PAPERS & PROCEEDINGS

OF THE

ROYAL SOCIETY

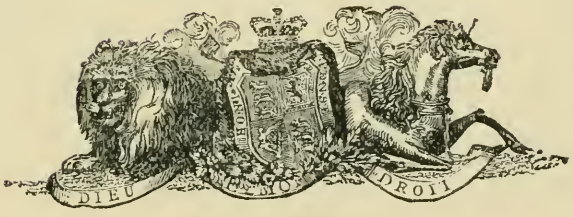
OF

TASMANIA,

FOR THE YEARS

1900-1901.

(ISSUED JUNE, 1902.)



Tasmania:

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Royal Society of Tasmania.

ABSTRACT OF PROCEEDINGS, MAY, 1900.

A meeting of the Royal Society of Tasmania was held in the Art Gallery on Thursday, May 10, 1900, His Lordship the Bishop of Tasmania, Vice-President, presiding. An apology was received for the absence of the Hon. Sir James Agnew, K.C.M.G., M.D. (Senior Vice-President). This being the opening meeting of the present session of the Society, the Bishop gave a brief resume of the 1899 session's work.

At the commencement of a new session it may be as well if I put before the members of the society a few facts regarding the Royal Society and the Museum during the last 12 months, and then pass on to speak of our immediate hopes and intentions.

The Museum is constantly receiving valuable additions. Only the other day by the action of Mr. Morton a gift was received of English birds, some 173 specimens, beautifully set up.

We are met in the picture gallery, and it will interest you to know that one group of friends has given us pictures in the last year valued at £1,200. Others, too, have been given, making seven paintings in all.

Even these few facts will indicate how good a case we have when we ask the Government to fulfil their old promise to give us additional accommodation in the new wing, which has become absolutely necessary to us. The estimate of £4,000 was passed by both Houses in the year 1890, but in the time of financial depression it was impossible to claim it, and it lapsed. The Government has expressed itself entirely favourable, officially, to the estimate being once more passed. It will be fresh in your memories also that the Antarctic expedition was welcomed by an enthusiastic audience in the Town Hall under the auspices of the Royal Society. I think we may say that everything that could be done was done by our energetic secretary to receive the expedition fittingly. We are promised an Antarctic night by Mr. Morton as soon as the history of the expedition is made public, and I fancy we shall have to adjourn to the Town Hall if we are to find room for our audience.

I now turn to the future. Two sections will be at work, besides the central meetings of the society, the medical and historical sections, which, of course, feed the more important meetings. Who will take up the burning scientific question of the day? Shall it be the medical session or the whole society?

The most important subject I have kept to the last. It is known to most members that last January it was agreed in Melbourne that the next meeting of the Australasian Science Association should be held in Hobart. Our reputation for making such gatherings successful is, I regret to say, painfully high. All we can hope to do is to preserve our level. No effort will be spared to do this.

In the face of that coming meeting, would it not be possible to have the new wing of the Museum ready, or nearly ready. There is a work, too, which we may hope to present by that date. You are aware that we have one distinguished botanist among our members—Mr. Rodway—whose work is held in the highest esteem among his brother workers. Mr. Rodway has at length finished his great work on the "Botany of Tasmania," a work which is far ahead of anything that has yet appeared, and we are glad to be able to state that the Government will probably agree to publish it. It will be a noble gift to present to the association at its Hobart meeting in 1902. We have, however, another delightful prospect. It seems that the British Antarctic Expedition, which will, of course, be fitted out with the greatest care, and be as complete as human skill can make it, may be expected to visit Ho-

bart at the close of 1901, before proceeding south. Surely we ought to make every effort to hold the Association meeting at such a date as to enable all scientific men in Australasia to meet here to unite with us in sending off the expedition with the combined good wishes of all the scientific societies in this hemisphere. To compass this end we ought to be prepared. if necessary, to hold the association meeting in December, 1901, rather than in January, 1902.

We can depend upon Mr. Morton to watch events, and to inform us in good time what we should do.

We will now proceed to the business put down for this evening.

New Members.

Dr. D. H. E. Lines, Professor E. G. Hogg, M.A., and Mr. F. E. Burbury were elected members of the Society.

Paleontological Papers.

Mr. R. M. Johnston, F.S.S., read a paper "On the Further Notes on Permo-Carboniferous Fossil Cliffs at Darlington, Maria Island." "Observations regarding the discovery of a portion of a Fossil Reptile, found on the North-West Coast."

The papers were illustrated by lantern-slides, which the lecturer announced that he owed to the courtesy of the Secretary, Mr. Alex. Morton, who recently visited Maria Island. The slides were prepared by Mr. Beattie.

Aerial Navigation.

Mr. E. O. Litchfield read an essay on the history and present position of aerial navigation, particularly with reference to a gas and screw vessel now in preparation. The lecturer explained that the invention he had to describe was a combination of the gas and screw principles. The field or aerostation had been highly attractive to experimental scientists for a long time, and particularly during the past century. The problem was—how to design vessels heavier than air which could be driven through the air? As concerned the lifting of heavy weights by gas, many satisfactory and convincing experiments had been made by aeronauts. The difficulty now lay in constructing a vessel so compact and substantial as to travel through the air. The vessel of which he had to speak would carry just sufficient hermetically-sealed gas to bear the weight of the structure. Ascent and descent would be accomplished by the upward or downward pressure of suspensory screws. Mr. Litchfield illustrated his paper with a number of interesting lantern pictures.

A vote of thanks to Messrs. Johnston and Litchfield brought the meeting to a close.

J. B. WALKER, F.R.G.S.

JUNE, 1900.

The monthly evening meeting of the Royal Society was held in the Art Gallery of the Tasmanian Museum on Tuesday, June 19, Mr. Thos. Stephens, M.A., F.G.S. (vice-president) in the chair.

Apologies.

The secretary read apologies for absence from Sir James Agnew, the Bishop of Tasmania, and the Speaker of the House of Assembly.

Election.

The following were elected members of the society:—Messrs. G. E. Moore, M. Inst. C.E., H. J. Daniels, C. B. Petersen, and W. O. Wise.

The Late J. B. Walker.

The Chairman (Mr. T. Stephens) said he had to call the attention of those present to the handsome portrait of the late J. B. Walker, which had become the property of the society through the kind instrumentality of Mr. Beattie. Mr. Stephens became acquainted with Mr. Walker in connection with a prize won by that gentleman for a poem written in the early sixties. A few years later he became acquainted with Mr. Walker personally, and he knew him from that time to the end. Mr. Walker was prominently known in connection with many good works, and his connection with the Royal Society was intimate and singularly honourable. The society was, therefore, deeply indebted to Mr. Beattie for his kindly and valuable gift.

Colonel Legge, R.A., read a paper on "The Birds of Australia: Birds, Nests, and Eggs," for Mr. A. J. Campbell, of Victoria. The paper was illustrated by a very interesting and complete series of lantern slides.

"The Falls of Niagara as a Geological Chronometer," by Professor E. G. Hogg, M.A. The lantern slides shown were interesting, and the paper contained much matter of scientific value. Opening with some remarks tending to show how profoundly the natural drainage system of a country was modified by the country's glaciation, Professor Hogg proceeded to the description of the glaciated area of the United States, particularly as to the locality of the Great Lakes and the immediate neighbourhood of Niagara. The original ice-sheet here, he said, was estimated roughly to have had a thickness of about 30,000 feet. Various details were given showing the difference that has resulted in the contour and formation of the Great Lakes region since pre-glacial times, and so the broad influences which resulted in the making of Niagara were traced. The lecturer closed with some account of the condition and history of the Falls—whose actual age is variously estimated by opposing geological schools at from 7,000 to 30,000 years.

The meeting closed with votes of thanks to authors of papers.

JULY, 1900.

No meeting.

AUGUST, 1900.

The monthly meeting of the Royal Society was held at the Museum on Monday August 13, His Excellency the Administrator, Sir John Dodds, C.J., presiding.

Before the proceedings commenced Mr. T. Stephens, M.A., F.G.S., speaking as a vice-president, said that, on a former occasion, the society had congratulated His Honor, Sir John Dodds, on the distinctions conferred upon him in recognition of high services rendered in the course of a long public career. Any honourable distinction of this kind reflected credit not only on the recipient, but also on the country to which he belonged, and the institutions in whose welfare he had personally interested himself. On behalf of the Fellows of the Royal Society, of which His Honor would now become President, he desired to tender their hearty congratulations on the rank and position he was again about to assume as Administrator of the colony. (Hearty applause.)

Sir John Dodds, in reply, said:—Mr. Stephens, Ladies and Gentlemen,—I am taken completely by surprise. I did not know that I was to receive, nor did I expect, this further mark of your kindness. It adds to the many obligations under which my fellow-colonists have placed me, and I thank you very sincerely for the generous approval that you have given to the more than kind words in which Mr. Stephens has offered your congratulations. In whatever office it has pleased the people of Tasmania to place me, I have endeavoured to discharge the duties of that office to the best of my ability, and I most gratefully acknowledge and appreciate the encouragement and assistance that I have invariably received from the people amongst whom I have lived the greater part of my life. (Warm applause.)

Apologies were received from the senior vice-president, Sir James Agnew, K.C.M.G., and Mr. A. G. Webster, regretting that, owing to ill-health, they were unable to attend.

NEW MEMBERS.

The following gentlemen were elected members of the society:—Rev. W. R. Cunningham, Messrs. Thos. Bennison, Wm. Burn, C. B. Target, C.E., of Hobart, and Mr. W. J. Norton Smith, of Burnie.

PAPERS.

MAGNETIC SURVEY OF TASMANIA.

Professor E. G. Hogg, M.A., of the Tasmanian University, read a paper, which was illustrated by some specially-prepared lantern slides, entitled "The Proposed Magnetic Survey of Tasmania."

The writer said the discovery of the approximate position of the Southern Magnetic Pole by Sir James Ross, in 1840, was largely instrumental in causing Hobart to be selected by the Royal Society of London as the station of observation of the scientific expedition sent out under its auspices in the early forties, to investigate magnetic phenomena in this part of the Southern Hemisphere. Detailed magnetic observations were carried out in Hobart under the superintendence of Lieutenant Kay, R.N., from 1842 to 1850. During this period both the magnetic dip and the horizontal intensity passed through minimum values, though not in the same year, while the magnetic declination was found to be steadily increasing at the rate of about 1½min. per annum. Dr. Neumayer, who had been investigating magnetic phenomena for some years in Victoria, and had carried out a magnetic survey of that country, visited Hobart in 1868. He found the magnetic declination of Hobart to be 10deg. 25min. 9sec. E., a value not far removed from that calculated from Kay's observations on the rate of variation. The next determination of the declination was made by His Excellency Sir J. H. Lefroy, in 1881. He found it to be 8deg. 49min. E., or, rather more than 2deg. in defect of the value computed from Kay and Neumayer's observations. The explanation of this difference is probably to be found in the fact that, shortly after Neumayer's determination of the declination, it attained its maximum easterly value, and has since that time been slowly moving towards the west. Since 1881 no further observations on the magnetic elements of Hobart appear to be available, and some considerable uncertainty exists as to their value at Hobart, and their annual rate of change. Absolute magnetic observations have been carried on without intermission in Victoria since 1858. During each of the past two years the New Zealand Government has voted the sum of £500 for the purposes of the magnetic survey of that colony,

and considerable progress has been made. During the coming summer Professors McAulay and Hogg propose to begin a magnetic survey of Tasmania, a set of instruments of the latest pattern having been placed at their disposal by the University of Sydney through the kind offices of Professor Pollock. They intend to limit their work this summer to the absolute determination of the magnetic elements at the following selected stations:—Hobart, Port Esperance, Port Davey, Strahan, Mt. Lyell, Wynyard, Longford, Scottsdale, St. Helen's, Spring Bay, and possibly Oatlands. From the observations made at these widely distributed stations they hope to be able to construct a rough magnetic map of Tasmania, showing the approximate positions of the lines of equal magnetic declination, dip, and horizontal intensity. To ascertain the annual rate of variation of the magnetic elements it will be necessary to re-determine their values after the lapse of a few years. In order that their work may be easily available to future observers, and may also be of assistance to surveyors. Professors McAulay and Hogg have applied to the Government for a grant of £150 to enable them to erect suitable permanent marks on the sites of observation, and to defray other expenses incidental to the survey. If this grant of public money is made it is proposed that the work of the survey shall be carried out in co-operation with the Surveyor-General's Department. In addition to the magnetic observations at the selected stations, it is intended to lay out at each place the true geographical meridian, and to determine the bearings relative to the site of observation, of any prominent landmarks, etc. A detailed description of each site of observation will be lodged with the Surveyor-General.

The paper dwells briefly with the importance to navigation and surveying of a correct knowledge of the magnetic declination. It points out that if the rate of variation of the magnetic elements of Tasmania were once determined it might be possible, by examination of the magnetic records of Victoria and New South Wales, to learn approximately the value of the elements in Tasmania in the recent past, and by connecting the present observations with those made in the past form a fairly accurate conception of the magnetic history of Tasmania during the last 60 years.

A letter was received from Mr. Counsel, Surveyor-General, indicating that he supports Professor Hogg's views.

The Treasurer (Hon. B. S. Bird) said he felt that the work proposed to be undertaken was very important, and Ministers had placed £150 on the estimates towards the cost of this magnetic survey, so important in connection with navigation and scientific surveying. (Applause.) He moved a vote of thanks to Professor Hogg, which was very heartily accorded.

Mr. Stephens, in reference to Professor Hogg's mention of the record which he had sent him of the magnetic variation in 1839, said that he had received the record from the late Mr. Molesworth Jeffrey, who was with Sir John Franklin when he took the observation at Lachlan, near New Norfolk. This was in 1881, when he (Mr. Stephens), being engaged on the revision of the old map of Tasmania, had reported to the Government that, if there were much longer delay in reconciling the survey system of the colony, which was based on magnetic lines, with the true bearings established by the trigonometrical survey, inextricable confusion would be the result. The matter was taken up by Sir Henry Lefroy, and a reform of the survey system initiated by the Government, which, though interrupted by a change of Ministry, is now progressing as satisfactorily as is possible under existing circumstances. In connection with Professor Hogg's mention of causes of local variation Mr. Stephens cited a remarkable instance of the deflection of the compass needle, which he had noted on the summit of a peak in the Midland district, and recommended Rocky Cape, Badger Head, and a point between Bridport and Cape Portland as being, with Port Davey, the best sites for magnetic observations in Tasmania, so far as freedom from elements of local disturbance is concerned.

MUSEUMS AND ABORIGINALS.

The Bishop of Tasmania read a paper entitled, Notes on a Visit to the Museums at Perth and Adelaide, with special reference to the Blacks of West Australia, as follows:—

"During a recent visit to West Australia and South Australia, I found time to visit the Museums, and to discourse with the curators. I think a few observations will be of interest.

"I was struck here by the immense

amount of work still to be done in many departments of science. The botany of West Australia has been apparently well studied, but there are fields of science virtually unexplored—shells, insect life, and, perhaps fauna; for these a great deal has to be done. But there is yet another department needing attention, and that without delay. The crying need in West Australia seems to be for a small body of men who would study the habits and customs of the aboriginals of the colony. In no colony in Australia are they so numerous, and in no colony have they been so little studied. The reason is obvious. For the last ten years this colony has been engaged in the tremendous task of providing the resources of civilisation for a quadrupled population, and before that period the colony was small in number, and oppressed with the state of too much land area. The Government, however, is most generous to science, as a yearly grant now raised to £4,000 to the Museum in Perth testifies; and there is no reason now why this pressing duty in regard to the natives should not be taken in hand effectively. I put the question, indeed, to Dr. Stirling, in Adelaide, whether there was still room for a work on the Blacks of West Australia commensurate with such books as those of Roth, of Spencer and Gillen, and of the Horn Expedition. Dr. Stirling answered in the affirmative without hesitation, adding that, though the Australian black all through the continent is the same person, yet the effect of a long western coast line of thousands of miles with the food it gave, and the habits it fostered, must make us look forward with the deepest interest to the work on the blacks of this vast region, which has still to be written; and as the native population tends to diminish, I ventured to urge the question in Perth, suggesting, indeed, that steps should soon be taken to found a Royal Society, which does not at present exist. I went further and reminded them of the meeting in Hobart of the Science Association in 1902, and I even proceeded to suggest that West Australia might make a bold move, and try, at all events, to induce the Australasian Association to visit Perth in 1904.

"It seemed also a fitting opportunity to remind the Museum authorities and the Public Library, that possibly large quantities of historical material might soon be lost or removed to Sydney or Melbourne, unless they turned their attention to old records of the colony.

"I now proceed to give some account of the blacks of West Australia, their numbers, and the steps taken for their welfare. Two years ago the blacks were under the charge of an Aborigines Board, but this has now become a regular Government department, and in 1899 the first Government report under the new management was published, Mr. Prinseps being the Protector of the aborigines. Last year nearly £11,000 was spent by the Government on the natives, chiefly in the distribution of food to the aged and infirm, and in their own camps, blankets also forming a large item. There is a travelling inspector, who understands the dispensing of simple medicines. As to the numbers of natives in the colony, the following is the latest calculation:—Employed by settlers, 4,740; in receipt of relief, 868; self-supporting, 6,690. This makes a total of 12,300, exclusive of what may be called wild blacks, chiefly in the Kimberley district. They are numerous there, and of fine physique. The total number of blacks now in the colony of West Australia is computed to be 30,000. It will be of interest also to note what is the number in other colonies. Apparently the following are the latest figures:—New South Wales, pure blacks, 3,230; New South Wales, half-castes, 3,661; Queensland, computed, 20,000; Victoria computed, 479; South Australia (in the Northern Territory chiefly), 20,000; in all, 80,000 in the continent of Australia.

"It will be noted that the colony which has the largest number of this interesting race has still its scientific work to do among them. Indeed, up to the present there has been no regular system for photographing or measuring the natives at the prison at Rottnest, although for years blacks have been kept in confinement here, brought from all parts of the colony. I believe this first step is now to be taken. With regard to areas of land reserved for blacks, I note that 890,000 acres are put aside for this purpose, one block in Kimberley being 700,000 acres. By far the largest portion of this reserved ground is simply left for the blacks to roam over, and they are undisturbed in it. There are, of course, a good many questions of extreme interest which have to be faced by the Government.

"I believe there is no doubt that public opinion is becoming more and more directed to the welfare of the native population. There is much less chance of their ill-treatment, and cases of injury are more quickly detected, and the offenders punished. A great many of the blacks, chiefly in the proximity of a white population are becoming dreadfully and distressingly diseased, and owing to their nomadic habits and their impatience of regular control in hospital, it is hard

to know how to grapple with some of the worst forms of mischief. Even the distribution of blankets has its evil side by inducing the blacks to give up their native habits, which were better suited to their condition. Again, when a district becomes settled by white men some of the wisest of the settlers have come to see that it is their duty to provide work and food for all the blacks in that district, since the game has begun to disappear, and it is a fact, I believe, in some places that work is found for all the blacks, whether their aid is really needed or not. There is a conflict of opinion also whether the system of contract labour is the best. In this case, the native is bound to the settler for a certain period, and may not leave him, whilst the employer is bound to treat his black servants kindly. But it is also found that if a boy does run away, he is never any good afterwards if he is forcibly brought back, and if a simpler form of contract were possible with this nomadic race some think it might be better for both parties.

"It is well-known that there are several establishments under more than one religious denomination where the natives are cared for; New Norcia, under the Roman Catholics, is well known throughout Australia. The Swan River settlements, under the Anglican Church, are also doing good work; and there are others. Two questions of general interest are worth mentioning. First, the problem of the half-caste population. In some districts this class is increasing, and is at present uncared for to any great extent. The other problem is a very perplexing one, namely, what to do with native girls, brought up from childhood in such a mission as that on the Swan River. At present they are sent into the world, at 16, with only often very sad results, indeed. It looks as if native young women of this age are quite unfit to be turned loose on society, and really need another establishment, where they could be usefully employed till 25 at least. Enough has been said, I think, to show what a large field of work presses for workers in West Australia.

"One request I pass on to Mr. Morton from the Curator at the Perth Museum, namely, that the Perth Museum may be permitted to get a cast of a Tasmanian native's skull.

ADELAIDE MUSEUM.

"The change to the Museum in Adelaide, as regards the study of the natives, was great, indeed. Probably there is no such collection of native weapons and properties as in the Museum there. A very large room is filled with cases in double and treble rows, illustrating every department of their life; and what is still more striking is the classification of objects. Each district in Australia, and sub-district, has its own cabinet. Yet wonderful as this collection is, Dr. Stirling was of opinion that it could still be equalled, if not surpassed, by those who could afford to conduct expeditions into the interior; but it would be at great cost. Dr. Stirling told me that he would be glad to furnish us with a collection of certain number of aboriginal weapons and properties, if Mr. Morton would apply for them.

In conclusion, I beg to state that I put myself into communication with two gentlemen who could aid us in the scientific study of the natives, Mr. Campbell, of the Geological Survey Department of West Australia, one of the few gentlemen who has taken a deep interest in native habits and customs. He has promised us a paper ere long. Mr. Foelsche, Inspector of Police at Palmerston, Northern Territory, has taken photographs during a course of years of all types of natives in the North. I ventured to write to him to ask if he could supply the Museum with a representative set.

"I heard a curious story at Albany, fuller details of which I hope, in due time, to receive from Mr. Wright, the magistrate at Albany. This gentleman says that a party of six blacks were brought into Albany about four years ago from the Frazer Range, charged with murder. They were very small — not much over 4ft. high, and they all had six fingers and six toes. No one could talk their language, and after some days they were dismissed, and I regret to say that no one thought of photographing them. I gather from a Government report that the blacks in the Frazer Range do not number more than 100 now, but it is clear that there is a great deal yet to learn about the natives in the Western regions of the Australian continent."

CHEMISTRY AND MINERALOGY.

Mr. W. A. McLeod, B.A., B.Sc., Lecturer on Chemistry and Mineralogy at the Tasmanian University and the Hobart Technical School, read some notes, giving a description of some interesting rocks collected at Cape Adare during the recent Antarctic expedition.

LIGHT RAILWAYS FOR TASMANIA.

Mr. G. E. Moore, M. Inst. C.E., read a paper entitled "A System of Light Railways for Tasmania." He strongly recommended the more extended use of light railways in Tasmania to open up the country, especially in view of the success

of the working of the Dundas light line. Considering the rough nature of the country on the West Coast, it might be fairly conceded that in other parts of the country a 2ft. 6in. gauge light line (which he most favoured), might be constructed at about £2,000 per mile. Such lines would be very useful in serving country districts; a light or narrow-gauge line would pay interest on capital, whilst a standard-gauge line would never pay expenses. Adjacent land benefiting by a light line, and increased in value, should be assessed accordingly to assist in paying for the same. A light 2ft. 6in. gauge railway would be a great boon in bringing about better communication between the East Coast and the capital.

Hon. A. Murray, M. Inst. C.E., M.L.C. (Surveyor-General of the Straits Settlements), made some observations on the paper read by the Bishop of Tasmania, especially in regard to the natives of Ceylon and the ruins of the ancient cities, and Tanks, of Anuradhapura and Pollonarua, in the North Central Province, where a teeming population once existed, but which had disappeared owing to hostile incursions of the Tamils from Southern India, who drove the Singhalese from their homes and fields, and destroyed their magnificent network of irrigation reservoirs or tanks. Mr. Murray also spoke of the great benefit light railways would be to the colony, if more generally availed of, and he had been over every part of it. Tasmania, from what he had observed, had reason to be proud of her railways, and their management. (Applause.) Notwithstanding the annual losses sustained in the working of some of the lines, he believed they would ultimately prove to be a splendid asset as the country became more opened up and settled upon. Mr. Moore had stated that the narrow gauge line from Williamsford to Zeehan had only cost £2.800 a mile. Here was a line that in 1899 earned approximately £6,000. Out of this £4,000 went for working expenses, leaving a profit of £2,000, or about 3.20 per cent. on the capital expended in construction. That was a very satisfactory result, reflecting credit on the able General Manager and his staff. He expressed regret at having to leave the colony, which he admired so much, and where he had been so very kindly treated. He hoped to return to it some day. He wished the colony every success. (Hearty applause.)

Votes of thanks to the readers of the papers concluded the meeting.

Mr. Nat. Oldham rendered valuable assistance in manipulating the lantern for the exhibition of the slides.

SEPTEMBER, 1900.

The usual monthly meeting of the Royal Society of Tasmania was held on Monday at the Museum, Argyle-street. The Administrator of the Government, Sir John Dodds, presided.

LIGHT RAILWAYS FOR TASMANIA.

A discussion took place on a paper previously read by Mr. G. E. Moore, M.I.C.E., on "A system of light railways for Tasmania."

Hon. C. H. Grant, M.L.C., said he did not quite agree with all Mr. Moore's views. With regard to his classification, he thought it was somewhat artificial. He thought the classification ought to be one of railways, irrespective of the gauge, and that the term "standard" should not be used. In Spain, the gauge, was 9ft. 9in., and in Canada it was 5ft. 6in., and these were the standards in those countries; 3ft. 6in. was the gauge in South Africa, and in several of the Australian colonies, including Tasmania. There was a 3ft. 3in. gauge prevalent on the Continent of Europe, and it was also in use in India. The term "standard" was only applicable to localities. Steam tramways, he thought, ought to be dealt with apart from railways. There were several steam tramways on the West Coast, though Mr. Moore seemed to say there were none in this colony. Light railways could be made important feeders of main lines, and he preferred them to steam tramways (which were not much cheaper) because they saved break of gauge. Mr. Moore surprised him by his estimate of the cost of transhipment. In France it was 4d. a ton, and here it would be 6d. or 7d. Light railways recommended themselves if managers were not afraid to manage them. The gradients and curves, of course, ought to fit the nature of the country, and they ought to be worked with light engines, and at low speed. The maintenance ought to be in proportion to its capital cost. He should very much prefer to see the railway system of this colony extended by light railways, and these improved as time went on, and necessity arose. Engineers had acted on this principle, but the managers, influenced by the public, made the lines do more work than the engineers had intended. Mr. Moore spoke of people being rated along the line. That was tried in the Western railway, but no politician would revert to such a system. He preferred private to State ownership of railways. In other countries private enterprise had done more for the community in the matter of railways than the State. Tramways should be devoted to special objects, and the North-East Dundas "tramway" he regarded as a railway. He urged that special attention should be paid to surveys, and thus months of construction might be saved.

Mr. J. Fincham agreed with much that Mr. Grant had said. The term "light" railway was one of relative significance. He did not like the word "light," because it suggested flimsiness. "Light traffic railway" would, perhaps, be more accurate. The total cost of the Tasmanian railways compared favourably with the cost of the railways on the mainland of a corresponding character. To Mr. Nicholas Brown was due the credit of having first suggested the making of light railways in Tasmania. But the system was opposed by managers and others, and railways of a normal character were made. He spoke disapprovingly of over-building for a limited traffic, and warmly advocated the making of light pioneer and feeder lines (not suckers) at a minimum cost. He spoke of the conditions under which a break of gauge might be made, and suggested how expense on stations might be reduced. He estimated the light lines, such as he advocated, could be made at half the cost of normal lines. All future developments of the railway system here ought to be made with single goods lines, such as he had spoken of.

Mr. C. B. Target said there was the question of making a railway by Government agency, instead of by a company, involving a saving in directors' fees and in the superior staff; also a Government could obtain money at a lower rate than a company, and by employing small contractors, who would be paid only for what they did, the speculative profits, on risks, of a large contractor would be eliminated. He gave examples of the cost of companies' work compared with Government work in India.

Mr. G. E. Moore replied to some of the comments made. He said he was glad that, in the main, the speakers

agreed with him, and therefore what he said in reply was wholly as to details.

The Chairman said he thought the present system of setting off the increased value of land against the claim made by the owner for compensation was an equitable and intelligible one.

The discussion was then closed.

RESERVOIRS.

Mr. C. B. Target read a paper on "Reservoirs—Irrigation in India, and Deductions with special reference to the Hobart Reservoirs," illustrated by lantern views. Speaking of waste weirs, he said that "one of the important subsidiary works is the waste weir. I give sections, showing the growth of what was finally adopted as the best. These weirs were originally a piece of ground levelled at the end of the dam; this was found to wear away, then stone pitching was used, afterwards a wall was put to preserve the level, and avoid leakage between the stones, then a wall at the bottom to prevent the stones from slipping. You will find this idea adopted by Mr. Thwaites at the upper reservoirs. Now, although these aprons were carefully made, hardly any answered; there was always settlement, so the upper wall had to be made strong enough to stand unsupported by the apron; so I first tried rows of slabstone to bind the work together, and localise settlement; the success was partial only, as extra scour was created under the slabstones, so concrete was put under 2ft. deep. This, although an improvement, was not sufficient; so I built walls above the concrete to a level with the apron, the wall being coped with slabstones, the horizontal distance of these walls being the thickness of the apron multiplied by the slope. This system has proved thoroughly successful, and the flow of water being intercepted by these walls, the result is that the space above gets grouted in with silt, making the work stronger year by year." Speaking of the trouble at the Hobart upper reservoir and Mr. Thwaites's proposals, he said: "The Director of Waterworks very properly objects to building a retaining wall on a bad foundation, and proposes to go down to firm ground for the foundation, but with piers only; one of the objections to this is, letting the water further into the dam to destroy its stability. I consider there is no danger from filling this reservoir in the state it was in before the repairs were commenced, provided there has been no percolation, of which I am doubtful, and that the water be not suddenly lowered to allow a large quantity of soil in a half-sodden condition to slide down above water-level; but should it be assumed that there is danger on the water side, the way to prevent it is by not allowing the water to alter the angle of repose; this is not done by the proposals of Mr. Thwaites, who increases the danger by letting the water further into the dam, and increases the weight on the wet soil, so as to force out the toe or overturn the proposed retaining walls. To keep out the water, I would cut into the dam at the toe till fairly good stuff is found, and relay the soil taken out, mixed with good stuff to an extra width of say 30ft., in 3in. layers, well rammed with iron rammers, weighing not less than 18lb., and not more than 6in. in diameter; at one foot in height cut in again for another step one foot thick, and so on. The opportunity of the pitching being removed may be taken to increase the capacity of the reservoir, as we have seen that there would be an element of danger in putting the extra soil behind."

Discussion on the paper was postponed till next monthly meeting.

Votes of thanks were passed to Mr. Moore and Mr. Target for their papers.

The proceedings then terminated.

OCTOBER, 1900.

The monthly meeting of the Royal Society was held on Monday evening, the 8th inst. The Bishop of Tasmania, V.P., presided. The Secretary read an apology from the Acting-President (His Excellency Sir John Dodds), regretting that, owing to important official business, he was unable to preside.

The Hon. Sir James Agnew forwarded the following letter:—

October 8, 1900.

My Dear Mr. Morton,—Please convey to the Council of the Royal Society and to the Trustees of the Tasmanian Museum and Botanical Gardens my cordial and grateful thanks for their very kind wishes on the occasion of my birthday. I value these pleasant greetings more especially as coming from a body of friends who take a practical interest in the welfare and management of those two national institutions, which alone keep Tasmania in touch (as she ought to be) with similar institutions, not only in our neighbouring colonies, but in the world at large.—Very sincerely yours,

J. W. AGNEW.

A. Morton, Esq., Secretary R.S.

"VALUABLE WORKS OF ART."

The Chairman said, before the business of reading papers commenced, he wished to read a letter that had reached him since the last meeting. from Mr. F. G. Simpkinson De Wesselow, Grosvenor-mansions, Victoria-street, S.W., July 10, 1900:—My Dear Bishop,—My nephew at Millicent, South Australia, has forwarded to me a letter you wrote to him in April last, concerning the society you have formed at Hobart, and you desire to possess for it any relics of the past history of Tasmania. I happen to have several volumes of drawings and sketches made during the years I passed there, 1844 to 1849, which have been lying packed away almost ever since my return. I am exceedingly glad there is now a chance of their being of some use or interest, and I forward them to you with much pleasure. They are packed in a zinc-lined case, and I trust will reach you safely. Amongst them is a panorama of Hobart in 1848, taken from a spot just outside the Domain, probably now covered with buildings. There are, also, some sketches of the aborigines of Tasmania (then Van Diemen's Land), located at that time on Flinders Island, which I visited in 1845, in company with the artist, Prout, where we were hospitably entertained by the Superintendent, Dr. Milligan. Some sketches, too, of Melbourne in 1846-47, then in its infancy, may be interesting. Most of my time was passed at Hobart, where I had an appointment under the Admiralty at the Magnetic Observatory. This was situated in the Domain, close to the Botanical Gardens; and, as you will know, a lovely situation. In looking at the sketches again, I am forcibly reminded of the beauty of the Derwent and its surroundings, and of the many happy days passed in delightful Tasmania. I had many friends there, now all departed. Bishop Nixon, Bicheno, the genial Colonial Secretary, Charles Stanley, and others. The Bishop often joined our sketching parties, and I am glad you have some of his drawings. Charles Stanley was my dearest friend. I often visit his widow, and only a few days ago she showed me a book of drawings by Owen Stanley that she was about to send you. You will see by the sketches that I visited a good many parts of the island. Lake St. Clair was but little known, and our party explored it, sending up a boat from Hobart through the bush for the purpose. Also, the falls on Mount Wellington, now, probably, a regular place for picnics, were discovered by us. During our stay the convict system was at its height. All our servants were convicts. It was a sad moral stain on the community. "Out of evil cometh good," inasmuch as the beautiful roads and bridges could never have been made without the convicts. Port Arthur was the headquarters, and, in a sketch of Eagle Hawk Neck, I show the now historical savage dogs that guarded the peninsula."

The Bishop said he now had very great pleasure in handing over this valuable gift to the Royal Society, as also the volume of sketches presented by Mrs. Charles Stanley.

The Hon. N. J. Brown (Speaker of the House of Assembly) moved a special vote of thanks to the donors of this priceless gift of works of art, and also to His Lordship for securing such a gift to the Royal Society. The resolution was carried by acclamation.

PAPERS.

The Hon. N. J. Brown read a paper on "Federal Finance."

The Treasurer (the Hon. B. S. Bird), by request, moved that a special meeting be called for discussion of the paper next Monday week, "Further Observation on some Obsidian Buttons," by Mr. Thos. Stephens, M.A., F.G.S.

"Observations on further regulations made by the Government for the protection of mutton birds and their eggs" was the title of a paper read by the Bishop of Tasmania.

Mr. Geo. M. Thomson, F.L.S., of Dunedin, contributed a paper, giving a description of some interesting crustaceans obtained at Cape Adare during the recent visit of the Southern Cross.

THE HOBART RESERVOIR.

Messrs. C. H. Grant, T. Stephens, and the writer of the paper, Mr. C. B. Target, gave some further observations on the subject. By the aid of a diagram Mr. Thos. Stephens showed the different parts of the reservoirs, and the formation of the surroundings.

A vote of thanks to the authors of papers having been passed, the meeting adjourned till Monday, the 22nd inst.

OCTOBER 22, 1900.

Exhibits.—The president said before the business of the meeting was taken he wished to draw the members' attention to a valuable gift that had lately been forwarded to him from England as a presentation to the society; the gift consisted of over 200 sketches, mostly water-colour paintings of Tasmanian scenery, Tasmanian aboriginals, and a number of water-colour sketches of Melbourne and Victorian views, also a water-colour drawing of a panorama of Hobart in 1848. All of the views were done by a gentleman now a resident in London, Mr. F. G. Simpkinson De Wesselow. This gentleman resided in Hobart during the years 1844 to 1849 At that time Mr. De Wesselow had an appointment under the Admiralty at the Magnetic Observatory, then situated near the Botanical Gardens. Another volume containing a number of sketches, the work of the late Captain Owen-Stanley, R.N., also a gift to the society from Mrs. Charles Stanley, whose husband was at one time Private Secretary to Sir William Denison, was exhibited. This collection is, without doubt, one of the most valuable gifts yet received by the society. Mr. J. W. Beattie exhibited some interesting photographs. Among them was a photograph taken from a cast of the Rev. Robert Knopwood's face, also a photograph of the Rev. Dr. Bedford, who succeeded the former gentleman at St. David's, and several others.

Mr. A. Mault read an interesting paper, entitled "Hobart Society in 1845." The account, Mr. Mault said, was taken from among the least known of the elder Dumas's tales, called "The Journal of Madame Giovanni." This journal is professedly written by a French lady, who married a Venetian merchant, and who adopts the nom de plume of Giovanni. Though the hand of Dumas is very evident, the reader will soon see that the work is based upon the account of some lady who must have really visited the places that Madame Giovanni describes.

A hearty vote of thanks was accorded to Mr. Mault for his interesting paper.

Mr. Thos. Stephens, M.A., F.G.S., submitted the following notes :—

November, 1836. — Captain Lonsdale selected the original settlement, formed by Mr. Batman on the Yara Yara, as the scite (sic) of the infant metropolis at Port Philip. The Government had commenced building a gaol, and a commissariat store, and the town was named Glenelg, in honour of the Right Honourable the Secretary of State for the Colonies.

January, 1835.—Mr. G. A. Robinson succeeded in bringing in the whole of the aborigines remaining at large in the colony, eight in number, who joined their relatives at Flinders Island. — Elliston's Hobart Town Almanack, and Dr. Ross's Van Diemen's Land Annual for 1837.

The meeting then closed.

NOVEMBER, 1900.

The last monthly meeting of the Royal Society (for the 1900 session) was held at the Museum last evening, the President, His Excellency Sir John Dodds, presiding. There was a large attendance of members present. The chairman of the Council, the Hon. Sir James Agnew, K.C.M.G., forwarded an apology, regretting that owing to the state of his health he was unable to be present.

The Secretary (Mr. Alex. Morton) read an interesting letter that had been forwarded to the Society by Mr. Malcolm Harrison, of New Town, stating that on the 4th of this month he had found a goldfinch's nest, containing two eggs of the rightful owner and one of the pallid cuckoo.

Papers.

The Secretary, in the absence of the authors, read the following papers:—One by Mr. W. F. Petterd, F.Z.S.L., of Launceston, entitled "On some additions to the list of Minerals known to occur in Tasmania." The writer said the catalogue of the minerals known to occur in this island enumerates considerably over 250 distinct elementary substances and chemical combinations. In addition to this remarkably large number, subsequent research has brought to light several interesting examples, and now the author has been enabled to still further increase this number. The paper briefly enumerates 18 substances, to which mineralogists have applied specific terms, all of which were apparently previously unknown in Tasmania. It might reasonably be expected that from time to time, as geological and mining investigation proceeded, and the field of observation extended, occasional additions of rare or obscure minerals might be brought to light, but it could scarcely be anticipated that the restricted area of the island would afford such a prolific field in this department of scientific investigation, as is forcibly illustrated by the writer's comparatively numerous discoveries. The more recent careful examination and determination of a long series of igneous rocks has revealed several unusual rock-forming primary and accesory minerals, the occurrence of which in this island, the writer says, was previously unsuspected, and, doubtless, as this petrographical work is continued other forms of equal interest will be discovered.

The other paper was also by a Launceston member, Mr. F. E. Burbury, and constitutes the first part of a series of papers on the Diatomaceæ, and was entitled "Contributions towards a systematic catalogue of Tasmanian Diatomaceæ."

Professor E. G. Hogg, M.A., read a paper illustrated with specimens of the rock entitled "The Glacial Beds of Peppermint Bay."

A carefully prepared paper was read by Mr. A. Morton, giving an exhaustive account of the work done by the Society from the year 1840 to the present time, and showing how valuable had been the contributions of the Society to the world of science. To persons interested in the welfare of the Society the paper was of special interest, dealing as it did with the chief events that have transpired during the last 60 years. In limited space it is impossible to do more than mention the variety of subjects that were treated by Mr. Morton. The four departments of zoology, botany, geology, and meteorology were the first that received attention from the Society, and geography was not long overlooked. Interesting mention was made of the detailed work of the Society and its volumes of records. Important discoveries were also referred to, and a quantity of statistical information given Attention was directed to a long list of valuable papers that were from time to time read, and prominent mention made of the active part taken by the Society in various expeditions of research. Among other matters referred to were some of the minerals of Tasmania, and the advancement of the colony generally. The paper is one that entailed considerable labour and research in its preparation, and as a historical sketch will form a valuable acquisition to the records of the Society.

Mr. Morton's paper was illustrated with over 40 specially prepared lantern slides.

The Chairman complimented Mr. Morton on the class of paper he had read. He said that Mr. Hogg's paper was also of an interesting character.

ABSTRACT OF PROCEEDINGS, APRIL, 1901.

The monthly evening meeting (the first of the 1901 session) was held on Monday, April 29th, in the Tasmanian Art Gallery, the President (His Excellency the Administrator, Sir John Dodds) presided.

Apologies.

The senior vice-president, the Hon. Sir James Agnew, K.C.M.G., M.D., etc., and the Hon. C. H. Grant, M.E.C., sent an apology regretting their inability to be present.

New Members.

Mr. F. G. Simpkinson-De Wessellow, R.N., who, since the last session, had presented a number of water colour sketches to the Society, was unanimously elected an honorary member of the Society. Messrs. Frank Allwork, L.S.A., of New Norfolk, and P. J. McLeod, B.Sc., were elected Fellows of the Society.

Her Late Majesty.

Sir John Dodds, who was received with applause, said that this was the first occasion this year of the Society's meeting. They were all aware that Her late Majesty was the patron of their Society, and they were all honoured in the person of that patron. It was, therefore, fitting that on this occasion they should record their sense of the loss which the nation and this Society had sustained by the death of Queen Victoria. For more than 60 years Her late Majesty had exercised a personal influence for good which had made itself felt throughout the whole of the Empire. There was no feeling comparable in intensity with the feeling which Her late Majesty had engendered in the hearts of her subjects, and it would be idle for him to attempt in any way to describe the loss which the nation had sustained, and he thought it right to invite them to agree in expressing their deep sorrow for the loss of a sovereign, perhaps the greatest one they had ever known in their history. Let the example of her noble life abide with them as a people, and stimulate them to greater efforts. (Applause.)

Mr. Alex. Morton said an address to the Duke of Cornwall and York had been prepared on behalf of the Society.

Mr. Osborne Greene suggested that the use of the Society's rooms might be extended for the presentation to be made to Her late Majesty's grandson.

Sir John Dodds thought that the suggestion might be conveniently referred to the Council of the Society for consideration, but pointed out that Government House had been fixed as the place for the presentation of addresses to the Royal visitors, and he ventured to think that that would be more acceptable.

Papers.

Sir John Dodds then said he had much pleasure in introducing to the Society Mr. Wm. Heyn, of the Timber Department Admiralty — Harbour Contract Works, Dover, England.

In the absence of the authors, the secretary read the following papers. (a) Description and analysis of a new species of mineral, "Petterdite," a new oxychloride of lead, by Mr. W. H. Twelvetrees, F.G.S., Government Geologist. The author said this apparently absolutely new chemical combination occurs in attached crystal groups in a quartz gangue containing disseminated pyrites, in the form of somewhat thin hexagonal plates, which are usually minute in size (about 5 millimetres in diameter), but occasionally reach 9 min. dia., and still more rarely a larger size. It was, says the writer, evidently rare, and, so far as known, confined to the locality mentioned. The specimen, of which a slide was thrown on the screen, was remarkably fine, containing about 200 perfectly-formed implanted crystals. Mr. Twelvetrees said the mineral was a very attractive specimen, and was easily distinguishable from the more abundant sulphate and carbonate of lead, and was occasionally associated with fine groups of campylite. He had great pleasure in dedicating it to Mr. W. F. Petterd, of Launceston, who had done so much in the work of Tasmanian minerals.

The next paper was by Mr. W. F. Petterd, who gave a description of a meteorite from the Castray River, Tas-

mania. The writer said that considerable interest invariably attached to the discovery of meteoric substances, and he therefore assumed that a few remarks concerning the recent acquisition of a small but reliable meteoric stone, fully authenticated as having been unearthed in this State, would be of interest. The specimen, of which a lantern slide was shown on the screen, displayed the second of these stones which have been discovered in Tasmania, bringing the total number recorded up to date as having been found in Australasia to about 33 examples. Those recorded from Australasia weighed from three to four tons, to that now described, which was the smallest so far obtained. Mr. Petterd said it was beyond doubt that many had been overlooked. To the average observer they were very unattractive, and it was only when they fell into the hands of mineralogists that their nature was revealed. The description of the Castray meteorite was:—Type, siderite; weight, 51 grains; size, length, 18 m.m.; greatest breadth, 10 m.m.; locality, Castray River, N.W. Tasmania. It was originally obtained, with two others of like size and character, by a miner in 1899, when ground-sluicing the auriferous drift on the banks of the Castray, and afterwards, direct from the discoverer, came into the possession of Mr. T. Birkett, the well-known mine manager, by whom it was presented to the mineral collection of Mr. Petterd.

Mr. Heyn, before reading his paper, thanked the Administrator (Sir John Dodds) and the Premier (Hon. N. E. Lewis) for the help afforded him in his work here, and forgave Mr. Alex. Morton for his indefatigable importunity to induce him (Mr. Heyn) to come before them that night. The people of Hobart, possessing one of, if not the finest harbour in the world, could scarcely conceive what the want of it meant in the English Channel. It was to find the piles necessary for the temporary staging used at Dover (England) harbour construction, to enable the laying of 42-ton concrete blocks, that he had come to Tasmania, where he had succeeded in getting magnificent blue gum piles, ranging up to 100ft. in length, and 20 inches square, at Norfolk Bay and Port Esperance. Oregon timber of the same dimensions could have been procured, but the best blue gum suited the submarine works at Dover better, on account of its greater specific gravity, durability, and comparative imperviousness to ravages of the "terrida navalis," or common sea-worm. From a cargo sent them by Messrs. Gray Bros. they had seen at Dover that this was the most suitable. The process of utilising the logs was illustrated by lantern slides, prepared by Mr. Beattie. Mr. Heyn congratulated Tasmania on having thus additionally contributed towards the defences of the Mother-Country. He strongly recommended the use of blue gum or stringly bark to pave a street as a specimen of what could be done with it. He emphasised the necessity of all timber being cut at the proper time of the year, and properly seasoned, before exportation or use, as he preferred natural to artificial seasoning. He doubted whether our blackwood and Huon pine could be profitably exported to England, as equally good wood in black walnut or bird's-eye maple could be purchased there at very much lower prices. On entering the bush here he had felt indignation and sorrow at the wanton waste and ruin which ignorance and recklessness had caused in destroying thousands of splendid trees. He attributed this to ignorance of the first principles of forestry, and his remedy for that would be a School of Forestry and Agriculture, modelled on the plan of the most successful ones on the Continent. Our youth could attend them at the same time as the ordinary schools. He dwelt upon the necessity of reserving Crown lands, and, where young trees were coming up, the desirability of planting firs, and finally insisted upon the urgent necessity of acting at once. Otherwise, in a few years, our timber would be exhausted, and our fruit trade perhaps lost. Norwegian timber which he saw was being imported into Tasmania would grow to perfection in its own soil. When back in England it would always be a pleasure to him to do anything he could in the interests of Tasmania. (Applause.)

In the discussion that followed,

Hon. E. Mulcahy remarked that Mr. Heyn seemed to know more about our local timber than many of our local men did. Tasmania had had to face the fact of the important market of Victoria

being closed against her by duties, which practically shut her out; but that obstacle would be removed. It was, no doubt, a sin the way timber was destroyed, but to avoid it there was no choice unless the farmers had not only a market open, but means of transit to get the timber to it. The Government had not lost sight of the necessity of planting trees, and already had an order given for samples of seeds of certain trees. He moved a vote of thanks to the lecturer.

Mr. Heyn, in reply to Mr. Target, promised to send particulars of what some Governments made out of forestry.

Mr. Thomas Stephens, M.A., said that some two years ago, when in England, he inquired as to the chances of an export trade from the colony, and was told that some shipments previously had arrived so twisted and warped that no one would look at them. The West Australian woods were then coming into repute there. All competent judges said there was an opening for our timber in England, but it must be taken up by people with a proper knowledge and sufficient capital. He hoped that what Mr. Heyn had said would stimulate people to get the knowledge that would develop the trade.

Mr. Bernard Shaw differed from the lecturer in regard to what the pioneers had had to do to clear land for homesteads.

Mr. E. A. Counsel (Surveyor-General) agreed that timber destruction was unavoidable in the past, but now was the time to take steps against it.

Mr. Heyn replied that he had seen large quantities of land where, for want of knowledge of forestry, the only thing it could produce had been destroyed. He had not alluded to where homesteads with cereals had replaced the trees. He had seen blue gum trees destroyed where the soil would produce nothing else, and that it could not do so should have been ascertained before destroying. It had been done in the last few years.

Sir John Dodds could not help agreeing with a good deal that Mr. Heyn had said regarding clearing; but it must be remembered that if settlements were to be made, and population spread over the country, there must be a destruction of timber. It would be a good thing if the attention of Ministers were given to the matter of bush fires, with a view to the conservation of what, in the future, might prove a very large asset.

Votes of thanks to the authors of the papers were carried.

MAY, 1901.

The monthly meeting of the Royal Society of Tasmania was held in the Art Gallery at the Museum on Monday evening, May 27th. His Excellency the Administrator, who was to have presided, was prevented from attending by slight indisposition, and the Bishop of Tasmania occupied the chair.

Congratulatory reference was made to the honour recently conferred upon His Excellency the Administrator.

Timber in Tasmania.

A discussion took place on a paper written by Mr. W. Heyn, of the Timber Department, Admiralty Harbour Works, Dover, on "The present and future prospects of timber in Tasmania."

Mr. E. A. Counsel said he was of opinion that some points in Mr. Heyn's paper were likely to lead to erroneous impressions without further explanation. With regard to ring-barking, he was unaware of that process being carried on to the extent mentioned. There was no large extent of marketable timber of value in Tasmania that was wantonly destroyed by the selectors; they were too anxious to benefit by its proper treatment. Although quantities of blackwood and pine timber had been destroyed in the north-east of the State, it was too far from a market to pay for cartage, valuable as some of it was. The best land produced the best timber, and especially was this the case in the matter of blackwood. Mr. Heyn's limited experience in Tasmania had misled him into making the statement that very large quantities of timber were, at times, destroyed by bush fires. This was not so, for, although the fires traversed bush country, the timber of large growth was, at times, only blackened. The time was opportune for initiating an experimental plot, in order to propagate a number of the most suitable kinds of timber.

Mr. L. Rodway said he took great interest in the matter of planting forest lands in Tasmania. A country could not be denuded of its timber without affecting the climate. This was the experience of all countries. In Australia, the vegetation was not well suited for the purpose of retaining water on the land. If planting were indulged in to any extent, exotics must be chosen, and it would be necessary to import. This could not be done, however, unless a State nursery was established. To establish a State nursery was a matter that required caution, as there would be no apparent return for some years to come; but the expense would not be great. If we had a State nursery, seeds and plants could be obtained from all parts of the world, but special attention must be given to the varieties that gave the best results. He had passed through the Huon district some time ago, and was astonished at the neglected appearance of the orchards. If a State nursery was established, the matter of orchard growth must be taken into consideration, and all useful information given to orchardists.

Mr. R. E. Macnaghten said he had lived for five or six years in the district referred to by Mr. Heyn. He did not think the damage done by ring-barking was extensive, but the injury done by bush fires was enormous. He thought that Mr. Heyn's advice and suggestions should receive careful consideration, and he did not think such a valuable paper should be confined to Tasmania, but that it should, if possible, be produced in some of the English magazines.

Mr. R. M. Johnston said he had stated many years ago that the waste of valuable timber in Tasmania was too great, but he realised that the cost of sending the timber to a market was excessive. That was a position many settlers had to face, and was one of the causes of so much waste. He would like to know if areas could not be planted with some of the foreign soft woods plants, that would eventually obviate the necessity of importing such timbers. Although there was plenty of certain varieties of timber at present, it was essential that the future should be studied.

Discussion of the subject was adjourned until a future meeting.

JUNE, 1901.

At an adjourned meeting of the Royal Society of Tasmania on Thursday evening, June 6th, the discussion on Mr. W. Heyn's paper on "The present and future prospects of timber in Tasmania," was resumed. His Excellency the Administrator (Sir John Dodds, K.C.M.G.), presiding.

TASMANIAN TIMBER.

(By A. O. Greene).

up the forestry question, now much neglected.

Mr. A. O. Green, of the Railway Department, read an additional and able paper on the subject, and brought to the meeting 27 specimens of Tasmanian timbers labelled with the common and scientific names, weight per cubic foot, specific gravity, etc.; also some other specimens of timber that had been in use up to 70 years in the State. He said:—The subject that has brought us together this evening is one of the very highest importance for Tasmania as a whole, and worthy of this society, which has for its object the study of the natural products of Tasmania to the end that science in general, and the good of Tasmania, may be advanced. This country has been like England, and many other countries in the past, when forests were looked on as a bar to progress, and as stifling the energies of the inhabitants of the country. It is a phase through which all countries pass, or have passed, where there is luxuriant vegetation. But all countries in time are forced to recognise the value of the timber products which a beneficent nature forms for us, from the atmosphere we breathe. The first feeling of mankind about the forest is that of being overwhelmed by it, and trees are looked upon as encroachers upon the domain of man, to be got rid of at all costs. But in every country of which we have records, as time has passed, the forest has come to be looked upon as an indispensable adjunct to the life of man in the country, in that it tempers the wind and heat, moderates hail and storm, conserves water against periods of drought, forms and prevents the dispersal of that fertilising "humus," without which soils become barren, and when rightly used, is a prolific source of revenue for all time.

We are greatly indebted to Mr. Heyn for his valuable paper, in which he has reminded us of the advantages that Nature has given us, and in which he has not feared to place before us the small appreciation, in which they appear to him as a visitor to be held by the inhabitants generally. We can, I am sure, quite feel for him in his diffidence, after so short a sojourn, in speaking upon a subject authoritatively, which so nearly concerns us as Tasmanians; but I am confident that every member of the Royal Society of Tasmania will feel indebted to Mr. Heyn for sinking his personal feelings in this matter, and giving us his impression of our great national asset, and the manner in which it seems to him to have been treated.

With regard to the practical recommendation that is before us, i.e., the establishment of a nursery of forest trees with the view of encouraging planting for the purpose of shelter, water conservation, beauty and profit, it is one that eminently deserves the whole-hearted support of this society, and I trust that the proposition will be endorsed by us with such unanimity that the hands of the Government, and others interested, may be strengthened to help forward the project as it deserves.

It is a matter which has, on several occasions, been discussed in this room, and I myself had the honour in 1893 of reading a paper upon the advantages of planting coniferæ, iving a list of suitable trees, and a light resume of what has been done in other countries; also another paper in 1894, more especially devoted to the economic preparation and uses of our timbers, but incidentally bearing on the subject in hand.

At the present time, in many parts of the island, sand-blows, wind, the failure of springs, and the impoverishment of the soil, are compelling people to recognise the beneficial influence of trees upon a country.

In some parts of the island, even now, after our short occupation, timber has to be brought from comparatively long distances for structural and other economic purposes. To those conversant with the subject it is painfully apparent that in the near future most of our forests within a working distance of railways and centres of population will be rendered absolutely barren, as far as production of timber is concerned. And this period, I may say, taken with regard to the unit of the life of the nation, is so short as to be almost the actual present. This is a matter which intimately concerns every inhabitant as well as the Government; but under our form of rule, the Government in railways, bridges, and jetties is far and away the largest consumer of timber, therefore is more interested than any individual in the conservation of the timber resources of the State; as one instance there is every prospect that within a short period the sleepering of our railways alone will become a question of

grave anxiety, from the failure of the forests near the lines to produce timber suitable for this purpose.

As it is well to approach a subject such as this from its beginning, I may be pardoned for offering for consideration some propositions that have passed into axioms:—

A well managed forest produces a large amount of timber, not for this year only, or next, or even for a generation, but for all time. A constant output of timber of the best quality of its kind is ensured for ever by methods that have been usual for centuries, in many countries where forestry has been a profession. In all newly-inhabited countries, and in barbarous countries, the wants of the moment are supreme, the trees are abundant, each man takes what he wishes for use, and destroys wholesale, without let or hindrance. After a time it comes to be recognised that a tree that is the product of the State soil for a century belongs, in some measure to the Government, and without any view to the future, the State, for the purpose of present revenue, licenses companies, or individuals, to cut down for their own profit, and to destroy the forest, so long as they pay the fee demanded by the State for that right. Then with regard to fire, it is generally looked upon as impolitic, in new countries, to restrict too harshly, either its use, or its abuse. In forestry, the two greatest enemies are fire and the license-holder.

State forests should be defined by marked bounds, and defended from the ravages of thieves and fire by forest officers, and by fireguards. In a new country statistics should be gathered to fix the best season for felling each kind of tree, the proper method for seasoning the timber, the period required for the various trees to reach a growth suitable for the purposes for which they may be wanted, and for the trees to reach maturity; also to obtain information as to the uses for which each timber is best suited, the defects it is subject to, and the diseases to which the trees are liable. Roads suitable for the removal of timber should be made, and the forest divided into blocks, of which one at a time is open for felling. After these preliminaries the trees in a block should be marked in consecutive numbers, and the issue of licenses to enter the forest to cut tracks and to fell indiscriminately is stopped. Trees are only allowed to be felled in their season. Applicants for timber are taken by a ranger to a tree or trees of the kind they require, and told the price, say, 1s. 4d., or 3d. a cubic foot, or trees are sold by auction, as they stand, at the estimated quantity of timber in them. After the purchase, it is to the interest of the purchaser to use up the whole of the tree, and not to buy a tree with 500ft. of useful timber in it for the purpose of cutting 10ft. out of the middle.

Under the licence system a man will wander for miles through the forest in search of timber, cutting tracks, trying, and even felling, trees and leaving them until his fancy is suited, thus damaging ten or a hundred times as much of the property of the State as the timber he uses is worth; besides leaving behind him the rest of the trunk, and all the branches and tops to cumber the ground and prevent the growth of young trees, to form a harbour and breeding ground for insects and fungi that are enemies of the forest, and to add greatly to the destructiveness of any fire that may occur. At first, a systematic treatment of the forest is looked upon by all concerned in the timber industry as fatal to their interests, but in every country in which it has been tried, it has been found to convert an evanescent industry into a permanent one, to improve the status and profits of the worker, and to form the source of a very large State revenue. This paper is written without works of reference, but quoting from my paper of 1893:—

"Norway, at that time, exported timber to the value of £2,000,000 annually, while the profits from some of the European State forests were, annually: — Sweden, £21,000; Austria, £90,000; France, £1,000,000; Prussia, £1,500,000."

Further details of methodical forestry are, that the forests should be worked in blocks of such dimensions as are suited to the rate of growth of the timber, and in such a way that the trees that are left shelter the young growth, and that the prevailing winds shall scatter the seeds from the standing portions on to the cleared parts. This is supplemented by hand-sowing and planting—a part of the pay of the ranger or bailiff being for trees successfully planted out from the nursery at his cottage. As the trees grow, if necessary, they are cut out as poles, and the whole of the new part of the forest is kept growing at the greatest speed possible, and from the same influences, producing superior timber. When the end of the forest is reached, the trees on the first section will have arrived at maturity, and thus the profits are kept always at the highest state. On the other hand, under the licence system, every man who goes into the forest destroys many, many times as much as he uses, the tops and refuse, and the cutting of tracks destroy saplings, and make an entry for fire and cattle, which still farther increase the damage done by the timber getter, and in a very short time, perhaps 50, say 60 to a 100 years, not

a marketable tree is left, and beyond that, the point on which I wish to lay especial stress is this, that in most cases in inhabited countries, no first rate tree will ever grow in that forest again. What is called rubbish will grow, and that, with the debris of the tops, will so smother the young growth, that those plants that force their way through will be permanently injured, will tend to branch instead of forming straight trunks, and, roughly speaking, will never again form good timber-producing trees of their class. This is not theory, but fact, that has been proved over and over again in every part of the world where civilised man has come. In new countries where the licence system obtains, the destruction of the forest is brought about very rapidly, and in older countries the effect is kept up by similar systems, and by rights of commonage, and the task of converting the forest again to a productive state is one that requires considerable expenditure, and a length of time that must be measured by generations.

The project before us is a modest one, i.e., that a small piece of land shall be taken whereon to raise trees, for the planting of denuded tracts, watercourses, and sandblows, and, incidentally, to spread abroad the meaning of the old saying that "He who plants a tree is an unselfish man, in that he benefits not only himself, but also his neighbour and posterity." I must beg your forbearance if I have appeared in what has gone before, to have wandered from my subject, but in all works that are undertaken, no matter how limited the present means may be, it is well to begin with a plan that is complete in every respect, instead of providing for the apparent needs of the present moment only. It is the especial object of this society, by its discussions, to bring before its members, and through them the Government, and the inhabitants of Tasmania, the advantages to be derived from a right knowledge of the natural products of the State, and I think that every one of us has realised the immense latent value that there is in our forests. The trees produce fuel, both wood and charcoal, structural material, fibre for the purpose of making paper, acetic acid, tar, potash, and various essential oils, all of them valuable in commerce, and when worked in conjunction, one with another, adding very largely to the profits of forest property.

It is well known that by one method we may exhaust the whole of the commercial value of the source of these natural products in one or two generations, and by the other, that the output may be considerably increased, and kept at that increased rate for all time. It is, therefore, from a national point of view, well worth while to launch this scheme with an eye to the future, and upon the most perfect lines of which we are capable. A beginning is valuable as a beginning—the planting of trees for shelter and ornament will be advantageous in many ways, as well as commercially. Every man who plants a tree values trees more highly, and an adherent to the cause of forest conservation is gained. I would beg of you not to treat this scheme that I have outlined as chimerical, because it is not immediately attainable, but so to use your influence that the proposed nursery of forest trees shall, in the future, develop into a complete and profitable system of forest conservation for Tasmania.

Mr. Targett said that afforestation would, if started in Tasmania, give employment to a number of people, prove an immense boon in the immediate future, and help to preserve the beauty spots.

Mr. Counsel wished it to be understood that he criticised Mr. Heyn's paper in the very best spirit. They all owed Mr. Heyn a debt of gratitude. Mr. Green's paper contained sound thought, but many of his recommendations were not practicable; no country could carry them out. In a district suited for agricultural settlement the timber had to be cleared; a country could not be opened up by the timber trade alone. In West Australia, as in Tasmania, they had no State forest, but the agriculturist worked hand in hand with the timber-getter. Good land in this State is too good to be utilised as timber land. (Hear, hear.)

Hon. John Henry thought it would be a good thing to, at an early date, re-initiate a system of State forestry. Mr. Green's paper was excellent in many respects, but was not sound on the practical side, in this country, the circumstances of which had to be first considered. On the rich lands of the North-West Coast, it would be, for instance, impracticable; it would mean delaying the opening up of good country for settlement for a remote period. There the settlers must get rid of the timber, and that was their difficulty; if only used for forestry purposes, that land would only support a few. He agreed with Mr. Counsel that good land was too valuable to maintain as forests, whilst there were considerable areas that would grow useful timber, such as the stringy bark, that were not suitable for cultivation, hence the necessity for re-introducing the State forest system.

Mr. Macnaghten, in an interesting

speech, thought Mr. Heyn's paper indicated how population and immigration would increase by increasing the utilisation of our resources.

Mr. T. Stephens spoke on the question of instruction in forestry.

His Excellency thought several of the speakers had not properly caughth the meaning of Mr. Heyn's paper. His propositions amounted to this—"You have some excellent land, which you are right in endeavouring to settle people upon; but you also have a large amount of land that will not pay to cultivate, as far as ordinary farm products are concerned, and on that you may profitably produce timber. (Hear, hear.) You have a valuable asset indeed in the shape of splendid forests, which will prove a splendid asset in time to come, if you properly conserve them, and they occupy land that cannot be turned to other profitable uses. The good lands suitable for cultivation of other products, of course, are not included." (Hear, hear.)

Mr. Heyn thanked His Excellency for putting speakers right as to the purport of his paper. He complained of Mr. Counsel's attitude, and maintained that valuable forests were being shamefully destroyed in Tasmania, and told him that the best blue gum did not grow on the best ground, as he had stated, but on poor and rocky land, on which nothing else would grow. (Hear, hear.) Replying to Mr. Counsel at considerable length, he claimed that his paper put the correct phase of the matter forward, and advocated the establishment of a good school of forestry. (Applause.)

The meeting terminated with the usual votes of thanks.

JULY, 1901.

The monthly meeting of the society was held at Hobart on Tuesday, July 30th, the Bishop of Tasmania presiding. There was a good attendance.

Three new members were elected—Dr. P. C. Boyd, Mr. Russell, E. Macnaghten, B.A., and Mr. Henry J. Wise.

Apologies for inability to attend from the president of the society, Sir John Dodds, from the senior vice-president, Sir James Agnew, and from the Hon. N. J. Brown, were received.

Mr. Alex. Morton, in the absence of Mr. W. F. Petterd said that that gentleman had prepared two papers of interest They would be printed for the use of members. The first of these papers was on the "Microscopic Structure of Some Tasmanian Rocks." It described some aberrant members of the basalt family, which, although not common in Tasmania, are occasionally met with. Tachylyte was a glassy form of basalt, originating from the rapid cooling of the magma by contact with a cooler substance. It was commonly found in thin layers, but sometimes is met with, as at Bothwell, in comparatively large lumps. It also occurs at Fernhill, near Deddington, and, in a lesser quantity, at Burnie. Limburgite (from the Burnie-Waratah railway) was a dense, hard, and extremely tough rock, so much so that it became notorious during the construction of the Burnie and Waratah railway. It is dark, almost black in colour, and very fine grained in texture. Basalt-vitrophyre (from Sheffield was microscopically one of the most attractive rocks in Tasmania. It was usually intensely black, extremely brittle, and easily reduced to fragments. Hydrated olivine basalt (Native Point, Perth) was a rock of abnormal physical character, invariably heavy from the absorbed moisture, and soft to a degree. It fractures on exposure to atmospheric action. It closely resembles palagonite, and was obtained in sinking holes in the locality mentioned.

Mr. Petterd's other paper was on some land shells from Maria Island, Tasmania.

Coal Discovery at Wynyard.

Mr. R. M. Johnston, Government Statistician, read the following note on the Wynyard discovery:—

"I had read with much interest of the discovery of coal on the north-western part of Tasmania, near Wynyard, a few weeks ago. Hitherto the existence of members belonging either to the mesozoic or upper coal measures, or to the permo-carbon or lower coal measures, of Tasmania, was unknown to geologists, in all that region of the North-West Coast lying between the Mersey Coal Basin and Cape Grim. A few days ago, I was fortunate in receiving from Mr. Victor West, of Wynyard, a specimen of the bituminous shale associated with the newly-discovered coal seam exposed on the Inglis River, about 16 miles south of Wynyard. Fortunately, Mr. West selected a piece of the shale bearing a clear impression of a portion of the frond of a fossil fern. The typical plant remains of this period are two species of a genus of the Coniferæ (Noggerathopsis); characteristic net-veined ferns of the Genera, Gangamopteris and Glossopteris; and lycopods of the Genera Tasmanites and Schizoneura. The following are the localities where the lower coal measures were known hitherto to occur in Tasmania, viz., Mersey, Tippagory Range, Tamar, Mount Pelion, Henty River, Fingal, Ben Lomond, Harefield, Adventure Bay, and Mount Cygnet. As a rule, when coal seams occur in these lower coal measures, they are found to be purer, more bituminous, and freer from ash than the cool seams of misozoicage? They are, therefore, better adapted for steam purposes and for the production of gas, than the coal seams of the later age, which alone hitherto have been worked to any extent in Tasmania. It is to be hoped that the discovery at Wynyard may turn out to be a good working seam, or seams. If so, it will be of untold value to the district of Wynyard, as well as to the colony generally. Mr. West has kindly promised to give me further particulars regarding the general geology of this district at an early date, which I shall be pleased to communicate to the fellows of this society."

Replying to questions, Mr. Johnston said he had not sufficient particulars yet to say whether the seam or seams were of sufficient size for favourable working.

Mr. T. Stephens said that at a meeting of the society in 1869, he exhibited a pebble of hard and compact kerosene shale, found with many others near the mouth of the River Inglis, and expressed the opinion that portions of the carboniferous series from which it had come, though removed by denudition near the coast line, would one day be found at no great distance inland. This shale is practically identical with the so-called "cannel coal," discovered a few years ago near Barn Bluff.

Astronomical Observations at Capetown Observatory.

Mr. Kingsmill began by referring to the kindness of Sir David Gill, the Government Astronomer at Capetown, who gave him opportunities of seeing the work of his observatory, and made him a present of some beautiful photographic slides, showing some of the most remarkable results. These slides were supplemented by others obtained from the Royal Astronomical Society. The lecturer first gave a description of the Capetown Observatory. It is an Imperial institution, provided for and controlled by the Admiralty, and it is liberally endowed for astronomical research, having a staff of 30 observers. It resembles a village, having a number of buildinges for the instruments, and for the observers' residences. The site chosen was as near the bay as possible, for the sake of the shipping. Formerly, a gigantic time - ball was dropped at the observatory, which was visible to the ships four miles off in Table Bay; now a smaller time-ball is dropped electrically close to the docks by means of a wire from the Observatory.

The accurate determination of time is a very small part of the Observatory work; the position of stars is determined for the use of mariners; in fact, most of the Southern stars whose position is given in the "Nautical Almanac" are recorded there from observations taken at the Capetown Observatory. The most interesting work, however, to the general public is that which simply satisfies the thirst of the human mind for knowledge of what is observed in the heavens without any reference to commercial utility.

The lantern slides shown illustrated in a most interesting manner the methods by which the actual materials of the stars were ascertained. It was shown how iron was proved to exist in form of vapour in the sun's atmosphere, in the atmosphere of the bright star Canopas, and in that of Alpha Centauri. Hydrogen was also shown to be an element as abundant in the stars as it is on the earth. These wonderful revelations are due to the spectroscope. That instrument not only enables us to ascertain the materials of which a star is composed, but it actually can be made to reveal the motion of a star along the line of sight, to show whether it is aproaching to or receding from the earth, and the rate at which this takes place.

Three beautiful photographs were shown on the screen of the star Argus, and the portion of sky around it. This, the lecturer said, would, no doubt, be specially interesting to members of the Royal Society here from the fact that its records contain several papers read on the nebula of Argus by the late Mr. Francis Abbott, whose observations of the star and of its nebula extended from the years 1867 to 1872. This star has gone through the most extraordinary variations in brightness during the last 200 years. It was first observed at St. Helena by Halley; then at the Cape of Good Hope by Sir John Herschel. It increased in brightness, until it became the second star in the sky in 1843. During the 25 years following it steadily but slowly diminished. In 1867 it was barely visible to the naked eye, and the year following it vanished entirely from the unassisted view, and has not yet begun to renew its brightness. The time it was observed by Mr. Abbott it was a faint telescopic object, surrounded, however, by a remarkable nebula. A photograph of this was shown by the lantern, taken during an exposure of 45 minutes. A second photograph was shown of the same object from exposure of over three hours, and a third photograph from a 25 hours' exposure. In the first of these a considerable number of stars appeared in th field of view; in the second the number of stars was greatly increased; in the third (the 25 hours' exposure) revealed an absolutely countless multitude of stars surrounding the nebula. Many of these are too faint to be detected by the human eye. even when aided by the most powerful telescope.

Some groups of star clusters in other parts of the sky were shown, and it seemed as if there was no limit to the number of stars that could be revealed in a single telescopic field by photography. The star clusters were, in some cases, so dense as to appear like a continuous mass of light. Slides of nebulæ were next shown, and it was pointed out by the lecturer that at first nebulæ were supposed to be simply star clusters, the diffused light of which could be resolved into separate stars if we had a sufficient magnifying power; but modern observations, with the aid of the spectroscope and photography, show that this hypothesis is incorrect. The nebulæ have been proved to consist of vast spaces filled with glowing gas, which sometimes envelopes stars. These masses of gas generally have definite forms, the spiral being the most common.

The systematic study of nebulæ may be said to have commenced through the labours of Sir William Herschel at Slough. The discoveries that Herschel made were reckoned not by tens, nor by hundreds, nor by thousands. It was left to Sir John

Herschel, the only son of Sir William, to complete his father's labour of extending the survey to the southern heavens. He undertook, with this object, a journey to the Cape of Good Hope, and sojourned there for the years necessary to complete the great work. As the result of the labours thus inaugurated, there are now 3,000 or 4,000 nebulæ known to us, and with every improvement of the telescope fresh additions are made to the list.

Comets formed the next subject illustrated. Photographic slides were shown of Swift's comet of 1892. In the photographs of comets the stars had a remarkable appearance. Instead of being round dots, as in other photographs, they all appeared like a number of short arrows pointing in one direction. The reason of this was the rapid motion of the comet among the stars, which compelled the photographer, in order to keep the comet still, to represent the stars as moving. The length of each streak representing a star indicates the distance and direction of the comet's motion.

The process by which a comet's tail was developed, and the materials of which it is composed, were next discussed.

Some further photographs were shown of the sun and of the spots on his surface, and the lecturer concluded by remarking on the fascinating character of the study of astronomy, and the labour which had been expended upon it from the earliest ages.

The student of this subject finds an answer to many questions, but as he studies he finds that many more questions arise, which remain unanswered. Whence comes the fascination? Why is it that we, who are of yesterday, delight in the contemplation of such vast periods of time, of number, and of distance—such a boundless exhibition of force and grandeur? Surely, the answer must be "The heavens declare the glory of God."

A hearty vote of thanks was accorded to the lecturer.

The Chairman announced that at the next meeting Mr. J. W. Beattie would give a lecture, illustrated, on the East Coast of Tasmania, as visited by Tasman. At the September meeting Mr. A. Mault would read a paper on the timber industry. At the October meeting the secretary (Mr. A. Morton) would probably have some notes of his visit to Canada. That would be after his return from Vancouver, and, no doubt, he would have something interesting to say with regard to his visit.

Mr. Nat. Oldham operated with the lantern slides illustrating Mr. Kingsmill's lecture.

AUGUST 26.

Owing to the inclemency of the weather the meeting to be held this evening was postponed to September 9th.

SEPTEMBER, 1901

The monthly evening meeting was held on September the 9th, the President, His Excellency the Administrator, presiding, when the following paper, illustrated with lantern slides, was read:—

NOTES ON A TRIP TO THE BARN BLUFF COUNTRY.

(By Mr. J. W. Beattie.)

The greater part of the following notes on the Barn Bluff country were written under the most distressing conditions imaginable, both from the tourist and photographic aspects—the latter especially, as it was in the interests of photography that I made the journey. Sitting in a little hut, in the midst of wildly beautiful country, made still more wild, and also dismal, by the awful strife of the elements outside, which, day after day, raged with a fury scarcely imaginable to a lowlander, and, to my way of thinking, certainly worthy of a better cause

If long-continued pleasure brings weariness, it can be imagined into what mental state one is driven when the opposite cause is in operation, and day succeeded day in furious wind and rain (the roaring of the wind in the big trees around keeping me awake at night), to be succeeded by heavy snowfalls, and thunder and lightning, making every living and dead thing around in such condition that it was, to say the least, misery to walk outside the hut, the tension became so acute that I could scarcely sleep at all. How I wished the Barn Bluff country elsewhere, and called myself names for undertaking the trip at this late time of the year, and the only sympathy I usually got would be from the extra hearty wind gust outside, sending a cloud of fine snow through the cracks in the weather-boards of the hut, down my neck, a process cooling, if not comforting. At last came the crisis—I could bear it no longer. The packer had been expected night after night, and he never came, and each successive disappointment became more acute. Tucker was running low, and if more snow came, the consequences might prove serious, so I decided to clear out, and one Sunday morning saw me plodding through the February Plain, swag on back and camera in hand, and the following day (Monday) found me at Mr. Howe's comfortable house at Mole Creek—42 miles from Pelion—tired, but thankful at being out of the storm region, and within reasonable distance of home, after an absence of nearly three weeks.

I left Hobart on April 4, by express, in company with Messrs. E. Hawson and Boxall, who, with myself, formed the party bound for the Barn Bluff country. The route lay via Mole Creek, then to Liena, on the Mersey River, 12 miles further on southerly; then via Innes's Track to Pelion Huts, 28 miles ahead, through Gad's Hill and February Plains, still heading southerly, then away to Barn Bluff, 14 miles further on in a N.W. and north-easterly direction. The weather in Hobart, on leaving, was very wet—southerly—which continued nearly to Evandale, where we left it, hugging the Great Western Tiers right on to Mole Creek, although there was an occasional shower before the terminus was reached. We arrived at Mole Creek about 5.20 p.m., and carried our baggage on to Mr. Howe's store, where we also cast aside the garments of city wear, and assumed those suited to the rough, wild country which lay ahead of us. We were joined here by Mr. W. J. Lloyd, head teacher of the Mole Creek State School, who completed our party.

After refreshment, we started for Liena (Mersey River) at about 7.30, on riding horses, the swags coming on in a chaise cart, and we progressed admirably, the road all the way being exceedingly good, and with the moon at the full it was a very pleasant journey. The Western Tiers end somewhat abruptly their western trend at Mole Creek, their grand, wall-like formation running southerly from there, and it is this bold terminal headland that we can see from Pelion, 40 odd miles south, standing out finely, and retaining almost the same form that it presents to the Mole Creekers on its northern side. From Mole Creek we keep along the main road westerly for a mile or so, turning sharply south after crossing the Sassafras Creek, and keeping on the Circular Ponds and Liena-road. We fall in with some good farms midway on the journey, the Circular Ponds district representing a patch of good agricultural flat land under the Western Tiers, so-called from the prevalence of "pot holes" or depressions, peculiar to limestone country; but the country generally right through to the Mersey is barren, hungry-looking, and unsuitable for agriculture. On the west side the road is bounded all the way through by the Barren Tier, and when the fine form of the Western Tier is lost, on the east, steep, rough, timber-clad hills and gullies prevail, in which a couple of sawmills do business. It was with some satisfaction that at last we found ourselves above the great valley of the Mersey River,

whose waters, in the wonderful stillness of the beautiful night, we could hear rushing on a thousand feet below, and, leaving the road, which zig-zags down the great depth, we lead our horses down a "short cut," picking up the road again lower down, and soon we reach the Mersey Bridge, across which lies the incipient township of Liena. The Mersey River here is small, somewhat similar in size to the Meander at the bridge, Deloraine, but differing widely in feature, in that it flows through steep, "gorgy" country, the abrupt head of the Barren Tier, north-westerly, being rather imposing. There is a clear, grassy, flat on the western side, with a couple of cottages and a hut, comprising the township. The latter building we took possession of, stowing our luggage and fodder for the night, we ourselves camping about three-quarters of a mile further south in a house belonging to a settler, who, at the time, was absent. We arrived at the Mersey at about 11 o'clock, and by the time we got settled in our rugs for the night it was considerably after 12. As the orders were to be up at 5 and make an early morning start direct for Pelion, we had rather a small margin left for sleep, and we, unfortunately, rather overdid it by getting up at 5.30. Breakfast and packing up take time, and it was 8.10 before we got fairly on the road. This was the mistake of the day, which caused us so much trouble and discomfort later on, and it is one which all travellers in bush country try to avoid—starting late on a long journey. It's bad policy, and generally ends in trouble. Had we got away at 6 o'clock, as we ought, we would have come out of it with comfort all round. We started with a smiling morning, nice sunshine,, and a south-westerly breeze, but as we got upwards and onwards our evil genius met us, and never left us during the whole of our stay in the locality; the wind went round to the nor'-west, and it blew and rained dismally. Our track lay for a short distance along the banks of the Mersey, when we strike southerly into a road running up Gad's Hill a distance of four miles, with a rise of something like 2,000ft., through fine land generally, heavily timbered, and prettily clothed in fern, sassafras, and myrtle. It is a long, weary pull up this hill, well-graded as it is, much of it being in wretched condition, and the wonder was how, in some places, the patient pack horses, heavily laden as they were ,came through it without accident.

The summit of this hill once gained, we stand on the northern end of a great plateau. a divide between the Mersey and Forth Rivers, and the track runs southerly along this elevation, ultimately bringing us to the head waters of both these rivers, the distance being between 20 and 25 miles. Geologically considered, the plateau has a belt of granite passing over its northern end; then an overlay of basalt, with about four miles of a fucoid sandstone country, the balance of the distance having a capping of dolorite.

At the top of the hill we pass through a cattle station belonging to a member of the Field family, known as "Gad's Hill Station," nicely grassed, where we noted numbers of horses and cattle enjoying themselves amidst the plenty around. Through the finely - grassed and wooded plains of this station the track, made by Mr. Surveyor Innes in 1896, really commences, and runs in a more or less southerly direction right out to Pelion, and as the going here is good we make full progress towards our destination.

About eight miles further we come to the Berriedale Plain — another of Messrs. Fields' possessions—a large, open mixture of button rush and grass, rather poor, and very wet, and by the time we reached the stockkeeper's house we were rather damp, and feeling sorry for ourselves. However, we made a halt here, under the spreading shelter of a "gum top," slung the billy, and gave the horses a rest and something to eat, and, in an hour's time, we were off again. The prevailing timber of the Gad's Hill country seems to be swamp gum (E. amygdalina), gum-top (E. sieberiana), and stringy bark (E. obliqua), of good quality, while further south no good timber of any account is met with, a very stunted peppermint (E. amygdalina) chiefly prevailing. I am told there are also extensive patches of fine wattle country on Gad's Hill.

Passing over to Berriedale Plain, keeping southerly, and rising through dense forest, we break out into what is known as February or Mackenzie Plain. This is a large extent of open button-rush country, broken up into timber patches, rises, valleys, and tarns, and our route runs through it for a distance of eight miles or more, and it is one of the most trying and dangerous parts of the journey. Exposed for the whole of the distance to the caprices of a cruel climate, the traveller may readily be caught in a dense fog or snowstorm, and so be in peril of losing his way, before he can get clear of the plain ,as the track is ill-defined, and the staking infrequent, and only those possessing a very intimate knowledge of the country would be able to find their way out in safety. In spite of all the associated perils of this great plain, however, it appears, in fine weather, very beautiful, the clumps of timber splashed and dotted over its ex-

panse, giving it a pretty, park-like appearance, and the uninitiated would naturally imagine the country to be quite the reverse of what it really is—a veritable barren, howling wilderness, the "Terra del Fuego" of Tasmania. From the highest part of this plain, called the Divide, which is also the highest part of the plateau, a very fine panorama of the mountains ahead, from west to south, can be obtained. The Cradle Mountain, away to the north, Mount Oakley Range and West Pelion, to the west; while between west and south we can see the Pelion, Du Cane, Rugged, and Pillinger groups, all fine, bold mountain ranges, while on the plains below us two or three big tarns break up what would otherwise be rather a monotonous foreground, completing a finely picturesque panorama. I have, unfortunately, to give these picturesque details somewhat prematurely, as they were obtained during the return journey only, the whole features of the country, from the February to Pelion Huts, being "wiped out" during the journey out by the dreadful state of the weather. When our party fairly entered upon the wilds of the February Plain the weather turned downright cruel, a heavy, cold, cutting wind, with driving rain, setting in, and making things particularly miserable. How we wished to be within sight of the huts! Riding became out oc the question, so we dismounted, and plunged through the boggy ground, leading our horses, which was hard work, in addition to the heavy walking, for the poor beatsts were, by this time, tired out on account of the wet and thoroughly bad state of the track. The lateness of the hour, also, began to make us feel anxious, travelling being so slow under such adverse conditions, and our guides were frightened at the prospect of darkness overtaking us while on the plain, the track being so indefinite and easily lost, so we had to exert ourselves to the utmost, splashing through it, and just succeeded in gaining the end of the plain as the daylight almost faded out.

Towards the end of the plain, and where it narrows down into a gully-like form, collecting and concentrating its drainage, as one of the great feeders of the Mersey, and delivering its waters down into the great river gorge far below,we get a fine and bold angular aspect of Mount Pillinger — or Mag's Mountain—which very picturesquely terminates this end of February Plain. Crossing the narrow valley of this part of the plain, rising quickly and turning westerly, we stand on the eastern trend of the Oakley Range, and our track runs, well-defined, down its sides, bringing us into the Pelion Plains at Lake Ayr. At the head of this track we are confronted with an impressive scene, a vast mountain amphitheatre, formed by the Pillinger, Rugged, Du Cane, East Pelion, and Oakley Ranges. This is the birthplace of the Mersey River. It is a grand picture, full of food, both for the artist and the philosopher. The one would revel in material for his canvases, and the other would find his soul lifted up towards the One whose presence under such conditions comes so near, and is made so manifest by His wonderful works around.

But our party, at this time, saw none of this beauty. Mist, rain, and the gloom of night, blotted it almost all out, showing only just enough of an indefinite space to leave a vague impression on our minds that there was something grand beyond, if we could only see it.

The Oakley Range, where we stand, is about 1,800ft. above the plain below, and the distance to the Pelion Huts, our destination for the night, is five miles. The made road down this range is rough enough to negotiate ordinarily, and the boggy plains still worse; but can anyone conceive what a five-mile tramp through them in the dark would be like? None of our party had ever had such an experience, and certainly don't wish for a repetition. How we got through it so well is a wonder to me, and I can only attribute this to the ability of the packers, in some measure, and, most of all, to the sagacity of the pack horses, who had been there before. Speaking for myself, it was a most peculiar experience, for, in the semi-darkness, everything on either side presented the most grotesque and puzzling shapes and appearances, and when we got on the plains, the wavy, white grass, of which I had no previous experience, gave the surroundings the appearance of vast lake-like stretches, and made things look most uncanny. On we went, however, stumbling and splashing, moving slowly in single file. Sometimes down would go one of the pack horses, and the procession would stop until the order was passed along to move on again, then more stumblings, shoutings, boggings right up to the knees, complete collapses over the wretched grass clumps, wringing wet, and still on we had to move. The distance seemed interminable, but at last the sagacious horses turned off the track, and headed right up the hill, and the joyful news came back along the line that we were at the huts. It was a tough scramble up the hill, but the comfort ahead lent additional strength to our already overtaxed stock, and the shouts that came back from the huts above us, in answer to our yellings, were as balm to our

troubled spirits. "Get the 'billy' on," we shout as we climb, and in a few minutes more we can see the lights inside the huts, and are soon alongside, and our troubles for the time being are ended; just at half past 8 p.m. There are two huts on the hill, in the timber, one being higher on the hill than the other, and from the higher one came an old friend—Mr. G. Renison Bell—to meet us, and we introduced ourselves, to his utmost astonishment. Although heartily pleased to see us, yet he thought it savoured somewhat of lunacy to come into this country in such weather, more particularly did he apply this to myself, with all my photographic baggage; and I believe he was right.

Mr. Bell is here, I understand, in the interests of the Great Western Railway Co., prospecting the country. However, here we were, right in the heart of the Pelion country, and, wet or fine, we would have to make the best of it, and so we really did. With a splendid fire, a change of dry clothing, plenty of "tucker" and hot tea, we soon regained our normal condition, and felt comfortable, and even happy, although the wind and rain roared and splashed outside. Next morning (Saturday, 6th inst.), at daybreak, we were roused up by the packers to know our intentions, and, considering our struggles of the previous day, and the fact of the weather still continuing very wet, and no prospect of change, we decided to put in the day at Pelion, and hope for the best. The weather was south-westerly, plenty of wind, with heavy rain squalls, and a low scud driving across the sky at a tremendous pace. However, about mid-day it began to improve, and by 1 o'clock it stopped raining, and cleared enough to allow us to get outside and look around. The two huts are rather snugly situated in the timber, on the hill above the track, but a much more convenient situation might have been chosen for them. They are acceptable, however, in any situation in such a country, and especially under present circumstances. They were erected by a Northern company holding some mineral concessions in the vicinity, which I shall refer to later, and are at present only used as rest houses by tramps, like ourselves. Under the able guidance of Mr. Renison Bell, we set out to climb into the country lying behind the huts—to the south-east—and, passing through a belt of dense myrtle scrub, rising rapidly, we soon gained an open plateau, under the Pelion Range, from which we could pick up our last night's course, and view our prospective one to Barn Bluff as well. We found ourselves surrounded by a chain of high mountains forming a basin, and having a radius of something like four or five miles, with an opening to the north and north-west of, perhaps, a couple of miles, where, stretching away in the distance, are open button-rush plains, rises, and timber patches, with an impressive background of Barn Bluff and Cradle Mountains towering up against the sky. This great basin, in which we stand, forms the head waters of the Forth River, and a vast and magnificent gorge, into which the contributions from this basin empties, is formed on the open, northern side already noted, running outwards, as far as can be seen, in a north-easterly direction. The gateway, if I may so term it, of this great Forth gorge, is in keeping with its grandeur, for, on the east, stands up boldly and fully from the plain, the western termination of Mount Oakley (whose range continues easterly for four or five miles, and forms the northern side of the basin), with its broken columnar greenstone formation, resembling, rather strikingly, our Cape Raoul; while on the west the fine proportions of Mount Pelion West, with a grand columnar greenstone capping, conical somewhat to the east, but resolving into a great wall facing north. Pelion West forms the western end of the great half-circular chain of mountains on which we were now standing, its eastern termination being a conical mount, with a sharp, natty, greenstone pinnacle top, called East Pelion, and between these two extremities of the chain are three finely-proportioned mountains, one on the west, called Mount Ossa, now named "Backhouse," after the great philantropist and scientist, and friend of J. B. Walker's father, after whom he named his son James, the remaining two being nameless. The Surveyor-General suggested this name as an association for the purpose of better identification of Mr. Walker. Here was a chance to perpetuate the memories of two of Tasmania's worthy sons, for what can be more graceful, and also sensible, than the keeping alive, topographically, the names of those who have nobly and unselfishly served their country? This form of nomenclature, in conjunction with native names ,is, I think, most desirable, and I cannot help again repeating what I have often said before, that it is a pity some authoritative system of nomenclature, undertaken by a recognised body, should not be established to deal with such important matters.

The two names chosen by us, and which have since been approved by the Surveyor-General, were Bonwick and Walker, men whose tastes and inclinations were so much alike, and whose sympathies and

energies were always directed towards the advancement of the interests of Tasmania particularly, and also of Australia generally. Mr. James Bonwick still lives in London, and is well and kindly remembered by many here who have sat under him in past days as scholars, and whose works on Tasmanian history, relating particularly to the extinct native races, are valuable text books on that subject. Of the merits of Mr. James Backhouse Walker, so lately taken from amongst us, it is hardly necessary for me to remind you. I can safely and very feelingly say, that "he being dead yet speaketh." Not only are his valuable historical researches regarded as standards of our past, but the effects of his great activity in the cause of the higher education of this State bear testimony to-day to his ability and worth, with a freshness and power which appeals to us all.

Under Mount Oakley's eastern end is a long lake, about 1½ mile long, and rather narrow, called Lake Ayr, after, I presume, Mr. Bobbie Burns's "toon o' Ayr." From this lake, and also from a small though voluminous stream, "Bonwick's Rivulet," junctioning with the lake outfall ,the Forth River receives its primary impetus. The whole panorama was grand and fascinating, although the wind was bitterly cold, and from behind the kindly shelter of a great rock we drank it all in. Coming down from the higher levels of Bonwick, and turning towards its western trend, we visited one of the Pelion coal tunnels. The work done here represented a tunnel of over half a chain long, with heaps of coal lying at its entrance on either side Two seams. have been discovered, one 17in. in thickness, the other 26in. Considerable exploratory work has been done towards testing these deposits, three tunnels in all having been put in, and much trenching done. The results seem as yet to be only moderately valuable. analysis showing, according to the Assistant Government Geologist. a low quality of coal, with a value dependent on the success of the Barn Bluff mining field. The Launceston people seem to have a much better opinion of the coal, their analysis proving, they say, one sample to be a splendid steaming coal, and another sample was admirable for coking purposes. It is also alleged that the Pelion Copper Company used it at their forge, and considered it to be the best quality of coal in the colony. However, I think there can be no question as to the value of these great coal deposits, if the Barn Bluff country "pans out" well, timber all around being exceedingly scarce. Coming down towards the hut, and the weather still keeping fine, we crossed over the plain, northerly, towards Mount Oakley, where, on the high banks of the yet youthful Forth River, we come upon the Pelion Consolidated Copper Company's mineral show. There are four lodes uncovered on the property, and partly prospected. Those running from the north and south assay well for silver, and those east and west for gold, and all down the creek mineral indications are to be found in the country rock, a quartzite schist.

The company ceased work, I am told, after spending something approaching £1,200 on the property, on account of the utter isolation of its position precluding all possibility of getting their ore out. There are several tons of really good ore, bagged and at grass, awaiting means of transport. I heard that work was to be resumed as soon as the development of the field around is likely to secure a means of communicaion with outside, and then their fine property must become of great value.

Towards evening the weather became again stormy and wet, and next morning (Sunday, April 7) it was as bad as ever, and we had to remain in the hut all day. Monday, 8th inst., broke fine with frost, so we made a start for Barn Bluff Camp, getting away from Pelion soon after 7 o'clock. From the "branch off" to the Pelion Huts, the track runs through a belt of forest ,clothing the southern bend of the Forth Gorge, and then sweeps round in a great bend, under the bases of Mounts Walker Ossa, and West Pelion, which tower up very grandly all round, and rising along the eastern side of West Pelion until the Forth Gorge is cleared, we turn sharply round north-westerly, and have a clear run in that tuirection for eight miles or so, over button-rush plains and timber patches. Just as the track takes its north-westrly turn, it overlooks the Forth River Gorge, and it presents to us a scene of the wildest grandeur. Photography cannot convey anything like a corcorrect representation o fthe scene which I have not seen surpassed, in all my bush wanderings, for weird sublimity. Here it is that the whole of the drainage from the great Pelion Group, Lake Ayr, and the Oakley Range, form into one united stream, and pass on as the Forth River.

From here we can see the great formation of the Barn Bluff mine, the big knob, standing up finely on the west side of the gorge, not more than three or four miles distant as the crow flies, yet our windings make the distance eight miles, or more, before the camp is reached. The day turned out exceptionally fine, and we had ample opportunity to see the fine mountain scenery around, as we progressed. The Pelion Group, which we were leaving,

looks very grand, the full proportions of the different members of the group becoming finely marked the further we kept to the north-west. Southerly ,just clear of West Pelion, the Eldon Range rolls out boldly in the distance, and coming further west, Murchison and Black, and other hills, which I did not recognise, all show up well, but too distant to photograph effectively. But the pictures are to the north-west, standing up with splendid effect, the two highest mountains in Tasmania, Barn Bluff and Cradle Mountain, According to Innes, Cradle Mountain is 5,085ft., and Barn Bluff 5,045ft. I was told that the name of "Cradle" originated from the shape of the mountain resembling a gold miner's cradle. Perhaps that is correct, although I cannot vouch for it. But concerning the christening of Barn Bluff I feel I can safely speak, and I do unhesitatingly denounce it as a vile slander on a noble mountain. No effort of the most fertile imagination can, in my opinion, resolve this mountain into anything approaching the resemblance of the most orthodox or unorthodox of barn of the past or present, and I would like so much to have a chance of giving it a really good name. (How would Beattie's Bluff do?!!!) After crossing a long stretch of plain, we enter rather broken country, leaving our north-westerly course, and coming round easterly, in the vicinity of Swallow's Camp. We find ourselves now in country bearing a melancholy interest, T. J. Connelly, the Rosebery resident, having recently perished in the snow somewhere in this vicinity, and the search parties were still actively engaged in searching for his remains. Coming down to Swallow's Camp, pitched above the shores of a lovely lake named "Windermere," we met one of the searchers, and from him we learned all of the pitiful details—few, certainly, but painfully significent — surrounding the disappearance of the poor man. It was sad to look back, only a couple of months when I met him in Rosebery looking well and cheerful, and romping with his two litle girls on the verandah of the hotel. Lake Windermere, just under Swallow's is a lovely lake, with an area of about 500 acres, and fringed with King William Pines, the shores making effective pictures, particularly with the bold head of Barn Bluff looking patronisingly over the rather steep north-western bank ofthe lake. We camped here for an hour, slung the billy and drank tea and scenery to our hearts' content. Swallow has a good mineral show, partly opened out here, and which is about to be thoroughly developed, and he has others in the vicinity. Now that we are within the Barn Bluff mineral field it may be of interest to briefly describe somewhat of its geological features. I will quote from Mr. Waller's recent report on the district, which I daresay many of my readers will not have teh opportunity of seeing:—"The country consists mainly of finely laminated schist. The whole country shows marked evidence of prolonged glacial action. Superficially it strongly resembles the Lake Dora district. The rock most frequently met with is a strongly foliated quartz schist. I think that quartz schist is a more appropriate name for the rock than quartzite, the name by which the rock is locally known, as it lays more emphasis on its schistose character. The rock occurs in long bare ridges all over the country, the intervening flats and hollows being covered with button-grass or scrub, or being occupied by small lakes. I think that it will be found that the softer schists are really in greater abundance than the quartz schist, but these being softer have been worn away by the erosive action of the glaciers, and, therefore, are now hidden from view beneath the buttongrass and glacial debris of the low-lying ground.

Leaving Lake Windermere we rise over its western boundaries, and move across broken country, in a north-easterly direction, towards the Barn Bluff mining property, about three miles distant. Barn Bluff and Cradle Mountain are seen to advantage just above the dip down into the gully where the camp lies, but I had almost forgotten to mention passing another lake, lying in very fine bold surroundings midway between the camp and Lake Windermere. We called it Lake Andrews, after Mr. H. Andrews, who is the pioneer prospector of this part of the country. I was going to say Mr. Andrews' home was at Liena—he cerainly has a wife and family living there—but from what I saw and heard of him I should conclude his home was in the wild Pelion country, for there he is always to be found "badgering" about. He knows every "hole and corner" of it, and keeps a nice assortment of mineral shows "up his sleeve" for the convenience of any speculative traveller who may come along. May he "go in and win," I say, for he well deserves any success that may come to him! These two lakes — Windermere and Andrews—for beauty of form, are as nothing compared with the lovely lake situated just above the Barn Bluff property. About a mile in length, and broken up into beautiful bays and promontories, and magnificently backed by Cradle Mountain, it is a subject which I hardly think can be excelled in Tasmania for delightful composition. Possessing so much of the elements of the beautiful, and being nameless, our party unanimously decided to name it after one who possesses, we had always thought, in an

eminent degree, elements of the beautiful of another and higher type, which we all so much admire and love. I refer to that benevolent, Christian gentleman, the Hon. Sir James Agnew. This lake, whose outflow junctions with the Forth River below, is to furnish the mining company with water-power to drive their machinery, and the enormous pressure obtainable, combined with the inexhaustible supply which the lake can furnish, will be an asset of incalculable value to the mine.

The Barn Bluff property, of which so much is heard now, is comprised of two 80-acre sections of a highly metalliferous character, the efforts of the proprietary, up to date, in their endeavour to determine the value and extent of their huge caperiferous outcrop, being represented by about 21 open cuts, or excavations, denoting a large expenditure of money and enterprise. Here are some assays from some of these excavations, obtained from our Government Analyst:—

No. 1 Face.—Copper, 4.5 per cent.; silver, 1oz. 17dwt. 16gr.; gold, trace.

No. 2 Face.—Copper, 9.5 per cent.; silver, 0oz. 19dwt. 19gr.

From across huge face.—Copper, 4.6 per cent.; silver, 2oz. 9dwt.

Assay by Mr. Stitt, of Zeehan.—Copper, 6.7 per cent.; silver, 14oz. 14dwt.

These assays will give some idea of the surface prospects. What depth will prove has yet to be decided, but indications point to greater values. Vigorous tests in the shape of tunnelling will soon be commenced, and the results will be awaited with much interest by a large section of the investing public. Mr. Murray, late Government Geologist of Victoria, who lately visited the property, makes some interesting remarks on its geological formation and probable value ,which, I think, is worth a brief quotation, coming, as it does, from such an authority. He says:—"A number of excavations show quartzitic schistose rocks, with a general east and west strike, highly impregnated with iron pyrites, and a considerable proportion of copper pyrites. It cannot be described as a lode, but as a great belt of schistose bands impregnated with ore, some rich, others poor, but, taken as a whole, I consider it to be a good, low to medium grade proposition. As to the downward extent of the great formation, the probabilities are that it extends as far as human skill can reach, and from a rough consideration of some 8 millions of tons of ore bearing rock in actual sight, 25 per cent. of which would prove payable, I should estimate the workable ore within 4 per cent. of copper, besides such gold and silver contents as may occur. Higher up the gully, above the Barn Bluff property, is another mine known as the North Barn Bluff. We did not visit it, but could see the workings, high up on the hillside, represented by a couple of tunnels, with the ubiquitous mullock heap at their entrance.

The Barn Bluff Camp is snugly situated in the timber by the Agnew Creek. We found it very comfortable, although at the time deserted, all the occupants being absent on their Easter holidays. Next morning (Easter Tuesday, April 8) found us on the move again, returning to Pelion, under, alas, the lamentable conditions of fog and mizzling rain. Fine weather here seems to be the exception, and as we crossed the open plains, where yesterday all around us Nature smiled in kindly welcome, not a vestige of surroundings could be seen; all was blotted out by mist and rain, and in many instances it was difficult to determine the run of the track, as it is not staked, and those who are not acquainted with the country have to be guided by the horse tracks, which are often easily missed. From the yawning valley of the Forth, up its great gullies and gaps, streamed the fog, wrapping up and soaking all Nature in its ghostly embrace, and as we filed along the plains, phantom-like through its envelopments, our situation was far from agreeable or comfortable. It was not until we got well on towards Pelion West that the sun began to break up the mist, and away to the south the mountains stood out bright and clear. Skirting the edge of the plain above the Forth Valley, the scene was grand in the extreme; the breaking mists, twisting, writhing, and swirling, from the great gulph beneath, looked like emanations from some gigantic witch cauldron, and we looked on in admiration. The Pelion Huts were soon reached, and preparations for the return journey home made by all but myself, I remaining to obtain the balance of photographs that time, and the weather had prevented me from securing. Wednesday, April 9, at 7 o'clock, Messrs. Hawson and Boxall left me, Mr. Lloyd having, I had forgotten to mention, gone home on Sunday. I did certainly have some misgivings at staying behind with such a lot of photographic baggage, in such a wild uncertain climate, and so far from outside help. Yet I felt I had not done my duty, and as the packer promised to return in a week's time, I thought it right to stay, and, of course, I had good company with Mr. Renison Bell. How I fared from the time I was left, until the day I was compelled to flee out of it, I have briefly indicated at the commencement of this article, and as I have already outrun the length of any decent paper I will fill in the time of my stay with brief extracts from my diary to reduce length as far as possible.

April 9.—Wind, S.W. Blowing and raining all day.

April 10:—Wind, S.W. Blowing and raining all day.

April 11:—Wind, west; cleared afternoon. Got photo. Mount Bonwick.

April 12:—Wind, west. Wet all day.

April 13:—Wind, changed to N.W., and cleared a little in the afternoon. Got photos in Forth Gorge.

April 14:—Fearful weather. Blowing living gale, with rain. Hailstorms during morning. Thunder about midday. Afternoon, snow. Rain at night.

April 15:—Rained and blew all night. Fearful weather all day. Wind, rain, and sleet.

April 16:—Fearful night of wind, snow, thunder, and lightning. Everything white. Snowed nearly all day.

April 17:—Snow about 8in. deep. Damp and misty.

April 18:—Turned frosty during night, and morning broke clear and bright. Cradle and Barn Bluff looked sublime, snow clad, with early sun streaming on them. Started off with camera to ascend East Pelion. Mr. Andrews assisted me,and we had a fearful struggle in the snow through the scrub, up the mountain side, and when we reached the top fog came down, and blotted all the landscape out. Came back to hut drenched and disgusted.

April 19:—Dull and threatening. Went with Andrews out to pine scrub, but weather turned wet from the west, and it rained heavily all day. Came back to the huts drenched.

April 20:—Dull, foggy, and showery. This is now the fifth day over the time packer promised to come for me. Decided to tramp in, and will start to-morrow.

April 21:—Quiet morning. Wind, S.E., looking fine. Started at 8.15 with H. Andrews for Berriedale Plains, 17 miles. Bid good-bye to friend Bell with a good deal of misgiving. He is all alone, and tucker none too plentiful, and no sign of the packer wit hhis fresh supply. Got to Berriedale, easy walk, at about 5 o'clock, and set to work to get in firewood for the night.

April 22:—Left Mark Shaw's at ten to 9, arriving Gad's Hill station at 11 o'clock. Went down old track into Liena, and camped an hour at Mr. C. Roden's, who kindly insisted on dinner. Weather, very bad, wind and rain in torrents. Got into Mole Creek, Mr. Howe's store at 4.15 p.m. tired, but glad I had escaped.

April 23:—Left by 6 a.m. train. Ran into Launceston, and came on to Hobart by afternoon express.

It only now remains for me, in conclusion, to say something regarding the prospects of this district as a whole, and the condition, both present and prospective, of the means of communication between it, Mole Creek, and also the West Coast. From those who are competent to give an opinion, those who have personally inspected and prospected the field, I find a general consensus of opinion most favourable to its future success as another addition to our copper producing centres. That, surely, is satisfactory; also we must not lose sight of the valuable coal deposits, already mentioned, which,in a country where timber is not abundant, and every year becoming scarcer, will form an invaluable substitute, and may, indeed, be largely utilised further afield. Another important factor in the future welfare of this field is the existence of splendid water facilities for the generation of power suitable for all mining operations. Such a field, so highly favoured by Nature, requires, to make it a success, a railway, and I suppose that will ultimately come, when results, which always speak louder than words and any amount of writing, demand it. At present, however, the means of communication is, to put it very mildly indeed, extremely unsatisfactory, and is deserving of the immediate attention of the Government. From Liena to the Barn Bluff copper mine, the distance by present track is 42 miles, while, taking it as the crow flies it cannot be more than 17 miles. Much of Gad's Hill is positively unsafe for pack and saddle horse traffic, and is really a menace, and shuld be immediately remedied. The track along the plains sadly wants attention in a great many places, a bit of corduroy here and there, and in exceptional boggy places, cutting out the turf altogether, and geting down to the solid gravel. Then I would strongly urge better staking of the plains, the stakes not to be so far apart. As it is at present this is a sad deficiency, and who knows but had this been properly arranged, as it most assuredly should be, poor Connelly would not have been lost, and without considering the irreparable loss sustained by the poor fellow's relatives, this State would have been saved much expense, and also alarm. Now let us glance at what Government propose doing towards the improvement of this route. It has been ascertained that the distance can be materially shortened, and this is to be accompanied by deviating in a south-westerly direction from Berriedale Plains to the Forth Valley, which will be gradually descended, making an easy grade, and ultimately reaching the high ground somewhere near the centre of the mineral area. Ths deviation, it is estimated, will effect a reduction in the distance of something like 15 miles, and will also avoid much of the high snowy country which occupies so much of the route of

the present track. The West Coast outlet is the continuation of the Innes's Track, which we have already dealt with as far as Barn Bluff, and passing through Mount Farrell, terminates at the Emu Bay Railway at Pieman River, 36 miles further on.

One last word. I cannot close without expressing my heartiest thanks to those who so kindly assisted me during the trip. To my companions, Messrs. E. Hawson and Boxall, ever ready to lend a hand with the camera. To H. Andrews for his very kind help in this and other directions, and also to the Parson Brothers, the packers, so obliging at all times. Then last, but not least, to my friend G. Renison Bell, who, during my stay, did so much to make it comfortable and enjoyable. I shall not readily forget the yarns and songs, and best of all "soul chat" which we had during the evenings before that warm old fireplace of the Pelion Hut.

OCTOBER, 1901.

The monthly evening meeting was held on Monday, October 9th, His Lordship the Bishop of Tasmania (the Right Rev. Dr. Montgomery), vice-president, presiding.

PAPERS.

The following papers were read:—"Practicable Forestry in Tasmania and elsewhere," by Mr. A. Mault; "Note on Itacolumite, or flexible sandstone," by Professor E. G. Hogg, M.A.

NOVEMBER, 1901.

A meeting of the Royal Society of Tasmania was held on Tuesday evening, the 5th November, 1901, at the Museum, Argyle-street. Mr. T. Stephens, M.A., F.G.S., presided, and there was a large attendance of ladies and gentlemen.

Absent.

The Chairman said he was sorry they were deprived of the presence of His Excellency the Administrator of the Government (Sir John Dodds, K.C.M.G.), who was prevented from being present by serious illness in his family. His Excellency regretted his inability to be there to bid farewell to the Bishop of Tasmania.

Letters of apology for unavoidable absence were received from the Hon. Sir James Agnew, K.C.M.G., M.D., and the Very Rev. Dean Kite, and the Hon. N. J. Brown, M.E.C.

New Member.

Dr. Holden, Bellerive, was elected a Fellow of the Society.

The Bishop of Tasmania.

Mr. Alex. Morton, Secretary to the Society, read the following observations with reference to the connection with the Society of the Bishop of Tasmania, now about to leave for England, which had been forwarded by the Administrator of the Government:—

Fellows.—"The Right Rev. Dr. Montgomery, since his arrival in this State 12 years ago, has ever taken the deepest interest in all matters relating to the Royal Society of Tasmania. During these years, whether as an observant traveller in the more remote parts of the island, or as an enthusiastic contributor to the proceedings of the Royal Society, or again as a most valued helper as a councillor and vice-president, the Fellows of the Society owe him a debt of gratitude for the yeoman service, sympathy, and encouragement which he has ever been pleased to render to them. He has himself been an active worker in all matters of research which related to the early history of the State. With our late dear friend, Mr. James Backhouse Walker, he has contributed many valuable papers relating to the earlier explorations and explorers. He has also enriched our proceedings by valuable contributions to our knowledge on all matters touching the now extinct Tasmanian aborigines, and their half-caste descendants inhabiting the islands (Furneaux Group) of Bass Strait.

"As regards the half-castes, he has always taken the deepest interest in their well being, and in their industries, chiefly mutton-birding and fishing. As the Sooty Petrel, or 'mutton-bird' industry forms almost the sole means of support to these Tasmanian half-castes, it is not surprising that His Lordship should take more than usual interest in the natural history and general habits of this remarkable sea bird. In two of his papers read before the Royal Society he fascinated the members with his wonderful observing powers, and his vivid description of what he had witnessed during 'A night in a petrel rookery,' and also in his interesting 'Notes on the habits of the Cape Barren goose.' His Lordship's 'Notes on the mutton-bird industry' are by far the best and most complete that have yet been published.

"It is worthy of note that, owing largely to the representations made by His Lordship on the subject, certain islands have been reserved from use for the depasturing of cattle, a practice very destructive to the young birds; that the sale of eggs has been prohibited; and that adequate protection has been given to these birds, to seals, and to other members of the indigenous fauna of the islands in Bass Straits.

"It is also of interest to our Fellows to know that it is mainly owing to His Lordship that the Society possesses its special historical section. One of his best contributions to this section is his paper, 'A survey of two early journeys westward—Sharland's in 1832, and Sir John Franklin's in 1842.' But, perhaps, the Society owes most to him for his many valuable donations to its library and collections. Among these may be mentioned the very fine series of water-colour sketches from the brushes of Captain Stanley, R.N., and those of Lieut. Simpkinson de Wessellow, R.N. The latter are not only of the highest artistic merit, but as representing the scenery of Tasmania

in the early thirties and forties, they now possess the greatest historical value. Besides the large and valuable collection of birds and other objects of interest, presented by His Lordship to our Museum, we have to thank Mrs. Montgomery and His Lordship for the magnificent and celebrated 'Milton Shield,' just presented by them to our National Art Gallery." (Applause.)

The Chairman then read the following address to the Bishop:—

"Dear Lord Bishop,—As members of the Council, and as representatives of the Fellows of the Royal Society, we desire to give expression to our feelings of regret at your approaching departure from among us. Of our personal esteem and regard for yourself you are well aware, but we may also testify to our appreciation of the services, which as a contributor to the Transactions, and as a promoter of early historical research you have rendered to the Society, and of the good offices to which we owe the acquisition of a unique and valuable series of artistic drawings commemorative of early colonial days. Though deeply sensible of the loss which must follow the severance of your direct and personal connection with the Royal Society, we are gratified to know that you are called to occupy a position of great importance and usefulness in the Mother-Country. Of the arduous character of the duties of that office it is not for us to speak; but we are well assured that they will be in entire consonance with your own aspirations, and we believe that their execution will be materially aided by the wide and varied experience gained during your episcopate in Tasmania. In bidding you farewell, we desire to associate Mrs. Montgomery with yourself in the good wishes which we now cordially offer." (Applause.)

The Chairman mentioned that the Council had nominated the Bishop of Tasmania as an honorary member of the Royal Society, and said he hoped they might count upon a continuance of his interest in the society. As an honorary member, he would take the place of the late Baron Von Mueller.

The election of the Bishop as honorary member was then agreed to. (Applause.)

The Bishop of Tasmania said that this was the last occasion of his appearance in public here. He felt deeply grateful to the Royal Society for their address. He was prouder of his membership and vice-presidency of the society than of any other secular office which he had held. It had been one of the traditions of the society that it had never been known that once a person was nominated for membership a black ball was put into the box. But there was one striking exception. He had never had a white ball given him. (Laughter.) When he was balloted for it was found that there was not a white ball in the box. (More laughter.) He was elected entirely in black balls. (Continued laughter.) He thanked the society very much, on his own behalf and Mrs. Montgomery's. They had tried to do their humble part in society during their stay in Tasmania. He had never had any scientific training, but he had a love of Nature and of birds, and his case ought to an encouragement to non-scientific people to join the society. In the future, he would have to carry on correspondence with every part of the world, and the training he had received in the Royal Society of Tasamnia would be of use to him. In obtaining treasures from distant lands, he owned first allegiance to his own society, but, in the second place, he would always remember Tasmania. (Applause.) The Bishop then read the following reply to the society's address:—Gentlemen, — I beg to offer you grateful thanks for your address to me. There is no body to which I have been so proud to belong in this land, as to the Royal Society of Tasmania. Indeed, it is an interesting fact that at a meeting at the Colonial Institution in London, just after my consecration in 1889, I referred to the Royal Society as one of the objects to which I ought to direct my attention. Ever since I came to Tasmania, it has been one of my greatest joys to take part in the meetings, and to work for our national collection in the Museum. I hold that all who have enjoyed the privileges of membership here, ought in some way to contribute to our treasures, either during their life-time or by bequest. So far as I have been able to do so, I have not forgotten this ideal. Nor is it anything but delight to obtain from others for the Museum those relics and treasures which are sure to be lost unless they find a home in a national collection. If in days to come, I can aid the Royal Society in any manner, I shall be eager to

do so; and I beg to thank you for permitting me to become one of your honorary members. — I remain, gentlemen, yours sincerely, H. H. Tasmania. (Applause.)

Visit to British Columbia.

Mr. Alex. Morton gave an interesting and instructive account of his recent visit to British Columbia to obtain salmon ova for the Tasmanian Fisheries Commissioners, and exhibited lantern views of scenes in Honolulu, Victoria City, Vancouver, and other parts of British Columbia. He advised travellers from Australia to England to go by way of Canada, because they would hear nothing the whole way but the English language. He mentioned that Honolulu was the only place in the world where the English sovereign was below par. There, there were no barmaids. the hotels closed at 11 p.m. on week days, and were closed all day on Sundays. Education was compulsory, and among the Hawaiians there was not a man, woman, or child (of age to leave school), who could not read and write. There were five daily newspapers in Honolulu. Passengers going to the United States had to answer 21 questions put to them on board ship before they landed. He read these, which were of a very inquisitive kind, and sometimes very amusing. One of them was "are you a polygamist?" and he heard this put to a lady, who had just stated in answer to another question that she was "single." Some of the ladies were very indignant at the questions. Victoria City, the capital of British Columbia, was the first city to adopt the electric tramcar.

Mr. J. W. Beattie (for the Bishop of Tasmania) exhibited two lantern pictures — Barn Bluff and The Cradle; and Barn Bluff from The Cradle.

A cordial vote of thanks was passed to the authors of papers.

FORTY-EIGHTH ANNUAL REPORT.

The annual meeting of the Royal Society of Tasmania was held at the society's rooms on Monday evening, April 21st, Mr. R. M. Johnston, F.S.S., vice-president, presiding.

Corresponding Members.

The following gentlemen, who during the meeting of the Australasian Association for the Advancement of Science, were presidents of the several sections, were elected corresponding members of the society: — Messrs. T. A. Coghlan, F.S.S., Government Statistician of New South Wales; Professor A. Pollock, B.Sc., Sydney University; W. R. Greig-Smith, M.Sc., Macleay—Bacteriologist, Linnæan Society, Sydney; Professor Mica-Smith, B. Sc., School of Mines, Ballarat; Mr. T. S. Hall, M.A., University, Melbourne; Sir Thos. Fitzgerald, K.C.M.G., and Mr. Percy Oakden, A.R.I.B.A., Melbourne; Dr. W. E. Roth, Chief Protector of the Queensland Aborigines; Professor W. B. Benham, D.Sc., M.A., Otago Institute, Dunedin; and Professor Arnold-Wall, M.A., Canterbury Institute, Christchurch, New Zealand; R. W. Chapman, M.A., B.C.E., University, Adelaide.

New Fellows.

Messrs. Chas. Hudson (General Manager of the Tasmanian Railways), T. D. McEwan Kay, B.A., and J. E. Philip were elected Fellows of the Society.

Annual Report.

The Secretary (Mr. Alex. Morton) read the following annual report.—

The Council of the Royal Society have pleasure in submitting the following report for the year 1901, and regret that, owing to the sessions of the Association for the advancement of Science and the International Medical Congress, it was not found possible to have the annual meeting of this society earlier in the year.

Meetings.—There have been eight meetings during the session, all of which were of interest, particularly those in which the timber industry and forestry of Tasmania were discussed. At the first meeting, presided over by His Excellency Sir John Dodds, Administrator, a paper was read on "Timber Conservation" by Mr. W. Heyn, a timber expert, then on a visit to Tasmania, which introduced the subject, and was followed by a number of papers dealing with the general and important subject of the preservation of our natural woods, and the cultivation of forests, as a national work, by Messrs. L. Rodway, A. Mault, and A. O. Greene. Papers on "Geology" and "Mineralogy" were contributed during the session by Messrs. R. M. Johnston, Petterd, Twelvetrees, and Professor Hogg. A paper by Mr. J. W. Beattie "On a Trip to the Barn Bluff," illustrated by numerous lantern slides, was also read.

Publications. — Botany of Tasmania.—Mr. Leonard Rodway, now recognised as the leading authority on Tasmanian botany, has prepared a work on this subject, which is being printed by the Government, who, on the representation of this Council, placed a sum on the estimate which was passed by Parliament for the cost of printing this important scientific production. The volume will be largely illustrated, and is expected to be ready during the present year. It will be of immense advantage to students, and a stimulus to the study of this fascinating subject by those who lay no claims to the possession of expert knowledge.

Early Records of Tasmania.—The late Mr. James Backhouse Walker, who at the time of his death was a member of this Council, had at different periods contributed some valuable papers on the early history of Tasmania. The Council made a suggestion to the Government that these papers should be collected and published in one volume, and a sum having been passed by Parliament for this purpose, the book is now in the press, and will be issued during the present session. The preface to what may be looked upon as the memorial volume of the late Mr. Walker, has been written by the Rev. George Clarke, Chancellor of the Tasmanian University.

Papers. — Nineteen papers have been read during the session.

Library.—The society has received the usual number of scientific exchanges.

Obituary.—The society has during the past year sustained a serious loss in the death of three of its members. The Hon. C. H. Grant, who died in September, was a member of the society for many years, and always took a deep interest in its welfare. Dr. R. S. Bright, who died in October, was a regular attendant at the meetings of the Council, and did all in his power to promote its welfare. The Hon. Sir James Agnew, the oldest member of the society, passed away in November, at a ripe old age. He was elected in 1841, and always took a generous share in the work of the society. As it is the intention of our new President, His Excellency Sir Arthur Havelock, G.C.S.I., to refer to the work of Sir James Agnew at the opening meeting on April 29, it is unnecessary to anticipate what will then be said.

Resignation. — The resignation of His Lordship Dr. Montgomery, late Bishop of Tasmania, was regretfully received by the Council in October last, the step being rendered necessary by his departure from Tasmania. Dr. Montgomery was always ready to help on the work of the society, and it was through his Lordship that the society obtained the portfolios of Tasmanian and Victorian scenery, painted during the years 1845-7-8, by Lieut. Simpkinson-de-Wesselow, R.N. The folio of water colours painted by the late Captain Owen Stanley, R.N., were also obtained through His Lordship's kind interest. A farewell address was presented on behalf of the Fellows at the meeting on November 5, and His Lordship was unanimously elected an honorary member of the society.

Changes in the Council.—The following gentlemen have been elected to fill the vacancies in the Council caused by deaths and resignation:—Hon. G. H. Butler, M.R.C.S.E., M.L.C., Professor Neil Smith, M.A., Messrs. L. Rodway and A. Mault.

Fellows.—Seven fellows have been elected during the year.

Finance.—The income has been—Subscriptions and donations, £229 0s 3d; expenditure, £158 3s 10d.

Adoption of the Report.

The Chairman, in moving the adoption of the annual report, referred to the serious loss of three of the members to the Council by death, and the resignation of his Lordship the Bishop of Tasmania, the Right Rev. Dr. Montgomery. The Chairman also referred to the work on botany being brought out by Mr. Rodway.

ADDITIONS TO THE LIBRARY.

The Secretary stated that the Library of the Society had been enriched by the addition of forty-five scientific works. This collection had been left to the Society by the late Mr. C. H. Grant and had been recently forwarded to the Royal Society by Mrs. Grant. The following is a list of the books presented:—

Entomology.—Illustrations of British Entomology; or, a Synopsis of Indigenous Insects: Containing their generic and specific distinctions; with an account of their metamorphoses; times of appearance, localities, food and economy, as far as practicable. By James Francis Stephens, F.L.S. Embellished with coloured figures of the rarer and more interesting species. Mandibulata, Vol. 1 to Vol. 8, with supplement. London 1828 to 1846. Do., do., Haustellata, Vol. 1 to Vol. 4. London 1828 to 1834. An Introduction to Entomology, or Elements of the Natural History of insects, by Wm. Kirby, M.A., F.R., and L.S., and W. Spence, F.L.S.,

with coloured plates. Four volumes, Vol. 1 to Vol. 4. London, 1828. The Zoo'ogist Synonymic List of British Butterflies and Moths, by Henry Doubleday. London 1859. The British Coleoptera Delineated. Consisting of figures of all the genera of British Beetles, drawn in outline, by W. Spray, M.E.S. London 1840. An Introduction to the Modern Classification of Insects; founded on the natural habits and corresponding organisation of different families, by J. O. Westwood, F.L.S. Vols. 1 and 2. Plates. London 1839-40. The Butterflies of Great Britain, with their transformations, delineated and described, by J. O. Westwood, F.L.S., Coloured plates. London 1855. Essay on the Indigenous Fossorial Hymenoptera; comprising a description of all the British species of burrowing sand wasps contained in the Metropolitan collections; with their habits as far as they have been observed, by W. E. Shuckard, M.E.S. Plates. London 1837.

Conchology. — The Linnean System of Conchology, describing the orders, genera and species of Shells, arranged into divisions and families, by John Mawe. Plates. London 1823. A Concho'ogical Manual, by G. B. Sowerby, junr. Illustrated by upwards of 660 figures. (Second Edition). London 1842. General Conchology; or a description of Shells, arranged according to the Linnean system, and illustrated with plates, drawn and coloured from nature, by W. Wood. London 1815.

Infusoria.—A History of Infusoria, including the Desmidiaceæ and Diatomaceæ, British and foreign, by Andrew Pritchard, M.R.I. Illustrated by 40 plates. London 1861. A Synopsis of the British Diatomaceæ; with remarks on their structure, functions and distribution; and instructions for collecting and preserving specimens, by Rev. Wm. Smith, F.L.S. Plates by Tuffen West. London 1853-56. Vols. 1 and 2.

Reptiles.—A History of British Reptiles, by Thos. Bell, F.R.S., etc. Plates. London 1839.

Echinodermata.—A History of British Starfishes, and other animals of the class Echinodermata, by E. Forbes, M.W.S. Plates. London 1841. Iacobi Theodori Klein Naturalis dispositio Echinodermatum accesserunt Lucubratiuncula de aculeis Echinorum Marinorum et Spicilegium de Belemnitis, edita et descriptionibus novisque inventis et synonymis auctorum. Aucta a Nathanaele Godofredo Leske. Lipsiæ, 1778. Plates.

Natural History Works.—The Natural History of Animals, by Thos. Rymer Jones, F.R.S. Plates. Vols. 1 and 2. London 1845. The Ocean World, by Louis Figuier. Plates. London 1868. The World Before the Deluge, by Louis Figuier. Plates. London 1867.

Sponges.—A History of British Sponges and Lithophytes, by Geo. Johnstone, M.D., Coloured Plates. Edinburgh 1842.

Geology.—Journal of Researches into the Geology and Natural History of the various countries visited by H.M.S. Beagle, 1832 to 1836, by Chas. Darwin, M.A., F.R.S. London 1840. Geological Observations of the Volcanic Islands visited during the voyage of H.M.S. Beagle, 1832 to 1836, by Chas. Darwin, F.R.S. The Structure and Distributions of Coral Reefs, being the first part of the Geology of the voyage of the Beagle during the years 1832 to 1836, by Chas. Darwin, F.R.S. London 1842. Corals and Coral Islands, by James D. Dana, LL.D. Plates. New York 1872.

Ichthyology.—Natural History of British Fishes, their structure, economic uses, and capture by net and rod. Cultivation of Fish Ponds. Fish Suitable for Acclimatisation. Artificial breeding of salmon, by Frank Buckland. Plates. London 1880.

General Zoology.—Introduction to Zoology, by R. Patterson. Belfast 1846. A Cyclopœdia of the Natural Sciences, by Wm. Baird M.D., F.L.S. Plates. London 1858

Botany. — Exercises de Botanique a L'usage des commencans ouvrage elementaire, orne de 77 planches. Paris 1806. A Manual of Botanic Terms, by M. C. Cooke. Plates.

Vote of Thanks.

It was unanimously agreed that a special vote of thanks be accorded to Mrs. C. H. Grant, for the valuable donation of the above works to the society's library.

Re-Election of Vice-Presidents.

The Hon. N. J. Brown, Colonel W. V. Legge and Messrs. R. M. Johnston, and L. Rodway, the retiring vice-presidents, were re-elected.

Revision of Rules.

The following members of the Council were appointed a sub-committee:—Messrs. Thos. Stephens, Bernard Shaw, Russell Young, and A. G. Webster, to revise the rules.

The New President.

The Chairman said it would be very gratifying to know that His Excellency Sir Arthur Havelock, as president of the Royal Society, intended to take interest in

the work of the society. The members would all remember the very keen interest their late respected president Sir Robert Hamilton, when Governor of Tasmania, took in the work of the society. His Excellency had kindly consented to preside at the opening meeting of the 1902 session, on Tuesday, the 29th April, and to deliver the presidential address. He felt sure there would be a large gathering of members on that occasion.

Vote of Thanks to the Press.

On the motion of Mr. Russell Young, seconded by Mr. R. E. McNaghten, a hearty vote of thanks was accorded to the press, for the very able manner in which the proceedings of the society had been published.

The meeting then closed.

TASMANIAN MUSEUM AND ART GALLERY EXTENSION.

FOUNDATION-STONE CEREMONY.

The laying of the corner-stone of the extension of the Tasmanian Museum was performed by His Excellency the Administrator, Sir John Dodds, on March 20th, 1901.

Among those present with Sir John Dodds were Lady Dodds and Miss Gatehouse, and Mr. Warren Dodds, private secretary; the Premier (Hon. Neil E. Lewis), and Mrs. Lewis; the Bishop of Tasmania; the Mayoress of Hobart (Mrs. J. G. Davies); the Minister for Lands (Hon. E. Mulcahy); the Hon. Adye Douglas (President of the Legislative Council and Mrs. Douglas; the Chief Secretary (the Hon. G. T. Collins); Hon. Dr. Butler, M.L.C., and Mrs. Butler; Messrs. W. B. Propsting, John Hamilton, W. H. T. Brown, J. W. Evans, Davenport Hoggins, Ms.H.A.; the Town Clerk of Hobart (Mr. J. W. C. Hamilton) and Mrs. Hamilton; Mr. Justice and Mrs. McIntyre; Mrs. R. C. Patterson; the Chancellor of the University (Rev. Geo. Clarke); Mr. T. Stephens, and the Registrar (Colonel T. Stephens), and the Registrar (Colonel Cruickshank); Captain Munro, of H.M.S. Dart; the chairman (Rev. G. W. Sharp) and members of the Ministers' Association, several aldermen of the city, and several members of the Royal Society. There was a large concourse of the general public.

The corner-stone is of freestone, from Brighton, and is placed at the north-east corner facing Macquarie-street. The architect is Mr. J. Shields, Director of Public Works, the contractor being Mr. Cheverton, and the overseer of works, on behalf of the Government, Mr. J. Maddison. In the corner-stone cavity were placed copies of "The Mercury," the "Tasmanian News," and two Launceston papers; a list of the trustees of the Museum and the Council of the Royal Society, as well as some statistical documents and coins. The building is to be completed by November. Its upper room will be used as a new art gallery, and the remainder for the display of Tasmanian articles.

The silver trowel used was designed and manufactured by Mr. A. Butterfield, of Elizabeth-street, and inscribed—"Presented to His Excellency, the Administrator, Sir John Stokell Dodds, on the occasion of his laying the corner-stone of the new wing of the Tasmanian Museum and Art Gallery. Hobart, March 20, 1901." The inscription on the corner-stone is—"This stone was laid by His Excellency the Administrator, Sir John Dodds, C.M.G., on the 20th March, 1901."

His Excellency, in commencing the proceedings, said:—"Ladies and gentlemen, —Before proceeding to the very important duty of laying the corner-stone of the new wing of the Museum and Art Gallery, I propose to trace very shortly the formation and growth of the institution itself. It is the offspring of the society formed by Sir John Franklin in 1841, and which a few years later became the Royal Society of Tasmania. The meetings of the society in those days were held at old Government House, which stood near the site of the present Town-hall. In the year 1846 the Council of the society, who had previously established the Botanical Gardens, decided to begin the collection of specimens of natural history for a museum. A room in the Legislative Council Chambers was obtained, and for some years that room constituted the Museum of Tasmania. In 1849 the Government, recognising the importance and value to the community of the growing institution, granted an annual sum towards its support, and the Royal Society then obtained more accommodation by removing to the building at the corner of Harrington and Mac-

quarie streets, now occupied by the Athenæum Club. In course of time this building became overcrowded, and the Government, on being applied to, agreed to grant a site and to erect a suitable building for the preservation of the rapidly increasing collection of specimens, conditionally on the Royal Society contributing the sum of £1,500. Dr. Milligan, who was then Curator of the Museum, set to work to raise the money, and very soon he succeeded in collecting nearly £2,000 from the Fellows of the Society. This public-spirited action of the Fellows deserves the highest commendation. It was an unselfish and splendid effort on their part to provide a treasure house for the educational advantage of all who now or hereafter may desire to become acquainted with the scientific history of these southern lands. In 1862 the first portion of the new building, that which stands at the angle of Macquarie and Argyle streets, was completed. In 1883 it became necessary to appoint a new curator and secretary, and an excellent and very energetic officer was obtained in the person of Mr. Morton, then assistant curator of the Australian Museum at Sydney. To his exertions is due much of the success achieved by the Tasmanian institution. (Applause.) In 1885 another advance was made. Up to this date the Museum belonged to, and had been maintained principally by, the Royal Society, but it was felt that the time had arrived when it should become a national institution. Parliament passed an Act vesting the Museum in trustees for the public, and granted an annual endowment, and also a sum of £3,000 for an extension of the building. I had the privilege of bringing in that Act, and carrying it through the House of Assembly. The corner-stone of the extension was laid by Sir James Agnew in December, 1886, and the new building was opened for use by that good friend to Tasmania, Sir Robert Hamilton, in 1888. It gave greater and much-needed accommodation for the specimens belonging to the Museum, and also provided a room in which to begin the formation of a National Art Gallery. The first presentation of valuable pictures to this gallery was made by Miss Ada Wilson, and since then this lady and her sister, Miss Wilson, have presented other beautiful and costly works, which have been most highly appreciated. (Warm applause.) In passing, I may mention also that many other generous donors have presented pictures which delight all lovers of art who visit the gallery. And now I come to the present extension of the building, the corner-stone of which will be laid to-day. Its frontage will be on Macquarie-street, as you see, and it will provide a new Art Gallery of 100ft. long, and also another room of equal size, which is to be used for the exhibition of Tasmanian specimens only. At the back there will be another room of 60ft. long, which will became a bureau of information, and in which will be exhibited trophies of Tasmanian industries. When this extension is completed the Museum and Art Gallery will be a handsome addition to the public buildings of Hobart, and a monument to the perseverance of those who have so ungrudgingly laboured among us to promote scientific research and the study of nature. In this respect Tasmania justly can claim a proud place among the Australian States. Our Royal Society is the oldest Royal Society in these portions of the Empire. Her late Majesty, Queen Victoria, was its patron, and honoured it by the presentation of autographic copies of her own works. It has in no small degree contributed to the scientific knowledge of what has been called the "Land of the Dawning." On its roll of members there have been entered many famous names, Sir John Franklin, Sturt, Leichhardt, Sir Thomas Mitchell, Ross, Crozier, Gould, Sir Joseph Hooker, Strzelecki, and many others. Most of these have passed away, but there are left to us still others who are carrying on the work with untiring devotion. It is invidious to particularise, but I cannot forbear to mention Mr. R. M. Johnston and Mr. Thos. Stephens, as men whose work is conspicuous in quality and volume. And there is yet another whose association with the Royal Society is so complete, and whose services to it have been so great, that he stands out pre-eminently. I refer to Sir James Agnew. He has been a member of the society from the beginning in 1841, and during all the 60 years which have elapsed since he has taken the keenest active interest in its work, and often has given lavishly of his wealth to aid the society in promoting the intellectual culture of the community. (Applause.) We owe much to the Royal Society. It has obtained for us by the subscriptions and exertions of its members the Botanical Gardens, the Museum and the Art Gallery, and it has stimulated and encouraged a love of art, the pursuit of scientific knowledge, and a desire for a better understanding of the wondrous works of nature. I will now lay the corner-stone of the building, which, I think, is the first public one commenced in Tasmania since

the accession of His Majesty, King Edward the VII." (Applause.)

The Chief Secretary (Hon. G. T. Collins) then handed His Excellency the silver trowel, with which he spread the mortar for the reception of the memorial stone. The stone was then lowered, and having given it the customary taps with the polished mallet, Sir John said:—"I have tested the laying of this stone with the level, and pronounce it to be well and truly laid. (Applause.) In the old country it is customary on occasions of this kind that a prayer should be offered in connection with the ceremony, though I am aware that it is a new feature in connection with such proceedings in Tasmania; but still, it is a good old custom, and a beautiful and simple prayer has been handed to me,with a request that I should read it, which I now do:—

"O God, who by Thy power hast laid the foundations of the earth, and caused Thy spirit to brood upon the face of the waters, regard with Thy favour the increase of this building, set apart for the furtherance of Thy glorious works. Guide, we beseech Thee, the students of truth, for whom we have prepared this house, that they may abundantly reveal the treasures of Thy creation, and help them so to labour that all things that Thou hast made may, with one voice, proclaim thy power and glory: enable us by their aid so to read what thou hast written in the books of nature, that we may adore Thy wisdom, and trace Thy gracious Providence in all the works of Thy hands. Grant this, we beseech Thee, O Heavenly Father, in the name of Jesus Christ, Thy Son, our Lord. Amen."

The Bishop of Tasmania then presented an address, beautifully illuminated, as follows:—"We the Council of the Royal Society of Tasmania, desire to take this opportunity to offer Your Excellency our warmest congratulations on the circumstance that you have attained for the second time, and have held for lengthened periods, the high position of Administrator of the Government. And we cordially recognise the fact that the various duties connected with this high office, when under your rule, have invariably been discharged with a courtesy, ability, and practical interest in both social and State affairs, which have not failed to secure the entire satisfaction of the community." The Bishop of Tasmania added:—"It is with regret, from one point of view, that I find myself the actual reader of this address. The honour of presenting it belongs, of unquestionable right, to our beloved senior vice-president, Sir James Agnew, a man full of days and honours, whose riches have for years been lavished upon public objects, and notably upon the Museum and the Art Gallery. (Applause.) No living man has done so much for us as Sir James. He is also one of the two survivors of the first members of the Royal Society when formed in April, 1841. The other is Sir Joseph Hooker. The society unanimously wishes that the most tenderly revered man in Tasmania were strong enough to witness this scene, which would give him such unfeigned pleasure. Nor is it right for the society to omit the mention on this occasion of the secretary of the Museum, to whom is due to a very great extent this new development. Ministers could not well have proposed the grant that Parliament has made, had they not been sure that the Museum held a high place in the estimation of the public as an institution which has attempted in every possible way to interest all classes here, and to sustain the reputation of Tasmania in scientific circles. This is due in a great measure to the work of Mr. Morton for 17 years. It only remains for me now, Your Excellency, to assure the public that the Royal Society feel confident that they, coupled with the unremitting exertions of Mr. Morton, will be able to make such arrangements for the forthcoming meeting of the Australasian Science Association in Hobart, in January next, that Hobart may more than support its reputation as a place where all great meetings of such a character are both pleasant and pre-eminently successful. Of course the work that falls upon the secretary, and upon the absurdly small staff at his disposal, is very heavy, and the society feels that the salary attached to the office of secretary at present is wholly inadequate for the work that has to be done. They would be glad if some means could be devised whereby a more adequate remuneration could be made, especially in face of the increased work that must follow upon so great a development of this building. (Applause.) We look forward with keen interest to the growth of science and the spread of art among our people in this new century, and pledge ourselves to do all in our power to enable Tasmania to take her full share in such progress. (Applause.)

Mr. R. M. Johnston, on behalf of the trustees of the Tasmanian Museum and Art Gallery, presented a handsomely-illuminated address, which said:—"We desire to give you our best thanks for the able manner in which you have con-

ducted the auspicious ceremony we have just witnessed. It is a proof of the good work done by the Museum that its enlargement has become, for a second time, necessary; not only for the proper display of objects already in its possession, but for the exhibition of a great series of most valuable and interesting specimens indicative of the mineral wealth of Tasmania, which have been promised. It is almost needless to say that by increased facilities for display, the present scientific arrangements will be more effectually carried out, and will thus afford still better means than hitherto for educational study. We also desire to take this opportunity to offer Your Excellency our warmest congratulations on the circumstance that you have attained for the second time the high position of Administrator of the Government."

Mr. Alexander Morton presented an engrossed address of the members of the Microscopical Club of Launceston.

The Town Clerk (Mr. J. W. C. Hamilton) presented addresses on behalf of the Mayors and Corporations of Hobart and Launceston, the Town Board of Zeehan, Town Board of Devonport, and the Municipal Council of Brighton.

Mr. W. J. Watchorn, on behalf of the Marine Board of Hobart; Mr. Bernard Shaw, P.M., for the Civil Service; Mr. T. B. Blyth (Sergeant-at-Arms), for the Glamorgan Municipal Council; the District President (Bro. G. L. Swift), accompanied by the District Grand President Bro. G. E. Mills), for the Druids of Southern Tasmania; and Mr. G. S. Crouch, on behalf of the Y.M.C.A. and the Temperance Alliance, respectively, presented addresses, also Mr. Wilfrid Hudspeth, B.A., for the A.N.A.

The Bishop of Tasmania presented a handsomely illuminated address as follows:—"We, the Bishop, clergy, and laity of the Church of England in Tasmania, as represented by the Diocesan Council, desire with all respect to congratulate Your Excellency upon the position you have been called to occupy as the first Administrator of the State of Tasmania. You have represented the power and nobility of the great Queen, sir, in the last days of her glorious reign, and of King Edward also in the opening of an era which we hope and pray will be a fitting sequel to the Victorian age in a new century. This land once changed its name in the process of constitutional development, and in your term of office it has now transformed itself into a State, as part of what we fain would believe is destined to be the future Empire of the South Pacific. Whilst we rejoice in such expanding liberty, we note, at the same time, with deep satisfaction, an universal conviction that the truest freedom needs the most strenuous leadership. Just as we desire no timid Sovereign on the throne of England, so also we look forward with confidence to a long line of His Majesty's representatives among us to teach us that high authority implies deep responsibility, and results in courageous action. It is because we believe that, both in your office as Chief Justice and as the representative of His Majesty the King, you, sir, have taught us these principles, we respectfully and joyfully approach you to-day with our felicitations, praying that God may endow you with foresighted vision and just judgment, to preside over the destiny of our infant State, and we assure you of the continued and fervent loyalty of all the members of the English Church to the Throne of England, and to the Empire of that Greater Britain, the growth of which we follow with earnest attention, and of which we hope to be worthy members by the good hand of God upon us."

Revs. G. W. Sharp (president of the Council of Churches), and H. B. Barber (secretary) also presented an address.

His Excellency, in replying, said he recognised that they had paid a splendid tribute to His Majesty's representative, and that, combined with that spirit of loyalty, there was also a feeling of friendship towards himself. (Warm applause.) The support and encouragement that he had ever received from the people among whom he had spent his life, had been the means of producing all the efforts that they had been good enough to say had been worthy of their commendation. He would have but poorly filled his high office without such support and assistance. He regarded it as the highest honour of his life; it was a tribute so splendid that it was very rarely received even by the most distinguished. He again thanked them, and added that upon his return from the West Coast he would take the opportunity of replying individually to the addresses that had been so kindly presented to him. (Applause.)

The proceedings then terminated.

After the ceremony some two hundred visitors accepted Lady Dodds's invitation to afternoon tea in the Royal Society's and Tourist Rooms.

Mr. A. G. Webster, in proposing the health of Sir John Dodds, said he felt sure that the Museum would secure the support of the public and of Parliament.

Sir John, in reply, said he felt sure it would become an important factor in the life of the community, and of great educational value. He proposed the health of "The Premier and Parliament."

The Premier responded, and the Minister for Lands expressed the hope that the building would be completed to contract time.

ON SOME LAND AND AQUATIC SHELLS FROM MARIA ISLAND.

By W. F. Petterd.

I herewith submit a list of the species of land and fresh water testacea which were recently collected on Maria Island, East Coast. It includes several which have but a restricted distribution on the adjacent mainland, and the somewhat remarkable association of species is of more than passing interest, although the majority are such as are to be found widely dispersed. The appearance at this insular locality of the local Helix sinclairi is quite unexpected, and H. lottah and H. nelsonensis have strayed far away from their originally recorded habitats.

The almost microscopic H. halli is not usually an abundant species, but here it appears in considerable quantity, and is in fact the most common of the smaller forms. There are also several specimens of a new species with little affinity to any already known. Of the two species of aquatic shells, one is quite a new departure in the Ancylus, not only as regards our local molluscan fauna, but as well as relates to the genus generally.

Its unique characteristic is the widely-spreading margin of the aperture, a peculiarity not to be found in any of the numerous species of the genus. This remarkable departure from the normal condition, in a genus which affords but limited variation in general structural peculiarities, is difficult to adequately account for, but it would appear to afford a stronger attachment, and may thus resist disturbance in a swiftly flowing stream.

Description of New Species.

1. *Ancylus mariæ*, n. sp.

Shell small, thin horn-brown colour, broadly irregularly ovate, concentrically striate, with well marked lines of growth. Aperture extremely large, the margins broadly, prominently, and flatly expanded, thus forming an irregular base of attachment. Apex prominent, obtuse, oblique, and submarginal.

Long., 5 ; lat., $3\frac{1}{2}$; alt., $2\frac{1}{2}$ mill.

Habitat : Maria Island, East Coast, attached to submerged stones and aquatic plants in a small running stream.

This is a very peculiar form of a genus which has several representatives on the mainland. In its young state it has much the general appearance of A. tasmanicus, Tenison

Woods, but maturer examples have a constant and unique flat expansion of the aperture, which thus forms a firm base of attachment, and by this character it is separated from all known congeners.

So far as known, it is restricted to the insular locality mentioned. It is apparently abundant, and was the only species collected on the island.

2. *Helix discors*, n. sp.

Shell minute, openly umbilicated, depressed lenticular, of a pale brown colour, finely striated throughout with distant, prominent, oblique riblets, whorls 4, convex above, obtusely carinated at the periphery; aperture roundly lunate, margins approximating.

Diam., greatest, 2; height, $1\frac{1}{2}$ mill.

Habitat: Maria Island, under and attached to stones.

This new species is about the size of Helix hobarti, Cox., but differs much in both form and sculpture. Its decided lenticular build, and, for so small a shell, prominent riblets, quite separates it from the large number of minute species of the genus which have been described.

LIST OF SPECIES COLLECTED.

Aquatic Species.

1. Potamopyrgus simsoniana. Brazier variety.
2. Ancylus mariæ, n. sp.

Land Species.

1. Bulimus dufresnii. Leach. Abundant, but not large.
2. Bulimus gunnii. Pfr. Very plentiful in favourable localities.
3. Vitrina verreauxi. Pfr. Abundant.
4. Helix sinclairi. Pfr. Rare; of the usual type.
5. ,, ruga. Cox.
6. ,, legrandi. Cox.
7. ,, diemenensis. Cox.
8. ,, halli. Cox.
9. ,, nelsonensis. Cox.
10. ,, juliformis. Cox.
11. ,, hobarti. Cox.
12. ,, lottah. Mihi.
13. ,, discors, n. sp.

NOTE ON *HIPPOMEDON KERGUELENI*, MIERS, AN AMPHIPOD RECEIVED FROM CAPE ADARE, SOUTH VICTORIA LAND.

By Geo. M. Thomson, F.L.S., Corresponding Member of Royal Society of Tasmania.

In June of this year I received from Mr. A. Morton several specimens of an Amphipod crustacean secured by the "Southern Cross" expedition at Cape Adare, South Victoria Land They had been obtained by letting down a baited net through a hole in the ice, but there is no information as to the depth from which they were got.

The specimens, which are all females, belong to *Hippomedon kergueleni*, originally referred by Miers to *Lysianassa* (Ann. and Mag. Nat. Hist., vol. xvi., p. 74), and then to *Anonyx* (Trans. of Venus Exped., Zoology of Kerguelen Island, Crustacea, pp. 8 and 9, pl. xi., fig. 4), but more recently shown by Stebbing to belong to Boeck's genus *Hippomedon*. The Rev. T. R. R. Stebbing (Amphipoda of H.M.S. "Challenger," p. 623, pl. viii.) has drawn up a description of this species with that care and minuteness of detail which characterises his work. The specimens received by me differ only in trifling details from his description, but conform more closely to that given by Miers.

The genus is now credited with five northern and four southern species, but of these, two of Stebbing's Kerguelen Island species aad one Australian are founded on single specimens, and the former two may yet have to be merged into *H. kergueleni*.

TASMANIAN DIATOMACEÆ.

By F. E. Burbury.

The swiftly flowing South Esk River, confined to its narrow bed, in which numerous rock pools have been worn, the North Esk, a placid stream, subject to tidal influence for some miles; and the Tamar River, formed by the junction of these two, with a 40-miles course to the sea, and a gradually increasing salinity, offer a specially favourable habitat for various genera and species of the Diatomaceæ, and it is interesting to note the distribution of the genera—in some cases indifferent to most severe changes in conditions, in others susceptible to the slightest influences. Thus Actinocyclus Barkleyi I have found at the First Basin, a mile above the bridge, in fresh water, in company with Synedra splendens and Nitzchia rigida and Nitzchia viridis. The Actinocyclus is brought down into the slightly brackish water of the Tamar basin, continues to thrive right down the Tamar, is found again at George Town, and probably on all coasts of Tasmania, as I have gatherings of it again from Hobart. Not so, however, the synedras and nitzchias. Nitzchia rigida at once gives place to varct. sigma and it. sigma amphioxys, the slight, and it must be very slight, amount of salt suffices to bar the one species and aid the other. The diatoms found in the purely fresh water of the South Esk are those of a cosmopolitan character, being probably all world-wide. In the North Esk, at that point where the tidal influence ceases, two interesting forms are met with—Eunotia transylvanica and a new Suirella of large size, only heretofore met with in the bed of the Yarra River. Coming down towards the wharves we find Hyalosira Whampoensis, syn. with Triceratium javanicum, an extremely interesting form. It is one of the three known species belonging to the genera, and which usually inhabit tropical seas. It is of interest to find it so far south. Some years ago this form was found, and sent home to Kitton by Mr. W. F. Petterd, and at this time was unknown except in Java. It has, however, been since found in a fossil state in Hungary. On the river flats by the Depôt grounds are found some fine specimens of the genera Suirella, viz., Suirella splendida, Suirella robusta and spiralis, with a newer species, rather rare, which also has been only heretofore located in the Yarra. Here also the genera Coxinodixus is represented by Eupodiscus commutatus. Some beautiful Camplydiscus—Camplydixus echeneis and daemelianus, and an occasional valve of Triceratium Robertsianum will reward

the collector. Lower down the Tamar, in the ti-tree swamp, a remarkable form is met with in Nitzchia clevei, a form which would seem to be almost unknown to the Old World. It can hardly be missed, its great length being in striking contrast to other species. Here also I have located Van Heuxtzia vulgare and a beautiful Stauroptera. At George Town and the Heads no less than 37 species are found, and these by necessary imperfect gatherings. The most striking frustules are those of Rhabdonema Adriaticum, which are very plentiful. Pleurosigmas decorum, formosum, latum, and strigalis, and a more or less rare and unknown variety are also found in company with Triceratium fimbriatum and a very large and very rare valve of Mastogloia species. Closely allied in their general forms are those gathered at Cornelian Bay, Hobart, the same Mastogloia being located, as also Eunotia transylvanica, the latter of which, however, I am unable to find in my George Town gatherings. I have also found some fourteen varieties at Prospect in an intermittent spring of hard water. These call for no special comment, except that, speaking broadly, they tend to ally themselves more to the marine forms than to those usually found in fresh water gatherings. Photo-micrographs of the more important and interesting forms have been taken. In conclusion, may I solicit the aid of members of the Society in this work. Green or yellow confervæ scraped from piles of wharves or floating buoys, or from stones, etc., at low tide contain many forms, and need only be sent on to me in a rough state.

Tasmanian Diatomaceæ.

Actinocyclus Barkleyi. 522. Grun. Inveresk, N. Esk, Hobart, Depot, Ti-tree.

Achnanthes salina. Kütz. N. Esk, Depot.

Achnanthes longipes. 279. Agvar. Hobart.

Achnanthes exilis. 282. Kütz. Prospect.

Achnanthes pusilla. Grun. George Town, Low Head. Rare.

Achnanthidium lanceolatum. 276. Bréb. Hobler's, N. Esk.

Amphora acutiuscula. 134. Kütz. George Town. Uncommon.

Amphora marina. 129. Wm. S. Low Head. Uncommon.

Amphiphora lepidoptera. 263. Greg. Low Head. Rare.

Actinoptcychus splendens. Ralfs. N. Esk.

Auliscus sculptus. 482. Ralfs. Hobart.

Coxinodixus excentricus. 531. Ehr. Depot Grounds.

Coxinodiscus concinnus. Depot Grounds.

Camplylodiscus daemelians. Grun. Depot Grounds.

Camplylodiscus echeneis. 377. Ehr var. Depot Grounds.

Cerataulus sp. Hobart.

Cerataulus sp. George Town. Very rare.

Cymbella gasteroides. 146. Kütz. Hobart, N. Esk.

Cymbella cymbiformis. 147. Ehr var. Prospect.

Cymbella sp. Hobler's, N. Esk. Rare.

Cocconeis placentulata. Ehr. Hobart, Prospect.

Cocconeis scuttellum. 287. Ehr. Hobart, Low Head.

Cocconeis grevillei. Wm. S. George Town.

Cocconeis pseudomarginata. Greg. Low Head. Rare.

Cocconeis regalis. Wm. S. Low Head.

Cocconeis lineolata. Ehr. Prospect, Hobler's Bridge.

Cyclotella compta. 446. Kütz. Hobler's Bridge.

Cyclotella sp. N. Esk. Rare.

Cocconema cistula, var, minor. Hempr. Prospect.

Cocconema parva. Wm. S. Hobler's Bridge.

Eupodiscus commutatus. Grun. N. Esk. Depot.

Epithemia gibba. 296. Kütz. S. Esk. Depot Grounds.

Epithemia sorex, var. Turgida. 295. Kütz. Hobart.

Eunotia pectinalis and undulatus. 300. Raben. Hobart.

Eunotia transylvanica. Pant. Hobart. Very rare.

Encyonema gracile, var. minor. 151. Raben. N. Esk, George Town.

Encyonema turgidum. 150. Grun. Hobler's Bridge.

Gomphonema vibrio. 273. Ehr. Hobart, Prospect.

Gomphonema bacillum. Cleve. Prospect.

Grammatophora marina. Grun. George Town.

Grammatophora subtillissima. Bail. Low Head.

Hyalodiscus maximus. Eulst. Depot Grounds.

Hydrosira whamphoensis. Swartz. 453. Syn. Tricaratium Javanian. N. Esk, Ti-tree, Depot. Rare.

Melosira distans. Wm. S. Oatlands.

Melosira borrerii. Grev. Inveresk, Depot, Hobart. Low Head.

Mastogloia sp. Hobart.

Mastogloia grevilli. 155. Wm. S. Hobler's Bridge.

Mastogloia sp. Low Head. Very large; very rare.

Nitzchia sigma. 396. Wm. S. N. Esk.

Nitzchia sigma, var. amphioxys. Grun. S. Esk, Prospect, Ti-tree

Nitzchia rigida. 396. Grun. Cataract Gorge. Rare.

Nitzchia fasciculata. 397. Ehr. Prospect.

Nitzchia clevei. Brun. Ti-tree, N. Esk.

Nitzchia sigmatella. 397. George Town.

Naricula viridis. 165. Kütz. Cataract Gorge.

Naricula sp. Ti-tree, Tamar River.

Naricula liber. 222. Wm. S. Hobler's Bridge.

Naricula Smithii. 187. Breb. Tamar River, Low Head.

Naricula distans. 185. Wm. S. George Town. Rare.

Naricula splendida. Greg. George Town. Rare.

Naricula Braziliensis. Grun. Low Head. Very rare.

Podosira maxima. Kütz. N. Esk.

Pinnularia Brebissoni. Kütz. Prospect.

Pleurosigma strigosum. Depot Grounds.

Pleurosigma decorum. 254. Wm. S. George Town.

Pleurosigma var. George Town. Rare.

Pleurosigma formosum. 254. Wm. S. Low Head.

Pleurosigma latum. Grun. George Town.

Plagiogramena Gregoryanum. 337. Grev. George Town.

Rhabdonema adriaticum. 360. Kütz. Low Head.

Suirella minuta. 373. Breb. North Esk.

Suirella fastuosa. 372. Ehr. Hobart. Very rare.

Suirella splendida. 371. Kütz. Hobler's Bridge.

Suirella sp. (large, same as in Yarra), new. Rare.

Suirella robusta. 371. Ehr. N. Esk.

Synedra splendens. 309. Kütz. N. Esk, Ti-tree.

Synedra ulna. 310. Ehr. Depot Grounds.

Synedra longa. Wm. S. Prospect.
Synedra pulchella. Kütz. Hobler's Bridge.
Synedra Gallionii. Ehr. George Town.
Stephanopyxis sp. Cataract Gorge.
Stauroneis acuta. 160. Wm. S. Prospect.
Stauroneis phoenicenteron. Ehr. Prospect.
Stauroptera sp. Ti-tree, Tamar River.
Stauroptera aspera. Kütz. George Town.
Tabellaria ventricosa. 356. Kütz. Cataract Gorge.
Tryblionella maxima. 355. Grun. Hobler's Bridge.
Triceratium Robertsianum. Grev. Depot Grounds.
Triceratium fimbriatum. Wall. George Town. Rare.
Van Heuxtkia vulgare. 239. Prospect, Ti-tree.
Xanthiopyxis umbonatus. Wharf.

OBSERVATIONS REGARDING THE RECENT DISCOVERY BY G. THUREAU, F.G.S., OF A FOSSIL REPTILE IN THE MERSEY COAL MEASURES AT RAILTON.

By R. M. Johnston, F.S.S.

Mr. G. Thureau, formerly Government Geologist of Tasmania, has kindly submitted to me a carefully prepared cast of the remains of a fossil reptile discovered by him in the spoil-heap from a (then) new main shaft sunk by a Sydney company near Railton, in the Mersey Coal Measures, and, therefore, of Upper Permo-Carboniferous age. The original was placed by Mr. Thureau in the hands of the late Professor M'Coy for identification; but the regrettable death of the Professor soon after prevented this investigation, and Mr. Thureau is now anxious to make known his important discovery to the Members of this Society; because—as Mr. Thureau thoughtfully observes—the possession of this interesting fossil from our rocks—now in the Melbourne Museum—"rightly belongs to Tasmania."

The cast referred to—now submitted for the inspection of the Members of this Society—represents portion of the central and caudal vertebræ of the reptile, with the simple gently-curved ribs of the central part perfectly connected. The central or pre-sacral vertebra number 13 or 14, with a length of three inches, and greatest breadth one and a half inches; vertebra of the tail thicker, more pronounced, four to five in a length of nearly one inch.

The absence of the head, limbs, and caudal extremity, and the absence of definite knowledge regarding the articulation, form, &c., of the vertebræ, make it impossible to do more than assign its position to the great family of Labyrinthodonts, whose range in Europe is generally determined as from the Carboniferous to the Trias, and are especially abundant in the Permian. It is stated by

Nicholson and Lydekker that only one genus (*Rhinosaurus*) persisted to the Lower Jurassic.

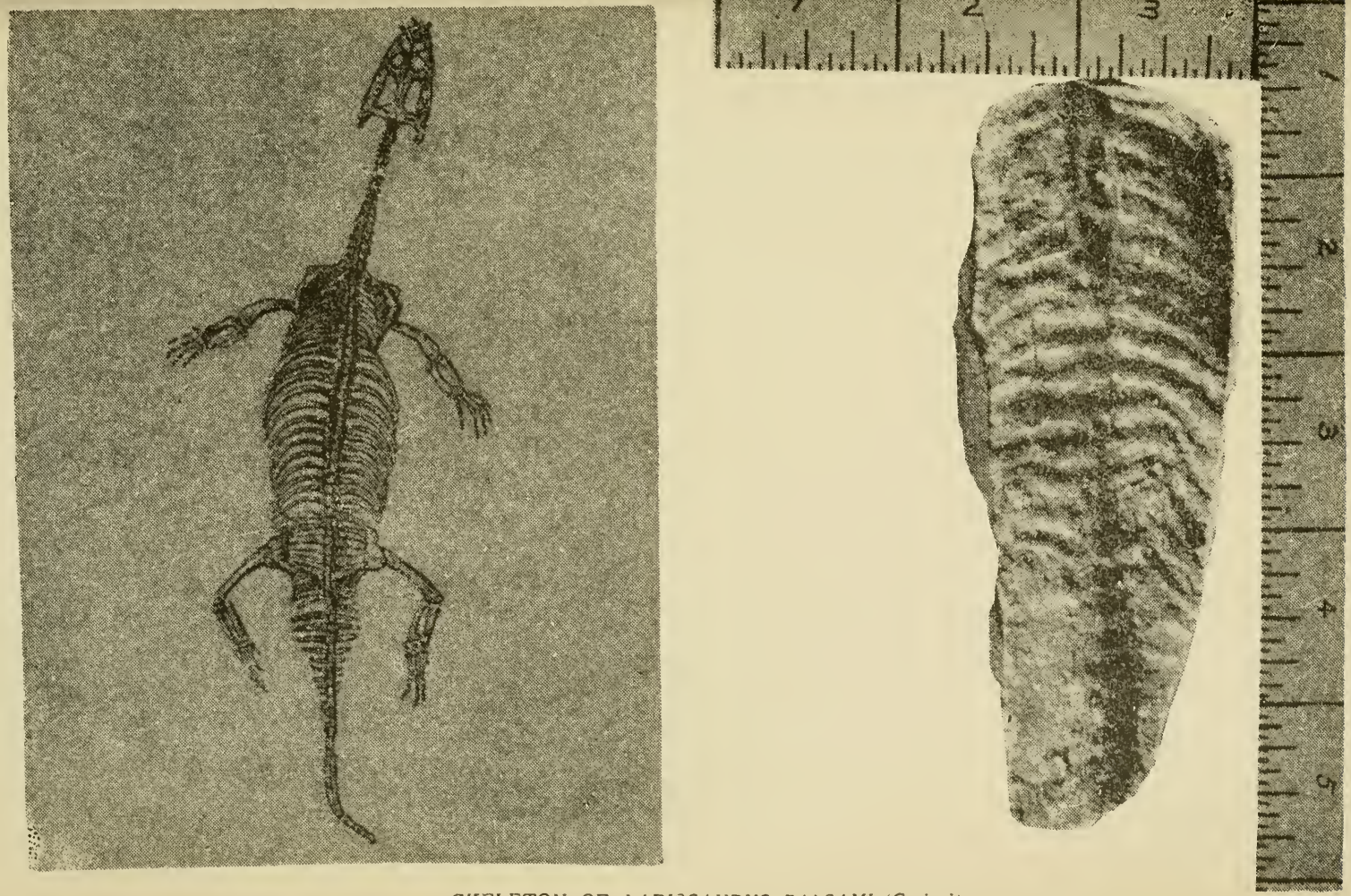
The Pterodactyls or winged reptiles, to which Mr. Thureau suggests a reference, had not the elongate central vertebræ of the form whose cast is now before you, and there is not the slightest evidence of the characteristic bones of the manus. Moreover, the Pterodactyls only make their first appearance in Europe in the rocks of Upper Jurassic age, whereas the fossil skeleton of the reptile now considered, if obtained, as stated, from the Mersey Coal Measures, undoubtedly belongs to Permo-Carboniferous age.

It is to be hoped that Mr. Thureau may be able to obtain the original for the Tasmanian Museum, to which, by right, it belongs, when the opinion of our best European or American specialists may be obtained as to its exact affinities among the reptilia. My own opinion, which I have great diffidence in expressing, is, that it probably comes within that group of the Labyrinthodontia, embraced within the Sub-order *Microsauria*. The Labyrinthodonts included in this Sub-order, resemble Lizards in outward appearance, and have the centra of the vertebræ more or less elongated, and long curved ribs.

One genus of this order, *Limnerpeton*, of the Permian of Bohemia, possesses characteristics of the vertebræ of the central and caudal parts, which come very close to our Tasmanian representation from the Permo-Carboniferous Coal Measure of Railton, Tasmania.

I am sure the Members of this Society will agree with me in thanking Mr. Thureau for his valuable cast of the reptile, and for his promise to endeavour to secure the original for the National Museum of the Country where the skeleton was found.

For the sake of reference, and as a compliment to Mr. Thureau, I propose in the meantime to refer always to this, the oldest known remains of a vertebrate in Tasmanian rocks, as "*Thureau's Microsaurian*."



SKELETON OF *LARIOSAURUS BALSAMI* (Curioni)

Muschelkalk, Perledo, Lago di Como, Italy (⅛ nat. size; original in Munich Museum).

FURTHER NOTES ON THE "PERMO-CARBONIFEROUS FOSSIL CLIFFS" AT DARLINGTON, MARIA ISLAND.

By R. M. Johnston, F.S.S.

(Read 10th May, 1900.)

Maria Island, lying to the east of Spring Bay, must be regarded as the most southerly outline of the great granite axis forming the eastern fringe of Tasmania, traceable northwards through Schouten Island, Freycinet's Peninsula, Bicheno, Falmouth, St. Helens, Eddystone Point, to Gladstone. Crossing the narrow Banks' Strait it may be further traced through Clarke Island, Cape Barren Island, Long Island, Goose Island, Hummock Island, the Strzelecki Peaks, and Killicrankie Range of Flinders Island, and the elevated masses of granite forming the interesting cluster of islets known as the Kent's Group. From this point the granite axis is again traceable through the rocky shoals, reefs, and islets to the most southerly limit of the Australian mainland at the granite headlands of Wilson's Promontory.

Maria Island, like Bruni Island, is divided into two parts—North Maria and South Maria. The two divisions are connected, between Oyster Bay on the west and Reidle Bay on the east, by a narrow strip of sand two or three miles long, giving the island, as a whole, somewhat the appearance of an ancient hour-glass. The greatest length lies between Cape Boulanger on the extreme north, and Cape Peron on the extreme south, covering a distance of about 15 miles. The greatest breadth, about 10 miles, lies in a line between Long Point on the west, and Ragged Head on the east; that is within the larger division of the North Island. Maria Island, as a whole, covers an area of about 38 square

miles, and, as its mass in the north rises rapidly, with fantastic outline, from the sea to a height of over 3000 feet, it presents a very imposing appearance as seen from the nearest part of the mainland, six or seven miles distant.

The general geological features of both North and South Divisions of the island are very similar, and closely agree with those of the Schouten Island and Freycinet's Peninsula, with which at one time, no doubt, they were connected.

Thus, in all, we find the easterly half entirely composed of grey and, sometimes red, granites, often coarsely porphyritic. The large tabular crystals of the various kinds of felspar are particulary conspicuous in places. Flanking the granites on their western side, in a more or less well-determined north and south trough or valley, occur metamorphic rocks of Archæan age, together with schists. slates, and close-grained limestone, probably of Lower Silurian age. In such situations stream-tin has been sparingly found, both on Maria Island and on the Schoutens. The great mass of the western half of both divisions is occupied mainly by the prevailing diabasic greenstones of the country, and form, as elsewhere throughout Tasmania, its loftiest and most characteristic physical features. The border of the greenstone ranges, in the southern and western portions of the northern division, is low-lying, composed of scrubby sand-dunes, enclosing marshy lagoons. Towards the north-east, at Darlington, occur fine sections of limestones, mudstones, and conglomerates of Permo-Carboniferous age.

Nowhere throughout Australia and Tasmania are there so complete a series or finer sections of the marine rocks of Permo-carboniferous age exposed than those occurring in the grand precipitous sea-cliffs near Darlington, at the north-western extremity of Maria Island. Darlington, the only settlement, wherein live a few families engaged in pastoral occupation, is most charmingly situated underneath the shadows of the two curious lofty peaks of Mount Maria, nearly 3000 feet high, whose well-known features, as seen from the seaward side, have suggested the fanciful idea of "Bishop and Clerk," a name by which they are now known. The northern outlook from the settlement is especially grand,

as it embraces the distant outlines of the fantastic chain of serrated granite ranges of the Schouten Island and Freycinet's Peninsula. Away to the extreme north these crests melt away towards the cultivated settlements around Swansea and Great Swanport, at the head of Oyster Bay; while to the left stands out the bold coast-line of the mainland, lying between Cape Bernier and Okehampton, near the entrance to Spring Bay.

Immediately to the north and east of Darlington, along the coast-line, occurs a low-lying spur of the diabasic greenstone, which suddenly terminates at the western shoulder of the great cliff-encircled half-moon bay lying directly under "The Bishop and Clerk."

From the point where the diabasic greenstone spur terminates, the coast-line north and east encircling the half-moon bay is walled in by perpendicular and partly overhanging cliffs, composed of stratified marine beds of the Permo-Carboniferous system. Looking downward from the crest of one of these perpendicular cliffs, in the direction of the "Bishop and Clerk," whose slopes and crest, composed of diabasic greenstone, rise abruptly from above the 400 feet perpendicular stratified fossil cliffs to a height of nearly 3000 feet, the half-moon bay and its environing fossil cliffs present a scene of exceeding grandeur. Along the base of the cliffs of stratified rocks there is a narrow marginal strip of low flat rocky ledges, upon which have accumulated, at certain points, vast quantities of fossiliferous blocks of limestone and mudstone, which, by the continuous undermining action of the great open sea-rollers, have been detached from time to time from the overhanging ledges on the face of the beetling cliffs.

The huge blocks which have fallen from these overhanging cliffs are strewn about or tumbled upon each other in the wildest confusion, while the fossils on the surface of the limestone masses, by the weathering action of sea and air, stand out in bold relief in greatest perfection.

The genus Pachydomus, with its large globose specific forms, is especially noticeable. Blocks, 40 and 50 tons in weight, seem at first sight to be made up of a compacted conglomerate of these large fossil bivalves; but a closer inspection reveals the presence of numerous

associates. Originally, in my larger work, on "The Geology of Tasmania," for the sake of convenience in description, I provisionally divided the various members of the Permo-Carboniferous rocks at this place into three great divisions or zones, part characterised by differences in the *prevailing forms* of fossil life, and partly by a considerable difference in the character and composition of the successive beds or groups of strata.

(1.) *Erratic Zone.*—The lowest beds visible above sea-level have been termed by me *The Erratic Zone.* Composed of more or less impure limestones, frequently studded with great erratic boulders of quartzites, slates, schists, and granites or conglomerates of these older rocks, cemented together by limestone. Some of these huge, angular, erratic granite blocks weigh over a ton.

There is abundant evidence now to show that these huge erratics must have been borne thither by meeting ice-sheets. Similar evidence of glacial action during the age in which these rocks were formed, occur in England; Talchir and Salt Range, India; Dwyka Conglomerates, South Africa: Bacchus Marsh Conglomerates, Victoria; New South Wales; and in many parts of Tasmania, in rocks of the same horizon. Fuller details of glacial evidence are given in my observations on "The Glacier Epoch of Australia," read before the Members of this Society, in the year 1893. (See Papers and Proceedings of Royal Society of Tasmania, June, 1893.)

(2.) *Pachydomus Zone.*—Immediately above the *Erratic Zone* occurs a series of alternating beds of calcareous shale and solid limestones, characterised conspicuously by the prevalence of the large globose bivalves of the genus *Pachydomus.* This series, or *Zone*, is about eighty feet in thickness, and was termed by me originally the *Pachydomus Zone.* It must not be inferred, however, that this genus is solely confined to this division, or that this genus alone is to be found within the limits of the zone so named. All that is intended here, by the classified name, is, that in this group of beds, the genus Pachydomus dominates supremely over all other forms of life, and a forty-feet bed is almost wholly composed of their fossils. The following is a fairly typical list of

the Pachydomi of this zone, with their more common associates :—

Pachydomus globosus	J. de Sow.
„ de Koninckl.....	R. M. Johnston.
„ Hobartensis	„
„ gigas.....	M'Coy.
„ carinatus	Morris.
Eurydesma cordata	„
Notomya Gouldii	R. M. Johnston.
„ trigonalis	„
„ Beddomeii.....	„
Aviculopecten limæ formis	Morris.
„ Illawarensis	„
„ squamuliferus	„
„ Fittoni	„
Platyschisma ocula	J. de Sow.
Connularia Tasmanica	R. M. Johnston.
Stenopora Tasmaniensis	Lons.
„ informis	„
Favosites ovata	„
„ sp. indel. forming broad flat patches over a foot in superficial extent.	

(3.) *Fenestella Zone.*—Succeeding the *Pachydomus* beds there occurs a series of thin, friable, shaly, rusty mudstones, more or less decomposed towards the upper surface, and almost wholly composed of the crushed, laminated frond-like layers of the common species of *Fenestella.* These beds are now estimated to be about 124 feet in thickness, and are generally overlaid, as more recently observed by Mr. Montgomery, by a thin band or layer of volcanic ash or tuff, which he describes as being very hard, full of small glittering granules of glassy quartz, felspar crystals common, also fragments of various rocks. It decomposes into a yellowish-brown clayey stone, which still shows the glassy quartz granules very distinctly. As the whole of the beds of the cliff have a distinct uniform dip of about 1 in 15 in a direction south by east (S. 28° E.), this band, traceable at sea-level to the north, may be followed in the same position, continuously, to the higher surface north and west, where at a height of 185 feet, near the cliff top, and at the head of a deep gully or arm of the sea, it may be again observed in a more or less decomposed state. Mr. Montgomery draws particular attention to the position and peculiar character of this band, as he is of opinion it may serve as a valuable datum line by which

to recognise the stratigraphical position of the beds further inland, where among a higher series they are to be found—as also along the higher members of the sea cliffs to the east occur the limestone bands, quarried for the Portland Cement Works of the Maria Island Company. The works lie inland, in a valley, towards the head of Bernacchi's Creek.

The common forms, *Fenestella internata*, Lons., *F. plebeia*, M'Coy, and *Protoretepora ampla*, Low, make up the greater part of the *Fenestella Zone*. Associated with them, however, may be found the following typical forms, viz :—

Spirifera Tasmaniensis	Morris
„ Darwinii	„
„ glaber	„
„ duodecimcostata	M'Coy
Productus brachythærus.....	G. Low.
Strophalosia Clarkei.....	Eth.
„ Jukesii	Eth. Jr.
Pleurotomaria Morrisi.....	M'Coy.

(4.) *Productus Zone.*—The series of beds overlying the Fenestella Zone are divided by Mr. Montgomery into two groups. The first group in succession termed by him *The Productus Zone* is about 30 feet thick, composed largely of beds of blue hydraulic limestone from 6 inches to 4 feet thick These are the beds chiefly worked at the quarries for the production of Portland cement. The blue limestone bands are separated from each other invariably by beds of calcareous shale and mudstone. The limestones are replete with the common forms of Spirifera, Strophalosia, Productus, Aviculopecten, Stenopera, Crinoids, and Fenestella. Pachydomus, common, but less frequent.

(5.) *Crinoid Zone*—The next and highest groups in position of the Darlington beds are estimated by Mr. Montgomery to be about 320 feet thick, and are termed by him the *Crinoid Zone.* This zone is composed of limestones, consisting chiefly of crinoid remains, occurring in beds from six inches to four feet thick, separated by thin shaly partings. Mr. Montgomery states that this limestone seems very pure, except that it frequently contains bands and masses of chalcedony *(Buhrstone)*, formed by the infiltration and segregation of silicious solutions. The beds of the

larger quarry at the Portland cement works are stated to belong to the lower part of this series. The buhrstone referred to might yet prove to be of commercial value for milling purposes, as it is very abundant and easily quarried. It is greatly to be regretted that the manufacture of Portland cement at this place has failed of success, seeing, as Mr. Montgomery has reported, that good cement has already been manufactured there, and that there are good facilities of all sorts for making and shipping larger quantities of it.

To the geologist and palæontologist, the Darlington beds of Permo-Carboniferous age are of the greatest interest. The fossils of these rocks afford a splendid field for further palæontological investigations. Professor Boehm, of Freiburg University, Baden, whom I recently induced to visit this fine section at Darlington, declared to me that to him, as a professional palæontologist, it was the grandest sight that he had ever beheld. The main object that I had in view in recording these observations is that it may perhaps induce the younger members to systematically extend our knowledge of the Permo-Carboniferous age in Tasmania, and especially of these Darlington beds. I am indebted to Mr. Montgomery's paper for the large detailed table of strata appended, and for the sections which illustrate them. (Appendix B.)

For the series of splendid photographic slides of the Darlington fossil cliffs, prepared to illustrate this paper by Mr. Beattie, I am indebted to my friend, your Secretary, Mr. A. Morton, who obtained them when he last visited the island for this purpose, accompanied by Dr. Boehm. The enlarged figures of typical fossils of these rocks, to be shown on the screen, are taken from the plates which illustrate my large work, "Systematic Account of the Geology of Tasmania."

As the limestones quarried by the Maria Island Company for the manufacture of Portland cement are of much interest, from an economic point of view, I have appended (Appendix A) a valuable analytical report of the character of these limestones, submitted to Mr. Wallace, Secretary for Mines, by Mr. W. F. Ward, Government Analyst.

Appendix A.

Government Laboratories,
Hobart, 4th September, 1900.

Dear Sir,

The samples of cement received from you on the 14th ult., and stated to be from Maria Island, have been examined, with results following :—

	1	2	3
Silica, soluble	26·2	26·5	22·4
Silica, &c., insoluble	5·0	1·1	1·2
Oxide of iron	2·6	2·2	1·8
Alumina	3·8	3·4	4·0
Magnesia	1·1	1·2	0·8
Lime, &c., by difference	56·3	63·6	53·2
Carbonic acid and water	5·0	2·0	16·6
	100·0	100·0	100·0

No. 1, cement ; No. 2, blue lias clinker ; No. 3, crumbling cement brick, 10 years old. No appreciable amount of phosphoric acid was found in any sample ; a small quantity only of sulphate of lime is included in the lime.

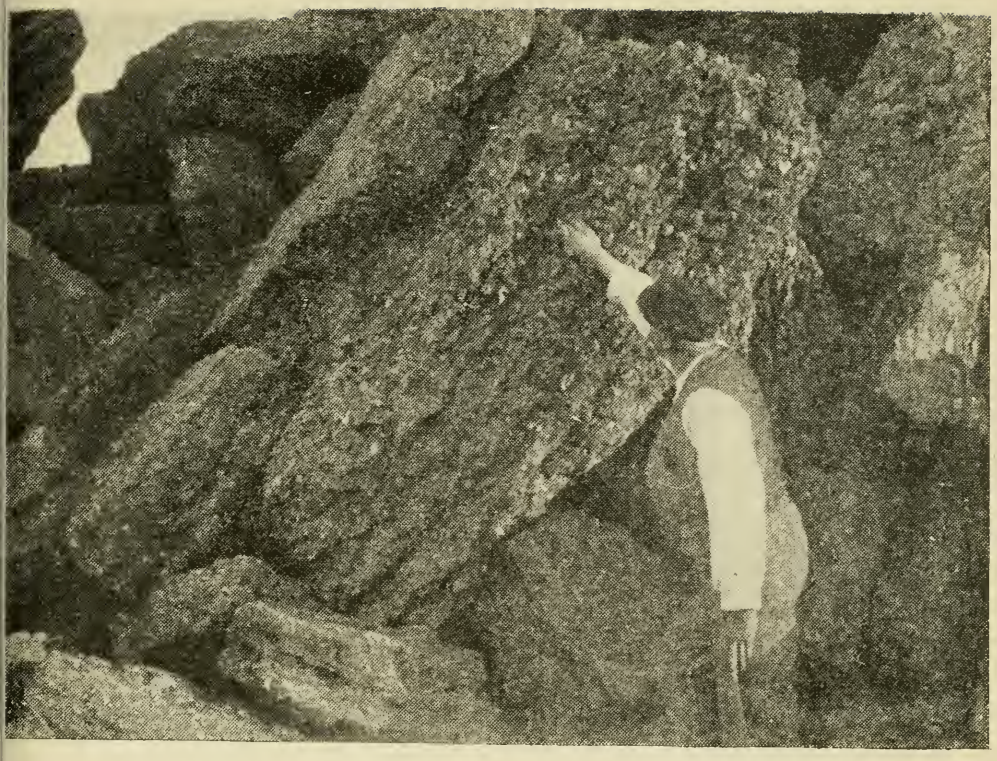
To render the results more strictly comparable, they have been calculated, excluding the carbonic acid and water lost on ignition in each case, as follow :—

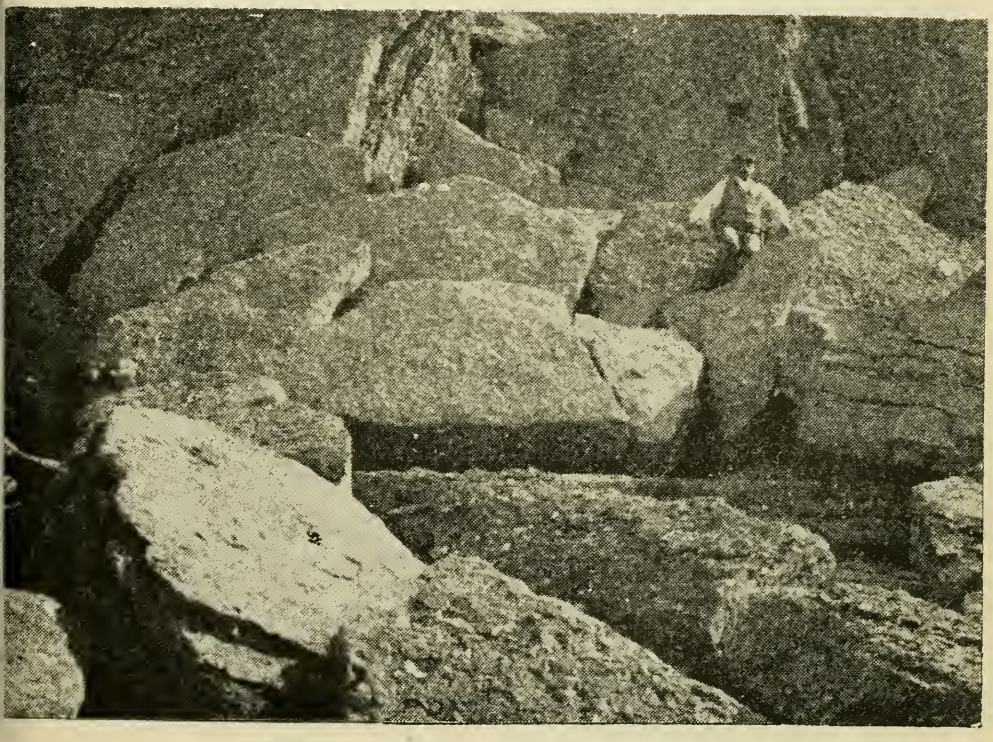
	1	2	3
Silica, soluble	27·58	27·04	26·86
Silica, &c., insoluble	5·26	1·12	1·44
Oxide of iron	2·74	2·24	2·16
Alumina	4·00	3·47	4·80
Magnesia	1·16	1·23	0·95
Lime, &c.	59·26	64·90	63·79
	100·00	100·00	100·00

Variations in compositions of cements from several different countries are added for comparison :—

	Per cent.
Silica	19·9 to 26·1
Alumina	5·2 „ 10·6
Oxide of iron	2·1 „ 5·0
Lime	59·1 „ 67·3
Magnesia	0·3 „ 3·5
Sulphuric acid	0·3 „ 4·2

It will be seen that in the Maria Island material the silica is rather above the maximum, and the alumina rather below the minimum given above. Alteration in these respects would probably mean improvement, but I am inclined to attribute the crumbling of sample No. 3 to mode of preparation of the cement, as there are some limestones which will yield cement or lime according to the





FALLEN BLOCKS OF FOSSILIFEROUS

At foot of Cliff, Fossil Cliff Bay, Darlington, Maria Island

temperature at which they are burned. A rotary kiln, very largely used in America, is a great improvement on the old forms of calciners.

Yours faithfully,

W. F. WARD, *Government Analyst.*

To the Secretary for Mines, Hobart.

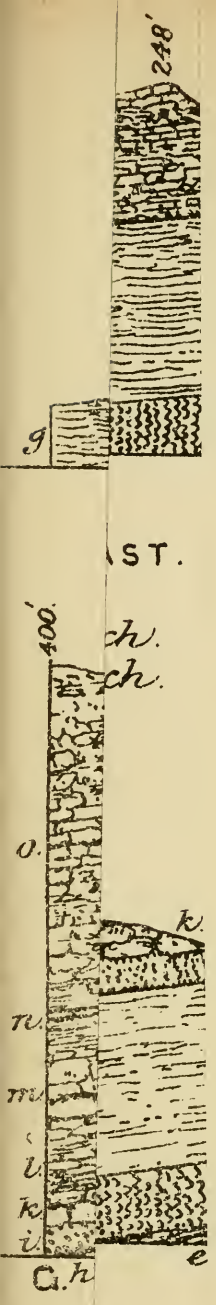
Appendix B.

Detailed Description of the Darlington Beds, as described by A. Montgomery, M.A.

	Thickness.		Description of Beds.	Total Thickness of Strata.	
	Ft.	In.		Ft.	In.
Crinoid Zone.	320	0	Limestones consisting chiefly of crinoid remains in beds from 6 inches to 4 feet thick, separated by thin shaly partings. This limestone seems very pure, except that it frequently contains bands and masses of chalcedony (*Buhrstone*) formed by the infiltration and segregation of siliceous solutions. The beds of the large quarry at B. on plan belong to the lower part of this series.	608	0
Productus Zone.	30	0	Beds of blue hydraulic limestone, 6 inches to 4 feet thick, worked in quarries at A. C. D. E. and F. on plan, separated by beds of calcareous shale and mudstone, amounting, probably, to nearly half the whole bulk of the beds. The limestones show fossils of *aviculopecten*, *spirifera*, *productus*, and *fenestella* in abundance; *pachydomus* common, but less frequent. Small stones not uncommon	288	0
	43	0	Shaly limestones, very rich in *Spirifera* and *productus*	258	0
	2	6	Dark shaly mudstone.....	215	0
Fenestella Zone.	1	9	Volcanic ash or tuff, very hard, full of small glittering granules of glassy quartz, felspar crystals common, also fragments of various rocks: decomposes to a yellowish-brown clayey stone, which still shows the glassy quartz granules very distinctly.....	212	6
	124	0	Mudstones, with but little lime, very rich in species of *fenestella, stenopora*, &c...	210	9

Detailed Description of the Darlington Beds—*continued.*

	Thickness.		Description of Beds.	Total Thickness of Strata.	
	Ft.	In		Ft.	In.
Pachydomus Zone.	40	0	Thick limestone bed, almost entirely made up of shells of *pachydomus globosus*, but containing a great deal of sand and large stones	86	9
	6	0	Calcareous shale	46	9
	0	9	Solid hard limestone	40	9
	2	0	Calcareous shale	40	0
	2	6	Limestone and shale with *spirifera* shells and a good deal of gravel	38	0
	1	6	Solid hard limestone	35	6
	5	0	Calcareous shale	34	0
	1	6	Solid hard limestone	29	0
	1	6	Calcareous shale	27	6
	5	0	Limestone, almost entirely composed of shells of *pachydomus*	26	0
	1	0	Calcareous shale	21	0
	2	0	Solid limestone	20	0
	1	6	Limestone full of boulders	18	0
	3	6	Calcareous shale	16	6
Erratic Zone.	4	0	Limestone with a great many stones in it	13	0
	4	0	Conglomerate of boulders of metamorphic slate and sandstone and granite, cemented together by limestone	9	0
	5	0	Impure limestone, with boulders	5	0
			Sea Level	0	0



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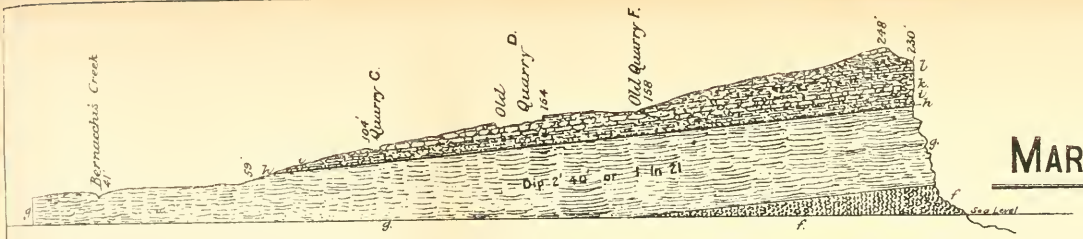
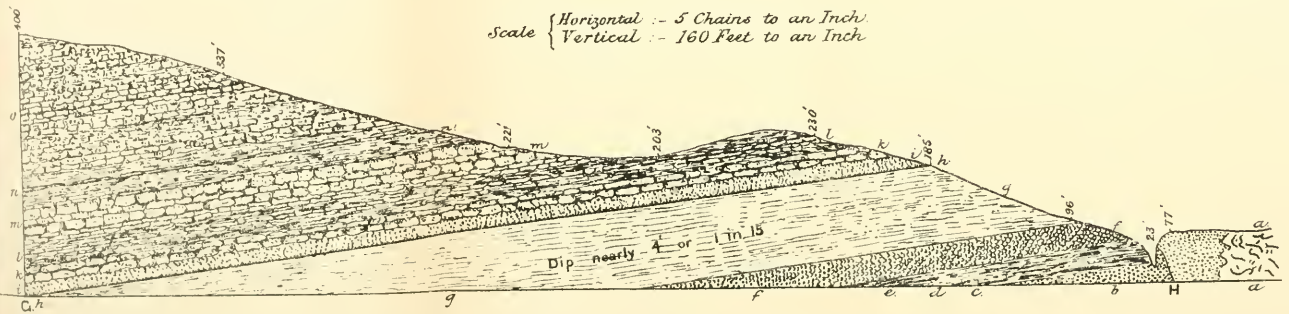
MARIA ISLAND.



SECTION THROUGH MIDDLE SPUR FROM CREEK TO COAST.

Scale { Horizontal :- 5 Chains to an Inch.
Vertical :- 160 Feet to an Inch.



SECTION ALONG COAST FROM G. TO H.

a. Greenstone b. Limestone & conglomerate. c. Calcareous shale & thin beds of limestone. d. Bed of Pachydomus shells e. Calcareous shales with thin beds of solid limestone f. Thick bed of Pachydomus shells. g. thick bed of mudstones with very abundant remains of species of Fenestella &c. h. bed of volcanic ash. i. shaly limestone with numerous species of Spirifera, Productus &c. k. thin bedded hard limestones worked in quarries on Middle Spur. l. horizon of limestone beds worked for cement in quarry A. m. horizon of crystalline crinoidal limestones in bottom of quarry B. n. mixed beds of limestone and mudstone. o. beds of hard limestone seen in face of cliff at G.

4.56

PRESENT AND FUTURE PROSPECTS OF TIMBER IN TASMANIA.

Paper read by W. Heyn, Timber Department, Admiralty Harbour Works, Dover, at a Meeting of the Royal Society of Tasmania, 29th April, 1901.

After introductory remarks, Mr. Heyn proceeded to say—

You will naturally ask me why I came out to Tasmania, a long distance of some 13,000 or 14,000 miles (a few hundred more or less not being of much matter) from England; what I came for, and the probable results of such a long journey. Had I come to see and admire the lovely scenery of your island, or to revel in the delightful air of one of the most perfect climates I have ever experienced, or other charms, I acknowledge that I would have been amply repaid for the protracted sea voyage and loss of time by what I have seen and enjoyed since my arrival in Hobart. But, as a business man, I must confess that none of these reasons actuated me in coming to Tasmania, for, to tell the truth, until I actually saw and experienced them, I never once imagined that such a beautiful island existed. The facts are these: In the English Channel, which, as you know, separates England from France, we have not along the whole stretch of coast, from the Isle of Wight to the mouth of the Thames, a single harbour of refuge, or marine station worthy of the name, or suitable for the large-sized ships, of which our naval and merchant services are now principally composed. You, who have one of the finest, if not the finest, natural harbours in the world, can scarcely understand what the want of a good, safe, and easily-entered harbour means

in a channel ploughed by storms and heavy seas from the Atlantic on the one side, and from the North Sea on the other, and subject to be clouded over very frequently by those impenetrable fogs which are so common and dangerous along our English coasts. But, beside the question of having a place of refuge to which our ships can repair under severe stress of weather,—and, you must remember, that it is calculated that on an average nearly 2000 ships of one class or another pass Dover every day,—there is another reason equally strong, and, if possible, more important, as far as the interests of our great Empire are concerned, which rendered the construction of a great National harbour at Dover an absolute necessity, as well as a great national duty.

As you are aware, our coast at Dover is only about 21 miles distant from France; so close that one of our new torpedo-catchers could cross to Calais and return to Dover inside of an hour's time. You also know that the English Channel is the great highway through which all the European fleets, and a great number of other warships, are continually passing; consequently, Dover, with the requisite battleships and torpedo-boats, commands one entrance of the Channel, and can, in case of need, either attack a hostile fleet, prevent an invasion of our shores, or inflict punishment upon any neighbour who wishes to annoy us. When the Dover National Harbour is completed, it is computed that a large portion of our fleet and torpedoes can lie at anchor in safety there, ready to strike if any of these emergencies arise.

The necessity of the formation of a great national harbour in this part of the English Channel has for a great number of years engrossed the attention of the naval and military authorities of our country, and as long ago as 1844, a Royal Commission sat on the subject, and plans, for which the late Duke of Wellington was, I believe, in part responsible, were prepared and considered. These plans must have been tied up very tightly with red tape, for it took 52 years to open them, and it was not until the year 1896 that any tangible progress in the carrying out of this great national under-

taking was made, and entrusted to Messrs. S. Pearson & Son to execute.

After all, perhaps, this delay was beneficial, for, when first proposed, it was intended only to spend two millions upon the work, whereas the present plans will require an expenditure of at least double that amount, with corresponding advantages in extent and execution.

I have prepared a sketch of the proposed works, which I will try to explain to you, so that you may have some idea of what has been accomplished during the last three years, and still remains to be done before one of the finest artificial harbours in the world will be finished, and which will still require about seven years for its accomplishment.

It is to find the timber requisite to enable us to carry out this gigantic work that I, representing the timber department, have been sent to Tasmania; and you will be glad to hear that, so far, my mission has been most successful, and I feel certain that when the piles I have procured here reach England, they will prove admirably adapted for the work for which it is intended to utilize them. The splendid workmanship shown in the squaring of these logs will also prove that Tasmanian axemen are among the finest in the world. In connection with this I may mention that a considerable portion of this timber has been cut and prepared, and will be shipped from your township of Dover, to be taken to and used at Dover, in England—a curious coincidence.

This, I am happy to think, will add another record to the services which little Tasmania has been able to render to the mother country. She has already sent six contingents of her most stalwart and tallest sons to help to keep flying the flag so dear to us all, and now she is furnishing some of her finest and tallest trees as her contribution of the most necessary timber for the completion of a harbour in which Britain's fleet can keep watch and guard over those shores which must always be kept, and

which we all intend to keep, inviolate from the tread of any invader.

To give you some idea of the magnitude of this work, only as far as the timber required in its construction is concerned, I give you the quantities which can be regarded as the minimum required before it is completed :—Hardwoods, principally greenheart and rock-elm, 25,000 cubic feet, and softwood, pitch-pine, red-wood, &c., 75,000 cubic feet for permanent work; and for merely temporary staging, 550,000 cubic feet blue-gum and other hardwood; and pitch pine, &c., for superstructure, 700,000 cubic feet; so that an undertaking which will consume some 27,000 to 30,000 loads, or 1,500,000 cubic feet, in its construction, is not a matter which any timber-producing country can regard with indifference.

You will naturally ask why we were obliged to come to Tasmania for these piles of 100 feet in length and 18 to 20 inches square? Could we not have got them in some other quarter less distant, and at a smaller cost? In reply to this, I can tell you that we could and did get very good timber of the same length and dimensions from Vancouver's Land, and have employed already a large quantity on the Dover works. We found, however, that this Oregon timber, which, I may mention, cost us considerably less in price than Tasmanian blue-gum, had certain disadvantages. In the first place, it has only 47 to 48 lbs. of specific gravity. This, in itself, is an objection for driving purposes. In a place like Dover, where we have to contend against strong tides and currents, it is nearly impossible to get a pile of Oregon 100 feet in length into position for driving it into the ground, through 47 feet of water at low tide, unless it is what we call "weighted" with old railway iron at the end, and which entails an expense in material and labour of nearly £10 per log. Then we have to reckon in these submarine structures with a very small, but most destructive, little insect called, in Latin, the "*Terridæ navalis*," or, in plain English, a species of seaworm. We found that in 21 months to two years' time this ravaging little animal completely honeycombed an 18-inch log of

Oregon, and rendered it unfit for further use as a pile. As all these piles are only employed as temporary staging to enable us to lay our 42-ton concrete blocks for permanent use, it stands to reason that, if after we have laid these blocks, we are able to use the piles a second time, they only cost us one-half; three times, one-third, and four times practically nothing. Now, we had received through one of your most enterprising timber firms, Messrs. Gray Bros., Adventure Bay, a small cargo of Tasmanian timber, in which we found blue-gum logs, which were, in our opinion, likely to supersede Oregon to our advantage. In the first place, the specific gravity of Tasmanian blue-gum being nearly 75 lbs. to the cubic foot, water being about 65 lbs., there was no necessity to weight the piles to get them into position, thus saving an expenditure of £10 per log, and in case of being carried away by accident they would sink where they were, and could be easily recovered, instead of floating about, a menace to the works or to ships and steamers. Experience showed us that the sea-worm did not find *eucalyptus* to its taste, and, consequently, virtually confined its ravages to the other timber of a softer and more succulent nature, of which it had no difficulty in procuring a sufficient supply for its wants in our harbour.

You have in your forests in Tasmania a tree which combines the *desiderata* we require for our piling purposes—length, dimensions, solidity, and high specific gravity, and less liability to attack by the *terrida*, in number sufficient for our wants for many years to come, and in situation near enough to the sea to allow of its being loaded on ships without too heavy a transport cost. This timber is known to botanists as the *Eucalyptus globulus*, and is commonly called Blue-gum, and for size, strength, and durability it would be difficnlt, in my opinion, to find any wood superior to it. The enormous size and height to which these giants of the bush grow, enable us to hew out of them piles of 100 feet in length and 20 inches squared parallel from top to bottom. To do this, however, we require a tree 15 ft. to 18 ft. in girth 5 feet from the ground, and about 150 feet to the first branch. We found trees of this length and dimen-

sions in Norfolk Bay, and also at Port Esperance, where there are at present several hundred logs lying ready to be sent off in the ships now on their way to load them.

The following slides, so admirably prepared by Mr. Beattie, will give you a fair idea of our work in the bush :—

No. 2. Tree-felling.
„ 3. Squaring logs in bush.
„ 4. Squared log, with butt. (Axemen.)
„ 5. Bullocks bringing piles (driver and animals).
„ 6. Ditto at stage, ditto.
„ 7. Tramming piles to beach (behind horses).
„ 8. Ditto (before horses).
„ 9. Piles, Norfolk Bay, ready shipment.
„ 10. Ditto.
„ 11. Ditto.
„ 12. Dinner-time, bush.
„ 13. A bush road.
„ 14. A steam hauler (instead of bullocks).
„ 15. Hauling logs through bush.

You have also another species of *eucalyptus* growing in the same, or even larger, quantities, and of equal length and dimensions, I mean the Stringy-bark (*Eucalyptus obliqua*). When cut it is often difficult to distinguish it from blue-gum, except in the specific gravity, which is, I believe, generally about 5 lbs. less. When grown in the same soil where the best blue-gum is found, on the slopes of your gullies, with the roots imbedded among rocks and stones, there is little to chose between either, both being excellent. Personally, for this Admiralty work, I prefer the blue-gum, not alone for its greater specific gravity and consequent strength and durability, but also for a most important point, that is, its greater freedom from bad knots. I have found a much more considerable number of faulty and rotten knots in Stringy-bark than I have ever met with in Blue-gum. I can assure you that even one rotten knot in one of these piles is sometimes a most serious matter when it comes to driving them ten to twelve feet into the ground. I have even seen a log of Stringy-


Freehold

MAP OF NORTHERN PART OF BERNACCHI'S FREEHOLD

MARIA ISLAND.

SCALE

bark, 100 feet long and 18 inches square, break right across the centre, where one of these knots existed, merely from its own weight, which would be from nine to ten tons. In selecting, therefore, the Blue-gum here, I have studiously avoided all bad or suspicious knots, a defect which might, at a critical moment of its use, occasion serious damage to life and property. You will at once perceive how very careful we must be in the quality of the timber, and in the construction of the temporary staging, in which it is the prominent feature, when you hear that every part of this staging must be able to sustain a weight and resist a pressure of 450 tons throughout. Of course, I have had a long experience in Baltic and American timber, but, with the exception of rock-elm, which is a very treacherous wood, I have seldom seen knots so detrimental to the value of the log as in *eucalyptus*. I have often seen Danzig timber full of knots, but as long as it was not required for sawing purposes it could perfectly well be employed for beams, and, in fact, sometimes the knots were the strongest part; but in *eucalytus* my experience is that the tendency in the knots is to rot, and, if I may, I would suggest to your timber exporters to be very cautious in their selection in this respect. Of course, it is impossible, or nearly so, to get wood quite perfect, and Blue-gum, as well as Stringy-bark, has the defect of shakes and shrinkage; but both these may be very considerably modified by care and attention. At first I was rather frightened to drive piles which had great shakes at the ends, but I must say that, with one or two exceptions, they bore the ordeal very well. All those piles which I am now sending to Dover are ringed at both ends in the bush before being transported to the beach by tramway; and I find this a very good preventative. I think that, generally speaking, these shakes are more detrimental to the appearance of the timber than injurious to its real value But for timber which has to be sold in open market, of course it would be wrong to overlook the fact that these shakes might prove a serious obstacle to their sale. Ringing large logs, painting or tarring the ends, particularly of planks or boards, will, I feel certain, help to diminish this. As for "shrinkage," cutting at the proper time, or ring-barked three or six months before

cutting, and then, particularly in the case of sleepers and boards, allowing them to season in the *open air*, but *under cover*, will, in a great measure, prevent this, and benefit the timber much. Your Stringy-bark of the best quality, when well cut and seasoned and polished, resembles a good deal our English oak, and might be used for many similar purposes at a remunerative price, for oak is getting very scarce in England, and fetches high rates now.

Respecting the value of Blue-gum and Stringy-bark for paving purposes, I can scarcely speak with any real authority, not having had any practical experience with these two woods employed in this way. I have seen, from personal experience, that the Australian Jarrah does very well, and stands a heavy traffic without shrinkage or apparent injury for a reasonably long period. The only sample of wood-paving I have seen in Hobart is not calculated to inspire much confidence or lead to larger export orders; but, then, I do not consider that the wood has had anything like fair play. In the first place, it is not laid on a good concrete floor, one of the very first requisites for a wood pavement, either to serve for any time or to look well. Besides, I feel certain that the wood employed was not properly seasoned before laying, and, under these circumstances, it would be wrong to blame it, or to say that it was unfit for pavement. Why not give it a good trial?

If you will allow me to say it, I think, with careful scrutiny, you will be able to find a street in Hobart, for choice the one with the heaviest traffic, which could do with a new pavement. Why not take up a part or the whole of it and pave it with Blue-gum or Stringy-bark blocks, properly seasoned and prepared six months before, and then laid on solid concrete flooring? You will then have an opportunity of seeing and showing what the wood is worth in this capacity, and, considering that you have it close at hand, and that it is cheap, the cost would not be excessive; or, even if it did cost more than your present pavement, it might be worth the difference in bringing in orders from other countries. Perhaps some wanderers to your shores, if the trial proved successful, which, I am inclined to

think, if properly carried out, it would be, might be struck with its appearance; and in these days of unlimited Limited companies, which float far less legitimate projects, they might inaugurate a boom in your timber market which would be as welcome, as it is, to all appearance, badly wanted at the present time.

I cannot lay too great stress upon the absolute necessity of all the timber, particularly that intended for the European and English markets, being cut at the proper time when the sap is down, and seasoned for at least six months before exportation. The seasoning applies principally to boards, planks, sleepers, and small scantling generally. I can assure exporters, from a long personal experience, that there is not the slightest use in sending unseasoned scantlings of Tasmanian timber to England. It would arrive there warped, cracked, and disfigured, and would have no chance against the enormous quantity of really good wood with which it would have to compete. There are two methods by which seasoning may be accomplished, either naturally or artificially, but, I think every man practically acquainted with timber, will agree with me that the natural process is by far the more beneficial, not only as regards the appearance of the wood, but its strength, which has been proved to be greatly increased by proper seasoning, and lengthens its life nearly 100 per cent.

You will perceive that in the foregoing observations I have only spoken of Blue-gum and Stringy-bark. My reasons for so doing are—

1st. That I have had more experience with these two descriptions; and

2nd. Because I believe that they are likely to be the principal woods which, from the large supply you have of them, and their peculiar characteristics in length, dimensions, and durability, are the most likely to be able to compete against other timber in English or European markets. You have in your Huon Pine, Blackwood, Myrtle, and other woods (principally used for the manufacture of furniture), timber, which for beauty and solidity cannot easily be surpassed; but I do not think that they could hold their own in English markets

against bird's-eye maple, black walnut, and many others which can be procured there much cheaper than they could possibly be delivered from Tasmania, leaving a fair profit to your exporters. A considerable quantity of Blackwood has, however, lately been sent to Woolwich, where it is being used in the construction of gun-carriages, and has, I believe, given satisfaction. Another thing of great importance, in a business point of view, is that these foreign woods can be delivered in nearly any quantity required, and that there always exist large stocks of them, seasoned and ready to be selected by intending purchasers. You, on the contrary, as far as I have seen or heard, have, comparatively, to Blue-gum and Stringy-bark, a very small quantity to dispose of ; indeed, scarcely more than is necessary for your own and the neighbouring States' consumption.

I shall not easily forget my impressions on entering your Bush for the first time. The whole scene struck me as so weird, so antediluvian, if I may so express myself, so very different from anything I had seen before ; such a contrast to either our English woodlands or the continental forests. Those blanched giant trees, some of them 250 feet in height, spreading out their bare branches to the sky ; the young undergrowth of gums in full foliage, and splendid ferns of every species and size, formed a picture which never can fade from my recollection. But, mingled with my feelings of instinctive admiration with which I regarded your splendid trees, a great emotion of regret, pity, and at last indignation overcame me when I saw the waste—wilful and ignorant destruction of some of the finest trees which ever existed in any country. When I thought and knew, that every one of those magnificent, but ruined, monarchs of the forest would have been worth, at least, some £50 in England, I felt really heartsick as I looked at such standing monuments of man's ignorance and folly in destroying, or allowing to be destroyed, such a valuable factor in the prosperity of your country and of its climate.

On investigation I found that bushfires, on the one hand, and wanton and useless ringbarking and burning

on the other, were the principal causes of this deplorable destruction of such valuable property.

As for bushfires, I believe you have laws regulating the lighting of fires in the bush; but making laws is one thing, and seeing that they are enforced (a very necessary adjunct) is another. Are these laws enforced by proper and continual supervision? To speak from my own experience, I should say not. Everywhere I found abundant evidence of the recklessness with which fires were lighted, and the carelessness with which they were left burning afterwards, when a strong breeze might raise a conflagration in which lives and property would be imperilled. I believe in such cases Government has to compensate the sufferers. Would not prevention in this, as in so many other instances, be the better alternative, and money spent in supervision, save money spent in compensation, besides preserving valuable timber from destruction? This is, I think, a matter which should engage the serious attention of those in power, and any really practical move in this direction should have the approval of the inhabitants of this country. Personally, I feel convinced that eight out of ten bushfires are the result of culpable negligence or gross carelessness and ignorance in the use of fire for clearing purposes.

As for the terrible and disastrous waste caused by indiscriminate hacking, hewing, and even malicious vandalism, along with ringbarking, there ought to be some immediate and drastic measures taken to prevent this national loss to property. I may safely say that I have seen thousands of trees ringbarked and destroyed by ignorant men upon ground upon which nothing else could possibly grow, and who had thus destroyed the only valuable asset upon their land. Had these men been properly instructed in the first elements of forestry, they could not possibly have failed to see the folly of spending their labour, time, and money in annihilating the only good thing their soil could produce; or had there been anyone to call their attention to the suicidal irrationality of such a procedure, the waste and destruction might have been stopped in time, and the owners would have seen that it was their interest to preserve rather than to destroy.

It appears to me, therefore, that ignorance is really more to blame for the waste and destruction of your timber than carelessness or recklessness. A man who really understands a business from which he hopes to gain a living or profit, is not, generally, reckless or careless. He knows what he is about; the value of the products with which he has to work; the best and most economical way of getting the utmost out of them, trusting to technical and practical knowledge to help him through, and not to haphazard and indiscriminate methods which can never end in any good result. Now, I believe that it is the first duty of a really enlightened Government to give their citizens an opportunity of gaining this knowledge, which does not come intuitively, but has to be *taught* and *learned*, on reasonable terms; and this can only be done by the organisation of good, well-appointed, Technical Schools. You have done, and are doing, a great deal in this respect for the Mining industry, the other great factor in Tasmanian prosperity. Why not do something for the other branch—forestry and agriculture? After all, the value of the mines is a problematic one. You are perfectly right in doing your utmost to promote their proper exploitation, but why neglect the sister industry, where you have the positive evidence of existing value and worth? The proper management of the one is as much a science as it is of the other.

Now, as far as timber is concerned, it seems to me that when a country possesses such treasures of vegetable wealth as Tasmania, no effort should be spared to make the most of such a source of national wealth and prosperity, by establishing a School or Schools of Forestry and Agriculture, where those who have the sense to appreciate the value of the great gift with which nature has endowed this land can either learn themselves, or have their children taught, the proper way to set to work to derive the greatest advantage from it. You would not expect a man to be able to make a pair of shoes or a piece of machinery without some practical previous knowledge of bootmaking or engineering; so how can you be surprised if a man who knows absolutely nothing of the laws of forestry and

agriculture, by his ignorance wastes and destroys the products of the land entrusted to him, impoverishing the country, and doing no good to himself or anybody connected with him? And it is not alone the conservation and intelligent use of the timber which *already* exists here which concerns you, but also the propagation of other kinds of wood, which now and in future, as the country develops, you will require in quantities sufficient to repay any reasonable expenditure in its acquirement. I see that your timber merchants are importing cargoes of Norwegian deals and boards, at a cost, I should say, of nearly £20,000 per annum. Why not take prompt measures to grow similar timber here, and keep this annual payment to foreigners in your own country? Larch, fir, and pine all grow splendidly here. As a proof of this assertion, pines and ash planted as far back as 1821, 1840, and 1860, gave splendid results, attaining 12 feet in girth and 70 to 80 feet in length. I have seen here very fine average oaks, beech, ash, chestnut, and firs, and have not the slightest doubt that, if properly chosen and planted, they would thrive well. The cultivation of these trees might be encouraged by the Government leasing suitable tracts of waste lands at a very low or peppercorn rent, on condition that they should be used solely for this purpose. You have plenty of ground in the Peninsula, Huon district, and inland regions on which to make plantations, which in ten or twelve years' time will already begin to show useful results. But all this must be done in a methodical and scientific manner, otherwise badly-directed energy will end in failure and disappointment.

From what I can learn and see, a School of Forestry, Agriculture, and State Nursery would not be a very expensive undertaking, even in the beginning, and ought, under proper management, to become soon, at the very least, a self-supporting institution, while rendering invaluable services to the country.

I have been informed, on very good authority, that a suitable plot of ground can be acquired in the neighbourhood of Hobart, about 100 acres in extent, on a lease of 21 years, at an annual rental of £25, with the right of

purchase at the termination of the lease at £12 per acre, and with the necessary supply of water practically guaranteed. This seems a promising starting-point for the project which, I believe, would prove so advantageous to Tasmania if properly carried out. This establishment should, in my opinion, provide for three sections at the outset; others can follow as the undertaking succeeds.

1st. *Forest Section.*—This would include importation of desirable seeds from different parts of the world, as well as collection of native seeds. Growth and distribution of nursery stock, particularly of trees likely to benefit materially and physically Tasmania, such as firs of all description, and walnut, to replace your blackwood, and bird's-eye maple your Huon pine; beech, birch, &c. Practical teaching, with ocular demonstration, of the art of forestry to those desiring it.

2nd. *Orchard Section.*—Treating of typical fruit-trees, to which the many heterogeneous growths could be compared and named. The various principles of planting, pruning, thinning, manuring, treatment of pests, best mixtures to enhance quantity and quality of crops, to be taught in a practical manner.

3rd. *Cereal and Grass Section.*—Dealing with the proper production of cereals; experiments in fertilisation and pest eradication; analysis of soils and of manures, and practical instruction in ploughing, sowing, planting, management, &c.

I have been told that the initial cost of such an establishment, including the building of a small house, clearing of several acres, and salary of a permanent resident gardener, besides cost of imported seeds, would be about £500, and that an annual subsidy of about £250 would suffice to keep it going. I am not in a position to verify the exactness of this statement; indeed, I fear the initial expense should be much higher if the establishment is to be of real service; still, if the necessity of such an institution was in principle acknowledged, these details could be settled afterwards. I believe, if properly organised and practically worked, such a school would soon become self-supporting, as so many similar ones on the Continent are at the present day. For one

instance, take the Forestry and Agricultural School established for many years at Gembloux, in Belgium. Boys, when they have reached 13 or 14 years of age, after having gone through the usual schooling term at their respective schools, are allowed to enter this institution after passing an examination, which any properly educated lad with ordinary intelligence can easily do. He is boarded, taught practically and scientifically everything necessary to make him, in two or three years, during which he has to pass periodical examinations, proficient in forestry and agriculture, at an expense to his parents or friends of about £30 to £40 per annum. There are scholarships attached, which, in many cases, cover this outlay. Any lad who leaves the school with a certificate of proficiency is sure to meet at once with an engagement from large land and forest owners, who are only too glad to avail themselves of the services of persons thoroughly and practically brought up. There are numbers of them employed also at very remunerative salaries in foreign countries, such as Russia, Siam, Burmah, Turkey, &c. Your youth would, however, soon find an opportunity, either under Government, or for their own or family's account, to turn their practical training to good advantage at home. In these schools, also, there are, during certain months of the year, classes for adults, which farmers and foresters can profitably attend, at a very small expense. The school fees, charges for analysis of manures and soils, valuation of properties, laying-out of grounds, gardens, products of nursery, cattle, &c., render such schools soon self-supporting, and as the manual labour in the estabishment is practically done by the pupils, and nearly all the necessaries for living are produced there, the annual expenditure should not be very great.

I cannot help thinking, from what I have seen here, that this instruction is very much required, and I believe that your best agricultural men would agree with my views. I have visited many of your orchards and fruit farms, and it seems to me that, in a great many cases, a good deal more of technical knowledge was required—in choosing the trees, planting and pruning them, as well as packing the fruit for export—if your great fruit

industry, of such enormous value to Tasmania, is to succeed as it ought. Of course, I will be met with the objection that the Government resources might not be adequate to establish and keep up such a school. I do not see why all the expenses of such an establishment, in my opinion so necessary for advancing the pecuniary and commercial interests of those engaged in timber and agricultural pursuits, should fall entirely upon the Government. The personal initiative and support of the large number of persons interested ought to be forthcoming if such a scheme is considered advisable and necessary, and after formulating the lines on which it was to be run and the amount which the promoters considered likely to be forthcoming, the Government could be approached for the grant of an annual subsidy until the institution became self-supporting, as I feel sure, if properly managed, in a few years, it would. To raise these funds by an infinitesimal tax on exported fruit and timber, or an annual subscription by all those interested, should not be a matter of great difficulty if taken in hand by competent persons, consisting of timber and export merchants, members of your agricultural societies, fruitgrowers, shipping companies, and prominent public men.

Another point which I should like to impress upon Government is the fact that in numerous parts of Tasmania young trees are coming up from seedlings, which, in 15 to 30 or 40 years, will be valuable timber, and that these locations should be jealously reserved, and all "rights" inimical to State interests there eliminated.

I have thus given you a few of my impressions, and made some suggestions which I believe would materially benefit the forestry and agricultural interests of Tasmania. It rests with you to decide whether they are worthy your attention. You may be quite certain that systematic forest and agricultural management not only benefits those directly interested, but also the whole industry of the State.

I would impress upon you, however, that, if you decide on doing something, lose no time in doing it at

once. You have already lost enormous quantities of valuable timber through its destruction by ignorance, waste, vandalism, and preventable fires. If you allow this to continue unchecked for a few years more, it must result in the exhaustion of your timber, and disaster to thousands of people depending on this branch of industry; but if a bold comprehensive scheme to conserve what you have, and to plant for the future, and for the practical and scientific development of agriculture in all its branches be adopted and carried out, not only will you reap an abundant reward in the present, but coming generations will profit by and bless you for the efforts you have made to promote and protect one of the most important industries in this Island.

In conclusion, if, either here or on my return to England, my services can be of any use, they are, as far as my official duties will permit, entirely at your disposal, either for reference, information, or advice.

I can assure you that I will always not alone think it a pleasure, but consider it a duty, to do my utmost to advance the interests of Tasmania, to which I am so much attached, and where I have met with so much kindness.

SUPPLEMENTARY NOTES ON SOME ANTARCTIC ROCKS AND MINERALS.

By W. A. Macleod and O. E. White.

In the proceedings of the Royal Society of New South Wales, Vol. XXIX., page 461, *et seq.*, appears a paper, read in 1895, on Antarctic Rocks collected by Mr. C. E. Borchgrevink.

The authors are Professor David, Messrs. W. F. Smeeth, and J. A. Schofield. A brief summary of this valuable paper will be interesting, more especially as since then there has been donated to the Tasmanian Museum a small collection of Antarctic rocks and minerals.

The paper mentioned is sub-divided into two parts :—

I. Introductory notes about Antarctica—
- (*a*) A general introduction.
- (*b*) A summary of the history of Antarctic Exploration.
- (*c*) A summary of Antarctic Geology.

Under this last head the authors show that *Eruptive Rocks* (Plutonic and volcanic, granite pegmatite, granulites, syenite, diorite, diabase, pumice, andesites, augite-labradorite rocks, basalts, basic scoriæ, Palagonite tuffs), *Sedimentary Rocks* (Tertiary limestones, and rocks of, perhaps, Triassic and Palæozoic age, sandstones, shales, quartzites, arkose), and *Metamorphic Rocks* (Gneisses, mica schists, argillaceous schists) are well represented. Then follows a list of the then known volcanoes, and their heights and other interesting Geological data.

II. Petrology of the rocks collected by Mr. C. E. Borchgrevink :—

(*a*) Specimens from Cape Adare—
- Garnetiferous-Granulitic-Aplite.
- Trachytes.
- Glassy Augite Andesite.
- Vesicular Andesite Glass.

Basaltic Andesite.
Olivine Dolerite.
Olivine Basalts.
Limburgites.
Basic Tuff.
Mica Schist (Biotite).

(*b*) Specimens from Possession Island—
Amygdaloidal Trachyte.
Augite Andesite.
Basalts.

The specimens presented to the Tasmanian Museum have been placed at the author's disposal, through the kindness of Mr. A. Morton, and comprise the following—

Minerals—
Quartz, containing Siderite.
Ferruginous Quartz Specimen.
Massive Olivine.

Rocks—
Basalt (Olivine).
Basalt (Olivine).
Basalt (Hornblende).
Scoriaceous Basalt.
Sandstone.
Mica Schist.
Decomposed Basalt (?) Ferruginous.

Taking these in the order above given, the first specimen is that of a milk-white variety of quartz, attached on one side to mica-schist, and fringed on the other edge (water-worn) with crystalline carbonate of iron. Another more massive specimen is a ferruginous or "rusty" quartz. Unfortunately, these specimens are barely large enough to permit of assay specimens being taken; still, the appearance of quartz would warrant prospecting for gold, if climatic conditions were favourable.

The remaining mineral specimen consists of a granular and fragile massive mineral, pale green in colour, and resembling bottle glass. The hardness, colour, and chemical tests (yielding $Si\ O_2$, Mg O, and a little Fe O) clearly point to the mineral being "olivine." This is a particularly fine specimen, and the mineral probably occurs in connection with the basalts to be mentioned.

Amongst the Rock specimens *Basalts* are well represented, and vary in texture from fine-grained, dense, dark-coloured rocks to scoriaceous, lighter-coloured varieties.

The first and smallest specimen is that of a dense black *Basalt*, showing here and there a few black augites and very small grains of olivine. Under the microscope the augite (of which an excellent cross-section is present in one slide) appears almost colourless. Prismatic and a weaker pinacoidal cleavage are shown: prismatic angle about 87°. The augites are quite free from corrosion, and enclose a few magnetite grains. The olivine grains show traces of crystalline outline, and are altered round the margins and along cleavage cracks into ferruginous matter. Magnetite is present in large and small grains, sometimes showing crystalline form. The base consists chiefly of lath-shaped felspars, which show what appear like fluxion phenomena round the porphyritic constituents. The felspars, which are of a basic variety, are closely packed together, and in the interstices come fine grains of magnetite and a little glass. Fig. I. is a diagrammatic drawing showing a cross-section of an augite prism, and the base.

The rock termed Hornblende Basalt is one possessing a peculiar whitish-grey coat of weathering products, but, on fracture, shows a very fine dense rock, with here and there a few porphyritic crystals. Mr. Twelvetrees suggests that, on account of these porphyritic hornblendes, the rock is an andesite. In the New South Wales collection some doubtful andesites are mentioned. An analysis of this specimen gives 45 per cent. of $Si\,O_2$, placing this rock amongst the Basalts.

Under a high power the base of this rock is seen to consist of long lath-shaped felspars, grains of magnetite, and everywhere are scattered small needle-shaped crystals, which do not extinguish straight, and probably are felspathic microliths. These are set in a glass of a light brown tint. Fig. IV. shows the arrangement of felspars, microliths, and glass.

In the scoriaceous Basaltic Rock, augites and olivines are clearly visible to the naked eye. The augites are similar to those above mentioned, but the olivines are

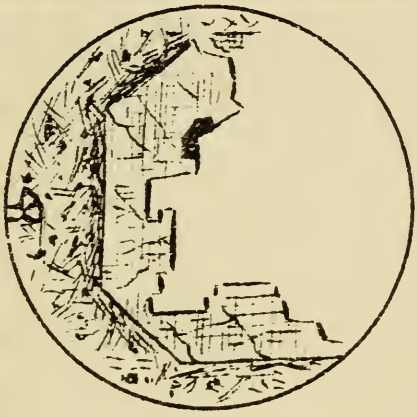


FIG. 1.

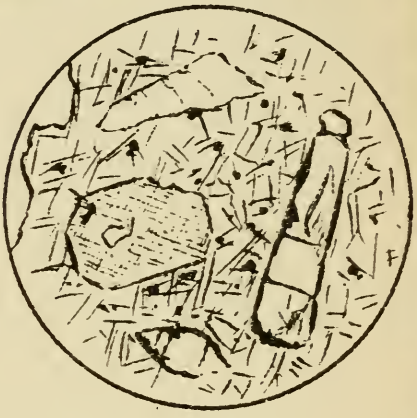


FIG. 2.

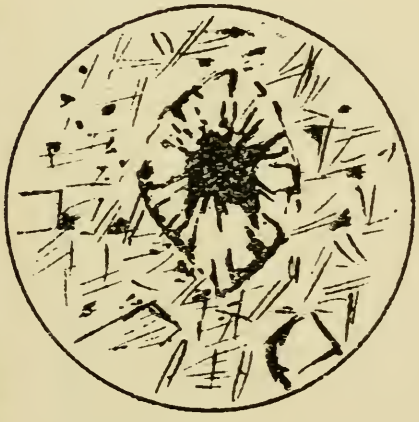


FIG. 3.

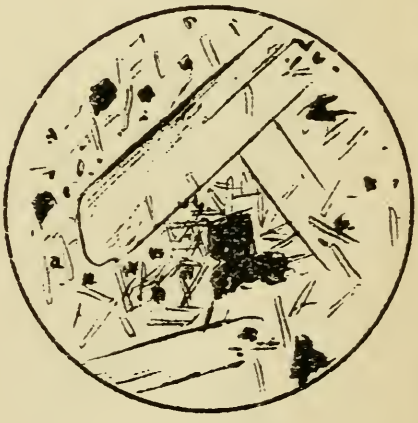


FIG. 4.

W A M.

much better developed than usual, and exhibit good crystalline outlines, high refraction, straight extinction, and an irregular cleavage transverse to their length, and somewhat similar to that exhibited by the Fayalites in the Sandy Bay Basalt. Fig. II. diagrammatically represents a section of this rock. The olivines are only slightly decomposed. Magnetite sometimes forms peculiar skeletons (perhaps decomposition products of the olivine), one of which is represented in Fig. III. The section of this rock is too thick to admit of an accurate determination of glass in the base.

Of the Sedimentary Rocks we have a single representative, in the form of a sandstone, fine-grained, and composed of angular fragments of felspars.

Amongst the altered rocks there is one specimen of a grey schistose rock which, under the microscope, in transmitted light, shows a confused mass of transparent flakes (perhaps sericite), with here and there large spots, probably occupying the place of former crystals. Analysis shows this rock to consist chiefly of SiO_2, Fe_2O_3 (or FeO), and Al_2O_3, with traces of CaO, and a high ignition loss of 5·45 per cent. This would point to a rock from which K_2O, Na_2O, MgO, and CaO had been leached out, and secondary hydrous compounds formed. This analysis agrees with those given by Rosenbusch (Elemente der Gesteinlehre, p. 497), and points to a rock of continental origin, and along with the Biotite Mica Schist of Professor David's collection, gives strong circumstantial evidence as to the existence, *at some time*, of an Antarctic Continent.

The remaining specimen is of a brown-red colour, and slightly scoriaceous, and, most probably, is a decomposition product of some scoriaceous basalt.

The authors, in conclusion, wish to thank Mr. Morton for the kind loan of the above specimens; and also Mr. W. H. Twelvetrees, for some kindly hints.

A FURTHER NOTE ON OBSIDIAN BUTTONS.

By T. Stephens, Esq., M.A., F.G.S.

The occurrence in Tasmania of these singular spheroids of jet black obsidian, popularly known as "buttons," was brought under the notice of the Royal Society in 1897, by Messrs. Twelvetrees and Petterd,* who gave a very full description of the specimens which had come under their observation, and discussed the various theories which have been put forward to account for their origin and distribution. In the same year I contributed a few supplementary remarks on the subject † with special reference to the earliest records of the discovery of these "buttons" in Australia and Tasmania. In 1898, during a journey from Texas, U.S.A., to San Francisco, I had noted the presence of obsidian in lava-flows of Northern Mexico, and had seen some extensive tracts of comparatively recent volcanic rock in Southern California, which suggested the possibility of our obtaining from that source further evidence respecting these singular volcanic products. Shortly after my return to Tasmania, I sent copies of the abovementioned papers to Dr. Joseph LeConte, the well known Professor of Geology in the University of California, in the hope that his intimate knowledge of the geological conditions of the United States might enable him to throw fresh light on this very obscure subject.

The occurrence of obsidian in the peculiar form under consideration does not appear to have been noted in California, but Professor LeConte kindly replied to my

* On the occurrence of obsidian "buttons" in Tasmania, by W. H. Twelvetrees, F.G.S., and W. F. Petterd, C.M.Z.S. Proc. Royal Society of Tasmania, 1897. p. 39.

† Remarks on obsidian "buttons," by T. Stephens, M.A., F.G.S. Pro. Roy. Soc. of Tasmania, 1897, p. 54.

inquiries, saying that he had consulted Dr. A. C. Lawson, Associate Professor of Geology and Mineralogy, and that their joint suggestion was, that the button-shaped forms described and figured in the paper of Messrs. Twelvetrees and Petterd might possibly be due to the formation of spherulites in a lava with obscure flow-structure, this structure being brought out by weathering; but this suggestion appeared to have been offered with some hesitation in the absence of any opportunity of examination of specimens. The next thing to be done was to attempt to supply specimens for personal examination, and an application to the Trustees of the Tasmanian Museum resulted in my being enabled to forward to San Francisco three obsidian buttons from a collection made many years ago near Glenelg, in Victoria, and presented to the Museum.

By the last mail from America I received a second letter from Professor LeConte, in which he says that, after careful examination of the specimens, he gives up the theory of their possible concretionary origin. His letter continues as follows :—

"I cannot think they have any relation to volcanic bombs: their meteoric origin seems to me out of the question. Professor Lawson throws out the following suggestion :—'May they not be the result of the bursting of bubbles on the surface of some liquid stiffly-viscous lava, ready to solidify? The bursting of such a bubble would probably leave a mound-like centre surrounded by an elevated ring-like margin, sharply elevated at first, but quickly becoming more rounded by gravity and by cohesive shrinkage, before setting completely. Thus might arise the appearance of the flat side. Subsequently the little ring and mound separate from the lava-mass by conchoidal fracture, forming the hemispherical side. The fracture is supposed to be determined by inequality of surface tension produced by the bursting of the bubble.'

"You see it is a mere suggestion, but I can think of nothing better to offer. As to their mode of occurrence, it is easy to see that their *form* would favour wide distribution by mechanical means, and their *singularity*, by human agency.

"Many thanks for these valuable additions to our Museum."

The suggestion thus offered by Professor LeConte claims attention as being the nearest approach to a satisfactory solution of a difficult problem that has yet been put forward. It is necessarily conjectural, for the exact conditions attending the bursting of bubbles of interstitial steam or gas near the surface of a rapidly cooling glassy volcanic magma have never been witnessed by any human

eye. The ellipsoidal shape, which is not uncommon in Australian specimens of the buttons, is inconsistent with the theory of a long rotatory flight through the air, for any such volcanic ejectamenta must have cooled too quickly to allow of any change of form on reaching the ground. A similar elongation of originally spheroidal cavities in vesicular basaltic lavas is a familiar instance in this connection.

The general probabilities seem to be in favour of the origin of the obsidian in or near the country in which the "buttons" are found, even if volcanic rocks of the necessary acidic type are not now in evidence: that they have been largely distributed by human agency cannot be doubted. Their reported occurrence in drift gravels in certain localities is still a mystery for the elucidation of which no satisfactory explanation has yet been offered.

THE GLACIAL BEDS OF LITTLE PEPPERMINT BAY, TASMANIA.

A Paper read before the Royal Society of Tasmania by Professor E. G. Hogg, M.A.

Little Peppermint Bay is a small arm of the sea on the western side of D'Entrecasteaux Channel, about 27 miles south of Hobart. The nearest point at which the Channel steamers call is Woodbridge, or Peppermint Bay, about half a mile south of the beds described in this paper.

The prevailing beds in the locality belong to the Permo-Carboniferous series, and have, over a large area, a fairly uniform dip to the S.E., at about an angle of 30°. They are intruded into by two distinct types of igneous rocks, viz., the Oyster Cove porphyries and the diabase greenstone, and, near the contacts, are disturbed to a considerable extent.

The glacial beds are exposed on the beach at the western part of Little Peppermint Bay, along the new and old roads from Woodbridge to Kingston, where they cross the Little Peppermint Bay Creek, and may be traced along the course of the creek for over half a mile. The greatest height at which they are found above the sea-level is about 200 feet. This occurs at the most westerly point at which they can be traced. The rock in the neighbourhood at this spot is the felspar porphyry, but no contact could here be found to determine the relations of the glacial and the igneous rocks.

The glacial beds are composed of an extremely tenacious fine-grained matrix, in which are embedded boulders, generally of small size, for the most part rounded, and frequently striated. Photographs of some of the striated stones are appended to this paper. No boulders to which the term massive could be applied were found; in fact, no

boulder was seen which was more than one foot in its longest dimension. The colour of the rock varied in places, but, except on the sea-beach, the prevailing tint was grey, with patches of purple-coloured clay in places. The clay, except for its greater tenacity, has many points in common with the glacial beds of Coimaidai, near Bacchus Marsh.

Among the included boulders are black, grey, and white quartzite, chert, coarse-grained granite, sandstone, slate (unfossiliferous), white and rose quartz, mica-schist, micaceous sandstone, quartz-porphyry, quartz-felspar-porphyry, and quartz-felspar-hornblende-porphyry. A large number of microscope slides were prepared from the igneous rocks for the purpose of comparison with the Port Cygnet and Oyster Cove igneous rocks—a very necessary point to determine if, as it would appear, certain of the Port Cygnet rocks are contemporaneous with the marine beds of Port Cygnet. However, a comparison of the slides of rocks taken from the glacial beds, and of over 100 slides taken from the Port Cygnet and Oyster Cove igneous rocks, appears to lead to the conclusion that the igneous rocks found as boulders in the glacial beds do not belong to the Port Cygnet and Oyster Cove series, and that we must look elsewhere for the origin of these rocks. From the granite specimens no conclusion can be drawn. It is worth mentioning that, so far as the author is aware, the nearest granite *in situ* is at the Hippolyte Rocks, south of Maria Island, on the east coast of Tasmania.

Among the included blocks was a piece of hard, dark-blue limestone, containing a fossil, which Mr. R. M. Johnston, F.L.S., has kindly identified for me as a form of Tellinomaya, probably of Upper Silurian age. The fossil is not in a state to admit of specific determination.

Where exposed on the beach in Little Peppermint Bay the glacial beds are pierced by three well-marked parallel dykes and an irregular dyke, all bearing S. 30° E. The dyke material is much weathered, but on the whole it appears probable that the dyke belongs to the Oyster Cove porphyry series.

The occurrence of glacial beds at the horizon of the Permo-Carboniferous series exposed at Little Peppermint Bay is of the greatest interest. The glacial conglomerates exposed at the north end of Maria Island lie nearly, if not

quite, at the base of the Permo-Carboniferous series. The Little Peppermint Bay beds lie almost certainly on a much higher horizon. Further examination may tend to show that in S.E. Tasmania the glacial beds are related to each other in a manner somewhat similar to that of the glacial beds at Lockinvar and Branxton, New South Wales, as described by Professor David, F.R.S. (Proc. Roy. Soc. N.S. Wales, 1899, p. 154).

ON A METEORITE FROM THE CASTRAY RIVER.

By W. F. Petterd.

There is invariably considerable interest attached to the discovery and identification of meteoric substances. I therefore assume that a few remarks respecting the recent acquisition of a small but veritable meteroic stone, fully authenticated as having been unearthed in this State, may be of interest. The specimen in question makes the second* which has been discovered in this Island, and brings the total number recorded up to date as having been obtained in Australasia, to about 33 examples†. These vary in weight from 3 to 4 tons to that now described, which is the smallest hitherto obtained. It is beyond reasonable doubt that many have been, and are, overlooked, as to the average observer they are remarkably unattractive, and it is usually only when they fall into the hands of the mineralogist that their true nature is revealed. Specimens of over 250 independent occurrences in various parts of the world are preserved, often with detailed records (*vide* Dana's System of Mineralogy, 1898).

As is well-known to those interested, it has been found convenient to class these objects into three divisions, although they pass more or less gradually into each other, viz. :—

1. *Siderites*, or meteoric iron proper (consisting chiefly of nickeliferous iron, and enclosing schreibersite, troilite, graphite, &c.)
2. *Siderolites* (consisting chiefly of nickeliferous iron and silicates, both in large proportion.)

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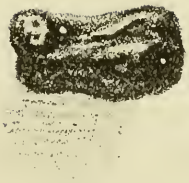
* The minerals of Tasmania, 1896, p. 53.

† Records of Australian Museum, 1897-8-9.



THE CASTRAY METEORITE.

3. *Aërolites*, or meteoric stones, (consisting generally of one or more silicates, interspersed with isolated particles of nickeliferous iron, troilite, &c.).*

It is estimated that about one-third of the known elements have been detected in the various forms of meteoric substances, many in their free state, but by far the greater number as homogeneous mineral species in the condition of alloys, oxides, sulphides, silicates, phosphides, and hydrocarbons.† Of the somewhat large number of compounds which have been recognised and described, about 12 species are unrepresented among the terrestrial minerals.

Of the meteorites recorded from Australia, 22 are classed as belonging to the first, or siderite section, seven to that termed siderolites, and one doubtfully belonging to the aërolites.

That already recorded from this State, as well as the one now described, belong to the siderite or nickeliferous-iron section.

A noted peculiarity of the metallic ingredients in thin section is the development of the "Widmanstatten" markings on a polished surface being exposed to the action of acids or bromine, owing to the inequality of action on the various alloys of nickel and iron.

Details of Specimen.

Castray Meteorite—

Type : Siderite.

Weight : 51 grs.

Size : Length, 18 millimetres ; greatest breadth, 10 millimetres.

Locality : Castray River, North-West Tasmania.

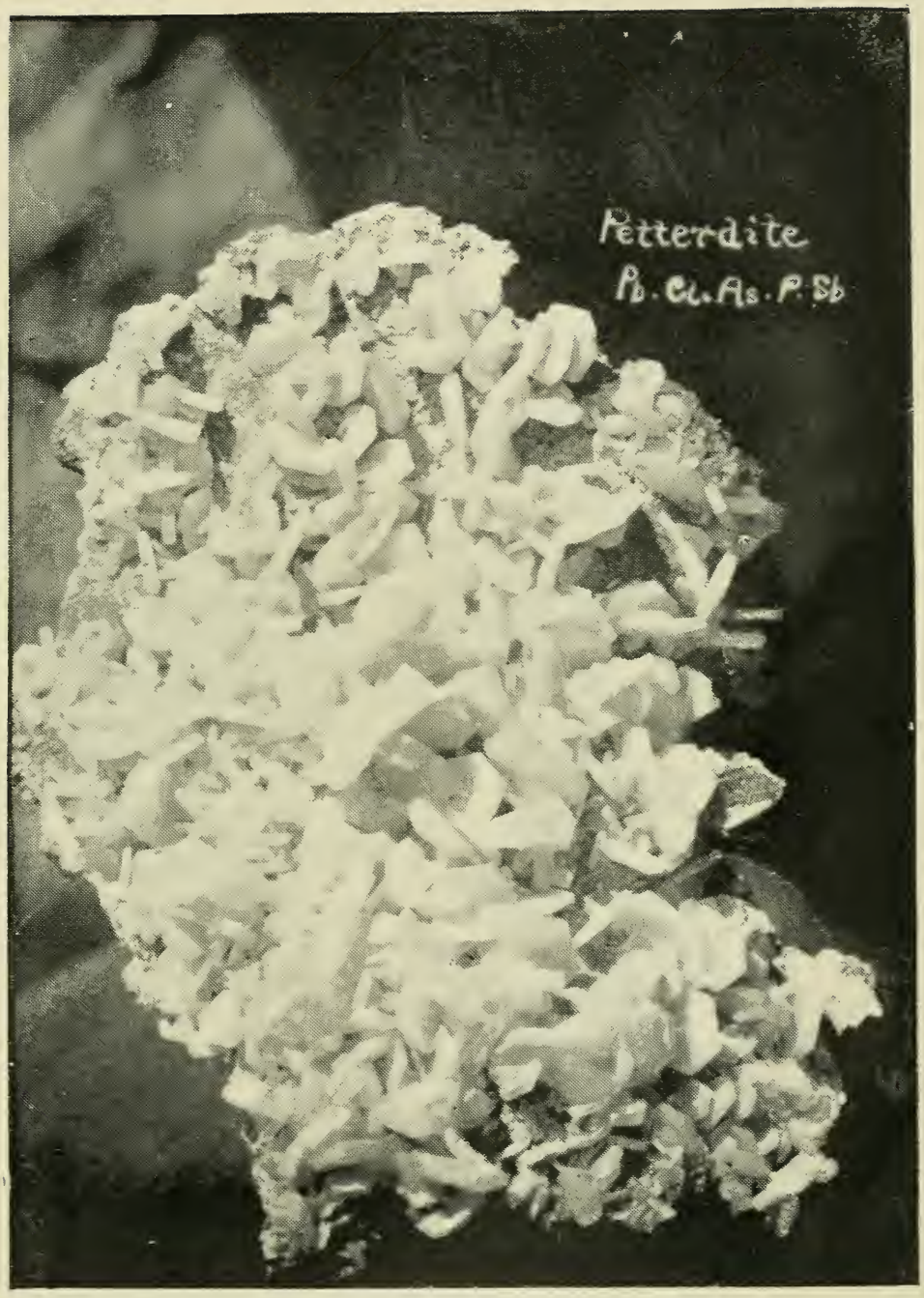
The specimen is dark, almost black, with the characteristic smooth, almost graphitic, surface glimmer common to this class of meteoric substances. In shape

* Introduction to the Study of Meteorites. (British Museum, 1896.)

† The discovery of undoubted diamonds in the numerous masses of meteoric iron found in the Canyon Diable, America, was announced in the American Journal of Science, July, 1891.

it is elongably quadrate, tapering, and abruptly angulated at one end; it is longitudinally furrowed, and has several irregular pittings or diminutive "thumb-marks" on the respective surfaces. It is strongly magnetic. It was originally obtained, with two others of like size and character, by a miner, in 1899, when ground-sluicing the auriferous drift on the banks of the Castray River, and afterwards, direct from the discoverer, came into the possession of Mr. T. Birkett, a well-known mine manager, by whom it was presented to the mineral collection of the writer.

I have to thank Mr. W. H. Twelvetrees, Government Geologist, for illustrating this interesting object.



PETTERDITE.

DESCRIPTION AND ANALYSIS OF A NEW SPECIES OF MINERAL, PETTERDITE, A NEW OXYCHLORIDE OF LEAD.

By W. H. Twelvetrees.

This apparently absolutely new chemical combination occurs in attached crystal groups in a quartz gangue containing disseminated pyrites, in the form of somewhat thin hexagonal plates, which are usually minute in size (about 5 millemetres in diameter), but occasionally reach 9 mm. dia., and, still more rarely, a larger size.

Macles are not rare, irregularly attached and implanted on each other, and on the matrix.

Fracture :—Rather irregular, brittle and dull.

Colour :—White, passing to pale grey on the surface.

Streak :—White.

Lustre :—Dull, inclined to rough, waxy, opaque, shining on the edges of the crystals.

Hardness :—1·5 to 2.

Gravity :—7·16, determined by Mr. W. F. Ward, Government Analyst.

Before blowpipe :— On coal OF. forms white to yellow mass. RF. a bead of metallic lead is easily produced without fluxes.

Heated in forceps, strongly decrepitates.

Flame :—With OCu distinctly azure blue. In powder with H_2SO_4 dull greenish blue.

In cold HNO_3 dissolves quietly and very slowly ; in hot acid dissolves slowly, giving with $AqNO_3$ a thick, curdy precipitate.

The powder heated before blowpipe gives slight odour of As_2O_5.

Analysis, kindly made by Mr. O. E. White, of Hobart :—

PbO	= 74·04
As_2O_5	= 2·60
P_2O_7	= 2·10
Sb_2O_5	= ·50
Cl^-	= 20·

Locality.—In the superficial workings of the Britannia Mine, Zeehan.

It is evidently rare, and, so far as known, confined to the locality mentioned. One remarkably fine specimen contains about 200 perfectly formed implanted crystals. The accompanying illustration fairly represents this specimen. It is an attractive mineral when in large groups, as shown, and is easily distinguishable from the more abundant sulphate and carbonate of lead. It is occasionally associated with fine groups of campylite.

THE MICROSCOPIC STRUCTURE OF SOME TASMANIAN ROCKS.

By W. F. Petterd.

I purpose to describe in this paper some aberrant members of the basalt family, which, although not common in this Island, are occasionally met with, and which are not only difficult of interpretation to the ordinary observer, but are sometimes a puzzle to the field geologist.

As is so well understood, the normal basalts are basic lavas (silica = 45 to 55%) of high specific gravity and dark colour, and are essentially composed of plagioclastic (labradorite), felspar, augite, magnetite, and often olivine. They cover considerable areas in the northern part of the Island, and isolated patches occur in the eastern and southern portions.

As far as is known, the Tertiary basalts as occurring here do not differ in their normal characteristics from the familiar types, with the exception of the fayalite basalt of One-Tree Point, and the melilite basalt of the Shannon Tier.

The varieties now enumerated and described are the abnormal accompaniments of the usual types which occur in but limited quantity, or are formed under peculiar local conditions.

No. 1.—Tachylyte, Bothwell.

(Sp. Gr.: Spherulitic, equal to 2·72; non-spherulitic, equal to 2·77.)

This is the glassy form of basalt, originating from the rapid cooling of the magma by contact with a cooler substance. It is commonly in thin selvage layers, but sometimes is met with, as at the locality quoted, in comparatively large lumps. It varies in colour from rich dark brown to intensely black, and when freshly broken has a shining vitreous lustre. It is sub-conchoidal in fracture, and, though hard, it is brittle. On weathering it often generates a thin film on the exposed surface of a beautiful pale to dark ultramarine blue, which renders it an object of curiosity and interest. External nodular spheruloids are occasionally prominent on the surface, which show a pronounced radiating structure. It may vary to a structure known as variolite, and in a single example which has come

under my notice the tachylyte has, apparently, become interwoven into this spherulitic substance.

It also occurs at Fern Hill, near Deddington, and, in a lesser quantity, at Burnie.

Microscopical Characters.

This is a basalt glass, yellowish brown and structureless, containing large opaque spheroidal segregations inert on polarised light, and only capable of being examined towards their edges, which, being thinner, transmit a little light. In this part their colour is dark brown, becoming slightly purple at the periphery, which is roughly crenulated. Over their thinnest areas they may be seen under a $\frac{1}{8}$ objective to be crowded with globulites and thin rods, the latter essentially trains of globulites forming longulites, and arranged mostly radially towards the circumference. Their arrangement side by side resembles that of hairs on the coat of a furry animal. This structure ceases on approaching the crenulate border. The smaller dark brown crenuli, or segregations, in the rock are too dense to transmit light. Many of them are surrounded by an absorption area, in which the glass is bleached to a pale yellow, and incipient areas of this description are scattered everywhere, giving the field a somewhat mottled appearance. These spheroids appear to be independent of the cracks in the glass, and which pass through them undeflected, which suggests that these segregations were the latest phase in the consolidation of the rock. The glass of which the rock consists is covered with a network of fractures, and trains of globulites have occasionally collected along the cracks, which are also frequently the depositories of minute granules of magnetite. With a high power, globulites may be discerned in abundance everywhere in the glass.

No. 2.—Limburgite.

(From Burnie-Waratah Railway. Sp. gr., equal to 2·8.)

This is a dense, hard, and extremely tough rock, so much so that it became notorious during the construction of the railway connecting Burnie and Waratah, where it occurs as a narrow band at the 7-mile. It is dark, almost black, in colour, and very fine-grained in texture.

Microscopical Characters.

This is a felspar-free basalt, with augite and olivine, equal to limburgite (Rosenbusch) and magma-basalt (Boricky), and has many of the features shown by slices of Bohemian

magma-basalts, and described by Boricky in his work on the basalt rocks of Bohemia (1). Such rocks occupy a position between the basic and ultra-basic rocks, and Rosenbusch has given the name of limburgite to those with abundant olivine, with the intention of detaching them from basalts, and of emphasising their position as extreme members of the nepheline and melilite effusive series. Limburgite has been recorded from Cape Verde, Kilimanjaro, and Madagascar, besides the European occurrences. Judd and Cole (2) describe it from Lamlash (Holy Isle), Arran (2).

The constituents of the Burnie rock are olivine, augite, and magnetite, in a brown glass devitrified by the development of globulites and crystallitic rods.

Augite is in colourless crystals, porphyritically dispersed, and, as numerous small laths and prisms, vertical sections give an extinction angle up to 36°-40°.

Olivine is abundant and fresh, giving numerous characteristic hexagonal sections in the zone (010), (001). Its crystals are often corroded and scattered, and cracks introduce inclusions of the base.

Magnetite is present in fair quantity in well-formed crystals and minute grains.

The base is a brown glass with globulites, belonites, and microlitic laths of augite. Some of the rods may, perhaps, be incipient felspars. The globulites cluster more densely round the borders and in the neighbourhood of the larger crystals, forming semi-opaque aggregations. Amygdaloidal cavities are discernible, some beautifully fringed with zeolites, some with an isotropic periphery and a faintly-polarising crystallitic centre.

No. 3.—Basaltvitrophyre (Glassy Basalt).*

(From Sheffield.)

This is, microscopically, one of the most attractive rocks occurring in this State. It is usually intensely black, although rarely of a dark grey-brown colour, with a shining vitreous lustre, having commonly numerous veins and patches of milk-white to glassy zeolitic magma, which, in

(1) Petrographische Studien an den Basaltgesteinen Böhmens, 1874, pp. 53–60.

(2) On the Basalt Glass of the Western Isles of Scotland, Q.J., Geo. Soc., 1883, p. 459.

* As Pitchstone, "The Geology and Palaeontology of Queensland and New Guinea," Jack and Etheridge, 1892.

Minerals of Tasmania, 1896, page 68.

the cavities, crystallises into definite forms, and then shows clusters of chabazite, phillipsite, with beautiful patches of mesolite interspersed. It is extremely brittle, and thus easily reduced to fragments.

Microscopical Characters.

This is the glassy form of basalt, a true vitreous basic lava, with pheno-crysts of olivine sparsely scattered in a structureless glass of a pale yellow tint, occasionally deepening into gamboge. Apparently, it occurs massive, and does not form a mere tachylytic selvage. It, consequently, falls into Rosenbusch's division of basaltvitrophyres. It is a volcanic product, which is typically represented by the Kilanea lavas in the Sandwich Islands, and its structure is strikingly repeated in slides of modern lava from Hawaii. The olivine crystals are nearly as fresh-looking, and have the same inroads of the corrosive magma.

Like the same form in the Sandwich Islands, the glass is wonderfully clear, a marked contrast to the opaque nature of so many European tachylytes. It carries small colourless or yellowish globulites, some with opaque margins, but the bulk of the iron, instead of separating out into magnetite, would seem to have been used up by the olivine. There are no complete displays of perlitic structure, but it is incipient, and some of the porphyritic crystals are surrounded by a perlitic ring associated with globulites. The strain phenomena are instructive. Several olivines have tufted fissures proceeding from their borders into the surrounding glass, arranged like cilia, evidently the result of the strain of crystallisation, upon the glass. These fissures sometimes connect two fissures, and spring, too, from larger cracks, which traverse the glass in various directions. The same crystals under partly-crossed nicols show a reaction rim, which in plain light is seen to be a granulated border. Wherever the smaller fissures are numerous, they are associated with granulation, yellow translucent globulites. The crystals of olivine often enclose the glassy base in ovoid and circular forms, some of which are prolongations of the base, being connected with the outside magma by a narrow neck. I could not detect more than a crystal or two of augite and triclinic felspar. In the darker portions of the glass zeolitic cavities occur with spherulites round their margins. Elsewhere a spherulite exists with an approach to an axiolitic nature, being elliptical in form, with an elongated medium axis.

No. 4.—Hydrated Olivine Basalt.

(From Native Point, Perth.)

A rock of abnormal physical character, inasmuch as it is invariably heavy from the absorbed moisture, and soft to a degree. It is pale brown in colour, showing a variety of tints between almost yellow to a fairly-dark shade. On exposure to atmospheric action, it commonly fractures in all directions, and finally breaks up into fragments. It closely resembles the tuffaceous substance known as palagonite. It was obtained in sinking-holes in the locality mentioned.

Microscopical Characters.

This structure is that of a normal basalt. The porphyritic mineral is olivine, and augite in the form of grains and minute prisms is embedded in a plexus of narrow lath-shaped felspars. There is a glassy base, and large patches of zeolitic substance (chabazite ?) and vesicles crowded with minute spherulites. Magnetite is present in small quantity. The twinned felspars give extinction angles up to 27°, and are probably labradorite.

The most important mineral is the olivine, which exhibits interesting alteration features. The crystals have the irregular forms which intra-telluric minerals receive from the attacks of the magma at the crisis of eruption, and are invariably margined with a deep orange or brownish-red border, consisting of fine fibres perpendicular to the contour. The interior is of a citron-yellow colour, and both the interior and the border have assumed a pleochroic nature. The former is serpentinous (sometimes chloritic), and the latter, in all probability, is a hydrated ferric oxide. No fresh olivine remains in the rock. The change sometimes proceeds until the precipitate of ferric oxide colours the whole crystal, and occasionally we see it result in laminæ with the cleavage lines, pleochroisms, and red and green interference colours of biotite. This mineral is very similar to the hydrated silicate of iron, lime, magnesia, and soda called "iddingsite," but its general features indicate that it is a pseudomorph after olivine. For a discussion of this kind of replacement, see H. H. Arnold-Bemrose on the Microscopical Structure of Carboniferous Dolerites and Tuffs. Q.J., Geol. Soc., 1894, p. 617.

OUTLINES OF THE GEOLOGY OF TASMANIA.

By W. H. Twelvetrees, F.G.S., *Government Geologist.*

Tasmania, a small geological outlier of Eastern Australia, offers a highly interesting field to the geological student. It must, however, be conceded that its physical history in pre-Cambrian and early Palæozoic times can only be dimly guessed at. In later Palæozoic times, the conditions appear to have been insular; in the Mesozoic, there was evidently a connection with the great Gondwana continent, which sank beneath the Indian Ocean prior to the Tertiary period. The greater part of the island has since remained above sea-level.

The inaccessible nature of the highlands has greatly retarded geological research; still, in spite of the physical difficulties, the progress made in this direction has been considerable. In 1841-5, Count Strzelecki published some geological notes on the Island. From 1851 to 1855, Dr. J. Milligan, then Secretary of the Royal Society of Tasmania, reported on a large portion of the East and South Coasts. In 1855, Mr. A. R. C. Selwyn reported on coal seams. In 1861-7, Mr. Chas. Gould, Government Geologist, prepared numerous important reports and maps. Mr. S. H. Wintle contributed various geological notes, 1865-1882; Rev. J. C. Tenison-Woods has written several papers on Tertiary geology and palæontology; Mr. C. P. Sprent, Deputy Surveyor-General, from 1876 to 1887, wrote on the Western geology of the Island; Mr. Thos. Stephens, M.A., from 1863 to the present date, has constantly contributed to our knowledge of the geology of the State; in 1888, Mr. R. M. Johnston's monumental work, "The Geology of Tasmania," appeared under Government auspices, and for many years this author has enriched our geological literature. The late Professor G. H. F. Ulrich, in 1874-6, reported upon Mounts Bischoff and Ramsay. Our Government Geologists, Messrs. G. Thureau, Alex. Montgomery, M.A., and Mr. Jas. Harcourt Smith, B.A., have, in no mean degree, extended our

knowledge of the general geology of the Island. Mr. W. F. Petterd has contributed his "Catalogue of Minerals of Tasmania," and several papers on the eruptive rocks. Other workers, Professors David, Tate, Krause, Hogg, Feistmantel, Mr. R. Etheridge, Jun., Mr. J. Dennant, have added the results of their researches, while the names of authors of papers read before the Royal Society of Tasmania (Messrs. W. F. Ward, Alex. Morton, Danvers Power, T. B. Moore, Graham Officer, &c.) suffice to show that this Society has had an honourable share in the construction of the literature of the subject.

Mr. R. M. Johnston, the *doyen* of Tasmanian geologists, has worked out thoroughly the stratigraphy of the Tertiary, Mesozoic, and Upper Palæozoic systems, and successive Government Geologists have contributed to our knowledge of detached areas in different parts of the Island; but the lower Palæozoics still require much study before they can be properly defined. In this sketch, the main developments of each system, as far as at present known, will be briefly referred to.

Pre-Cambrian.

The massive quartzites at Port Davey are usually referred to this age, but their stratigraphical relations need working out. The mica-schists and gneiss-like rocks at the Dove River, and the hornblende zircon-gneiss of the Upper Forth, are also possible members. In the North-West, the hornblende and talc schists, with associated dolomitic limestone in the Rocky River district, enclosing deposits of pyrrhotite and copper pyrites, need investigation. These rocks are well seen at the Rocky River Mine, and at the Rio Tinto, further north, on the same strike. The hornblende schist runs through to the junction of the Nine-mile Creek with the Whyte River.

Cambrian.

The only strata which can be definitely referred to the Cambrian system are the friable yellow sandstones at Caroline Creek, between Railton and Latrobe. These have a strike (E. 60° S.) different from the prevailing direction of the Silurian strata of the Island, and contain *Dikelocephalus tasmanicus* (*R. Eth., Jun.*), *Conocephalites stephensi* (*R. Eth., Jun.*), *Asaphus sp.*, *Scolithus tasmanicus* (*R. M. Johnston*), *Leptaena*. These are the most ancient fossils yet found in our rocks. The elucidation of the relations of these strata with the adjacent schists and limestones is much needed.

Silurian.

The divisions of this system are still largely tentative. The following scheme, in which the eruptive rocks of the period are included, must be taken as provisional:—

Upper and Middle Silurian.

5. Quartz porphyries and felsites at Mounts Darwin, Jukes, Owen, Tyndal, Read, Red Hills, Black, Murchison, Farrell;
4. Gabbros, peridotites, pyroxenites, and serpentine at Dundas, Trial Harbour; Heazlewood, Forth, Anderson's Creek;
3. Brachiopod sandstone, at Middlesex, Heazlewood, Queen River; slates, sandstones, and limestones, with melaphyre lava, at Zeehan;
2. Schists, conglomerates, and limestones, at Mount Lyell; greywacké series at Dundas; slates and argillaceous schists, at Mounts Read and Black.

Lower Silurian.

1. Limestone, at Gordon River, Railton, Chudleigh, &c.; slates and sandstones, at Beaconsfield, Lefroy, Mangana, Mathinna, Scamander, &c.

The Silurian system is strongly developed in Tasmania, especially in the N.E., N.W., and W. Owing to paucity of fossils, its subdivisions are unreliable, except in a few instances, and its boundary-lines with the Cambrian rocks are still obscure. The lower division is represented on the West Coast by the Gordon River series, and on the East by the slates, in which our gold reefs occur at Lefroy, Beaconsfield, Mathinna, &c. The limestones along the Gordon River are fossiliferous, containing *Favosites*, *Orthoceratites*, *Raphistoma*, *Orthis*, *Rhynchonella*, *Euomphalus*, *Murchisonia*, &c. They reappear to the N.E. of Mount Farrell in the bed of the Mackintosh, a short distance above its junction with the Sophia River. The limestones of Chudleigh, Mole Creek, and Ilfracombe are placed provisionally in the lower division. They are non-fossiliferous, and the only way of fixing their age is to connect them stratigraphically with the Caroline Creek Cambrian beds. The slates and schists between the Heazlewood and Corinna belong to an undetermined horizon in the system, and some of them may be pre-Silurian. The slate and schist reefs which run out to sea on the N.W. Coast can only vaguely be referred to as Silurian; at Rocky Cape, they are probably lower in the geological record.

The auriferous slate series, with sandstones and conglomerates, appear at Beaconsfield, Lefroy, Waterhouse, Gladstone, Mount Victoria, Mathinna, Scamander, Fingal, &c. Fossils are extremely rare. They comprise doubtful fucoid casts, worm tracks, and, in one instance, a graptolite is recorded from the Lisle slates. The specimen was found by the late Mr. G. Thureau, and subsequently lost; but, from inquiries, it seems nearly certain that it was a Diplograptus. Unfortunately, the range of this genus is too great for use in determining the horizon of the beds. The metamorphic sandstones of the St. Helens and Scamander districts are referred doubtfully to the same horizon as the slates.

It is difficult to locate the so-called schists (slates and argillites) of Mounts Read and Black. These are charged with complex gold and silver-bearing sulphidic ores of zinc, lead, and copper. They may be low down in the system; or, on the other hand, they may be contemporaneous with the Lyell schists. The latter also cannot be placed definitely, but, from fossil brachiopods found at Gormanston, it seems possible that they belong to the Queen River series, greatly metamorphosed. The King and Queen River slates and sandstones, charged with fenestellidæ and encrinites, and casts of brachiopods (spirifera and orthis), belong to the Middle Silurian or the lower part of the Upper Silurian. Silurian sandstones at the Heazlewood, towering above the road at the 14-mile, and on the old Godkin Amalgamated, are referred by R. Etheridge, Jun., to the lower part of the Upper Silurian. They have yielded the following fossils:—*Hausmannia meridiana*, *Cromus murchisoni*, *Cornulites tasmanicus*, *Rhynchonella capax*, *Tentaculites sp. ind.* (*Favosites grandipora* in limestone). At Zeehan, the sandstones, slates, and limestones, which are traversed by argentiferous galena lodes, appear to occupy the same geological horizon, and carry the following fossils:—*Hausmannia meridiana* (in the Despatch limestone), *Asaphus sp. ind.* (in the Despatch limestone), *Illænus johnstoni sp. nov.* (in the Despatch limestone), *Cromus murchisoni* (in slate), *Rhynchonella cuneata* (in slate), *Rhynchonella borealis* (in slate), *Strophodonta sp. nov.*, *Leptodomus* (?) *nuciformis sp. nov.* (in the Despatch limestone), *Lophospira* (in quartzite), *Murchisonia* (in quartzite), *Eunema montgomerii* (in the Despatch limestone), *Tentaculites sp. nov.* (in slate), *Raphistoma* (?) *sp. nov.* (in white sandstone).

The general trend of the Zeehan beds is west of N. and east of S., and their dip is to the N.E. at angles of from 60° to 70°. It may be mentioned that a high angle of dip

characterises the Silurian strata throughout the Island. Interbedded with the sedimentary beds at Zeehan are sheets of Silurian basalt (melaphyre), known locally as "white rock." This is often tuffaceous and vesicular. In the Oonah and Montana mines, it may be seen in the form of contemporaneous sheets.

Of about the same age are slates, sandstones, and limestones in the Bell Mount district, between the Forth and Wilmot rivers. The sandstones there and at Mount Claude contain abundant casts of fucoid stems; fenestella, trilobites, and rhynchonella also occur at Bell Mount and the Five-mile Rise. Clay slates, with calymene, orthis, cardiola, in the Eldon Valley, are referred to the Upper Silurian.

Associated with the rocks of the system in the N. and W. is an extensive development of serpentine, the altered form of gabbro and its appendages, peridotite and pyroxenite. Dykes of it cross the Silurian strata on the road between Waratah and the Whyte River, and the rock underlies metamorphosed sandstones at the Heazlewood. A great variety of gabbros and pyroxenites may be seen along this road. Nickel Hill, at the Sixteen-mile, is a mass of serpentine rock, containing nickel ores, and Bald Hill, immediately to the west, is likewise serpentine as far as the Nineteen-mile, where it impinges against Silurian slates. A pyroxenite dyke in Silurian strata carries the silver-lead lode at the Magnet Mine. Gabbro, pyroxenite and serpentine occur in the Dundas district, and reappear west of the Comstock, and again at Trial Harbour. In the Valley of the Forth, and at Anderson's Creek, west of Beaconsfield, further areas of serpentine are exposed, and at the latter place the rock is often asbestiform, and is mined for asbestos. It is difficult to assign a precise age to our gabbros and serpentine. They have been thought to be pre-Silurian; but the Heazlewood intrusions suggest the close of the Silurian as a possible date.

Very important rocks are the quartz-porphyries, or felsites, which form the backbone of the West Coast Range. These are the geographical axes of Mounts Darwin, Jukes, Huxley, Tyndal, and continue northwards through Mount Murchison, and on the east side of Mount Farrell. They are the home of copper ores, and enclose characteristic deposits of hematite and magnetite. Chloritic copper-bearing schists, some of them probably schistose porphyries, flank them, and are enclosed in them. On the whole, the quartz-porphyry is massive, but it occurs also laminated. It was probably intrusive, but this can only be decided after

further investigation. Its tendency to assume laminated forms indicates that it was involved in the foliation of the Silurian rocks. Its connection with our granites has not been worked out. It is placed with some hesitation at the close of the Silurian.

A belt of felsite, a little to the west of this zone, can be traced through Mounts Read and Black, across the Pieman River, at the railway crossing. The green augite-syenitic rock at Lynchford has probably some connection with the felsites.

Devonian.

3. Dial Range and West Coast upper conglomerates.
2. Soft slates at Fingal.
1. Granite in North, East, and West Tasmania.

Our granites are considered to be of Lower Devonian age, *i.e.*, soon after the close of the Silurian. No granite intrusion into Permo-Carboniferous strata has been observed, while it is frequently intrusive into the Lower Silurian slates, and has been established as intrusive into Upper Silurian at Middlesex. Evidence has been forthcoming recently, at the Heazlewood and at Mount Agnew, showing that the consolidation of the granite was subsequent to that of the gabbroid rocks. There is an exposure of granite, generally tin-bearing, running down the eastern side of the island from Mount Cameron and Mount Stronach to the Blue Tier and Ben Lomond, St. Marys, Seymour, Bicheno, Freycinet's Peninsula, Maria Island, as far south as the Hippolyte rocks. It occurs again in the Middlesex Field, at Granite Tor, Mount Farrell, Hampshire Hills, Mount Housetop, Magnet and Meredith Ranges, Mount Heemskirk, Mount Darwin, and evidently underlies the whole of the West Coast. The quartz-porphyry dykes at Mount Bischoff, the tourmaline lodes at Mount Black, Renison Bell, and elsewhere in North Dundas, the stannite lode and spherulitic quartz reef at Zeehan denote the granitic reservoir below a large portion of the mineral fields on the West Coast. The normal granite is a dark mica one, mostly spotted with large porphyritic crystals of orthoclase felspar. In its tin-bearing varieties the magnesian mica disappears, and gives place to muscovite and lithia micas.

The Fingal slates, of a soft sandy nature, have been doubtfully retained in the Devonian, on the strength of a fossil resembling *Anodonta jukesii;* but it is uncertain whether they can be stratigraphically separated from the Silurian slates at Fingal.

The horizontal beds of conglomerate, which lie as heavy caps on the Dial Range and most of the Western Mountains, have been assigned to this system. These massive conglomerates crown Mount Farrell, Murchison, Lyell, Owen, Jukes, Roland, Claude, &c.

Permo-Carboniferous.

These rocks consist of sandstones, mudstones, grits, conglomerates, and limestones, with shales and thin coal seams. The most productive coal measures in Tasmania do not belong to this system, but are Upper Mesozoic, probably Jurassic. The Permo-Carboniferous strata have been thoroughly examined by Mr. R. M. Johnston, and his classification is adopted:—

Upper—

7. Elæolite syenites, phonolites and trachytes, at Port Cygnet.
6. Southport, sandstones and shales.
5. Mount Cygnet and Adventure Bay, sandstones and shales.
4. Upper marine mudstones overlying Mersey coal; Porter Hill shales and sandstones, Sandy Bay.
3. Lower coal measures; Mersey Basin.
2. Tasmanite shales.

Lower—

1. Lower marine mudstones, limestones, conglomerates, and grits, throughout S.E., N.E., and Midlands.

Conglomerates, grits, and micaceous sandstones and slaty flagstones, in thick beds, form the base of the system. These conglomerates, at One Tree Point, North Bruni, at Darlington, the northern point of Maria Island, below the limestone beds, contain large blocks of granite, porphyry, &c. The angular blocks on Maria Island are over a ton in weight, and on Bruni, too, they are very large. The Lower Marine series of limestones and mudstones comprises, in Southern Tasmania:—

3. Fenestella mudstones, at Porter Hill, The Grange, Cascades, &c.
2. Spirifera and strophalosia mudstones, Huon Road, &c.
1. Limestones, on Maria Island, at Bridgewater; also at Fingal, Middle Arm, &c., in the North. They contain *favosites*, *spirifera*, *productus*, *conularia*, *pachydomus*, *notomya*, *aviculopecten*, &c.

These marine beds occur all along the Derwent, from Bruni Island to New Norfolk. At Porter Hill, south of the Alexandra Battery, on the Brown's River Road, sections are exposed of the lower marine series, with its common fossils,

passing upwards into shales and sandstones of the upper division of the system, with *Gangamopteris* and *Cythere tasmanica* (Johnston).

Fossiliferous limestones and mudstones occur at Variety Bay. At Eaglehawk Neck, the sea beach exposes grits and conglomerates with rectangular joints filled with oxide of iron, forming a natural "tesselated pavement" greatly admired by visitors. The jointing is probably due to the vicinity of a concealed body of intrusive diabase. At the Middle Arm of the Tamar, near Beaconsfield, the fossiliferous limestones repose on Silurian rocks. Dally's old quarry abounds with *Eurydesma cordata.* Fossiliferous mudstones, with *spirifera, productus, terebratula, pachydomus, eurydesma,* occur on the Meander, near Cheshunt. At Mount Cygnet, the succession is—3, fenestella zone; 2, spirifera zone; 1, shaly mudstones. The spirifera sandstones occur all round Lovett and Lymington.

On the West Coast, the lowest conglomerates of the system are composed of pebbles of schist and quartzite, and rest on ancient schists in the Barn Bluff district.

The upper division of the system comprises sandstones and shales, which contain the coal of the period, and includes marine mudstones, overlying the coal in the Mersey district. In the Mersey Basin, notably, near the Great Bend of the river, near Latrobe, beds of variously-coloured clays enclose thin layers of bituminous shale, called Tasmanite, from the abundance of fossil spore cases of the lycopod *Tasmanites punctatus* (Newton), which contains over 25% of resinous matter. The exact relation of these shales to the other beds in the Mersey Basin is not settled.

The beds of the Mersey coal measures are grits, variegated sandstones, marls, and the coal plant remains are the forms characteristic of the Permo-Carboniferous, viz.:—*Glossopteris, Gangamopteris spatulata, G. obliqua, Noeggerathiopsis media.* Mr. Johnston has also recognised a *schizoneura* (rare). The coal of these measures is superior in quality to the coal in the Jurassic measures, but the seams are not of such importance. They are overlaid by marine marls and limestones, sandstones, and conglomerates, with *Fenestella plebeia, Spirifera tasmaniensis, Terebratula sacculus, Pleurotomaria morrisiana, Pachydomus, Aviculopecten, Cardiomorpha, Pterina,* &c. These are called the Upper Marine Beds in Tasmania.

The upper zones of sandstones and shales at Porter's Hill, in the South, correspond with the Upper Marine beds of the Mersey. Two hundred feet of the former are exposed along the Derwent, containing *Cythere tasmanicus* (Johnston),

Gangamopteris, Spirifera tasmaniensis, S. darwinii, S. duodecimcostata, Terebratula sacculus, Avicula, Arca, Aviculopecten, Eurydesma sacculus, Edmondia, Inoceramus, Pachydomus pusillus, Pleurotomaria morrisiana, Conularia, Theca, &c.

On the north bank of the Henty River, on the West Coast, between the Henty and Badger, the lower coal measures are hard dark grey shales, which contain *Gangamopteris spatulata* (McCoy), *G. obliqua* (McCoy), *Noeggerathiopsis media* (Ettingsh.). Above these are mudstones and impure limestones, with *Fenestella plebeia, F. internata, Protoretepora ampla, Stenopora tasmaniensis.*

In the North-East part of the Island, foraminiferal limestone of this system has been found by Mr. Thos. Stephens. At Harefield, in the Fingal Basin, a diamond-drill bore has revealed the existence of 97 feet of conglomerates, sandstone, and shales, resting on Silurian slates, at a depth of 674 feet in the bore-hole. These underlie the Upper Marine beds. Very little coal was found, but the shales contained imprints doubtfully referred to *Schizoneura* and *Gangamopteris.* The Upper Marine beds overlying these were 313 feet thick, and consisted of fossiliferous blue shale, limestones, mudstones, &c.

At Mount Cygnet, the lower coal measures rest on the fenestella beds, and are overlaid by 200 feet of grey sandstone. The coal shales contain impressions of *Vertebraria australis* and *Gangamopteris spatulata.*

At Adventure Bay, on Bruni Island, lower coal measure shales and seams lie conformably on the lower marine mudstones. conglomerates, and sandstones. They contain dwarfed forms of *Gangamopteris spatulata, G. obliqua, Glossopteris browniana, var. præcursor* (Brongt.).

At Southport, brown sandstone is overlaid by carbonaceous shales, with imprints of *Vertebraria australis.* The Adventure Bay and Southport series form the uppermost beds of the system.

The elæolitic and trachytic rocks, which are developed at Port Cygnet and Oyster Cove, are referred provisionally to the close of this period. Some of them appear to be fluidal, and interbedded with the Permo-Carboniferous mudstones and sandstones, but further examination is requisite. The majority are intrusive rocks, forming parts of a mass of elæolite-and alkali-syenite, with associated dykes of phonolitic, tinguaitic, and trachytic porphyries. The accessory minerals of the nepheline rocks, nosean, ægirine, sodalite, melanite, &c., are present here in all the wonderful variety characteristic of that group. Mounts Livingstone and

Mary, on either side of Lovett, and the beach south of the Regatta Ground, show these rocks in great variety. A good deal of free gold has been shed into the alluvial flat at Lymington. The source of the metal is believed to be the line of contact between the porphyries and the Permo-Carboniferous sediments. This belt of rock passes S. to the other side of the Huon River, and N. across to Oyster Cove.

Mesozoic.

The series of freshwater beds which succeed to the Upper Palæozoic belongs to the Mesozoic division, but cannot, as yet, be subdivided with certainty. The nearest approach to a subdivision would be as follows; but the reference to European equivalents is quite provisional:—

Cretaceous (?)—

4. Diabase (dolerite) in intrusive masses, laccolites, sills, and dykes.

Jura—

3. Upper coal measure sandstones.

Trias—

2. Sandstones and shales, with coal seams, at Ida Bay, containing *Pecopteris lunensis* (R. M. Johnston).
1. Variegated sandstones, with *Vertebraria australis* (McCoy), and remains of heterocercal fishes and amphibians.

1. The sandstones at the Government House Quarry, in the Domain, at Knocklofty, at Ross, &c., belong to the Lower Mesozoic. Mr. R. M. Johnston considers the Lower Sandy Bay mudstones, exposed three miles from Hobart, on the Brown's River Road, to be the base of the system. They contain obscure plant impressions. The variegated sandstones of Lower Sandy Bay are supposed to overlie them conformably. In the Domain, the sandstone has yielded bones of amphibians (*Labyrinthodonts* ?). From the Cascades to Knocklofty, there are about 1000 feet of these sandstones, from which the heterocercal fish, *Acrolepis hamiltoni* (Johnston and Morton), has been recorded. Messrs. Johnston and Morton give the section in ascending order, as follows:—

	Feet.
1. Yellow fissile sandstone	20
2. Flaggy sandstone, with fish remains	5
3. Mottled shales, with plants	60
4. Thick sandstone beds, quarried for building	715
	800

The sandstone near Tinderbox Bay is on the same horizon as the Knocklofty beds, and contains remains of a fish described by Messrs. Johnston and Morton, under the name of *Acrolepis tasmanicus*. This sandstone overlies conformably the uppermost beds of the Permo-Carboniferous mudstones.

This series of sandstones and shales contains the plant remains called *Vertebraria australis* (McCoy). Recently, Vertebraria has been regarded as the rhizome of glossopteris. In Tasmania, it is confined to the Lower Mesozoic, and the passage beds at Southport, which are just the strata in which glossopteris has not been found.

3. The sandstones which enclose the Mesozoic coal seams are readily recognised by their soft, felspathic nature; they are generally greenish-grey to yellowish brown, sometimes white. They are widely spread throughout East and South-East Tasmania, and occur also in the South. The maximum development observed is about 1000 feet. They are largely interrupted by intrusions of diabase, which breaks through, and, to all appearances, locally overspreads, them. Whether this overspreading is real, or only apparent, is still a matter of dispute. They flank the Central, Western, and Eastern Tiers, and fringe isolated mountain caps of diabase at Mount Nicholas, Mount Victoria, Mount Saddleback, Ben Nevis, Mount Elephant, Mount Dundas, Cradle Mountain, Ben Lomond, Tower Hill, &c.

From Fingal and Mount Nicholas they extend on the outskirts of the diabase ranges southwards to Seymour, Douglas, and Denison rivers, Llandaff, Spring Bay, and thence all over South-East and a good deal of South Tasmania, besides encircling the whole of the elevated central part of the Island with a narrow girdle. In the South-East they are cut up very much by intrusive diabase. In this brief description detailed mention of localities is impossible. Well-known occurrences are those on Ben Lomond, Schouten Island, Triabunna, Okehampton, New Town, Sandfly Rivulet, Tasman Peninsula, Upper Derwent, Campania, York Plains, Norwich, &c. The fossil flora from these beds must be regarded as characteristic for the Upper Mesozoic. The plants have been scheduled by Mr. R. M. Johnston, as follow:—

Filices—

Alethopteris Australis	(Morris)
„ serratifolia	(R. M. Johnston)
Cardiopteris Tasmanica	„
Cyclopteris? Australis (possibly a Salisburia)	„
Danaea Morrisiana	„

Gleichenia dubia	(M'Coy)
Glossopteris moribunda	(R. M. Johnston)
Macrotaeniopteris Wianamattae.....	(Feiston)
Neuropteris antipoda	(R. M. Johnston)
„ Tasmaniensis	„
Odontopteris crispata	„
Pecopteris Buftoni.....	„
„ caudata	„
„ odontopteroides	(Morris)
Rhacophyllum coriaceum	(R. M. Johnston)
Sagenopteris Tasmanica	(Feiston)
Sphenopteris Morrisiana	(M'Coy)
Sagenopteris salisburioides	—
Sphenopteris alata.....	(Brongt)
„ elongata	(Carruthers)
„ Tasmanica	(R. M. Johnston)
Strzeleckia gangamopteroides.....	„
„ tenuifolia	„
Taeniopteris morrisiana	„
„ tasmanica	„
Thinnfeldia buftoni	„
„ feistmantelii	„
„ obtusifolia	„
„ media	(T. Woods)
„ polymorpha	(R. M. Johnston)
„ superba	„
„ trilobita	„
Trichomanides ettingshauseni	„
„ spinifolium	(T. Woods)
Equisetaceae.	
Annularia australis	(Morris)
Cycadaceae.	
Podozamites distans?	(Presé)
Pterophyllum dubium.....	(R. M. Johnston)
„ risdonensis	„
„ strahani	„
Sphenozamites feistmantelii.....	„
Ptilophyllum oligoneurum	(T. Woods)
Coniferae.	
Baiera tenuifolia.....	(R. M. Johnston)
Ginkgophyllum australis.....	„
Salisburia hobartensis	„
Zeugophyllites (poa-cordaites) elongatus	„

The sandstones are extensively broken by intrusions of dia base, or dolerite, which cut up the coal measure areas into different basins. Dykes of diabase traverse the beds. This rock, called dolerite in England and diabase on the Continent, is a holocrystalline mixture of augite, labradorite, felspar, and titaniferous iron ore, or magnetite. Its effusive equivalent is basalt; gabbro forms its plutonic roots. It appears to have been a subterranean intrusion of molten

material, which never succeeded in reaching the surface, or if it did, its superficial, subaërial portion has been removed by denudation. The masses now visible, as at Mount Wellington, and crowning the Tiers, may be looked upon as huge laccolites and sills. Up to the present, no evidences of lava flow have been found in the structure of this rock. It is devoid of ore-deposits.

Tertiary.

A great stratigraphic break exists between the Mesozoic and the succeeding strata. The Tertiary system cannot be subdivided as in Europe. Mr. R. M. Johnston has proposed the two divisions, palæogene and neogene, which are here adopted. According to this arrangement, the Tertiaries will be subdivided, as follows:—

Neogene (= approximately to pliocene)—

4. Glacier moraines of the Western highlands. River terraces and estuarine deposits.

Palæogene (= Eocene to miocene)—

3. Basalt lavas.
2. Fluviatile and lacustrine clays and sands, tin-ore drifts and leads.
1. Fossiliferous marine beds at Table Cape (= Eocene).

1. The researches of J. Dennant and the late Professor Ralph Tate have shown the marine fossiliferous beds at Table Cape to be of Eocene age. These strata are covered with the basalt, which, in the Island, appears to separate the lower from the upper Tertiaries.

2. The extensive lacustrine deposits within the watershed of the Tamar and its tributaries were described long ago by Mr. Johnston, under the apt title of sediments of the Launceston Tertiary basin. They cover an area of 600 square miles, and embrace the pre-basaltic or palæogene clays and sands, which are spread all over that part of the Island, as well as the post-basaltic, or neogene, valley terraces. The thickness of these beds is from 900 to 1000 feet.

At Launceston, the ferruginous sands and clays of the Windmill Hill are palæogene. They contain fossil impressions of the plant genera, *Betula*, *Fagus*, *Quercus*, *Cinnamomum*, *Banksia*. At Dilston, Windermere, and Muddy Creek similar beds occur. At Carr Villa, the boring-core showed an impression of *Betula* at a depth of 500 feet. A bore at Belmont went down in the palæogene sandstones and

shales to 894 feet, without reaching bottom. This is equivalent to about 200 feet below sea-level. At Beaconsfield, palæogene clays rest in a gutter of palæozoic rocks, 270 feet below sea-level, and their lowest layer is rich in fossil fruits (*Spondylostrobus*, *Platycoila*, *Cordia*, &c.), and a leaf of *Cinnamomum* has been recorded. Fossil conifers are also found in this bottom clay. In the N.E., the high plateau of sand and gravel, containing alluvial tin-ore, near Derby and Branxholm, which is capped with basalt, marks the ancient course of the Ringarooma River before it was choked with lava, and diverted to its present channel. At Burnie, in a white pipeclay below the basalt, imprints of leaves of European types have been found. At Waratah, leaf-imprints have been obtained from a greyish Tertiary sandstone, beneath 45 feet of basalt, at a height of 2000 feet above sea-level. These leaves have been determined by Mr. R. M. Johnston, as follows:—*Eucalyptus kayseri n.s.*, *Laurus sprentii n.s.*, *Quercus bischoffensis n.s.*, *Ulmus tasmanicus*, *Cycadites microphylla n.s.* Leaf-beds of similar age, and containing impressions of *Cinnamomum*, also occur in the cliff at Strahan. Tertiary leaf-beds also exist in the tin-drift in Thureau's deep lead at St. Helens. The basin of the Derwent exhibits a series of Tertiary sands and clays, the latter of which, at Cornelian Bay, Sandy Bay, One Tree Point, Glenora, &c., contain the usual impressions of *Quercus*, *Fagus*, *Salix*, *Cinnamomum*, &c. The so-called travertin, at Geilston, contains *Cypris alburyana* (Johnston), conifer stumps, and leaf impressions of *Quercus*, *Fagus*, *Salix*, *Cinnamomum*. At the head of Oyster Bay, near Swansea, there are Tertiary, probably palæogene, clays, which contain a good deal of clay ironstone. Beds and seams of lignite occur at Dilston, Evandale Junction, Kelly Basin, and other places in Tertiary areas. At Kelly Basin, such beds contain fossil resin, and at Evandale Junction the beds also enclose resin globules.

3. At the close of the Palæogene, a great outpouring of basaltic lava took place, and this rock is very general throughout the Island, though rarer on the West Coast. Three types of basalt have been met with up to the present:—1, olivine basalt; 2, nepheline bearing olivine basalt; 3, melilite basalt, associated with nephelinite. The first type is the common variety of the Island. It has overspread the Campbell Town and Conara plains, and widely conceals sediments in the Launceston Tertiary basin. Its mineral constituents are uniformly felspar + augite + olivine. Its texture is doleritic on the coast N. of Lefroy, at Mount Horror, at Paddy's Peak, Hampshire. Fine

columnar structure may be seen in the quarry near the breakwater at Burnie. Dykes of this basalt traverse the granite at Lottah, and at the summit of the Blue Tier. At One Tree Point, Sandy Bay, a basalt is exposed which contains the red-iron olivine fayalite, visible under a hand-lens, as dark red spots (described by O. E. White and W. A. Macleod). Basalt-glass, or tachylyte, occurs in the basalt in several parts of the Island, *e.g.*, Waratah, Richmond, Bothwell, &c, No craters are known.

The second variety of basalt is that forming the remarkable bluffs at Circular Head and Table Cape. The late Professor Ulrich at one time determined it to be nepheline-bearing, but afterwards withdrew the reference to nepheline, believing the mineral in question to be apatite. Apatite is abundant in the rock, but recently microscopical examination has shown nepheline to be present also. The structure is doleritic; the mineral constituents are plagioclase + augite + olivine + nepheline.

The third type is melilite basalt, with typical nephelinite, or nephelinite-dolerite, at the Shannon Tier, near Bothwell. The geological horizon has not yet been determined, but the age is believed to be Tertiary.

4. *Neogene.*—The post-basaltic valley terraces can only be separated from the earlier Tertiaries by position and lithological characters. Some of the gravel drifts of the Derwent, of the Longford plain, and in the neighbourhood of Launceston, belong to this division. The lignite beds of the Henty River contain leaves of *Fagus jonesii* (Johnston) and *Acacia meiringii* (Johnston), both closely resembling existing species.

The close of the Tertiary, or the beginning of the Quarternary, witnessed a glacier epoch in the western part of the Island. The highlands round Barn Bluff, Mounts Tyndal, Sedgwick, Jukes, Darwin, &c., and the western edge of the great central plateau, abound with tarns, ice-scratched stones, and moraines. Signs of ice-action have been traced to sea-level on the West Coast, but the most abundant evidence is to be found above the 2000-feet level. No proof of glacier conditions in this period in the Eastern part of the Island has been adduced yet.

Tin-ore and gold-ore are the most important of the mineral resources of the Tertiary system. These occur in the alluvial gravels and leads of the period. The sands in the Savage River, and other tributaries of the Pieman, have been worked for osmiridium, and, at Mount Stronach, for monazite. The zircon sand, near Table Cape, was also exploited a few years ago. Tertiary clays are used largely

for brick-making and pottery; the gravels for road-making. Though there has been great volcanic activity, there are no signs of Tertiary lode-deposits.

Quarternary.

Recent—

3. River alluvium and sand dunes.
2. Raised beaches and helicidæ sandstone.

Pleistocene—

1. River drifts.

The later terrace drifts in the valleys of existing rivers are referred to the Pleistocene. Sand dunes, consolidated to shelly sandstones, occur on Cape Barren, Badger, Kangaroo, and other islands in Bass' Straits, containing shells of helix, succinea, &c. These sandstones sometimes overlie a raised beach. The raised beaches on the North Coast indicate elevation within the recent period.

The foregoing sketch does not pretend to do more than merely outline the general geology of the Island. Much information has been drawn from the labours of Mr. R. M. Johnston, here acknowledged, but many important matters still require attention. Among these are—(1) age of the schists of Mounts Lyell and Read; (2) age of the hornblende schists of the Rocky River; (3) age of the quartz-porphyry, or felsite, of Mounts Jukes and Darwin, and its relation to the granite; (4) age and nature of the Barn Bluff schists; (5) age of the gneiss and schists of the Upper Forth; (6) connection (if any) of the Lynchford augite-syenite-porphyry with the felsites on Mount Jukes and Mount Read; (7) geological occurrence of the Mesozoic diabase; (8) origin of the obsidian "buttons"; (9) connection of the nepheline basaltoid rocks at Circular Head and Table Cape with the prevailing normal basalts; (10) age of the elæolite syenites and phonolitic rocks at Port Cygnet and their boundaries; (11) origin of the lake basins in glacier areas and on the Tiers; (12) the nepheline and melilite rocks at Shannon Tier; (13) the occurrence of garnetiferous chlorite schist in granite at St. Helens, and numerous other questions fraught with interest to the geologist.

These remarks may be closed by mention of the names of resident geologists, to whom inquirers may address themselves for information:—In the South: Mr. R. M. Johnston, stratigraphy and palæontology; Mr. Thos. Stephens, M.A., Hobart, stratigraphy; Mr. O. E. White, Hobart,

eruptive rocks. In the North: Mr. W. F. Petterd, Launceston, mineralogy and petrology of the Island; Mr. Geo. A. Waller, Assistant Government Geologist, Launceston, geology and ore deposits. In the West: Mr. F. J. Ernst, Zeehan, eruptive rocks and ore deposits; Mr. T. B. Moore, Strahan, glacial geology. In the East: Mr. Henry Grant, St. Helens, granites and tin-ore deposits.

Suites of Tasmanian rocks, fossils, ores, and minerals may be seen at the Tasmanian Museum, Hobart (Mr. Alex. Morton, F.L.S., Curator); the Victoria Museum, Launceston (Mr. H. H. Scott, Curator); the Zeehan School of Mines (Mr. Reid, Director); the Government Geologist's Office, Launceston. A complete collection of Tasmanian minerals is owned by Mr. W. F. Petterd, Launceston.

THE MINERALS OF TASMANIA.

By W. F. Petterd, C.M Z.S.

To the geologist, the fascinating science of mineralogy must always be of the utmost importance, as it defines with remarkable exactitude the chemical constituents and combinations of rock masses, and, thus interpreting their optical and physical characters assumed, it plays an important part part in the elucidation of the mysteries of the earth's crust. Moreover, in addition, the minerals of a country are invariably intimately associated with its industrial progress, in addition to being an important factor in its igneous and metamorphic geology. In this dual aspect this State affords a most prolific field, perhaps unequalled in the Commonwealth, for serious consideration.

In this short article, I propose to review the subject of the mineralogy of this Island in an extremely concise manner, the object being, chiefly, to afford the members of the Australasian Association for the Advancement of Science a cursory glimpse into Nature's hidden objects of wealth, beauty, and scientific interest. It will be readily understood that the restricted space at the disposal of the writer effectually prevents full justice being done to an absorbing subject, which is of almost universal interest, viewed from the one or the other aspect. The economic result of practical mining operations, as carried on in this State, has been of a most satisfactory character, and has, without doubt, added greatly to the national wealth; but, for detailed information under this head, reference must be made to the voluminous statistical information, and the general progress, and other reports, issued by the Mines Department of the local Government. Suffice it to say, under this head, that metallic ores and metals to the gross value of about fifteen million pounds sterling have been won during the past decade.

This short article has been prepared for the collector of minerals as such, thus leaving the geological aspect of the subject to other hands, and the economic side of the question to its special State Department. It will be found that this Island is one of the most favoured hunting-grounds

for the mineral collector; its diversified topographical character, with numerous mountains and valleys, affords special facilities for the prospector and miner, while its geology offers the wide range of the crystalline quartzite and schists of the Archæan and Silurian epochs to the Tertiary and Recent formations. In addition, the Island presents an almost boundless variety of igneous rocks, ranging from the older and almost indecipherable felsites to the effusive melilite and normal basalt, with their varieties.

A prominent feature on the North-West and North-East and granite bosses, enclosing pegmatite dykes and elvan courses, which afford the minerals peculiar to these acidic rocks. The serpentine intrusions of the North and North-West add diversity to the region available to the mineralogist, while the apparently intrusive Mesozoic dolerite, which claims so large an extent of the Island, is not an altogether barren field for the ardent mineral collector. On almost every side something great or small will be found worthy of attention, and, should the excursion be extended to the northern portion of the State, the most advanced enthusiast may rest assured that ample scope will be found for hammer and bag, with every reasonable certainty of his being able to add to the cabinet specimens both rare in nature and fine in quality.

Concise Retrospect of the More Important and Interesting Minerals Known to Occur.

Among the native elements may be mentioned the beautifully-crystallised alluvial masses of gold which have been and still are occasionally obtained in the district immediately west of the mining township of Waratah. Native bismuth occurs, disseminated through a hornblende matrix, at Mount Ramsay, and, in association with fluor, wolframite, and chalcopyrite, at Mount Black, and a mass, weighing 55 lbs., was obtained near Weldborough in alluvial tin-drift. Native copper is found, as foil of extreme tenuity, in the cleavages of the killas, or slate, adjacent to the celebrated Mount Bischoff Mine, and is abundant in the form of arborescent masses about Mount Lyell; in fact, at one locality it has been worked as an ore of the metal. Native silver occurs at several of the Zeehan and Heazlewood mines, and some remarkably beautiful examples have occasionally come to light. Sulphur has been obtained in some quantity in the Mount Bischoff workings, and a limited dusting of this element has been observed on some of the galenite won at

the Montana Mine, Zeehan. Diamonds have been shown as from the Mount Donaldson district, Pieman River; but the reported find needs confirmation. Osmiridium occurs in association with gold at the Savage River and other localities north of the Pieman, and, in small particles, near the Blue Tier, Beaconsfield. This alloy has been extensively sought for recently for the iridium contents, but with only scant success as regards quantity. Native iron is known from two recorded meteorites; the first obtained at the Blue Tier, and the second, a small but veritable specimen, from the Castray River. (Proc. Royal Soc., Tas., 1901.) Tellurides are not actually known to occur, but the refining of bismuth from the Shepherd and Murphy Mine, Bell Mount, reveals the fact that tellurium occurred as a contamination. It is, therefore, reasonable to anticipate the discovery of telluride of this metal. In the sulphides the majority of those usually encountered in metalliferous localities are abundant, with several of exceptional occurrence, such as dufrenosite, huascolite, stromeyerite, zinkenite, and jamiesonite. Stannite is mined as an ore at the Oonah Mine, Zeehan, where it is occasionally found intermixed with bismuthenite, a most unusual association. Fahlerz, or tetrahedrite, is remarkably abundant, often highly argentiferous, such as that mined at the Curtin and Davis Mine, near Ringville, where it frequently assays several hundreds of ounces of silver to the ton; while specimens have been obtained at the Hercules Mine assaying as high as 3000 ounces. At the Heazlewood, a richly-nickeliferous variety of pentlandite occurs, which has been named heazlewoodite. Bornite of most beautiful colouration is commonly found in the Mount Lyell district, and stibnite only occurs in the auriferous reefs of the Lefroy district. Tennantite is said to occur at the Mount Lyell Mine, associated with cupriferous pyrite and chalcopyrite. On the North-East Dundas field, compound sulphides of unrecognised species are occasionally met with. They are homogeneous interchanges of the elements S, As, Bi, Cu, Fe, and Pb, with more or less Ag and Au. A remarkably fine example was obtained at the No. 1 Curtin and Davis Mine, in the form of an interwoven group of large prismatic crystals, longitudinally striate. This, on analysis, proved to be a sulphide of bismuth and antimony, with small proportions of iron and copper. To this I propose to apply the specific name of histrixite (porcupine ore). The metallic minerals of this portion of the State are well worthy of study. At Mounts Reid and Murchison are enormous deposits of the mixed sulphides of Fe, P, Zn, and Cu—all more or less auriferous (sometimes to a high

degree) and argentiferous. They are, apparently, the result of metasomatic replacement. The arsenides and sulph-arsenides are but sparsely represented in variety, but are occasionally abundant individually. Arsenopyrite is very characteristic of the mineral field in the vicinity of the Scamander River, and leucopyrite occurs in the Colebrook Mine, in company with axinite and pyrrhotite, and also contaminates the ores of the North-East Dundas district. At Barn Bluff, zones of the older schists occur, impregnated with pyrrhotite and cupriferous pyrite. A noticeable feature in this last-mentioned district is that, on the exposure of the freshly-taken-out mineralised rock it is quickly coated with an efflorescence of white and yellow iron sulphates. At the McKimmie Mine, near the junction of the serpentine and Silurian slates, some quantity of massive pure niccolite was obtained and exported, but it is not now accessible. The compounds of Cl, Br, and I are but sparsely represented; the superficial portions of some of the silver-lead lodes occasionally contain appreciable quantities of cerargyrite, embolite, and, still more rarely, iodyrite. A very impure Halite, occurs at the Salt Pans, east of Oatlands, and atacamite has been observed in comparatively small spangles on the outcrop of the Comet Mine. The most noticeable discovery in this group is a species recently described under the name of petterdite, and collected in the silicious outcrop of the Britannia Mine, near Zeehan. It is a chloride of lead, containing As_2O_5, and P_2O_7, with a smaller quantity of Sb_2O_5. It occurs in implante groups of quasi-hexagonal plates of somewhat large size and attractive appearance.

Of the fluorine compounds, fluorite is abundant at the Mount Bischoff Mine, where, also, prosopite—a hydrous fluorite of aluminium and calcium—also occurs as a secondary product. At the Republic Tin Mine, Ben Lomond, as well as at the Mount Black Mine, fluorite is obtained from white to a dark purple colour, sometimes in well-cut but small cubes. Its variety, chlorophane, occurs at Bischoff and Hampshire in amorphous and crystalline bunches.

In the assemblage containing the oxides of the gold, iron, and tin groups, the number is naturally somewhat extensive, and, individually, often exists in considerable quantity, such as asbolite (occasionally cobaltiferous); hematite—that at the Blythe River being of remarkable purity, and practically inexhaustible abundance—limonite, pyrolusite, &c. Among the more noticeable are the fine crystal developments of cuprite in the vicinity of Mount Lyell. Its lovely

variety, chalcotrichite, occurs in small capillary tufts of an intense crimson colour at the Colebrook Mine, near Ringville. The sapphire occasionally abounds in tin-drift in the North-East mining districts, and is sometimes of the beautiful royal blue so eagerly sought after by gem-hunters. The pleonaste, or black spinel, on the same tin-fields, is one of the many common minerals known to the miner as "Black Jack." On the Zeehan and Dundas field very fine specimens of stilphnosiderite and massicot have been met with. Cassisterite occurs in fine, well-developed, intensely black crystals—often macled—at the Lottah Mine at Blue Tier, Bell Mount, and Storey's Creek, in the Ben Lomond district. At Constables' Creek, on the North-East Coast, bunches of well-formed mahogany-coloured crystal groups have been met with, and at Mount Bischoff the impregnations of this mineral in the local topaz-porphyry are of special interest.

At the Rex Hill Mine, the tin-ore is impregnated throughout a granite rock, in which the large orthoclase crystals are pseudomorphed to cassiterite, this being the first recorded instance of such a replacement in this State, or, perhaps, outside the classical locality in Cornwall, England. Alluvial tin is found in great profusion of colouration; it varies from glassy (almost colourless), to amber, brown, and ruby, hence the local appellations of resin tin, ruby tin, and so on.

Among the oxides of the elements of the arsenic and sulphur groups, nothing worthy of special mention has been exhumed, with the exception of wolframite, bismite, and cervantite.

Chief among the elements of the carbon-silicon group is the oxide of the latter quartz. It appears here in hosts of varieties, even for so variable a mineral. Among the more common forms are rock crystal, chalcedony, cornelian, cacholong, and infusorial earth. The milk-opal, with an occasional splash of the fire and colour of the precious variety, is abundant, impregnating and seaming the Permo-Carboniferous sandstone at Bothwell, and wood opal (silica after organic matter) has been obtained in very beautiful and perfect examples, so much so that much of the material is worthy the attention of the lapidary. In the bi-silicates, which comprise the rock forming iron-magnesium minerals, are pyroxene and hornblende, with their array of conflicting variations, both as regards diversity of colour and growth. In the Heazlewood district, the rhombic form, bronzite, and its variety bastite, are obtained in characteristic development, and the monoclinic diallage, often altered to schillerspar, occurs at the same locality. Well-formed crystals of

augite of fair size may be collected in quantity near the Railway Bridge which spans the Hellyer River. At the Colebrook Mine, uralite reaches a remarkable state of development. The average specimens of hornblende, tremolite, and actinolite are found, while beryl of comparatively enormous size, but dull colouration, occurs in a pegmatite dyke about 500 yards north of the Republic Mine, Ben Lomond. It is associated with extremely fine and perfect crystals of an almost white orthoclase, the individuals of which sometimes reach several inches in length, and are occasionally twinned.

Among the unisilicates, axinite is to the front as a prominent species. It is almost solely confined to the igneous formation known as the Colebrook Mine. It is in large violet-coloured plates, freely interspersed in association with calcite, pyrrhotite, datolite, arsenical and iron pyrites. Garnet of several sub-species is occasionally met with, and a new manganese variety, which has been named Johnstontite, has been discovered in the peculiar rocks at Port Cygnet. At Hampshire Hills there is an extensive development of well-crystallised idocrase, which, practically, illustrates a contact phenomenon. The white silvery lithia variety of muscovite, which is termed zinnwaldite, is plentiful in the tin-districts on the North-East Coast. Of the whole group of felspars, as occurring in this State, orthoclase has its highest crystallographic development. In the trachytes and phonolites of Port Cygnet wonderfully-fine crystals are easily broken free of the rock, and these often show both Baveno and Carlsbad twinning; its variety, sanidine, also occurs at the same locality in almost colourless glassy crystals. A massive white scapolite has been unearthed at Beaconsfield. Saussurite is abundant in the altered gabbros of the Heazlewood district. In the alluvial tin-drifts of the North-East and at Shekelton, near Table Cape, the zircon occurs in extreme profusion. Many from the former locality are really nice gem-stones when properly cut, and are reported to be among the most lustrous in the world. In the rock-forming section of the group we can claim hauynite, nephelite, and melilite, all old-world forms only recently identified as occurring here, the last giving its prefix to a basaltic rock at Shannon Tier.

Here we must note those remarkable pellets of mystery, the only known form of acidic volcanic glass which has, so far been discovered in the Island, and which are usually termed obsidian buttons, but more recently obsidianites and australites. Whence came they, and why have they been so long neglected by our local geologists and physicists?

Although obscure in appearance and diminutive in size, they are difficult of interpretation, and offer a field of investigation worthy of any student of natural phenomena. That they are extra-terrestrial is almost beyond doubt; in any case, it is obviously apparent that they can have no connection with the known Tertiary volcanic rocks as occurring here, for these are all of basic composition. The writer is strongly of the opinion that but one shower of these objects occurred, in post-Pliocene times, which impinged upon the earth in a north-western track, crudely extending from this Island to Victoria, from thence to the northern part of West Australia, and thence to the western islands of the Malay Archipelago. It has been noticed that examples collected from many points along the track indicated have the same general characteristics as regards form, colouration, size, and composition. Moreover, they almost invariably present the same amount of surface abrasion. Recent writers have shown that there are reasonable grounds for the supposition that they are of meteoric origin, but there still exists a remarkable diversion of opinion as to their source.

In the sub-silicates we possess a few species which will repay attention, not the least interesting being the water-clear topaz, which occurs so abundantly about Mount Cameron, at Bell Mount, and at Killikrankie Bay, Flinders Island. These make veritable gem-stones of high lustre and limpid beauty, and are often used as such. Sometimes they are of unusually large size and good crystallographic development. The variety pycnite occurs at Bischoff; in patches of radiating disks. The ordinary black schorl, or, more scientifically, tourmaline, is very abundant in large masses and radiating bunches wherever the stanniferous granite prevails. A hair-brown variety has been collected near the northern flank of Mount Heemskirk, and its near ally, zeuxite, which assumes an aciculated habit, is plentiful at Mount Bischoff, its only locality in this Island. Our local petrologists know how microscopically abundant and disseminated sphene has proved to be. At the Lucy River, a tributary of the Pieman, our only known sillimanite schist occurs. In the zeolites, we have a goodly array of species, in conformity with the variety and profusion of their parents, the effusive and other igneous rocks. Analcite is often met with in the hauyne-phonolite of the Port Cygnet series. The prevailing dolerite affords scolecite, which affects a radiating structure. In the nephelinite of the Shannon Tier the white natrolite is extremely plentiful, freely bespattering the rock with bunches, and coating the

vughs. At Bell Mount, remarkably-fine double-terminated crystals of gmelinite have been obtained. The ordinary forms, such as chabazite, phacolite, and phillipsite, are to be found in more or less quantity, and in all states of preservation, where the Tertiary effusive rocks prevail. In the basaltvitrophyre, which is, apparently, common about Sheffield, numerous beautiful zeolites abound, including radiating masses of stilbite several inches in length. The margarophyllite section embraces a large number of those indefinite so-called mineral species which, as a rule, do not afford the mineralogist any serious interest. It includes the normal chlorite, and a variety poor in iron, which is termed leuchtenbergite, which has been identified in the variolite rock at the Magnet Mine, beyond Waratah. In every way, typical gilbertite is abundant at the Anchor Tin Mine. Sericite occurs as sericite-schist, and talc of a beautiful pale-green colouration and glimmering lustre has been discovered on the north flank of the Meredith Range. A thin seam of green pyrophyllite, highly auriferous, occurs at the Mount Lyell Mine, as a thin flucan between the orebody and the adjacent country-rock. Serpentine in considerable variability is prominent at the Forth, near Beaconsfield, at the Heazlewood, on the Huskisson River, and at Dundas, that from the last-mentioned locality often showing splashes and blebs of kammererite. At the Heazlewood this substance appears to merge into the ultra-basic and gabbroid rocks of the locality. In the class of anhydrous phosphates, apatite is only known in very limited quantity at the Hampshire Hills; the same may be said of mimetite and plumbogummite. Pyromorphite, in compact entanglements of the hexagonal prisms of a peculiar dark-green colour, has been found plentiful at one of the Zeehan silver-lead mines, and carminite has recently been identified from the Magnet Mine. At the Britannia Mine, Zeehan, a small quantity of campylite, showing the characteristic barrel-shaped crystals, is known to occur. Quite recently diligent search has been made for the phosphate of the cerium metals, monazite, on account of the thorium contents, which element, in the form of nitrate, is used in the manufacture of the incandescent gas mantles. It has been found to occur in the form of heavy alluvial sand, practically, wherever the granite is met with. In this form it has been obtained at the Stanley River, a tributary of the Pieman, at Mount Stronach, at the Pioneer Mine, at the South Esk Tin Mine, and at Derby; but, so far, not in sufficient quantity to render it of economic value. Of the hydrous phosphates, wavellite is, perhaps, the most abundant and

mineralogically interesting. It is found in aggregates of mining, radiating disks of silvery white, implanted on the cleavages of the Silurian slate at Back Creek. It is often accompanied by varisite, and a little of the former has been noticed at Mount Ramsay. Clustering radiating acicular bunches of pale blue symplesite occur on ferro-manganese gossan in the upper levels of the Magnet Mine, and evansite has been obtained at Zeehan under similar circumstances. At the Comet, Dundas, and other silver-lead mines, masses of bindheimite have been mined, but good examples are not now, by any means, easily obtainable. Of the tungstates, &c., a few species are known to occur occasionally, such as scheelite (Mount Ramsay), wolframite, and a small quantity of vanadinite.

The sulphates and chromates of the metals are always of interest, and welcome additions to the cabinet of the collector, as they are often beautifully crystallised and attractively coloured. The Comet Mine has become somewhat celebrated as the producer of, perhaps, the finest groups of anglesite that have been found in the Commonwealth, and the carbonates of lead (cerussite) from the same mine have an almost equal reputation. But the mineral which has rendered this State famous among collectors in all parts of the world is the inimitable crocoisite, especially that obtained some few years back at the Adelaide Mine, Dundas. Its intensely-bright hyacinth-red colour, prismatic habit, and adamantine lustre render it one of the most attractive objects in the mineral world, and it has, consequently, been most eagerly sought after by all who admire Nature's handiwork. Few collectors of any note are now without specimens of this beautiful substance, but still the demand appears to continue; from far and wide, applications are continually being made for the mineral as occurring in the Dundas Mine. It has also been obtained at a few other localities, notably, in the Heazlewood district and at the Magnet Mine.

On the East Coast, the extremely-rare phospho-chromate of lead and copper, vauquelinite, has been obtained. It assumes a curious siskin-green colour, and is almost invariably amorphous, without any indication of crystallisation. It has been thought to be practically confined to the silver-lead region of Siberia, and, therefore, its detection in this State is of more than passing interest.

The hydrous section is represented by alunogen, epsomite, melanterite, and a few others of like nature, including a peculiar group of iron-chrome sulphates from the Blue Tier,

near Beaconsfield. In the carbonates we have fine crystallised cerussite from the Mount Reid and Comet mines, and equally attractive delicate-pink rhodochrosite from the Hercules Mine. On all our silver-lead fields siderite is a common lode gangue, and, as such, it not unrarely shows finely-developed crystals, and the same applies to the dolomite of the Magnet Mine. In the hydrous class of carbonates is the local dundasite, and the bright apple-green zaratite—the latter confined to the serpentine region at the Heazlewood. It is, undoubtedly, the finest occurrence known of this comparatively rare substance. In habit it assumes a varnish-like coating on pentlandite and chromite. The carbonates of copper malachite and azurite both occur, but not nearly so highly developed as at many localities on the Mainland.

Among the hydro-carbons there are a few worthy of more than pasing interest, among which may be mentioned the tasmanite of the Mersey, the pelionite, or cannel coal, of Mount Pelion, and the asphaltum found on the eastern Bass Straits islands; but, unfortunately, not in quantity to render it of commercial importance. With the Tertiary lignite at Macquarie Harbour, masses of copalite, or a species allied thereto, are often met with. It burns with a bright, smoky flame, and gives off an aromatic odour.

In conclusion, it may be well to remark that the total number of distinct species known to mineralogical science may be estimated at between two and three thousand, and of this number a few years' investigation has resulted in the discovery and recording of not less than 300 in Tasmania; so it may be conceded that within the restricted confines of this Island we have an unusually prolific harvest of these compounds and native elements. In all reasonable probability, this is a larger number than has been recorded for any equal area on the surface of the globe, an area, moreover, which is, apparently, far from exhausted. It may be of interest to state that about forty species occurring here have not, so far as known, been discovered on the mainland of Australia, while at least five are not known elsewhere. Several of the more prominent for beauty and scientific interest, such as crocoisite, vauquelinite, zaratite, datolite, and axinite, were, until recent years, supposed to be confined to classic localities, but in our little Island are comparatively abundant and attainable.

THE MAGNETIC SURVEY OF TASMANIA.

By Professor E. G. Hogg, M.A.

[*Read before the Royal Society of Tasmania*, 13 *August*, 1900.]

Section I. The History of Magnetic Observation in Tasmania.
Section II. Magnetic work in Victoria and New Zealand.
Section III. The work of the proposed Survey.

I. *The History of Magnetic Observation in Tasmania.*

The earliest record of a magnetic determination in Tasmania I owe to the kindness of Mr. T. Stephens, M.A., one of the Vice-Presidents of this Society. From his communication to me it appears that when Sir John Franklin founded the village of Lachlan in 1839 the magnetic declination at Lachlan was 10° 10′ E.

In the first volume of the *Tasmanian Journal* is a copy of the communication addressed by Sir James Ross on the 7th April, 1841, to the British Admiralty, in which he sets forth, among other matters, his discovery of the position of the southern magnetic pole. In latitude 76° 14′ S. and longitude 164° E. he found the magnetic dip to be 88·40°, and the declination 109·24° E.; from which he deduces that he was then only 160 miles from the magnetic pole. The impetus given to magnetic research by his discovery was, probably, the determining cause which led to the subsequent selection of Hobart as the spot on which were afterwards carried out the first systematic magnetic records ever made in Australasia.

From its southerly latitude, its situation relative to the great land-mass of Australia, and its position almost in antipodes to Great Britain, Tasmania is eminently fitted as a station for magnetic observations, and, recognising this, the Royal Society of London, in the early forties, fitted out a complete survey party, with the latest form of instruments, to investigate, under the superintendence of Lieut. Kay, R.N., the magnetic elements of Tasmania, and to determine the rate of variation of these elements. The instruments were set up in the Domain, not far from Government House, and observations were taken covering the period from 1842 to 1850. The results obtained in Hobart were subjected to the closest examination by Sir Edward Sabine, and from them, taken in conjunction

with observations made at a later date in other colonial observatories, some important generalisations were obtained by Sabine with regard to the magnetic problem in the southern hemisphere.

It is a matter of regret that neither in the library of this Society, nor in the public and parliamentary libraries of Hobart, is to be found the official publication of either the magnetic observations made by Lieut. Kay and his colleagues in Hobart, or of Sabine's report thereon. In this context it may not be out of place to state that in the Hobart Observatory is a large accumulation—perhaps 60 or 70 volumes—of the actual records of observation made by the members of the Royal Society's expedition. The scientific enthusiasm of the Government Astronomer, Mr. Kingsmill, has rescued them from the decay into which they were likely to speedily depart if left in the condition in which he found them when he took possession of the observatory; and, though they now rest in the decent obscurity of a shelf in the observatory cellar, this scarcely seems to be a suitable place of interment, and I trust that this Society, as the leading scientific body in Tasmania, may see its way to secure these records, which are, so to speak, scientific heirlooms of the greatest interest.

I will now lay before the Society a brief *résumé* of the results obtained by Lieut. Kay and his party during their prolonged stay in Hobart. In 1843 the mean declination of Hobart was 9° 53′ 19″ E., and between this date and 1848 it increased to 10° 0′ 37″, giving a total increase of 7′ 18″, or an annual increase of about 1′ 27″. During the period covered by Lieut. Kay's observations the dip fell from 70° 42′ 18″ in 1842, to 70° 32′ in 1845: it then began to increase, and in 1848 it had attained the value of 70° 35′ 42″. The happy accident that, during Lieut. Kay's stay in Hobart, the dip passed through a minimum value, is a matter for much congratulation. It is also of great interest to find that, during the period under consideration, the mean value of the horizontal intensity also passed through a minimum value. This minimum value was reached, not in 1845, when the dip was at a minimum, but three years later—in 1848. An admirable account of the instruments used by Lieut. Kay in his magnetic work in

Hobart is given by him in Vol. I. (1842) of the *Tasmanian Journal.*

A long gap is now met with in the magnetic history of Tasmania. No absolute determination of the magnetic elements was again made until the visit of Dr. Neumayer to Hobart, in 1863. This observer determined the mean declination of Hobart in 1863 as 10° 25′ 9″ E. If the mean rate of increase inferred by Lieut. Kay from his observations had held true over the period between 1843 and 1863 the declination should have been 10° 22′ 53″. The difference between the observed and computed values of the declination for 1863 may (in part) be accounted for by the fact that the stations selected by Lieut. Kay and Dr. Neumayer were not identical, though both were situate in the Domain. I shall, later on, have occasion to refer to the part played in magnetic work in Tasmania by the volcanic rock—known as Tasmanian greenstone—which occurs so widely in the S.E. of the Colony, and, in particular, outcrops so much in the Domain. Accepting Dr. Neumayer's result as correct, the increase of declination of Hobart between 1843 and 1863 amounts to 31′ 50″, giving a mean annual increase of 1′ 36″, as against 1′ 27″ computed from Lieut. Kay's observations. The declination in 1881, when the next determination was made, should have been 10° 53′ 48″; assuming the previous rate of increase to have been maintained, but the observations made by His Excellency Sir J. H. Lefroy at the station employed by Kay discovered the declination to be only 8° 49′ 2″ E., a quantity somewhat more than 2° in defect of the computed value. Although the instrument employed by Sir J. Lefroy—a prismatic compass—is not the most delicate instrument for determining the magnetic declination, the difference between the observed and computed values of the declination in 1881 cannot be put down entirely to errors of observation. The explanation is not far to seek: between the dates mentioned the declination must have attained a maximum, and was, in 1881, proceeding to a minimum. In the neighbouring Colony of Victoria we know that in the 15 years preceding 1881 the declination decreased at the rate of about 2′ per annum, and from what we know of the secular variations elsewhere, it is permissible to assume

that a state of affairs obtained in Tasmania similar to that in Victoria. If the same weight be attached to Sir J. Lefroy's determination as to that of Dr. Neumayer, we should have that, during the period under discussion, the annual average rate of change of declination was no less than 5′—assuming that the maximum declination was reached in 1863—the most suitable hypothesis for reducing the change of declination to a minimum. Seeing that the annual rate of change in Victoria between 1866 and 1881 only amounted to 2′, it is difficult to accept for Tasmania an annual average rate of change so large as 5′. The explanation may lie in the rough method of determination employed by Sir J. Lefroy; at all events, it is a matter of some importance that this difficulty should be cleared up.

If any magnetic measurements were made by the American expedition to Hobart to observe the transit of Venus in 1874, I have been unable to find them. The same remark applies to the observations made by the Austrian scientific expedition which visited Hobart between two and three years ago. As, however, the observations of the lastmentioned party were made at the Observatory, where the highly magnetic greenstone outcrops, their results are quite valueless for the purposes of comparison with those of Kay and Neumayer.

The results of the observations taken by Lieutenant Colbeck and Mr. Bernacchi of the Southern Cross, during the recent stay of that vessel in Hobart, have not yet reached me.

This brief summary of the history of magnetic research in Tasmania shows that during the visit of the Royal Society of London's expedition both the dip and the horizontal intensity passed through minimum values, and leads us to infer that after Dr. Neumayer's visit the declination passed through a maximum value, but when this occurred we do not know, and what is the present annual rate of change of the declination we do not know.

II.—*Magnetic work in Victoria and New Zealand.*

Absolute magnetic measurements were first begun in Victoria, in 1858, by Dr. Neumayer. Between that date and February, 1863, he carried out, without interruption, hourly readings of the magnetic elements, these differen-

tial observations being kept under control by frequent determinations of the absolute values of the magnetic elements, eight such absolute determinations being made, on the average, each year. During the same period Dr. Neumayer made a complete magnetic survey of Victoria, the magnetic elements being measured at no less than 235 stations. After the departure of Dr. Neumayer from Australia, absolute measurements of the elements were made from time to time by Mr. Ellery, F.R.S., then Government Astronomer, with Neumayer's instruments, until 1865. In the following year a new set of instruments was provided for the magnetic observatory, and since that time the absolute values of the magnetic elements have been determined about ten times each year. This work is now being carried on by Mr. Baracchi, F.R.A.S., Government Astronomer, to whom I am indebted for this brief sketch of the history of magnetic observations in Victoria.

Some few years ago the question of the magnetic survey of New Zealand was brought before the Government of that country, who decided to devote the sum of £500 a year to the purpose. The work was entrusted to Mr. Coleridge Farr, B.Sc, and a complete set of instruments was borrowed for him from the Kew Magnetic Observatory At the meeting of the Australian Science Association held at Melbourne last January, a report was made to the Association by Mr. Farr, on the subject of the survey, from which it appears that up to that date he had succeeded in making absolute determinations of the magnetic elements at 69 stations.

III.—*The work of the proposed Survey.*

The investigation of magnetic phenomena may be carried on in two ways—either in the magnetic observatory, or by survey work in the field. The date seems far distant when Tasmania will possess a magnetic observatory, though, perhaps, when the value of Tasmania as a meteorological station is more fully appreciated, it may be possible to secure a magnetic observatory, to be worked in conjunction with a properly equipped meteorological observatory. The magnetic survey of a country stands on a somewhat different footing: though its work is of the highest scientific value, it is not without its

utilitarian aspect, as it may contribute information of great importance to the sciences of navigation and surveying.

I will now proceed to lay before this Society a brief account of the work proposed to be done by Professor M'Aulay and myself in connection with the magnetic survey of Tasmania, which it is our intention to begin during the coming summer.

The instruments to be employed are the bifilar magnetometer and declinometer of the latest Kew pattern; they have been lent to us by the University of Sydney, through the kind offices of Professor Pollock of that University.

Having regard to the short time—8 or 10 weeks—during which the instruments will be at our disposal, we consider that the most valuable results will be obtained by limiting our observations, for this summer at least, to about 10 well-selected stations. By this means we hope to be able to get a fairly complete grip of the general magnetic distribution in Tasmania, and expect that the information disclosed by this summer's work will be of the greatest value when we come to select stations of observation at any future time. The stations we propose to select are :—Hobart, Port Esperance, Port Davey, Strahan, Mt. Lyell, Wynyard, Longford, Scottsdale, St. Helens, Spring Bay. If time permit, Oatlands will also be made a station of observation. It will be seen that the places selected are fairly spaced through the Island of Tasmania; if the magnetic elements are determined at these points, it will be easy to compute them approximately for any other station.

Our selection of the stations enumerated has been largely guided by geological considerations, owing to the prevalence in Tasmania of magnetic rocks. At a meeting of this Society held as far back as the 2nd April, 1845, attention was drawn by Mr. R. C. Gunn to the magnetic properties of the greenstone taken from the summit of Brady's Look-Out, and most surveyors of experience in Tasmania can testify to abnormal deviations of their compasses arising from masses of greenstone and basalt close at hand. An interesting illustration of this is to be found in the University grounds, where the declination varies from 7° E. to 11° E.,

according to the spot at which the instruments are set up. It may be added, that highly magnetic greenstone occurs on the summit of Mount Wellington. Our sites of observation have obviously been chosen so as to avoid, as far as possible, proximity to volcanic masses known or suspected to be magnetic.

At each of the selected stations we propose to determine, in absolute measure, the declination, dip, and horizontal magnetic intensity. These quantities being known for ten places, well distributed over the Island, we shall be in a position to construct a rough magnetic map of the country, on which the iso-magnetic lines will be shown. This map, as a first approximation, will not allow for the abnormal magnetic phenomena introduced by the greenstone and basalt: the determination of the local abnormalities so introduced must be left to some future time. The variation of the magnetic elements is of not less scientific interest than the determination of the absolute values of the elements themselves, at any given date. To ascertain the variation, it will be necessary to redetermine, after an interval of a few years, the magnetic elements at the stations previously employed; and to properly effect this, it is necessary that the sites of observation should be suitably marked, so that future observers may have no difficulty in picking them up. The erection of permanent marks, such as are employed in all important geodetic operations, appears, to Professor M'Aulay and myself, to be so important that we have laid before the present Government of the Colony an application for a grant of £150, to defray the cost of their erection and other incidental expenses incurred in the survey. In the event of this grant of the public moneys being made, we propose that the work of the survey should be carried out in co-operation with the Surveyor-General's Department. We are assured of the cordial assistance of the Surveyor-General in all matters connected with the survey.

At the selected stations of observation we propose to mark out the true geographical meridian, and, when the stations are suitable, to determine the bearings relative to the site of observation, of any prominent landmarks in view. The information so acquired may be of value in supplementing that already acquired for the purpose

of constructing the map of Tasmania. A full description of the exact locality of each site of observation will be lodged with the Surveyor-General, together with a detailed account of the method employed to lay out the meridian.

It is scarcely necessary for me to detain the members of this Society by pointing out the importance, to all concerned with navigation, of an accurate knowledge of the magnetic declination, and of its rate of variation. So many of our selected stations are on the shore-line of Tasmania, that we hope to be able to make some considerable additions to the information already acquired on these points.

With the exception of the large properties of the Van Diemen's Land Company, whose boundaries were laid down by astronomical methods, it may be said that surveying in Tasmania has been, in the past, practically based on magnetic methods. The element of uncertainty introduced into surveys by the variation of the declination may not obtrude itself in any field work for some time, but directly any attempt is made to collate the county maps with the trigonometical survey, there is reason to fear that grave discrepancies will show themselves. Surveying according to astronomical methods is in many parts of Tasmania very tedious and difficult, owing to the climate, and a more complete knowledge of the declination than is now possessed would be useful and convenient to surveyors, especially in the case of isolated surveys, and groups of surveys being made in new districts.

It is to be hoped that before long the trigonometrical survey of Tasmania will be proceeded with, so that a new map of the Island may be compiled; and it is probable that much information of value towards this end may be collected during the magnetic survey.

There are long gaps in the magnetic history of Tasmania, but when an accurate knowledge of the variation of the magnetic elements has been again attained, it may be possible, by analysing the magnetic records of Melbourne and Sydney, to reconstruct the past magnetic history of Tasmania, and form an approximately correct idea of the magnetic changes which have taken place since Lieutenant Kay first set up his instruments, in Hobart some sixty years ago.

BOTANY.

By L. Rodway.

The first thing that strikes the student of botany when he observes the more conspicuous vegetable growth of Tasmania is what would naturally be expected, namely, the close relationship between the flora of this and nearest extensive tract of land, the south-eastern portion of Australia. Another feature of interest is the vast number of European aliens which have established themselves, and, in the more settled centres, threaten to exterminate the native growth, at least of the herbaceous plants. We may estimate that, in Tasmania, with a fairly inclusive definition of the word species, a collector may amass about 1100 flowering plants and ferns which may be considered native, or established Out of this collection no less than 110 have been introduced from Europe, about 3 from America, 2 from Africa, and 4 or 5 from the neighbouring States in Australia and New Zealand. A phenomenon of great interest to students of distribution is that, out of our small flora, no less than 68 indigenous forms are common also to England. Of endemic species, we have the respectable total of 142. By far the greater number of the balance, 770, are confined to south-eastern Australia; about 20 per cent. spread to Queensland, New Zealand, and the eastern borders of Western Australia, while a few species extend even to South America and Japan.

Of the special features of the landscape here, as in Australia, it is dominated by the sombre Myrtaceæ; but in number of species of this order, Tasmania is poor. Of Eucalypts we have but about 13 species, against 250 for Australia, and of the whole order 29, against about 750, though it should be noted that of this large number Western Australia alone claims nearly 500 endemic species. One other order of plants gives a marked feature to the country in parts, the *Casuarineæ*, or native oaks. Their equisetum-like foliage gives them the aspect of a survival from an

earlier age. The order is small, and, except *C. equisetifolia*, which spreads from Polynesia to Asia and Africa, is confined to Australia.

That ancient and keenly-interesting order *Proteaceæ* is very poorly represented in Tasmania. We possess but 24 species, and out of these 11 are endemic. Of the large genus *Grevillea*, of which Australia can boast some 173 forms, Tasmania can only lay claim to one, *G. australis*, and, in *Hakea*, to 7 out of 115; *Conospermum*, 1 out of 36; *Personia*, 2 of 70; *Banksia*, 2 of 50. Many large genera are quite unrepresented. On the other hand, of the ancient genus *Orites*, whose ancestors may be still traced in the Cretaceus period, Tasmania absorbs as her exclusive possession 4 out of the 6 existing in the present day. Also, the monotypic genera, *Bellendena*, *Agastachys*, and *Cenarrhenes*, are endemic. The *Leguminosæ* and *Compositæ* here, as elsewhere, form a preponderance of wild flora. Among the former, the Acacias constitute a graceful and beautiful portion of the shrubland so novel to the European visitor, and none of them possess this grace and beauty more than our endemic prickly mimosa, the drooping *A. riceana*. There is nothing about the *Compositæ* that calls for exceptional notice, except the feature common to the Southern Hemisphere, the numerous forms of everlastings. The asters are fairly numerous, but are mostly shrubs (*Olearias*). The wild daisies (*Brachycomes*) are mostly blue or mauve, and the Senecios occasionally are arborescent. *Abrotanella forsterioides*, which occurs only on mountain-tops, forms dense pulvinate masses, and has a superficial resemblance to moss. *Pterygopappus lawrencii* has a somewhat similar habit. *Donatia novæ-zelandiæ*, among the *Stylideæ*, and *Dracophyllum minimum* amongst the *Epacrideæ*, have also the same peculiar appearance. An order of exceptional interest in Tasmanian botany is the *Epacrideæ*. Of the 290 Australian forms, West Australia claims about 145 as endemic; of the remainder, 60 appear in Tasmania, of which 30 are recorded as endemic. The genus *Epacris*, with nominally 11 species, is ill-defined, and requires revision. The beautiful climbing *Epacris*, *Prionotes cerinthoides*, with its long crimson bells, is of more than passing interest in that its partially-bilocular anthers connect this order with the more northern *Ericaceæ*. The genus *Richea*, with simple leaves with linear venation and broad sheathing bases, is, except one species, *R. gunnii*, found sparely in the highlands in Victoria, exclusively Tasmanian. It, with the allied genera, *Dracophyllum*, *Andersonia*, and *Sprengelia*, form a decidedly primitive type of foliage for so highly-organised

shrubs. *R. pandanifolia* and *D. milligani*, when well developed, grow erect and unbranched, with a head of long sword-like leaves, often many feet in length, recalling the aspect of a cordyline or a palm rather than a dicotyledon. The *Rhamneæ*, *Rutaceæ*, and *Rubiaceæ* are all fairly represented, and with a large proportion of endemic types. *Caprifoliaceæ*, on the other hand, is represented by but one common Australian species, *Sambucus gaudichaudiana*. *Rosaceæ* again, as in Australia, is but poorly represented; still, we have two interesting endemics, a *Geum*, *G. renifolium*, with reniform leaves and large strawberry-like flowers. Unfortunately, it occurs only towards the summit of Adamson's Peak and La Perouse. It appears, however, not very difficult to acclimatise to a low altitude. The other is a Raspberry, *Rubus gunnianus*. It is small, with a creeping habit, and bears, when well developed, a scarlet fruit nearly an inch in diameter, consisting of drupels each nearly ½-in. The flavour is poor, and though most common towards mountain-tops, it seems to resist all efforts of cultivation. The large order, *Stylideæ*, though almost confined to Australia, is hardly to be found in Tasmania. Only one species, *S. graminifolium*, the familiar trigger-plant, with its irritable column and tall raceuse of crimson-rose flowers, is ordinarily met with. The *Cupuliferæ*, which supply the broad-leaved trees to the forests of the Northern Hemisphere, are here replaced by the *Myrtaceæ*. But, in Tasmania, we still have two Fagus of this order. *F. cunninghami*, a noble tree, with wood of an excellent quality, is abundant in rich forest land throughout the Island, and *F. gunnii*, a small Alpine tree, that occurs only at a high elevation in the West and South-West. This latter has the singular distinction of being the only deciduous indigenous species in Australia. In *Hydrocharidaceæ*, *Vallisneria spiralis*, as here found, is more robust than the European type, and the peduncles create annoyance by refusing to retract in the orthodox coil. *Elodea canadensis* has also come here from Europe, America, or somewhere. As in England, so here, only the ladies of the species have arrived, but this seems to be not at all disconcerting, and its propagation in watercourses is often more generous than entertaining. The orchids are fairly numerous; about 70 kinds, mostly of the Australian genera, *Pterostylis*, *Caladenia*, *Thelymitra*, *Diuris*, and *Prasophyllum*. Probably none are endemic; only one, *Sarcochilus parviflorus*, epiphytic. Two, *Gastrodia sesamoides* and *Dipodium punctatum*, are, doubtless, parasitic on roots of higher plants, but the connection has never been traced. Amongst the *Iridaceæ*,

Hewardia tasmanica is of unusual interest, in so far that the pistil is only partially immersed in the floral tube; this feature is responsible for this plant usually being placed amongst the lilies. The flower is rather nice, deep chocolate, purple, or pale yellow, and about 2 inches across, but it does not care to depart from its native habitat, the highlands of the West and South-West.

Among the *Burmanniaceæ* there is one interesting little beast, a *Thismia*, that is sparely found in gullies of Southern Tasmania. It has no immediate relative nearer than Borneo or Java. Its presence is a decided puzzle. Such an ephemeral saphrophyte could hardly have been transmitted over long distances by bird-assistance, besides its immediate relatives are not only far off, but not identical. The lilies do not call for special attention in such a restricted space. The pond-weeds, duck weeds, and other fresh-water plants, as might be expected, are, as elsewhere, of the commonly-distributed types of the Old World, but the *Restiaceæ* and *Centrolepideæ*, so common in Tasmania, belong to a type of plants decidedly Southern Hemispheric, and probably the remains of a former type. The perianth is still there, but primitive and uncertain; the leaves are reduced and sheath-like, and the whole type gives one the idea of an early effort thrust aside by the more robust development of the sedges.

The sedges, or *Cyperaceæ*, an order of keen interest, must be passed for want of space, except to allude to the paucity of species of *Cyperus*, two only occurring here, *C. lucidus* and *gunnii*. *Fimbristylis* is entirely absent, but *Lepidosperma* makes its presence recognised by some nine or ten species.

Of the grasses, Tasmania is very poorly off for indigeneous species, 45 forms, and of these, only 2, *Microlæna tasmanica* and *Deyeuxia gunniana*, are endemic; but we make up for it, on the other hand, by the numbers of aliens, chiefly European, that are steadily dispersing themselves far and wide. *Anthoxanthum odoratum* and *Holcus lanatus*, above all others, are making themselves very much at home. It is surprising that, with so easily-transmitted species as grasses, only six forms, *Imperata arundinacea*, *Aira cæspitosa*, *Trisitum subspicatum*, *Glyceria fluitans*, *Festuca duriuscula*, and *Phragmites communis*, should be common alike to Europe and Tasmania.

The conifers of Tasmania are of great interest to the botanist. We have no true pines or firs. We have one genus, *Arthrotaxis*, belonging to the *Taxodium* section of *Pinoideæ*; it contains three species, all

confined to Tasmania. Unfortunately, it lives only at a considerable elevation, and objects to cultivation. *Callitris,* of which we have two species, *C. rhomboidea,* distributed also to South and East temperate Australia, and *C. oblonga,* confined to Northern Tasmania, together with the curious little shrub, with minute crowded 4-rowed leaves, *Fitzroya archeri,* belong to the Cypress section. The remainder are all yews. *Dacrydium franklinii,* a noble tree of the West and South-West, that yields the valuable Huon pine, has minute overlapping leaves, and as minute few-flowered cones. It is an excessively slow grower, and inhabits only low-lying swamps; wherefore, its age of usefulness is limited. *Phyllocladus rhomboidalis,* the only Tasmanian representative of the New Zealand genus, is a useful timber-tree, but is seldom found of much size. The leaf-like *Cladodia* are somewhat the shape of the leaf segments of *Apium graveolens,* whence the tree is locally known as celery-topped pine. *Podocarpus alpina* is small and procumbent, with yew-shaped leaves and red fleshy peduncles to the solitary seeds; *Microcachrys tetragona* is procumbent, leaves minute four-rowed, and the cone many-seeded, the bracts crimson and fleshy, the cone having the appearance of a small crimson mulberry $\frac{1}{2}$ in. long; *Pherosphæra hookeriana* is very similar to *Dacrydium franklinii,* only dwarf, and the cones have many scales of cartilaginous consistency. These three are Alpine and endemic. In ferns, though we cannot approach New Zealand, Tasmania is fairly well off. We have about 70 species; most of them are confined to New Zealand and Australia. None are endemic. *Hypolepis tenuifolia* and *Polypodium punctatum* run absolutely into one another in our bush; also do *Asplenium bulbiferum, laxum, hookerianum,* and *flaccidum,* and some forms approximate very nearly *A. obtusatum.* Of tree-ferns, we have *Dicksonia antarctica, Alsophila australis,* and *Cyathea cunninghami,* and *Todea barbata* sometimes assumes that form. *Pteris aquilina, Asplenium trichomanes, Gymnogramme rutæfolia, G. leptophylla, Aspidium aculeatum, Cystopteris fragilis, Hymenophyllum tunbridgense,* and *H. wilsoni,* occur also in Europe.

Space will not permit even a cursory glance at the lower cryptogams; nor would such a glance be of any value, if it did.

NOTE ON THE BIRDS OF TASMANIA.

By Colonel W. V. Legge, F.L.S., &c.

(President of the Australian Ornithological Union.)

Compared with tropical countries, or other regions of similar area, the Island of Tasmania cannot be said to be rich in bird life. There are two apparent causes for our limited *avifauna*. First, the comparative paucity of fruit-bearing flora and insect-life; secondly, our island being the terminal point of the Australian "region," and separated from it by a strait, does not come in for its share of distribution of species, nor its proportion of northern migrants, which do not wander further than the southern parts of the continent. If, therefore, we confine ourselves to land-birds proper, and eliminate the numerous species of Petrel recorded as inhabiting our seas, the Penguins, the Gulls, and Terns (*Gaviæ*), the geese and ducks (*Anseres*), the Plovers and snipe-like birds (*Limicolæ*), and, finally, the Herons (*Ardeidæ*), there remains but a small list, even if we include the Rails, Coots, Cormorants, and Grebes. To the casual observer, however, who may wander through the open, settled country in the South, Midlands, Western, and Coast districts (not including the West), our feathered friends would seem to be fairly numerous; for it is in territory of this sort that the majority of our species are to be found. It suits the habits, and provides food, for the parakeets, the various honey-eaters, small fly-catching birds (among which the showy chat-robins are conspicuous), tree-tits, *Acanthiza*, the diamond birds (*Dicæidæ*), and various other small Passerine birds, frequenting open country in preference to forest. On the other hand, in the dense and lofty forests, birds are few and far between, except in small tracts of land bordering creeks and rivers in the gullies, which are clothed with luxuriant scrub, and where insect life is more abundant. Again, if we penetrate the dense mountain forests of myrtle (*Fagus cunninghami*), in the West of the island, we find the almost impenetrable scrub and tangled undergrowth

absolutely unfavourable to bird life, and miles of this true and most formidable "jungle" may be struggled through without a single species being met with. Very little, indeed, is known as yet concerning the *avifauna* of the densely-clothed mountains of the western half of the country, where the dark and humid forests which fill the gullies and cover the sides of the ranges are suited to the habits of such birds only as the scrub-wren (*Sericornis humilis*), migratory fly-catchers (*Myiagra*), one or two of the thick-heads (*Pachycephala*), also the forest-loving honey-eater (*Melithreptus*), and, finally, the black crowshrikes, or magpies, whose far-reaching notes always betray their presence. In addition to these denizens of the trackless Western forests, we find the bold and lofty mountain-tops, which stand out of the wilderness in lonely grandeur, furnishing a home for certain raptorial species, such as the White and the Australian goshawks, the Black-cheeked Falcon, and the Hobby (*Falco Lunlatus*), while around the borders of the solitary tarns and lakes, which sparkle on their plateau summits, the ubiquitous Pipit (*Anthus australis*) is usually found, with, near at hand, one or two wandering honey-eaters, if the Alpine flora happens to be in flower.

In the Midlands, already referred to in connection with the Passerine birds above-mentioned, we have the stronghold of the few species of plover found in Tasmania, accompanied in summer by the migratory Golden Plover, which visits us from Northern Asia; and, round the large lagoons and -salt-pans characteristic of the district, the Double-banded Dottrel, and some rare species of waders are occasionally met with. Higher up on the open stock-runs, with alternating plains and scattered timber-tracts, the marsh Harrier (*Circus assimilis*), the Brown Hawk (both also common in the lowlands), and many of the commoner low-country species are usually seen; and here, too, that grand but predatory bird, the Wedge-tailed Eagle, the *bête-noir* of the pastoralist, is sure to be seen, either perched on some lofty tree or soaring at immense heights above the landscape.

In 1845, a carefully-compiled list of Tasmanian birds was submitted by the Rev. J. T. Ewing, at a meeting of the Royal Society, and published in its Proceedings for that year. Mr. Ewing was a keen observer of birds and their habits, and was a contemporary of Gould's while this great naturalist was in Australia. His list was exclusively compiled from Gould's work, supplemented by a few species observed by himself. A Tit found by Gould in Tasmania was named after Ewing (*Acanthiza ewingi*), but it has since been

considered identical with the well-known "Brown-tail" (*A. diemenensis*). It is not, however, certain that this is correct, as further research may lead to the rediscovery of Ewing's Tit. Subsequent to the publication of Ewing's list others have been printed, and used for reference, but up till late years scarcely any additions were made to the 169 birds enumerated in the first-named.

In 1886, a "Systematic List" was drawn up by myself, the various orders, families, and sub-families into which our birds are divided being classified on the same system as that adopted in my "Birds of Ceylon." This list has now been revised, and included in this "Note." The now universally-received nomenclature of the "British Museum Catalogue" has been used, and the vernacular names adopted in the Australasian Association List of 1898 given to our birds. It is to be hoped that, in future, naturalists and collectors will adhere to the names in question, which are the result of much thought and care on the part of the compilers.

If we compare the number of the members of the various families and orders given in the list with those inhabiting the continent, we see at a glance how far the Australian *avifauna* is represented in our Island:—Birds of prey are fairly numerous, the proportion of species in Tasmania being 12 to 27 in Australia, not inclusive, however, of the owls, which are only 3 to 14; fly-catchers (*Muscicapidæ*) number 8 species out of 67, which is a poor representation, one, the Fantail, being peculiar to the Island. Honey-eaters (*Meliphagidæ*) are also indifferently represented, our quota being 10 out of 82. In the parrot "order," Tasmania has 12 species out of 59. Passing to shore birds (plovers, dotterels, curlews, &c.), we find 23 in Tasmania out of a total of 46 recorded for Australia, which is a better representation than that of any order but petrels, of which we have 27 species out of 38 as yet noted from Australasian seas, this being accounted for by the fact that these birds are wanderers over all the Southern Ocean.

In some instances, for simplification, genera adopted in the British Museum Catalogue have not been made use of in the following List:—

SYSTEMATIC LIST OF TASMANIAN BIRDS.

Order ACCIPITRES.

Suborder **Falcones.**

Family FALCONIDÆ—(11 species).

Subfam. ACCIPITRINÆ.	Circus Gouldi, *Bonap.*	Allied Harrier (Swamp-hawk).
	Circus assimilis, *Jard & Selby.*	Jardines Harrier.
	Astur Novæ Hollandiæ, *Gmelin.*	White Goshawk.
	Astur approximans, *Vigors & Horsf.*	Australian Goshawk.
	Accipiter cirrhocephalus, *Vieillot.*	Sparrow-hawk.
Subfam. AQUILINÆ.	Uroætus audax, *Latham.*	Wedge-tailed Eagle.
	Haliætus leucogaster, *Gmelin.*	Grey-backed Sea Eagle
Subfam. FALCONINÆ.	Falco melanogenys. *Gould.*	Black-cheeked Falcon.
	Falco lunulatus, *Latham.*	Australian Hobby.
	Hieracidea Orientalis. *Schlegel.*	Brown Hawk.
	Cerchneis cenchroides, *Vig. & Horsf.*	Australian Kestrel.

Suborder **Pandiones.**

Pandion leucocephalus, *Gould.* Australian Osprey.

Suborder **Striges.**

Family BUBONIDÆ—(2 species).

Subfam. BUBONINÆ.	Ninox boobook, *Latham.*	Brown Hawk-owl.
	Ninox maculata, *Vig. & Horsf.*	Spotted Hawk-owl.

Family STRIGIDÆ—(1 species.)

Strix castanops, *Gould.* Tasmanian Barn-owl.

Order **PICARIÆ.**

Family CUCULIDÆ—(6 species).

Subfam. Cuculinæ.	Cuculus pallidus, *Latham.*	Pallid Cuckoo.
	Cuculus flabelliformis, *Latham.*	Fantailed Cuckoo.
	Chalcococcyx plagosus, *Lath.*	Bronze Cuckoo.
	Chalcococcyx basalis, *Horsfield.*	Narrow-billed Bronze Cuckoo.
	Chalcococcyx lucidus, *Gmelin.*	Broad-billed Bronze Cuckoo.
Subfam. Phænicophainæ.	[a] Scythrops Novæ Hollandiæ, *Lath.*	Channel-bill Cuckoo.

Family ALCEDINIDÆ—(2 species).

Subfam. Halcyoninæ.	Halcyon sanctus, *Vig. & Horsf.*	Sacred Kingfisher.
Subfam. Alcedininæ.	Alcyone azurea, *Latham.*	Blue Kingfisher.

Family CYPSELIDÆ—(1 species).

Chætura caudacuta, *Lath.*	Spine-tailed Swift.

Family CAPRIMULGIDÆ—(2 species).

Subfam. Steatorninæ.	Podargus Strigoides, *Latham.*	Frogmouth (Morepork).
Subfam. Caprimulginæ.	Ægotheles Novæ Hollandiæ, *Lath.*	Little Night Jar.

Order **PASSERES.**

Section A. **Thrush-like Passeres.**

(10 *primaries*, 1*st small.*)

Family CORVIDÆ—(4 species).

Subfam. Corvinæ.	Corvus coronoides, *Vig. & Horsf.*	Australian Raven.
	Corone Australis, *Gould.*	White-eyed Crow.
	Strepera fuliginosa, *Gould.*	Black Magpie.
	Strepera arguta, *Gould.*	Hill Magpie.

Family DICRURIDÆ.—(1 species).

Chibia bracteata, *Gould.*	Drongo.

Family CAMPOPHAGIDÆ—(2 species).

Graucalus parvirostris, *Gould.*	Summer Bird.
*Lalage tricolor, *Swainson.*	White-shouldered Caterpiller-eater.

[a] Accidental.

Family PRIONOPIDÆ. (2 species).

	Collyriocincla rectirostris, *Jard & Selby.*	Whistling Shrike-Thrush.
	[a] Grallina picata, *Strick.*	Magpie Lark.

Family LANIIDÆ— (5 species).

Subfam. Gymnorhininæ.	Gymnorhina hyperleuca, *Gould*	Magpie.
	Cracticus cinereus, *Gould.*	Butcher-bird (Jack-ass).
Subfam. Pachycephalinæ.	Pachycephala olivacea, *Vig & Horsf.*	Olive Thickhead.
	Pachycephala gutturalis, *Lath.*	White-throated Thick-head.
	Pachycephala glaucura, *Gould.*	Grey-tailed Thick-head.

Family—MUSCICAPIDÆ—(8 species).

Subfam. Muscicapinæ.	Rhipidura Diemenensis, *Sharpe.*	Fantail.
	Myiagra rubecula, *Lath.*	Leaden Flycatcher.
	Myiagra nitida, *Gould.*	Satin Flycatcher.
Subfam. Saxicolinæ.	Petræca Leggii, *Sharpe.*	Scarlet-breasted Robin.
	Petræca Phœnicea, *Gould.*	Flame-brested Robin.
	Petræca Rhodinogaster, *Drapiez*	Pink-brested Robin.
	Petræca vittata, *Quoy et Gaimard.*	Dusky Robin.
	Malurus Gouldi, *Sharpe.*	Long-tailed Warbler (Blue Wren).

Family TURDIDÆ—(3 species).

Subfam. Turdinæ.	Geocichla macrorhyncha, *Gould.*	Ground Thrush.
Subfam. Sylviinæ.	Acrocephalus Australis. *Gould.*	Reed Warbler.
Subfam. Ephthianurinæ.	Ephthianura albifrons, *Jard & Selby.*	White-fronted Chat.

Family TIMELIIDÆ—(8 species).

Subfam. Craterpodinæ.	Cinclosoma punctatum, *Lath.*	The Ground Bird (Ground Dove).
Subfam. Timaliinæ.	Calamanthus fuliginosus. *Vig & Horsf.*	Striated Field Wren
Subfam. Brachpyterinæ.	Megalurus gramineus, *Gould.*	Grass Bird.
	Stipiturus malachurus, *Shaw.*	Emu Wren.

[a] Accidental.

Subfam. Acanthizinæ.	Sericornis humilis, *Gould.*	Brown Scrub Wren.
	Acanthornis magna, *Gould.*	White-breasted Scrub Wren.
	Acanthiza Diemenensis, *Gould.*	Brown-rumped Tit (Brown Tail).
	Acanthiza chrysorrhœa, *Q. & G.*	Yellow-rumped Tit (Yellow Tail).

Family MELIPHAGIDÆ—(10 species).

Subfam. Meliphaginæ.	Acanthorhynchus tenuirostris, *Lath.*	Spine Bill.
	Melithreptus validirostris, *Gould*	Strong-billed Honey-eater.
	Melithreptus melanocephalus, *Gould.*	Black-headed Honey-eater.
	Glycyphila fulvifrons, *Lewin*	Tawny-crowned Honey-eater.
	Ptilotis flavigularis, *Gould.*	Yellow-throated Honey-eater.
	Meliornis Novæ Hollandiæ, *Lath.*	White-bearded Honey-eater.
	Meliornis Australasiana, *Shaw.*	Crescent Honey-eater.
	Manorhina garrula, *Lath.*	Garrulous Honey-eater (Miner).
	Acanthochæra inauris, *Gould.*	Wattle-bird.
	Acanthochæra mellivora, *Lath.*	Brush Wattle-bird.

Section B.

Swallow-like Passeres.

(9 Primaries.)

Family ZOSTEROPIDÆ—(1 species).

	Zosterops cærulescens, *Lath.*	White-eye.

Family DICÆIDÆ—(3 species).

	Pardalotus punctatus, *Shaw and Nodder.*	Diamond Bird.
	Pardalotus affinis, *Gould.*	Yellow-tipped Diamond Bird.
	Pardalotus quadragintus, *Gould.*	Forty-spotted Diamond Bird.

Family HIRUNDINIDÆ—(2 species).

Subfam. Hirundininæ.	Hirundo neoxena, *Gould.*	Australian Swallow.
	Petrochelidon nigricans, *Vieill.*	Tree Martin.

Family FRINGILLIDÆ.

Subfam. Fringillinæ.	Zonæginthus bellus, *Lath.*	Fire-tailed Finch.

Family MOTACILLIDÆ—(1 species).

	Anthus Australis, *Vig & Horsf.*	Pipit.

Section B.

Starling-like Passeres.

(10 Primaries, 1st Rudimentary).

Family ARTAMIDÆ—(1 species).

	Artamus sordidus, *Lath.*	Wood Swallow.

Order PSITTACI.

Family CACATUIDÆ—(3 species).

Subfam. Cacatuinæ.	Cacatua galerita, *Latham.*	White Cockatoo.
	Calyptorynchus xanthonotus, *Gould.*	Black Cockatoo.
	Callocephalon galeatum, *Latham.*	Gang-gang Cockatoo.

Family PSITTACIDÆ—(6 species).

Subfam. Platycercinæ.	Platycercus flaviventris, *Temminck.*	Green Parrakeet.
	Platycercus eximius, *Shaw.*	Rosehill Parrakeet.
	Neophema venusta, *Temminck.*	Blue-banded Grass Parrakeet.
	Neophema chrysogastra, *Latham.*	Orange-bellied Grass Parrakeet.
	Nanodes discolor, *Shaw.*	Swift Parrakeet.
	Pezoporus formosus, *Latham.*	Ground Parrakeet.

Family TRICHOGLOSSIDÆ—(3 species).

Subfam. Trichoglossinæ.	Trichoglossus, Novæ Hollandiæ, *Gmelin.*	Blue-bellied Lorikeet.
	Glossopsittacus concinnus, *Shaw.*	Musk Lorikeet.
	Glossopsittacus pusillus, *Shaw.*	Little Lorikeet.

Order COLUMBÆ.

Family GOURIDÆ—(2 species).

Phaps chalcoptera, *Latham.*	Bronze-wing.
Phaps elegans, *Temminck.*	Brush Bronze-wing.

Family TRERONIDÆ—(2 species).

[a] Lamprotreron superbus, *Temm.*	Superb Fruit Pigeon.
[a] Lopholaimus antarcticus, *Shaw.*	Topknot Pigeon.

Order GALLINÆ.

Family TETRAONIDÆ—(2 species).

Coturnix pectoralis, *Gould.*	Stubble Quail.
Synöicus Diemenensis, *Gould.*	Great Brown or Swamp Quail.
Synöicus Australis, *Latham.*	Brown Quail.

[a] Accidental.

Family TURNICIDÆ- ·(1 species).

Turnix varius, *Latham.*	Painted Quail.

Order **FULICARIÆ.**

Family RALLIDÆ--(8 species).

Porphyrio melanotus, *Temm.*	Blue Coot.
Tribonyx Morticri, *Sclater.*	Native Hen.
Fulica Australis, *Gould.*	Coot.
Hypotœnidia phillipinensis, *Cuvier.*	Pectoral Rail.
Hypotænidia brachypus, *Swainson*	Short-toed Rail.
Porzana fluminea, *Gould.*	Spotted Crake.
Porzana palustris, *Gould.*	Little Crake.
Porzana tabuensis, *Gmelin.*	Red-backed Crake.

Order **LIMICOLÆ.**

Family ŒDICNEMIDÆ--(1 species).

Burhinus grallarius, *Latham.*	Stone Plover.

Family CHARADRIIDÆ—(22 species).

Sub-Fam. HÆMATOPODINÆ.	Hæmatopus longirostris, *Vieill.*	White-breasted Oyster Catcher.
	Hæmatopus unicolor, *Wagler.*	Sooty Oyster Catcher.
Subfam. LOBIVANNELLINÆ.	Lobivanellus lobatus, *Latham.*	Wattled Plover (Spurwing.)
Subfam. CHARADRIINÆ.	Squatarola Helvetica, *Linn.*	Grey Plover.
	Charadrius fulvus, *Gmelin.*	Golden Plover.
	Ægialitis bicincta, *Jard. & Selby.*	Double-banded Sand Plover.
	Ægialitis monacha, *Geoffroy.*	Hooded Sand Plover.
	Ægialitis ruficapilla, *Temm.*	Red-capped Sand Plover.
	Zonifer tricolor *Vieillot.*	Black-breasted. Plover.
Subfam. SCOLOPACINÆ.	Gallinago Australis, *Latham.*	Australian Snipe.
	Limosa uropygialis, *Gould.*	Barred-rumped Godwit.
	Glottis nebularius, *Gunnerus.*	Green-shank.
	Tringoides hypoleucos.	Common Sand-piper.
	Tringa subarquata, *Guldenot.*	Curlew Stint.
	Tringa accuminata, *Horst.*	Marsh Stint.
	Tringa ruficollis, *Pallas.*	Red-breasted Stint.
	Strepsilas interpres, *Linn.*	Turnstone.
	Numenius cyanopus, *Vieillott.*	Australian Curlew.
	Numenius phæopus, *Linn.*	The Whimbrel.

Subfam HIMANTOPODINÆ.	Himantopus leucocephalus, *Gould.*	White-headed Stilt.
	Cladorhynchus pectoralis, *Dubus.*	Banded Stilt.
	Recurvirostra rubricollis, *Temm.*	Red-necked Avocet.

Order GAVIÆ.

Family LARIDE—(8 species).

Subfam. STERNINÆ.	Sterna (Hydroprogne) caspia, *Pallas.*	Caspian Tern.
	Sterna poliocerca, *Gould.*	Bass's Straits Tern.
	Sterna frontalis, *Gray.*	Black-billed Tern.
	Sterna nereis, *Gould.*	White-faced Ternlet
Subfam. LARINÆ.	Larus (Gabianus) pacificus, *Latham.*	Pacific Gull.
	Larus Novæ Hollandiæ, *Stephens.*	Little Gull.
Subfam. STERCORARIINÆ.	Megalestris Antarctica, *Lesson.*	Antarctic Skua.
	Stercorarius crepidatus, *Banks.*	Richardson's Skua.

Order TUBINARES.

Family DIOMEDEIDÆ—(6 species).

Diomedea exulans, *Linn.*	Wandering Albatross.
Thalassogeron cautus, *Gould.*	White-capped Albatross.
Thalassogeron culminatus, *Gould.*	Flat-billed Albatross.
Diomedea melanophrys, *Temm.*	Black-browed Albatross.
Thalassogeron chlororhynchus, *Lath.*	Green-billed Albatross.
Phœbetria fuliginosa, *Gmelin.*	Sooty Albatross.

Family PUFFINIDÆ*– (16 species).

Subfam. FULMARINE.	Ossifraga gigantea, *Gmelin.*	Giant Petrel.
	Daption capensis, *Linn.*	Cape Petrel.
	Halobœna cœrulea, *Gmelin.*	Blue Petrel.
	Prion desolatus (turtur), *Banks.*	Dove Prion.
	Prion ariel, *Gould.*	Fairy Prion.
	Prion Banksi, *Smith.*	Banks' Prion.
	Prion vittatus *Illiger.*	Broad-billed Prion.
Subfam. PUFFININE.	Majaqueus equinoctialis, *Linn.*	Spectacled Petrel.
	†Priofinus cinereus, *Gmelin.*	Grey Petrel.
	Pterodroma macroptera, *Smith.*	Long-winged Petrel
	Pterodroma atlantica. *Gould.*	Atlantic Petrel.
	Pterodroma Solandri, *Gould.*	Solander's Petrel.
	Œstrelata Lessoni, *Garn.*	White-headed Petrel.
	Œstrelata leucoptera, *Gould.*	White-winged Petrel.
	Puffinus tenuirostris, *Brandt.*	Short-tailed Petrel (Mutton Bird).
	Priocella glacialoides, *Smith.*	Silver-grey Petrel.

* I have not included Forster's Petrel. I am not aware of it having been procured in Tasmanian seas.

† Grey Petrel more suitable than "Brown."—("Vernacular List.")

Family PROCELLARIIDÆ—(6 species).

Subfam. OCEANITINÆ.	Garrodia nereis, *Gould.*	Grey-backed Storm Petrel.
	Cymodroma melanogastra, *Gould.*	Black-bellied Storm Petrel.
	Cymodroma grallaria, *Vieill.*	White-bellied Storm Petrel.
	Pelagodroma marina, *Lath.*	White-faced Storm Petrel.
	Oceanites oceanicus, *Kuhl.*	Yellow-footed Storm Petrel.
	Halodroma urinatrix, *Lath.*	Diving Petrel.

Order **STEGANOPODES.**

Family PELECANIDÆ—(1 species).

Pelecanus conspicillatus, *Temm.*	Pelican.

Family PHALACROCORACIDÆ—(4 species.)

Phalacrocorax (novœhollandiæ) carbo, *Lina.*	Common Cormorant.
Phalacrocorax lecuogaster, *Gould.*	White-breasted Cormorant.
Phalacrocorax melanoleucos, *Vieill.*	Little Cormorant.
Phalacrocorax strictocephalus.	Little Black Cormorant.

Family SULIDÆ—(1 species).

Sula serrator, *Banks.*	Australian Gannet.

Order **ANSERES.**

Family ANATIDÆ—(14 species).

Subfam. CYGNINÆ.	Cygnus atratus, *Lath.*	Black Swan.
Subfam. ANSERINÆ.	Anseranas semipalmata, *Lath.*	Pied Goose.
	Cereopsis Novæ Hollandiæ, *Lath.*	Cape Barren Goose.
	Chenonetta jubata, *Lath.*	Maned Goose.
	Dendrocycna Eytoni, *Gould.*	Eyton's Tree Duck.
	Tadorna tadornoides, *Jard. & Selby.*	Ruddy Sheldrake.
Subfam. ANATINÆ.	Stictonetta nevosa, *Gould.*	Freckled Duck.
	Anas superciliosa, *Gmelin.*	Wild Duck
	Anas castanea, *Eyton.*	Chestnut-breasted Duck
	Spatula rhynchotis, *Lath.*	Australian Shoveller.
	Malacorhynchus membranaceus, *Swains.*	Membranaceus Duck.
	Erismatura Australis.	Blue-billed Duck.

Subfam. FULIGULINÆ.	Nyroca Australis, *Gould.*	White-eyed Duck.
Subfam. ERISMATURINÆ.	Biziura lobata, *Shaw.*	Musk Duck.

Order **HERODIONES.**

Family ARDEIDÆ—(6 species).

Notophoyx Pacifica, *Lath.*	Pacific Heron.
Notophoyx Novæ Hollandæ, *Lath.*	White-fronted Heron.
Demiegretta sacra, *Gmelin.*	The Reef Heron.
Herodias Timoriensis, *Lesson.*	White Egret.
Nycticorax Caledonicus, *Lath.*	Night Heron.
Botaurus poicilopterus, *Wagler.*	Bittern.

Order **PYGOPODES.**

Family PODICIPIDÆ—(3 species).

Podiceps Cristatus, *Gould.*	Tippet Grebe.
Podiceps Nestor, *Gould.*	Hoary-headed Grebe.
Podiceps Novæ Hollandiæ.	Little Grebe.

Order **IMPENNES.**

Family SPHENISCIDÆ—(3 species).

Catarractes chrysocome, *Lath.*	Crested Penguin
Eudyptula minor, *Forster.*	Little Penguin.
Eudyptula undina, *Gould.*	Fairy Penguin.

THE RECENT MOLLUSCA OF TASMANIA.

By MARY LODDER.

TASMANIA may be considered fairly rich in recent molluscan species, as she possesses nearly 700 marine forms, with about 100 terrestrial and fresh-water kinds besides. Very many of the species in all branches are extremely small, requiring much careful search in order to obtain them, and microscopical examination to reveal their characteristics, their beauties of form, sculpture, and colouring. But such work is well repaid by the results, whilst, doubtless, there are still various species to be discovered in the less well-known parts of the island, for many of the recognised forms are very local in their habitats, and, in numerous cases, their minuteness renders them so difficult to find that even an experienced collector may overlook them. On the other hand, some of the marine species afford a strong contrast by the great size to which they attain, the most remarkable being *Voluta mamilla* (Gray), which is a foot long when full grown, and broad in proportion; but adult specimens are rarely found in good preservation. The young examples are much prettier as regards colour and markings, having brown bands and dashes on a creamy-yellow ground externally, while the interior is of a rich yellow, and highly enamelled; the large mamillary nucleus (which was thought to be a deformity in the first specimen discovered) is always a striking characteristic, giving a curious appearance to the very young shells. This species is chiefly found on the North Coast, where *V. fusiformis* (Swainson) and *V. undulata* (Lamarck), with the rarer *V. papillosa* (Swainson) are also to be had.

Megalatractus maximus (Tryon) is another fine shell, also somewhat scarce in perfect condition. The finest specimen I have seen was in the collection of the late Mr. C. E. Beddome, who dredged it in the Derwent; it measured $7\frac{1}{2}$ inches in length, and $2\frac{3}{4}$ inches in breadth. *Triton spengleri* (Chemnitz) attains a length of 5 inches, its solid structure and thick varices making it a weighty shell. *Cypræa umbilicata* (Sowerby) is another remarkable shell found on

the North Coast, but not very plentifully nowadays, its size and elongated form distinguishing it from any other recent *Cyprœa* found in Tasmania, whilst it resembles the fossil *C. eximia* (Sowerby), which occurs at Table Cape and elsewhere in this Island; but *C. umbilicata* is much larger.

The well-known "Mutton-shells"—one would be hardly complimentary to the goddess in calling the large representatives of the *Haliotidæ* "Venus' Ears," the name that some of the smaller species bear in Europe—may also be numbered among the giant molluscs of our shores. *Haliotis albicans* (Q. and G.), with *H. naevosa* (Martyn), probably afforded many a good feed for the aborigines in days gone by. Some white folks profess a liking for this "marine mutton," but opinions differ as to the desirability of adding such an item to the usual bill of fare. Scallops, mussels, and "Warreners" are more favoured, while many other species would probably be found very good if one had but the courage to try them. Oysters, which, apparently, were plentiful in the days of the aborigines, are sadly scarce now. A former resident of Stanley, Circular Head, told me of an enormous number having once been washed up on the beaches in that neighbourhood, when he was a boy.

Fasciolaria coronata (Lamarck), *Siphonalia dilatata* (Q. and G.), *Ranella argus* (Gmelin), *Purpura textiliosa* (Lamarck), *Conus anemone* (Lamarck), *Scutus anatinus* (Donovan), *Murex triformis* (Reeve), *Nerita punctata* (Q. and G.), *Cassis achatina var. pyrum* (Lamarck), *C. semigranosa* (Wood), *Columbella semiconvexa* (Lamarck), *Cyprœa angustata* (Gmelin), *Trivia australis* (Gray), *Marginella muscaria* (Lamarck), *Turritella tasmanica* (Reeve), *Phasianella australis* (Gmelin), *P. ventricosa* (Q. and G.), *Turbo undulata* (Martyn), *Cantharidus badius* (Wood), *Cantharidus fasciatus* (Menke), *Calliostoma meyeri* (Menke), *Clanculus undatus* (Lamarck), *C. limbatus* (Q. and G.), *Patella limbata* (Philippi), *Acmœa crucis* (Tenison-Woods), *A. alba* (Ibid), *Subemarginula rugosa* (Q. and G.), *Macroschisma weldii* (Tenison-Woods), *Megatebennus trapezinus* (Sowerby), *Mitra glabra* (Swainson), and many other species of these, and other genera of *Gasteropoda*, are to be found more or less in profusion.

Of *Polyplacophora*, *Chitons*, we have several species, the prettily-marked *Ischnochiton crispus* (Reeve) and *Chiton pellisserpentis* (Q. and G.) being abundant. The handsomest representative of the order is the scarce *Callochiton lobatus* (Carpenter), with its smooth shell and broad mantle of dark reddish-brown contrasting well with the rich orange colour of the animal.

Of the naked, or shell-less, mollusca, there are a few that have been described, and many yet to be identified. *Allportia expansa* (Tenison-Woods) is a curious and interesting form that is rather plentiful among the rocky pools at low water. Of the *Doris* family, there are surely many, and of *Onchidium* at least one, species to be found in similar situations.

Of the class *Scaphoda*, two species of *Dentalium* and one of *Cadulus* are recorded, whilst no *Pteropoda* are as yet listed for Tasmania, I believe. Of *Cephalopoda*, we have some ten known species, the internal shells, or, more familiarly known, "Cuttle-bones," of the *Sepiæ*, being plentiful on the beaches; while the shell of the curious little *Spirula peronii* (Lamarck) is not uncommon at times on the East Coast. The beautiful "Paper Nautilus," *Argonauta nodosa* (Solander), is occasionally found on the mainland of Tasmania, but is more plentiful on the islands in Bass Straits, where it is said to come in shoals about every five or seven years, though it is difficult to obtain the larger specimens, as the gulls break them so often in their eagerness to devour the animal.

The largest of the *Pelecypoda* is *Pinna tasmanica* (Tenison-Woods), which is found a foot long, and sometimes covered with barnacles (*Serpulæ*) and fair-sized oysters. The young specimens are very pretty, of a pale greenish or horny tint, semi-transparent, with curiously raised fluted scales at the broader end. *Venus lamellata* is a beautiful shell when its pink frills are perfect. *Cochlodesma angasi* (Crosse and Fischer) is sometimes plentiful, and of a large size, on the sandy beaches, but the gulls are fond of these too. *Anatina creccina* (Valenciennes) is also to be found in the North; *Mactra rufescens* (Lamarck) is often so abundant at Port Sorell that it becomes a weariness to the collector; *Venus gallinula* (Lamarck), *V. roborata* (Hanley), *Tapes fabagella* (Deshayes), *Gari zonalis* (Lamarck), *Tellina albinella* (Ibid), *Dosinia cærulea* (Reeve), *D. grata* (Deshayes), *Cytherea rutila* (Sowerby), *C. diemensis* (Hanley), *Crassatella kingicola* (Lamarck), *Cardium tenuicostatum* (Ibid), *Barbatia carpenteri* (Dunker), *Axinœa striatularis* (Lamarck), *Mytilus ater* (Frauenfeld), *Modiola australis* (Gray), *Vulsella ovata* (Lamarck), with five species of *Pecten*, are among the most attractive of the bivalves usually to be found on the Tasmanian beaches. *Trigonia margaritacea* (Lamarck) is somewhat local, Bruni Island being a good place for it. The rare *Choristodon rubiginosum* (Adams and Angas) occurs in the East and South. Several species of *Myodora* are also found, and *Panopœa australis* (Sowerby)

is at times found alive on the East Coast, while *Spondylus tenellus* (Reeve) occurs on the North Coast, but seldom as a perfect shell.

Of *Brachiopoda*, the best known is the so-called "Roman Lamp," *Waldheimia flavescens* (Lamarck), which is washed up amongst seaweed on the Northern beaches, and is also found alive in rock-pools in favourable situations, where the tiny *Megerlina lamarckiana* (Davidson) is also found clinging in numbers to the under-sides of the stones. *Terebratella rubicunda* (Solander) has been introduced into the Derwent amongst oysters from New Zealand.

Among the terrestrial, or pulmonate, *Gasteropoda*, *Bulimus dufresnii* (Leach) is one of the most widely-distributed, varying greatly in size and texture, according to the locality. *B. tasmanicus* (Pfeiffer) is our sole arboreal species, being found on wattles and boobyallas on the East Coast only. *Helix launcestonensis* (Reeve), from the Scottsdale district, is the finest representative of the genus in Tasmania; *H. stephensi* (Cox) being another good one. The European *H. aspersa* (Muller) and *Zonites cellarius* (Muller) are plentiful in some of the gardens in Hobart and Launceston. There are two *Vitrinas*, of which *V. verreauxi* (Pfeiffer) is the most widely distributed throughout the Island. One tiny species of *Pupa*, *P. lincolnensis* (Angas), found also in Australia, has been discovered, near Swansea, by Mr. R. M. Johnston. The small grey slug, *Limax legrandi* (Tate), is abundant in the North, and there are some very large spotted slugs, notably, *Cystopelta petterdi* (Tate), with various smaller kinds in different parts of the Island. Of fresh-water mollusca, there are several minute forms that are of interest, especially the curious little *Gundlachia*, of which two species are recorded for Tasmania; the genus is only found in Trinidad and Cuba besides. There are some forms of *Amnicola* and *Hydrobia*, one of which, *Potamopyrgus*, is common with New Zealand only. *Ancylus irvinæ* (Petterd), from the Great Lake, is an unusually large form, while *Physa eburnea* (Sowerby), from lagoons near Ross, is a fine shell. *Unio legrandi* (Petterd) and *U. depressus* (Lamarck) inhabit only the rivers that empty themselves eventually into the Tamar.

Most of the land shells are peculiar to Tasmania, whilst many of the marine species are common to Australia, especially the Southern and Eastern shores of the continent; and some have a world-wide distribution, whilst a few appear to be found now in a semi-fossil state only, such as *Potamides ebeninum* (Bruguière), *Ranella epitrema* (Tenison-Woods),

and *Arca trapezia* (Deshayes). The rare *Astele subcarinata* (Swainson) was first described from Tasmanian specimens, and on one occasion, at least, in recent years it has been washed up in abundance at Marion Bay. The beautiful *Modiola arborescens* (Chemnitz) was thrown up plentifully on the Port Sorell beaches, North Coast, a few winters ago, not having been seen there before, though occasionally it had been dredged in D'Entrecasteaux Channel. The type specimens came from the West Indies; the species extends to China also. *Ianthina communis* (Lamarck) and *I. exigua* (Ibid), the violet floating sea-snails, are sometimes washed on to Tasmanian shores.

ADDITIONS TO TASMANIAN FLORA.

By. L. Rodway.

Before the year closes I am anxious to place on record a brief description of three interesting plants. Of these two are new species, the other doubtless introduced.

Ranunculus setaceus. ns — A small glabrous, tufted perennial with numerous, fairly stout, long, fibrous roots. Leaves numerous setaceous, but slightly flattened, simple or with one pair of filiform simple lobes towards the apex, 1—3 in. long, apices sometimes tipped with glands, base rather broad sheathing. Flower solitary on a slender peduncle, always shorter than the leaves, sometimes very short. Flower rather small, yellow, sepals broadly ovate, erect, pointed, 1½ lines long. Petals scarcely exceeding the sepals, usually 5—6, very narrow, oblong, blunt, gland about the middle. Stamens very variable in number in proportion to robustness of habit. Achenes not numerous, somewhat flattened, smooth, style slightly curved ; ripe achenes more swollen with a sharply recurved style ; receptacle short, conical, beset with bristles. Not at all or sparsely stoloniferous.

In mud and under water in and about pools on the Ironstone Range, alt. 3,000ft.

The plant flowers freely under water, and does not when permanently submerged depart in any manner from the sub-aerial form.

I have described this plant as a new species only after mature consideration. Its relationship to *R. rivularis*, Banks. *et* Sol., is undoubted, but if it is taken as an extreme variety of that species where are we to draw the line? This plant is very close to *R. millani*, F. V. M. and *R. robertsoni*, B., and if these are included with *R. rivularis* we shall also have to take in many New Zealand and S. American plants. Even with this extensive clubbing the species would be still ill-defined, and the mass of varieties would be unworkable.

Pseudanthus tasmanicus. ns—A prostrate, wiry, much-branched spreading undershrub, 1—2 ft. long. Dicœcious. Young parts tuberculato-hispid. Leaves alternate, broadly ovate to orbicular, sometimes with a small blunt point, other times slightly emarginate, 1—2 lines long on a slender petiole of similar length. Stipules scarious, sheathing blunt, often abruptly truncate ½—1 line long. Male flowers solitary in the upper axils, pale green. Perianth lobes equal or nearly

so, ovate, blunt, 1 line long ; pedical slender, 1 line long. Stamens 8, filaments slender, $\frac{3}{4}$ line long, anthers pink, broadly ovate small. Pistil rudimentary, but well developed. Female flower similar to the males, but the perianth lobes slightly longer and red at the base. Staminodes small, 8. Pistil flask-shaped, longer than broad obscurely, 3-lobed, tapering into a short style ; stigma capitate, tuberculate irregularly 3-lobed. Ovule solitary and occupying the entire ovarian cavity at time of flowering. Fruit not seen.

Among and about basalt rocks on the shores of Lake Lucy Long on the Ironstone Range and on the banks of the South Esk, near Avoca.

Rumex dumosus, A. Cunn.—Basal leaves few, soon withered, oblong narrow pointed, constricted as in *R. pulcher*, petiole as long as leaf. Stem leaves sessile, small slender subtending branches and flower clusters. Stem erect, very branched and spreading. Flowers very few together in distant clusters, often solitary, pedicels slender 1—2 lines long. Inner perianth segments becoming rigid, acute, and reticulated bordered with few, usually 2, prominent spines, not developing a tubercle.

Occasionally found on the roadsides in many parts of Tasmania, and probably introduced from the mainland, where it occurs in south-eastern districts. It is confined to Australia, unless it is, as Von Mueller considered, a form of *R. flexuous*, Sol., of New Zealand. This dock may easily be taken for *R. pulcher or R. brownii*, from both of which it differs, however, in the much more branched habit, few flowers in the clusters, and few spines to the margins of the mature inner perianth lobes.

SOME ACCOUNT OF THE WORK AND WORKERS OF THE TASMANIAN SOCIETY AND THE ROYAL SOCIETY OF TASMANIA, FROM THE YEAR 1840 TO THE CLOSE OF 1900.

By Alex. Morton,

Secretary Royal Society of Tasmania.

When the Scientific History of Australasia shall come to be written, it will be seen how large a share Tasmania has taken in the world of Science, and how valuable have been her contributions to its knowledge. Very early in the history of the British Settlement in Tasmania, a systematic attempt was made to classify its Flora, with the special object of discovering what edible roots or fruits were to be obtained; and this, though perhaps undertaken with a view rather to the utilitarian than the purely scientific results, was of use to the investigators who followed in the same line.

The scattered work of individual observers was first focussed in a Society, founded by Sir John Franklin in 1841, which was called at first the Philosophical, and soon afterwards the Tasmanian Society. The meetings were held at Government House, then the most central place in the city, and the roll of names on its list of members contained such names as Sturt, Leichhardt, Sir Thomas Mitchell, Captains Ross and Crozier, and many others well known to fame. In the first volume of proceedings I find the name of Dr. (now Sir) James Agnew, with Port Phillip as his address. Ever since then his name has been identified with the work of scientific societies in Hobart, and his liberality in connection with them is too well known for me to do more than allude to it here in passing.

The four departments of Zoology, Botany, Geology, and Meteorology, were the first to receive the attention of the Society, while Geography, in the face of the new discoveries being made daily, soon claimed a large share of attention.

The first Journal, published in 1843, has compressed in its pages so much that has gone to the making of history, as to make one wonder if the times seemed as remarkable to those who lived in them, as they do to us now.

John Gould, then in Sydney preparing for his great work on the "Birds of Australia," contributed a paper on the habits of the brush turkey, which had been studied, apparently to little effect, before he turned his attention to its classification.

An article by Dr. Hooker on the fossil wood found at Macquarie Plains reminds us that the eminent surgeon was even then preparing to give the world the results of his examination of the Flora of Tasmania.

The catalogue of edible fruits and roots, compiled by Mr. James Backhouse, finds its place here, considerably added to by Mr. Ronald Gunn, whose work has left scarcely anything to be done in this direction. There are descriptions of the birds and some of the fish of Tasmania, an article or two on the advantages of irrigation in the colony, and a list of native words compiled from documents in the Colonial Secretary's office by that remarkable adventurer, Jorgen Jorgenson, the Convict King.

A battle between the observers of the Ornithorhyncus as to whether that extraordinary specimen were to be classed as oviparous or viviparous was then at its height, and a careful paper in this journal gives all the reasons for preferring to believe it viviparous, but no dawn of belief that it might yet be found to have some of the characteristics of both seemed to have visited the mind of anyone. A legendary tale of the Australian Blacks, one of those collected by Mrs. Parker, shows that the Aborigines, untroubled by scientific considerations, had decided that it was a cross between the kangaroo rat and the duck, laying its eggs like the duck, and then caring for them like a kangaroo rat.

Perhaps of even greater interest to us at the present time is the fact that the return of the ships Erebus and Terror from their expedition to the Antarctic regions is recorded in this volume, with a report of the work done by Captains Ross and Crozier and those associated with them. Lieut. Kay, of the Terror, remained here in charge of the meteorological station, and did a great deal of work in connection with the magnetic survey of Tasmania. Both subjects—that of Antarctic exploration and the magnetic survey of Tasmania—have been very much shelved subjects from that time until the last year or two.

The late Mr. James Barnard was one of the earliest members of the Society, and though, perhaps not a specialist in any particular subject, was devoted to furthering the aims of all the workers, and continued his interest in this Society until its dissolution, and was a member of the Royal Society until his death.

The Rev. T. J. Ewing early made a list of the birds of Tasmania, and was one of the most useful members.

Dr. Richardson began the classification of the fishes in Tasmanian waters, which has since been carried on by other workers, and completed by Mr. R. M. Johnston.

That brilliant scholar and eminent divine, the Rev. Dr. Lillie, contributed an introductory paper to the first volume of the proceedings, and took a keen interest in the work of the various branches, into which the energies of members were directed. He was for a time Hon. Secretary of the Royal Society, and did much while in that position to further its highest aims.

The famous geologist, Count Strzelecki, who walked a distance of 7,000 miles in investigating the geological conditions of Australia and Tasmania, gave some account of his journeyings to this Society, and described many little known parts of the island. The Count examined a natural mineral water found near Circular Head, and observes, among other things, that it is sufficiently nauseous to be of medicinal value! Count Strzelecki, in 1845, published the first systematic sketch of the geology and general physical character of Australia and Tasmania.

A series of very interesting articles, by Captain Cotton, on irrigation, and one on a newly discovered steam digging machine, remind us that then, as now, there were not wanting those who saw the advantages that would accrue to Tasmania if a more enterprising spirit were manifested by the residents.

It is difficult, in looking over volumes in which every word is of historic interest, to leave out any item, but that would need so much more time than I have at my disposal that I must be content to make a selection, not perhaps the best that could be made, but one that is possible to compress into the limit of time available. For a like reason, while there are many names of useful workers left out of this short chronicle, it is not to be supposed that they were not worthy to be all on the roll of honour, but the inexorable demands of time forbid.

The second volume contains a fuller account of the Antarctic Expedition, and of the landing in two places, and taking possession in the name of Her Majesty the Queen, of the whole Antarctic Continent. It has not yet become a summer resort!

We are reminded that in the time of Sir John Franklin the "Beagle," with Darwin on Board, called at Hobart, and the great man had opportunities of observing the many interesting things in so new a country. One of the things that filled him with surprise was, that the steamer in which he went to Kangaroo Point had been entirely built in the colony.

A paper contributed by Dr. Agnew, on the poison of snakes, marks not his first membership, but his first

active work for the society. His name appears in the first list of members, with residence :—Port Phillip. His first paper was written from Saltwater River, Tasman Peninsula, where as medical officer to the government he had leisure to observe the poisonous apparatus of the venomous reptiles of that country retreat. Some very useful remarks on the nomenclature and classification of rocks in new countries, by the English geologist, Mr. J. B. Jukes, set forth clearly the grouping on which geologists should found their method of classification.

The Rev. T. J. Ewing, whose list of birds is contained in the first volume, is represented in the second by a paper on the statistics of Tasmania, from which it may be of interest to make a few extracts. The three years under review are from 1838 to 1841. The revenue from the customs increased during the three years from £70,000 to £85,000, an increase of 21 per cent. The post office revenue rose from £4,300 to £6,500, or 25 per cent. The total revenue, including sales of Crown lands, rose from £144,562 to £237,381. The average value for the three years of the imports was £665,535, for a population which, including convicts, only numbered 50,000 souls. The sheep in 1841 amounted to 1,167,737 ; the horses numbered 12,000 ; horned cattle, 90,000. There were 1287 marriages during the period.

The Rev W. Colenso, an enthusiastic naturalist, contributed valuable notes of a trip in New Zealand, during which he collected more than 1000 specimens of natural history.

The picturesque museum at Ancanthe, built by Lady Franklin, contained not only specimens of natural history, but a good library containing books classified as follows:— *(a)* Works illustrative of Tasmania and the neighbouring colonies; (*b*) Works written by persons who had been, or were then, residents of Tasmania; (*c*) Works written and published in Tasmania, provided they were of such a character as would not be objected to by the Trustees. The collection contained besides many other interesting books, some of the volumes of the splendid work Gould's Birds of Australia, Mr. Westgarth in a paper on Port Phillip, then little known, describes its geological formation, but gives no hint of the alluvial richness that, in a few years, so transformed that country.

In the summer of 1838 the Rev. W. Colenso, whose papers on New Zealand form a most interesting part of this second volume, was fascinated by the description given by the Maories of the gigantic bird they called the Moa. They insisted that it lived in a cavern on the side of a mountain, that it subsisted on air, that it was guarded by two immense reptiles, and that if anyone ventured near it he would be

trampled on and killed by the monster. Mr. Colenso procured some bones, and after careful examination he concluded that it was an extinct species. His paper is a piece of clear and almost convincing piece of reasoning, but was disagreed with by Professor Owen, who thought the bones, after examination, to be so recent that he expressed the hope that the animal might yet be seen striding about in the "Zoo." The Wellington Valley in New South Wales was just then attracting considerable attention on account of the fossil bones of a giant extinct animal, a Mastonodontoid pachyderm, which Professor Owen describes in this volume. This discovery was especially of interest as suggesting a more humid climate than that now common to Australia, for these creatures were frequenters of marshes, swamps, and lakes. The Aborigines of Tasmania were studied by several members, and Archdeacon Davies wrote of their ways in a careful paper or two.

This was, *par excellence*, the time for exploration. The vast new country, with untold wealth and unknown natural resources, attracted the attention of all those adventurous spirits who love to have the pleasure of treading where no foot of civilised man has before trodden. At this time Leichhardt was in the north exploring the country between Moreton Bay and Port Essington before that last journey of his, the plan of which was sketched with such sanguine anticipation of success, but from which no whisper has yet come to tell us whether it is well with him.

Sir Thomas Mitchell was continuing his investigations in the region of the Darling and the Bogan, while Captain Sturt was battling with heat, drought, and scurvy, in heroic efforts to penetrate the secrets of the central part of the dark continent. The account of his work, given in this volume, is pathetic reading.

One member whese name appears very often in the proceedings, is Mr. Ronald C. Gunn, of Launceston, whose work for the Society was of a very extensive character. He was made a Fellow of the Royal Society, London, an honour never since bestowed on a Tasmanian. He was an indefatigable worker, and did much for the scientific development of his adopted country. He and Dr. Grant were the first to send to London live specimens of the Tasmanian Tiger, a notice of which appeared in the London *Times* of May, 1850.

In the third volume of the Tasmanian Journal the name of the Rev. W. B. Clarke appears for the first time. This eminent geologist, the first in Australia to predict the finding of gold, wrote to this Journal on the subject of the fossils of the silurian age in New South Wales. Incidentally he

mentions that his collection of N.S.W. fossils exceed 1,000. When we remember the difficulty of collection we can appreciate the labour involved in gathering so many specimens. Two quotations from the minutes of the Society will give a good idea of the thrilling interest of some of the meetings.

March 24, 1847. — Read (*inter alia*) Sir T. Mitchell's account of his journey into the N.W. interior of New South Wales.

April 7, 1847.—Read Captain Sturt's journal of his exploration in the interior of New Holland from South Australia.

The difference between these two narratives is widely marked, one, that of Sir Thomas Mitchell, being a cheerful story of pleasant wanderings over fine country, while that of Captain Sturt is a brave man's description of tragic battling with heat, want of water, and sickness. In one place the thermometer, graduated to 127, burst in the shade, while at the breath of the hot wind the leaves fell off the trees.

The Society also published an account of Leichhardt's overland journey to Port Essington, and a sketch of the plan of the unfortunate traveller's last journey. For that expedition a sum exceeding £1,500 was raised by public subscription, and supplemented by a grant of £1,000 from the Government of N.S.W.

Dr. Leichhardt started on this expedition with the warmest wishes of the Australian community. It makes one sorrowful, even now, to think that the heroic band stepped out of sight in the silence of the great lone land, and no seeking has ever been rewarded with even a fragment of knowledge of how they all met their deaths.

That good friend of the Society, Sir Joseph Hooker, contributes some papers on the conifere of the island, and credits Mr. R. C. Gunn with the discovery of more than half of the conifere of the whole colony. A most exhaustive paper on the Microscopic life found at the ocean washing the South Pole, was given by Professor Ehrenberg, in Berlin, and then sent by him to the Tasmanian Society, a little incident showing that the Society was well and favourably known in the scientific centres of the world.

A name which was long and honourably associated with the Society was that of Dr. Milligan. The third volume contains a paper by him on the fossils of the country between Hobart and Launceston. All his contributions were marked by much care to obtain scientific accuracy. In 1849 the Tasmanian Society lost its separate existence and became

merged in that which is represented here to-night. Exit, therefore, the Tasmanian Society, having honourably fulfilled its mission.

On the 14th Oct., 1843, the Royal Society of Van Diemen's Land for Horticulture, Botany, and the Study of Science, was formed with the help of Sir Eardley-Willmot, Bart. Its first work was the holding of two Horticultural Shows, which were very successful, but a Horticultural Society being after that formed by the professional gardeners of Hobart, the shows were discontinued, and exhibits were instead sent to the shows of the new society. HerMajesty the Queen became the patron of the Society; the Government placed a large part of the garden in the Domain at the disposal of the members, and made a grant of £400 a year, for the purpose of paying its officers and promoting its objects generally. At the end of 1845 the Secretary resigned, and Sir Eardley Wilmot, then Lieut.-Governor, fought strenuously to raise the Society from a horticultural to a more scientific one, as being more in accord with the idea of a Royal Society, to which Her Majesty had given her patronage. He opposed the appointment of any secretary who should be a mere clerk, and said the Secretary of a Royal Society should not only be able to meet the members on terms of equality, but should be a man who could be on a par with men of science anywhere. As a suitable man was not at the moment to be found, one of the vice-presidents, the Rev. Dr. Lillie, undertook the duties gratuitously for a time, and eventually Dr. Milligan was appointed, whose devotion and attainments made the Society what it has since remained—an honour to Tasmania and Australasia.

For a time the principal interest centred round the Gardens, but in 1846 it was decided to begin a collection of natural history specimens for a museum. A room in the Legislative Council Chambers held the beginnings of this museum, and in 1849 the Government granted a sum of £100 towards its support, from which time the Museum was formally recognised, and its usefulness has grown apace, until the very popular institution of which I have the honour to be Curator holds a firm place in the affections of the people of Tasmania. The first Journal of the Proceedings of the Royal Society was published in 1851, and the statistics of the colony, dealt with by Mr. James Barnard, afford interesting data for comparison with those of to-day, especially those of education. The Church of England had 35 schools on the penny-a-day system, the Roman Catholics 4, and in these denominational schools 1812 children were educated. In the Government Board Schools 1,080 children were taught, and 194 in infant schools; while 460 children attended the

Queen's Orphan Schools, of whom 396 were the offspring of convicts, and were taught at the expense of the British Government; 64 were the children of free parents, and were paid for by the Tasmanian Government. It was estimated that, including those taught in private schools, the number of children under instruction amounted to 6,214, a number which may be considered as fairly satisfactory. There was then no daily newspaper published in Tasmania, but four were published in Hobart twice weekly, and two once a week. Three were published in Launceston. The total imports exceeded the exports by 17½ per cent.

The introduction of salmon into Tasmanian waters afforded some discussion, and was introduced in a paper by Captain Stanley, in which the opinion of Mr. Young, the manager of the Duke of Sutherland Salmon Fisheries, is quoted, and his advice given. Mr. Young says :—"I hope that you will get a suitable vessel, so that you can with safety carry the young salmon, but in case you should not succeed in getting it in every respect fitted for their safety, I would not advise you to proceed with it at all. Were you to make an ill-prepared job of it and not succeed, it would deter yourself and others from the attempt for a long time (for, assuredly, it will at some time be done successfully)." Mr. P. S. Seager has, with much trouble, written a history of the salmon experiments in Tasmania, which has been read before this Society, and will, perhaps, be familiar to most of you; but it ought to be mentioned, in passing, that the last and very successful shipment in the year 1888 was brought out at the sole expense of Sir James Agnew, by Sir Thomas Brady, then Inspector of Fisheries in Ireland.

That perennial subject, the weather, of course came up for discussion, and some valuable statistics were forthcoming on this interesting topic. There were 14 days in 1847 on which a hot wind blew, and on two days especially the air was like a heated furnace. The thermometer registered 103deg. in the shade, and later 100deg. The next year was remarkable for intense cold in the months of November and December.

At this time coal was being discovered in every direction—at Schouten Island, Port Arthur, Mersey and Don Rivers, and many other places; and Dr. Milligan was requested by the Government to report on them. This first volume has some of these reports, and specimens were sent to the Museum of Practical Geology, London, for analysis by Sir H. De La Beche. Though he did not think so highly of them as Dr. Milligan did, yet the discovery of coal in so many parts of Tasmania was a matter of the highest importance to the future of the colony. Even then, with four

steam vessels on the Rivers Derwent and Tamar, it was a great consideration to obtain coal at a cheaper rate than it could be imported from Newcastle, England.

The Bridgewater Causeway and Bridge were the subject of an article by the Director of Public Works, Mr. W. P. Kay. The work of making the Causeway occupied nine years, at an average expenditure of £4,500 per annum, and the cost of the bridge was £7,580. The solid contents of the causeway filled into the river was computed at 560,000 cubic yards, and must have cost about 1s. 5½d. per cubic yard. The cost of convict labour does not seem to have been less than that of free, if the money spent on the Causeway may be taken as a criterion. We, in these more prosaic times, when the more important discoveries in botany and natural history have all been made, can hardly realise the great interest of those early meetings, when so much was new and sometimes with no parallel in the old.

Various kinds of manna were found on many of the trees in the new world, and one was discovered by Mr. Robert Kay which differed from all known kinds, and was considered to be an exudation from the mallee (Eucalyptus Dumosa). The aborigines in the North-west of Australia, where this manna was found, believed that Bhami, their hero-god, who had been taken by the spirits to the land of fadeless flowers, had sent this manna as a substitute for the honey that, owing to the drought and the absence of flowers, had for some seasons failed them.

Sir William Denison, whose practical engineering skill was of the greatest use to the colonists during his governorship, contributed among many others, an interesting paper on the construction of dams, with a view to irrigation. It is a little remarkable, when we remember how often the necessity of irrigation was pressed on the attention of the people in those early days, that no more impression was apparantly made on the minds of those to whom such a system would have meant riches. We have abundant proof that Tasmania was not, on the whole, unprogressive at this time, but the people were slow to realise that science in agriculture is of the first importance.

The remarks of Dr. Agnew on the snakes of Tasmania, mentioned in connection with the Tasmanian Society, had stirred the observing power of several others, and a number of experiments were made on the relative virulence of various species of snakes, the results of which were communicated to the Royal Society by Major Cotton.

On 18th September, 1848, Dr. Nixon, Bishop of Tasmania, was elected a Fellow, and the first contribution I notice from

him is one on the productiveness of Mummy wheat. From one ear received from Lady Franklin more than 7,000 ears had been taken the next season.

Obsidian buttons have lately been the cause of some speculation at the meetings of the Society; and it will interest some to know that as early as December, 1851, a specimen of this curious substance was exhibited by Dr. Officer. The report says:—"Dr. Officer showed an obsidian looking substance, having much the form of a common bung of a cask, or cork of a wide-mouthed bottle, flattened and rounded on the top and bottom (where it betrays the action of weather), and having a number of well-defined impressions round the sides, as if so compressed or pinched in while semi-fluid. This remarkable substance is said to be found on the natural surface of the pasture lands of Victoria; inquiries have been set on foot by Dr. Officer to trace, if possible, its origin."

An announcement is made at the annual meeting in January, 1853, of the removal of the Museum and Library, as well as the meetings of the members, from the rooms forming part of the Legislative Council Chambers to a hall in Harrington-street (now the Athenæum Club). This was an expensive undertaking, as formerly the rooms had been obtained rent free, while the rent of the new building was £60 per annum, with rates and taxes. The inconvenience, however, only had the effect of stimulating the members to renewed exertions in the direction of obtaining a permanent home for the increasing collection. The report of the Council says:—"The Council consider that the first step should be to apply to the Crown for a grant of a suitable piece of ground as a site, upon which, as a basis, then to proceed to raise by public subscription or otherwise a sum of money adequate to the speedy execution of so much of the plan of an extended edifice as the immediate and not very remote exigencies of the case may demand." A site was granted by the Government for the erection of a Museum, about £2,000 were raised by subscription, and the first part of a fine building erected, which contained three rooms, of which only two were then used, one for a library, another for the Museum collection. There was no lack of public spirit in those days: The facilities of communication were increasing in both Hobart and Launceston. Many ships were put on the berth to load produce for California. There were several steamers employed on the Derwent and Tamar, one of them the redoubtable Kangaroo, and a steam service between Hobart and Launceston was being seriously discussed. There were 14 stage coaches running on the main and branch roads of the colony, eight of which started from Hobart, five from

Launceston. Sir William Denison, whose interest in the society was very great, was responsible for many papers on agricultural subjects, and had some experimental plots prepared in the paddock in front of the present Government House to determine the best way to sow potatoes for large crops. He also had some observations on the best way to grow turnips, which seemed to be full of practical common sense.

When one remembers that from 1849 to 1854 the period of unrest and excitement in consequence of the discovery of gold were at their height, one can the better appreciate the devotion shown by those who remained at their ordinary avocations, and gave so much in time and money to further the cause of science and education in the land of their adoption. It was, however, impossible that the Royal Society should not feel some reflex of the tide of excitement which was turning the heads of so many in the community. Yet their work seems neither to have been left undone, or done badly, in the stress of the times. Every subject that was at all likely to educate the people, either in agriculture or engineering, in social science, or in manufactures, was taken up in a spirit of readiness and helpfulness, that must have been of the greatest use in a new community, and that marked it as an educative force in all directions. Natural History was, of course, not neglected. The discoveries of giant extinct marsupials, whether in New South Wales or elsewhere, were reported to the Journals of the Society, and aroused much intelligent interest. Reverting for a moment to the gold discovery, I am reminded that gold was discovered in California in 1847, but in 1846 Sir R. Murchison, who two years before that stated that no gold had been discovered in Australia, though he expected it would eventually be found there, received from New South Wales a small parcel containing gold in quartz, as a proof that his expectation had been realised. Some Cornish miners were advised by him to go and seek for gold in the alluvial of New South Wales, and in 1848 he interviewed Earl Grey, then Minister for the Colonies, informing him of the strong ground he had for believing in the existence of large bodies of gold ore, in quartz, at that remote spot; but Earl Grey took no steps in the matter, as he thought that the discovery of gold would be very embarassing to the interests of a wool country. He had yet to learn how adaptable a wool country may be to other forms of industry.

A medical paper was contributed by Dr. Bedford on the treatment of Scarlet Fever, which attained the dimensions of an epidemic during the years 1852-3. His recommendation

of Belladonna, as a preventive and cure, is interesting, but I do not know whether subsequent experiments in its use modified the opinion of its efficacy.

The important subject of drainage, which can never be properly dissociated from water supply, was discussed in a paper by Sir William Denison. One of the conclusions at present of interest, was that for a really efficient system of drainage the supply of water must be very much increased, preferably by tapping the grand supply of the upper Derwent.

The losses and gains to Tasmania in consequence of the gold rush were noted by Mr. James Barnard in a paper on the statistics, published in the proceedings for 1852.

The population loss is set down at over 8000. During the period 1851-3 inclusive, the average value of the imports, per head of the population was £18 19s. 9d., and of the exports, £19 15s. 4d.

The balance of trade, upon the calculation of the same period of three years, was £156,505 in favour of the colony; clearly denoting under the feverish and exciting conditions of the times, the healthy state of the commerce of the little island. The quantity of gold exported in the same period amounted to the large total of 212,000oz., but most of this was first brought over from Tasmania by the lucky diggers. It was valued at £714,870.

Wages rose to an enormous amount, in consequence of the scarcity of labour, painters and plumbers getting up to 16s. per day. Mr. Barnard says: "The houses uninhabited two months before the gold discoveries were 599, or five per cent of those built; the first effect of these discoveries was to create the belief that there would be a general desertion of houses by people of every grade rushing off to the diggings. House property at the onset was greatly depreciated, and sold—and that with difficulty—at a nominal price. In a short time, however, there came an unlooked for reaction. The streets of Hobart and Launceston by the end of the year began to swarm with lucky diggers and numerous visitors, the former bent upon enjoying the fruits of their success with their friends, the latter to take up their abode more or less permanently, attracted by our superior climate, and our more quiet, better protected towns. The demand for dwellings at once exceeded the supply, and soon there was not a house to be had without a scramble, rents rising 300 or 400 per cent."

At a meeting held on the 9th April, 1854, the first report of the Victorian Government Botanist, Dr. Mueller, was laid on the table. In this quiet way a name was introduced into

the annals of Tasmanian science which for many years was honoured in all the colonies as that of a man with a rare devotion to duty, a great amount of knowledge, which was always at the service of even the humblest votary of his beloved science, and a modesty and simplicity of life sufficiently uncommon as to be remarkable. All the scientific societies in Australasia owe much to his faithful work. The volume for 1853 contains the first of a large number of papers by Dr. Milligan on the Aborigines of Tasmania, their number, their traditions, and their language.

Dr. Erichsen contributes a paper on the insect fauna of Tasmania, which has particular reference to the geographical distribution of insects.

Mr. Morton Allport was one of the untiring workers whom the Society had the good fortune to number among its members. In all, he wrote 24 papers on various subjects, and was one of the most enthusiastic among those who believed that the introduction of the Salmonide into Tasmanian waters could be accomplished, and that it would be a great advantage to the colony when that had been done. His death, at the comparatively early age of 46, deprived Tasmania of a good citizen, and the Royal Society of one of its most faithful and persevering friends.

Various contributions to our knowledge of Tasmanian Botany appear under the name of Dr. Mueller. The coal seams were at this time beginning to be worked with great zeal, but unfortunately with little knowledge, and the result was in many cases disappointing. The history of a new country always contains the record of many mistakes, and they are not only in the region of science and manufacture. Among papers of interest further afield may be mentioned one on the census in the United States, which is full of facts collated in a charming manner, and one by Dr. Carpenter, read at the Royal Society of Great Britain, on the influence of suggestion in modifying and directing movements independently of the will. The vast subject of hypnotic suggestion, was even then, receiving the attention of medical students, and as a science does not seem to have advanced much since that time.

The new and fascinating method of taking sun pictures was the cause of a thoughtful paper on the subject, in which the process was explained with a clearness that must have started many an experimenter in the island on the path of the amateur photographer.

The vexed question whether the Desmidiacie were really belonging to the animal or vegetable kingdom, is discussed

with much clearness by Mr. Harrap, at a later date, and the arguments on which he differed from Professor Ehrenberg and others logically stated.

These questions of the exact position of the wonderful links between the kingdoms is at all times one of absorbing interest, and then, as now, opinion was divided about some of them. The number of these beautiful alge found in Tasmania then amounted to 38.

Dr. Downing gave some account of Norfolk Island, which was written in a chatty style, and contained a good deal of information about the climate, natural productions, and geological characteristics.

Three recent discoveries, each important, mark off the year 1865 as noticeable, and they are all referred to by Dr. Hall in an address to the physical section of the Society. One was the separation of the illuminating from the heat-giving rays of the sun, discovered by Professor Tyndall, and which was the beginning of many discoveries in refraction that cannot be mentioned for want of time. The second was full of promise that has not, so far, been realised, except to a limited extent. It was the discovery of magnesium wire and its high illuminating power. It is useful, doubtless, but it has not superseded gas or electricity, as was at one time fondly hoped. The third was Baron Liebig's discovery of a substitute for mother's milk, and did much to reduce the mortality of infants during the first year of life, but if mothers more fully understood the importance of the subject it would be more used than it is at present. Even now the infant mortality is far too high for the enlightenment of the age. I mention these to show how alert the members were then, as now, to notice what was going on in the world outside Tasmania, and to utilise that knowledge for the benefit of their fellow-citizens. In May, 1865, the attention of the Society was directed to the necessity of some method of establishing a time signal which should give the time regularly so as to be available for the whole of Tasmania. The first duty of fixing a time signal was soon after undertaken by Colonel Chesney, who arranged for three guns to be fired at 4 p.m. on the first Thursday in every month, or, if that day proved wet, they were fired on the first fine day following. In 1867 the Museum, three rooms of which had been built, contained a sufficient collection to justify bringing into use the upper room, and various kind friends gave much time to the arrangement of the specimens in the best way then considered possible. One cannot speak of their labour with other than gratitude, even though the classification had been of the primitive order.

The practical aspect of every new discovery commended it or the reverse, to the notice of many of the Fellows, and the

possibility of a manufacture of paper from the Esparto grass, which, it was believed, would grow well in Tasmania, drew a discussion on the subject, and Mr. James Barnard took great pains to set before the Society all the available information on the subject, including plans and cost of machinery.

Political economy came under discussion for the first time in 1872, when Mr. E. C. Nowell read a paper on the subject with special reference to the unemployed. For the first time the colony was experiencing the fact that there is such a thing as a labour problem, and it has not left us since. Occasionally papers were read on the beetroot industry, and all the scientific and practical information necessary to start a beet factory are to be found in the records of the society; but the production of sugar from beetroot is not yet one of our established industries.

The name of the Rev. J. E. Tenison Woods appears for the first time in the reports as a contributor in1874,but the reverend geologist had then been a corresponding member for many years. His great services to the people of Australia generally and his devotion to science made him a contributor whose papers were valued, and whose personality was honoured in all the scientific societies on this side of the equator, while his name and that of the Rev. W. B. Clarke were familiar as household words in all parts of the world. In 1872 the Council acquired a large wooden building, which was I think used as a store, and all the specimens, for which there was no room in the Museum, were placed there. From this time onward the proceedings of the Society are familiar to many of the present members of the Society that a recapitulation of them would be unnecessary.

The obligations under which the Society lies to Mr. T. Stephens, Mr. R. M. Johnston, and the many members now here who were good friends of science since 1875 are known to all present, and their recapitulation would only seem fulsome, but an exception to this rule may be permitted in the case of the Hon. Sir James Agnew, whose connection with the Society dates from 1840, and who was the able and liberal hon. sec. of the Society from about 1861, almost to the present time, with the exception of a visit to England, when Mr. James Barnard well filled the gap until his return. From Sir Eardley Wilmot, who was a most interested President of the Society, to the present, the Royal Society has been fortunate in having as Governors of Tasmania, so many who were keenly alive to the advantages of a scientific society as an instrument for the elevation of the people. It has been well said that many tastes and one hobby make the condition of greatest happiness. To all who will, the Royal Society offers that choice of tastes and hobbies which will be of the

most use to the possessor, and the most beneficial to his fellow creatures. A list of the subjects dealt with during the period of the Society's existence, shows how varied was the field of its activities, and how eminently practical was much of its work.

In June, 1874, the first contribution from Lieutenant Legge was recorded in the form of a paper on the birds of Tasmania, and accompanied by 20 prepared type specimens as the beginning of a type collection of birds. Col. Legge's interest in the Society has been constant since that time, and though, during his residence in Ceylon, he gave up his spare time to the description of the birds of that tropical country, he began on his return here to take the same place in the Society as before he left, and is now one of its best friends.

The contributions of Mr. R. M. Johnston began in 1873, and have been continued ever since. Geology, paleontology, ichthyology, and economic science have all been treated in his thorough and masterly manner, and he is a worker to whom we are all very much indebted. In 1880 Mr. Johnston came to take up his residence in Hobart, and from that time the period of most active exertions in behalf of the Society commenced. The Government published Mr. R. M. Johnston's book on the Geology of Tasmania, a work which was the fruit of years of patient observation and careful study, and is an invaluable text book. His hand book of Tasmanian Botany has also been of the greatest use to students. To convey some idea of the work done to the Society by Mr. R. M. Johnston, I give a list of the subjects contributed by that gentleman:—Pisces, 14; Conchology, 9; Botany, 4; Geology, Palœontology and Mineralogy, 45; Economic Science, 12. A total of 84 papers.

Of earlier date still, are the contributions of Mr. T. Stephens, M.A., whose papers on geological subjects have been continued from time to time for more than forty years, and whose interest in the work of the Society is unabated.

Dr. Swarbreck Hall and Mr. Francis Abbott are also two contributors, whose statistical and other papers were very numerous and instructive. For some years Dr. Hall contributed papers on the relation of the climatic condition to the health statistics of the colony, and Mr. F. Abbott's Meteorological papers were looked forward to with great interest month by month. Mr. F. Abbott, jun., the present superintendent of the gardens, followed in his father's footsteps, and though of late the pressure of other duties have prevented much work of a special nature for the Society, his membership has continued unbroken.

For many years after its establishment, the Royal Society did nothing towards advancing the historic knowledge of

Tasmania, but Mr. J. R. McClymont, M.A., and Mr. J. B. Walker, F.R.G.S., took up the subject in the eighties, and while Mr. McClymont wrote on the geographical part of the subject, Mr. Walker took up the history of settlement and of discovery with much patience and ability. His delightful English, his proved accuracy, his untiring care in collecting facts in connection with the early history of his native country, and his enthusiasm for the good of the Society, made his death last year a calamity to the Society, almost every member of which was his personal friend. The historical section owes its existence principally to His Lordship the Bishop of Tasmania and to Mr. Walker, both of whom worked with great zeal in its establishment. The various papers contributed by Mr. J. B. Walker are of so much value that the Government have granted a sum of £100 to have them gathered and printed in one volume.

There are many new workers, who, during the last few years, have devoted themselves to special branches of science, and kept up interest in the meetings by timely contributions, among whom, without disparagement to other workers, may be mentioned Mr. L. Rodway, whose botanical notes and contributions to the Flora of Tasmania have been invaluable. Mr. Rodway's forthcoming work on the Botany of Tasmania is to be published by the Government, and is arranged on a most comprehensive and useful plan, whose completeness leaves nothing to be desired.

The splendid work of Mr. Petterd, who was joined afterwards by Mr. Twelvetrees in descriptions, merits more notice than can be given to it here, for their study of mineralogy has resulted in the discovery of new and rare minerals, and they have much increased the general knowledge of the subject. Mr. Petterd has also published a monograph of the Land shells of Tasmania, a most complete work, and has also written and described many new shells, in addition to his great service in the discovery and description of minerals.

The mosses were carefully worked by Mr. A. R. Bastow when he lived in Hobart, and that interesting study has since been taken up by Mr. W. A. Weymouth.

In conchology, Miss Lodder has done good service to the Society, and has classified the specimens of Tasmanian shells in the Museum, replacing from her own collection those which were in bad order.

The work of Mr. Sprent, whose explorations in the island were carried out with utter disregard for personal comfort, should be cheerfully recognised. His interest in the collection of minerals, when the mines were just beginning to be opened up, was only an earnest of what might have been done had his life not been so prematurely ended.

Mr. C. E. Beddome was also a good friend to the science of conchology, and his own specimens and studies were always available for the use of any students.

The meteorological work of Mr. A. B. Biggs, of Launceston, has been of the greatest value, and his patient record of much observation increases very much the value of the reports of the Society.

Mr. A. Montgomery, formerly Government Geologist, contributed several papers on geological subjects, and was one of the members whose careful observation was at the service of the Society on any subject lying within the scope of his studies.

Among scores of contributors and hundreds of subjects one might go on for an hour enumerating those to whom the Society is indebted in various ways, but this necessarily imperfect sketch must conclude with a list of the main subjects treated during the time under review. Remembering the many difficulties inseparable from life in a new country, and the special conditions of the population, with the upset caused by the discovery of gold, the list of papers as a partial record of work done by scientific men in Tasmania is creditable, and we may well be proud of belonging to a Society which has so splendid a record.

Taking the subjects in order the number of papers is as follows:—

Mammalia	12
Aves	27
Conchology	44
Reptilia and Amphibia	6
Pisces	53
Insecta and Crustacea	18
Vermes	3
General Zoology	18
Botany	85
Geology, Paleontology, and Mineralogy	132
Geography	45
Ethnology	19
Astronomy and Meteorology	56
Economic Science and Education	20
General Subjects	65

Total papers, not including small papers on various subjects, 606.

It is to be hoped that this record, compiled at the end of this century, may stimulate those who carry on this work in the century to come not only to do likewise, but much more abundantly.

PRACTICABLE FORESTRY IN TASMANIA AND ELSEWHERE.

By A. Mault.

The immense extent of forest land in Tasmania has struck every visitor to the island from the time of Abel Tasman to our own day. On the visitors who came to stay as settlers, this fact made an unfavourable impression, as its signification to them was the cost of clearing land for cultivation. And this impression has coloured and affected all that has been done in the way of dealing with forest land in the State. Trees have been regarded almost exclusively as impediments to agriculture, and not as possessing any intrinsic value worth consideration. Consequently every suggestion made for forest conservation has been regarded with suspicion as possibly entailing something to be done for forestry at the expense of agriculture and settlement. It is time that this suspicion should be banished. There can be no doubt but that agriculture is the mainstay of the country, and that nothing should be allowed to hamper or obstruct it. But a proper system of forestry, instead of doing this, would really benefit agriculture by improving climatic conditions. In fact forestry need not enter into any competition for land with agriculture. Land altogether unsuitable for agriculture is very well suited for tree growing. I know great tracts of country in France that could not be let for half-a-crown an acre per annum for farming, but which yield more than thirty shillings an acre under forest cultivation. There is an immense extent of similar country in Tasmania, and some of this could be better used for forestry than for anything else. The rule to be followed in the appropriation of land for any purpose, is to appropriate it for the purpose that will yield the largest return. By all means reserve for settlement, and for agricultural and horticultural purposes, all the best of the land ; when that has been done there will be plenty left for pastoral purposes and forest conservation.

With regard to forest conservation itself, there is a great deal of misapprehension. To judge by the manner in which it has been discussed in these rooms and elsewhere, one would think that the advocates of forest conservation proposed to subject the whole of the Crown woodlands in the State to a regime of conservation. Such a proposal is not only impracticable, but useless, as it would be sure to break down under its own weight of responsibility and costliness. This mistaken idea of what is proposed has arisen from a misunderstanding of what has taken place in other countries. It is true that in France, Germany, India, and other countries

where a system of forest conservation exists, the system applies to all the State domains; but these countries are all old settled ones, in which the State domains form but a comparatively small proportion of the area of the whole territory. The woodlands of these domains are therefore only of such an extent as can be practically dealt with. It would be folly in Tasmania to do more than deal with a reasonable portion of its woodlands.

The first thing to be done is to determine what this proportion shall be, and to select the sites of the reserves. In making this selection, after taking care that land is not taken that is better suited for other purposes, the most important condition is position and accessibility; then the question of adaptability of the climate and soil of the locality to the kind of timber proposed to be grown and conserved must be considered. As the position of the reserves is thus so important, no time should be lost in determining this point, at least with regard to those in the more settled parts of the country. I understand that of the 12,000,000 acres of still unalienated Crown land in the State, about 175,000 acres have been proclaimed as forest reserves. This area I think quite insufficient in extent for future requirements, but it is still more inadequate when the location of the reserves is considered. Not only should there be large national reserves for industrial and commercial purposes in accessible places, but there should be smaller ones in the neighbourhood of all townships for local requirements of all sorts. The advantage — not to say the necessity—of doing this, seems to have been altogether overlooked in Tasmania hitherto, with the result that in such a simple matter as the supply of firewood the cost in many places has doubled within the last dozen years—and the firewood industry is an important one from the point of view of the general population. In many places also—especially places without railways — wood for constructional purposes has greatly appreciated in value. In some other countries greater prevision has been shown, particularly in France, where many of the communes have woodlands that are managed for them by the National Forest Department, with the result that in some of them the revenue derived is sufficient to pay for the whole cost of local government without any recourse to rating for either municipal or educational purposes. The provision of all these necessary national and local reserves can now be made with far less difficulty than in the future, and I would strongly urge that it be at once made.

There is no necessity for any further legislation to carry out my recommendation thus far. As the *Crown Lands Guide* says, "The Governor-in-Council may, by proclamation in the

Gazette, except from sale, and reserve to His Majesty such land as he sees fit for the preservation and growth of timber." Under this power 175,000 acres have, as I have before said, been reserved, but so far as I can learn no special action has yet been taken to preserve or grow timber on these reserves. So that what is required is not only that the reserves should be increased in extent, but that they should be actively and practically administered so as to fulfil the object which is the pretext of their reservation.

It will be noted that in all this, when once the reserves are proclaimed, there is no interference whatever with the present administration of Crown lands, even that part of it which deals with exploitation of timber in forest lands that are not reserved. All the present system of sawmill leases and timber licenses may be carried out as set forth from page 31 to page 52 of the *Crown Lands Guide*. I express no opinion on that system if forest reserves are more expressly withdrawn from its operation ; but only wish to make it clearly understood that the forest conservation I advocate will not in any way interfere with the revenue derived by the Lands Department from its leasing and licensing regulations.

With regard to the larger forest reserves of the State, some will have to be for general purposes, and some for special ; and the locality selected for each of them will, of course, depend on its purpose. As before mentioned, good arable land is not necessary—in most cases it may be said—is not desirable. Some part of every large reserve will be found to possess such better quality of soil as may be desired for the nursery that should be attached to every reserve. Usually the larger reserves, at the time of their selection, will contain trees of several kinds, and of course these kinds will be conserved to their maturity ; but in the long run it will probably be found best to select for the permanent afforestation of each reserve the cultivation of the special tree that has proved the most successful in its region. Thus, in time we shall have large regional reserves of all our most marketable kinds of eucalyptus, such as blue gum, peppermint, stringy-bark, and iron-bark ; of pines, such as Huon, King William, and celery-top ; and of blackwood, myrtle, and other woods. At the same time persistent efforts should be made to introduce suitable foreign timber trees for the local production of industrial woods possessing qualities that are wanting in the Tasmanian ones.

With regard to the smaller local forest reserves there will probably be in many cases but a very restricted scope for selection. Still the selection should be made, even if it involved the reafforestation of land that has been partially cleared for pastoral purposes, or has never been covered with

bush. In such cases probably the best initiatory process would be wattle planting, with or without some tree planting for permanent timber. Till the timber has grown to maturity, the wattle might be subject to a 13 or 15 year rotation for bark and firewood, and from the first rotation coming in the expenses of the reserve should be more than met. In the cases in which the reserve is already wooded, the regime would be similar to that of the large reserves carried out on a smaller scale.

Each reserve should have an adequate staff to properly take care of it—not necessarily an expensive staff, but one suitable to the condition and extent of the reserve. But the central administration should be virtually a school of forestry. It should consist of a properly qualified conservator, and two or three more or less qualified assistants. When the system of conservation best adapted to our conditions here is duly decided upon, it should be systematically but gradually carried out in all the reserves. The system will be based upon a thorough practical knowledge of forestry in general, and of the timber trees of Tasmania in particular. Of course in the large reserves the trees will at first be there, and the conservancy will have to decide what is the best to be done with them in their present condition—that is, to make the best of them as they are, and with the view of enabling the introduction of a proper system of rotation, which is the basis of all economical forestry. Some of the timber will require a long period of rotation, probably 100 years, and the reserve will have to be divided into a corresponding number of sections or "cantons," as they are usually called. It is evident that this cannot be done at once, for probably in all the cantons as at first defined there would be mature trees that would be spoilt if made to wait for their turn in the rotation of felling. It will be in arranging for and meeting this condition of things that the skill and discretion of the conservancy will be proved. It is not an insurmountable difficulty, and with patient perseverance it will be astonishing in what a short time a reserve will be reduced to comparative order, showing one canton in process of being cleared by the current year's felling, last year's canton being prepared for planting and in process of being planted, and those of previous years being watched, tended as required, and periodically thinned. This latter operation is timed to secure, if possible, a market according to the age of the thinning for hop poles, telegraph poles, fencing, mining timber, railway sleepers, piles, and wood for such like services, and if the waste cannot be sold as firewood or charcoal, it is burnt to disencumber the ground. Under this system by the time the last canton of a forest is felled, the

trees in the first will have arrived at maturity, and the market will be kept regularly supplied with timber and wood of all sorts and kinds.

The conservancy will have to settle the questions of the proper time of felling the various kinds of timber trees, the proper manner of planting, the best method of seasoning wood, including seasoning hard woods while the trees are standing as practised in the teak forests in India, the time and manner of selling the wood, the means to be taken for protecting the forests from fire, and all such details of forest conservation. The carrying out of all its duties by the conservancy will naturally train its staff to the fulfilment of theirs, so that in time they can be entrusted with the charge of the various reserves under due direction and supervision from headquarters. The varying importance of the State and local reserves will afford means of duly recognising zeal and ability by promotion. But the importance of getting a well-trained staff emphasises the necessity of securing a thoroughly capable conservator, for there cannot be good training without a good trainer. It would be the falsest economy to get an incapable or badly trained man who could only introduce or perpetuate a bad and slovenly system.

It will naturally take some time to get the conservancy into full working order, so that it can show paying results. The length of this time will very much depend upon the conservator, and the means given him to make a proper start. This can be done by at once establishing an important local reserve at headquarters. I would suggest that the area of Mount Wellington proclaimed by the Governor-in-Council of the 25th September, 1871, as a water reserve for the supply of the City of Hobart, should be also proclaimed as a forest reserve, together with all the adjacent unalienated Crown lands. That such lands are not well adapted for ordinary settlement is, I think, shown by the fact that they are not already taken up. What the area of this reserve would be I cannot say precisely, but probably such parts of it as could be conveniently held and administered, together with the water reserve, would form a forest of five or six thousand acres, quite a sufficient area for the proper instruction and development of a School of Forestry. Such a proclamation would not interfere with the water supply of Hobart, but on the contrary further protect and increase it by the re-afforestation of much of the mountain that by fires and neglect has been left bare, and led to the continuous diminution of the rainfall there. Neither should it interfere with the enjoyment of the mountain by the people of Hobart and their visitors, but greatly increase it by adding the additional charms of judicious planting, and, by careful guarding,

restrain the mischief and dirty doings of the larrikin element in our midst. On the other hand the great diversity of soil and climate to be found on the mountain with its slopes and valleys exposed to every aspect of the heavens, and shown by the wealth of its flora, point it out as eminently fitted as being the training ground of our School of Forestry. All but three of the eight woods I mentioned as the chief marketable woods of the State already grow there naturally; and the other three, with perhaps the exception of iron-bark, would probably grow if proper conditions were observed. In fact the experimental observation of what would grow, and what would not, and what conditions had to be observed, would form most useful object lessons in the course of study and practical work both with regard to native trees and to attempts to introduce European, American, and other pines and hardwoods. The scientific and technical education of the higher grades of the conservancy officers could be easily arranged for, and the results of the manual and technical training of the lower grades of forest guards should more than pay for such training when carried on so near to such a market as Hobart. But apart from this, the occupation of the mountain for this purpose would greatly add to its value in all respects, and the training could be easily and continuously supervised so as to insure an early supply of the officers required for the whole State. I am convinced that this is the best, the easiest, and the most economical method of properly inaugurating a system of forest conservancy on the State.

I need not expatiate on the necessity of taking early means of establishing this system. Forestry, like agriculture, deserves every encouragement, for like agriculture it adds, when properly carried on, to the wealth of the soil on which it is exercised by continually renewing its fertility, whereas mining, though productive of immediate large returns, permanently impoverishes the ground by taking out its wealth once for all. In a young community of course mining is encouraged, so that money may be earned, and become available in a short time. The timber treasure of the State has for the same reason been worked on the same lines as the mineral wealth—it has been allowed to be worked out without making any provision for its renewal, though such renewal is as practicable in regard to timber as it is impossible in regard to minerals. It is true that the land from which trees have been removed is sometimes improved by the removal, and fitted for other purposes; but it is rarely so in the case of land leased for saw-milling purposes, and on which felling and splitting licences are valid; for such land is usually left so encumbered with

rubbish and tree stumps and so quickly overgrown with scrub as to be more difficult and costly to clear than when in primeval forest.

It is time that a new policy in regard to this matter should be adopted, or at least that a new system should be introduced to supplement the present one. The rate at which our available forests have disappeared and are disappearing is great, and continually becoming greater. As nearly as I can estimate from the replies received to my enquiries, from 70,000,000 to 100,000,000 square feet of sawn timber are produced yearly in the State, of which about one-tenth is exported. What the quantity is of unsawn and hand-sawn timber, timber used for mining, fencing, splitting, and such like purposes, wasted by splitters and burnt by bush fires, it is almost impossible to guess, quite impossible to estimate; five or six times the quantity sawn is probably far below the real quantity. So it is quite time to arrange how we are going to supply such a consumption from our available sources—that is, from accessible sources; for there are millions of acres no more accessible at present than if they were in the moon. On the other hand, there are evident signs that if we wish to secure any important share in the markets of continental Australia, and South Africa and England, we must be ready not only with an assuredsupply of marketable timber, but with one of properly seasoned timber. It behoves us, therefore, to prepare for action. The best preparation we can make consists in organising measures, one of the chief of which will be forest conservation. In adopting this we may dismiss all misgiving by the knowledge of the fact that no country which has adopted it has ever regretted its adoption.

NOTE ON ITACOLUMITE OR FLEXIBLE SANDSTONE.

By E. G. Hogg, M.A.

A.

The existence of flexible sandstone appears to have been known of since 1780, when specimens were brought to Europe from Brazil by the Marquis of Lavradio, Viceroy of Rio de Janeiro. The bed-rock in which the flexible sandstone occurs was found by Von Eschwege to be largely developed near Mt. Itacolumi in the State of Villa Rica, Province of Mina Garaes, Brazil, and is described by him as a fissile sandstone containing plates of talc, chlorite, and mica. This rock contains a little gold, and has been shown by Heusser and Claraz to be the parent source of the Brazilian diamond. The beds generally rest on the crystalline schists and frequently pass into conglomerates. According to Fr. Hartt (Geology and Physical Geography of Brazil, 1870) the bed-rock is probably an altered Lower Silurian formation, while Prof. O. A. Derby classes it as of Huronian age. In this bed-rock the flexible sandstone occurs in some abundance; it is distributed in such a manner as to point strongly to the conclusion that the sandstone is only flexible when it has been considerably metamorphosed. Professor Derby* states that on one side of a fissure the rock may be often found without any trace of flexibility, while on the other it is laminated and flexible. He concludes that flexibility is not an original characteristic of the rock, but is a "phase of weathering" or decay brought about by percolating waters.

Mr. R. D. Oldham, F.G.S., Director of the Indian Geological Survey, † has discussed at some length the occurrence of flexible sandstone at Kaliana, near Dadri in Jhind. [It is probable that the specimen exhibited by the Lord Bishop of Tasmania came from this locality.] Mr. Oldham states: "at Kaliána the flexible stone occurs on a hill composed of vertically bedded glassy quartzites: it is confined so far as my investigations and enquiries went, to one single spot where, for about 20 feet across the strike, and for about 30 yards along it, the rock has become flexible; near the margin of this area the flexible stone passes downwards into the ordinary quartzites, but in the centre the decomposition had extended downwards to the floor of the quarry, a depth of fully 15 feet; here, too, the rock was much softer, more decomposed and flexible than near the margin."

* Amer Journal of Science, Vol. XXIII. (1884), pp. 203, etc.

† Records of the Geological Survery of India, Vol. XXII, Part I, pp. 51, etc.

This view of the connection between the decomposition and flexibility of the sandstone is, to a certain extent, borne out by Mr. Tuomey in his Report on the Geology of S. Carolina. He observes that the itacolumite of that state "passes even in the same mass into compact quartz, to be distinguished from common quartz only by its stratified structure," and that "the passage from the arenaceous to the compact variety is gradual, and it is in this passage that it assumes the form of itacolumite" (flexible sandstone).

It must be noticed that the term itacolumite has two different significations; it is with some writers "flexible sandstone," with others the bed-rock in which "flexible sandstone" occurs.

It would appear that so far as the field relations are concerned—though more evidence on this point is much to be desired—itacolumite only becomes flexible when it has undergone a certain amount of decomposition, probably due either to weathering, or to the percolation of water or other solvent. Such weathering or solvent action may remove, either *in toto* or in part, certain of the original constituents of the rock. Of course, as a result of chemical combination, these constituents may be replaced, to a more or less extent, by other bodies.

It is worth noticing that so far as our knowledge on the subject goes, flexible sandstone only occurs in metamorphosed deposits, which are undoubtedly of very ancient origin.

B.

In this section of the note I must acknowledge how much I am indebted to the paper of Mr. Oldham, previously referred to. I now propose to give a digest, mainly drawn from Mr. Oldham's paper, of two theories brought forward to explain the peculiar properties possessed by flexible sandstone.

It seems best to refer to the generally accepted theory, *i.e.*, the theory found in recent times in many extensively purchased treatises and manuals on geology. This theory would ascribe the flexibility of itacolumitic sandstone to the talc, chlorite, and mica stated to occur in it. It is only fair to notice that the partisans of this older view were unacquainted with the modern methods of petrological analysis. This older view of the cause of flexibility can be traced to Von Eschwege, to whom is due the fanciful name of itacolumite. But apart from the difficulties depending on the physical properties—in the matter of elasticity—of mica, it appears quite clear from Mr. Oldham's paper that flexibility is exhibited by the itacolumite, even when mica is absent, or is quite subsidiary. If the cause of the flexibility lie in the presence in the slab of flakes of mica, chlorite or talc, whose planes are parallel to those of the laminations of the slab, it is diffi-

cult indeed to see how to account for the stretching of the slab when tension, and its compression when pressure, is applied. I have recently been able to examine a specimen of flexible sandstone in the possession of Mr. T. S. Hall, M.A., Acting-Professor of Biology in the University of Melbourne, and in this specimen both of the phenomena of extension and compression are present. After all, if the rock shows flexibility when mica, chlorite and talc are either entirely absent, or are quite subsidiary, it seems quite clear that the older theory must be abandoned.

The theory with which we have now to deal is, I believe, the one usually accepted amongst modern geologists. Though not without its own difficulties it is in many ways more convincing than the one due to Von Eschwege.

Mr. Oldham's view, as stated in his own words, is that: "the flexibility of the rock is due, not to the flexibility of any of its constituents, but to some peculiarity in the mode of aggregation of the individual grains of quartz and other material of which it is composed." A similar idea was put forward by Klaproth § as far back as 1785, and at a later date by the Rev. Dr. Haughton, F.R.S.

Mr. Oldham appears to have carefully examined the rock in thin microscopical slides. As a result of his labours, he states: "If a slice of flexible sandstone is examined under the microscope, by reflected light, it exhibits a structure most conspicuous in all the specimens of flexible, and equally conspicuous by its absence from all specimens of non-flexible, stone I have examined. The rock consists of irregular aggregates of grains of quartz separated from each other by fissures and crevices which extend deep into the stone and give one the impression of ramifying through its mass further than they can be actually traced. Should one of these aggregates of quartz grains be touched with a needle it will be found loose and easily moveable from side to side, but it cannot be displaced without fracture, either of itself or of the surrounding particles. In fact the rock consists of a number of irregular aggregates of quartz which hold together by projections on one fitting into hollows in another, while the clear space between them allows of a certain amount of play."

Mr. Oldham gives two plates supporting his view of the structure of the rock. Mr. Oldham then proceeds in development of his theory as follows:—"In the Kaliána rock there is, besides the quartz and accessory minerals, a certain proportion of felspathic paste, more conspicuous in sections cut transverse, than in those cut parallel to the bedding. This paste does not surround the individual grains of quartz, but occupies spaces between aggregates of grains, and it is

§ Schrift Berl. Ges. Natfur. Freunde VI., 322 (1785).

to the decomposition and removal of this paste that the flexibility of some specimens is due. In such a rock the development of a flexible structure depends on the proportion and mode of distribution of the felspathic mud."

I have, I think, stated the essentials of Mr. Oldham's theory, viz., the peculiar mode of aggregation of the quartz grains, and the removal of a certain proportion of the "felspathic mud" in which, to a more or less extent, the quartz grains are included. The partial removal of this enveloping mud creates free spaces which the quartz grains may occupy when stress is applied to the surface of the slab.

A theory, apparently identical with that of Mr. Oldham, was put forward in 1887 by Herr O. Mügge.||

Through the kindness of Mr. Morton, secretary of this Society, I recently secured a small piece of flexible sandstone, believed by Mr. Morton to have been brought from India. In external appearance it does not differ appreciably from the specimen exhibited by the Lord Bishop this evening. The microscopic slides prepared show that the rock consists mainly of quartz grains which had suffered little attrition before deposition. Biotite and muscovite are both present, but from their feeble development they can hardly be regarded as a main cause of the flexibility of the stone. In addition the slide shows the occurrence, in fair quantity, of a matrix of isotropic character containing much included matter. The inclusions are, for the most part, quartz grains of microscopic dimensions and a small amount of opaque matter, the nature of which I have failed to determine. This opaque matter is, however, so subsidiary, as to suggest that it does not play any part in the explanation of the flexible nature of the rock.

The slides appear to me to clearly show that part of the paste originally enclosing the un-and sub-rounded grains of quartz has been removed. The slides do not throw any light on the interlocking structure of the quartz on which Mr. Oldham's theory largely depends. This negative result is possibly due to the fact that my slides were not cut in the direction required to show up to advantage the interlocking structure, and the small piece of sandstone in my possession did not admit of the preparation of many slides. On consideration it does not appear clear that the "interlocking" of the quartz is the fundamental point in any theory brought forward to explain "flexible sandstone" It would seem rather that a *vera causa* is to be found in the partial removal of the matrix, whereby the quartz grains have free play to move when the slab is stressed in any manner. As regards the origin of an interlocking structure in the quartz Mr. Oldham is silent, and indeed any theory to explain this

|| Neu. Jahrb. I Band., 1887, pp. 195-7.

difficulty is very hard to formulate. Mr. Oldham, it is only fair to say, attributes much weight to the removal of the matrix in a suitable proportion. I cannot do better than again quote from his paper. "The development of a flexible structure depends on the proportion and mode of distribution of the felspathic mud; if absent or only present in very small proportion, decomposition will not extend deep into the rock, the quartz grains will be detached and fall off, leaving the undecomposed rock with a mere film of weathered stuff on the surface; if it is too evenly distributed, the quartz grains will not be in sufficiently intimate contact with each other, and as the rock weathers it will decompose into grains of sand easily detached and removed; if finally it should be suitably distributed, but too large in amount, the voids left by its removal will be so large that the quartz aggregates will not interlock with each other."

Mr. Oldham goes on to state, "the number of conditions which must be fulfilled satisfactorily accounts for the rarity of flexible sandstone, and to a certain extent for the capriciousness of its distribution in rocks which are of the same age and have, to all appearance, the same composition and structure."

With this statement of Mr. Oldham I am quite in accord; the removal of the matrix in just a suitable proportion seems necessary. With regard to the isotropic matrix, it would appear that we have to look to a double metamorphism. The rock was, we will assume, a normal sandstone initially; intense heat may have led to a partial fusion whereby the external surfaces of the quartz grains may have been transformed into a glassy material; at a later date solvent action may have removed this matrix in such suitable proportion as to give flexibility without disintegration. This is, of course, mere hypothesis, but the importance of explaining the isotropic base of the rock is at least as serious as the interlocking structure of the quartz.

Mr. Oldham, in support of his view, attaches much importance to the appearances presented by the flexible sandstone near Chárli, south of the Pemganga River in Berar. He states "it is an ordinary soft sandstone of rounded grains of quartz with a little felspar, held together by a cement of carbonate of lime, which forms 35·9 per cent. of the whole mass. Here there is no comparatively soluble material whose removal leaves the rest of the rock as a mass of irregular aggregates interlocking with each other, for on removal of the cement by solution, the rock falls into sand. But if the fractured surface of the rock is examined, an abundance of sheeny patches point to a crystallisation of the cementing matrix, and these planes afford a number of planes along which solution proceeds with greater rapidity than elsewhere, and as a result

the rock becomes divided into irregular aggregates of sand and calcite."

It seems to me that the sample of the Chárli sandstone needs much consideration before it can be regarded as a real support to Mr. Oldham's views as to the flexibility of the Kaliána rock. The difference between the two cases is fairly obvious; in the Kaliána stone the quartz grains interlock, and the matrix is partially removed; in the Chárli rock the interlocking takes place not between the quartz grains, but between the facets of the crystals of calcite forming the base. The two explanations have, however, an important feature in common, viz., the occurrence of free cavities which may ramify into the rock in all directions.

In this context it may be well to mention the occurrence of flexibility in a rock which is not sandstone. Mr. G. W. Card * in 1892, drew attention to a flexible limestone of Permian age developed at Marsden, in the County of Durham, and at a point south of Sunderland. The rock is very finely laminated, is very soft and friable, and in general appearance not unlike a fine-grained sandstone It appears (according to Sedgwick) to have resulted chemically from deposition in successive layers.

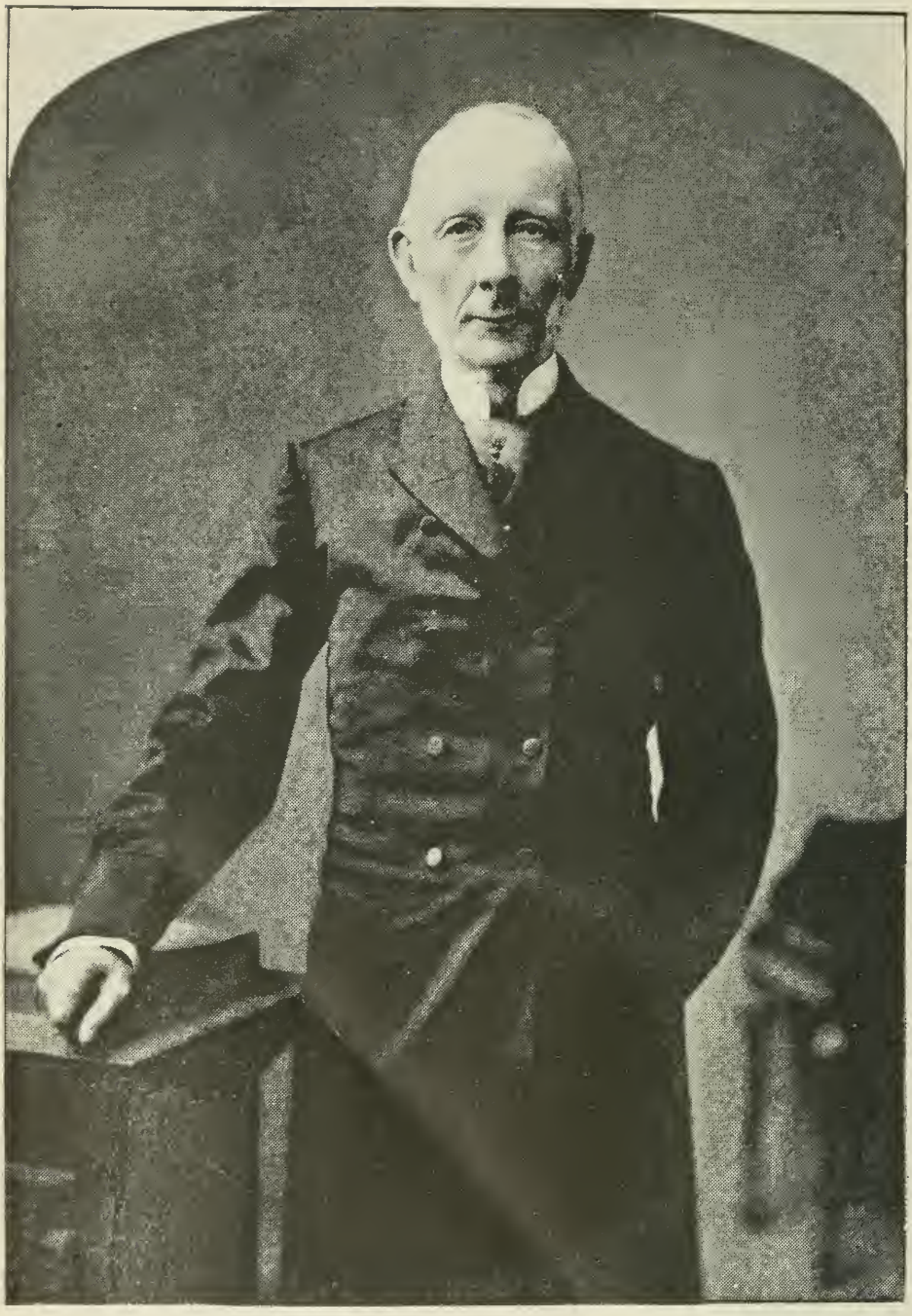
From sections prepared for the microscope it would appear that a low power reveals a large number of irregularly shaped empty spaces, in the main ranged linearly in directions parallel to the bedding, but also occurring promiscuously through the section. The material of the slide is mainly an aggregate of grains of dolomite, with a very few grains of quartz and specks of blue and brown material. Mica is very rarely present. The larger grains of dolomite appear to be intergrown in such a way that the convexity of one fits into the concavity of another. As a cause of flexibility, Mr. Card suggests: In the first place room for internal movement is provided for by the abundance of empty spaces, and in the second the structure revealed by high magnifying power suggests the possibility that many of the grains are interlocked in such a manner as to permit of a certain amount of movement upon one another. Owing, however, to the small size of the grains, Mr. Card was unable to demonstrate whether the grains actually possessed such power of movement or not.

Mr. Card's paper is of the greatest interest; the rock it describes differs much both in point of age, composition, and mode of origin, from Mr. Oldham's flexible rocks; again, the reality of the interlocking structure is far from certain, while the existence of cavities allowing free play of molecular movement seems well established.

* Geol. Mag. (3) IX., 1892, pp. 117, etc.

The instances I have cited may now be summed up. The Kaliána rock shows (?) interlocking structure of quartz with removal of matrix ; the Chárli rock shows cavities with possible interlocked structure of matrix. The rocks described by Mr. Card show cavities with possible interlocking of main material of rock (dolomite).

It would appear from these results that interlocking is often doubtful, and in the main subsidiary ; that flexibility depends on (1) the nature of the matrix ; (2) the removal of such matrix in suitable proportion, as set forth by Mr. Oldham, so as to allow of free movement of the other constituents of the rock.



SIR JAMES AGNEW, K.C.M.G., M.D., M.E.C.

Obituary.

Sir James Wilson Agnew, K.C.M.G., M.D., M.E.C., Senior Vice-President of the Royal Society of Tasmania. Died on 8th November, 1901, in the 87th year of his age.—Born at Ballyclare, Ireland, on the 2nd October, 1815, he studied for the medical profession in London and Paris, and at Glasgow, where he graduated M.D., as his father and grandfather had done before him, and came to Australia in 1839. After a short stay in New South Wales and Victoria (then known as Port Phillip), he accepted from Sir John Franklin the offer of appointment as medical officer to an important station at Tasman's Peninsula, where he devoted the greater part of his leisure time to the study of natural history. Prior to his removal to Hobart for the more extended practice of his profession, in which he subsequently attained a position of acknowledged eminence, he had assisted in founding the Tasmanian Society, and he became an active member of the Royal Society, into which the former Society merged in 1844. Shortly after the retirement of Dr. Milligan, its Secretary and Curator, in 1860, he undertook the duties of Secretary as a labour of love, in order that the whole of the limited amount available out of income might be appropriated as salary for the Curator of the Museum. From that time onwards, except during occasional periods of absence from Tasmania, he continued to act as chief executive officer of the Royal Society in the capacity of Honorary Secretary for many years, and latterly in that of Chairman of the Council; and to the admirable manner in which those self-imposed duties were discharged,

the records of the Society will bear enduring testimony for those who were not personally cognisant of his work. As far back as 1843 he contributed to the original Society an exhaustive account of the structure, habits, and venomous properties of Tasmanian snakes. This was followed in 1864 by a paper "On the Poison of Venomous Snakes," which, after describing in detail some of his experimental researches, gives full directions for the necessary remedial treatment in cases of snake-bite, and is still a standard authority on the subject.

It is not by the number of papers appearing in the journals that the value of the services of such a man is to be gauged. A glance through the records of the Royal Society will show that he was ever on the look out for opportunities of promoting its work in the cause of Science, and in the public interest. He took an active part in the various projects for acclimatising the Salmonidæ in Tasmania, and defrayed the whole cost of the last importation of salmon ova from the mother-country, which was carried out with complete success, a cordial vote of thanks being accorded to him on the occasion by both Houses of Parliament. This, however, was only one of many instances of his liberal support of public enterprises which he deemed deserving of encouragement, and as to those with which he was more directly connected, the Library of the Royal Society, as well as the Tasmanian Museum and Art Gallery, will for all time bear witness to his generous benefactions to those institutions. He was not a politician in the ordinary sense of the term, but was a valued Member of the Legislative Council for many years, and held office without portfolio in various Ministries up to 1886, when, as Premier and Chief Secretary he took an active part in the re-organisation of the Department of Education and other business of great public importance. He was created K.C.M.G. in 1894.

But it is not only for such qualities as were evidenced in his public life, or in the practice of his profession, that the memory of Sir James Agnew will be held in affectionate remembrance. Of his private benevolence, and of his readiness to help any institution or enterprise that appealed to his sympathy, there can be no official record. Nor is it possible, even for those who knew him best, to give any adequate description of the versatility of his genius, which enabled him to take a keen and intelligent interest in everything that came in his way, from the translation of an Ode of Horace, or some literary criticism, to the discussion of *arcana* connected with his own profession, or the latest discoveries in mechanical and electrical engineering. This active interest in everything that concerned humanity continued throughout his life, and his faculties happily remained unclouded to the end.

> "He had reaped
> The harvest of his days, and fell asleep
> Amid their garnered sheaves."

Richard Stonhewer Bright, M.R.C.S., E., L.M., L.S.A. Died 28th October, 1901.—Born at South Audley-street, London, in 1835, he was educated at Christ's Hospital and King's College, and, following in the steps of his father, took up the study of the medical profession, and qualified for membership of the Royal College of Surgeons in 1857. Commencing his professional career on his arrival in Tasmania in 1858, he continued in active practice until his death, having been for 41 years Honorary Surgeon at the

General Hospital, Hobart. At the Intercolonial Medical Congress, held at Brisbane in 1900, he was unanimously elected President of the Congress to be held at Hobart in 1902, an honour which he did not live to enjoy.

Dr. Bright was an old and valued member of the Royal Society of Tasmania, having been elected Fellow in 1865, and a member of the Council in 1897. He was also President of the Medical Section of the Royal Society.

Hon. Charles Henry Grant. Assoc. M. Inst. C.E., M.E.C. Died 30th September, 1901, in the 70th year of his age.—Born at Great Marlow, Buckinghamshire, England, on the 9th November, 1831, he was educated at King's College, London, where he achieved distinction in mathematical studies, and he subsequently gained large experience in Telegraphy and Railway Engineering, both in England and in Canada. He came to Tasmania in 1872 to superintend the construction of the Main Line of Railway between Hobart and Launceston, of which he acted as General Manager until the line became the property of the State in 1890. He was elected a member of the Legislative Council in 1892, was a leading member of many public institutions, and was one of the representatives of Tasmania at the Federal Convention held in Adelaide, Sydney, and Melbourne in 1897-8. He was elected Fellow of the Royal Society of Tasmania in 1872, and a member of the Council in 1880, and was one of the original Trustees of the Tasmanian Museum and Botanical Gardens, taking an active and conspicuous share in all the duties which thus devolved upon him.

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CONTENTS.

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