable grass being lost.

NOTES OF A VISIT TO MALLACOOTA INLET.

By CHAS. DALEY, B.A., F.L.S.

(*Concluded.*)

It is of interest to note the geographical position of this area at the extremity of the Pacific slope, which, owing to its aspect, its humidity, and its comparatively sheltered position east of the great coastal range, has a distinctive character of its own. This is especially noticeable in its vegetation. Mention has already been made of the prevalence of two trees, one of which, *Eucalyptus corymbosa*, the Blood-wood, is found from Cape York, in Queensland, to Mallacoota; and the other, closely allied to it, *Angophora intermedia*, the Apple, extends from near the Queensland border also to Mallacoota. Neither of these trees is found in Tasmania, so here we have the definite southern limit of their growth. Mr. R. T. Baker, whose valuable work on the eucalypts is so widely known and appreciated, gives the most southerly limit of the Blood-wood and the Angophora as the Genoa River. Practically both trees extend to the coastal ridge, and at Mallacoota I found that their range passed beyond the Genoa in a south-westerly direction. Mr. Lees, whose long practical experience and wide knowledge of the forests of Eastern Gippsland make him a competent authority upon the subject, verified my conclusion, and furnished me with some interesting information on this subject. To quote his words: "*E. corymbosa* and *A. intermedia* (Apple), miscalled 'Gum Myrtle' by the Census Committee, extend westwards of the Genoa River to the Wingan River. The latter represents approximately the delimitation, and just beyond we meet the easterly extension of the Snowy River Mahogany, *E. botryoides*." This determination extends the range of Blood-wood and Angophora about twenty miles further to the south-west, the Wingan River entering the ocean near Ram Head. Mr. Baker's theory is that the Angophoras and Blood-woods, as the oldest of the red-wooded Australian Myrtaceæ, "should occur on land that has been longest above sea-level": and hence, taking Victoria and Tasmania as geologically younger than the Great Divide, he states these trees "have not yet found their way to those parts." Apart from the debatable question raised of geological age in relation to the presence or absence of arboreal growth, Mr. Baker shows that the absence in Tasmania of Blood-woods and Angophoras, and their paucity in Victoria, may reasonably "be attributed to some physical or geological agency." It seems to me that this physical agency may certainly be referred to the continuous eastern mountain system of Australia, parallel at no great distance from the coast, providing, along the well-watered and sheltered Pacific slope, a region

peculiarly fitted by aspect, rainfall, and other climatic conditions, as well as by properties of soil, for the extension of vegetation, especially from the prolific north towards the genial south, and thus increasing the range of certain species beyond the limits which, under other less favourable conditions, they would occupy. Thus the species of Blood-wood showing the greatest power for accommodation to climate, and also the most adaptive species of Angophora, have reached the southernmost limit of the continent, and have also made some progress in migration westwards along the southern slope. To the same agency is probably due the presence of the Cabbage Palm, *Livistona australis*, the Victorian Waratah, *Telopea oreades*, an occasional Kurrajong, *Brachychiton populneus*, the Gippsland Orange, *Acronychia levis*, and other northern plants unknown elsewhere in Victoria. To this facility for extension and distribution afforded by the direction and position of the mountain barrier is also due the presence of bird and reptilian life approximating generally more to that of New South Wales than of Victoria.

Mr. Griffiths Taylor, Commonwealth Physiographer, has, in connection with his work on "The Physiography of Eastern Australia," pointed out how, through the eastern Geocols or gaps in the Main Divide, the entry of the vegetation of one area into another may be made. One of these Geocols—the Cooma or Monaro stretches from Omeo through Bombala to Cooma. It is probable that an offshoot of this may have been also additionally instrumental in the distribution of some northern species of plants into Gippsland, the tendency being for plant migration towards the coastal regions.

In connection with this distribution of plants, the important influence which geological formations exercise over the character of the vegetation cannot be overlooked. Mr. R. H. Cambage, F.L.S., who has done excellent work in studying the relationship of the flora of New South Wales to the geological formations on which it occurs, refers to the Blood-wood, *E. corymbosa*, as always selecting the sandstone, and avoiding the Wianamatta shale, in the Hawkesbury district. At Mallacoota the Ironbark, *E. sideroxylon*, so inseparable a feature and almost an indicator of Victorian auriferous areas, is naturally found growing over the Ordovician measures. Mr. Lees informs me that the Snowy River Mahogany, extending eastwards to the Thurra River, then the Apple and Blood-wood, at first scarce and intermittent, but gradually increasing until well into New South Wales they come in contact with the Tallow-wood, *E. microcorys*, do not mingle, but form distinct botanical zones, confined to lower altitudes, and not extending beyond the slopes of the coast range. Then northwards, at

Murrungowar and throughout the M'Culloch Range, above an elevation of 1,000 feet, Messmate, *E. obliqua*, replaces these species, and higher still on the coast range are White Mountain Ash, *E. regnans*, with Black Sallee, *E. stellulata*, as a distinctive feature of the Bendoc district.

The Victorian Woollybutt, *E. delegetensis*, the Manna Gum, *E. viminalis*, extend upwards to the region of the Snow Gum, *E. pauciflora*, var. *alpina*. Mr. Lees also states that it is interesting to note that at Wallagaraugh and Genoa there are two isolated Manna Gums, *E. viminalis*, on the Drummer Mountain, a few isolated Spotted Blue Gums, *E. Maideni*, and four specimens of the Gully Gum, *E. Smithii*, the latter species being unexcelled as yielding "the highest class of medicinal oils in Australia." On the Cann River are two or three Spotted Gums, *E. maculata*, the only ones discovered in the county. Among some scarce plants recorded at Mallacoota, Mr. Lees has noted the following ferns:—*Gleichenia Hermanni*, *Polypodium serpens*, *Dicksonia* (*Davallia* ?) *pyxidata*, *Pteris longifolia*, *Asplenium nidus*, *A. Hookerianum*, and *A. obtusatum*. *Nephelium leiocarpum*, Smooth Rambutan, occurs sparsely in the eastern district, and the presence of other interesting sporadic plants shows how favourable conditions along the sheltered Pacific coast-fringe have undoubtedly led to the southward migration of northern species.

From Lake View Hotel I made several excursions on foot eastwards along a ridge of hills towards the Howe Range, through well-timbered country. About half-way to the Cape there is a fresh-water lake of fair size called Barragoota.* In this direction the Xanthorrhœas were very noticeable—*X. minor*, *X. hastilis*, and *X. australis*. Just north of Cape Howe, at Black Head, the last-named grass-tree grows abundantly, and a number of men is employed in obtaining the gum, the value of which has been trebled since the outbreak of the war, prior to which the industry in many parts of Australia was exploited by Germans for the picric acid and other valuable constituents extracted from the gum. At Black Head the gum is stripped, put in bags, taken to the seashore, and sent away for chemical treatment.

Previous reference has been made to the great fertility of the soil around the lake and river. At Dorron's Hotel, in the

* A few years ago, whilst I was studying the origin of place-names in Gippsland, the overseer of the Lake Tyers Aboriginal Station obtained for me from the blacks the meanings of some names submitted. The meaning of Mallacoota was given as "Big flock of birds." Mr. Lees informs me that its meaning is the "West Water," whilst Barragoota means the "East Water." As "coota," "goota," "gutti," "gatta" are variations for water, I think the latter meanings given to these two names are more probable than the former. The station natives are generally unreliable as to the meaning of native words.

garden, apples, plums, peaches, apricots, limes, lemons, oranges, raspberries, passion fruit, and vegetables, &c., grow vigorously, and even bananas ripen. The gardens are remarkably free from the pests and diseases so noticeable nearer the towns and cities. The old Gippsland saying that it is wise to grow nothing that cannot walk out is in full force, so fruit, as well as a good deal of maize, &c., is chiefly used for feeding pigs.

Mallacoota has its own distinctive charm. In the calm and peaceful hush of the summer even, from a hill overlooking the Inlet, the scene, under the soft moonlight, is very beautiful. The ripples gleam like silver, and the voices of the night come through the air. One hears the whirring of wings as the wild-fowl come in from distant flight, the plaintive and tuneful piping of Swans, the faint sound of leaping skipjacks, their silvery sides shining in the moonlight, and the break of the water surface as other fish rise gently. Softened by distance comes faintly the sound of a popular tune from a gramophone. A Boobook Owl calls from a clump of timber. The mournful reiteration of a Pallid Cuckoo strikes on the ear. The diminishing "Chug chug" of a motor-boat passing up to "The Narrows," the call of an Owl, "the chaunt of a marsh-frog in rushes, the wash of a wave" come singly, or commingle with the varied notes of wild-fowl on the Goodwin Sands. The peculiar cry of a prowling fox is immediately followed by the challenging bark of a watchful collie, which for the moment deadens other indeterminate sounds. Over the sand-ridges breaks the steady roar of the ocean, "never silent since the world began," and the current flows steadily out to its bosom past the glistening bar to where "the sandy spits, the shore-locked lakes, melt into open moonlit sea."

I returned from Mallacoota by way of Genoa, from which the coach starts for Orbost. Gipsy Point, about six miles down the river from Genoa, is the more convenient place for approaching the Inlet, and recently a survey of a road has been made from there to Mallacoota West. From Genoa eastwards there is a good and well-graded road for many miles through forest country, often park-like in aspect and beautiful in appearance, devoid of settlement, and for the most part in its primitive state, kangaroos being frequently seen from the road. It was a distinct pleasure to see so much forest country as yet intact and free from the ravages of fire and axe. It is in such areas that forest conservation can be best put into effective operation. Near the Wingan River is a Government battery, several prospectors operating down the river for gold, a fair reef prospect being opened up about ten miles from the battery.

Except for the dropping of a mail in a box or kerosene tin along the road, no sign of settlement is seen for many miles.

Between the Thurra River and the fertile Cann there is some splendid scenery, especially at the Drummer Mountain, whence the Pacific Ocean can be seen, and on which the fern vegetation in great variety, from the deep-embowered streamlet to the mountain-top, flourishes most profusely. Here, too, the Gippsland Waratah, *Telopea oreades*, grows freely. The woodland scenery can hardly be surpassed, even in Gippsland.

At the Cann River, which flows to Tamboon Inlet, and along the course of which there is some very productive land on the rich alluvial flats, we changed our conveyance for one of the old-time Cobb's coaches, giving plenty of room and comfort. Well-timbered country continued, and at Euchre and Victoria Creeks the road winds along for miles above and among fern vegetation delightful to the eyes, whilst the clear air and the scent of fragrant musk and scrub made the journey exhilarating. The Bemm River marked the next scanty settlement, and from there to Bellbird Creek the road continued good. A divergence was made to Club Terrace, a former briefly prosperous mining district. North of this, on the Combienbar, is some very picturesque country.

We stayed at Bellbird for the night. It is just a bush clearing in the forest, a delightful spot amid the dense timber and luxuriant jungle along the creek. From here the road became heavier and more sandy, with a marked preponderance of *Banksia marginata* in the vegetation. At Cabbage-tree Creek a branch track passes the Livistona palms and goes to Marlo. The last stretch, through the Brodribb River to Orbost, was much the worst part of the 89 miles coach journey, being partly under repair and reconstruction. We reached Orbost and its green river flats after an interesting journey, and next day took train homewards.

No one can doubt of the great future before this great stretch of country between Orbost and the border. Its vast timber supplies, its mineral resources, rich river flats, and forest ridges only need for development good roads and speedy means of communication. Some day a railway will connect Orbost with Eden through Genoa, and then distant Mallacoota will come to its own, and the charm of its scenery, its mild climate, and advantages for the nature student and the sportsman will make it a deservedly popular resort and sanatorium.

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A SKETCH OF THE GEOLOGICAL HISTORY OF AUSTRALIAN PLANTS.—THE PALÆOZOIC FLORA.

By FREDERICK CHAPMAN, A.L.S., &c., Palæontologist, National Museum, Melbourne.

(*Read before the Field Naturalists' Club of Victoria*, 10*th Sept*, 1917.)

INTRODUCTORY.

THE beginnings of life on the earth is a subject of ever-recurring interest, and plant-life especially presents a fascinating field of research. According to ordinary expectations, we ought to be able to trace the early history of plant-life of a period long antecedent to the appearance of animals, but, alas! the ready disintegration and decay of plant structures has frustrated this hope, and, whereas many surprising discoveries of delicately-structured animals, such as bristle-worms and jelly-fishes, have lately been made amongst some of the oldest fossiliferous rocks, the only plants decipherable are of doubtful fucoid origin. In some cases these primitive fossils appear to have a strong claim to be regarded as seaweeds, whilst others—and they are numerous—can with as much certainty be referred to tracks, rill-marks, or even plant-like animals, such as sponges, with dendroid growth; others, again, show a claim to hydrozoan affinities.

Following Lyell's metaphor, Darwin says:—"I look at the geological record as a history of the world imperfectly kept and written in a changing dialect. Of this history we possess the last volume alone, relating only to two or three countries. Of this volume only here and there a short chapter has been preserved, and of each page only here and there a few lines. Each word of the slowly-changing language, more or less difficult in the successive chapters, may represent the forms of life which are entombed in our own consecutive formations and which falsely appear to have been abruptly introduced." As the present poet laureate puts it, we are left to decipher what remains of "Nature's history book, which she hath torn, as ashamed of." This broken record of organic remains is especially noticeable in the vegetable world, for there, besides the inherent delicacy of tissue, the preserving agency of rapid sedimentation, resulting in the exclusion of aerobic bacteria, is often wanting under terrestrial and lacustrine conditions, and only by the merest chance has there occurred a fortuitous happening of events which permitted the remains of ancient plants to be embalmed in the rocks for present-day study.

In some few cases, however, there has been an ideal preservative covering, as in that of leaves in beds of pipe-clay; and in many instances even the structure of tissues has been preserved, as in the coal-balls of the Yorkshire coalfields. In

the latter case so entirely excellent are they as to call forth a remark from one of our leading palæobotanists that he preferred studying sections of petrified stems of cryptogams under the microscope than similar structures in the living tissue. In certain instances even the pollen grains from some of these ancient palæozoic forms have been chemically treated and studied.

PALÆOZOIC FLORAS.

The older palæozoic sediments of Australia, as in other parts of the world, are very poor in any fossil remains which can be with even a small degree of certainty assigned to the vegetable world. Many of the so-called seaweeds or fucoids, as already stated, may belong to the animal kingdom, or merely due to the disturbance of the mud layer through animal or physical agency.

In the Lower CAMBRIAN of South Australia the genus *Girvanella*, probably one of the blue-green algæ (*Cyanophyceæ*), often forms a large proportion of the limestone. As at the present day, these lime-secreting algæ separated the $CaCO_3$ from the waters of brackish-water lakes and salt lagoons of the sea margin, and were thereby most important and effective agents in making the rock-material of the earth's crust. The South Australian *Girvanella* has its pellets formed of loosely-rolled lime-coated cells, and a limestone of Upper Cambrian age in the neighbourhood of Mount Wellington, North-East Gippsland, which contains similarly-formed pellets, has the tubes regularly and closely coiled. This *Girvanella*-limestone from the Dolodrook River contains large, pea-shaped pellets, the centre of many being occupied, as a nucleus, with an ossicle of a crinoid. The presence of the crinoid fragments would point to a deeper water origin than usual for this calcareous alga; on the other hand, it is just possible that the crinoid remains were derived from an elevated rock mass situated above the shore-line of the Cambrian sea. This rock was discovered a few years ago by our fellow-member, Dr. E. O. Thiele, who also brought to light an important trilobite fauna of contemporaneous origin. The Upper Cambrian of Heathcote has lately given evidence of what appears to be the remains of an undoubted plant of a genus hitherto only known from New York State, in America. This interesting specimen was found by Professor Skeats: it is associated with a brachiopod fauna. It is generically determined as *Sphenothallus*, named on account of its wedge-shaped leaves. An interesting calcareous alga, *Epiphyton*, has been lately described from the Antarctic.* It was found in a limestone pebble picked up by Wild in 85° S.

* "Brit. Antarctic Exped., 1907–9, Geology," vol. ii., 1916, p. 81.

From the associated *Archæocyathinæ* in the limestone, this algoid species belongs to the Lower Cambrian, and, in fact, is closely related to another of the same genus found in the Lower Cambrian of Siberia by Van Toll.

In ORDOVICIAN times the Australian coast-line covering parts of South Australia, Victoria, and New South Wales, as well as Tasmania, was fringed with extensive black mud-flats and shallow seas, in which flourished abundant growths of the plant-like animals called Graptolites. Remains of undoubted plants, however, seem to be unknown in these beds, the Graptolites either superseding the plants in this area or else surviving the ordeal of fossilization by their more durable chitinous peridermic covering. That sulphur bacteria must have been present in these dark shales is fairly evident from a study of the conditions prevailing at the present time in an area like the Black Sea,* and, in fact, whilst examining some very thin slices of Victorian Ordovician slate under a high power, I was struck by the appearance of some minute objects having a resemblance to certain fossil bacilli found in a coprolite of Permian age by Renault and Bertrand.† These bodies are long, sausage-shaped, slightly curved in some cases, and measure 1 m. in diameter. As in modern land-locked areas, there also probably existed a plankton consisting of lower animal organisms and diatoms.

Passing upwards to SILURIAN times, large tracts of the Australian continent were covered with shallow to moderately-deep seas, especially in southern and central Victoria, in southern and central New South Wales, in Queensland, and the Northern Territory. The oldest Silurian is that of the Melbournian division, equivalent to the Llandovery or Valentian of Europe, and probably almost confined to the Melbourne bed-rock and the sandstone of Heathcote, although some locally-developed beds in New South Wales may turn out to be of similar age. In these shallow seas were deposited sandstone with false bedding, and pyritous and limonitic mudstones. Later on, in Yeringian times, the equivalent of the Wenlockian, deeper water conditions seemed to have predominated, as seen in the coral limestone of Lilydale and Waratah Bay, Loyola, and Toongabbie, in Victoria, and of the Federal Territory in New South Wales. The shallow water and marine deposits of both Melbournian and Yeringian stages contain numerous fucoids referred to the genus *Bythotrephis*. There is some

* See Schuchert, "Proc. Amer. Phil. Soc.," vol. liv., 1915, p. 259; also, Andrussow, "La Mer. Noire," Guides des Excursions, VIIe., Cong. Geol. Internat. St. Petersbourg, 1897, Art., xxix.

† "Compt. Rend.," vol. cxix., 1894, p. 377; also, Seward, "Fossil Plants," vol. i., 1898, p. 135, fig. 28*b*.

doubt as to the plant origin of this form, and it has been suggested by Rothpletz that it may be a sponge. However, the branching habit is more closely comparable to that of a seaweed, and in well-preserved specimens there are no visible pores as in a sponge, nor crypts which might suggest sites of polypidoms referable to corals or hydrozoa. One of the slabs with *Bythotrephis* from the Silurian of South Yarra, and now in the National Museum, is thus referred to by W. Blandowski, an early Government surveyor*:—"The specimens of fucoidæ here in question I found in the quarry near the gates of the Botanical Gardens. . . My attention was drawn to about a dozen flat stones, laid by order of our gallant director of the Botanical Gardens, Dr. Mueller, in the dirt, to assist the ladies in crossing a muddy spot in the lower walk along the banks of the Yarra. Our learned friend did not, I suppose, anticipate the valuable fossil he thus caused to be exhibited." This fossil has since been identified with the Trenton Limestone species, *B. tenuis*, J. Hall.†

Another probable fucoid, found in the glossy grey slates of the Walhalla beds, is *Confervites acicularis*, Göppert, a Lower Devonian form in Germany: this is accompanied by a Wenlockian species of *Bythotrephis—B. divaricata*, Kidston.‡ These slates of the Centennial mine in Gippsland also contain abundant remains of the undoubted lycopodite, *Haliserites*, which is a well-known plant in the Erian (Lower Devonian) of Canada, the passage beds of the Scottish Devonian, and the Devonian of Wassenbach, Germany.§

The pellet-making alga, *Girvanella*, is again in evidence in the Silurian (Yeringian) limestone of Lilydale and the Tyers River, in Victoria, the rock at the former locality often resembling an oolite in its granular appearance.

The DEVONIAN limestones bid fair, by continued research, to yield many forms of calcareous algæ. One interesting specimen which I have lately described from the Middle Devonian of the Mitta Mitta River, Gippsland, is referred to *Sphærocodium*, a genus in which the thallus forms a pellet like *Girvanella*, and having dichotomously-branched, single-celled filaments radiately arranged, the thallus usually being attached to crinoid stems or fragments of shells. Benson has lately discovered some limestone full of oolitic grains in the Tamworth district, and these, like other typical oolites, probably owe their origin to *Girvanella*-like plants. Associated with the Tamworth oolite grains are some simple arenaceous foraminiferal tests.

* "Trans. Phil. Inst. Vict.," vol. ii., pt. i., 1857, p. 145.
† "Proc. R. Soc. Vict.," vol. xv., N.S., pt. ii., 1903, p. 104, pl. xvi., fig. 1.
‡ "Rec. Geol. Surv. Vict.," vol. iii., pt. 2, 1912, p. 231, pl. xxxviii.
§ *Ibid.*, p. 231, pl. xxxvii.

The arborescent cryptogams, represented by the widely-distributed genus *Lepidodendron*, are a predominant feature of the Devono-Carboniferous flora. In New South Wales the lower part of the Middle Devonian at Tamworth has yielded *Lepidodendron australe*, but the genus and species is more abundant in the higher beds—the Upper Devonian and Lower Carboniferous. In New South Wales certain *Lepidodendron* horizons are generally referred to the Upper Devonian, whilst in Victoria they are called Lower Carboniferous. Etheridge finds *Lingula* (*L. gregaria*) associated with these beds, which, however, by its relationship to *L. mytiloides* of the European Lower Carboniferous, belongs perhaps more properly to the latter formation. But it is very evident in studying both floras and faunas in Australia that the well-defined epochs of the northern hemisphere have no such stratigraphical break between them here, the beds being often represented by "passage beds." The Upper Devonian in Victoria has an interesting flora, contained in the red and yellow sandstones of Iguana Creek, in East Gippsland, where the moderately large strap-shaped leaves of the semi-aquatic gymnosperm, *Cordaites*, occurs, together with the oldest-recorded Australian ferns, *Sphenopteris iguanensis* and *Archæopteris Howitti*. A similar flora in New South Wales contains, besides *Cordaites australis* and *Archæopteris Howitti*, *Pecopteris obscura* and *Sphenopteris Carnei*. The genus *Cordaites* is found elsewhere in the Middle and Upper Devonian of North America and in the Carboniferous of Europe.

In the CARBONIFEROUS of Australia we have an apparently sudden increase in the members of the palæozoic flora. *Lepidodendron* is much in evidence, and in this period was widely distributed, reaching as far as South Africa, where it is found in the Lower Karoo of the Orange River Station.* In Carboniferous times the Australian landscape must have presented a glorious sight, and the graceful habit of the trees, combined with the beauty of the ferny undergrowth of *Archæopteris* and *Sphenopteris*, would no doubt favourably compare in beauty with some present-day aspects of Queensland sub-tropical scenery. As Seward remarks,† "A fully-grown *Lepidodendron* must have been an impressive tree, probably of sombre colour, relieved by the encircling felt of green needles on the young, pendulous twigs. The leaves of some species were similar to those of a fir, while in others they resembled the filiform needles of the Himalayan Pine, *Pinus longifolia*." The type form, *L. australe*, is found in Victoria, Queensland, and New South Wales, and it has been suggested that the

* Seward, "Geol. Mag.," vol. iv., 1907, p. 481.
† *Idem*, "Fossil Plants," vol. ii., 1910, p. 95.

Upper Devonian species, *L. nothum*, from Thuringia, may be identical, as well as the Canadian species, *L. rhombicum*. In New South Wales *Lepidodendron* is used as an index fossil, the Lower Carboniferous being distinguished by *L. australe*, and the Upper series by *L. Veltheimianum*, together with *Rhacopteris*; whilst *L. australe* is an abundant fossil, represented by stem, leaves, and sporophylls, in the Star series (Lower Carboniferous) of Queensland.*

The typically Carboniferous type of fern, *Rhacopteris*, is represented in New South Wales by several species—*R. septentrionalis*, *R. intermedia*, and *R. Roemeri*. It is a handsome fern, with *Adiantum*-like leaflets and spreading veins, and is referred by Stur to the *Ophioglossaceæ*,† to which the living Adder's Tongue Fern belongs. The better-known "*Rhacopteris*" *inæquilatera* has been shown by W. S. Dun ‡ to be synonymous with *Aneimites ovata*. This latter genus is referred by Seward to the *Schizæaceæ*, of which the Climbing Fern (*Lygodium*) is a familiar example.

From the *Rhacopteris* beds of Paterson, New South Wales, W. S. Dun has obtained *Cardiopteris, cf. polymorpha*, Göppert, a species which is found in the Carboniferous of Europe. Seward has compared this genus with *Neuropteridium*. It may possibly be related to the earliest seed-bearing plants, the *Cycadofilices*, which were abundant at this time.

Although vegetation was abundant in the Australian Carboniferous, the physiographic features and geological events of the continent at this time were not favourable for the formation of coal measures. This will be readily conceived when we remember that during this epoch there was a great effusion of volcanic lavas and tuffs following, after some considerable break, those of the Devonian, but with less counteractive subsidence, only limited areas like that of the New England plateau being transgressed by the sea. In New South Wales alone there is a series of lavas and tuffs which show a thickness of at least 20,000 feet. Owing to the general tendency of uplift, and the greater permanency of land masses in Carboniferous times, the only coal accumulated is in thin seams, too poor to be of economic value. But this great effusion of volcanic rocks in the Upper Carboniferous undoubtedly produced the oscillatory effect of intermittent subsidence throughout the succeeding Carbo-Permian period in New South Wales, resulting in its rich and valuable development of coal seams. In Victoria, deposits belonging to the Carboniferous period are

* Chapman, "Proc. Roy. Soc. Vict.," vol. xvi., pt. ii., 1904, p. 309, pl. xxvii., figs. 1–5.

† Abhandl. k.k., "Geol. Reichs.," 1885, vol. xi., pt. i.

‡ "Rec. Geol. Surv. N.S.W.," vol. viii., pt. ii., 1905, p. 157.

indicative of fresh-water or local lacustrine influence only, and do not yield any coal accumulations so far as these rocks reveal at their outcrops.

Whilst the coal flora of Europe and North America belongs largely to the period of the *Lepidodendron*, that of the southern hemisphere comes later, in the great development of *Gangamopteris* and *Glossopteris*. In regard to the term PERMO-CARBONIFEROUS—or more correctly CARBO-PERMIAN—there is strong reason for regarding these beds as true Permian.* They are contemporaneous with the Lower Gondwana of India and the Karoo of South Africa. In Victoria the Carbo-Permian beds consist of glacial conglomerates, corresponding to the Talchir series of India and the Dwyka Conglomerate of South Africa, which pass up into *Gangamopteris*-bearing sandstones. The fern known as *Gangamopteris* is common to Russia, India, Australia, South Africa, Brazil, and Argentina, and is generally more abundant in the lower part of the *Glossopteris*-bearing rocks. *Gangamopteris* chiefly differs from *Glossopteris* in the absence of a definite midrib and in having the median anastomosing veins almost parallel. In some forms the fronds are much more broadly ovate or rounded than in *Glossopteris*, the latter being more uniformly tongue-shaped.

Whilst the Australian Carboniferous flora shows marked affinities towards that of Europe in containing *Lepidodendron* and *Rhacopteris*, the *Glossopteris* flora belongs to a special development of vegetation evolved in a separate area mapped out as Gondwanaland, extending from China through India, Australia, South Africa, South America, and the Antarctic. There are several more or less well defined species of the genus *Glossopteris*, and their abundance and variety merit the special importance given to this period of vegetative development. The *Glossopteris* flora is found in all the Australian States (in Victoria represented by *Gangamopteris*), but only in New South Wales and Queensland have coal measures been extensively formed. In New South Wales the quantity of coal is roughly estimated at 100,000,000,000 tons, and that of Queensland is not far short. The coal series of Tasmania and Western Australia are insignificant, being represented by small seams and poor quality coal. The fossil plant remains, long known as *Vertebraria*, have been shown to belong to the rhizomes of the *Glossopteris* ferns. *Naggerathiopsis*, found in New South Wales and Tasmania, shows some affinities with the *Cordaitales*, which view is held by Zeiller, Seward, and Solms-Laubach; it may therefore be an interesting survival from Devonian times in Australia of a component of the European flora. The

* See David, "Federal Handbook Brit. Assoc.," 1914, p. 267.

equisetalean, *Phyllotheca*, was an important plant in the Australian flora of this and later (Triassic) times; in its foliage it shows some strong affinities to *Annularia* and *Calamocladus*. A fine specimen of a stem with attached leaves, collected at Stockton, New South Wales, by a former member, Mr. A. E. Kitson, I have identified with *Calamocladus*. Not the least interesting botanical fossils obtained from the Australian Carbo-Permian are the silicified tree-trunks which I have elsewhere determined as *Araucarioxylon*. Sections of these woods were figured in 1833 by W. Nicol,* and similar wood was named, but not described, as *Araucarioxylon Nicholi* by Carruthers,† subsequently referred to by R. Etheridge, jun.‡ In 1904 the writer prepared a series of micro-slides from a well-preserved tree-trunk from the Carbo-Permian of the Barron River, Queensland, and gave a detailed description of *Araucarioxylon Daintreei*.§ Newell Arber,‖ in writing his "Catalogue of the *Glossopteris* Flora" in 1904, refers to the above genus and species in his historical sketch (p. 57) and footnote 4 (same page), but in the body of the work has renamed this species *Dadoxylon australe*.¶ As regards the genus, it was shown in the description of *A. Daintreei*, and borne out by a subsequent examination of other specimens, that the structure of the pith-bundle must be compared with *Araucaria* rather than with *Cordaites*. *Dadoxylon* was originally founded on wood of dubious characters, where the pith was usually large, fistular, or solid. Our Australian specimens, being decidedly coniferous and not dubiously cordaitalean, are therefore placed in the genus *Araucarioxylon*. It is extremely interesting, in view of these facts, to witness the early development of one of our best-known types of coniferous trees in Australia so far back as at least Permian times.

Besides abundant remains of ferns in Carbo-Permian times, there is plentiful evidence of spore deposits, as seen in the "white coal" of Tasmania and the kerosene shale of Hartley and other places in New South Wales. The white coal (so-called) is grey to fawn-colour, and has as much claim to albinism as a white elephant. It is a spore-bearing sandstone rock or shale, the spores being very thickly scattered through the mass, producing a laminated structure in the rock. The spores are uniform in character, and were named *Tasmanites punctatus*

* "Edin. New Phil. Journ.," vol. xiv., 1833, p. 155.
† "Proc. R. Phys. Soc. Edin.," vol. v., 1880, p. 328.
‡ "Geol. and Pal. Queensland," 1892, p. 198.
§ "Proc. R. Soc. Vict.," vol. xvi. (N.S.), pt. ii., 1904, pp. 318-322, pls. xxviii., xxx.
‖ "Cat. Foss. Plants, Glossopteris Flora" (Brit. Mus.), 1905.
¶ *Op. cit.*, p. 191.

by E. T. Newton, of the English Geological Survey. They are sac-like bodies of a yellow colour, split by compression, and superficially punctate or hirsute.

The kerosene shale of New South Wales has a very different appearance, the rock in section being more or less carbonaceous and thickly filled with flattened elliptical sacs about 300 mm. in length, named *Reinschia australis* by Renault and Bertrand, and compared by them to the *Hydrodictyaceæ* or *Volvocineæ*. Palæobotanists are now inclined to regard these bodies as spores. A few years ago I was greatly interested to find a representative of kerosene shale identical with that of the New South Wales variety, in a collection of geological specimens made in the Falkland Islands by Mrs. Allardyce, of the Falkland Islands Government House. Its occurrence in that remote locality proved the extension of these peculiar deposits, probably formed in a chain of depressions beyond South America. At about the same time Hallé recorded a *Glossopteris* flora from the Falkland Islands, thus setting at rest any doubt as to the adventitious nature of the kerosene shale specimens.

Towards the close of the Upper Palæozoic in the Australian regions, several types began to appear which are more characteristic of the succeeding Triassic sediments. Amongst these pioneers of the Mesozoic flora are *Brachyphyllum*, a slender, branched, coniferous tree or shrub which is found abundantly in Jurassic strata in Yorkshire, India, New Zealand, and Victoria; *Baiera*, a digitate type of leaf of the *Ginkgo* group, both this genus and *Ginkgo* being better known from Jurassic strata in Australia; and *Cladophlebis* (formerly *Alethopteris*), a fern genus which became so marked a type of filicales in Jurassic times, not only in Australia, but in very widely distant localities, as England, India, Greenland, Eastern North America, China, Japan, Poland, and New Zealand. *Phyllotheca*, as already noted, occurs sparingly in the Carbo-Permian, though very abundant in the Triassic series. *Taeniopteris* is also found in the Upper Coal measures of New South Wales, but occurs only as a rare and precocious member of the Mesozoic flora.

This commingling of floras of two epochs is not confined to the latest period of the Palæozoic, as we have already seen a similar example in the Devono-Carboniferous flora of Victoria and New South Wales. Thus, as our knowledge of the plants and animals of these supposed breaks in time periods increases, we shall more and more clearly recognize that the arbitrary gaps made by geologists are of no permanent importance, and are now being slowly but surely bridged.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 14th January, 1918.

[The report of the meeting will appear in the March *Naturalist.* —Ed. *Vict. Nat.*]

EXCURSION TO RICKETT'S POINT (BEAUMARIS).

A good party assembled for the excursion to Beaumaris on Saturday, 10th November, where it was proposed to study geology and shore-life, but a stray nail, which punctured the tyre of the car that was to take us to Beaumaris, was the determining factor in fixing Rickett's Point as our ground for study. Arriving on the spot in relays, the portion of the excursionists who decided for geology were soon interested in the rocks of this part of the Bay. The indentations of the shore-line, due to the synclines of soft sandy marl, and the corresponding iron-sand reefs of the gentle anticlines, were noticed, which give so much variety and picturesqueness to the Black Rock district. In the ironstone were seen the remains of probable sand-loving trees and their fruits, the rough bark in some cases being faithfully pseudomorphosed. Above the terrestrial and littoral ironstone at this spot lies the marly sand, in which occasional marine shells occur, thus pointing to several changes of level within a short geological period –the Kalimnan. A microscope was put at the disposal of observers, and, whilst examining some sand from a rock pool, a veritable "living fossil"—an ostracod –was seen groping its way amongst the marine *débris*. This particular crustacean belongs to the genus *Cythere*, and, as *C. canaliculata*, was named by Reuss from a Miocene fossil which he found in the Vienna Basin. It migrated in that period to Australian seas, since it is found in the Miocene of the Mallee bores, and thus lays claim to being quite an old colonist. It still lived on in Scotland till Pleistocene times, and is now practically confined to the Australian coast, being very common in Hobson's Bay and Port Phillip, and found also in Bass Strait and off Western Australia.* The valves of this species are easily distinguished by the deeply impressed canals marking the surface of the

* See "Proc. R. Soc. Vict.," vol. xxvii., N.S., part 1, 1914, p. 32, pl. vi., fig. 8.

ovoid carapace. The occurrence of heavy minerals in the marly beds of the cliff was pointed out, and samples were taken home for detailed examination. The leader of the shore-life party (Mr. J. Searle) was unable to secure a boat for tow-netting, so the members turned their attention to the rock-pools left by the receding tide. In these were found great numbers of rotifers of the genus Synchæta, shore-dwelling copepods such as *Idya furcata*, small amphipods and isopods, and a few specimens of living foraminifera. The rocks were covered with winkles, limpets, chitons, and other molluscs, while in less-exposed places anemones of large size were seen and admired. On the sandy bottoms of some of the pools numerous prawns were seen, and their fearless curiosity—which sometimes led to their capture—demonstrated. Some of the party who were taking their first lesson in shore-life were surprised when told that the chitons were molluscs, so a few limpets and chitons were detached from the rocks and their parts compared; rough dissection with a pocket knife showed the radula or lingual ribbon in each, as well as other points of similarity. On a jutting rock numerous clusters of the cirripede, *Ibla quadrivalvis*, were found, and when our students were informed that these were crustaceans their wonder was increased. They could see no resemblance between these rough projections fixed on the rock and the lively prawns in the pool below, but when the life-history of the barnacles was explained their interest in zoology increased, and the fact that cirripedes were crustaceans attached to the rock by their heads, and that they caught their food with their feet, will be a lasting impression. When told that the Ascidians, on the rocks under their feet, shapeless masses as they were, had in infancy possessed a rudimentary backbone, a notochord, it was examined with greater interest, and, as one of the ladies of the party held a specimen at arm's length to see it "squirt," the picture on the title-page of the *Onlooker* was conjured up, and someone was heard to say, "So *that* is evolution." Bottles were filled with specimens for home study, and a very pleasant excursion terminated. F. Chapman, J. Searle.

The Fleurieu Peninsula Rosella. A fine coloured figure of this parrot appears in the current number of the *Emu*. It is a species, or perhaps variety, which is confined to the neighbourhood of Cape Jervis, South Australia, and is remarkable for the brilliancy of the red on the breast, &c. The coloured figure is a splendid piece of work, for which the engraver and the printer deserve great credit; unfortunately, however, neither of their names appears on the plate.

THE BUFFALO PLATEAU IN JANUARY.

By D. J. PATON.

(*Read before the Field Naturalists' Club of Victoria, 9th July, 1917.*)

IN response to a request from Mr. F. G. A. Barnard that I should write something for the Club anent my experiences on the Buffalo Plateau in January last, the following notes are presented with some diffidence for your consideration this evening.

Fourteen or fifteen years ago this region and the adjacent Alps received some attention from members of the Club, their observations being recorded in the *Naturalist* of that time, and I am indebted to an interesting paper by Messrs. Barnard and Sutton (*Vict Nat.*, xx., p. 4), and the report of the Club camp-out at Christmas, 1903 (*Vict. Nat.*, xx., p. 144), for much valuable information.

The scenery and winter pastimes that may be enjoyed at the Buffalo have since attracted increasing numbers of tourists, for whom the whole region has been opened up at Government expense. A graded carriage-road has been constructed to the summit; The Chalet, a splendid house of accommodation, built; and tracks marked out with finger-post directions to the places of interest on the Plateau. A lake has been formed for skating and boating. Thus the writer was in a more comfortable position than the bold explorers who, fourteen years ago, scaled the Plateau by a steep bridle-track, spent a wet Christmas under leaky canvas, and finally slid down the mountain-side in the rain, "yet merry withal."

We journeyed from Melbourne by the 4 p.m. express on Friday, 26th January, 1917, changing at Wangaratta. A journey of seven hours brought us just before 11 p.m. to Bright, where we stayed overnight. The following morning we resumed the journey by coach, starting about 9.30 a.m. Lunch was taken, and the ascent made a kind of picnic. If desired, one may be taken up by motor, but the slower conveyance gives more leisure for the examination of the scenery and the wonderful views which present themselves from time to time. From Bright to Porepunkah the roadside was lined with bushes of the introduced Blackberry, *Rubus fruticosus*, with tempting clusters of fruit fully ripe. Everywhere the proclaimed St. John's Wort, *Hypericum perforatum*, has possession of fields and hillsides. The foliage of the Ovens Acacia, *A. pravissima*, attracts attention. The work of the dredge is much in evidence. On one dredged area is a fine group of Black Wattles, *Acacia decurrens*, the only vegetation, evidently owing their existence, in a soil robbed of humus, to their power of fixing atmospheric nitrogen.

Leaving Porepunkah and the Ovens Valley, the road makes for the Plateau. The latter, which is not visible from Bright, comes into view, and all eyes are turned in that direction. The huge grey mass rears itself into the sky; great areas of rock, bare or scantily clothed with vegetation, indicate steep precipices and unscalable rocks. A mighty cleft in the midst —the famed Gorge—is already visible. Meanwhile, we have left the fields and entered timbered country. Our road runs parallel with the Eurobin Creek, passing Manfield's, and then, gradually ascending, leaves the creek far below, though we get frequent glimpses through the trees of its restless waters, brawling over the granite boulders in its bed. It forms a beautiful picture, bordered with ferns, the Fishbone Fern, *Lomaria discolor,* being very luxuriant here, whilst beside the road grow graceful shrubs of the Fern Heath-Myrtle, *Baeckea crenatifolia,* in full bloom. Descending slightly, we cross the creek by the Eurobin Bridge, after pausing to gaze at the Gorge, which is here in full view. Here we can make out the Fall itself—a distant silver ribbon wavering in the sunlight. This is a scene of which description fails to give any adequate idea. Here we leave the coach and proceed to the Ladies' Bath Falls, a few minutes' walk upstream by a winding track. The creek here falls over a ledge into a large, rocky, granite basin. The water is almost perfectly smooth, and the rocky bottom is clearly visible. In October the vicinity of the falls is gorgeous with *Tecoma australis, Billardiera scandens, Prostanthera rotundifolia, Eriostemon correifolius,* and the splendid *Grevillea victoriæ.* In January their glory had departed. *Helichrysum ferrugineum* and *Trachymene Billardieri* were the most notable flowers.

Leaving the Falls and rejoining the coach, we commence the real ascent of the Plateau. Soon the Gorge recedes from view, and we leave the granite, not entering it again till we approach "Mackey's Look-out." The road winds slowly round the mountain-side, ascending higher and higher, often doubling upon itself. An idea of the sinuous nature of the road is gained from the fact that it is just six miles as the crow flies, but seventeen and a half miles as the coach crawls, from Porepunkah to The Chalet. As the road is not wide enough for two vehicles to pass safely, except at certain points, traffic is regulated, vehicles being permitted to enter the reserve only at specified times. During the climb, which first takes us away from our objective, we note the following plants in bloom:—*Veronica Derwentia,* the orchid *Dipodium punctatum* (fine specimens), and *Stylidium graminifolium.* At intervals there are splendid views of valley and mountain ranges. Small gullies cross our road, and far below we get glimpses of tree-

ferns. Getting round a spur of the range, we begin at last actually to approach our goal.

About eleven and a half miles by road from Porepunkah we enter granite country, and half a mile further on reach "Mackey's Look-out." Here are shelter sheds, and here we have lunch. Here we found in bloom *Lomatia ilicifolia, Grevillea parviflora, Westringia senifolia* (waning), and *Pelargonium australe*, the last growing in cracks of the smooth, slippery, granite surfaces, which, sloping at a steep angle, are almost bare of vegetation. Here grows also a variety of *Acacia longifolia* with broad phyllodes and large flower-spikes. It flowers in October. The view is very fine as we resume the ascent. The road here doubles on itself, and is cut into the granite rock-faces, or built up with blocks of the same. Another commanding view-point—"Staker's Look-out"—is half a mile further on. After passing the latter, the road enters the cleft between the main plateau and the North Buffalo, and the rugged peaks of the latter are seen to advantage. Ascending higher and higher, the road doubles and twists, passing huge boulders, and finally attains its highest point (4,500 feet). During this stage the bulbous Fringe-Lily, *Thysanotus tuberosus, Lobelia gibbosa, Isotoma axillaris*, and several plants mentioned later, were seen.

Now we get our first view of the Plateau. A grassy valley stretches before us, through which wanders a deep, limpid brook, bordered with flowering shrubs. Beyond rise granite peaks, one in particular, near the summit of which a huge rock is precariously balanced, being pointed out as the "Monolith." Descending into the valley, we pass along it towards the Gorge, and wind up the eminence on which The Chalet is built. Here is our goal: but the afternoon is still young, and a new world is ours to conquer, so we soon sally forth to seek new adventures. Proceeding first to "Bent's Look-out," a pile of rocks on the south lip of the Gorge, only a few yards from The Chalet, we examine in safety, behind iron railings, the wonderful prospect that lies before and beneath us. We look down, far below, at the foot of the dizzy precipice, on wooded hills, a yellow streak here and there among the trees marking the road which we ascended so laboriously. Beyond is the Ovens Valley, the paddocks mere "pocket-handkerchief allotments"; beyond that again, rising tier on tier, the Alpine mountain ranges. Descending a winding footpath to another railed look-out, the full majesty of the Gorge makes itself felt. Opposite rises an almost perpendicular wall, a sheer drop of 1,700 feet. To the left the waters of the Buffalo Falls hurl themselves into the abyss, breaking into iridescent fragments on projecting rocks. Following the track between and over

rocks, we cross the bridge that spans the stream where the rapids commence, and make our way out to a flat rock which stands above the fall. Here, with the waters roaring in ceaseless fury beneath us, we may observe the work of erosion in progress, huge blocks of granite being gradually detached and hurled to the bottom of the Gorge. Returning to the track, and proceeding to the "1,700," we view the south wall opposite, and the sheer descent below. Far below, on the creek banks, appear green rosettes—the heads of tree-ferns: whilst the eucalypts are correspondingly dwarfed. Even on the perpendicular wall vegetation has established itself wherever a ledge or cleft has provided a lodgment. Successive generations of tourists have seen, in various rock-forms in and around the Gorge, imaginary resemblances to various persons and objects. A "Chinese mandarin" is amongst the distinguished visitors; there is a likeness of Sir Graham Berry (a Victorian Premier), a "statue" of Queen Victoria, a "pulpit rock," and many more.

Having gazed at the Gorge, and the prospect of valley and mountain, we have leisure to note the plants which bloom around us. Owing to the lateness of the season, most of the notable plants were still in bloom. *Oxylobium alpestre* was everywhere, also *Leptospermum lanigerum, L. scoparium, Kunzea pedunclaris, K. Muelleri, Goodenia hederacea, Westringia senifolia,* and *Trachymene Billardieri.* Here the rare *Prostanthera Walteri* was also found. Proceeding up the valley, numerous plants claim our attention: amongst them, *Hibbertia serpillifolia, Viola hederacea, Comesperma retusum, Baeckea Gunniana, Arthropodium paniculatum, Stypandra caespitosa, Craspedia Richea, Stylidium (Candollea) graminifolium,* and *Wahlenbergia gracilis,* the last three very deeply coloured. In boggy ground are a multitude of herbaceous plants, amongst them the composites *Podolepis longipedata, Brachycome scapiformis, Helichrysum leucopsidium, H. baccharoides, H. rosmarinifolium,* and the glorious *Celmisia longifolia.* Creeping in the mud are *Scaevola Hookeri* and *Lobelia gelida.* Still further on we come upon large clumps of the epacrid *Richea Gunnii,* with spikes of cream urn-shaped flowers. At "Carlile's," now deserted, we take the road leading to Lake Catani, having the "Monolith" in full view. Shortly we come to the head of the lake, a sheet of water having a remarkably natural appearance, but formed by throwing a wall across a ravine and impounding the waters of the stream in the valley above. It is sixty acres in extent, and frozen over in winter, when it is used for skating. On the banks of the stream above the lake we collected *Epacris heteronema* and *Prostanthera cuneata.* Meeting the road to "The Horn" near the head of the lake, we follow it back, passing along the

farther side of the lake to the bridge below the embankment. The waters issuing from the lake form the "Underground River." Finally we get back to The Chalet, ready to do full justice to dinner.

Having two hours of daylight after dinner (owing to the *Daylight Saving Act*, then in force), we employed them in a visit to the "Monolith." Branching from the road to the lake at the finger-post, and following a winding track, we reach our goal after a stiff climb. The "Monolith" itself is about 40 feet high—a huge block of granite poised a little to one side of the hilltop. The top is easily reached by a railed ladder, but the view from here is circumscribed owing to its comparatively low elevation (4,686 feet). Towards the east, however, the Alpine ranges are discerned. Near the "Monolith" *Panax sambucifolius* and *Olearia myrsinoides* were collected. Descending by a different track, we reach the road near Carlile's, which we follow back to The Chalet, on reaching which we are glad to end our labours and seek repose.

Let me preface my remarks on the remainder of the week's experiences with a few remarks on the Plateau as a whole. It consists of a series of valleys or depressions like drained lakes, of an average elevation above sea-level of about 4,500 feet, from which rise hills of varying height. The treeless valleys are grass-grown, usually more or less boggy, and decked with flowers, whilst the stream that often wanders through them is bordered by graceful shrubs. The hills are forested, the highest peaks, like "The Horn," bearing the Snow Gum, *Eucalyptus pauciflora* var. *alpina*. The whole of the Plateau is permanently reserved as a National Park. The Chalet is built of timber sawn on the spot, the remains of the sawmill being still visible. In point of comfort it leaves little to be desired.

Our Sunday morning walk led us to Point Helena, on the eastern escarpment of the Plateau, from which a fine view of the Buckland Valley is obtained. It is reached by a track from Lake Catani, and the last stage is scramble and squeeze between and over the granite blocks of the summit; but the view from the top repays damage to clothing and skin. The following plants were seen on the way:—*Gaultiera hispida* (fruit), *Coprosma hirtella*, *Prostanthera Walteri*. In a small swamp, named the "Violet Farm," besides *Viola hederacea* and *V. betonicifolia*, we collected *Prasophyllum fuscum*, *Thelymitra longifolia*, *Stellaria pungens*, the humble *Pultenæa fasciculata*, *Acæna sanguisorbæ*, *Oreomyrrhis andicola* (fruit), fine specimens of *Celmisia longifolia*, and others. Near Point Helena were *Pimelea linifolia*, *Helichrysum Stirlingii*, and the ferns *Aspidium aculeatum* and *Asplenium flabellifolium*.

Sunday afternoon saw us at "Edinboro' Castle," to reach

which we proceed along the road to Carlile's, then by a track across the valley to the appropriately-named "Crystal Brook," and follow up the course of the stream. The banks of the stream are clothed with shrubs, amongst which are *Eriostemon alpinus*, *Grevillea parviflora*, *Pimelea ligustrina*, and *Prostanthera cuneata*, with stray flowers of *Bossiæa foliosa*. In the boggy ground are *Linum marginale*, *Lotus corniculatus*, the prostrate *Azorella cuneifolia*, *Veronica nivea*, *Prasophyllum patens*, *P. fuscum*, *Xerotes longifolia*, and the beautiful little fern *Lomaria alpina*. As the valley narrows *Gastrodia sesamoides*, *Geranium dissectum*, *Rubus parvifolius*, and *Acæna ovina* flourish on the forested slopes. After proceeding some distance we follow a finger-post direction, and after some scrambling, by a track up the right-hand slope, the "Castle" is reached. It commands a good view of North Buffalo and portion of the main plateau. Near the "Castle," on the opposite side of the valley, are Lady Carmichael's Falls, but the trickle of water coming over at the time of our visit aroused no enthusiasm.

On Monday morning we walked to Lyre-Bird Hill, of which something will be said later. In the ravine below the lake we found the conifer *Nageia alpina*, and at various points near the lake *Drimys aromatica*, *Boronia algida*, *Stackhousia viminea*, *Daviesia ulicina*, *Asperula oligantha*, *Thysanotus tuberosus* (very fine), much *Lomaria alpina*, and others. We spent the afternoon in more thoroughly examining the Gorge and its surroundings and the valley behind. Besides the plants already mentioned we found *Leptospermum flavescens*, *Pterostylis parviflora*, *Pteris arguta*, *Pultenæa mollis* (flowers withered), and, in the valley, *Gentiana saxosa*, *Epacris serpillifolia*, *Drosera peltata*, *Scleranthus biflorus* (in cushion-like tufts), *Hydrocotyle hirta*, *Aciphylla simplicifolia*, and *Isotoma fluviatilis*.

Tuesday was given up to an expedition down the Gorge, under the guidance of Mr. Newton. Passing "Echo Point," on the south wall, where a threefold echo is returned, we commence the rugged descent. A little way down is the "Mushroom Rock," a huge block of granite supported on a slender pedicel. Here the real descent commences. Following a precarious track, scrambling down between and over rocks, clinging to grass-tussocks, horizontally or diagonally, over steep slopes, we descend about 1,000 feet, then proceed horizontally to an inviting fern-bower under "Bent's Look-out." From above this appears at the bottom of the Gorge, but is really little more than half-way. Here we find a welcome change from the barren side of the Gorge to the coolness of ferny shades. Climbing amongst the ferns we come to a pleasant grotto beneath overhanging rock, where we are glad to rest awhile. The chief ferns here are *Dicksonia antarctica*, *Aspidium*

aculeatum, *Gleichenia circinata*, *G. flabellata*, *Pteris incisa*, *Lomaria Patersoni*, *L. Capensis*, *L. discolor*, and *Grammitis rutifolia*. Growing amongst the ferns were *Mentha australis* and *Urtica incisa*. From this point our descent was even more reckless. Forcing a passage, "tobogganing" over ferns and undergrowth, slipping and sliding, we got down to a precipitous gully which led to the bottom of the Gorge, where the waters of the creek, after their great leap, make their way noisily between the huge boulders of water-worn granite. Here is a good view of the fall. A much better idea of the real depth of the Gorge is obtained here than the foreshortened view seen from above. In the gully, besides ferns, we collected *Dodonæa viscosa*, *Lomatia longifolia*, *Atherosperma moschatum*, *Lyonsia straminea*, *Prostanthera rotundifolia*, &c. After resting, we re-ascended the Gorge by a different route, arriving safely at The Chalet, tired but quite satisfied.

On Wednesday, taking lunch, we made the ascent of Mount Dunn, an eminence (4,986 feet) near the centre of the Plateau, from which a good view of peaks and rocks is obtained. Following the track as to "Edinboro' Castle," but continuing up the valley, we reach the turn-off leading to Mount Dunn. The ascent is easy, but near the top ladders have to be used, drawn up, and used again, whilst the last stage, over a slippery, sloping surface, is just a little precarious. The view from the top is rather weird. The peaks, built up, as it were, of detached boulders, many of which momentarily threaten to roll into the valleys, the pinnacle of "The Horn," the bold mass of the Cathedral Rock and the "Hump," the "Devil's Couch," "Og, Gog, and Magog," and the "Giant's Causeway," are all visible from here, and give the impression of a land inhabited by heaven-scaling giants rather than puny mortals like ourselves. After viewing the prospect we descended to a little valley, where we lunched, afterwards returning leisurely by a track leading round Lake Catani. *Dianella Tasmanica* and *Epilobium glabellum* were found, also *Veronica Derwentia* and a great many plants already mentioned.

Thursday was occupied by a trip to "The Horn," the highest peak on the Plateau. For this purpose we entered an ancient conveyance and took the "road," first passing Lake Catani, then winding southerly around the hills, gradually ascending. Soon we arrived at the "Torpedo Rock," and here left the conveyance, following the track up Lyre-Bird Hill. On the way up we encountered the large rock ironically termed "The Pebble." Near by was a large patch of the orchid *Chiloglottis Gunnii*. At the top of the hill are "The Galleries," remarkable passages between the rocks. Some have perpen-

dicular, others sloping walls. Outside "The Galleries" we gain a distant view of the "Leviathan Rock." Resuming our journey, we pass through "Dingo Dell," and arrive at the "Leviathan Rock," said to be the largest detached rock in Australia (or the world), and to weigh 30,000 tons. Its mass is certainly immense. Here was a fine specimen of *Clematis aristata*, also bushes of *Grevillea Victoriæ*, but with only one or two flowers. Further on the "Kissing Stones" were pointed out—two boulders which have so fallen as to support each other in the attitude of osculation. We pass close to the "Cathedral" and "The Hump," a remarkable mass, the "Cathedral" rising clear above the vegetation, and apparently unscalable. Further on still we are shown the "Balanced Egg," which, to use the guide's expression, "defies gravity." Here, in a valley, *Claytonia australasica* and *Cardamine dictyosperma* were collected. Sundry other imaginative resemblances are pointed out, notably the "cannon" on "Cannon Hill." After lunching at the foot of "The Horn," we commence the ascent by a well-marked track winding round to the southern face, where we get a view of the precipitous wall of the Plateau, and a foretaste of the views from the top. Emerging from the vegetation, our path is between and over piled rocks devoid of soil. Steps are cut in the rock, and the top is railed. Here we enjoy the glorious view from an elevation of 5,045 feet. Mountain and plain are spread out like a map. Kosciusko, ninety miles away to the east, is visible, and Mount Macedon, about 130 miles to the south-west, is said to be visible on a clear day. Descending by a different track, we viewed the remarkable "Wall of China," on the south face of "The Horn." Here was collected the rare *Aciphylla glacialis*, in fruit. Other plants which were flowering here, though done at the lower elevation of The Chalet, were *Boronia algida*, *Oreomyrrhis andicola*, *Hovea heterophylla*, *Olearia stellulata* (small variety), and *Dianella Tasmanica* (very fine). Large numbers of "Bogong Moths" were noted in a crevice between the rocks. We returned by the same road, the guide beguiling the way with more or less authentic anecdotes of past tourists.

Later in the day we visited the "underground river," a stream flowing through a narrow ravine which has apparently become blocked up by the descent of boulders from the hill-sides, completely roofing over the stream, which flows between their interstices. Entering the cavern where the water emerges, the explorer descends into almost Stygian darkness. Holding a guttering candle-end, he works his way over slippery rocks, deafened by the roaring waters, and in imminent danger of a "ducking." Reaching an opening between the rocks, he is

told to insinuate himself into it, and look upwards. On doing so, he gazes into a darkness made visible by numerous scintillating points of light, like stars in the firmament—the glow-worms which inhabit the cavern. Then, returning as he came, he emerges into daylight again, having seen and heard the "underground river"—thankful that it is all over.

So ended our week of almost perfect enjoyment. Friday morning saw us in the coach, rattling down the mountain side; Friday night saw us in smoky Melbourne—and all was over.

The following list of October-flowering plants may be of interest as compared with the above January lists:—*Ranunculus Gunnianus, Caltha intraloba, Tetratheca pilosa, Boronia algida, Eriostemon alpinus, Micrantheum hexandrum, Daviesia latifolia, Hovea heterophylla, Acacia penninervis, A. alpina, A. longifolia, A. dealbata, Baeckea diffusa, Grevillea Victoriæ, Pimelea alpina,* Styphelia (two species), *Epacris microphylla, Luzula campestris.*

Few introduced plants have intruded on the Plateau. Along the road are a few thistles. The Flat-weed, *Hypochæris radicata*, and White Clover were seen near The Chalet and camping-ground.

I would urge on any who have not visited the Buffalo its claims from a naturalist's point of view. An observer in almost any branch would be amply repaid, whilst there are few places more suited for the purpose of pure holiday-making.

[From the foregoing paper it would seem that the vegetation of the Plateau has suffered little at the hands of the tourist since its opening up to that traffic some nine or ten years ago. For an account of the physical features of the Plateau the reader is referred to the illustrated memoir (No. 6) by Mr. E. J. Dunn, F.G.S., issued by the Geological Survey Department in 1908 (see *Vict. Nat.*, June, 1908).—ED. *Vict. Nat.*]

ANOTHER GREAT GIFT.—In many instances collectors of natural history objects have had the collecting habit aroused in them in their boyhood days by the collecting of postage stamps. In the December *Naturalist* some account was given of the great gift by Mr. H. L. White, of Belltrees, Scone, N.S.W., to the National Museum, Melbourne, of his magnificent collection of Australian bird-skins. Now we have the same gentleman handing over to the Mitchell Library, Sydney, his wonderful collection of New South Wales postage stamps, valued at £15,000, as a gift to the nation. A portrait of Mr. White appears in the January *Emu*.

NOTES ON THE REPRODUCTION OF TERRESTRIAL ORCHIDS.

By E. E. PESCOTT, F.L.S., F.R.H.S.

(*Read before the Field Naturalists' Club of Victoria, 8th Oct.*, 1917.)

LOVERS and students of orchidaceous plants have for years spent much time and study in considering and describing the structures of the reproductive organs of these plants, and their labours have usually been directed in showing how that Nature has specially constructed the wonderful floral organs for the express purposes of pollination and fertilization.

Thus Darwin has written his immortal work on "The Fertilization of Orchids" to prove mainly two laws—first, that Nature abhors self-fertilization: and second, in pursuance of this law, that Nature has designed that all orchids shall be cross-fertilized, in order that, by the production of seed, the species may be perpetuated. Following this work, Fitzgerald, who admits the inspiration of Darwin, published his magnificent monograph on Australian orchids, illustrating over two hundred species, as well as their marvellous structure. Fitzgerald's conclusions right through are that the continuance of most species is due to and dependent upon the production of the seeds. Dr. Rogers, of South Australia, who has taken up Fitzgerald's work, has also published valuable papers along these lines, the papers being contained in the "Transactions of the Royal Society of South Australia." The more important ones are entitled "A Critical Review of South Australian Prasophylla" and "Mechanism of Pollination of Certain Australian Orchids." In these and other papers stress is laid upon pollination as the agent for the ensurance of seed production.

It is admitted that orchids are marvellously and uniquely adapted for cross-pollination: it is admitted that as a result orchids produce a prolific abundance of seed: and it is also admitted that Nature must have originally so designed these flowers for the purposes mentioned. But it must also be admitted that Nature has lamentably failed in these purposes at the present time, and that all of these wonderful designs are possibly but survivals of the original intention. For, while Nature has given these wonderful mechanisms, and while she also prolifically produces results in the form of millions of seed, she rarely produces a seedling plant. Fitzgerald, a keen observer, tacitly states this, for, while he differs in some respects from Darwin's conclusions, and while he is certain that most species are dependent upon seed for a continuance of the species, he does not state anywhere that he had seen one plant which he could call a seedling plant of a terrestrial orchid. He refers to the "difficulty common to all orchids of inducing seed

to vegetate," and, again, to "the great difficulty in persuading them to vegetate." Other remarks are interesting. He states that *Thelymitra carnea* fertilizes itself, and produces a seed capsule, yet it is not nearly so common as *Acianthus fornicatus*, the majority of the flowers of which are unproductive. Further, "*Phaius grandifolius* and *Calanthe veratrifolia* grow in similar situations. Every flower of the Phaius produces seeds, only occasionally one of the Calanthe: yet Phaius is rare and Calanthe common."

Cheeseman, in the "Transactions of the New Zealand Institute," 1875, says that only a quarter of the flowers of *Pterostylis trullifolia* yield capsules, whereas *Acianthus Sinclairii* produces an extraordinary number of seeds; yet in many districts it is not more abundant than the Pterostylis.

In the B.A.A.S. Handbook of South Australia (1914), Dr. Rogers says that "in certain genera (such as Caladenia, Microtis, Prasophyllum, and Thelymitra) capsules are produced freely, and seeds are shed in countless numbers. Some of these seeds doubtless survive and germinate, but the vast proportion of them must perish. Many attempts have been made to cultivate them artificially, but, so far as the writer can ascertain, such attempts have been unsuccessful. Very little indeed is known about this mode of propagation."

In observations of many years, covering many localities, and having collected and observed many species in thousands of plants, I had been forcibly struck with the absence of seedling plants. Indeed, I have never yet seen anywhere what I could faithfully determine to be a seedling terrestrial orchid. Further, seeds of many species were sown for several years, and in many ways, but none of the seeds ever germinated.

Nature has gifted most plants with what might be termed the "double chance." Geraniums grow easily from seeds—so do roses, so do carnations; but they may also be reproduced by the propagation of cuttings. They will, as well, root readily when the growths come in contact with the soil. Daffodils produce seed, so do gladioli and liliums: but all of these are reproduced far more readily by bulb or corm reproduction, and increase *underground*. And it is this underground increase that has been given to orchids in order that the species may continue and increase. Fitzgerald noticed this in several species, but he proposed certain limitations, which have since been proved erroneous. Dr. Rogers adds that a great proportion of terrestrial orchids must depend for their propagation very largely upon vegetative reproduction. There is now no doubt whatever that the very large majority, and perhaps the whole, of our terrestrial orchids increase their species by multiplication of the tubers or tuberous roots underground.

THE GENUS PTEROSTYLIS.

Taking this genus as a type, and especially as the Greenhoods are so well known, the methods of reproduction and increase may be explained at length.

The method of the continuance each year of what may be called the parent plant is well known. When the vegetative growth appears from the tuber and pushes its way to the surface to grow the foliage, stem, and flower, it is enabled to do so by the plant food that was stored in the tuber by the work of the foliage of the previous year. As this store of food is slowly exhausted, the tuber gradually shrinks and shrivels until a mere skin remains. While growth is taking place, however, a small root is pushed out from the stem, just above the old tuber. From this quickly grows a new tuber, in which the growing foliage stores another food supply. When the flowering has been completed the plant slowly dies, leaving only a new tuber in the soil, the old one having disappeared and the skin having rotted away.

Regarding the increase in the tuber system, or the production of juvenile tubers, the genus naturally separates into three groups.

Group 1.—When the tuber breaks into vegetative growth, and, after the foliage has appeared above ground, the root system is formed. This root system comes from the main stem which proceeds above from the tuber, and never from the tuber itself. Several roots branch out laterally and almost horizontally through the soil. Usually they are very close to the surface. Apparently a liberal air supply is needed for the roots and for the subsequent development. As the lateral filamentous root system is developing, the tip of each root begins to swell, the swelling increasing week by week until each strong root has terminally developed a new tuber. Later the roots die, leaving several new tubers in the soil, and quite away from the parent tuber.

In the reproduction of the parent tuber, the new season's tuber is always found slightly below—sometimes only one-eighth of an inch—the older tuber. This ulterior position is necessary, so that the laterally produced or juvenile tubers may gradually reach a lower and more suitable strata of soil. Thus one plant, in addition to reproducing the parent tuber, may grow two or three, or even more, juvenile tubers, thus considerably increasing the species.

Frequently the filamentous roots, which finally terminate in the juvenile tuber, are several inches in length. *Pterostylis nutans* often produces these roots to a length of six or eight

inches. The extreme length so far noted was in *Pterostylis pedunculata*, one plant of which had a lateral root eleven inches in length.

In 1915 I planted three pots with tubers of *Pterostylis nutans*; the pots contained 10, 12, and 13 tubers respectively. When the foliage had died down after the flowering season, the flowers all having been cut to prevent seed-production, the tubers numbered 18, 29, and 26 in the pots. Thus in one season 35 tubers had increased to 63 tubers—that is, there were 28 additional tubers and the 35 parent tubers as well. In nature the increase of this species is often more numerous than this. In 1914 fourteen tubers of *Pterostylis concinna* were planted in a pot. Five only produced flowers in July, the flowers again being removed. In the following May, 1915, 33 plants had appeared, giving an increase of 19 tubers, in addition to the replacing of the 14 parent tubers. If further proof be needed: in 1915 I collected a small four-leaved plant of *Pterostylis nutans*, with variegated foliage. It was evidently, from its size, a juvenile tuber, and, of course, was a "bud variation," or "sport." In 1916 the plant again grew strongly, producing nine or ten leaves, variegated as before, but no flower. In 1917 *two* plants, both with variegated foliage, appeared, the parent plant flowering, the additional plant having been produced from a juvenile tuber.

In the first group of Pterostylis the roots are usually long. This group consists of species that are lovers of cool, moist, or shady locations, and includes such species as *P. nutans*, *P. concinna*, *P. curta*, *P. pedunculata*, *P. pedoglossa*, *P. nana*, *P. alpina*, *P. falcata*, *P. reflexa*, and others.

Group 2.—This group may be classed as belonging to stiff clay soils or to hot, open, and dry situations. In these species the filamentous roots are quite absent, their place being taken by stout fleshy roots, often not more than a quarter of an inch in length, so that the juvenile tubers are formed quite close to the parent tuber, and, when fully developed at the end of the growing season, all of the tubers are found in a compact mass together. So closely packed are they that sometimes the tubers will be flattened and distorted by the pressure of one against the other. Included in this group are *P. vittata*, *P. barbata*, and *P. longifolia*. The shortness of the lateral roots explains the occurrence of the separate rosette of foliage, often found growing right alongside the flowering plant of one of these species. This rosette of foliage is the growth from the juvenile tuber, which, in all species, rarely produces a flower in the first year of its existence. Indeed, it is frequently not until the third year that the juvenile tubers perfect their

growth by producing a flowering stem. Even so, a juvenile tuber is capable of becoming a parent tuber in its second season, before it has produced a flower.

(*To be continued.*)

THE HOME OF THE BLACK COCKATOO.—"Wanda," in an interesting article in the *Argus* of Saturday, 2nd February, gives some account of a visit paid to the uninhabited country beyond the Grampians along the upper reaches of the Glenelg. He speaks of it as one of the homes of the Black Cockatoo, which he regards as the queen of the forest. He says:—"Curiously, the first cockatoo I saw was the Gang-Gang. The Gang-Gang is one of the prettiest of the black Cockatoos. A flock of three flew away in front of me. Then, through the trees, but never above them, came a flock of seven of the Funereal Cockatoos. They were calling loudly as they flew, evidently in protest against our desecration of their home. We were passing through a dense forest of Swamp Gums—small, undersized, gnarled trees. Here and there grew a Wild Cherry tree, always close to a gum, for it is a botanical theory that the cherry is a parasite on the gum, and unless it mingles its roots with those of its host it will not thrive. We passed into denser country. It was early summer, but the place had all the appearance of late spring. I never saw such a wealth of flowers. The Grampians are famous for their wild-flowers. Wild violets decorated the side of the track, while sarsaparilla trailed over every log. We were within half a mile of the Glenelg when we passed an old stump of a tree. It had been burned by a fire, and was only some ten or twelve feet high. Right on the top was a Black Cockatoo. I could hardly believe my eyes. There she sat until we got within a few yards of her; then she flew away, my boy remarking—'She is nesting,' and so she was, and in a most curious place. Evidently, from the manner in which she stuck to the nest, the eggs were nearly hatched. The nest could have been reached with very little trouble, but I was not a collector, so, not wishing to worry the parents, passed on. It was a striking tribute to the loneliness of the place, and its extreme quietness. A little farther on we came to a small group of the birds on a small honeysuckle (Banksia) tree. They were at their usual work of tearing off the seeds and flowers of the tree. They do this to practically all the trees in the forest."

ABOUT MEMBERS.—Mr. E. O. Armytage, late of Beaconsfield, has been severely wounded while serving as lieutenant in the famous Scottish regiment, the Black Watch. Dr. W. Macgillivray, of Broken Hill, has enlisted, and is now in Europe with the A.A.M.C.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 14th January, 1918. The president, Mr. F. Pitcher, occupied the chair, and about 45 members and visitors were present.

CORRESPONDENCE.

From the Secretary, National Committee of the Young Men's Christian Association, as follows :—

"On behalf of the National Committee of the Y.M.C.A., I beg to extend to the Field Naturalists' Club of Victoria our thanks for the cheque for £212 5s. 1d., the net amount of the proceeds from your annual wild-flower show, held in the Town Hall on 2nd October last. This splendid financial result, largely due to the energy and earnestness of your members, brings with it more than the actual money. It means to us that the work we are trying to do has your sympathy and endorsement, so, in thanking you for this generous expression of your goodwill, may we add our earnest desire to administer this fund so that you may feel that your labour has been well invested.—Yours faithfully,

"ALEX. JAMIESON.

"National Secretary."

ELECTION OF MEMBERS.

On a ballot being taken, Miss Lilian Evans, York-street, Moonee Ponds; Miss Dorothy Phillpot, "Narrabeen," Mary-street, Malvern; and Mr. Albert E. Keep, Alma-road, Caulfield, were duly elected as ordinary members, and Mr. Allan MacCaskill, jun., as a country member of the Club.

GENERAL BUSINESS.

With regard to the letter from the Chief Inspector of Fisheries and Game, inquiring as to the question of a change in the opening of the quail season, which had been held over from the previous meeting pending advice from the ornithological members, it was decided that the matter be left in the hands of Messrs. J. A. Kershaw, F.E.S., and G. A. Keartland to deal with.

The chairman announced that Mr. F. Keep had presented to the Club six of the Commonwealth military maps covering districts adjacent to the metropolis, which would be of value to members in arranging excursions, &c. A vote of thanks was unanimously accorded to Mr. Keep for his gift.

Mr. G. A. Keartland stated that the *Game Act* was being openly infringed, particularly in the districts north of the metropolis, by the shooting of quail, and mentioned that he had already reported the matter to the authorities. It was decided to support his action, and leave further action in his hands, in conjunction with Mr. Kershaw.

The chairman stated that a proposal was before the committee to hold an exhibition of the various branches of the Club's interests on the occasion of the annual meeting in June, in order to bring the objects of the Club more immediately under the notice of the general public.

The chairman said that Mr. J. W. Audas, F.L.S., had placed a number of reprints of a recent article on "Victorian Grasses" at the disposal of members. The article was a useful contribution on a difficult subject.

REMARKS ON EXHIBITS.

Mr. E. E. Pescott, F.L.S., called attention to a number of New South Wales flowers sent by Miss A. Fuller from the Blue Mountains, where she was enjoying a holiday, and remarked on the freshness of many of the specimens. He also drew attention to fresh specimens of the rare and curious orchid, *Drakea Huntiana*, forwarded by Mr. A. B. Braine, of Cravensville State school, N.E. Victoria. This species had been recorded in the December *Naturalist* as new for Victoria.

Mr. H. B. Williamson said he had a number of plants of the epiphytal orchid, *Sarcochilus falcatus*, which he had brought from East Gippsland, and would be willing to distribute them to members who would guarantee to try and grow them.

Mr. J. A. Kershaw, F.E.S., said that a number of Cabbage Palms, *Livistona australis*, had recently been planted in suitable situations in the National Park, Wilson's Promontory, where no doubt they would do well.

Mr. F. G. A. Barnard said that during the Christmas holidays he had followed the tourist track constructed some time ago along the Sassafras and Menzies Creeks, Dandenong Ranges, and had found it full of interest, birds in the Menzies Creek portion being especially noticeable. He recommended the walk as well worth taking, and not at all arduous.

Mr. J. Gabriel spoke of the depredations of the Canary Fly in Melbourne suburban gardens recently. Messrs. C. French and E. E. Pescott gave advice as to the treatment of this insect, the former stating that the present season was one of the worst known for insect pests of all kinds.

Mr. H. B. Williamson said that during a recent holiday in East Gippsland he had noticed great devastation to native foliage caused by two species of caterpillars, and Mr. C. Daley,

F.L.S., said the same matter had come under his observation. Mr. J. A. Kershaw, F.E.S., said from the descriptions given he thought the caterpillars depleting the gums of their foliage would be the larvæ of the Bag Moth, *Teara contraria*, Walker, while those travelling over the ground in great numbers were probably the larvæ of *Persectania ewingi*, Westw.

PAPERS READ.

1. By Mr. J. A. Kershaw, F.E.S., entitled "Two Snakes New to Victoria."

The author exhibited and briefly described specimens of two snakes collected in the Mallee, in the north-western portion of the State, and forwarded to the National Museum, which had proved new to Victoria. They were both small species, and had been identified as *Rhynchelaps australis*, Krefft, previously known from Western Australia, and *Denisonia nigrostriata*, Krefft, recorded from Queensland and South Australia. So far only single specimens had been obtained. He stated that the number of species of snakes, exclusive of the Typhlopidæ (blind snakes), recorded for Victoria is now sixteen.

2. By Mr. A. H. Burns, entitled "Notes on the Butterflies of Wandin-Ferntree Gully District."

As the author, who is a country member, was unable to be present, the paper was read by Mr. F. G. A. Barnard.

The author stated that the district over which he had collected was well suited to the varied habits of butterflies, and that more than two-thirds of the Victorian species could be found there. He gave brief descriptions of the species of the family Nymphalidæ which he had met with, together with some account of their life-histories.

Mr. Barnard said it was Mr. Burns's intention to give a second paper, dealing with the Lycænidæ and Hesperidæ, in which groups he believed the author had made some original observations.

EXHIBITS.

By Mr. J. W. Audas, F.L.S.—Dried specimens of *Prostanthera nivea*, Snowy Mint-bush, collected at Spring Vale, 11th October, 1917; orchid, *Thelymitra canaliculata*, R. Br., collected at North Devon, near Yarram, 24th October, 1917, new for Victoria; *Orthoceras strictum*, R. Br., Crow Orchid, and *Cryptostylis longifolia*, R. Br., Long-tongue Orchid, collected at Nar Nar Goon, 10th December, 1917; also *Alhagi camelorum*, Fisch, "Camel Thorn," a new introduction from Central Asia, forwarded by Mr. G. H. Adcock, from Rutherglen, 10th January, 1918.

By Miss C. C. Currie.—Flowers of orchid, *Dipodium punctatum*, *Comesperma ericinum*, &c.

By Mr. C. French, jun.—Aboriginal sharpening stone, col-

lected near Frankston, 12th January, 1918; also rare fungus, *Cyttaria Gunnii*, Berk., collected by Mr. H. A. Brown near Healesville on *Fagus Cunninghami*, Southern Beech, new for Victoria, also collected by Mr. J. W. Audas in South Gippsland.

By Miss A. Fuller.—A number of flowering specimens of New South Wales shrubs and plants, principally Myrtaceæ, Proteaceæ, and Compositæ, also the orchids *Orthoceras strictum* and *Cryptostylis longifolia*, from the Blue Mountains, New South Wales.

By Mr. E. E. Pescott, F.L.S.—Fourteen aboriginal spear-heads from North-West Australia, made of quartz, quartzite, flint, clear glass, bottle glass, carnelian, &c.

By Messrs. Pescott and French.—Fresh specimens of orchids, *Dipodium punctatum*, from Croydon, and *Drakæa Huntiana*, from Cravensville; dried specimen of *Thelymitra canaliculata*, R. Br., from Mr. A. B. Braine, Cravensville, 12th November, 1917, new for Victoria.

By Mr. J. Searle.—Under microscope, hydatid cysts in rabbit.

By Mr. H. B. Williamson.—Plants of epiphytal orchids, *Sarcochilus falcatus* and *Dendrobium striolatum*, and the fern *Polypodium serpens*, from Cann River, East Gippsland.

After the usual conversazione the meeting terminated.

Correction.—In the exhibits at the December meeting by Mr. D. J. Paton, recorded in the January *Naturalist*, page 131, *Crowea* (*Eriostemon*) *saligna* should read *C. exalata*, and *Brachyloma depressa* should read *Leucopogon rufus*.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 11th February, 1918.

The president, Mr. F. Pitcher, occupied the chair, and about fifty members and visitors were present.

REPORTS.

A report of the excursion to the Lilydale Quarry on Saturday, 19th January, was given by the leader, Mr. F. Chapman, A.L.S., who reported a fair attendance of members. Some account was given of the general geological features of the limestone, after which search was made and a number of characteristic fossils obtained. A visit was afterwards paid to the site of the old crater on the Melbourne road, and its story told.

A report of the excursion to Toolangi from Saturday to Monday, 26th 28th January, was given by Miss C. Currie, who reported that the members had spent a very pleasant time there. The very fine timber trees and the wealth of vegetation in every direction had excited the attention of all, and, though

midsummer, several interesting plants and shrubs had been found in bloom.

A report of the visit to the Zoological Gardens on Saturday, 9th February, was given by the president, Mr. F. Pitcher, who said that about 40 members and friends had attended. The party was shown round the gardens by the director, Mr. D. Le Souëf, C.M.Z.S., and his assistant, Mr. J. Wilkie, through whose kindness, and knowledge of their peculiarities, the various animals, birds, reptiles, &c., were displayed to the visitors under the most favourable conditions, and many interesting notes and anecdotes related regarding the specimens. After the principal portions of the Gardens had been visited, at the invitation of the office-bearers of the Club an adjournment was made for afternoon tea, which Mr. Le Souëf had kindly arranged to be taken on the lawn surrounding his office. He had taken the opportunity to express the thanks of the Club to Messrs. Le Souëf and Wilkie for their kindness, to which the former replied in his usual happy style. Mr. Le Souëf then invited the members to inspect his private museum, which contains a large and valuable collection of natural history specimens. The afternoon was greatly enjoyed by all, and closing time appeared to arrive too soon.

GENERAL BUSINESS.

Mr. G. A. Keartland referred to the request preferred by sportsmen to the Fisheries and Game Department to alter the opening of the quail season to March, which, he said, had been definitely refused. The opening of the duck season on the New South Wales side of the Murray River had been arranged for the same date as in Victoria—viz., 15th February in each year.

Mr. J. A. Kershaw, F.E.S., reported that he and Mr. G. A. Keartland had waited on the Chief Inspector of Fisheries and Game with the request that police supervision be given to the northern metropolitan districts on account of the unlawful shooting of young quail, when it was promised that effective steps would be taken.

REMARKS ON EXHIBITS.

Mr. F. G. A. Barnard called attention to his exhibit of a growing specimen of the fern *Botrychium ternatum*, Meadow Moonwort. He had exhibited the same plant at the June meeting, when he stated that the new season's fronds usually appeared about the second week of February. He had brought the specimen again to verify his statement, the new fronds being now just above the ground, while last year's infertile frond was still in fairly good condition.

Mr. H. B. Williamson called attention to dried specimens

of two plants new for Victoria—viz., *Logania longifolia*, R. Br., var. *subsessilis*, collected by the late Mr. C. F. Hawkins at Murrayville (Wimmera), August, 1917, and *Solanum violaceum*, R. Br., collected by Rev. A. J. Maher at Mount Drummer, near Genoa (East Gippsland), October, 1914.

PAPER READ.

By Professor Sir Baldwin Spencer, K.C.M.G., F.R.S., entitled "What is Nardoo?"

The author, in expressing his pleasure at being able again to attend a meeting of the Club, said that it was about thirty-one years since he was first present at a meeting, and he could not but acknowledge his indebtedness to members of the Club for their great help in many ways during that long period.

He said that some three years ago Mr. E. H. Lees, C.E., F.R.A.S., had contributed a paper to the Club under the same title, in which he claimed that the word "Nardoo" was not the name of a plant, as usually understood, but the name for a food obtained from several plants. Since the publication of that paper he had given the question considerable attention, and would endeavour to show that Mr. Lees was wrong in his conclusions. He quoted from a number of authorities, and finally from the MS. journal of Dr. Beckler, of the Burke and Wills expedition, now preserved in the Melbourne Public Library, and could come to no other conclusion than that the word "Nardoo," used by the natives of the Cooper's Creek district, is applied to the plant *Marsilea quadrifolia* and its products only, and that the food "Nardoo" used by Burke and Wills was made from the sporocarps of that plant.

The author referred to the growing specimen of *Marsilea quadrifolia* exhibited on the table by Mr. F. Chapman, and said that the reason many persons had not succeeded in finding the sporocarps attached to plants growing in the latitude of Melbourne was that, owing to the much moister climate, the plant had no need to produce a large number of spores in order to ensure its reproduction. He exhibited actual specimens of sporocarps obtained at Cooper's Creek by the late Dr. A. W. Howitt.

Considerable interest was taken in the paper, and many questions were put to the author at its conclusion.

Mr. G. A. Keartland stated that he had found the plant in question on the Fitzroy River, North-West Australia, and, although he inquired diligently, had not heard it called "Nardoo" by the natives.

Mr. A. D. Hardy, F.L.S., said that the Marsilea grew freely around the Kilby Lagoon, near the Yarra, at East Kew, where members could easily obtain specimens.

Mr. F. G. A. Barnard asked whether the seeds of the Portulaca mentioned in the Burke and Wills expedition report resembled those of the Portulaca of our gardens, the author replying that, whilst the seeds were used, the fleshy leaves and stems formed the chief article of food derived from this plant.

Mr. F. Chapman remarked that he had found sporocarps attached to his plants, and Mr. F. Pitcher said that in the Economic Museum at the Botanic Gardens were two grinding stones reputed to have been used by Burke and Wills at Cooper's Creek, also portion of a cake made of Nardoo meal.

Professor Spencer, after replying to the various remarks, maintained that ample and satisfactory evidence had been produced to support his contention.

NATURAL HISTORY NOTES.

Mr. F. G. A. Barnard called attention to a recent statement in the *Argus* "Nature Notes" that the call of the Kookaburra was the effort of *two* birds, and asked the opinion of bird authorities present. Mr. G. A. Keartland and Mr. P. R. H. St. John both maintained that one bird only produced the complete call.

Professor Spencer illustrated the track of the introduced garden snail on the blackboard, representing it as a series of short, thick, broken lines, which may often be seen on an asphalt path, and asked members to try and find an explanation for this peculiarity.

Mr. A. D. Hardy, F.L.S., mentioned that he had found snails attacking the foliage of a plum tree, which, he thought, was a rather unusual food.

EXHIBITS.

By Mr. F. G. A. Barnard.—Pot plant of fern, *Botrychium ternatum*, just showing new season's fronds.

By Mr. F. Chapman.—Fossil corals and stromatoporoids obtained on Cave Hill quarry excursion, also samples of volcanic deposit (tuffaceous) from Crater Hill, Lilydale; growing specimen of *Marsilea quadrifolia*, in illustration of Prof. Spencer's remarks.

By Mr. C. Daley, F.L.S.—Aboriginal grinding stones, upper and lower (the latter showing, on the reverse side, husking holes), from north-west Riverina.

By Miss Fuller.—Fresh specimens of the "Blanket-flower," from Western Australia.

By Mr. E. Keep.—Flowering specimens of *Acacia pruinosa*, "Frosty Acacia," and *Leptospermum scoparium*, the pink-flowered New Zealand variety.

By Mr. F. Pitcher.—Flowers of *Stenocarpus sinuatus*, Endl., Fire-wheel Tree, New South Wales and Queensland; *Backhousia*

citriodora, F. v. M., Sweet Verbena Myrtle, Queensland, grown at Botanic Gardens; *Callistemon paludosus*, F. v. M., Swamp Bottle-brush, Victoria and New South Wales: also dried sporocarps of *Marsilea quadrifolia*.

By Prof. Spencer.—Dried specimens of *Marsilea quadrifolia*, showing sporocarps; also sporocarps obtained at Cooper's Creek, Central Australia, by the Howitt Relief Expedition, 1862.

By Mr. J. Wilcox.—Flowering specimens of the New South Wales Christmas-bush, *Ceratopetalum gummiferum*, grown at Camberwell.

By Mr. H. B. Williamson.—Dried specimens of *Logania longifolia*, R. Br., var. *subsessilis*, from Wimmera, and *Solanum violaceum*, R. Br., from East Gippsland, new for Victoria; also *Acacia triptera*, Benth., and *Daviesia incrassata*, Smith, probably Victorian, but localities doubtful at present.

After the usual conversazione the meeting terminated.

EXCURSION TO LILYDALE QUARRY.

Starting from Flinders-street on Saturday, 19th January, as a modest party of four, on arrival at Lilydale our number had increased to nineteen, comprising, in addition to members of the Field Naturalists' Club, some members of the Microscopical Society of Victoria, who had arranged, at the invitation of the leader, to join the excursion. Armed with the approval and caution of the station-master at Lilydale, we proceeded up the line and turned off into the Cave Hill Quarry. The day being still and warm, the wood smoke from the kilns hung about the quarry, and, although not absolutely unpleasant, made the air rather pungent. Gathering our forces at the entrance of the quarry, we were about to make our peace with a supposititious official engineer, when we discovered to our surprise that he was a fellow-member who had arrived earlier, and whom we exonerated from all suspicion of having skimmed the palæontological cream prior to our arrival. After a short explanation of the age and method of deposition of the limestone, its fossil contents, and the nature of the changes it has undergone since its consolidation, we proceeded to examine the blocks on the floor of the quarry. An absence of the rich, friable limestone was noticed, from which so many fine specimens of gasteropods have formerly been obtained. However, a fair number of specimens were collected, and after about an hour's hammering the following fossils were found: Calcareous Algæ. *Girvanella* and other forms. Corals. *Cyathophyllum* sp.; *Favosites grandipora*, Eth. fil. Alveolites (?) *Heliolites interstincta*, Linné, sp. Stromatoporoids. *Clathrodictyon*, sp.,

and other forms, some perforated by "*Caunopora*" tubes. The nature of these latter is still a matter of doubt. Perhaps the best explanation is that they represent the corallites of a form allied to *Aulopora*, which lived commensally with the stromatoporoid and became enveloped in its stony skeleton. Crinoids.—Numerous joints and stem ossicles. Gasteropods.—Fragments of *Euomphalus northi*, Eth. fil., sp. Some interesting points were raised and discussed, such as the relation of the dolomitization to the bedding layers; the immunity of corals, in certain cases, to dolomitization, perhaps owing to "fixation" by bitumen from the organism; the presence and significance of ripple-marks, several good examples of which were seen on the south-eastern face of the quarry; and the sphæroidal structure of the basalt consequent upon flowing over swampy ground as evidenced by the section seen in the quarry. The party then walked to the top of the hill to examine the quartzites and to satisfy themselves as to its original sandy nature. Crossing the line by a bridge, the depression or tuff-cone on the Melbourne road was next visited, where the former vegetable garden in its centre is now transformed into a small orchard. Although some doubt has at various times been expressed by geologists as to the nature of this depression at Crater Hill, this point can be easily settled by examining the red beds on the adjoining road-cutting, which are seen to contain adventitious pellets such as would certainly be absent from a bed of lava decomposed *in situ*. A coccus pest, determined by Mr. F. P. Spry as *Lecanium hesperidum*, L., sp., was found covering the younger twigs of the neighbouring hedge of Osage Orange, which somewhat marred its usually rich foliage at this season. The afternoon proved to be pleasant and profitable, and the return to the station was made in good time to catch the 5.35 train to town, a few members remaining for tea and a later train.—F. Chapman.

[Reports of previous visits to the Cave Hill Quarry will be found in the *Naturalist* for May, 1909 (xxvi., p. 7), and November, 1914 (xxxi., p. 101).—Ed. *Vict. Nat.*]

EXCURSION TO TOOLANGI.

This excursion was arranged to extend from Saturday, 26th January, to Monday, 28th, so as to include the Foundation Day holiday on the latter date. We were promised the hottest day for sixty years on the Saturday, owing to the fact that the sun would be nearer the earth on that day than it had been at any time during that period; however, though it certainly was a hot day, it did not prove exceptionally so, and the heat

was hardly noticeable when we got out into the beautiful country. The fourteen-mile drive from Yarra Glen to Toolangi was very interesting—among hills covered with medium-sized eucalypts. From one point, locally known as "Cape Horn," there was an extensive view over the Yarra valley to the Dandenong Ranges and Malleson's Look-out. As we walked up the steep part of one hill we could not help admiring the Sweet Bursaria, just then at its best, bearing its panicles of small, creamy-white, scented flowers. Here also were found spikes of the pink orchid *Dipodium punctatum*, often called "native hyacinth" by the bush folk. Our destination, Alanbee House, we found to be nicely situated in a sheltered spot, and as an agriculturist I could not but admire the seven acres of potatoes close by, which were in splendid order, and were excellent when sampled at dinner. We were going to be very energetic in the afternoon, but, attracted by some pleasant shade alongside the Yea River afforded by a thicket of hazel, musk, sassafras, and tree-ferns, amidst which the umbrella and star ferns were climbing, not even the leeches and mosquitoes could make us move. The call for afternoon tea was more successful. Mr. J. A. Kershaw, F.E.S., who had been announced as leader of the excursion, was unfortunately prevented by his official duties from leaving town, so we were glad when our fellow-member, Mr. Chas. Daley, F.L.S., who was spending a holiday in the district, kindly undertook to act as leader on the morrow for a visit to the Sylvia Falls. This was particularly good of him, for he had been there only a day or two before with Mrs. Daley, and was well aware of the difficulties of the track. We went to the "Canoe" in the evening, and found the ferns along the river a beautiful sight. On the way back we passed Mr. C. J. Dennis's house, surrounded with wattles and gums, and "Ginger Mick" introduced his friendly self, accompanying us back to "Alanbee." The walk to the Sylvia Falls seemed to us more than the seven miles it is reputed to be, but it was very beautiful and interesting, and, even if we did cross the stream twenty-nine times, we did it each time over a different kind of crossing. A soft mist was falling, making the bushes moist, while our footsteps made no sound on the soft wet leaves as we went along. Our path was through a tangle of blanket-wood, sassafras, hazel, musk, lomatia, with tree-ferns decked with filmy ferns, mosses, and lycopods. Later we came to the myrtles, *Fagus Cunninghami*, but I like to call them by their proper name—beech. They were so beautiful—the old, old trunks covered with mosses and lichens, even out to the uttermost points of the limbs. They yield a beautiful timber for household use. From them Beech Forest, in the Otway peninsula, got its name.

One cannot describe the beauty of everything, especially on such a favourable day. The Star Fern, *Gleichenia circinata*, grew here most luxuriantly—one might almost say by the acre. There were huge banks of it along the stream, and in one place a little island covered with it. The Falls were beautiful, but we were not tourists—only naturalists. They were reached only after the party had been revived with lunch. Our way back was up a very steep hill covered with the Hop Goodenia, *G. ovata*, wire-grass, and shrubby acacias, interspersed with shapely Blackbutts, *Eucalyptus pilularis*, standing tall and straight. We passed a lovely small tree which our leader recognized as the Tree Geebung, *Persoonia arborea*; it has edible fruits, and is known locally as the "Johnny Bright Plum." Altogether, it was a most enjoyable day. On Monday we were fortunate in getting Mr. Smedley, of Alanbee House, to be our guide. He took us past a little bush saw-mill, across a swamp full of tea-tree, with plenty of the pretty little Utricularia showing its bright purple flowers; then up some very steep hills covered with shrubs and big timber to Smedley's Falls. They were very lovely, but their surroundings were very different to the Sylvia Falls we had visited the day before. Then we went to another saw-mill, passing on the way masses of *Clematis aristata* and *Tecoma australis* climbing up the eucalypts by their strong, rope-like stems. At the mill we saw so many magnificent logs of Mountain Ash, *Eucalyptus regnans*, and talked so much about timber, that we left fancying ourselves timber experts. Tired as we were, our enthusiasm was revived by the finding of the dear little pink orchid *Spiranthes australis*, one of the gems of our summer-flowering plants. After dinner some of the party got ready for their return to Yarra Glen and home, the rest staying till next morning and leaving at the early hour of 5 a.m. to catch the morning train to town, fortunately the heavy rain keeping off till we had reached the station. Many more trees and shrubs common to our elevated mountain districts were noticed, but I think I have said enough to show that Toolangi is well worth a visit by a nature-lover. There are also many birds to be seen and heard, but our party did not include an ornithologist. —C. C. Currie.

[A report of a previous excursion to Toolangi will be found in the *Naturalist* for February, 1910 (vol. xxvi., p. 144).—Ed. *Vict. Nat.*]

NOTES ON THE REPRODUCTION OF TERRESTRIAL ORCHIDS.

By E. E. PESCOTT, F.L.S., F.R.H.S.

(*Continued from page* 164.)

(*Read before the Field Naturalists' Club of Victoria, 8th Oct.*, 1917.)

Group 3.—Up to the present time I have only been able to place one species of Pterostylis in this group—viz., *P. parviflora*—although there are species in other genera which exhibit the same mode of reproduction. The habit of growth of this species is as follows:—When the flowering season (March to May) is approaching, the tuber sends up its vegetative growth, culminating in a flowering stem, which has no basal foliage. As the flowers approach maturity, the flower-stem from the tuber to the ground level thickens considerably, while the reproductive tuber for next year's flower develops near the old parent tuber. The fleshy underground portion of the flower-stem develops a vegetative bud, from which a rosette of small foliage appears. Sometimes a second rosette appears, and occasionally a third, all growing from the one stem. According to the strength and size of the tuber, so is the number of "eyes." This means that an abundant autumn rain in one season, causing the development of a vigorous rosette of foliage, will result in a large tuber full of storage food for the next season: and in that case, as a result, several buds will develop at the base of the subsequent flower-stems. In succeeding years, two and sometimes three flower-stems will have developed from the one growing stem. Later, a juvenile tuber will appear lower down, on the growth stem. Thus we find a parent tuber with its reproductive tuber at the base, a juvenile tuber on the stem higher up, and one, two, or three rosettes or flower-stems at ground level. Later, a separate growing stem develops, conveying the sap for other rosettes. In other words, by the lapse of a few years, each rosette comes to have an independent growing stem, all of which are still conjoined, or wrapped up in the original fibrous coating that formed the protective covering or epidermis of the original vegetative stem. And it is only when this fibrous coating decays, in the lapse of years, that each rosette or flower-stem attains an independent existence.

THE GENUS PRASOPHYLLUM.

In this genus, with one exception, the lateral roots are produced in the same way, above the parent tuber, but they are usually very stout and very short. Again, terminal juvenile tubers are produced on the roots, and these so overlie the parent tuber that they appear like offsets from them. Sometimes

in favourable situations, the lateral roots of *P. elatum* are longer. On one occasion one lateral root of this species was observed five inches long. One cluster of *P. album*, collected 24/11/15, had four flowering-stems close together, with a total of eleven tubers, not counting the older parent tubers. In addition, two foliage (non-flowering) juvenile tubers from last season were present. In a similar manner, *P. patens*, *P. fuscum*, *P. Frenchii*, *P. brevilabre*, and *P. despectans* increase.

The one exception in this genus is *P. flavum*. This is a tall-growing species, almost as tall as *P. elatum*, with yellow flowers. The flower-stems develop from a thick, fleshy, tuberous root-stock, which is very like the root-stocks of certain garden Irises. In this case the rhizomes of this species are wonderfully like those of *Dipodium punctatum*.

Other Genera.

The species in the genera Corysanthes, Caleya, Acianthus, Cyrtostylis, Calochilus, Lyperanthus, and Chiloglottis, all, so far as observed, produce very long filamentous roots, with terminal juvenile tubers.

Corysanthes pruinosa is occasionally found in colonies on the trunks of tree-ferns. The parent orchids, in growing at the base of the fern, send filamentous roots upwards. These roots find the shelter of the tree-fern trunk congenial, and so they push on, forming the tubers, and dying, leaving the tubers a few inches up the stem. And thus, in the lapse of years, additional roots send new tubers further and higher up the stems. In this way I found *Corysanthes unguiculata* nine inches from the ground, growing from under the bark of *Melaleuca squarrosa*.

The species of Caleya have very large tubers, the longest filamentous root noted being one of *C. major*, nine inches long.

The lateral roots of *Lyperanthus suaveolens* are stouter than usual, and, on the average, they are longer than any other species. The longest noted was 12½ inches.

The longest root observed of any species was one of *Chiloglottis trapeziforme*, which exceeded 15 inches in length.

In *Microtis porrifolia* the lateral roots and the subsequent juvenile tubers are far more numerous than in any other orchids observed. This will account for its prevalence in its native habitat. This species is exceedingly hardy, and readily survives cultivation, for a time at least. Further, it possesses the rare occurrence of showing the dormant "eye" or bud on the tuber very prominently.

The Genus Caladenia.

This genus, with the closely-allied one, Glossodia, again presents some remarkable features of reproduction. The

paired tubers are, of course, present. In Caladenia they are often readily observable, but in Glossodia they are not so easily discovered. These are really hot climate orchids, and Nature has therefore provided their tubers with special protection against heat and evaporation. On casual inspection, the plants of *Glossodia major* invariably have apparently only one tuber each. On dissection, the paired tubers (old and new) are found to be enveloped in quite a number of tough fibrous sheaths, often as many as twenty of these sheaths being found enfolding the tubers, the inner ones being of a silky nature, the outer ones being very tough. There is no doubt that these sheaths are for protective purposes.

The juvenile tuber is developed inside the sheath. Later, a second leaf appears from the parent plant, then two flower-stems appear to be coming from the one tuber. The tuber increases in size until a separation occurs. Even then, with two tuber systems in the soil, they are connected by the top of the sheath, the two flowers and leaves coming from the identical vegetative stem. Later, the stem sheathings decay, and there remain two separate plants, each with its pair of tubers. Many years may elapse before this articulation, uniting the two plants, disappears. It is not common, in this State, for more than two tubers to be so united: but Dr. Rogers states that in Western Australia the tubers of various individuals are united curiously together, not in juxtaposition, but by actual articulation. This is there common with *Glossodia Brunonis*. It is interesting to note that with this species there are many tubers, all united by articulation, finally ending in one stem near the surface. From this one stem comes quite a colony of flower-stems and foliage. In Western Australia this articulation also occurs commonly with *Caladenia Patersoni*. Again the tubers are articulated, finally uniting in one stem before foliage and flower growth develops. This articulation is not at all common in this State.

In many species of Caladenia, particularly *C. Patersoni*, *C. dilatata*, *C. filamentosa*, *C. latifolia*, *C. leptochila*, and *C. cairnsiana*, the sheathings that were noticed in Glossodia are neither so plentiful nor so complete. The new parent tuber may usually be seen developing through the base of the sheathings. And in this way, year by year, the tuber grows deeper in the soil. In its downward development the tuber leaves behind the fibrous shells of other years, so that the remains of the tubers may easily be noted on the root-stalk which is extending from the tuber to the ground surface. One plant of *Caladenia dilatata* was observed with the sheathing shells of four older tubers, and five shells were found on a plant of *Caladenia latifolia*. In 1915 a plant of *Caladenia Menziesii*

was collected which had a small leaf growing independently from one of these old sheathing shells; and at the same time a plant of *Caladenia fimbriata* was noted with a single small leaf growing out of the same tuber from which the adult foliage was growing, showing that a juvenile tuber had developed inside the sheathing envelope, and was therefrom producing its foliage.

From these observations it is certain that in some species, if not in a considerable number, the root-stalk or underground stem, extending from the tuber to the surface, is of a permanent character, forming a permanent and protective medium for the conveyance of the sap, resulting in a minimum amount of sap evaporation.

A considerable number of genera remain to be discussed, and they will be considered in a future paper. But enough has been said to show that terrestrial orchids are largely dependent upon tuber development and increase for the continuance and extension of the species. Little is known regarding the seeds of these plants. In very many species seeds are produced in hosts. Whether they are germinable, whether they remain in the soil awaiting suitable conditions for development, or whether they are all abortive, is not known. Apparently there is no necessity for the production of seed, owing to the tuberous increase, and apparently the elaborate apparatus or arrangement of the organs is to some extent but a survival of the pollination and fertilization operations of other days.

[The paper was illustrated by a large series of lantern slides depicting the flowers and their various parts.—ED. *Vict. Nat.*]

THE AUSTRAL AVIAN RECORD (vol. iii., No. 5), bearing date 26th December, 1917, contains fewer additions and corrections to Mr. Mathews's list than usual, none of them affecting Victorian birds. The editor and Mr. T. Iredale devote several pages to "Avian Nomenclature Notes," in which several changes are proposed. A coloured plate is included, which figures the Black-and-White Wren, *Nesomalurus leucopterus*, and the Dirk Hartog Grass-Wren, *Diaphorillas carteri*.

TOOROURRONG RESERVOIR.—This pretty little lake, situated amid the foothills of the Plenty Ranges, and visited on several occasions by excursion parties of the Field Naturalists' Club, is in danger of being polluted by a plant well known to the microscopist, *Vallisneria spiralis*. This plant has found the shallow margins of the lake an ideal habitat, and has spread enormously. The authorities are now engaged in raising the embankment, so that a greater depth of water can be impounded, and the plants thereby drowned.

BOOK NOTICE.

THE FLORA OF THE NORTHERN TERRITORY. By Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist, Professor of Botany, University of Melbourne, and Olive B. Davies, M.Sc.; with Appendices by J. H. Maiden, F.R.S., I.S.O., Director of the Sydney Botanic Gardens, Government Botanist, and A. A. Hamilton and Edwin Cheel. Published by authority of the Minister for Home and Territories. M'Carron, Bird and Co., printers, 479 Collins-street, Melbourne. 1917.

THIS, the latest of the divisional floras of Australia, besides listing the plants collected during recent explorations, notably the Barclay expedition, in the Northern Territory—viz., that portion of Australia north of the 26th parallel of south latitude and between the boundaries of Western Australia on the west and Queensland on the east, records all the plants previously noted in the National Herbarium (Melbourne) Census and other publications as occurring in "Northern Australia"—"Northern Australia" probably including, as well as the Northern Territory, portions of northern Western Australia and northern Queensland. The flora is arranged in orders in the sequence of Engler's System, and extends to 281 pages ($7\frac{1}{2}$ x $4\frac{3}{4}$ inches printed). Most of the recent collections, which include some new species and genera, were made by Mr. G. F. Hill, who was the botanist and entomologist of the Barclay expedition. A rather novel feature is a "Key to the Australian Natural Orders," in which the characters of each order are set out in tabular form; this extends to 14 pages ($6\frac{1}{2}$ x $7\frac{3}{4}$), and can be made use of by workers in any State. Two pages of popular names are given and a large number of plants are grouped under different headings, indicating their economic or other qualities. In the appendices by Mr. J. H. Maiden on the eucalypts and acacias will be found a great deal of valuable information applicable to other portions of Australia. A new eucalypt is named after Professor Baldwin Spencer, K.C.M.G., and a variety of *Acacia sericata* is named *Dunnii* after Mr. E. J. Dunn, F.G.S., late Government Geologist of Victoria. The volume is well indexed, and includes twenty-seven plates, drawn by the Misses E. M'Lennan, B.Sc., I. Cookson, B.Sc., E. Archer, B.Sc., and M. Flockton (Sydney); also a map of the Northern Territory, by Capt. A. L. Rossiter, showing the route of the Barclay Expedition and the characteristic vegetation at the various camping places.

The Victorian Naturalist.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 11th March, 1918.

The president, Mr. F. Pitcher, occupied the chair, and about fifty members and visitors were present.

REPORTS.

A report of the excursion to Berwick on Saturday, 23rd February, was given by the leader, Mr. R. A. Keble, who said that there had been a fair attendance of members. The bluestone (basalt) quarry had been visited, and in the fluviatile clay underlying the basalt a number of fine specimens of leaves, &c., were obtained, particularly *Fagus Luehmanni* and *Lomatia Bosistooides*. A portion of a legume was also obtained, the first yet found in the deposit.

A report of the visit to the Burnley Horticultural Gardens on Saturday, 9th March, was given by the chairman, who said that there had been a good attendance of members. About thirty had proceeded up the river by motor-boat to the Gardens, where about a dozen more were awaiting their arrival. The Director of the Gardens, Mr. J. P. M'Lennan, before starting on a tour of the Gardens, asked the party to assemble in the lecture room, where he gave a brief *résumé* of the operations carried on by the students, which include a number of ladies. Both theoretical and practical horticulture are dealt with in the course of instruction. Some fine samples of preserved fruit made by the students were on view. An adjournment was then made to the grounds, where first of all the notable flowering plants and shrubs were pointed out; afterwards a visit was paid to the orchard, where methods of cultivation, pruning, &c., were shown. At the invitation of Mrs. M'Lennan, an adjournment was made to the lawn for afternoon tea, but the good things had hardly been handed round before a thunderstorm, with heavy rain, caused all to seek shelter, and thus interrupted what would have been a very pleasant finale to an enjoyable and profitable afternoon.

On the motion of the president, a cordial vote of thanks was ordered to be sent to Mr. and Mrs. M'Lennan for their hospitality and kindness.

ELECTION OF MEMBER.

On a ballot being taken, Dr. Griffith Taylor, B.E., B.A., F.G.S., Commonwealth Bureau of Meteorology, Carlton, was duly elected an ordinary member of the Club.

GENERAL BUSINESS.

The president welcomed Mr. and Mrs. A. A. Weeks, of Gosford, N.S.W., to the meeting, stating that the Club had been greatly indebted to them for supplies of flowers on the occasion of the recent Patriotic Exhibition of Wild-flowers. Mr. Weeks, in briefly returning thanks, expressed the pleasure of his wife and himself at being able to be present at a monthly meeting of the Club.

The chairman drew attention to the notice in the *Naturalist* stating that the committee would greatly appreciate the services of any of the members who would take shorthand notes of the monthly meetings in order that full and correct details might be secured for publication.

The president also called attention to the proposed exhibition of specimens to take place at the annual meeting on 10th June next, which would be open to the general public. A number of leaders in different branches had signified their willingness to act as organizers, and it now remained for the general body of the members to make the display a success. He said that, though it was primarily intended to exhibit Victorian specimens, others would be accepted in limited quantities.

NOTES ON EXHIBITS.

Mr. A. D. Hardy, F.L.S., drew attention to his exhibit of the bark and timber of a giant eucalypt from the Beenak Forest.

Mr. C. Daley, F.L.S., drew attention to some photographs exhibiting the rough character of the country in the vicinity of the Wonnangatta River, North Gippsland, which has recently come into prominence in the daily press.

Mr. E. Wilson called attention to his exhibit of seventeen species of longicorn beetles taken on a Manna Gum, *Eucalyptus viminalis*, in his own garden at East Malvern.

PAPER READ.

1. By Mr. A. D. Hardy, F.L.S., entitled "The Tall Trees of Australia."

The author said that a statement had recently been put forth by the American Museum of Natural History claiming to have in America the tallest and biggest trees in the world, and twitted Australia with having recorded sizes which, when put to "the ultimate test—the tape measure," shrank before it, leaving the Sequoia the monarch of all trees. In the Annual Report of the State Forests Department of Victoria for 1910 some account had been given of the tall trees of Victoria, and he desired to remind members of the facts there stated. He had no doubt that the tallest and biggest trees of to-day are the Sequoias of California. The Americans had preserved their marvellous specimens of the vegetable kingdom, while ours

had been allowed to disappear through want of appreciation and neglect, or had been made available to the service of man by the use of the axe and the saw. He placed on record, however, the height of a "Mountain Ash," *Eucalyptus regnans*, felled at Thorpdale, Gippsland, in 1880, which, measured by a qualified surveyor with a steel tape, totalled 375 feet. The author pointed out by means of diagrams the difficulties of securing the true measurement even with a theodolite, and that the question of girth depended very largely on the number and size of the buttresses, usually associated with big trees.

Some discussion ensued, in which Messrs. Pitcher, Gabriel, Shephard, and Barnard took part.

Owing to he lateness of the hour, with the consent of the author, the reading of Mr. J. W. Audas's paper on "The Characteristic Vegetation of the Yarram District" was postponed until next meeting.

EXHIBITS.

By Mr. J. W. Audas, F.L.S.—Timber specimen of *Banksia serrata*, L., Saw Banksia, from Yarram, October, 1917—a handsome mahogany-coloured wood, useful for furniture and boat-building; also fruit specimens of the Arghel, a Syrian plant, *Gomphocarpus fruticosus*, Linn., now naturalized in this State. These resemble swans, and are sought after by children to float on water; collected at Healesville, March, 1918.

By Mr. F. Chapman, A.L.S.—Flowering specimen of *Eucalyptus Lehmanni*, Schauer, Green-flowering Gum of Western Australia, grown at Balwyn.

By Mr. C. Daley, F.L.S.—Photographs of Valley of Wonnangatta River, taken from Mount Howitt; the track from Bryce's Homestead; and a scene on the Wonnangatta River; also quartz pebbles impressed into water-worn stones from near Stockdale, Gippsland, and a twin-leaf of eucalyptus.

By Mr. C. J. Gabriel.—Marine shells—Victorian representatives of the genus Cypræa, or Cowrie shells.

By Mr. A. D. Hardy, F.L.S.—Series of bark sections and timber from *Eucalyptus regnans*, recently felled at Beenak; also publication, "The Giant Trees of Victoria," on behalf of Forests Department, Victoria.

By Mr. R. A. Keble.—Fossil leaves, &c., obtained on excursion to Wilson's Quarry, Berwick, including portion of a legume, probably new to science.

By Mr. F. Pitcher.—Flowering specimens of *Crotolaria laburnifolia*, Linn., Laburnum-leaved Bird-flower, Queensland; *Hakea ruscifolia*, Labill., Ruscus-leaved Hakea, Western Australia; and *Lambertia formosa*, Smith, Port Jackson Honey-flower, New South Wales, grown at Melbourne Botanic Gardens.

By Mr. H. B. Williamson.—Dried specimen of *Acacia lineolata*, Fitzgerald (determined by Mr. P. H. Maiden, F.L.S., Sydney), collected by Mr. D. C. Trainor at Rosebery (Wimmera), September, 1913.

By Mr. E. Wilson.—Seventeen species of longicorn beetles taken on a Manna Gum, *Eucalyptus viminalis*, at East Malvern.

After the usual conversazione the meeting terminated.

ORCHIDS.—Mr. R. W. Armitage, M.Sc., Beechworth, writes :—"The attached list of orchids grown or collected by Mr. A. B. Braine, head teacher of the Cravensville State School (about 30 miles south-east of Tallangatta), and his pupils is noteworthy as showing the interest evinced in these singular plants in an out-of-the-way corner of Victoria. It comprises 51 species belonging to 17 genera. Mr. Braine remarks that his finding of *Drakea Huntiana* was the first record for Victoria; *Prasophyllum intricatum*, first time sent to Dr. Rogers from Victoria; *Chiloglottis Pescottiana*—new species, 1916; *C. trapeziformis*—recorded for Victoria first time in 1916; *Thelymitra canaliculata*—recorded for Victoria 1917, but specimen found in Gippsland about three weeks before his; Pterostylis—several apparent hybrids sent to Dr. Rogers; possibly some new species may be listed in 1918. The complete list is:—Acianthus exsertus; Caladenia carnea, cœrulea, congesta, deformis, dilatata, Patersoni, testacea; Calochilus Robertsoni; Chiloglottis diphylla, Gunnii, Pescottiana, trapeziformis; Corysanthes pruinosa; Cyrtostylis reniformis; Dipodium punctatum; Diuris maculata, pedunculata, punctata, sulphurea; Drakea Huntiana; Eriochilus autumnalis; Gastrodia sesamoides; Glossodia major; Microtis minutiflora, porrifolia; Prasophyllum album, flavum, intricatum, nigricans; Pterostylis acuminata, alpina, barbata, curta, cycnocephala, falcata, longifolia, nana, nutans, parvifolia, pedunculata, præcox, reflexa, revoluta; Spiranthes australis; Thelymitra aristata, canaliculata, epipactoides, ixioides, longifolia, pauciflora. Mr. Braine has a most beautiful school garden, and his orchids are doing splendidly."

THE LATE COLONEL W. V. LEGGE.—By the death, at the end of last month, of Colonel W. V. Legge, R.A., at the age of 75, the Field Naturalists' Club has lost another of its honorary members. He was elected in September, 1889, in recognition of his researches in Tasmanian ornithology, but he never contributed to the Club's proceedings. He was a native of Tasmania, and entered Woolwich as a cadet, passing into the Royal Artillery. As a military officer he had many important works entrusted to him. During his military life he spent some years in Ceylon, and became an authority on the birds of that island.

SOME ACCOUNT OF THE JOURNEYS OF DR. GEORGE NEUMAYER IN VICTORIA, 1859–64.

By F. G. A. BARNARD.

(*Read before the Field Naturalists' Club of Victoria, 12th Feb.*, 1917.)

IT is fitting that we should sometimes devote a little attention to the work of the early pioneers of science in this State, and with that view I want to bring under your notice this evening the work of Dr. Geo. Neumayer in Victoria in the early sixties. Some twelve years ago I took an opportunity of drawing attention to the three wonderful journeys made by the late Baron von Mueller in the early days of this State, when he added so much to the botanical knowledge of the then colony of Victoria that those who came after have had few opportunities to secure further novelties.*

While Dr. Neumayer's journeys were made at a later period of the colony's history, when the country was not so sparsely populated, they were not made without some hardships, and though the brief accounts of them do not contain so much that is interesting to members of this Club as those of Baron von Mueller, still here and there we find notes which give some idea of the state of the country in those comparatively far-off times.

Of Dr. Neumayer's personal history I have but little knowledge. He was born in Bavaria in June, 1826, and was therefore about thirty-three years of age when he started on his first trip to Maldon, &c. He had, however, been in Victoria for some years previously. Mr. Alexander Sutherland, in "Victoria and Its Metropolis," in referring to the beginnings of the Melbourne Observatory, says Neumayer arrived in 1857, commissioned by the King of Bavaria to inaugurate a magnetic survey of Australia, but Neumayer, in the account of his fourth trip, says :—"On 11th October (1861) left camp (near Epsom) at 9 a.m. and passed through Sandhurst. . . Left immediately for Kangaroo Gully, about seven miles distant. It was here that I lived *eight* years ago when engaged in gold digging. It is wonderful what effect those eight years have had about the place. Where there were formerly green forests and a muddy creek, a thriving little township with innumerable chimneys is now springing up. It was scarcely possible for me to identify the spot where my tent had stood in those primitive days of my mining life, and where I used to give lessons in navigation to the numerous seafaring men who had then visited the goldfields in search of good luck, and, wearied and disappointed, were anxious to return to their original

* "Some Early Botanical Explorations in Victoria," *Vict. Nat.*, xxi., p. 17 (June, 1904).

vocation. In commemoration of those days I called this point 'Navigation Point.'" From these remarks it is quite evident Sutherland is wrong, and that Neumayer arrived in Victoria about 1853. Of course, there is the possibility that he returned to Germany, and was sent out again by his king. Sutherland goes on to say that Neumayer applied for a site in the Botanical Gardens reserve on which to erect a magnetic observatory at the expense of the King of Bavaria, but was refused: however, later the application was granted for a site on the Flagstaff Hill. The Geodetic Survey had at the time a small observatory, under Mr. R. L. J. Ellery (afterwards Government Astronomer of Victoria), in the Royal Park. These were afterwards combined, and Neumayer appointed director, Mr. Ellery retaining the direction of the Nautical Observatory at Williamstown, afterwards removed to the Domain. The Flagstaff Observatory occupied a small building in the western portion of what is now the Flagstaff Gardens, West Melbourne, adjacent to King-street, where in the early fifties the inhabitants of the growing city were wont to gather on Sundays, &c., to learn the latest news of the shipping in the bay, which was transmitted thence by signal flags. On Neumayer's return to Germany he was appointed nautical astronomer at Hamburg, where he died in 1908, in his eighty-third year.

The quarto volume from which I have taken the information I purpose placing before you to-night is entitled "Results of the Magnetic Survey of the Colony of Victoria, Executed During the Years 1858–1864," by George Neumayer, Ph. D., late Director of the Flagstaff Observatory, Member of Various Scientific Societies, and was published at Mannheim (Germany), 1869. From the preface it seems that Dr. Neumayer left Victoria before the money necessary for publishing his results had been voted, hence the publication in Germany. A paragraph is worth quoting. He says:—"A considerable portion of the book is devoted to the narrative of my travels. In it I give a short account of the manner in which the work was carried through, including the mode of travelling and living, as also a short description of the country passed through, its general features, water-courses, and mountain ranges. If such an abridged account as the diary I was in the habit of keeping while in the field must necessarily be replete with interest at the present time, it will naturally be still more so in future times, when the primitive state of the greater part of the south-eastern extremity of the Australian Continent will have passed out of recollection."

At the commencement of his work he used a springcart with one horse, for he soon found that the jolting and knocking

about to which his instruments were subjected in public conveyances would soon render them useless, and, although all possible care was taken, he had three or four upsets; consequently, in 1861 he procured a light American waggon and used two horses. By this method he was also able to avoid staying at hotels and stations, for, in accepting the hospitality of settlers, he invariably found that much valuable time was lost. The observations were carried on both by day and night, so that, being on his own, he could make the most of every opportunity that presented itself. The details of his methods of packing and transporting the instruments are interesting, and it is pleasing to note that, with the exception of one barometer and one boiling-point apparatus, they went through the whole of the survey without any breakage. When he reckons that he covered nearly 12,000 miles in his investigations it will be seen that great care must have been exercised.

The results of the survey may be seen on the map of Victoria (8 miles to the inch) issued in 1876, where "var. . ." alongside the name of a town, &c., indicates the determinations arrived at by Dr. Neumayer.

He found it unnecessary to employ more than one man on the journeys, though he had sometimes to make use of the aboriginals as guides, and on several occasions he was accompanied by friends as his own private guests. Thus Mr. Irvine and Dr. Beckler went with him through the Mallee into South Australia; Mons. E. von Guérard, the artist, and Mr. Jno. Twynham to Kosciusko; and Mons. N. Chevalier, the artist, on his fifth and tenth trips, to the Grampians and Gippsland.

He made several minor excursions in 1858 and 1859. His main trips (mentioning only the more important places) were:—

1.—June, 1859.—To Mount Tarrengower (Maldon) and Maryborough.

2.—November–December, 1859.—To Queenscliff, Ballarat, Camperdown, and Portland.

3.—September–December, 1860.—With the Victorian Exploring Expedition under Burke and Wills as far as the Darling; returned from Swan Hill *via* Mournpall, Pine Plains, Horsham, Skipton, and Meredith.

February, 1861.—A short trip to Cranbourne to examine the great aerolite.

4.—September, 1861–January, 1862.—To Kilmore, Bendigo, Pine Plains, Wentworth, down Murray to sea, Mount Gambier, Hamilton, Daylesford, Bacchus Marsh, &c.

February, 1862.—Another visit to Cranbourne *re* the great aerolite.

5.—April–June, 1862.—To Cape Otway, Camperdown, Casterton, St. Arnaud, Echuca, Kilmore, &c.

6.—October–December, 1862.—To Seymour, Beechworth, Wodonga, Kosciusko, Wodonga, Rochester, Bendigo, &c.
7.—January, 1863.—To Cape Schanck and French Island.
8.—March–April, 1863.—To Queenstown, Healesville, Benalla, Wood's Point, Jericho, Bunyip, &c.
9.—November, 1863.—To Clunes, Avoca, Maryborough, Castlemaine, &c.
10.—November, 1863–February, 1864.—To Dandenong, Traralgon, Mount Useful, Dargo, Port Albert, Bass, &c.

In reading the details of these trips one cannot help being struck with the number of thunderstorms mentioned, which seems to quite bear out the impression of the present day that thunderstorms are not nearly so prevalent now as they were some thirty years ago.

The notes of the trips do not contain so many references to natural history as one would wish, and I will therefore refer to matters of perhaps more general interest, and to the physical characteristics of the country passed through. Thus, with regard to the first trip to Maryborough, &c., the only remark worthy of note is that on the morning of 26th June, 1859, the thermometer registered 34.2 at 8 a.m. at Carlsruhe, and that the water-holes in the neighbourhood were bearing ice.

TRIP II.—From 5th November to 19th December, 1859.

After visiting Geelong and Queenscliff, returned to Melbourne, thence to Mount Blackwood and Ballarat. Visited the trig. station at Spring Hill, near Creswick, which had been erected by Mr. W. J. Wills (later of the exploring expedition). Left Ballarat by coach for Geelong at 5 a.m. on 4th December, 1859, a strong northerly gale blowing. The coach-wheels caught fire several times from the extreme heat. Returned to Ballarat and worked across plains to Camperdown; visited the lakes Bullen-Merri and Gnotuk. Thence on to Portland, returning by steamer to Melbourne with cart, horse, &c.

TRIP III.—From 3rd September to 19th December, 1860.

Dr. Neumayer was asked to accompany the Burke and Wills Expedition, which had left Melbourne on 20th August, 1860, as far as the Darling, in order to give some instruction and practice in the use of the various instruments taken. He left Melbourne on 3rd September, and caught up to the expedition near Swan Hill on the 10th. Reached the Darling at "Billbarka" on 26th. Near here Mr. Landells killed a fine carpet snake, *Morelia variegata*, which measured 7 feet 2 inches in length and $7\frac{3}{4}$ inches round. He said good-bye to Mr. Wills on the 29th, and returned to Kumpang

with Mr. Burke, from whom he parted on 30th. He says of Mr. Wills :—"This was the last time I ever saw this young man, he having perished, as is well known, on his return to Cooper's Creek. There can be no doubt but that, both practically and scientifically, he united all the qualities of an explorer, and that had he lived he would eventually have attained an equally high reputation in connection with the science of the Australian continent with that which he has attained in connection with its exploration and crossing." He remarks that, with the exception of some ravens, parrots, and cockatoos, and one Native Turkey, no animal life had been seen during the whole trip from Lake Paika to the Darling. On the return large tracts of country were inundated, and near Lake Paika saw plenty of Pelicans and Black Swans, also kangaroos and wallabies. On 30th October left for Lake Tyrrell ; found portions of lake dry, showing dazzling white, from salt. Met Messrs. Beveridge, and went to their out-station known as "Tiebullit." Whole country covered with mallee scrub. Mallee-Hens fairly plentiful. On 4th November reached Piangeil, on Murray. Went on to Euston ; on 16th started for Mournpall, where Mr. Curlewis lent him an aboriginal to accompany him across the desert country to Pine Plains, a distance of about 72 miles. The track went continually over sand-hills 170 to 256 feet above sea. Camped at Terreejee.* Next morning started due south, ascended hill, from which he had a view of endless mallee, here and there broken by groups of fine pine trees ; otherwise nothing else to be seen, and not a sound to be heard. The temperature rose at 1 p.m. to 86°. Had to clear track in many places. Camped at night without water. Started early next morning, but countless sand-hills, with mallee and spinifex, everywhere. Reached Mr. Cameron's, at Pine Plains, about 7 p.m. Horses quite knocked up. The geological formation sand, with the same Tertiary sandstone as we find at Brighton, near Melbourne. The Messrs. Cameron expressed great surprise at his having undertaken to pass through the country between the Murray and this place with a springcart. The first attempt of the kind, though a year previously a missionary had got through on horseback. The basin of Pine Plains bears a strong resemblance to an extensive lake, and he was informed that some years before, probably in 1852–3, the years of the great floods in the Murrumbidgee, it was filled with water. Went on to Albacutya, and reached Lake Hindmarsh on 24th—a refreshing sight, having seen nothing but sand and heath for the last three weeks. Proceeded to Antwerp, passing through flats covered with Box-trees, *Eucalyptus melliodora*. On 28th proceeded towards Horsham,

* Not far from the site of the present Ouyen.

Box and Red Gum predominating at Upper Regions. His route was then through Glenorchy, Ararat, Skipton, Rokewood, Meredith, Geelong, to Melbourne, which he reached on 19th December, 1860.

VISIT TO CRANBOURNE.—Attracted by a short paper read before the Royal Society of Victoria by Mr. E. G. Fitzgibbon, Town Clerk of Melbourne, on 4th June, 1860, giving some account of the Cranbourne meteorites (Trans. Roy. Soc. Vict., vol. v., Proceedings, page viii.), Dr. Neumayer had intended visiting the locality for some time, but was not able to do so until 11th–13th February, 1861, when he left town in company with Mr. Abel, a mineralogist. He found the meteorite to be almost embedded in the earth; however, by means of instruments he was able to say that its probable height was about 4 feet and weight about 4.3 tons (afterwards by actual weighing it was found to weigh 8,200 lbs., or 4.1 tons). A visit was afterwards paid to the smaller mass, about two miles east of the township (near the present Clyde), which was determined to weigh approxmiately 1½ tons. Mr. Abel purchased this mass, and arranged for its removal to town.

TRIP IV.—From 28th September, 1861, to 21st January, 1862.

On this trip, during which he proposed to visit the Mallee and the country on the South Australian side of the border, he was accompanied by Dr. Beckler and Mr. Irvine. Instead of the springcart he used for the first time an American waggon drawn by two horses. He proceeded by the Sydney road to Craigieburn, thence on to Kilmore. On 30th proceeded towards Lancefield, and ascended Mt. Williamson (now known as Mt. William); found its height to be 2,680 feet. On 2nd October, while at Kilmore, experienced a very severe thunderstorm. On 3rd left for Heathcote, ascended Mt. Ida (1,537 feet) on 6th. Severe thunderstorms on 7th and 8th. On 9th left for Bendigo diggings. Passed through Sandhurst on 11th. Thence to Myers Creek and Mount Korong. Here flies were intolerable, and they had great difficulty in keeping the horses quiet, though grass and water were plentiful. Thence to Wedderburn and Lake Buloke. Noticed large numbers of Black Cockatoos in the district. Thence to the Yarriambiack Creek. Could not get any fresh or salt meat at the stations passed through, so thought it very good luck when one of the party shot a young wallaby, and thus provided the first taste of fresh meat for six days. Passed on through Brim station, and camped in the Mallee. Searched for Mallee-Hens' eggs, but was unsuccessful. Reached Lake Corong on 23rd. Took a stroll round the lake with the intention of getting some ducks or herons, with which the neighbourhood abounded. This is

a fine sheet of water, surrounded with sand-hills covered with pine trees (Callitris). Near the river were Box trees and Red Gums. Next morning saw some fine Black Swans and White Cranes. Started on 25th for Pine Plains. On afternoon of next day reached Putjewallah—"wallah" is, in the native tongue, "porcupine grass," and the name of the place is intended to convey the fact that there is plenty of porcupine grass there, which is certainly very true. Reached Pine Plains at 11 a.m. on 27th, the temperature having been up to 100° during the day. Towards evening the wind died away, and steady rain set in. The night of 28th was very wet. It was now his intention to make for the junction of the Murray and the Darling, but he could not get anyone to go with him as guide—even an aboriginal who had spent all his life in the Mallee refused to go. He, however, determined to go as far as the Salt Lakes, about 40 miles north, which he reached at 4.30 p.m. on 30th, after a terrible journey. Obtained some Bronzewing Pigeons on the way. Next day started for Terreejee (a little to the west of the present Ouyen), but, after getting about half way, had to return for want of water and feed for horses. Got back to Pine Plains about 11 p.m. on 3rd November. Found the Messrs. Cameron had made all preparations to start in search of him the next morning. Left Pine Plains on 4th, and on 6th reached the Mournpall Lakes. He remarks:—"What a wonderful change of scenery we meet with here—from the mallee scrub and desert country to these splendid gum-trees—a change which was quite sudden to us, having made the latter part of the last day's journey in the dark." Next morning, soon after leaving camp, while going along a billabong, they caught sight of a strange animal making a great noise, and appearing to be of a very large size. None of the party had ever seen anything like it before. It looked like a seal, but, on approaching closer, it was found to be one of the Musk Ducks so frequent on the Mournpall lagoons. At first one could not help being reminded of the blacks' "bunyip." Reached Jamieson's station, on the Murray, on 10th. Here learned news of loss of Burke and Wills. Temperature at noon, 95.9°. Reached junction of Murray and Darling on the afternoon of the 10th. An excessively hot wind was blowing on the 15th; temperature, 97.2° at 3 p.m. About 5 p.m. an immense number of the Brown Hawks, so common in the Darling country, made their appearance near our camp, soaring above and about it; they came apparently from the north-east, against a strong breeze. Found it very difficult to make observations owing to the mosquitoes, it being impossible to protect the eyes and face while using the telescopes. Reached the pyramid marking the

South Australian boundary on 25th. The pyramid is constructed of limestone, such as forms the whole of the Mallee scrub country. His route was then down the Murray to the sea, and back towards Victoria along the Coorong. He reached Mount Gambier on 1st January, 1862, and, leaving on 3rd, reached Dartmoor on 5th, thence through Digby to Hamilton. Arrived at Dunkeld on 12th; ascended Mt. Abrupt on 13th. Left the township at 6.30 a.m; found the ascent much more difficult than it looked, so did not reach the trig. station (2,776 feet) till 10.45 a.m. Very hot, and could not find a drop of water. Descended into one of the fern gullies, where splendid water was obtained. Reached camp again about 6 p.m.; temperature, 94.4°. Next day thermometer registered 100.6° at 1.30 p.m. Left Dunkeld that morning under a regular hot wind, but obliged to camp after going 9 miles: temperature, 104.2° at 3 p.m. Reached the Hopkins at 9 p.m. Thence through Beaufort to Lake Learmonth, Jim Crow Ranges (Daylesford), Ballan, and Melton to Melbourne.

VISIT TO CRANBOURNE.—Left Melbourne on 20th February for Brighton to join the party of Mr. A. R. Selwyn, Government Geologist, who was proceeding to Cranbourne to witness the removal of the larger meteorite to the Melbourne Museum. With Mr. Daintree's assistance, made a series of magnetical and astronomical observations close to Mr. Bruce's house. Next morning operations were commenced to remove the meteorite, and about 10 a.m., he says, "the mass made its first motion since its arrival on our planet, and at the time the question naturally enough suggested itself how long ago this might have been. It must, however, remain unanswered, as there is nothing whereon to form even a conjecture." A few hours after it was placed on a waggon and was soon fairly on its way to Melbourne. It was for a time deposited at the Melbourne University, but was subsequently sent to the British Museum.

[A full account of the Cranbourne and other Victorian meteorites will be found in an article by Mr. R. H. Wallcot, F.G.S., in the "Memoirs of the National Museum, Melbourne," No. 6, April, 1915.]

TRIP V.—From 6th April to 25th June, 1862.

Left Melbourne on 6th April, 1862, with Mr. N. Chevalier, the artist. On 7th camped in a little valley on eastern side of Station Peak (You Yangs): thence across country to Winchelsea. About seven miles beyond had to unpack waggon, and use one horse for packing. Very rough journey through Otway Forest. Reached Cape Patton at 6 p.m. on 13th, and Apollo Bay next afternoon. Here the residents were surprised that they had got through by the route he had

taken. Reached Cape Otway at 6 p.m. on 15th. Left on morning of 21st across country to Colac, where they arrived on evening of 24th. Passed through forest country with blue gums and fern-trees; crossed an open grass-tree flat not far from the Barwon. Thence to Camperdown, Mount Elephant, and Mortlake. Saw immense numbers of Native Companions on swamp near Mount Shadwell. Thence to Hexham, Caramut, and Penshurst. Soon after leaving Caramut the country became finer and more wooded, covered with box-trees, lightwoods, and wattles. Thence he went to Dunkeld, at the foot of Mount Abrupt, as he desired to ascend Mount William from the south-west. Traversed along the Victoria Valley, and at 7 a.m. on 10th May started for Mount William, but did not reach top (3,825 feet) until 5.30 p.m. A heavy storm came on, and had to sleep out between the rocks, so did not get back to camp till nearly noon of the next day. Thence to Balmoral, Cavendish, falls on Wannon (Nigretta, 61 feet), and Wannon Falls (near Redruth, 81 feet). Thence to Grassdale, Merino, Casterton, Chetwynd, Harrow, Mount Arapiles, Horsham, Longerenong, Marnoo, St. Arnaud, Quambatook, Kerang, Mount Hope, Echuca, Rochester, Rushworth, Whroo, Mollison's Creek (Pyalong), and Kilmore to Melbourne.

TRIP VI.—From 16th October to 23rd December, 1862.

Left Melbourne for Wallan on 16th October, 1862. Next day started for Mount Disappointment, and reached top; camped with Mr. Petty, of Geodetic Survey. Determined height as 2,631 feet. Heavy rain and wind during whole of night. Thence back to Upper Plenty and on to Kilmore. Thence by Sydney road to Wangaratta. Considered the view at Glenrowan Gap the finest he had seen in Victoria. Proceeded to Beechworth, Yackandandah, to Belvoir (Wodonga). Went across Murray to Albury to get information as to route to Kosciusko. Advised to go by Mitta Mitta Valley to Omeo. Owing to the difficult nature of the country about to be traversed, left the waggon at Wodonga, and packed the instruments on horses. Proceeded *via* Yabba, Snowy Creek, Mount Gibbo (3,713 feet), Granite Flat, to Mount Hope (4,505 feet). From View Point they got their first view of Kosciusko, and M. von Guérard made a sketch of the scene. Thence to the valley of the Indi at Groggan's Station (1,615 feet). Started on the morning of the 18th November for the ascent of Kosciusko. Arrived at the limit of dwarf eucalypts (6,254 feet) at about 2 p.m. Obliged to camp on account of illness of companions from heat, fatigue, and altitude, though the ascent, compared with similar elevations in other parts of the world, was an easy one. In the evening an immense number of

Bogong moths appeared about the camp. Next morning the wind rose considerably, blowing from the north. Numerous snow-fields had to be crossed, and at 11 a.m. they reached the highest point (7,176 feet) in Australia,* the temperature being 54.5°. They then went to Snowy Peak, which is about forty feet lower, when they saw a storm approaching from the north-east, and had to hurry back towards their camp, some seven miles distant. Before reaching this disaster overtook the party, His man Edward, in trying to find some maps placed under some rocks during the ascent, lost his way in the blinding rain and snow, and could not be found, while his other companions (three) were so knocked up as to be a serious hindrance instead of a help to him. Evidently Neumayer was a man of great courage and ability, combined with physical strength and resource, as pages 77 to 79 of his narrative testify. The details of his experiences at Kosciusko cannot be told in a few words without losing in the telling, so must be omitted.† He got his party (with the exception of the man Edward) safely back to Groggan's Station, on the Indi, and then made for Omeo, which he reached on the 25th November. Thence to Cobungrah and Mount Hotham. He named a peak in the main divide between the Victoria (a tributary of the Mitta) and the Dargo rivers Mount Wills, after the unfortunate explorer, but the name has not been retained on our maps, the present Mount Wills being north-east of Hotham, and, I believe, named after a police magistrate of the district. In my paper before referred to (page 185) I contended that the present Mount Hotham was not the Hotham of Baron von Mueller. This is confirmed by the following passage on page 82 of Neumayer's narrative. He says:—"At noon we crossed the Brandy Creek, and at 2 p.m. a bald hill, from which we could see the Buffalo Ranges in the distance, to the right Mount Hotham, and to the left the highest range of Gippsland, and also Mount Buller. This bald hill I called 'Stormy Point' (6,106 feet), as I had been told it was hardly possible to cross it without being assailed by a gale of wind." This description fits exactly the present Mount Hotham, often called "Baldy," officially recorded as 6,100 feet above sea-level, while his Hotham would be the present Feathertop, about eight miles to the right as he approached from Omeo. Camped at head of Little River (Kiewa ?). Next day proceeded along the Razorback to Mount Hotham, and

* As the result of numerous surveys, the height of the highest portion of Kosciusko is now given as 7,328 feet.

† Those to whom Neumayer's report is inaccessible will find two interesting accounts of visits to Kosciusko, with a map of the district, by Mr. A. E. Kitson, F.G.S., who also had his trials, in the *Victorian Naturalist* for October and November, 1905, vol. xxii., pp. 89 and 107.

ascended to summit (6,414 feet). Neumayer's heights were, of course, all barometrical. Feathertop (his Hotham) is now given as 6,303 feet. They then descended the ridge to the junction of the Feathertop Creek with the Ovens—a descent of nearly 4,500 feet, which was done in two hours. Thence to Bright, and on to Yackandandah, reaching Belvoir (Wodonga) at 11 a.m. on 6th December. Went at once to police station to see if waggon was safe, and to ask if any news of Edward, but could hear nothing of him. Sat down to dinner, and had hardly done so when the lost man made his appearance. It appears that when he missed his way on Kosciusko he got into the valley of the Thredbo River, thence to Kiandra, and worked his way to Albury, where he arrived on the same morning that we reached Belvoir (Wodonga)—"a strange coincidence when we consider that we both had travelled upwards of 300 miles, in quite different directions, since parting on Kosciusko." He returned to Melbourne by way of Chiltern, Rutherglen, Wahgunyah, Cobram, Caddandra, Shepparton, Rochester, Piccaninny Creek, Bullock Creek, Serpentine Inn, Sandhurst, Castlemaine, and Gisborne.

TRIP VII.—From 22nd to 31st January, 1863.

Left Melbourne on 22nd January for Schnapper Point (Mornington), thence to Dromana. Ascended Arthur's Seat (1,016), and on to Cape Schanck, arriving at noon on 25th. Thence to Mr. Barker's station, Stony Creek, and Sandy Point, on Western Port Bay. Went by boat across to Tortoise Head, on French Island. Returned to Sandy Point. Returned to Melbourne *via* Cranbourne. He remarks:—"When passing McKaye's farm I could not resist the temptation of paying a flying visit to the spot from which, twelve months ago, we removed the famous meteorite. The place now looks very deserted, a simple water-hole alone marking the memorable spot." Reached Melbourne on the 31st.

TRIP VIII.—From 9th March to 16th April, 1863.

This journey being principally through mountainous country, he took only horses, leaving Melbourne for Queenstown on the 9th March, 1863, where he arrived *via* Eltham and Kangaroo Ground the next day. Thence he crossed over One Tree Hill (1,014 feet) and reached New Chum Creek (now Healesville) the next afternoon. Here he determined to ascend Mount Juliet in order to test the value of a guide he had engaged to take him across the Dividing Range. The native name of Mount Juliet was given to him as Tingolargen. After getting off the track for some time, and having to camp out for the night, he eventually reached the top (3,574 feet), where a heavy thunder-

storm came on, and made the descent extremely difficult. From these experiences he came to the conclusion that the guide would be of little value, so on his return to New Chum Creek he arranged with two aboriginals to act as guides, but Mr. Green, who had charge of the aboriginals in the district, objected; however, he at last gave his consent, and a start was made along the Jordan track on the 18th. As no one had ever been across the ranges on horseback it was somewhat difficult to decide what route to take. The weather was very wet, and "brought with it one advantage, however—it was very easy to capture any number of Lyre-birds, as they were scarcely able to raise themselves from the ground." Much time was spent in clearing a track, and on 19th started up the range, which at first was very steep; however, he reached an old deserted "blacks' camp" (1,678 feet), where they rested, and recommenced clearing a track in the afternoon, the leeches being very troublesome on account of the recent rain. On the 20th started early and by 10 a.m. had reached the summit of the Dividing Range (1,968 feet). (This ascent was doubtless made somewhere in the vicinity of the now well-known Blacks' Spur road, and the deserted blacks' camp is probably the origin of the name given to the road.) Descended on a pretty easy incline into the valley of the Acheron, the country looking strikingly different from the southern slope of the range. Scarcely any scrub, the timber consisting largely of peppermint and myall. He then proceeded down the Acheron valley, remarking that the Acheron is a fine stream, and should be well adapted for rearing trout. The name, he says, is derived from the native word "Agaroon." On 22nd he says:—"With the exception of a wombat, which we killed last night, we have had no meat for the last few days; I was therefore very agreeably surprised this morning at hearing the crowing of some fowls close to us, which had apparently strayed from the old missionary station, and it was not long before we had a fine dish of rice and fowl before us." Thence he went on to the Goulburn, striking it at Sloane's Punt (now Molesworth). Then to Merton and across the Strathbogie Ranges to Longwood. Along Sydney road to Benalla. Then up Holland's River valley to Mansfield, and on to Jamieson. Passed through Gaffney's Creek, and at mid-day reached the Germans (3,405 feet), from whence there was a fine view of the Gippsland mountains and of Mount Buller, and thus had "an opportunity of giving to this latter mount its proper position, for it yet appears on the Government map as being on the southern side of the Dividing Range, which is certainly wrong." Reached Wood's Point about mid-day on 9th April—"Found everybody very busy in fixing the new township; new wood buildings springing

up on all sides." Reached top of Divide (4,000 feet) at noon, and descended by an easy track through a fern gully to Jericho (1,894 feet) in the evening. Thence he went on to the Springs (3,866 feet), where he made inquiries about the track to Buneep, and was informed that distance was fifty miles. This estimate was too little by at least twenty, and got the party into difficulties before reaching the Gippsland road. He reached the junction of the tracks to New Chum (Healesville) and Buneep safely, and says :—"We appear to be now emerging from the dead timber country, the forests here being in a far less decaying state than higher up, towards the Dividing Range. It is altogether a strange appearance which is presented by this belt of dead timber, occurring as it does almost at the same level all through the mountainous country. Several scientific men of great experience attribute it to the ravages of a caterpillar. This may be, but it is equally certain that these giant trees perish at an age when they have lost the tenacity necessary to resist the effects of low temperature and frost. A great distinction, of course, must be drawn between sporadic cases of dead trees and such where the green tree forms the exception among thousands of dead trunks." Camped at the junction (3,315 feet). Next day continued on through numerous fern gullies, then suddenly descended into the valley of the Yarra (1,365 feet) (In the light of recent surveys this was probably the head of the Thomson, previously thought to be the Yarra.) The track was now very difficult, blocked by much fallen timber, and so little grass for the horses that they were rapidly losing strength. On the 13th they were still in difficult country, undulations of 400 and 500 feet being frequent. As there was no grass, and he had used up all the horse feed, he was obliged to stay up all night and make dampers for the horses. Next morning, about 10 a.m., having just ascended a steep hill, one of the horses fell down and refused to move, so it had to be abandoned. (This circumstance is probably the origin of the name of Mount Horsfall, a peak in the Divide between the Yarra and Gippsland, and which has by some been attributed to a similar mishap to the late Professor Kernot.) He hurried on, thinking he was now near Buneep (Bunyip), and could return for the horse next day. At last, about 6 p.m., he struck a nice grass flat near a good stream of water, and decided to camp, having covered about 28 miles for the day. He reached Buneep at 10 a.m. the next day (15th) and returned to Melbourne by coach, leaving the horses with Edward at Buneep to get up strength again, as he proposed to return shortly and resume the trip easterly into Gippsland. He found, however, it was too late in the season to make such a journey.

TRIP IX.—From 13th to 21st November, 1863.

Left by train for Ballarat, where he had an opportunity of seeing the great improvement in the town since his first visit in 1859. Thence by coach to Creswick and Clunes. Selected Mount Beckwith (from which there was a fine view of surrounding hills) for a series of observations. Went on to Amphitheatre, Elmhurst, and Avoca. Thence to Maryborough, Dunolly, Bet Bet, and Maldon, to Castlemaine. On 21st visited hill on which the column in commemoration of Burke and Wills had been erected, and made observations. Then drove to Harcourt and ascended Mount Alexander, the view from which, owing to its central position, he considers one of the finest he had seen in Australia, so many prominent mountains and townships being visible in every direction. Returned to Melbourne by the last train.

TRIP X.—From 28th November, 1863, to 24th February, 1864.

The weather during early part of November was very unfavourable, so he had to delay his departure till the end of the month, and, as it was barely possible to penetrate Gippsland with horses, he had, of course, to do without the waggon. Reached Buneep the following afternoon, but too cloudy also on next day to make observations. Proceeded on by Gippsland road, which was very bad, and reached Redhill Creek (some miles north of the present Warragul) safely. Next day, 3rd December, he went forward to see how the track looked, and came to a spot where there was hardly room for the horses to pass between numerous deep holes. Skeletons of horses were showing in many of the holes, giving evidence of the difficulty of passing the place. He got four of his horses past this awkward spot, but Jimmy, who was the most heavily laden, slipped and fell into one of the deepest of the holes, disappearing completely, with the exception of his head. Had to step in and unload him, and eventually got him out. Lost several hours through having to clean themselves and their belongings from the mud. Arrived at Shady Creek at 1.30 p.m. Reached Moe Bridge about 11 next morning, and had a fine view of Mount Baw Baw. Passed through Traralgon and camped at Rosedale on the 6th, without having made a complete set of observations, owing to the wretched weather. From Rosedale he travelled *via* Heyfield and Seaton to Donnelly's Creek; from there he could see the summits of the Baw Baws, still covered with snow. As there was every appearance of bad weather, he made preparation for it. About 9 p.m. very heavy rain and wind set in, the cold being also so severe that he had to build up huge fires in order to keep themselves and the horses warm. The rain and wind continued for three days,

but he managed to get to the top of Mount Useful on the 17th *; however, owing to the unfavourable weather, could not see any distance. He then went across country to the Macallister, and after very severe travelling reached Glenmaggie on the 3rd January. Thence he went to Bairnsdale, arriving on the 7th. Remarks that at present it consists of only a few houses, but, with the opening of the lakes to navigation, it will probably develop into one of the most important places in Gippsland. He then left for the Tambo, with the view of reaching the Wentworth diggings and Dargo, which he accomplished on the 14th, and enjoyed a fine view of the ranges from a neighbouring hill. Here he was pleased to have a meeting with Angus M'Millan, the discoverer of Gippsland. His dog had killed a wombat, and the joint of wombat which he set before M'Millan was pronounced by him as the best he had seen prepared. M'Millan accompanied him next day to Providence Ponds, passing Iguana Creek on the way, where, he remarks, there is some fine country and timber. Reached Lake Wellington on 19th, and crossed over to Seacombe. On morning of 21st camped at Giffard's farm, on Merriman's Creek. Soon after leaving this place his dog was attacked by a large Eaglehawk, but the bird departed before he could get his gun out. Reached Tarraville and Port Albert on the 23rd. Got directions as to the road to the Tarwin, and started *via* Alberton. Had a fine view of Mount Singapore and the mountains on Wilson's Promontory from the Muddy Creek (Agnes River). Thence to Franklin River; proceeded along track to junction of tracks to Yanakie Station and Black's (Tarwin). Near this spot his dog unfortunately took a poisoned bait and died in a few minutes. He says there was nothing to do but "to prepare an honourable grave for my faithful companion of so many years, who had escaped all the perils of my various journeys, to fall a victim to culpable negligence a few days previous to my concluding my travels in Victoria." Camped at Sandy Point (Shallow Inlet). Early on 30th rode to Cape Liptrap, and got a splendid view across the ocean. Then started for Mr. Black's station on the Tarwin, where they arrived at 4 p.m. Reached the Powlett River on 1st February, which he crossed, and was preparing to take his observations on a sand hummock when a large brown snake erected itself, blowing and hissing at him, but he soon despatched it. He went on through the Bass country and Corinella to Cranbourne, thence to Melbourne on the 4th.

It has been difficult to condense Dr. Neumayer's narrative of 112 quarto pages into the compass of a paper suitable for a Club

* This period of wet weather corresponded with the occurrence of the great flood in the Yarra, at Melbourne, in December, 1863.

meeting, and, without giving much detail, make it interesting, while at the same time not losing sight of the immense amount of ground he covered. When my paper appears in print it will be much easier to follow if a map of Victoria is at hand to which reference can be made.

Of course, many parts of the country he passed through, then uninhabited or used only as squatters' runs, are now occupied by thriving towns and smiling wheat-fields. To properly judge of the courage and energy of this fine man, it is necessary to read the full text of his report. The work he did has, I believe, stood the test of time, and he must rank as one of those great scientific pioneers to whom Victorian scientists are indebted for the solid foundations they laid so truly in the fifties and early sixties.

ADDENDUM.—A paper, which I have been privileged to see, entitled "Our Observatory: the Story of its Establishment," by the Rev. C. Stuart Ross, M.A., which includes an interesting account of Neumayer's life, both in Australia and Germany, is now in the press, and will appear in the March number of the *Victorian Historical Magazine.* It confirms my surmise that Neumayer returned to Germany after a first visit to Australia. Some account of the Geodetis survey of Victoria, mentioned in the earlier part of this paper, taken from "Victoria and its Metropolis," may be interesting. It was commenced in 1858, on the advice of Mr. C. Ligar, the then Surveyor-General. A meridian line, starting near the Port Melbourne station, was run north through Flemington, Kilmore to near Wyuna on the Murray. On this meridian the intersection of the parallels of latitude 37 and 37·45° were determined, and the parallels themselves laid out to the westward for some distance, and on these parallels other meridians were laid out north and south as required. This survey was in charge of the late Mr. R. L. J. Ellery, afterwards Government Astronomer. In order to facilitate the measurements along these meridians and parallels, and to assist in connecting with earlier surveys, a trigonometrical survey was also instituted, and carried on simultaneously. Under this survey the well-known cairns on such prominent hills as Mt. Dandenong, Flinders Peak (You Yangs), Mt. Macedon, Arthur's Seat, Mt. Juliet, &c., were erected and their positions determined by a long series of observations.

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