TRANSACTIONS

OF THE

PHILOSOPHICAL INSTITUTE

OF

VICTORIA,

FROM JANUARY TO DECEMBER, 1857, INCLUSIVE.

VOL. II.

Edited for the Council of the Institute by

JOHN MACADAM, M.D., HON. SEC.

Melbourne.

1858.

TRANSACTIONS

OF THE

Philosophical Society of Victoria,

Including the Papers and Proceedings of the Society.

VOL. I.—8vo, pp. 290,—*with Plates and Plans, Price ONE GUINEA.*

CONTENTS:

MELBOURNE:

JAMES J. BLUNDELL & Co., 44 Collins Street West.

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ERRATA.—Sixth line from bottom of page xx of "Proceedings," for "two," read *five* saddle horses.

TRANSACTIONS

OF THE

Philosophical Institute of Victoria.

Art. I.—*On a New Form of Propeller for Steam Ships.* By David E. Wilkie, M.D.

[Read before the Institute, 4th February, 1857.

Not more than forty years have elapsed since steam power was first successfully applied to the propulsion of ships by means of paddle wheels, and, ever since that time, paddle wheels, with a few modifications in their construction, have continued to maintain their ground, notwithstanding the numerous inventions that have been proposed as a substitute. The most important of these inventions is the screw, which was successfully brought into use in 1836 through the exertions of Capt. Ericcson and Mr. J. P. Smith.

With the experience of twenty years the screw has undergone several important improvements,—the most practically valuable of which appears to be that of Mr. Robert Griffiths, which furnishes a simple means of altering the pitch of the blades, according to the velocity and the resistance. This new form of screw has also the advantage of acting equally well reversely, so that, in this respect, the screw and the paddle wheels are very nearly equal.

I shall not occupy your time with discussing the advantages and disadvantages of these two methods of propulsion; but it is necessary to state, shortly, the facts that have been ascertained respecting their efficiency, and the reasons that have led scientific men to devote their attention to the discovery of some new and better method of propulsion.

The paddle wheels act on the surface of the water where there is least resistance, and are liable to great irregularity of action in a rough sea. There is, in consequence, a considerable slip, or loss of velocity. The oblique action of the floats on the water also involves a loss of power.

The indirect transmission of power from the piston to the paddle wheels through a ponderous crank engine involves an additional loss of power.

The paddle wheels also act to great disadvantage when the vessel is either too heavily, or too lightly freighted.

It has been estimated in a recent article in the *New York Commercial Gazette* that of the actual motive-power of the Collins steamers, not more than one-half is available in their speed.

The screw also has many serious defects, and notwithstanding the great efforts that have been made to remove them it has hitherto proved inferior to the paddle wheels, especially when great velocity is required, or when there is great resistance to be overcome—as in head winds; and it has, therefore, been chiefly used as an auxiliary in full-rigged ships and men-of-war.

The screw has the advantage of working in deep water, where there is increased resistance; but its oblique action on the water is its great source of weakness, and is one of those difficulties which cannot by any possible means be remedied.

If we look to Nature as our guide, and take the feet of swimming birds, and the fins of fishes, as our model, we shall see that a perfect propeller should act wholly under water, as the screw, but, unlike the screw, the blades, or floats, of the propeller should act at right angles to the water.

The problem to be solved, therefore, is to discover some simple and effectual means of feathering the floats of a propeller under water without loss of power, and of reversing their action when backward motion is required.

Here it will, perhaps, be impossible in every respect to imitate the natural propellers of swimming birds and fishes, and especially that power which they possess of lessening the surface and resistance of their propellers in the act of feathering them; but let the attempt, at least, be made to imitate this natural action as far as possible, and if it should be found that there is necessarily some loss of power in feathering the floats, under the most favourable conditions, this will at least admit of being greatly diminished by lengthening the stroke, and thus diminishing the frequency of the feathering. A perfect propeller should also admit of being connected directly to the piston-rod of the steam cylinder, so as to avoid the loss of power necessarily resulting from a heavy crank engine.

This simple arrangement, however, would necessarily depend on a much greater speed of piston than that already attained.

A perfect propeller should also, when in action, have very little slip in the water, and when not in use it should either be capable of being readily lifted out of the water, or it should offer no impediment to the motion of the ship under canvas. Such are the necessary conditions, as it appears to me, that we are to look for in any form of propeller that is likely to offer superior advantages to the paddle wheels and screw.

These conditions, I think, will be readily admitted to be theoretically essential, although it may be alleged that the inventive genius of scientific men has already been taxed to the utmost to discover such a form of propeller without success.

But are we, on this account, to despair of all further improvement in our modes of propulsion? If it is true that one-half, or a larger per centage, of the steam power in marine engines is lost, or unavailable, in its application to the paddle wheels, and that the screw for purposes of speed is in no respect superior to the paddle wheels, is it at all likely, with these means of propulsion, that we shall ever obtain a velocity commensurate with the requirements of modern civilization?

Can we allow ourselves to believe that there is the same lavish waste of power in the mechanism which Nature has provided for the rapid movement of aquatic birds and fishes in their native element?

Past experience would seem to show that the larger the vessel the less is the proportionate resistance with the same lines and proportion of beam, and the greater the velocity with the same proportion of propelling power.

Unless, therefore, we are prepared to maintain that the propelling power in fishes is much greater, in proportion to their size, than is required in steam ships to obtain the same velocity, it is correct to infer that the propelling fins of fishes act much more effectively, and with less loss of power, than the paddle wheels and screw.

If, therefore, we assume that there is no such loss of power in Nature's machinery, surely we shall admit that by imitating Nature more closely than we have hitherto done we may yet succeed in discovering a mode of propulsion of greater power, and of more simple application, than the existing modes.

I cannot but hope that there is a wide field yet open for improvement in marine propulsion, and that modern science will yet develop more simple and effective means of obtaining a greatly increased velocity in steam navigation.

In accomplishing this desirable end, much remains to be done in improving the form and construction of ships themselves, and in thus lessening their resistance to the water; but it is no less true that a great increase of velocity would result from an improved mode of propulsion, by which the present waste of steam power would be avoided, and by which the whole power employed would be rendered effective for direct propulsion.

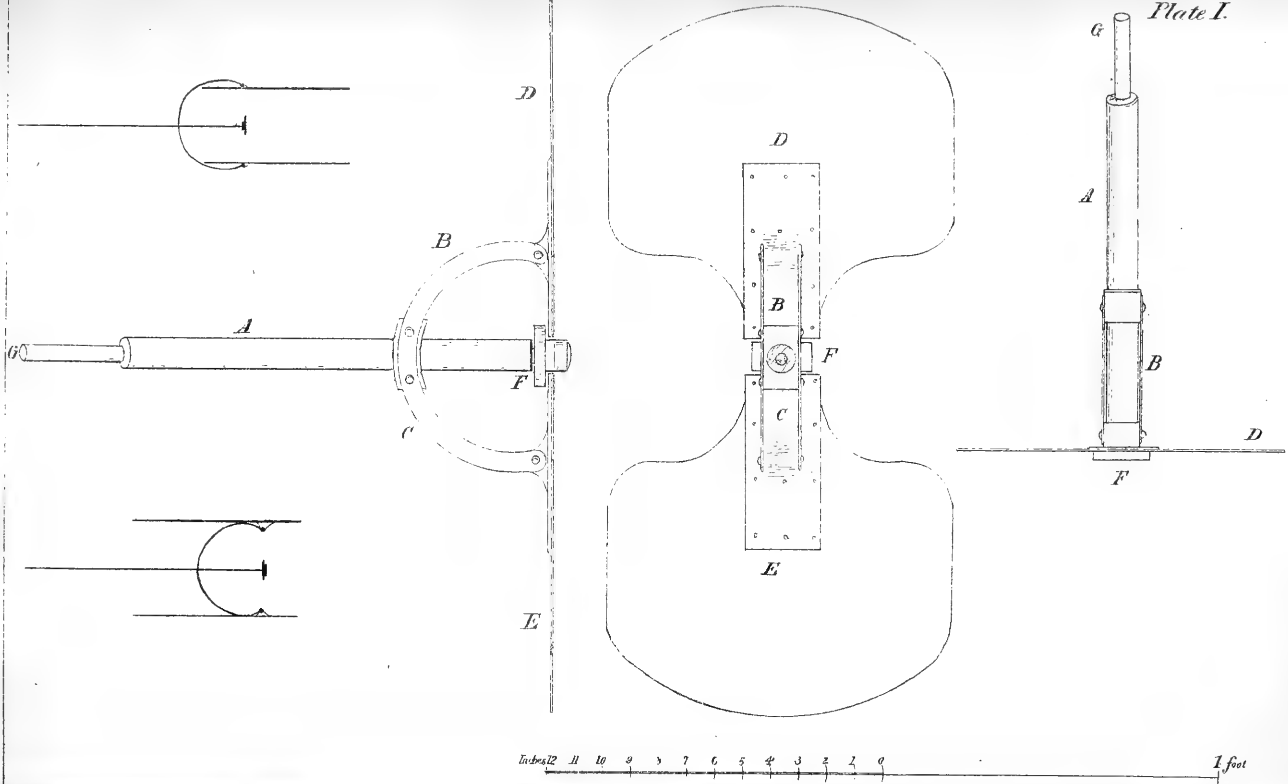
It had long occurred to me that some more effective mechanism than the paddle wheels or screw might yet be discovered; but it was only a few months since that I accidentally directed my attention to the subject, and it is with some diffidence that I now venture to bring under the notice of the Institute the model of a propeller upon a new principle, and whose object is to fulfil, as far as possible, the conditions which I have specified.

If the principle of its action is correct, and if it shall be found to possess any advantages over the paddle wheels, or the screw, I shall be glad to think that I have contributed to the advancement of practical science.

If, on the other hand, it shall be found to be unavailable, or inferior to other existing modes of propulsion, I shall, at all events, not regret that I have devoted some attention to a subject so interesting in a scientific point of view, and so important to the future commerce of the world.

The construction of this propeller is very simple, and easily understood, and, whatever may be the result of its practical application, I am not without hope that, in the principle of its action, you will find that it approaches very nearly to the conditions which were stated theoretically to belong to a perfect propeller.

Plate I.



Description of the Propeller (see plate).—The propeller consists of a shaft, *A*, with two arms, *B*, *C*, and two floats, *D*, *E*. The shaft is hollow, and, in the model, consists of an iron tube of one inch diameter, and five feet long; the two arms are fixed on the shaft near its extremity, in the form of a semicircle, with the concavity outwards, and they terminate three inches from the shaft, in a hinge point, to which the floats are attached. The floats consist of thin sheet iron, and are of an oblong shape, being 9 inches in length, and 12 inches in breadth. They are rounded or semicircular at the extreme end, and more rectangular at the opposite end, where they are hinged to the arms. From the hinge to the shaft there is a narrow projecting part, which rests on the shoulder *F* when the propeller is in action. From the construction of the joint the floats have an extensive motion, permitting them to feather either for forward or backward motion. The shoulder *F* is of brass, and being double, presents the form of a cross, and is fitted into the extremity of the shaft by a screw, at the same time this brass shoulder is connected to a smaller iron tube inside the shaft. This arrangement is for the purpose of turning the brass shoulder, and this is effected by means of the handle *G*, at the opposite end of the shaft, where there is also a stop, by which its motion is limited to a quarter of a circle. The shoulder in one position secures the floats for forward motion, and in the other position for backward motion. In forward motion, if the shoulder is turned while the floats are resting on it, their action becomes reversed in the return stroke, and in the same way in backward motion, if the shoulder is turned while the floats are resting on it, the backward motion becomes changed to forward motion.

To obtain uniformity of motion it will, under any circumstances, be necessary to have two propellers.

In large vessels it is proposed that the shafts of the propellers should work in the dead wood in front of the sternpost, and that the dead wood should be extended to the length of the stroke of the propellers, two horizontal spaces, *E* and *F*, being prepared for their reception, and provided with guides above and below, the floats, on either side of the dead wood, working free of the ship.

The shafts being thus secured, it is considered that the propellers will be very little liable to be affected by heavy seas, probably much less than the paddles or screw.

The propellers may be worked by two levers, and either one or two cylinders, as represented in Plate II.

Length of stroke being essential for speed the levers must be proportionably long, but it is also necessary to multiply the speed of the piston by attaching the connecting-rod to the levers proportionably near to the fulcrum.

a b and *c d* represent the levers, *a* and *c* being the fulcra on which they move. The lever *a b* is extended to *i* for the purpose of connecting the action of the two cylinders, and concentrating the power of both cylinders upon each propeller alternately, by means of the connecting-rod *i k*. *g* and *h* represent the cylinders, and *d e* and *b f* the propellers.

For the purpose of reversing the action of the propellers a moveable inclined plane will be fixed at each end of the stroke of the shaft within the ship, and when it is required to reverse the action the inclined plane will be placed in position to raise the projecting lever attached to the inner tube of the shaft. The rotation of the shoulder will thus be rapidly effected at the proper time without stopping the piston.

The first requirement in steam propulsion is speed, and at first sight the propeller which I have just described may seem only suited for low rates of velocity.

In low-pressure marine engines the speed of the piston averages about 250 feet per minute. Any required speed in the propeller, however, could be obtained by means of levers, as shown above.

But to obtain very high rates of speed with this propeller, or indeed with any other method of propulsion, it will be necessary to adopt high-pressure steam in marine engines.

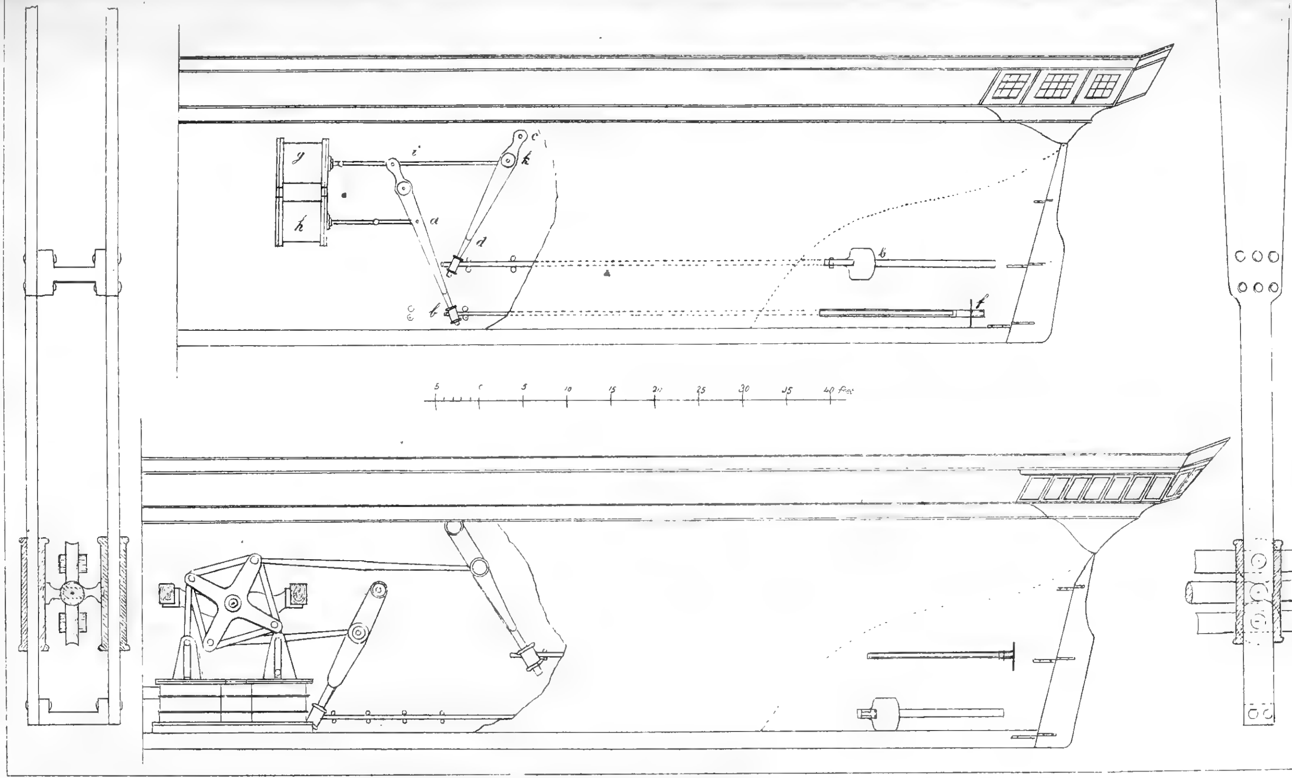
Hitherto steam vessels have been built, not exclusively for speed, but rather with the view of combining speed with carrying power.

For the purposes of modern mail communication speed ought to be almost exclusively aimed at, and when ships are built on this principle it will be necessary to abandon the ponderous low-pressure or condensing engines, and to adopt light high-pressure engines, similar in principle to those found so effective in locomotives on railways.

The greater speed of the piston in high-pressure engines, which reaches 500 feet per minute, would add greatly to the efficacy and speed of this propeller.

In applying steam power to give motion to the paddle wheels and screw, it is necessary to convert the reciprocating motion of the piston into a continuous rotatory motion, which is effected by means of the crank, and in direct-acting engines

Plate II.



velocity is obtained by shortening the crank and the stroke of the piston and thereby increasing the number of strokes and revolutions of the engine. But this shortening of the crank greatly increases the friction and consequent loss of power. If the velocity of the piston could be increased to any required rate it would simply be necessary to connect the piston-rod to the shaft of this propeller, and the whole force of the steam would thus be available for direct propulsion, without parallel motion, levers, or other gearing, and an immense saving would be effected in the weight of the engines. In the *Terrible* steam frigate of 1847 tons, and 800 horse-power, the contract weight of the engines was 212 tons, and the weight of the paddle wheels 44 tons.

There seems to me no sufficient reason why the present speed of the piston should not be greatly increased. If a great object is to be gained by an increased speed, a corresponding effort must be made to surmount the difficulties that may interpose, and there is no doubt, I think, that a greatly increased speed could be obtained by lengthening the cylinder, and using high pressure steam.

Until this is accomplished it will be necessary to multiply the velocity of the piston by means of levers, and to prevent any loss of power from the reciprocating motion of the levers, by means of the equalising air cylinder. The science of hydraulics in its application to propulsion is confessedly difficult to be understood, and no theory will be accepted as the present time that is not amply supported by experimental proof. Experiments properly conducted for testing the capablities of this propeller, and its comparative value, would involve a large expenditure of time and money, and I have therefore no experimental proof at present to offer in support of its alleged advantages. But the principle on which it is constructed is so obvious, and its construction is so simple, that careful theoretical deductions with regard to its practical application are not likely to deviate much from the truth.

In the position where the propeller is intended to work, the water will have a slight retrograde motion, partly induced by the action of the propeller, and partly by the collapse of the water in the wake of the ship when in motion.

At the commencement of each stroke, the floats will rapidly expand until they come to rest on the shoulder attached to the shaft, in which position the floats will be at right angles to the course of the ship, and will present the whole of their surface in the most favourable position for acting against the water, and will so continue to the end of the stroke. However rapid the movement of the propeller, a certain time is required for the floats to get into this position, and therefore, especially if the floats have a large surface, there will be a slip, amounting probably in extreme cases to one foot, which it will be, perhaps, impossible to prevent; at the end of the stroke, when the action of the propeller in the water ceases, the floats will be rapidly feathered by the forward movement of the ship. In the act of feathering there will be a certain resistance and loss of power from the sudden lateral displacement of the water, caused by the rotation of the floats upon their axes.

The projecting neck of each float will be thrown forward, but, as it is very narrow, and may be made still more so than shown in the model, this portion of the float will offer no resistance of any consequence.

The only loss of power, therefore, will arise from the backward and lateral movement of the body of the float.

The backward movement of the float will rapidly take place at the end of the stroke, and before the commencement of the return stroke, the fixed extremity of the float being carried forward by the motion of the ship, while the free extremity is left behind.

The float therefore will turn on its centre, the water being displaced partly forward and partly backward. A certain loss of power must result from this displacement which it would be difficult to estimate, but from the rapidity of the movement, and the extremity of the float being left unrestrained in its motion, it is difficult to see how the resistance could be great.

During the lateral movement of the float the return stroke of the piston will begin to operate on it, and the act of feathering will be completed in a gradual manner during its rapid forward movement. The extent therefore of the lateral movement of the float will not correctly express the amount of displacement or the actual loss of power, the float being drawn obliquely rather than forced laterally into its position parallel with the shaft. Thus the actual lateral displacement of the water will be practically very much modified and diminished.

In theory, therefore, the loss of power in feathering the floats would appear to be very small, and in a length of stroke of ten feet could scarcely exceed one foot, and supposing one tenth part of the stroke of the propeller to be ineffectual for propulsion, it does not follow that ten per cent. of the steam power is lost, unless there are very heavy engines to be kept in motion. If the floats are not instantly brought into position at the commencement of the stroke, it is because the steam cannot instantly re-enter the cylinder with sufficient rapidity to exert its full power on the piston, and if the power is not exerted it cannot be said to be lost.

A propeller on a new principle must necessarily require important modifications in the construction both of ships and machinery, and if this new propeller should be found to possess any advantages over the paddle wheels and screw, it ought not to be objected that its adoption would render such modifications necessary.

The principal alterations required would be a greater length in the dead wood under the stern, with finer lines in the run, and a greater length of cylinder, with increased speed of piston. A stroke of piston of eight, ten, or twelve feet, with a corresponding increase in the velocity of the piston, would suffice for all purposes of speed.

Great length and fine lines have added greatly to the speed of our modern clippers, and in the new American steam-ship *C. Vanderbilt,* the cylinders are ninety inches in diameter, and the stroke of the piston is twelve feet; while the leviathan steam-ship now building at Blackwall will have four cylinders six feet in diameter and eighteen feet long.

It may be objected to this propeller that reciprocating motion with long levers is not suited for marine engines.

All propulsion is effected by means of levers. The floats of the paddle wheels are connected to the shaft by means of levers, and the blades of the screw are equally to be regarded as levers, the only difference being that these levers have a continuous circular motion imparted to them by the crank, and that they act in the water, whereas I propose to impart a reciprocating motion to the propeller by means of levers acting within the ship.

A single lever of great length, with a reciprocating motion of great velocity, would not act securely or steadily in a rough sea, but if the lever is composed of two separate parallel pieces, three feet apart, and firmly connected together by cross heads at both ends, it will move as securely and steadily on its fulcrum or shaft as the paddle wheels on their shaft, and if the velocity of the piston can be increased to 800 or 1,200 feet per minute, for all ordinary purposes the propeller might be connected directly to the piston-rod without levers.

I shall not here consider what loss of power, if any, results from the use of the crank. It is obvious that the friction must be very great when the crank is short, as it necessarily must be to obtain speed, both with the paddle wheels and screw.

By the proposed arrangement the whole effective force of the steam is more simply, and more immediately, and more directly expended in direct propulsion.

If, however, the proposed levers be found objectionable for marine purposes, the reciprocating motion of the propellers might be obtained through the medium of a wheel and crank with continuous motion,—the connecting rods of the two shafts being attached to opposite ends of the diameter of the wheel.

But it appears to me that no object is to be gained by employing the continuous rotatory motion of the crank, while the disadvantages arising from the great length and oblique action of the connecting rods would outweigh any advantages which continuous motion might possess in other respects. If therefore, levers, are objectionable, the reciprocating rectilinear motion of the propellers may be effectively obtained by means of toothed wheels. The shaft of each propeller being provided with teeth, both on its upper and under surface, a large toothed wheel would be placed centrally between the shafts, and a reciprocating motion communicated to the wheel would give an alternate reciprocating motion to the propellers.

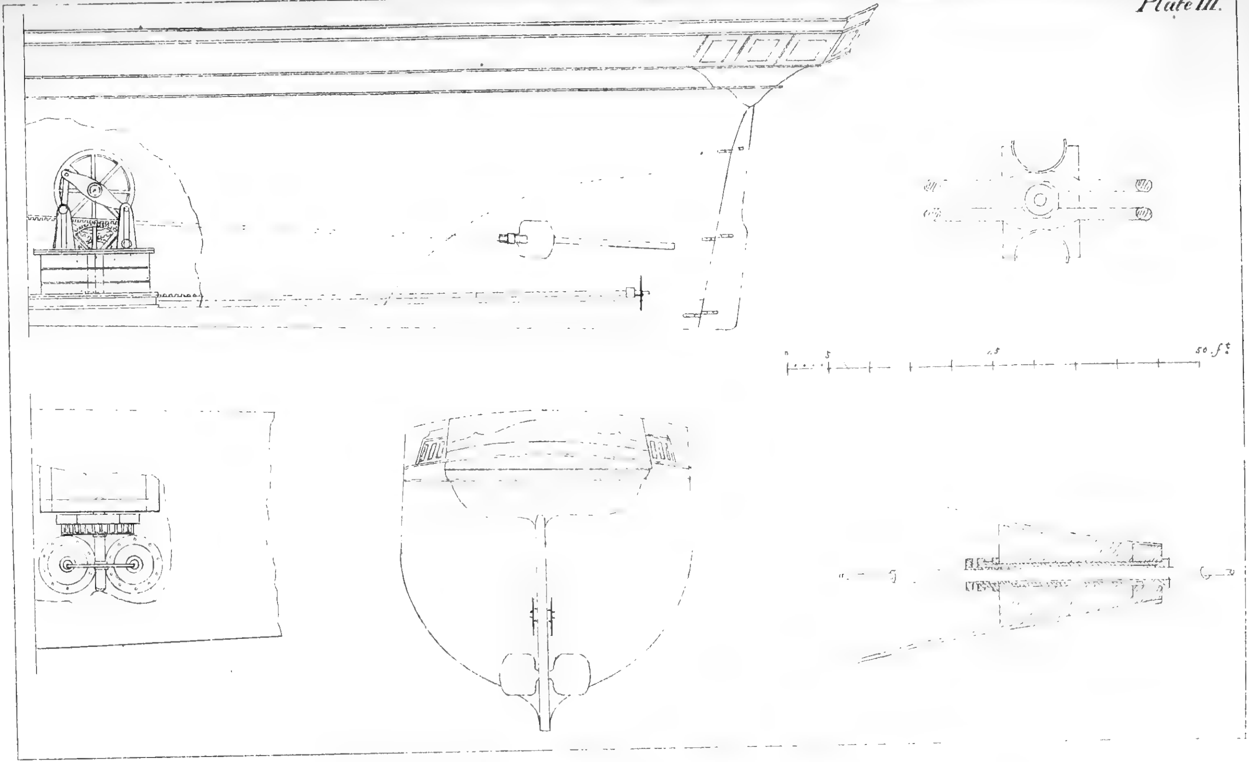
To secure the shafts of the propellers in their position, with the least amount of friction, two toothed wheels of smaller diameter would be required,—the one to work into the teeth on the upper surface of the upper shaft, the other into the teeth on the under surface of the lower shaft.

Any required length of stroke would be obtained by means of a multiplying wheel, to which a reciprocating motion is given by a connecting rod and crank.

The diagram in Plate III. will illustrate the relative position of the wheels, and the shafts of the propellers.

Toothed gearing has been frequently employed to multiply the velocity of the screw, and although objectionable from its liability to derangement, it has important advantages in combining economy of space with great length of stroke.

Plate III.



Many novel inventions have of late years been proposed as a substitute for our present mode of propulsion.

The principle upon which many of these are based is the supposed advantage of confining the water that is to be acted on with the object of securing a better hold on the water, and some of these methods have appeared to be at least equal in practical effect to the paddle wheels and screw; but there is reason to believe that whatever is gained by confining the water is lost by the great lateral pressure and friction of the water in the tubes and confining cylinders, and the amount of propelling force is to be measured, not by the hydraulic pressure, but by the volume and velocity of the water put in motion.

There seems, therefore, no sound reason why a propelling float of suitable dimensions, acting in deep water, and at right angles to the longitudinal axis of the ship, should not give the greatest available amount of propelling power, in proportion to the steam power employed.

If such be the fact, all future progress in steam propulsion must depend on the discovery of an effectual method of feathering propelling floats in deep water, without loss of power.

The advantages claimed for this new propeller are—

1. That it acts wholly under water, and may be placed at a considerable depth, where the water has an increased resistance.
2. There is very little loss of power in feathering the floats, or in working the propeller.
3. It may be connected with the piston rod, without the use of the crank.
4. The action of the floats may be easily reversed, without stopping the pistons.
5. With high-pressure steam, and increased speed of piston, and length of stroke, this propeller might be worked without gearing of any kind, and is apparently adapted for high rates of velocity.
6. Its action is more in accordance with that of the natural propellers of birds and fishes than either the paddle wheels or screw.
7. The machinery necessary for working the propeller will be more simple, and much less weighty, and therefore much less expensive, than that hitherto employed in steam navigation.

8. This propeller seems particularly adapted as an auxiliary power in merchant vessels, and would not require, like the screw, to be lifted out of the water when not in use.

ART. II.—*On the "Lyre Bird." (Menura Superba.)* By J. WOOD BEILBY, Esq., *Gipps' Land. Communicated by the Honorary Secretary.*

[Read to the Institute 4th February, 1857.]

ABOUT 5th July last, while passing through scrub on the margin of the Aar, or Tangel River flowing into the Glengarry, or Latrobe, Gipps Land, the nest of the Lyre bird was discovered in an opening of a few square feet by the hen bird leaving it in alarm. It was found to contain one egg, which subsequently, after leaving the nest undisturbed, in hopes of the hen returning to it, which she did not, was found to be fresh. Other nests similarly occupied were found during the same month. The nests are about two and a half to three feet in height, built upon the ground. The under structure is composed of layers of sticks, interlaced together to the height of 18 to 22 inches. Above this is the nest proper,—interiorly a very soft layer of dry grass, leaves, moss, and down from the birds, arched over, and completely concealed with a network of twisted vines, grass, and moss; the entrance to which is by an opening large enough to admit the hen bird on one side, rounded at top, from which a veil, or curtain, of the long fibrous moss found growing and hanging in long festoons from leaning trees in scrubs and fern gullies, falls, so as to completely conceal the opening when the female is sitting, or has left her nest. The cock bird cannot assist in the task of incubation, as proved by the fact that the lyre tail could not get in, and if outside would frustrate the design of concealment. The whole nest is so artfully constructed of materials of uniform colour, and bears so close a resemblance, exteriorly, to the heaps of drift, or decaying rubbish, accumulating everywhere in the scrub, that, unless the bird be scared out of it by a passer by, it would scarcely attract the investigation of the most observant. The female is said to lay but one egg, but from having found shells of more near a nest repaired for use this season, and the birds beiug observed to roost in families occasionally, I am inclined to think that probably the hen may lay a second egg, and then sit close, and thus remain undiscovered. The eggs are as long as a large duck's egg, but thicker. Colour a dappled black, like smooth unpolished black marble, with greyish veins between the rounded black clouding. The hen appears to desert her nest whenever discovered. The young run on the ground, and hastily conceal themselves at the slightest alarm, very soon after leaving the egg. At pairing season, in May and June, and early in July, the male birds are very assiduous in calling the hens to them, and may be heard chiefly early in the morning, and near sun-down, uttering their harsh gutteral cry of *Queeuk, queeuk*, accompanied by a loud clear whistling, reminding one of some of the notes of the English black-bird. They are expert mocking birds, and are often heard imitating the cries of the birds and animals familiar to them,—such as cockatoos of various kinds, pigeons, parrots, crows, magpies, &c. I have heard one imitate the howl of a wild dog, and others the sharpening of a saw, hammering, and other sounds made by carpenters, a few days after they had opportunity of hearing such sounds for the first time. While engaged in mocking, the bird is usually burrowing in loose soil (as our domestic fowls do in ashes), and meanwhile gives vent to such a strange variety of imitations, that I have fancied several birds must be joining in them, until I crept to the spot and became a witness to its sport. Individual birds, or pairs, are often in long possession exclusively of certain spots, and may be identified by their proficiency in the imitation of particular sounds. They are difficult to approach to shoot during the day, except where man is unknown to them, and are scared by the slightest sound. Specimens are most easily obtained by ascertaining (by the droppings beneath) the trees upon which they usually roost,—usually a bushy blackwood or wattle about twenty feet high, and shooting them at dusk or in moonlight. They will then not unfrequentlys it stupidly awaiting a second shot, if the shooter does not move till he has brought down his second bird. They appear to live chiefly upon worms, grubs, and the white roots of couch grass, and some other plants and grasses growing in the loose rich earth common to the scrubs. Their long claws are well adapted for scraping these up. In places frequented by these birds there are numerous smooth topped rounded hillocks, three or four feet across, of loose soil, freed from all roots of scrub or grass,—the history and use of which are at present unknown to me. Although a very shy bird naturally, attempts to domesticate it by rearing the young under a common fowl have succeeded sufficiently to induce further efforts, with greater care for the safe custody of the chicks.

A nest of the Lyre-tailed Pheasant will be forwarded to the Museum when an opportunity occurs for its transmission, by land or sea, from this presently inaccessible locality.

ART. III.—*On the Phenomena attending an Interesting Case of Mirage.* By Professor WILSON, M.A., *Melbourne University.*

[Communicated to the Institute 4th February, 1857.]

ON Sunday, 18th January last, about a quarter before two o'clock, I observed an interesting case of Mirage on the Sydney road. I was standing about twenty yards from the south-east entrance to the Royal Park, looking towards Brunswick. The road here is three chains wide, very dusty, bounded on the left by the trees of the Royal Park, and on the right by those of the Prince's Park; at the farther end, distant about a mile and a quarter, the "Sarah Sands Hotel," is visible and some trees with a well-marked outline. On the day in question the house and trees appeared to rise out of a lake, brilliantly illuminated by the sun, and in parts slightly agitated by the wind, but not so as to interfere with a very distinct inverted image of the house and trees formed by reflexion in the seeming water.

My position was at the foot of a slight rise in the road, the summit of which, at the distance of a few yards, was nearly on a level with the eye. The sandy surface of the ground was much heated by the sun, and at the same time a cool south wind was blowing briskly, so that the air, heated and rarified by contact with the ground, was rapidly cleared off by the cool wind, leaving only a thin film of rarified air along the surface of the ground. The rays of light from the sky, and objects at a distance of more than a mile incident on the surface of this rarer medium at nearly a right angle, suffered reflexion in a manner very analogous to that known as total internal reflexion, and thus produced the inverted images, and the appearance of water. On advancing up the ascent, so as to raise the eye, and thus diminish the angle of incidence of the rays which entered it, the lake contracted, appeared discontinuous, as if studded with islands, and disappeared. It reappeared again on placing the eye in the first position.

The same appearance was observed on the following Sunday, under similar circumstances.

The phenomenon is a well-known one; but every instance of its ocurrence in a locality where it has not been previously observed is worthy of record, and the collection of trivial scientific facts is one of the objects of a scientific society.

ART. IV.—*On the Cestracion Philippi (Port Jackson Shark), Trigonia and Terebratula of the Australian Seas.* By SIZAR ELLIOTT, Esq.

[Read before the Institute 4th March, 1857.]

THIS fish belongs to the Placoid order, or Sharks, (by the arrangement of M. Agassiz), and forms the only living example of the family of Cestracions (*Cestraciontidæ*), the members of which are distinguished from all other sharks by having the teeth flattened, and formed for grinding. Numerous genera of this family are abundant in the Mesozoic rocks of Europe, and all Naturalists and Geologists seemed hitherto to have been of opinion that they abound also in the Palæozoic Rocks; but Professor M'Coy, in his last work on the "British Palæozoic Fossils," proves that the succession of the teeth in the Mountain Limestone Genus Cochliodus (which was hitherto supposed to be a fossil-shark's jaw of the type of cestracion, and which furnished the key to Agassiz for grouping all the Palæozoic blunt fish-teeth of the Palæozoic Rocks with the Cestracions), was from below upwards, and that they were not on a rotating membrane, succeeding each other from behind forwards, so that, according to Professor M'Coy, the supposed Palæozoic cestracions belong in fact to the *bony* fishes, and not to the sharks at all: in other words M. Agassiz is in error in grouping the blunt fish-teeth of the mountain limestone with the blunt fish-teeth of the Mesozoic Rocks; the former having their teeth progressing from behind forwards, the latter from below upwards.

However the fact of greatest interest remains of the great abundance of the true Cestracion fishes in all the Mesozoic Rocks, particularly in the Oolites, and that the only living representative of the family inhabits the Australian Seas, an example of which is now on the table. This specimen was procured in December last, from a fishing station near Mordialloc, about fourteen miles from this city, and is called by the fishermen a Groper. From the close proximity of the mouth to the tip of the head it is well calculated for rooting, while the teeth can bruise or grind such Molluscs and Crustacea as may come in its way with facility; but I should conceive that sea weed would form the principal portion of its food.

In the same rocks in Europe the Trigonia (*Trigonos, triangular,*) abounds; shells forming a peculiar family (remarkable for the pair of diverging sulcated teeth); of which also the only living type is found in our seas. There are only two species of this shell well known, *T. Margaritacea* and *T. Pectinata.* The present specimens belong to the Society's collection, and were dredged in the harbour of Port Jackson, New South Wales, in about sixteen feet water, at low tide, from off the tail of a bank leading into deep water; the bottom was composed principally of dead broken shells and sand, the effect of the under current or drift, mixed with which the Trigonias were found, and could easily be groped out by the shark now under consideration. I believe they are to be met with only in this locality in the harbour. The interior of the shell is highly iridescent Mother-o'-Pearl. They are much prized by collectors. There are upwards of twenty fossil species, but they are not found below the Lias formation.

Terebratulæ, (*Terebratus, bored,*) agreeing in generic character with the living Australian ones, also abound in the Oolite Rocks of Europe, but are not so interesting as the above, because examples (though rare) are found in the seas of all parts of the world, and in all the rock formations from the Silurian to the Tertiary inclusive.

The specimens before you were also procured in the harbour of Port Jackson, from under rocks on the borders of the harbour, by inserting the arm into the cavities, where they can be detected hanging by a short fleshy tendon passing through the hole in the larger and upper valve. I mention this fact from the circumstance that Lamarck and others consider that, from the locality of the *Fossil* species of this genus, these shells may be presumed to inhabit the sea at a great depth; and Professor Owen remarks that the

Trigonia and Terebratula are still in existence, which *fed* the fishes of the Oolitic era. From the locality from whence the present specimens were obtained I should not conceive they are sought after by the Port Jackson Shark in such shallow water, and am not aware (other than the fact that they are discovered in a fossil state in the same localities) that they are, or were, consumed as food by the fish now under consideration. They have a curious kind of internal skeleton, as it may be termed, consisting of a flattened calcareous loop, with other pieces diverging from it, which are considered to be supports to the animal's body. There are sixteen recent, and numerous fossil species.

The oldest fossil Mammalia are in the Oolite, also forming peculiar genera, belonging to the insectivorous Marsupialia, such as live now in Australia only.

ART. V.—*On a New Mineral from M'Ivor.* By R. BROUGH SMYTH, Esq., C.E., F.G.S.

[Read before the Institute, 4th March, 1857.]

THE mineral described in the following analysis was forwarded to me by Philip Chauncey, Esq., District Surveyor, Heathcote. It occurs commonly in the quartz veins in small quantities, and is believed by the diggers to be *Molybdenum.* As my duties at present prevent my Mineralogical studies, I handed the specimens to George Ulrich, Esq., who has prepared the analysis which I now submit to the members of the Philosophical Institute.*

"The mineral is of a steel-grey colour, with metallic lustre, opaque, brittle; the fracture is conchoidal; the streak-powder dark-grey, or black; hardness 2·5—3; spec. grav. (?)

"Before the blowpipe, on charcoal, this ore smelts very easily to a metallic globule, with a sort of boiling motion, emitting at the same time dense white fumes, with a weak smell of sulphurous acid. Close to the mineral the charcoal bears a deep yellow crust, which gradually changes into white; then comes a small uncoloured ring, and again a small blueish

* Mr. Ulrich was not aware of my intention to publish these results until after his analysis was published, or his examination would have been more complete.—R. B. S..., 11th July, 1857.

white crust. This latter fume can be driven away by the reducing flame, turning greenish blue; the yellow crust disappears with an azure blue shine.

"According to these tests the mineral ought to contain *sulphur, antimony,* and *lead.* To make, however, more certain of it, the powdered mineral was mixed with soda, and again brought on charcoal before the reducing flame. The results were fine lead-like globules, with a yellow fume close to them, and a thin bluish-white one further off. As the metallic globules appeared rather brittle, they were fused together, and (to take up the lead) brought into contact with a small portion of boracic acid: the reducing flame produced herewith red pearls of metallic *copper,* clearly distinguishable on the edge of the slag.

"The phosphorsalt bead received from the mineral a fine emerald-green colour, identifying the presence of *copper.*

"In the open test-tube the heated mineral smelts very easily, causing a white, not fusible, sublimate not far up the tube, and emitting strong fumes of sulphurous acid, which redden blue litmus paper put in at the unheated end of the tube. In the half closed tube the mineral smelts, and sublimates rings of greyish white and white colour; no smell of sulphurous acid perceptible. This latter trial in the tube leaves now some doubt of the presence of antimony, or at least of such a portion of it as to bear an essential part in the chemical composition of the ore as a sulphide. To come to a certain result, however, the ore was brought together with a small piece of iron-wire in a cylindrical hole on the charcoal, and a mixture of borax and soda, in proportion of 1-2, was added as a covering, and the whole mass covered for a while with a good reducing flame. The regulus of lead with antimony (the sulphur having formed a slag with the iron) was taken out of the slag, and, on another piece of charcoal, brought into contact with boracic acid. The reducing flame produced in this way again small reguli of copper, surrounded only by a very thin white fume,—doubtless oxide of antimony.

"By way of these tests, and according to Plattner's experiments, the ore is *cuproplumbit,* $\acute{P}b^2 + \acute{C}u$., with a small quantity of antimony, or it is a sort of *Bournonite;* the components of which are commonly given quite in another way.

"The qualitative analysis gave the following results:—

"The finely powdered ore dissolved in nitric acid, with a blueish green colour, leaving a heavy white residue and particles of yellow sulphur suspended in the solution. After filtering, the residue (freed of the flocky sulphur) proved to be sulph. lead, with a trace of antimony. Here the fact was to be observed, that after the chief part of the solution had passed through the filter, and water was poured on it for washing the residue, the fluid received a milky appearance. As this is a proof of the presence of either antimony or bismuth, the white milky precipitate was filtered, and brought together with tartaric acid, it dissolved very easily, and gave thus a doubtless proof of the absence of bismuth, and the presence of antimony.

"The filtered fluid was now acted upon by sulphohydric acid; a black precipitate resulted, which, after careful washing, was brought together with sulphodydride of ammonia, and heated. As no perceptible change in colour or quantity of the precipitate took place, the fluid was, however, filtered, and chlorohydric acid added to it, the forthcoming greyish orange-coloured precipitate (still in very small quantity) proved now the presence of antimony without a doubt. The black precipitate, dissolved in nitric acid, to a green solution (*Cu.*), by parting with flocky sulphur. Sulphuric acid caused now a white heavy precipitate of sulphate of lead; and ammonia in excess, added to the liquor (filtered from sulphate of lead) imparted a light blue colour—no precipitate—testing so the presence of copper, however small in quantity, and the absence of bismuth and cadmium.

"The fluid, filtered from the black precipitate, caused by sulphuretted hydrogen, was mixed with ammonia, and chloride of ammonia, till it rendered red litmus paper blue, and then sulphohydride of ammonia added and no precipitate appearing proved the absence of iron, nickel, and cobalt.

"The final result of this qualitative anaylsis can now be stated as follows:—

"Lead and sulphur form the predominant components; copper and antimony are present in small quantities.

"As the specimen of the ore was very small, and much impregnated with quartz, a larger and purer piece, perhaps with crystals or cleavage observable, would be very satisfactory, and enable one to make an exact quantitative analysis to establish the fact of its being a new mineral, which most of the results of the above recorded experiments tend to.

"It need not be added that a trace of silver is not excluded by this analysis, and could in a purer piece be easily found by smelting, and afterwards cupellating with a portion of test lead. Most of these minerals contain a trace of silver."

Art. VI.—*On the Octoclinis Macleayana—a new Australian Pine.* Described by Dr. Ferdinand Mueller, Colonial Botanist of Victoria.

[Read before the Institute 2nd March, 1857.]

Ever since the progress of horticulture has been a scale for testing the advancement of civilisation, and therefore since time immemorial, the noble trees of the pine family have been regarded with a favour equally great and deserved. New explorations have added new forms, competing as garden ornaments with those already reared, and thus the interest for these plants has rather increased than diminished.

I would recall to your recollection the veneration of the ancients for the sacred cedar of Lebanon, recall the feelings which have cheered our own hearts in seeing the unaltered grandeur of the pine-forests of our native land at those times when nearly Flora's whole empire is buried under snow; I would recall all the impressions of those who glanced over the abnormal yet stately Kauri pines, the magnificent Deodars, the strange Ginkos, or our incomparable Araucarias, the Bunya Bunya with its colossal fruit; I would remind you lastly of the discovery of Wellingtonia, that giant in the empire of vegetation, now venerated as the highest and imperishable monument of a late hero of the British nation.

I scarcely need apologize when I direct your attention to one indeed of the finest denizens of this tribe of plants, since the generality of them have always been admired for their unfading foliage, their symmetrical and graceful forms, their perfect shade,—admired no less by the philosopher for their association with antiquity and history; esteemed by all for multifarious and universal utility.

I point at present to an ornamental tree, peculiar but to a small area of this country, a tree hitherto unknown to botanists and horticulturists abroad, and interesting particularly to us here as bearing the celebrated name of one of the most zealous promoters of natural sciences in Australia, the name of its discoverer, William S. M'Leay.

The noble tree which forms the subject of this memoir, occurs on forest slopes at Tacking Point of Port Macquarie, and received in Mr. Shepherd's meritorious catalogue of

Sydney Garden plants the name Leichhardtia Macleayana.* But in accordance with the unalterable rules in systematic phytology, this appellation, intended to form a renewed generous acknowledgment of the fruitful labours of an immortal man, has to give way to the priority of a more modest yet not less valuable botanical monument erected by the great and venerable Robt. Brown to the memory of my lamented countryman.†

In the newest monography of coniferae, published by the late Professor Endlicher,‡ the view of Mirbel has been adopted, which separates the Sandarach-pines of Australia, (the Cypress-pines of the colonists), principally on account of a six valved fruit, as Frenela from the typical Mediterranean Callitris, which genus is characterised by a tetramerous strobilus. M'Leay's pine therefore obtains in consonance with these views, likewise generic rank, as it differs from both Callitris and Frenela in an octamerous fruit; and this generic character is moreover supported habitually by a much stronger, more rigid, and quaternary development of the leaves. This quaternary disposition of the leaves displays beautifully the symmetry in the numerical development of flowers and leaves, reduced to half the number of the fruit divisions, and harmonizes therefore in proportion to the number of these organs in Callitris, Frenela et Actinostrobus, although quaternary leaves are actually without parallel hitherto in Coniferæ, some species excepted of Ephedra, a genus otherwise extremely different.

Admitting thus our pine into generic rank, the continental Australian coniferæ exhibit now the following array of genera:—Frenela, Actinostrobus, Octoclinis, Araucaria, Dammara, Podocarpus, Ephedra.

Octoclinis.—Flowers monoecious; male ones: a terminal ovate amentum; stamens many, four in a whorl, imbricated; filaments very short, bearing a peltate, scaly round acuminate connectivum, on which the three globose anther-cells are inserted; anther-cells opening lengthwise. Female flowers......Strobile pyramidate-globose, octogonous, slightly compressed, eight-valved. Valves woody, of unequal

* T. W. Shepherd's Catalogue of Plants cultivated at Sydney, 1851, p. 15.

† Leichhardtia Australis, an asclepiadeous climber, conf. R. Brown's appendix to Sturt's Central Australia, vol. II. p. 81. (1849.)

‡ Endlicher Synopsis Coniferarum, Sangalli, 1847.

length, alternately shorter, all below the apex mucronate. Central columna very short, pyramidal. Seeds numerous, much smaller than the valves, erect, inserted to the lower part and to the base of the valves, a few of the lower ones fertile, the rest sterile, amorphous and wingless. Fertile seeds nearly ovate, somewhat compressed and angulate, on the inner side nearly wingless, on the outer side winged. Indumentum crust-like. Embryo lying in a fleshy albumen, consisting of two cotyledons and a superior cylindrical radicule.

A tree of eastern extra-tropical Australia, with quaternary-verticillate always linear subulate triangular spreading persistent decurrent leaves, without dorsal glands.

Octoclinis Macleayana.—At Tacking Point of Port Macquarie, discovered by W. S. Macleay, Esq.

A tall pyramidal tree with dense foliage, and spreading scattered branches. Branchlets densely foliated, scattered. Leaves compressed, varying in length generally between $\frac{1}{4}$—$\frac{1}{2}$" in their free part, $\frac{1}{2}$—1''' broad, decurring to the next verticill, and alterning with the leaves of it, the middle nerve in age prominent, terminating in a very short mucro. Male amenta, 2—4''' long on a very short peduncle, surrounded at the base with four ovate-lanceolate, acuminate short bracts. Connectivum about 1''' long. Female flowers as yet unknown. Stroboli at the average one inch long, flat at the base, short stalked. Valves always alternately somewhat, in many instances conspicuously, shorter; their dorsal cuspis short green recurved. Seeds, at least the sterile ones, by mutual pressure of indeterminate form; fertile ones nearly $\frac{1}{4}$ of an inch long, with a brown testa; the inner margin wingless, or with a very narrow wing, the wing of the outer margin resting between the valves, sometimes broader than the nucleus, sometimes only below the middle developed.

In a retrospective view over the above characters it will be observed that the genus Octoclinis approaches amongst its allied cupressinous genera in foliage next to some Juniperi; in disparity of valves and number of seeds to Frenela; in number of cotyledons to Actinostrobus and Callistris; but differs, as already mentioned, from all in quaternary development of flowers and leaves, and in an octamerous fruit.

Sydney Botanical Gardens,
February, 1857.

Ludwig Becker delt & lith.

Hamel & Locher impr

Octoclinis Macleayana, Ferd. Mueller.

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OCTOCLINIS MACLEAYANA.

Explanation of the Plate.

1. Male Amentum.
2. Male Flower.
3. Anther-Cells.
4. Pollen-Grains.
5. Fruit-Valves.
6. Wingless Sterile Seeds.
7. Winged Sterile Seeds.
8. Fertile Seed.
9. Transverse Section of Fertile Seed.
10. Embryo.

All more or less Magnified.

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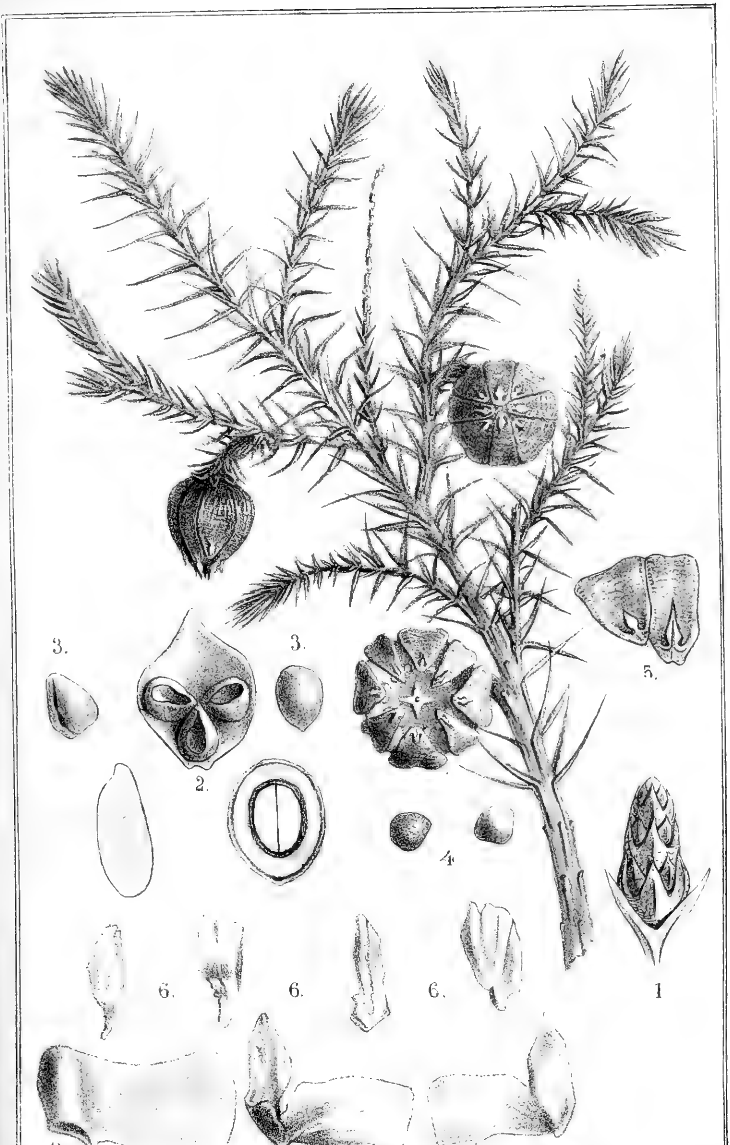

Ludwig Becker del.t & lith. Hamel & Locher imp.r

Octoclinis Macleayana, Ferd. Mueller.

Art. VII.—*On the Murray River Cod, with particulars of Experiments instituted for introducing this Fish into the River Yarra-Yarra.* By Edward Wilson, Esq.

[Read before the Institute 8th April, 1857.]

Mr. President and Gentlemen,—It is with some diffidence that I present myself before the members of the Philosophical Institute, to read a short paper descriptive of a little experiment which I have lately been making for the introduction of the fish known as the Cod-perch of the Murray into the river Yarra. I am no naturalist, nor scientific in any other way; my pursuits having long lain in very different directions. These remarks, then, must be considered as a mere popularly treated sketch of a scheme which I have good hopes has been tolerably successful, and which, if successful, will be thought to contain, I trust, some elements of interest.

For a long time I have been impressed with an idea of the singular disproportion between the endless *variety* and lavish *profusion* of the natural productions of the earth, and their unequal and even eccentric *distribution.* In a newly settled country like this, the consideration of this subject is particularly important. Our progress in equalizing the distribution of natural productions has not been altogether unsatisfactory, but I think that our comparative success ought rather to have the effect of urging us to new and more vigorous endeavours, than of leading us to become contented with what has been already done. How few of the present productions of the Colony, upon which we are mainly dependent for our comfort and enjoyment, were placed here naturally, and without the special interposition of man! And yet how astonishingly successful their introduction has been! How contracted the list of indigenous productions! How large the catalogue of those already at our service! In glancing down the list it is worth while to test their respective usefulness by a constant consideration of the question, how far we should now be inclined to part with any one of them. We think little of them, probably, now we have them. Let us consider how we should get on without them. The sheep, for instance, is not indigenous; and yet what would be the effect upon this colony of the entire annihilation of the sheep? The ox is not indigenous, yet how should we reconcile ourselves to be deprived of beef, or milk? The horse is not indigenous, yet how could we now spare that useful servant? The dog is not indigenous, nor the pig, the goat, the cat, the domestic fowl, the common pigeon, the duck, goose, and turkey. Strike one of these from our list now, and we should to a greater or less extent miss it.

And I may here remark that we are, perhaps, inclined to be guided too much by considerations of *profit* in many of these things, rather than by considerations of the enjoyments afforded by them irrespective of those of a pecuniary nature. We speak respectfully of the sheep for instance, because we are assured by our statistical friends that it enables us to produce an export of £1,200,000 to £1,500,000 annually. But if the sheep were taken entirely from us, the loss would be but imperfectly represented by a failure of exports to the amount I have named. What would become of the employment afforded to thousands by the attention required by this animal? How should we miss the endless variety of roast and boiled, and baked, the joints and chops and savory stews, which form no item of the export?

And if we can enumerate such a list of imported luxuries as the above in the animal kingdom, we have amongst our vegetable production a still wider range. How should we get on without our wheat, barley, oats, maize, potatoes, turnips, cabbage, lettuce, carrots, peas, beans, beet, and a hundred other things not in any instance indigenous, and yet successfully introduced, thoroughly established, and extensively used and appreciated amongst us? Then the apple, pear, peach, plum, grape, mulberry, cherry, quince, apricot, gooseberry, currant, melon, strawberry, raspberry, and fig! What a world of wholesome enjoyment is contained in such a list as this! What if we were called upon to resign all these, and fall back upon the native quandong and the little yew-berry which goes by the name of the native cherry!

What I wish particularly to urge is, that, having done so much as we undoubtedly have done in so short a time, we should be encouraged to still more energetic efforts. With a virgin country, an Italian climate, and British institutions to lend force and intelligence to our endeavours, and with a most extensive commerce ramifying over the whole globe, I hold the very highest conceptions of the capability of this country for very vast and varied improvements and additions, and I wish to see every possible step taken to give scope to its utmost possibilities, and that without the loss of one unnecessary day. In looking abroad over the earth, Nature seems to have been lavish in the supply of her various gifts, but singularly capricious in their adjustment; or rather she has properly and kindly left to man the interesting and agreeable task of supplementing her own efforts, of discovering by experiment and the action of his own intellect how far the gift itself may be multiplied, extended, and improved.

I must here confess my profound sorrow that no Government that this Colony has yet possessed has shown much inclination to do anything to further or assist this interesting process. It has long since been incessantly urged upon them that agriculture should be made a State department, and that experimental farms and gardens should be established, in which every plant, as well as every animal, that could possibly be found suitable to the colony should be fairly tested, and introduced by direct contact to the inhabitants at large. I trust this will not long be so. It is a duty, whether in our individual or collective capacity, to endeavour to multiply sources of comfort, enjoyment, and profit; and I cannot conceive why a duty at once so sacred and so agreeable should be so frequently ignored by those who have the power most signally to serve us.

It was by convictions such as these that I have been led to endeavour to reduce to practice what I think must be allowed to be unquestionably true in theory. We are rather given to *talk* too much, and *do* too little; and I confess that I have long yearned to secure practical effect to what, without individual action, is rather too apt to dwindle into resultless theory. People in this Colony have been talking, ever since I came to it, of introducing the alpaca. The last news from Adelaide acquaints us with the fact that, while we have talked, a Mr. Haigh of that city has *acted*, and has just succeeded in importing four healthy animals of this kind. Perhaps the example may be of service. But I for one must confess my little appreciation of the man of many words and little deeds.

If any of those I now address will take boat at Princes Bridge, and pull up as far as the river is navigable, they will observe on most fine days, but particularly in the morning and evening, and on holidays, an almost continuous line of anglers, of all sorts, sizes, and conditions of men. The only fish these sportsmen catch, consist, I believe, of a few herrings and black fish, with an occasional eel. The idea has often struck me that it is a great pity that they have not better game, and that the man would do them a great kindness, and not only them, but the countless generations who will come after them, who would put a better prey within their reach than a herring of a few inches long, or a black fish, which rarely reaches a size constituting it properly presentable at table. My thoughts naturally turned immediately upon the Murray River Cod, a fish which grows to an enormous size, is very delicate, palatable, and wholesome; but which, from some unknown reason, is only found in those waters which flow towards the north or west; never in those flowing to the south or east. I could see no reason why this natural law should be irrevocable, and I have for a very long time desired to try the experiment whether this valuable fish would not live and thrive as well in the Yarra, as in any of the waters in which it has been so mysteriously placed.

For a considerable time I was at a loss how to proceed. My first idea was to get them down by some rapid conveyance from the nearest point of the Loddon or Campaspe, in both which rivers they abound. But I did not feel justified in incurring a very heavy expense, and I also distrusted the length of the journey, and the probable exhaustion of the water in which it was necessary that they should be conveyed. By degrees I came to the conclusion that the best plan would be to trace up the tributaries of the Yarra and Murray respectively to the highest point at which those tributaries could be found united by a practicable road, and to leave to the fish themselves the duty of finding their way down to the larger stream. The King Parrot Creek, in which the fish is readily caught, and which discharges itself into the Goulburn just above Seymour, and the Plenty River which runs into the Yarra above Heidelberg, seemed to me the most suitable for the purpose, provided the road across the ranges were available for a light cart. On a recent visit to Yan Yean, I broached the subject to Mr. Sherwin, one of the oldest settlers in that neighbourhood, and got some very valuable information from him. And here I must gratefully acknowledge the services of that gentleman throughout the prosecution of my experiment. From the day I first mentioned it, Mr. Sherwin has entered into it with the greatest enthusiasm, has warmly co-operated with me in every way, and, residing near the immediate scene of action, has been able to render me invaluable assistance, Mr. M'Lellan, too, a settler on the banks of the King Parrot has lent me very important aid. I found that there was a very passable road between the streams, of not more than seventeen or eighteen miles, and I immediately sent up an expedition to test the experiment fairly. That expedition was of a very modest character,—consisting of a couple of men, a horse and spring-cart, with tent, water-tight box, rations, and fishing tackle—almost ludicrously inexpensive as compared with the object at which I aimed, or as the result of combined action; although quite sufficiently costly for an individual. I mention this as an illustration of the ease with which things are done if we each perform our share of the task, compared with the difficulty in the case of a single individual.

After sundry little mishaps, in the way of horse-losing, &c., by which all such experiments are naturally beset, I heard from my man, that on the 6th February he had got safely across with nineteen live fish, and had put them into the Plenty, a mile or two above the township of Whittlesea. I immediately wrote off to Mr. Sherwin, asking several questions of some interest to the successful issue of the experiment, and by way of giving you a correct idea of its progress, I cannot do better than introduce an occasional extract of the letters received from that gentleman. I wrote up to ask particularly whether Mr. Sherwin had himself seen the fish put in the Plenty, whether he was certain they were the true Murray River cod, and whether when put in they swam vigorously away as if life-like and healthy; or lingered on the surface, as is the case with a weakly, diseased, or disabled fish. I must remark, here, that I asked these questions in no distrust of the man who has had charge of the experiment, for it is but justice to bear my testimony to the great zeal, intelligence, and fidelity he has exhibited throughout. But about experiments like these there should be no room left for any doubt whatever. If, as I believe and hope, these fish are to prove the progenitors of countless thousands, which in their own good time will make their way throughout the waters of the Yarra and all its tributaries, the circumstances of their introduction to the streams on this side of the dividing range should be unquestionable.

On the 16th February Mr. Sherwin writes me in reply to my questions—" 1st. Whether the fish are actually seen put " into the river? Yes; I was present and assisted to put " them into the river, and a large water-hole through which " the river constantly flows. 2ndly. Are they really the " Murray cod? Fourteen were Murray cod, and five were "bream. 3rdly. When put into the water did they swim "vigorously away? The majority of them did. Some ap- "peared sickly, and after watching them a short time, five cod- "fish and one bream died; indeed, four were all but dead when "they arrived. One bream died about four hours after they "were put into the river, and three days subsequently I found "one codfish dead in the hole and one bream in the river. "There have, therefore, been seven deaths out of nineteen "fish; but I am certain no more have died, as I have con- "stantly watched both the river and the water-hole without "having discovered any more either sick or dead, and I think "that you have now living in the waters flowing to the "south, nine codfish and three bream." Mr. Sherwin goes on to say, "The latter fish is a *fac simile* of the fish of the "same name so common in the Bay, Saltwater River, and "Werribee. From the general appearance of the fish and "the number of deaths, I was of opinion that they had been "confined too long, and advised George to make shorter "trips, even though he brought fewer of them, and to feed "the fish by throwing into his pen some maggotty meat, as "some of them appeared to me to be suffering from starva- "tion more than any other cause."

After sundry further misadventures from floods and other causes, leading to the loss, at the King Parrot Creek, of a good many fish, Mr. Sherwin writes me again on the 25th February:—"In my last I expressed fears that the zinc box "had something in it deleterious to the lives of the fish, and "I advised certain changes; first, that a cask with a scuttle "should be substituted for the cistern; and second, shorter "trips by at least three days. I am happy to inform you "that these have been salutary changes, as the results show. "George arrived here with nine cod and three bream (after "an absence of four days), which, the instant they were put "into the river, darted off vigorously and disappeared. I "have constantly watched the place, both above and below, "and have not found any dead. On the 23rd he came down "again with another supply of twenty-eight fish—eighteen "of which were cod, and ten bream, all strong, vigorous, and "in beautiful condition, clean and bright, having the appear- "ance generally of only having just been captured; and "when put into the river they darted off instantly and dis- "appeared in the deep water. I have watched constantly "since, but have not found any yet either sick or dead.

"These make a total now of forty-nine fish put into the "river since the 6th, all of which I believe to be living and "doing well."

This you may easily conceive I looked upon as very good news—in fact the success of the experiment. I have little doubt that these would have been sufficient eventually to supply the waters flowing this way. But I was too pleased with the ease of the experiment to put a stop to it; and besides this I think that in all these attempts, it is very false economy to limit the operation to what may be barely sufficient for the purpose. If we attempt to supplement Nature, we ought to imitate her in one of her most striking attributes —*profusion*. If the thing be worth doing at all, let us take care to do it *well.*

On the 22nd March, Mr. Sherwin writes—

"The last batch of fish we put into the Plenty brought "the total number up to one hundred and seven, consisting "of sixty-six Cod and forty-one Bream, out of which number "I have an account of only ten deaths, namely, six Cod and "four Bream. I have every reason to believe that we have at "the present moment in the Plenty River sixty Codfish, and "thirty-seven Bream, all living and doing well; and I think "that after the batch that he will bring this evening for the "reservoir, he may, as far as the supply to the southern "waters is concerned, then close his labours; more particu-"larly as the weather is beginning to break up. I said when "I last had the pleasure of seeing you, that I read some-"where that a Codfish spawned 3,000,000 and upwards, and "I find, on reference to a work I have, that a Codfish has "been known to produce 3,600,000 eggs, while a Herring, "weighing only four or five ounces, spawns from 21,000 to "36,000. If, therefore, only *two* of our ninety-seven Bream "and Cod now living should spawn all right, we shall soon "have all the waters flowing southward into the Bay teeming "with myriads of the finest, and, for all domestic purposes, "perhaps, the most useful fish in the world."

I think that in the last remark my friend Mr. Sherwin probably allows his enthusiasm to run away with him a little. But it is only fair to mention that he is a native of Australia, that he has never been in England, and has, therefore, never had an opportunity of personally examining the claims to the very high character given to this fish,—of the herring, which affords sustenance and employment to thousands of people; of the true cod of Newfoundland, that supplies a fishery—the rights of which have more than once nearly furnished a *casus belli* between the two most powerful countries in the world; or of that monarch of all fresh-water fishes—the noble salmon of the northern hemisphere.

About ten days ago I paid a visit to the scene of operations, and I found that the wet weather then prevailing was indeed bringing the experiment to a conclusion, as far as this season was concerned. In high cloud-attracting ranges like those of the Plenty, flying showers are at this time of the year almost incessantly occurring, and these make the surface of the ground so slippery, that, combined with the steepness of the ascents, it is almost impossible for a horse to keep his feet while drawing a heavy lead. My own old horse, although one of the worthiest and most staunch of his staunch and worthy race, had become so dismayed with the glassy surface of one particularly steep hill that he had twice refused it, and two loads of fine fish had consequently been returned to their native waters. I was not able even to fetch over one load to put into the Yan Yean Reservoir, the most splendid nursery for fish probably in the whole world; consisting of several miles of water, varying to five and twenty feet deep, and at present almost unoccupied by any kind of fish.

I desired my man, therefore, to concentrate his energies upon catching a few more, and endeavouring to bring them to town alive. In this he believes that he succeeded, but I fear that the quantity of water in which they were placed was too limited to support life in fish of such a size, and on the morning after arrival they were found to be all dead. I have kept one or two in brine, by way of giving an idea of the character of the fish. I have also a few salted specimens on the table.

The Murray River Cod is, in fact, a species of perch. It grows to an enormous size, takes a bait of worm, frog, or offal greedily, and is wholesome and palatable even when very large indeed. Mr. Sherwin tells me that he has himself caught one of 73 lbs. weight, and that his men once assured him they had caught one of 93 lbs. Mr. Sherwin saw the head, and felt convinced that they were speaking the truth. My friend Mr. Foxton tells me that he lived almost entirely upon them for several weeks, and that he has no doubt of their growing to that size. He recollects catching one that gave himself and one of his men a very hard job to drag it home along the grass, with a stick thrust through its gills. In Adelaide they are reported to have been seen of 120 lbs. weight, and in size more resembling a porpoise than an ordinary river fish. Up to 20 or 30 lbs. weight they are very common. They are found along the whole course of the Murray and all its tributaries, even where dwindling into the most insignificant streams. And therefore I have no doubt of their forcing their way from the Plenty into the Yarra, and from it to all its minor branches. The Plenty at the place where they were put in is nearly as considerable a stream as the King Parrot Creek at the place where they were caught. It flows continuously through the whole summer into the Yarra, and although during the hot weather it is fordable at particular points, it abounds with deep holes, which constitute capital lurking-places for the fish during the drier months; and frequent freshets afford ample opportunity for their change of locality.

It will be perceived that although this paper professes to treat solely of the codfish I have made frequent mention of the bream, forty-one of which have accompanied the fish upon which we have principally concentrated our energies. Of this fish, Mr. Sherwin writes me,—" The bream is a fish " that I have never yet myself seen in the Murray, nor have " I ever seen it anywhere in fresh water till I saw them " caught in the King Parrot Creek, although common in the " bays and salt water rivers and creeks in different parts of " the coast. The bream, however, may be an inhabitant of " the different rivers to the north without my knowledge, as " I have only been upon them occasionally and for short " periods."

In the course of my experiment I have been met by two or three considerations; upon the satisfactory solution of which a good deal of the practical success of the experiment appears to depend. In the first place, it struck me that, inasmuch as the enormous size to which this fish sometimes grows might be taken to indicate maturity, it was doubtful how far it would be likely to be in a condition to breed till that maturity was attained. In the second place I was anxious to know at what age the young ones, if produced, would be likely to have arrived at such a size as to be worth catching, or presentable at table. Thirdly, I was in doubt whether this was one of the periodically sea-seeking fishes, and if so, whether if it reach the Yarra it will be able to overcome such an obstacle as that presented at our falls, just above the Queen's Wharf. As to its readiness to breed, I received most satisfactory evidence from Mr. Sherwin who tells me that several of those about six pounds weight which either died, or were so much injured by the hook as not to be worth preserving, were completely full of roe. And upon application to Professor M'Coy, that gentleman kindly furnished me with some information of a very pleasing nature indeed, as leading me to look for complete fructification of my scheme at a far earlier period than I had ever been sanguine enough to anticipate it. Professor M'Coy says, "I have no specific "knowledge of the rate of growth of the *Grystes Peelii*, or "Murray cod-perch, but analogy would lead me to expect "that *one year* would grow a mature fish, able to breed, and "probably of the smaller size you mention in your species. "But the fact bearing perhaps most directly upon the difficulty you allude to (of hearing of fish of 93 lbs., and "finding eggs in one of 6 lbs.) is unquestionable in all fishes, "namely—that, unlike warm blooded animals, there is no "limit to their growth. All fishes and reptiles continue to "grow larger as long as they live, and their maturity and "power of breeding is usually attained in the first year, at a "comparatively small size when compared with the dimensions of old individuals." As to the prolific properties of the fish, Professor M'Coy's testimony is very cheering indeed—"No one that I know," he says, "has counted the "eggs of the cod-perch, and the counting the European "perch (which belongs to the different genus *Perca*) would "not be applicable to your species. But here again a "general fact may serve your purpose—that every fish has "ten or twenty thousand times more ova in the roe than are "required to keep up the average number of its kind. This "is to allow for the enormous destruction of young ones by "voracious fishes and other creatures which live on them. "The men employed by the French Government to stock "the large fish-breeding ponds for supplying the poor with "food in many parts of France, find a small part of the roe "of one fish sufficient to fill the largest inclosures."

If the cod breeds in the Yarra or Plenty, it seems likely to be pretty safe from very destructive enemies. They eat one another I am sorry to say, with great greediness; but escaping their fathers and mothers, and elder brothers and sisters, their numbers do not seem likely to be greatly decreased by the few herons, kingfishers, &c., which I fancy are almost the only enemies with which they will have to contend.

If they are a sea-seeking fish, I hope that nature will have provided them with the same instinct for overcoming difficulties that she has furnished to the salmon and other river fishes which she compels periodically to seek the ocean. I am rather inclined to fancy that this is not the case, as Mr. Sherwin tells me that they are to be found far up the Murray at all seasons of the year, as, although they do not bite freely except during the warm weather, the aborigines seem able to catch one almost at any time. And as from the only possible outlet to the sea to some of the remoter tributaries of the Murray they would have to face a trip of probably over two thousand miles, I think it far more probable that they are a purely fresh water fish, and never migrate at all. In the event of getting some alive to Melbourne, I had intended to try what proportion of sea-water one of them would bear, or whether it would live in pure sea-water. Their premature death, however, prevented my subjecting their disposition to seek the sea to any such test. At the same time it is worth remarking that the only great obstacle in their way would be the pier above the Wharf. This obstruction is mainly artificial. It was placed there for the purpose of preserving the fresh water from the influx of the tide during the summer months, and as soon as the Yan Yean supply is completed it will become useless, and may probably at some day be altogether removed.

I have thus, Mr. President and gentlemen, endeavoured to lay before you a sketch of my experiment. If successful I think it will be allowed to be an interesting thing to have introduced to the waters of the Yarra a fish which I have proved to you sometimes attains nearly twice the weight of one of our ordinary sheep. I trust that the result of the experiment will be to place, at no very remote period, a new and wholesome delicacy upon the tables of Melbourne and its neighbourhood, and to furnish the anglers of our river-banks with a prey which may possibly give them some trouble to draw from its waters.

Personally I have no interest in the matter. I am no angler. I never caught a fish in the Yarra in my life, and most probably never shall catch one. If the cod ever should abound there, I may probably never taste it, for the time is coming in which I think it is unlikely that I shall remain a continuous resident in Australia. I have nearly completed my arrangements to give scope to a long-cherished desire to combine with the opportunity of seeing some of the more interesting countries in the world, the carrying out upon a larger scale the particular kind of experiment which I have here narrated as a very small one. I make the remark here, because I know the value in any such experiment of that kind of co-operation and encouragement to which I have had occasion gratefully to allude in mentioning the names of Messrs. Sherwin and M'Lelland, and I am not so absurdly proud or self-confident as to fail to bespeak it. I believe that a man can scarcely adopt a more useful or delightful pursuit to which to devote his time, his attention, and his means, than one which enables him, even in a small way, to add to or extend the productions of the earth, to endeavour humbly to supplement Nature in the supply of the multifarious blessings which she sheds around us, and to multiply legitimate enjoyments amongst the people.

ART. VIII.—*On the Supply of Water to the Town of Geelong. By* JOHN MILLAR, *Esq., C.E., F.S.A., &c. Engineer-in-Chief to the Geelong Water Commission.*

[Read before the Institute 6th May, 1857.]

HAVING had the honour of being appointed Engineer to the Water Commission of Geelong, and seeing that the supply of life's great essential, pure and unadulterated water, to the inhabitants of any portion of this colony, is so intimately interwoven with the well-being of all, being a part and parcel of our vital interests, so essentially necessary to the enjoyment of perfect health that it must be a subject of universal importance, I therefore propose placing before the Institute a general summary of what has been done under my commission towards the accomplishment of that object, and the attendant results of my labours.

I am perfectly sensible of the risk I incur in making statements on this subject, even when based on a sound theory, coupled with long practice, and strengthened by such statistical information as I may have been enabled to collect; aided as I may be by all this, yet statements of a startling nature may appear incredible to those whose attention has never been directed to such matters; if any such should doubt the accuracy of my conclusions, I can only say that they rest on facts which I conceive to be incontrovertible.

I beg leave to rapidly review the past, and in the general order in which my duties as Engineer to the Commission have been undertaken.

First, I shall briefly advert to three modes of supply which have heretofore been proposed by others, prior to my connexion with the Commission, as shewn by the accompanying:

TABLE NO. I.

Proposed Sources of Supply for Geelong, shewing Altitudes, &c.

Date.	*Proposers.*	*Nature of Scheme.*	*Where From.*	*Alti. above high water, Corio Bay.*	*Population.*	*Consumption per head per diem.*	*Proof head of water pipes equal to a column of water 800 ft. altitude.*
1852	Mr. Henry ...	*Pumping* & gravitation combined.	Buckley's Falls, River Barwon.	182	20,000	galls. 10	
1853	Mr. Taylor ...	*Pumping.*	Ditto.	361	30,000	10	Safe Head, 400 ft. To which pressure pipe castings may be ordered for town, and to which they will constantly be exposed.
1856	Mr. Darbyshire	Pumping & gravitation combined.	Ditto.	224	30,000	10	
1857	Mr. Millar, Engineer-in-chief to Water Commission.	GRAVITATION.	Wormbete.	405	50,000	50	

First, in 1852, Mr. Henry's—A pumping and very partial gravitation scheme combined: a crude and undigested plan, upon a very low scale.

Second, in 1853, Mr. Taylor's—A pumping scheme.

Third, Mr. Darbyshire's—A modification embracing both the foregoing plans, being a combined pumping and gravitation scheme, from the River Barwon, at Buckley's Falls, (at an altitude of fifty-four feet above high water mark in Corio Bay) from whence the water was to be raised by pumping to an additional altitude of one hundred and seventy feet, thus supplying (Geelong proper) a population of 30,000, at a limited consumption of but ten gallons per head per diem.

On the engineering merits of this scheme it will not be necessary for me to make any observations, as a fatal objection occurs at the very outset of its consideration, namely, in the quality of the water it is proposed to afford.—(*Vide* Dr. Macadam's analyses and Report.)

Subsequently, and very lately, another proposition has been mooted, namely, an extension of the Yan Yean to Geelong. It requires but the enumeration of a very few counter-reasons to set aside so futile a scheme.

To those not quite conversant with the Yan Yean scheme, I may briefly say that it is the name of the reservoir which is intended to supply Melbourne with water. It is an extensive natural basin, comparatively shallow, covering about 1300 acres, into which the waters of the River Plenty are directed, and is situated five hundred and ninety-five feet above the level of Hobson's Bay.

The water, if brought in an unbroken line to the city, (assuming the pipes to stand the pressure, which they will not do unless by the intervention of self-acting "pressure reducing valves,) would command the highest houses. It is, however, imperative on that Commission to filter their water from its vegetable and other impurities; and it is their intention to construct such filters adjacentto the line of mains at Darebin Creek, about midway, say three hundred feet, above datum; therefore the pressure, in relation to the height of the highest houses in Melbourne or elsewhere, must be reckoned only from the altitude of the service reservoir supplied from the filter-beds.

The length of pipe main conveying the water to Melbourne is about twenty miles; and the idea is to continue a sub-main (branching to Williamstown) along the Geelong and Melbourne Company's Railway to Geelong, the distance being an additional fifty miles, to be fed by the re-erection of the old Collingwood cast-iron tank, at North Melbourne, from whence Williamstown and Geelong would be *permitted* to get a *night supply*, thereby re-introducing and perpetuating (on the supposition of there being water to spare) the exploded intermitting system.

Besides, in alluding to it at all, which of necessity I am called on to do, as the only work of the kind as yet approaching completion in the colony, there are certain geographical and physical considerations which I should notice, were it not that by so doing, I would run this paper to a greater length than I had contemplated. Seeing, however, that attempts have been made to foist this water on the district to which I have the honour to be engineer, and having proved the great difference of purity between our own and the water in the Yan Yean reservoir, I therefore object on principle to its introduction to Geelong.

One, among other errors, which might have been obviated by the appliances of engineering forethought and skill, namely, the shallow embankment, causing the back water for a considerable acreage within its perimeter to be so shallow in its depth as must inevitably cause increased loss from extra evaporation, absorption, and the moisture entering vegetable life; consequently rendering the water apt to vegetate and become highly impure.

What a splendid opportunity was here lost, and which presents itself to a comprehensive mind, in the possibility of having the finest artificial inland lake in the world, impounding water enough, and to spare; the annual value of which, as a motive power alone, or for irrigation purposes, would have been equivalent to the interest of the entire expenditure, large as it has been.

In addition to the first outlay in such a proposition for supplying Geelong, there would be an annual charge by the Melbourne Commission for the water itself; and I may mention that their scale being, to large consumers, six shillings per thousand gallons, it follows that at this rate, on my estimated consumption of fifty gallons per head per diem, it would amount to an annual tax of £5 9*s.* 6*d.* on man, woman, and child; or on the population of 50,000 to £273,750 per annum—a sum, less than two years' expenditure of which, on our own account, would be more than sufficient to give us the same quantities per head on an increased population for many generations to come.

On the supposition even that the Melbourne Commission modified this rate for Geelong, it would still remain a fallacy.

In reference to such a proposition, I would observe that the Yan Yean Water-works are as yet untried; it is true that the floods of a more than ordinary wet winter have all but filled the reservoir, and disappointed the prognostications of some, who had fears on the subject. It is my own opinion, however, that with some modification, it will prove ample as regards *quantity* for the purposes for which it was *originally designed*, and a little more. I would therefore seriously advise the proposers of so preposterous an extension not to step out of their own proper sphere, to remember the adage that "charity begins at home," in good truth not to be spendthriftlike, reckless of consequences, seeing that the numerous suburban towns and villages springing up around Melbourne, many of which will ultimately be amalgamated with the city itself, must, as matter of necessity, and that at no distate date, be supplied, whilst their out-lying neighbours, such as Geelong, might be famishing for that which Yan Yean had not the means of bestowing. That my views will coincide with the majority of observers I doubt not, when I enumerate a few of the places dependent on Melbourne for their supply, such as—

Preston	Parkside,	St. Kilda,
Northcote,	Flemington,	Emerald Hill,
Pentridge,	Moonee Ponds,	Prahran,
Brunswick,	Essendon,	South Yarra,
Collingwood,	Keilor,	Windsor,
North Melbourne,	Williamstown,	Upper Hawthorne,
South Melbourne,	Footscray,	Lower Hawthorne,
East Melbourne,	Brighton,	Kew,
Richmond,	Sandridge,	Heidelberg,

and a host of others. A goodly list of off-shoots; and from the enumeration, who can say what would remain for Geelong, after all had been supplied? particularly if a succession of dry seasons set in, which has happened before, and unquestionably may occur again.

Seeing that I quite disagree with the mere modicum of twenty-five gallons per head per diem allowed to Melbourne, I append a table showing the quantities allowed by the London and other Companies, in climates scarcely requiring one-half as much as ours :—

Table No. II.

SUPPLY ALLOWED BY VARIOUS COMPANIES IN EUROPE AND AMERICA.

London.	Grand Junction ..	72½	gallons	average of forty gallons per head per diem.
	Southwark ..	34	,,	
	New River ..	48	,,	
	West Middlesex ..	36½	,,	
	Chelsea ..	33½	,,	
	East London ..	24	,,	
	Croydon ...	100	,,	
	Nottingham ...	40	,,	
	Whitehaven ...	50	,,	
	Glasgow ..	50	,,	
	Ancient Rome ...	310	,,	
	New York ...	300	,,	

To the above table I have appended the supply to Ancient Rome, after which all our modern ideas sink into insignificance, proving the luxuriousness of that age, which is said on the authority of Sextus Julius Frontinus to have been 310 gallons per head per diem, and conveyed a distance of upwards of fifty miles in aqueducts, supported on seven thousand arches, of great magnitude, many of which are still in existence—examples of the ancient magnificence and finely cultivated taste of the Roman people.

It is only by a patient investigation of the traces of ancient civilization as they survive in such public works, that we are enabled to form correct ideas of its real condition. The care taken by the Romans to ensure to all classes of society the full and comparatively free enjoyment of the first necessaries of life, indicates that if theirs was an iron rule its despotism was greatly counteracted by its intelligence, as witness the careful foresight in providing an abundant supply, evidently irrespective of outlay, for every use conducive to cleanliness, whereby every Roman citizen enjoyed the luxury of a bath, free of cost.

In modern times, particularly in the mother country, this matter—water supply—is still a vexed question, and has either been thrown into the hands of the local authorities or left to the enterprise of private companies, which has necessarily superinduced a mode of treating such works in a way but little conducive to the display of grandeur or magnificence; the great end sought after (and generally obtained) being a good dividend at the expense of the people. The consequences of the rigorous application of which principle have been such that the mother country scarcely possesses one work connected with the supply of water, to be quoted, for its boldness of conception, grandeur of design, or as a parallel to the Roman example alluded to.

Let us hope, and I believe, we have struck on a happy medium in Victoria—an amalgamation of the ancient system of management, (without its despotism)—with modern science in designing and conducting these great works, so conducive to the general prosperity of the colony. The management being placed in the hands of the representatives of the people, each commission being responsible to the Government as a head, all working together for the general good, having no personal interests to serve; and, I believe, I am not too sanguine in stating that the ultimate result will be, having water, the great necessity of life, as free for domestic uses as the air we breathe.

With a practical eye, and feeling that I could not honestly recommend one or other of the foregoing schemes for adoption without a thorough searching investigation of the natural facilities of the country, although in Nos. 2 and 3, namely, "Mr. Darbyshire's propositions," there are many good points, I was therefore, thrown on my own resources, commencing the task with a right good will, a determination to succeed, feeling that each member of the commission with which I have the honor to be associated took an equal interest with myself in its success, fully appreciating my early endeavours to remedy two of the greatest social wants of our hemisphere, namely pure water and an effective drainage, the former now under consideration of the Board, the latter must naturally follow, or rather should be a work of simultaneous execution.

Before going further into the matter, I may state that I purpose dividing it under separate heads.

First, the preliminary selection of a rainfall district, having an ample acreage of catch-water basin, and affording natural facilities for the formation of a reservoir on a gravitating system. Second, a feature survey of the district thus selected. Third, the all-important precursor, before adopting any scheme, viz., an investigation into and careful chemical analysis of the water recommended. Fourth, the preparation of an accurate contoured map and carefully-considered levels, from actual survey, of any locality so chosen.

On the first, second, and third items, it will not be necessary for me to go into any enlarged details, more than touching on the different heads as they occurred in the order of time.

First, the selection of site.

For the greater satisfaction of the members I may here state what has been my governing principle in the selection of a site for a reservoir.

From my earliest connection with the commission, I have advocated the adoption of the gravitation principle, and in all my subsequent and consecutive reports I have invariably urged on their attention the advantages arising from, and the necessity of, providing the supply from a reservoir placed at such an altitude as would give a sufficient command above the level of Geelong proper, and its suburban districts, as would enable us to have a constant high-pressure supply to all, and on such a scale as would be ample for the rapidly increasing population, and of such a nature as in all future time could be supplemented without loss or deterioration to the then existing works; being, all things considered, the cheapest and best;—the annual cost of the maintenance of such a system being a mere bagatelle as compared to the numerous advantages gained by its adoption.

It being now an admitted axiom with all hydraulic engieers of any standing in the profession in the mother country, (not wedded to antiquated notions,) arising, no doubt, as a general result, from the inquiries instituted by the several European Governments into the subject—that water collected in reservoirs from the rainfall over an extensive catch-water district, is not only purer than river water, but infinitely superior to well water, artesian or others, all of which are liable, more or less, to much mineral impregnation. To such an extent is this now impressed on the minds of the profession and scientific men in general, who may have turned their attention to, or made the subject a study, that the effect has been that nearly all the principal cities of Europe and America—(those in the Mother-country being London, Birmingham, Sheffield, Newcastle-on-Tyne, Halifax, Bristol, Manchester, Liverpool, Edinburgh, Dumfries, Glasgow, Greenock, Dublin, Belfast, Londonderry,)—either are or about to be so supplied, where possible, notwithstanding the princely sums which have been lavished on the old systems, and which are being abandoned and replaced by having recourse to the gatherings from the comparatively pure rainfall and natural surface drainage, where such is practicable, and if possible from the hilly country watershed, being, as a matter of course, purest near the original source, besides giving a command over the lower levels on which the inhabited districts are generally situated.

Taking the foregoing as a truism, and who can doubt it, as regards the old country, how much more is it applicable to this country and to this particular locality, the subject of the present paper, where the rivers are either originally unfit for such uses, or are being rapidly rendered so. The Moorarbool, saline, brackish, nauseous. The Yarrawee, originally one of the purest, least saline, and most wholesome river-waters in the colony, has become totally unfit for domestic purposes,—quite turbid from the uses made of it by the mining population running as it does through one of the most populous and successful gold mining districts at Ballaarat, it has become so charged with finely comminuted particles of clay, held in suspension, of an unusually persistent character, from the gold-washing and puddling operations, and which I find do not subside even on its reaching the Barwon river, with which it intermixes on its course to the ocean border, and at a distance probably not much short of one hundred miles, taking into account its many tortuous and capricious meanderings through the bush, it is still foul with extraneous matter, next to impossible to arrest, even by the finest filtering media.

Finding the Barwon above its confluence with the Yarrawee apparently pure to the eye, almost transparent, but palpably not so to the palate, being highly charged with saline matter, impregnated, no doubt, by having its course over, or intermixing with, the numerous saliferous springs which there abound.

Whilst on the subject of saliferous springs, I trust it will not be considered out of place, or an unpardonable digression on my part, to make a few remarks thereon, *en passant*, seeing that, as is well known to every settler, they abound in this colony, leaving the toil-worn traveller no alternative but to partake of them, however nauseous the draught, which but turns out to him a Tantalus cup, and instead of the expected pure water, he of necessity has to partake so far of epsom salts and damper for breakfast, or damper and epsom salts for dinner; so *vice versa*.

I doubt not but it may have come under the observation of many, that most of the large as well as smaller salt lagoons are cup-like in formation, which I believe to be caused by a gradual sinking of the outer crust of the earth, as the saliferous springs bring the brine to the surface, and which have found their way thither by "faults in the flag," caused possibly by slight shocks of earthquakes in time past.

To make this theory more readily understood to those who may not have had any experience in mining, more particularly salt mining, I shall further explain what I mean by the "flag." It is a term generally used by the miners in Europe for a very hard earthy matter, of about two feet thick, at some sixty, or it may be a hundred, yards from the surface of the earth, under which the upper strata of rock salt is generally found, varying in thickness from ten to fifteen yards. Brine is made by the passing of water (percolating from a higher level) over this bed, and, becoming saturated with the rock, escapes to the surface by simple pressure, rising through the faults or fissures which may have been formed as before explained, or other exciting causes. This, when evaporated by our dry atmosphere, in these lagoons, accounts for the crust of salt found in and around them in such quantities.

As the bed of the rock salt is dissolved by the motion of water over it, it becomes brine, and on making its way to the surface, leaving a vacuum, the outer crust will naturally sink, and follow the wasting away of the rock; accordingly we find these lagoons formed, and I doubt not increasing in depth, but so imperceptibly as scarcely to excite a passing notice. It is a well-known fact that such has taken place in the mother country, at Northwich and other salt neighbourhoods, where land formerly elevated is now submerged many feet under water. No doubt this sinking in the old country will, and does take place much more rapidly than with us, which is easily accounted for when I state that it is no unusual thing at many of these places to pump up an average of a thousand million gallons of salt brine per year.

I should mention, that generally, under this first or upper bed of rock salt (that is between the first and second beds), is to be found a stratum, of ten yards or so in thickness, containing no particle of salt, but quite impermeable to water; it is therefore quite natural to expect that the brine from the upper layer will make its way to the surface, just as we find it.

To return:—Being foiled by the impurities of the sources of supply which offered themselves in the neighbourhood of the town, I turned my attention to the source of the Barwon itself, to the elevated districts—the high and densely-timbered ranges, which, as an outlying belt, intercepts and condenses the rain-bearing clouds from abrupt contact with the saturated volume of air, highly charged with humidity from the Southern Ocean, carried landward by the prevailing winds, and, so far as I have been enabled to judge from the geological structure of the country, its general configuration, its wild and precipitous glens, its systems of deeply-indented ravines, abrupt hills, deep creeks, elevated ranges, and extensive gullies, all tend to the belief—in the absence of any well-founded meteorological data, or even statistical information to go on—that the local and visible effects have been produced by the copious outpourings, amounting to torrents of rain, which must have been supplied from the condensing vapours precipitated on its surface; a surface proving the humidity of the climate, clothed with all but perpetual verdure, even in the summer season, when the low lands or plains are literally scorched up, and not a blade of grass to be seen. These circumstances constitute it, as one of best *rain-gathering* districts probably in the colony, the aggregate volume of that falling within our water-shed, I doubt not, will ultimately keep the reservoir where I have decided on, after much and diligent search, in the valley of the Wormbete, well supplied, after making all due allowance for evaporation, leakage, absorption, decomposition, or other waste, in which opinion I am happy to say many of the earliest settlers—Hugh Murray, Esq., Thomas Austin, Esq., R. Bromhead, Esq., Edward Willis, Esq., and Dr. Thompson, &c. &c., who, after some twenty years personal observation,—quite coincide with me.

On the occasion on which I laid before my commission, my report of this district, and a recommendation of the site for the reservoir, I had the honour of their approval, sufficient to warrant me in taking my

Second Step—Namely, a feature survey of the valley and its numerous creeks, dying out, or rather taking their rise south, in the high timbered ranges, abutting against the east and west saddle, separating them from the Retreat Creek of the Wormbete forest, and comprising at least ten thousand imperial acres* of gathering ground within the water-shed marginal line, the surface of which I found to be like the general surface of the colony, hard and impermeable, so much so, that the body of the waters falling on its entire extent quickly drain off, (from its peculiar conformation,) suddenly swelling the numerous creeks and gullies to an enormous size, thus causing rapid but temporary floods after the rain, which, from the formation before alluded to, runs off in four or five days, gorging the Barwon, and causing it to overflow its banks, inundating the surrounding flats, swamps, and lagoons, north of the reservoir, again to find its way into mid-air by evaporation.

Traversing these creeks, and finding that the majority of them, and other minor gullies, were the natural channels of the available rainfall of this favourably circumstanced gathering ground, such as I have attempted to describe and represent by my finished map (which I have the honour to exhibit

* From a subsequent survey this quantity proves to be fifteen thousand acres.

this evening,) centred themselves by an arterial-like system in the valley of the Wormbete, near Hopkins's pre-emptive purchase, I at once determined on that as the best and most advisable site for the reservoir, provided a more careful inspection, and mature study warranted it. This having brought me to my—

Third step—namely, a chemical examination of the water which I recommended, together with an analysis of fourteen other available waters, more by way of comparison,—to which I need not more than allude, your having a report on these waters by one of the first analytical chemists of the colony, John Macadam, Esq., M.D., who, after patient, long, and laborious manipulation, with myself, in the laboratory of the Commission, has verified, in almost every particular, my original assertions that the sources which I had recommended—namely, the Wormbete and Retreat Creeks,—yielded as pure, if not the purest water in the colony of Victoria, and quite equal to the majority of the purest known waters of the mother country. *Vide* his report, which I have the honour of laying on the table of the Institute.

The completion and success of this analysis brought me to the

Fourth step—the final selection of the site of the reservoir. You will quite agree with me regarding the necessity that exists of bringing considerable practical knowledge, combined with due caution, to bear on the selection of such. The responsibility is not to be under-valued, seeing that the final success of any commission most materially hinges on the site being judiciously chosen, and with such skill as will ensure success.

Subsequent and more mature consideration has but affirmed me in my first resolve, seeing that all that is required in this naturally formed valley of the Wormbete, is the construction of such works as may enable me to arrest and impound the whole of the flood waters of the hilly country, on their onward passage to the sea, by the channel of the Barwon.

Besides, having discovered the possibility of otherwise increasing the quantity very considerably by intercepting the Retreat Creek taking its rise south of the great dividing range of the Wormbete Forest, and running westerly—having its embouchure into the Barwon some miles distant, higher up the stream,) by drifting a short tunnel through the dividing range at a suitable level, into an already formed natural channel, I shall be enabled to convey this additional supply into the Wormbete reservoir by way of Western Creek (see map). By securing this additional quantity, I would add upwards of ten thousand acres to the already large gathering ground, thus making assurance doubly sure, considering that in our variable climate, it is but prudent to put beyond hazard, or even doubt, the question of supply, by embracing all available sources within compass.

Every attention has also been paid to the principal point in reservoir construction, *i.e.* the natural impermeability of the bottom, and which I have thoroughly ascertained by numerous trial pits, which I ordered the chain and staff bearers to sink to an average depth, whilst my assistants were otherwise employed in camp duties, plotting their field-work.

Care has also been taken in selecting the site for an embankment, within certain limits of deviation,—the foundation of which must either be solid or capable of being made so,)—having good natural abutments on either side of the valley, at the shortest possible span, the height sufficient to impound forty feet of clear water at centre of embankment, exclusive of a subsiding depth of ten feet *additional*, considering, as I do, that the great value of a reservoir, more particularly in these latitudes, depends principally on its *greatest* cubical contents with the *least* possible superficial evaporating surface.

To make this a certainty, and the more palpable to the ready understanding of the commission, and that such may not be altogether depending on the mere assertion of my verbal opinion, I have had an accurate surface survey, longitudinal, and numerous transverse sections, taken at every five chains, across the valley, showing its converging sides, and giving at same time the area of each cross section, and the means of plotting accurate contour lines on the map, describing the tortuous perimeter of the water levels at the three several depths of forty, thirty, and twenty feet at embankment, above the eduction pipe, thereby enabling me to come to as close an approximation as may be of the separate cubical quantities of water retained for use by each proposition. See Table No. III.

Table No. III.

Acreable Extent, and Capacity in Gallons, of Wormbete Reservoir.

Contour.	Imperial Acres.	Gallons.
40	252	1,661,318,850
30	184	950,677,092
20	124	583,400,687

The capacity of this reservoir will more readily be understood from the tables which I append to this report, and, viewed in conjunction with the drawings showing water-space within the forty feet contour level, to contain one thousand six hundred and sixty-one millions of gallons.

Within the thirty feet contour level, to contain nearly one thousand millions of gallons.

Within the twenty feet contour level, to contain five hundred and eighty-three millions of gallons.

Table No. IV.

Debit and Credit account for two and a half years consumption from Reservoir, at the stinted Melbourne allowance of twenty-five gallons per head per diem for a population of fifty thousand.

	Gallons.
Quantity in Reservoir at the 40 feet contour,	1,661,318,850
Evaporation, &c., as explained (See Table No. VII.)	246,462,969
	1,414,855,881
First year's consumption, at twenty-five gallons per head per diem, ...	456,250,000
	958,605,881
Evaporation as before, on reduced surface, 154 acres	174,106,880
	784,499,001
Second year's consumption, as before, . .	456,250,000
	328,249,001
Evaporation as before, on still further reduced surface, for six months, ...	100,124,001
	228,125,000
Half-year, or 6 months' consumption as before,	228,125,000

The first, or forty feet contour level, is about half the annual rain-fall, and which would be equivalent to two and a half years' consumption of double the present population, at the Melbourne standard modicum of twenty-five gallons per diem. Even after taking into account the probable maximum waste arising from absorption, decomposition, leakage, and evaporation, on the one hand, and of no rain-fall whatever for the above period on the other.

This, be it remembered, is without taking into account any portion of the evaporation returned to the reservoir during the two and a half years' assumed drought in the shape of dew precipitated on the surface of the quiescent waters of the reservoir, which of itself alone would yield nearly another month's supply, exclusive of the ten feet depth of subsiding space at a lower level, left untouched.

In the absence of all meteorological observations to be depended on, in times past, for this locality, I must per force draw my conclusions from facts founded on those of the nearest adjoining districts where a known careful register of the quantities of rain falling has been kept for a series of years, as indicated by the pluviameter. I grant, however, it is difficult to calculate the rain-fall in any given district, even to an approximation by data resting on observations taken elsewhere; yet, at the same time, in the absence of such valuable and necessary local information, I must say that, in proper hands, the former will approximate nearer the truth than by quoting authorities from another hemisphere, it being exceedingly doubtful, in the present state of meteorological science in the colony, how far it would be safe to rely on such analogy, besides affording no guide in estimating the proportion of rain-fall in so favorably circumstanced a locality as that of Wormbete Forest. Besides, I prefer dealing with facts, when to be had; and, whilst on this subject, I will here record one, not generally known either in the colony or the mother country—a fact regarding the great amount of difference existing between the rain-fall of Melbourne and that of London, and several other cities of Europe. (See Table No. V.)

The synopses of several of the places enumerated are compiled from authentic documents kindly forwarded to me by order of His Excellency Sir William Thomas Dennison, Governor-General of the Australian Colonies; also from W. H. Freeling, Esq., Capt. R.E.; Surveyor-General of South Australia; and the Corporate body of Launceston, Tasmania; A. J. Skene, Esq., District Surveyor of Geelong; to all of whom I hereby register my thanks for the readiness evinced in forwarding to me the necessary Meteorological returns.

Table No. V.

Climates of Melbourne and London.

Comparative Rain-fall in Corresponding Months.

Australian Months, Victoria.	1847.	1848.	1849.	1850.	1851.	Mean at Melbourne	Mean at London, 20 Years, ending 1846.	European Months, England.
January ..	1.28	0.61	0.22	4.17	0.50	.136	2.44	July.
February..	0.97	0.03	1.03	1.37	0.65	.810	2.37	August.
March	2.10	1.61	2.53	0.65	1.43	1.664	2.97	September
April	5.09	1.61	5.45	3.12	1.23	.330	2.46	October.
May	2.07	6.94	3.01	1.43	4.77	3.644	2.58	November.
June	2.76	1.61	0.88	2.76	5.22	2.646	1.65	December.
July	2.63	1.11	4.38	1.98	1.70	.236	1.56	January.
August ..	1.99	4.23	7.62	2.08	3.04	3.792	1.45	February.
September	1.75	2.87	5.01	3.85	4.18	3.532	1.36	March.
October ..	2.33	6.51	1.05	0.28	1.33	.230	1.55	April.
November	2.40	4.17	12.13	3.44	6.91	.581	1.67	May.
December	0.88	2.45	0.94	1.85	0.94	1.412	1.98	June.
Totals in 12months of each year	26.25	33.75	44.25	26.98	31.90	32.63	24.04	Totals in 12 M'nths of each year
Mean of 5 years.	Excess of Melbourne over London, 8.59 inches.							Mean of 5 years.

Melbourne, 5 yrs., 1847 to 1851	32·63	London, 20 years, 1846	24·04
Sydney do. do.	45·79	Edinburgh, 21 years	25·60
Adelaide do. do.	24·23	Glasgow, 2 years	33·60
Launceston do. do.	33·50	Dublin, 6 years	30·87
Bonninyong, 1850 to 1853	29·64	Belfast	36·00
Melbourne 1856	28·60	Great Britain (mean of)	32·00
Yan Yean 1856	25·03	Paris	21·00
Geelong, ... 1856	24·72	Rome	36·00

It will be seen in the foregoing Table No. V., that, by placing the rain-fall of London (the Metropolis of the Northern Hemisphere), and that of Melbourne (the Metropolis of the Southern Hemisphere,) in a tabular form, in juxtaposition, an interesting fact is proved to demonstration, viz., that Melbourne exceeds London by upwards of 35 per cent. The table is compiled from the records of the Melbourne Observatory (then kept by William Henry Archer, Esq., Assistant Registrar for Victoria), which satisfactorily show that, from a mean of five consecutive years, commencing with 1847 and ending 1851, both inclusive, the Melbourne rain-fall was as high as 32·63 inches, whilst London was but 24·04 inches, taken from a mean of twenty years anterior to 1846, showing a difference of 8·59 inches, or, in other words, an extra one hundred and twenty-five millions of gallons of rain per square mile, leaving a large balance in favor of colonial account, and which but requires the appliances of skill to collect and turn to many profitable uses.

It is a matter of the utmost regret that no earlier complete series of rain-fall data for Victoria (than those I have enumerated) are extant; though several parties, as amateurs, formerly kept registries, yet, from change of residence or other causes daily occurring in a new country, many of them have been so irregularly kept (most dropped into disuse) as to afford but little reliable information.

It will be seen, however, that from such as we have, the authorised registers of the Australian colonies,—that of Victoria, kept at Melbourne,—New South Wales, at Sydney,—South Australia, at Adelaide,—and Tasmania, at Launceston,—all of which I have repeated as an addenda to Table No. V.—give a mean of 34·4 inches per annum, being, as I know, about two and a-half inches in excess of the mean of Great Britain, on the authority of Professor Thomson, a name well known in meteorological science. These registries which I have collated are astounding facts, and from such authorities will rather astonish Europeans who have never been out of the bounds of that hemisphere, and whose preconceived notions lead them to consider we have but little moisture here. I doubt not that this will even startle many of our old colonists, now resident in the mother-country, whose rain experiences whilst in the colony, without scientific registers, led them to imagine we had very much less rain here than in England, whereas quite the reverse is the fact.

It is not out of place here to reply to a query which may have, or at all events will, occur to your minds. Has the author of this paper kept any register at Wormbete? I answer in the affirmative. Considering it to be a prudent step in the eyes of my Commission to strengthen the opinions already enunciated by me in regard of this locality, I at once had a rain-gauge manufactured on the best principle, placed under the care of a gentleman of known honor and integrity, John R. Hopkins, Esq., and who, equally with myself, felt an interest in daily recording its readings, and which his constant residence there, and regular habits, enabled him to do.

Considering that the members of the Institute would feel but little interest in the returns of but a few months, since the guage was fixed at Wormbete, I have not included it in the above table; but it may be satisfactory to know that up to the latest date it records a rain-fall exceeding Geelong by *forty-five* per cent., quite equalling Melbourne; and exceeds Yan Yean by *thirty* per cent.*

Taking the records of Melbourne, as before stated, on Mr. Archer's authority, as showing a rain-fall of 32·63, and that of the Yan Yean (twenty miles north of Melbourne) on the authority of Charles James Griffith. Esq., M.L.A., the President of the Sewerage and Water Commission, who states it as being as high as 36 inches per annum, and which I believe, from my own experience, to be very considerably under the mark.

These, with simultaneous observations upon the quantity discharged by the outlets of this (Yan Yean) now ascertained area of surface drainage, and a comparison of the quantity of rainfall, will afford something like data of the greatest importance. This, together with a careful study of the configuration of the surface of that district, with its attendant or exciting causes, enable me to approximate pretty near the truth of what proportion of rain can be considered available; no doubt, however, this must be modified by the local circum-

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* Subsequently I have been enabled to fill up a Six Months' comparative Table, as annexed, of the before mentioned localities, quite verifying my anticipations:—

Comparative Rain-fall at Wormbete, Geelong, Melbourne, and Yan Yean.

MONTHS. 1857.	*Wormbete.* J. R. Hopkins, Esq., Observer.	*Geelong.* A. J. Skene, Esq., Observer.	*Melbourne.* R. B. Smyth, Esq., Observer.	*Yan Yean.* Chas. Taylor, Esq., Observer.	MONTHS. 1857.
January	0·82	0·70	1·23	0·97	January.
February ...	2·35	3·39	3·98	1·33	February.
March.......	2·84	1·99	3·80	3·61	March.
April	1·70	1·07	0·99	0·78	April.
May.........	2·77	1·72	2·00	2·05	May.
June	3·24	1·58	1·99	1·89	June.
	13·72	9·45	13·99	10·63	

stances of the Wormbete district, meteorological, hydrographical, and physical; evaporation, rain-fall, general configuration, soil, &c. &c., not only within the bounds of the catch-water district, but the surrounding country generally, as well as other varied circumstances, such as the prevailing winds, and other counter-agents bearing on the results. All must be taken into account and properly considered, with such accurate information as I may have been enabled to collect and record, so as ultimately to give me a perfect basis from which to deduce a calculation that can be depended upon in its resultant facts, not forgetting to take into account that the water shed commences at a high level, (something like twelve to fifteen hundred feet above the sea board,) falling with steep but regular gradients towards the valley, ensuring a rapid conduction of the water falling on its surface to the reservoir, thereby diminishing the likelihood of extensive evaporation and mineral impregnation.

Touching the *vexed question* of evaporation in these colonies, I may here state that the hitherto theoretical opinions formerly held by several parties in Victoria, have been considerably toned down by practical experience. It should not, however, be forgotten, that evaporation is more or less modified by several attendant causes acting on the atmosphere, such as temperature, moisture, force and direction of the wind, all tending to that uncertain condition, which, ever varying the evaporation, precludes the possibility of having any fixed rule, excepting an average founded on actual observation in the locality, and extending over a considerable space of time.

My opinion, founded on actual colonial observation, on large bodies of deep and almost quiescent water, such as reservoirs in a still state, enables me confidently to pronounce it as considerably under fifty-two inches per annum, and very probably the opinion held by Major (now Colonel) Cotton, from more extended observations in the colony as regards time, are still more in conformity with the fact. His opinion was forty-five inches.*

* Touching evaporation I have considerable pleasure in adding that, from subsequent information from the resident engineer at Yan Yean, he states that from careful observation during the time that the aqueduct, feeding the reservoir was closed for the completion of the tunnel, the water being then five and a-half feet deep in reservoir, the evaporation from the same was one-tenth of an inch per day during the *summer months* of January, February, and March, 1856. And again, in October of the same year, during which month the supply had been taken from the river, the evaporation was much the same, being an average for the entire year of but 36 inches.

As a general principle, I have advised that the consumption for Geelong be apportioned as follows, (looking on the standard modicum—" twenty-five gallons"—allowed in Melbourne, as no criterion for colonial guidance,) having the likelihood of a most abundant and unlimited supply. In my calculation I allow sixty gallons per head, per diem for the summer consumption, to supply the ordinary domestic wants, &c. &c., as hereafter enumerated, for a population numbering fifty thousand souls.

For the winter half-year, when consumption necessarily (for public purposes) is very much diminished, I allow forty gallons, being a mean of fifty gallons per head per diem, as the basis on which I found my calculations for the entire yearly consumption, and distributed under the following heads:—

1st. Domestic Uses.
2nd. Hospitals, Dispensaries, &c.
3rd. Asylums.
4th. Schools.
5th. Gaols, Court-Houses, &c.
6th. Public Wash-Houses and Baths.
7th. Shipping.
8th. Horse and Cattle Troughs.
9th. Extinction of Fires.
10th. Cleansing and Watering Streets.
11th. Flushing Sewers, Drains, &c.
12th. Ornamental Fountains.
13th. Public or Botanical Gardens.
14th. Gardening Purposes.
15th. Railways.
16th. Steam Engines.
17th. Manufactories.
18th. Abattoirs,

And Public Buildings in general, &c. &c.

In calculating the supply, I take the water-shed, being a surface catch-water basin, assumed to be, at a most moderate estimate, *ten thousand* acres in extent, within the marginal apex, the drainage of which flows into the Barwon, by way of Wormbete Valley, where I purpose impounding it by the formation of an embankment fifty-eight feet in height.

Table No. VI.

SUPPLY.

Assumed Rainfall.

		inches.
See data, Table No. VIII. taken at	.. .. ..	36·00
Dew	.. ..	0·00
		36·00
Evaporation	.. ..	27·00
25 per cent. available rain-fall	.. ..	9·00

	Gallons.
6,666 imperial acres, or two-thirds of watershed, allowing 9 inches or 25 per cent. as available rainfall	1,356,758,310
3,334 imperial acres, or two-thirds of watershed in the immediate vicinity of the Reservoir, or 50 per cent. as available rain fall	1,357,165,378
10,000	
252 imperial acres surface level of reservoir, at 40 ft. contour—	
Rainfall .. .. 36·00 inches. Dew .. .. 4·00 = 40·00	227,958,192
Available gallons of water per annum	2,941,881,880

Table No. VII.

Cubical Capacity of Reservoir, in Gallons.

		Cubic Feet.	Gallons.
Wormbete Valley proper	..	207,976,236	
Western Inlet ..	.. ..	53,541,047	
North-east Inlet	.. ..	5,147,058	
		266,664,342, or	1,661,318,850

Evaporation.

Acreage at forty feet level of surface	252	Mean 218 acres at 4·166 feet	
Ditto thirty feet	184		246,462,969
			1,414,855,881

Demand.

Consumption of 50,000 population, at an average of fifty gallons per head per diem, for all purposes, for twelve months	912,500,000
Showing a balance of above five hundred millions of gallons, as provision against occasional droughts	502,355,881
Consumption for an additional six months ..	456,250,000
Balance of forty-six million gallons for evaporation and contingencies, after supply for eighteen months	46,105,880

The working out of the last table (No. VII.) shows a balance of water still on hand from the *once filling* of the reservoir, and after supplying a 50,000 population for eighteen months, and without receiving during that period any additions to its quantity.

It will be observed that the quantity would snffice for the present population of 25,000 for two and a half years; or, by reducing the allowance per head to the *Melbourne standard* of twenty-five gallons, for five years.

This, let it be understood, is without infringing on but half the rain-fall, the whole of which being (2,941,881,880) two thousand nine hundred and forty-two MILLIONS of gallons—see Table No. VI. Were it impounded, it will readily be understood that there would be a sufficiency (after deducting for yearly evaporation) for nearly double the above periods; say *three, five,* and *eight* years respectively, quite sufficient to lull all anxieties respecting the probability of a water famine, even if three or four consecutive years of drought should ever unhappily again occur, as it has in the memory of many of the early settlers. It leaves a very ample margin to meet contingencies of any nature or kind, and more particularly all cavil.

It may be, that superficial observers, or persons who have not made hydraulic questions their study, may at first sight imagine that I have either set down the available rain-fall at a high figure, or from imaginary data.

In contravention of such idea, I append Table No. VIII. of actual rain-fall at Yan Yean reservoir, and quantities ascertained both by careful gaugings at mouth of inlet tunnel, and checked by water-gauge staff, permanently fixed at the outlet tower of the reservoir. I wish to show the several facts deducible therefrom.

Table No. VIII.

Time, 1856.	Rain Gauge.	Quantities calculated at a per centage on Rain-fall of Water Shed.	Gallons.	Gallons.	Millions Gallons. Quantities as gauged at Inlet, and checked by Tower Staff.
June	1·70	40,000 acres drained by Plenty River, 33 per cent. ..	507,478,356		
		5,500 acres, drained by Reservoir 65 per cent. ..	137,442,054		
		1,300 acres, surface of Reservoir, 100 per cent. ..	49,978,929		
				694,899,339	698
July	2·25	40,000 acres, as above, 35 per cent.	712,369,630		
		5,500 acres, as above, 70 per cent.	195,901,571		
		1,300 acres, as above, 100 per cent.	66,148,582		
				974,419,783	974
	3·95			1,669,319,122	1,672

Table No. IX.

Synopsis, showing Register of Pluviameter in Victoria for same months.

Yan Yean. 600 feet above sea level.	Melbourne. 130 feet above mean sea level.		Geelong. 125 feet above mean sea level.
June and July, 1856.	Time. Mean of Five Years, June and July ending 1851.	Time. June and July, 1856.	June and July, 1856.
3·95	5·006	5·135	4·46

The above tables, Nos. VIII. and IX., are compiled from accurate and authentic data, (kindly supplied me by Mr. Charles Taylor, resident engineer at Yan Yean reservoir, to whom I tender my thanks,) and checked from means within my own control. The quantities of water, 35, 70, and 100 per cent. respectively, may seem to be excessive for the registered rain-fall, but I know that nearly as much water escaped by the bye-wash, *i.e*, the River Plenty; that is, off the 40,000 acres, (the 5500 acres being the original and only water-shed of the reservoir swamp, to which it finds its way irrespective of the artificial aqueduct.) This reservoir having no bye-wash proper, therefore, strictly speaking, the word "bye-wash" is a misnomer, as at present applied by the authorities in connection with the scheme; it is simply an outlet overflow, constructed at the termination of the embankment. The real bye-wash is the original River Plenty, by which all that the aqueduct cannot receive pursues its onward course to the sea.

These tables prove one of two things—either that the pluviameter indicated less than the real fall, or that nearly all, if not quite all, the rain-fall on the 40,000 acres, found its way towards the reservoir, and would have nearly filled it, if the two-mile aqueduct had been *capacious* enough to convey it.

That the whole quantity came down I do not for a moment doubt; and it arose from the fact of the ground having been thoroughly well saturated prior to the rain now registered for June and July, 1856, thereby proving that heretofore the theoretical allowance of colonial engineers and others for available water is much *under the mark.*

I would have it, therefore, inferred, that the per centage as allowed by me for Wormbete is no way in excess, but otherwise scanty, seeing that it is a much more favorably circumstanced gathering-ground, all things considered, than the Plenty.

TABLE No. X.

Showing the proportion of Evaporating Surface of various Home and Colonial Reservoirs and natural Lakes, as compared to their acreable Water-shed in extent:—

Lake Corangamite	One-ninth.
Lake Colac	One-tenth.
Lake Wardyallock	One-eleventh.
Rivington Pike (England)	One-twentieth.
Yan Yean	One-thirtieth.
Wormbete	*One-sixtieth.*

In regard to the purity of the Wormbete reservoir waters, it should be borne in mind that from the time on which they are condensed on the surface until they are impounded in the reservoir there are no lagoons to fill, no sedgy marsh lands, no extensive swamps to pass over, absorbing much, discolouring the residue, and creating vegetable poison; no fallow lands or agricultural district to impregnate more or less by the impurities which they contain, and which may be gathered up by the waters passing over them; no contaminating influences arising from sheep or wool-washing establishments; and, being far removed from population, there are few floating impurities in the air, and no sewage matter to deteriorate the surrounding soil; scarcely a human being, all being still, save the occasional ringing note of the solitary woodman's axe; and it should not be forgotten that animal matter taken hold of in any shape by the solvent power of pure water, though in minute particles, is held by the first authorities to be prejudicial in regard to health.

It should further be borne in mind (and it is no slight recommendation,) that from the very natural configuration of the thousands of acres in this forest, it never can, in all time, become an agricultural district—must remain as it is, save being denuded of its timber, thereby giving an assurance that coming generations will, equally with the present, enjoy a pure water-gathering ground and pure water, without the intervention of artificial filters, many of which, in some of the finest works in the mother country, are exceedingly troublesome, and liable to get out of order.

The Retreat yields water of the greatest natural purity, the pellucid stream of which is comparatively free from even vegetable contamination, (notwithstanding the adjacency in such numbers of the tall but graceful and luxuriant tree-fern, and other plants of an almost tropical growth;) little or no perceptible change has been imparted to the water thereby; it is deliciously cool, strongly reminding me of the bright sparkling waters of the mother country; it is almost as pure as the purest known, and very much better adapted for domestic uses than most, being less impregnated either with mineral or chemical constituents—(*vide* Dr. Macadam's Report)—not requiring filtration, pure, brilliant, and entirely unexceptionable in colour or taste, betraying no organic taint, and evincing *prima facie* great purity.

Having shown that more than a sufficiency of water is procurable, it now rests with my Commission to order the necessary steps next in progression to be taken, by which so abundant a supply can be made available for the town, by the construction of such works as may be required for collecting, conveying, and distributing that which nature has put within our grasp, namely, the fundamental groundwork for creating a never-ceasing gravitation supply.

Having given much and serious study to the ichnographical features of the town and its suburban districts, with a view to high and constant service, it but remains for me to say, that, seeing it is a matter of the greatest importance, and should be kept most prominently in view, the supply being not only ample, but good and unlimited, with an ever-continued pressure constantly on, available at all times day or night from an altitude sufficient to command the upper story of the highest house in the most elevated district, sufficient to quickly and efficaciously extinguish fires, however extensive, and that without incurring any additional outlay for power, save the fire-plugs or hydrants, protecting the town against the devastating element of fire, a striking proof of the lamentable effects of which we so lately have had in the ravages committed in the Market Square, Geelong, on the night of 26th December last, destroying in so short a space of time £50,000 worth of property, which, had these projected works been but complete and in a working state, they would most assuredly have kept the total loss under £500, a difference of £45,500,—a large amount consumed by this one fire alone, which would have formed a considerable item in the expenditure necessary for the formation of water works.

Thus,—I take it, the future protection of the citizens and their properties will be secured from such a scourge by simple pressure, obtained from such an altitude as will render obsolete the primitive mode now obliged to be resorted to, as a matter of necessity, by an otherwise well-regulated, energetic, and fearless fire brigade, bringing to their aid a comparatively weak and inefficient mechanical power.

Suffice it to say that by this gravitation we avoid the necessity for the erection of steam-engines, or other expensive machinery, in duplicate or otherwise, ever liable to get out of order. We also avoid elevation syphons, with all their paraphernalia, which is rendered unnecessary, besides other expensive appendages too numerous to detail within the limited compass of this paper, nor is it desirable that I should do so, seeing that any or every pumping scheme is superseded by the adaptation of nature's own providing—a GRAVITATION SCHEME, *eligible*, *safe*, *simple*, and *comprehensive.*

It may be that I shall have the honour on a future occasion to submit, (subject to your wishes,) a further or supplemental paper, on an extended scheme, the possible formation of a reservoir, in the same locality, covering an area of four hundred acres, depth of water seventy feet at embankments, and the cubical contents of six hundred and forty-five million feet, or four thousand and eighteen million gallons in quantity;

the which is worthy of our consideration in a climate such as this, where the rain-fall has been known to be casual, exceedingly precarious, uncertain, and occasionally scanty in amount; sufficient to meet the views of the most utopian opinions on increasing population in any country, and more particularly that of our adopted one.

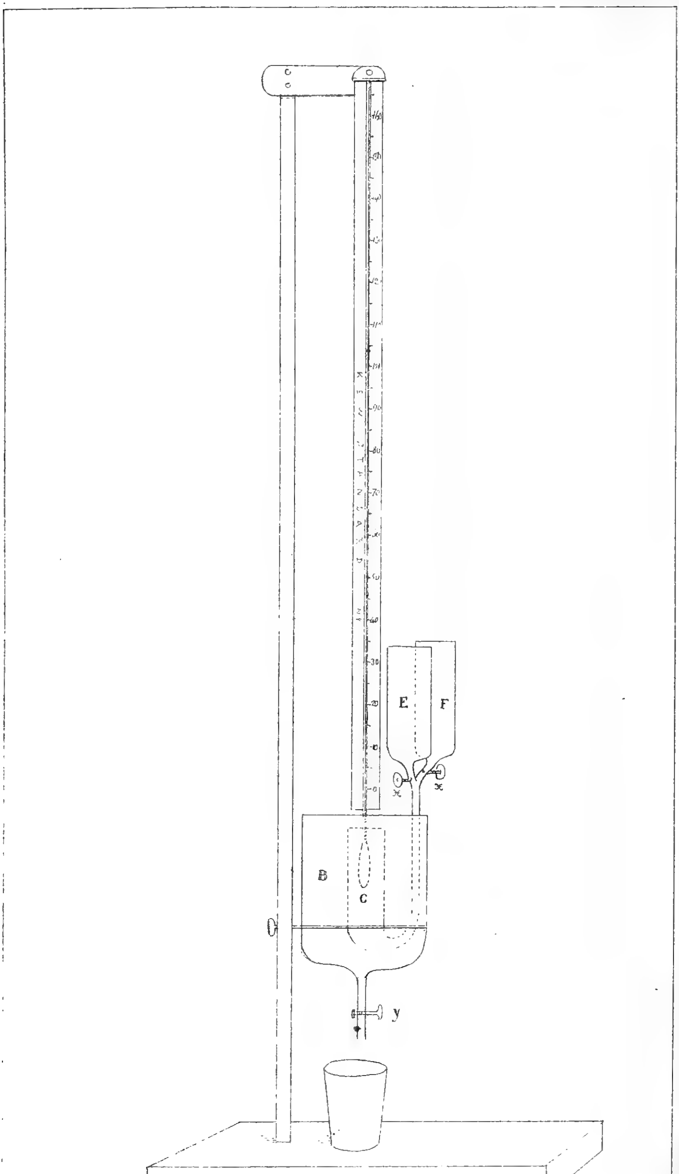
In the experience of the older colonists we have had two and even three (some say four), consecutive years of drought; if such should unhappily again occur, it may be that the population of Melbourne might be dependent on Geelong for water. Such being the case, by the erection of an embankment of the magnitude contemplated in my supplemental paper, we would have enough and to spare, so that Melbourne could be assisted without infringing on the rights of Geelong.

Foreseeing the possibility of deriving a revenue more than enough to warrant an extra expenditure of considerable capital by a well-digested system of *reproductive works,* using the surplus waters capable of being impounded—

1st. For use of Man.
2nd. Use of Animals.
3rd. Sheep Washing.
4th. Irrigation.
5th. Irrigation as Manure.
6th. Motive Power, by the use of hydro-pneumatic engines, or others.

I believe I am warranted in stating that the value of water for irrigation purposes is by no means as yet sufficiently known in the colony, but it is to be hoped that the day is not far distant that its merits will be appreciated as it deserves. And in connection with this, I will but draw your attention to a few facts connected with such a use in a climate not unlike ours, namely, the innumerable tanks and reservoirs of our conquered provinces of India, which had been constructed under the native princes for the use of their people. Scarce a village is without one, and where the population was dense, requiring greater, such as the present Madras Presidency, they had a reservoir thirty miles in circumference, having an embankment of some twelve miles long, and approaching a depth of fifty feet.

In reference to this subject I doubt not but when the time arrives for our Government to take the matter up in detail,



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it can be satisfactorily proved that such works can be made *reproductive*, and handed down to posterity as the triumph of the infant age of Victoria, and worthy of the times in which we live.

ART. IX.—*On the Construction of an Instrument for ascertaining the Dew Point. By* R. BROUGH SMYTH, *Esq., C.E., F.G.S., &c.*

[Read before the Institute, 6th May, 1857.]

GREAT difficulty is experienced by Meteorologists in determining the dew point by direct experiment.

In very hot countries, or in those places where the air is very dry, Daniell's beautiful invention is almost valueless. I need not state the objections to the black and white bulbs of Daniell: they are known to all who have ever used a hygrometer systematically, and compared the results with the dry and wet thermometers.

Mr. Glaisher has emphatically protested against the use of Daniell's instrument in hot countries, and indeed has very properly pointed out the liability to error when it is used, under any circumstances, by inexperienced persons. Even with the utmost care the best result is seldom within 0·25°.

An ordinary method of obtaining the temperature of the dew point is by a silver cup, and a freezing mixture. The cup is partly filled with water, and is cooled down by stirring in the refrigerating compound until a deposit of dew takes place on the outer surface of the cup, and at the moment when the dew is observed the temperature of the liquid is taken by a thermometer.

Now all I have to offer as a contribution to the instrumental aids of the Meteorologist is, an improvement on this last method.

The drawing shows at a glance the plan I would propose. The bulb of the standard Kew thermometer *A* is placed close to the inner edge of the thin gold cup *B*. Within the gold cup there is a copper vessel, *C*, connected by a (*Y*) pipe with the exterior cups *C, E,* and *F*. These are filled with water, and the temperature of *E* is supposed to be reduced to 33°, or lower when it may be required, by a freezing mixture. By turning the stopcocks, *x x*, the observer can cause the gold cup to be filled with water at any required temperature with great facility, and without withdrawing his attention from his instrument. It is presumed that the water and the outer edge of the gold cup will be of the same temperature; for after the liquids at different temperatures have passed through, and over the copper vessel, *C,* they will be well mixed before acting on the bulb of the thermometer, or the edge of the cup.

By the stopcock *y* the water, if it be too cold or too hot, can be easily run off into a waste cup.

By this arrangement, though I have not yet proved it by actual observation, it is believed that the dew point can be obtained with minute accuracy, say within 0·10°.

The instrument is easily portable. All the parts can be unscrewed and packed away; and it does not render necessary the use of a liquid like ether, which is very difficult to carry, and which wastes and deteriorates rapidly during the summer in this country.

Art. X.—*Account of some New Australian Plants.* By Dr. Ferdinand Mueller.

[Read before the Institute, 5th August, 1857.]

Mr. President and Gentlemen—It is not without hesitation that I submit to the Institute a limited number of plants, which have, perhaps, no other claims on your attention but their novelty; and I should have retained them for publication in a Phytological Journal, but for a desire of recognizing publicly in Australia the recent contributions of some scientific friends towards our knowledge of the indigenous vegetation. It offers, however, likewise, the opportunity to show how much the wonderful works of Nature remain to be revealed in our own country.

Some of the plants which I have the honor to exhibit are selected from a Herbarium formed by Mr. Hill, the Superintendent of the Brisbane Botanic Gardens, a gentleman of keen observation, and great ardour for botanical research. Others were communicated by Mr. Charles Stuart, who succeeded last season in forcing his way into the wilderness of Mount Lapérouse, in South-western Tasmania, and through whose exertions new features of its alpine flora have been unveiled. Others of these plants were discovered during a journey through the Grampians, performed by my zealous assistant, Mr. Wilhelmi, under the auspices of our Government. For some of these novelties I remain indebted to other gentlemen; and I can only regret that I was not enabled to bring on this occasion their merits more prominently before the Institute in a fuller display of their kind communications.

Only a few of the species are obtained by myself, principally salt bushes,—insignificant in their appearance, but invaluable in the desert for the subsistence of sheep-flocks. These were procured already, in 1851, near Lake Torrens, a locality which quite of late attracted so much interest, through Mr. Babbage and Mr. Goyder's enterprises.

And when the discovery of an extensive saltwater lake, in a position formerly assigned to the saline basin of Lake Torrens, was hailed with universal delight, and when this new approach to Central Australia in that direction augurs so well for the future, we can be but animated with ardent wishes for the welfare of the expeditions now engaged in the geographical exploration of the interior of South Australia.

I had, in distinguishing some of the more interesting of these plants, the pleasant opportunity of attaching to several of them the names of members of the Philosophical Institute, not only as a token of personal respect, but also as an appreciation of their services rendered to this society, and as a slight acknowledgment of the disinterested manner in which they fostered and cultivated science in this country.

MONIMIEÆ.

Hedycarya Pseudomorus.

(H. dentata var. Australasica, Sonder in Linnæa xxviii. p. 228 non Forster.)

Leaves long petiolated, ovate or lanceolate, acuminate, opposite and alternate; stigma depressed, minutely umbonate; carpels small, numerous, sessile, densely crowded, yellow.

In the forests from Cape Otway to Wilson's Promontory, and probably also in New South Wales.

I regarded this plant formerly as the type of a new genus, and I am indebted to the venerable maecen, Sir William Hooker, for information on its correct generic position. The learned Dr. Sonder referred it to Hedycarya dentata from New Zealand, not having seen its fruit. It is not a little surprising, that hitherto, of the numerous New Zealandian forest trees, only Pomaderris elliptica and Fagus fusca (the black birch of the New Zealand colonists) have been identified with Australian or Tasmanian trees, whilst, according to Dr. Hooker's flora of New Zealand, many of the shrubs, and a considerable portion of the herbaceous plants, proved identical with ours.

Wilkiea.

Flowers unisexual, female ones racemose apetalous; male ones unknown. Calyx subglobose, perforated at the apex, circumcised; germens numerous, sessile; styles none; stigma depressed, conical; carpels drupaceous, succulent, borne by the fleshy calyx; embryo minute at the base of a copious albumen.

A tree of eastern subtropical Australia, with exception of the ovaries smooth, with opposite short stalked coriaceous oblong or lanceolate ovate leaves, which are remotely serrated or entire, with a yellow calyx and black drupes.

I distinguish this interesting genus most regardfully with the name of one of the Vice-Presidents of the Institute, and regret that the specimens in my possession do not admit of a more perfect characteristic.

Wilkiea calyptrocalyx.

On subsaline banks of the Brisbane River. Hill & Mueller.

SAPINDACEÆ.

Nephelium tomentosum.

(Sect. Arytera.)

Branchlets, rachis of leaves and panicles brownish-tomentose; leaves on short petioles; leaflets in two to four pairs, opposite, oblique ovate, or ovate lanceolate, acuminate, serrated, above at last glabrous, beneath downy, with very short stalks; terminal pair the largest; panicles axillary and lateral; divisions of the calyx 5, acute; style trifid at the apex, carpels twin or ternate, ovate globose, often somewhat compressed, tomentose.

On the Brisbane River. Hill & Mueller.

A middle-sized beautiful tree.

Rutaceæ.

Boronia granulata.

(Sect. Zieria.)

Branchlets nearly glabrous, densely tubercled; leaves all trifoliolate, short stalked; leaflets linear, with revolute margin, like the petiols scantily tubercled, above glabrous, beneath velutinous; cymes pedunculate, many flowered, shorter than the leaf, puberulous; segments of the calyx deltoid-ovate, acuminate, three or four times shorter than the petals; stamens and style nearly smooth; stigma four-lobed; anthers roundish; carpels blunt.

Interior of New South Wales. Sir Thomas Mitchell.

Xanthoxyleæ.

Xanthoxylon brachyacanthum.

(Sect. Rhetsa.)

Glabrous, branchlets and peduncles furnished with short straight prickles; leaves alternate, unarmed, with 3 to 5 pairs of leaflets, and a wingles rachis; leaflets short-stalked, ovate or broad lanceolate, blunt acuminate, entire or somewhat repand; panicles much shorter than the leaves.

In the Araucaria forests of Moreton Bay. Hill & Mueller.

Buettneriaceæ.

Lasiopetalum Wilhelmii.

Leaves oblong-lanceolate, rounded at the base, flat at the margin, above glabrous, beneath velvety; cymes with crowded flowers and short peduncles; lower bracteole linear; segments of the upper bracteole lanceolate, of equal length; calyx longer than the bracteole, outside velvety, inside glabrous, with ovate-deltoid segments; anthers bursting at their whole length; germen trilocular, velvety; style smooth at the apex.

On the summit of the northern mountains of the Grampians. Wilhelmi.

A species, like L. micranthum, somewhat abnormal, in bivalved anthercells.

Elatineæ.

Bergia tripetala.

Annual, procumbent, glandless; stems and branches downy; leaves lanceolate-ovate, minutely serrated, smooth; verticills many-flowered; pedicels glabrous, shorter or as long as the calyx; flowers trimerous; petals ovate, blunt, somewhat longer than the calyx; stigmas very short; capsule slightly furrowed, longer than the calyx, with very thin dissepiments; seeds brown; testa latticed.

At the confluence of the rivers Murray and Darling.

Three other species of this genus are discovered in tropic Australia, during Mr. Gregory's expedition.

Euphorbiaceæ.

Pseudanthus ovalifolius.

Leaves oval, rarely oblong or orbicular, opposite or crowded, on very short petioles, at the mid-rib scabrous; segments of the male flowers spathulate, linear; exterior filaments twice or three times longer than the anthers, interior ones many times longer than the globose ovate anther-cells.

In vallies at the Grampians, the Serra and Victoria ranges. C. Wilhelmi.

Rosaceaæ.

Geum renifolium.

(Sieversia.)

Root without runners; stem simple, one-flowered, with simple and with short jointed glandbearing downs; stipules broad, ciliated, in front toothed; leaves hirsute, radical ones pinnatisected; lateral segments in one to three pairs, minute or wanting, terminal one large, kidney-shaped, crenate and short-lobed; leaves of the stem small, distant, cordate, or orbicular ovate, deeply toothed; bracteoles oblong-lanceolate, nearly emarginate, half as long as the calyx; segments of the calyx broad-ovate, nearly acuminate, outside hirsute; petals .... awns half-exesrted, hairy, not jointed, at the revolute apex naked.

On Mount Lapérouse, Van Diemen's Land. Stuart and Oldfield.

Rubus Moorei.

Shrubby, diœcious; branches terete, as well as the petioles copiously beset with reflexed short prickles; leafs palmate; leaflets five or three, stalked, ovate or lanceolate-ovate, acute, on both pages of equal colour, above glabrous, beneath velvety-tomentose, mucronulate-serrulated, at the rounded base entire; stipules linear, deciduous, teethless; panicles axillary, on very short peduncles, with minute prickles; bracts ovate, acuminate; segments of the tomentose calyx ovate, blunt, equal, shorter than the corolla, but longer than the stamens.

Clarence River. C. Moore.

It differs from the New Zealandian Rubus Australis in shorter acute, but not acuminate leaves, in ovate bracts, in a larger calyx, and in stamens shorter than the calyx.

The fruit is, according to Mr. Moore, blackish-red.

Rubus Hillii.

Shrubby, hermaphrodite; branches terete, grey-tomentose, as well as the petioles beset with reflexed short prickles; leaves simple, cordate, with three to five short acuminate, somewhat angular lobes, above scantily hairy, beneath grey-velutinous, at the margin short toothed; teeth unequal, acute; nerves and innovations ferrugineous; stipules and bracts fringelike-laciniated, together with the calyx silky-tomentose; panicles at last much spreading; calyx as long as the petals; its divisions acuminate, the inner ones smaller.

On the Brisbane River. Hill.

Allied to R. Lambertianus (Ser. in D. C. prodr. ii., 576).

MYRTACEÆ.

Lysicarpus.

Tube of the calyx bellshaped, below connate with the base of the ovary; limb five-lobed; petals five, inserted to a ring, which surrounds the faux of the calyx; stamens numerous, free; outer ones sterile, longer than the petals, with rather large inapert anthers; inner ones thinner, nearly as long as the corolla, with round bi-celled anthers, which open by longitudinal slits; anthers all dorsifixed, with a terminal minute gland; ovary three-celled, with numerous ovules; style cylindrical; stigma short-bilobed; capsule ovate, half emersed, loose, three-celled; its valves thin; seeds small, numerous.

A tree of eastern subtropical Australia, with generally ternate linear at the margin revolute exstipulate leaves, and with axillary and terminal pedunculate white flowers.

A genus allied to Metrosideros and Pericalymma.

Lysicarpus ternifolius.

On low mountains between the Dawson and Mackenzie River. Also on Darling Downs according to a specimen communicated by Mr. C. Moore.

This tree is esteemed for its excellent timber.

Leguminosæ.

Euchilus cuspidatus.

(Spadostylis.)

Tall, much branched; branchlets thin, downy; leaves small, ternate, heart-shaped, nearly sessile, cuspidate, mucronate, flat, glabrous, entire; stipules setaceous, persistent, much shorter than the leaves; pedicels thread-like, the fruit-bearing ones a little longer than the leaves; bracteoles linear-setaceous, scarcely shorter than the calyx; lower lip of the calyx much reflexed, but little longer than the other; pod turgid, ovate, glabrous, sessile.

On forest ridges around Moreton Bay. Hill and Mueller.

Araliaceæ.

Panax elegans, Moore and Mueller.

Arborescent, unarmed; leaves long, simply or double pinnate; leaflets in three to seven pairs, opposite, ovate, acuminate, acute at the base, entire, veined, glabrous, shining above, paler and opaque beneath; racemes very numerous, spreading, collected in one ample decompound panicle; peduncles thinly velutinous; flowers puberulous, longer than the pedicels; styles very short, scarcely recurved; berries round, compressed, two-rarely three-celled.

Richmond River. C. Moore. Moreton Bay. Hill and Mueller.

A magnificent plant, attaining a considerable size. Its timber was exhibited at Paris, under the name Aralia elegans.

Compositæ.

Senecio drymophilus.

Perennial, erect, scarcely branched, pubescent; leaves succulent, oblong or obovate-spatulate, almost entire or remotely toothed, flat; inferior ones tapering into a petiol; superior ones clasping with a cordate base; peduncles long, terminal, one- or few-headed, with distant bracts; scales of the cylindrical involucre 12-16, acute, nearly as long as the disk; ligules wanting; achenes thin, cylindrical, brown, smooth, streaked, half as long as the pappus.

In irrigated forest-valleys of Moreton Bay. Hill and Mueller.

Senecio primulifolius.

Perennial; stem simple, erect or ascending, at the base silky-tomentose; radical leaves crowded, blunt, cordate ovate, repand, stalked; beneath or on both sides cobwebbed; stem-leaf solitary, clasping, oblong or pandurate, sharply toothed; peduncles two or three, terminal, with a leaflike bract, woolly; involucre broad bellshaped, with 16-18 lanceolate-linear leaflets, scantily cobwebbed, twice as long as its laxe bracts, and of equal length with the disk, bearded at the apex; ligules several, conspicuous; achens glabrous, nearly three times shorter than the pappus.

On Mount Laperouse, south-western Tasmania. C. Stuart, A. Oldfield.

Senecio papillosus.

Perennial; stem simple, pubescent, densely hairy at the base, with a solitary flowerhead; radical leaves small, crowded, spathulate-ovate, entire, gradually tapering into the petiol, with slightly reflexed margin, above from papills very rough, beneath imperfectly hairy; stem-leaves narrow or linear-lanceolate, sessile, scarcely toothed; involucre almost hemispherical; leaflets 20 to 22 lanceolate linear, at the apex sphacelate and bearded, at the back scantily hairy and papillose, as long as the disk; bracts half or nearly as long as the involucre, appressed, ligules several, conspicuous; achens glabrous, of half the length of the pappus.

On Mount Lapérouse, Van Diemen's Land. C. Stuart, A. Oldfield.

Trineuron scapigerum.

Erect; stem scapelike, puberulous; leaves lanceolate- or spathulate-linear, acute; radical ones crowded, tapering into a fringed petiol; stem-leaf solitary, like the bract sessile, their lateral nerves obliterated; flowerheads a few, terminal, densely crowded, or forming a corymb with leafy bracts; leaflets of the involucre 8-12, oblong, with three pellucid nerves, hardly coriaceous; all flowers four-toothed; style of the female flowers short-bifid, of the male ones scarcely divided.

With the two preceding plants, discovered by C. Stuart and A. Oldfield.

GOODENIACEÆ.

Goodenia teucriifolia.

Annual, pubescent; stems slender, procumbent; leaves short-stalked, nearly membraneous, ovate lanceolate, or the upper ones narrow lanceolate, all acute, serrated; peduncles axillary, 1-3-flowered, pedicels with two bracteols; segments of the calyx nearly setaceous, as long as the tube; corolla glabrous; style almost smooth; ciliæ of the indusium very short; capsule small, ovate, or nearly globose; dissepiment scarcely half the length of the valves; seeds few, small, ovate-oblong, shining, brownish yellow, comparatively thick, with subtil dots, and a thin margin.

In the fissures of rocks, on the Glasshouse mountains of Moreton Bay. Hill and Mueller.

Goodenia amplexans.

Suffruticose, erect, glandulous-pubescent; branches terete, foliate; leaves oblong or ovate, with a heartshaped clasping base, sessile, acute, minutely toothed; flowers solitary, two or three, axillary; peduncles shorter than the tube of the calyx, bractless; segments of the calyx linear-subulate, a little shorter than the calyx; style villose; indusium conspicuously ciliate; anthers blunt; capsule ellipsoid ovate, to a third of its length bilocular; cells few-seeded; seeds livid, marginate, nearly smooth.

Ridges and gullies near Adelaide.

APOCYNEÆ.

Parsonsia. R. Brown.

(Sect. Gastranthus.)

Calyx without scales; lobes of the corolla in preflorescence valvate, tube ventricose, faux bearded; filaments free;

anthers dilated at the base, with blunt short lobes; hypogynous disk crenated.

Parsonsia ventricosa.

Climbing, leaves almost membraneous, ovate or lanceolate, long acuminate, short-stalked, with rounded or emarginate base, smooth; umbells nearly capitate; peduncles slender, as well as pedicels and calyces puberulous; calyx deeply five-cleft, with rhomboid ovate pointed segments, half as long as the corolla tube; lobes of the corolla lanceolote, acuminate, of the length of the tube, glabrous; filaments much shorter than the half exserted anthers.
Vallies of the Pine River. Hill and Mueller.

Melodinus, Forster.

(Sect. Dichostemma.)

Faux of the corolla with a double series of bifid scales, five in each series; upper ones inserted to the base of the corolla lobes, alternate with the inferior larger ones.

Melodinus acutiflorus.

Leaves lanceolate, flat, entire, blunt-acuminate, above glabrous-shining, beneath paler, puberulous; primary veins distant, divided, spreading; peduncles axillary, with two or three rarely single flowers, downy; bracts lanceolate subulate; segments of the calyx lanceolate, long pointed; lobes of the corolla lanceolate linear, acute; faux densely bearded.
On the Brisbane River. Hill and Mueller.

SCROPHULARINÆ.

Eadesia.

Calyx bell-shaped, five-cleft; corolla campanulate, somewhat funnel-shaped, five-cleft, indistinctly lipped; lobes oblong, the upper two broadest; stamens four, inserted to the base of the corolla, inclosed, two longer; anthers kidney-shaped, one-celled, attached with their back to the linear filaments; style simple, filiform; stigma dilated; capsule globose ovate, two-celled, loculicidal; valves bifid at the apex; seeds in each cell one or two, fixed to the base of the free dissepiments, kidney-shaped, scrobiculate.

A shrub of Southern Australia, with velutinous branches, with alternate lanceolate flat nearly glabrous undivided leaves, which are articulated at the base, sessile or short stalked, with short axillary or terminal one or few-flowered peduncles, and nearly white flowers.

This pretty genus, to which I attached the name of our friend Dr. Rich. Eades, differs from Anthocercis in a nearly bilabiate corolla, one-celled anthers, and few-seeded capsule.

Eadesia anthocercidea.

Shady places in the ranges near Mount Zero. C. Wilhelmi.

PROTEACEÆ.

Macadamia.

Flowers hermaphrodite, symmetrical, in racemes; sepals four, spathulate linear, recurved at the apex, deciduous; stamens four, inserted near the middle of the sepals; filaments longer than the anthers; connective protruding beyond the linear anther cells; hypogynous annulus denticulated; germen sessile; style filiform, deciduous; stigma vertical, continuous, blunt, upwards but slightly thickened; capsule nearly woody, dehiscent on one side; seeds unknown.

A tree of oriental subtropical Australia, with leaves three in a whorl or rarely opposite, lanceolate or oblong, flat, with pointed teeth, or above the base entire, net-veined, with stomata at the lower side; racemes terminal pedunculate; flowers twine, with a solitary bract.

A beautiful genus, allied to Adenostephanus, Orites and Xylomelum, dedicated to John Macadam, Esq., M.D., the talented and deserving Secretary of our Institute.

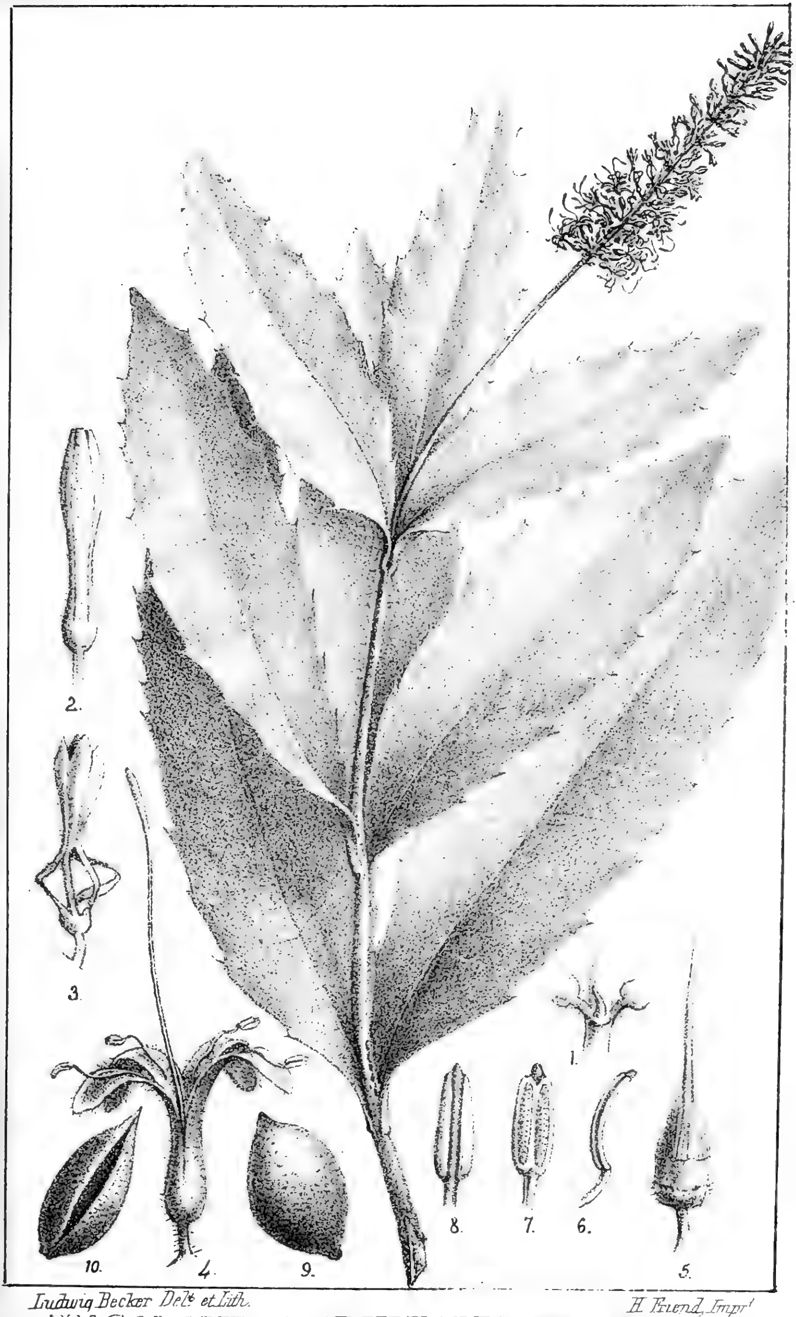
Macadamia ternifolia.

In forests on the Pine River of Moreton Bay. Hill and Mueller.

EXPLANATION OF THE PLATE.—1. Bract and pedicels, 2. Unexpanded flower. 3. Half-expanded flower. 4. Expanded flower. 5. Germen and annulus. 6 7 8. Anthers. 9 10. Fruit (natural size). All parts, except 9 and 10, more or less magnified.

Grevillea Hilliana.

Branchlets brown silky, leaves large, ovate oblong, blunt, entire or pinnatifid, cuneate at the base, flat, net-veined, above glabrous, beneath silvery-silky; their segments oblong lanceolate; racemes axillary and lateral, solitary, pedunculate, silky, densely many-flowered; bracts minute, lanceolate, deciduous; calyx small, inside and style gla-



Ludwig Becker Delt et Lith.

H. Friend, Impr.

MACADAMIA TERNIFOLIA. FERD: MUELLER.

(Nature Printing)

Ludwig Becker Dirx.

brous; stigma orbicular, nearly lateral, umbonate at its centre.

In forests at the Pine River of Moreton Bay. Hill and Mueller.

A magnificent forest tree, which I wished to bear the name of its discoverer, Mr. Walter Hill, the Director of the Botanic Gardens of Brisbane.

POLYGONEÆ.

Polygonum Linné.

(Sect. Homalocladium.)

Branches flat, almost leafless; flowers axillary; calyx five-cleft; stamens 7-8; styles 3; stipules minute.

Polygonum patycladum.

Perennial, glabrous; stem erect, towards the base nearly terete, near the branches compressed; branches quite compressed, leaflike, articulated, streaked, nearly transparent, either leafless or with a few oblong or hastate lanceolate leaves, which are short stalked and acute at the base; bracts and stipule short, with fringeless margin; flowers solitary, or a few lateral; styles at the base joined.

On moist places of New Caledonia. Shepherd.

Although the fruit is unknown, and the plant so dissimilar to other Polygonums, there can be scarcely a doubt of its belonging to this genus. In habit it resembles some leafless flat-branched Phyllanthi.

SALSOLACEÆ.

Blitum cristatum.

Procumbent, somewhat downy and glandulous; stems imperfectly streaked; leaves on long petioles, rhomboid or oblong ovate, acute, at the base blunt, at the apex with blunt teeth; glomerules axillary, many-flowered; fruit-bearing calyx dry, closed, acuminate, with cristate wings; seeds smooth and shining, with a nearly acute margin.

In the desert on the Murray, Darling and Lake Torrens.

Allied to B. carinatum.

Rhagodia nitrariacea.

Shrubby, erect or diffuse; branches spreading or reclined; branchlets divaricate, grey, spinescent; leaves alternate fasciculate, oblong- or spathulate-linear, blunt, quite entire, nearly smooth, gradually narrowed at the base; branches of the panicle short and rigid; flowers sessile polygamous.

Throughout the interior of Australia, from Arnhem's Land to Lake Torrens, the Murray River and its tributaries.

In habit resembling Nitraria Billardierii.

Chenopodium microphyllum.

Perennial, prostrate, much branched; leaves minute, ovate or lanceolate, stalked, entire, above green, beneath powdery-grey; glomerules spikate, few-flowered, on very short peduncles; calyx five-cleft, scarcely ribbed; the fruit-bearing one imperfectly closed; seeds black, slightly wrinkled, opaque, blunt at the margin; embryo forming a perfect ring.

Near the Barossa range. Dr. Behr. Also at Enfield, in South Australia, and in Bacchus Marsh, generally on slaty ridges.

Atriplex rhagodioides.

(Teutliopsis.)

Monoecious, shrubby, erect, grey; leaves ovate hastate, stalked, entire or imperfectly toothed; female glomerules axillary, male ones in paniculate spikes; fruit-bearing calyx rhomboid, without appendages, coriaceous, entire, above the middle open; seeds brown; radicule lateral.

In the saline desert on the River Murray and Darling and on Lake Torrens.

Atriplex leptocarpum.

(Obione.)

Monoecious, stems herbaceous, leaves small, ovate or rhomboid cuneate, ash-grey, unequally toothed or nearly entire; flowers axillary glomerate or in short spikes; fruit-bearing calyx oblong, compressed, oblique truncate or smewhat acute, entire, open only at the apex, smooth or with tubercles at the middle; seeds brown.

In the desert on the Murray and Darling.

Atriplex spongiosum.

(Obione.)

Monœcious, suffruticose, ashy-grey; stems dwarf, erect; leaves small, rhomboid or lanceolate ovate, acute, repand or with a few teeth; flowers in glomerules, or solitary;

fruit-bearing calyx nearly globose, spongy, perfectly closed, apiculate, without appendages; seeds black-brown, shining, roundish ovate; radicule superior, exerted.

On salt flats at Lake Torrens; also on Hooker's Creek and Sturt's Creek, in North-western Australia.

Atriplex inflatum.

(Obione.)

Monœcious, shrubby, erect, ashy-grey; leaves lanceolote or nearly ovate, or rhomboid, quite entire or slightly toothed; flowers in glomerules or solitary; fruit-bearing calyx much enlarged, spongy, nearly turbinate, winged by a transverse appendage, acuminate at the apex; seeds brown, shining, nearly round; radicle inferior.

Eastern subtropical Australia. Sir Thomas Mitchell. Frequent in the desert on Lake Torrens, the Murray, Darling, Murrumbidgee, Dawson and Burnett River.

Dissocarpus.

Flowers hermaphrodite, twine, without bracteoles; calyx urceolate, with a five-cleft limb, unarmed, without appendages, at last indurated; stamens 3-5; filaments subulate linear; anthers cordate ovate; styles two, capillary, united at the base; fruit consisting of two, rarely three, long, divergent at the base turgid and connate calyces; caryopsis enclosed in the lower part of the calyx; pericarp membraneous, distinct; seeds depressed, with a membraneous testa; embryo peripherical; albumen central, mealy.

A diffuse desert shrub of extra-tropical Australia, white tomentose, with alternate linear channelled leaves, and axillary flowers.

A genus allied both to Didymanthus and Sclerolæna.

Dissocarpus biflorus.

In the Murray desert, near Eustone. Sclerolæna biflora R. Br. belongs possibly to this plant.

Echinopsilon sclerolænoides.

(Eriochiton sclerolænoides. Ferd. Mueller Second Report, p. 15.)

Suffruticose, erect; leaves narrow lanceolate, acute, as well as the branches woolly, downy, younger ones somewhat silky; flowers axillary, solitary, forming leafy spikes;

fruit-bearing calyx with its spines involved in a dense wool, spines incurved, a little longer than the breadth of the calyx; pericarp woolly.

Desert of Lake Torrens, of the Murray and Darling.

Another species occurs in eastern subtropical Australia, which I may notice here for the sake of completeness.

Echinopsilon anisacanthoides.

Suffruticose, erect, glabrous; leaves crowded, thin, nearly cylindrical, acute; flowers axillary, solitary; calyx turbinate hemispherical, scarcely as long as its spines; one spine often bifid.

This species differs from Anisacantha merely in the position of its seeds.

Sclerochlamys.

Flowers hermaphrodite, without bracteoles, solitary; calyx minute, five-toothed, at last indurated, five-ribbed, and surrounded by an extremely narrow wing; stamens 3-5; anthers cordate ovate; styles two, capillary; caryopsis depressed, enclosed in the long turbinate calyx; pericarp membraneous, distinct; seeds horizontal; testa membraneous; embryo peripherical; albumen central, mealy.

A perennial procumbent, villous plant of extra-tropical Australia, with alternate linear crowded leaves and axillary flowers.

Sclerochlamys brachyptera.

Kochia villosa, Lindl. in Mitch. Trop. Australia, p. 91, according to Diagnosis.
Kochia brachyptera, Ferd. Mueller, Second Gen. Report, p. 15.

In the desert on the Murray, Darling and Lake Torrens.

Enchylæna R. Br.

(Sect. Heterochlamys.)

Lobes of the fruit-bearing calyx distinct, coriaceous, or at least not succulent.

Enchylæna villosa.

Stems short, herbaceous, procumbent or adscendent; leaves flat, oblong or lanceolate linear, acute, villose; lobes of the fruit-bearing calyx pubescent, upwards dilated, free, coriaceous, with an inflexed margin; caryopsis glabrous.

In loamy plains near Adelaide and in Bacchus Marsh.

Osteocarpum.

(Ferd. Mueller, Second Gen. Report, p. 15.)

Flowers hermaphrodite, solitary, without bracteoles; calyx minute, short toothed, at last indurated and one-ribbed; stamens three; anthers ovate; styles two capillary, joint at the base; caryopsis enclosed in the boney oblique globular calyx; pericarp membraneous, distinct; seeds horizontal, with a membraneous testa; embryo peripherical, annular; albumen central, mealy.

A perennial glabrous procumbent plant of extra-tropical Australia, with numerous short semiterete leaves, with bearded axils and minute axillary flowers.

A genus approaching to Sclerochlamys, Echinopsilon and Threlkeldia.

Osteocarpum salsuginosum.

(Ferd. Mueller, l.c.)

On the saline plains of Lake Torrens, the Darling and Murray River. Also in eastern subtropical Australia, found by Sir Thomas Mitchell.

Suæda tamariscina, Lindley in Mitch. Trop. Australia, is in all likelihood referrable to this plant.

ART. XI.—*On the Introduction of the British Song Bird.* By EDWARD WILSON, Esq.

[Read before the Institute, 4th July, 1857.]

MR. CHAIRMAN AND GENTLEMEN,—Amongst the various kinds of experiment to which I alluded in a Paper lately read before the members of this Institution, there is scarcely one possessed of more general features of a kind of elegant interest than that of introducing into this colony some of the song birds of England; and of thereby relieving the comparative silence of our woods and gardens. It seems probable that much might be done in this way, with a very trivial expenditure of either money or trouble; and if even in a single instance we could achieve success, I think that we should thereby confer a very signal benefit upon the colony at large. It may appear to some a trivial thing to be devoting our efforts in such a direction, while so much has to be done for the colony in matters of essential importance. But I confess that I am inclined to attach great consequence to the diffusion of these minor delights, and to estimate very highly their beneficial effect upon a people. There is a peculiar charm about the song of the sky-lark on a fine spring morning, or that of the nightingale during one of its own calm summer nights, that cannot be adequately described, but can never be forgotten by those who have once heard these birds. There may be a great deal, doubtless, in the associations by which they are surrounded. But it is the peculiar characteristic of these interesting creatures to so surround themselves, and it is the combination of such charms at which we should aim, and which I believe we should attain, if we were to follow out our experiments with reasonable spirit and perseverance. The corn field and the grove we have already spreading around us. Why should we delay the attempt to furnish them with their most agreeable inhabitants?

Before proceeding to consider the chances of success in the introduction of any of the native song birds of England itself, I would like to say a few words respecting that general favorite—the canary.

I think that there are good reasons for believing that this bird might be easily established amongst us in a wild state. In corresponding localities of France and Italy, a species of canary abounds, and adds greatly to the melody of the woods. There is nothing in the severity of our winters to interfere with them. The seeds of the native grasses, and of the various weeds with which even our best cultivated gardens are profusely supplied, furnish food to which they would soon become accustomed. They breed readily here in confinement, and would surely be still more likely to do so, if in a more natural condition.

An experiment with this pretty little bird has this particular advantage, too, that it might be tried at once, and with very little outlay. Canaries are frequently sold by auction in large numbers, and at prices varying downwards to five shillings each, so that a few dozens might be purchased and turned loose in suitable situations at a very moderate expense. They live long here in captivity, and can exist in a wild state, as in watching the process of rearing them I have seen them lost occasionally, and have been surprised at their return after an interval of a few days.

If an experiment of this nature were to be tried, I think it should take place in the spring; that the birds, probably accustomed all their lives to the shade, might become habituated by degrees to the excessive heats of our summer sun. They should be turned loose where water is accessible; where they might be able to return at pleasure to their old food, in their well-known cages; and where in their return they would be free from danger from cats; as while lingering, as they would do, round old haunts, they would be very liable to destruction from this quarter. Before being turned loose, they should be accustomed to the use of their wings, by being confined for some time in a room, or a very roomy cage. Considerable strength of wing, and a free use of it, is essential to their safety, as all new birds would be exposed to great annoyance from several of the native birds, and, if not equal to them in activity, their attacks might be fatal.

In proceeding to deal with the more purely British song-bird, we may pause to ask ourselves which we should first experiment upon. In the event of anything being done, I think it would be a pity to fritter away attention upon several sorts, and that it would be wiser to concentrate our attention upon one or two only, till experiments upon them had been fairly tried, and we had established them in the colony, or had proved that their introduction was impossible. Glancing down the list of larks, thrushes, blackbirds, robins, nightingales, linnets, finches, &c., I am inclined to think that it would be judicious to begin with the skylark, and that queen of songsters—the nightingale; and that whatever means may be available would be better expended at first in the greatest possible number of individual specimens of these two kinds, than in importing a smaller number of several of a longer list. By aiming at too much we might fail altogether; while by concentrating our attention in one or two directions, we may subject the experiments to a perfectly fair trial.

I have looked somewhat carefully into the history and habits of the nightingale, and I am strongly inclined to believe that it might be successfully introduced amongst us. It is found over almost all the warmer parts of Europe, a considerable portion of Asia, and part of Africa. At the same time it is somewhat capricious in its choice of locality. It is not found in Scotland or Ireland, nor in some of the counties of England (Devonshire and Cornwall, for instance) which one would think best adapted to its tastes. It is migratory; arriving in England about the middle of April, and leaving about September, for some portion, it is believed, of Asia.

I have long been impressed with the possibility and desirability of introducing this bird. A year or two ago, I wrote to one of my sisters in England, stating my desire to attempt the introduction of nightingales, and soliciting her co-operation. My sister readily consented, and went up to London for the purpose of making the necessary inquiries, and arranging for the shipment of some of the birds. In the course of her investigation she learned that a gentleman was then resident in London who has distinguished himself by great attention to the subject of ornithology. I will not mention his name. But if I did, you would agree with me in looking upon him as a very high authority. It occurred to my sister that it would be very well worth while to ask the advice of so experienced a gentleman, before proceeding further, and she therefore called upon him; but I regret to say that his opinion was so unfavorable to the experiment that all further action was suspended till I could be communicated with. The objections to the scheme were grounded on the supposition—first, that so delicate a bird as the nightingale could not be brought out safely to Australia; and secondly, that if it did arrive, and were turned loose here, it would find nothing suitable for its subsistence. He therefore pronounced the attempt little better than Quixotic. My sister urged in favor of the experiment that seven English skylarks had been set free near Geelong; and that, years after, they or their descendants had been heard singing cheerfully. The gentleman stated that he altogether doubted the fact; that there was an Australian lark which so nearly resembled the skylark of England in its habits that no one but a naturalist could distinguish it, and that this must have been the bird alluded to.

Now, with all deference to so high an authority, I am prepared to prove this gentleman wrong in some of his inferences, and I think that I am quite justified in distrusting him in others. I am afraid that there is too often observable in science a sort of pedantry which is lamentably liable to lend itself to obstruction; and I cannot help thinking that there is some trace of it here, and that this experiment was thereby somewhat unnecessarily disparaged. With reference to the skylarks turned loose on the Barrabool Hills, I had myself kept an eye on the issue of the experiment with some interest, and three or four years after they were set free I offered a reward of a few pounds to any one who would bring me authentic intelligence of them or their offspring. A very respectable Scotch mechanic called upon me some time after, and told me that he had heard a skylark singing above a large flat near the Jim Crow Ranges; that two lads came up while he was listening to it, and that they all distinctly recognised it as an English skylark. I took the precaution of assuring myself, by inquiry, that my informant was a truthful and respectable man, and have no doubt at all of the accuracy of his statement. I learned from several other quarters that the larks had been heard on the Barrabool Hills and in other directions. As far as I can recollect they were turned loose about the year 1850. About a year and a-half ago, Mr. Hickenbotham, the draper, in Swanston-street, called at the *Argus* office, to say that he had just heard an English skylark at Flemington. I have lately seen Mr. Hickenbotham, and questioned him particularly, and he states that he is quite certain that it was an English skylark. He says that he is the son of an English farmer, over whose fields the skylark sang almost incessantly; that he lived there till the age of manhood, and knows the skylark as well as any one can know it. About this having been an English skylark he has no doubt whatever.

As for any Australian lark so nearly resembling the English skylark as to be indistinguishable from it, I must plead guilty to a strong tendency to scepticism. I would appeal to my hearers as to whether any one of them ever heard or saw such a bird. I have ridden over the country all the way between this and Sydney in one direction, and between this and Portland in another, with some vigilant attention to the main features of the natural history of the continent, and I never saw such a bird. There is indeed upon our plains a bird somewhat resembling the skylark in size and color, which flutters upwards while it sings; but its song is little better than a sort of melancholy croak. There is as little chance of any one mistaking its voice for that of the skylark of England, as there is of anybody mistaking mine for that of Madame Bishop. I confess that with regard to the remark I have alluded to, I am utterly at sea.

I will now show that in some of his predictions the experienced naturalist was completely wrong. While making some further inquiries, and hesitating what my next step should be to test the experiment, I noticed some months ago the arrival here of a well-known bird-dealer, with a great variety of English song birds, including five healthy nightingales. I immediately put myself in communication with him, agreed for a price for his nightingales, and was kindly furnished with a great deal of information upon the whole subject of the shipment of birds. Mr. Brown is a partner in a concern long largely engaged in this business, and having branch establishments in various parts of the world—Germany, London, Paris, New York, Valparaiso, San Francisco, &c. Mr. Brown had brought out by this ship an assortment of birds, comprising nightingales, blackbirds, thrushes, starlings, goldfinches, linnets, skylarks, robins, woodlarks, and chaffinches. By way of testing the accuracy of the warning as to the difficulty of bringing any of them across the sea, I asked particularly how many of his English birds Mr. Brown had lost during the voyage. His answer was, "Not one by death. I have every English bird I started with, but one blackbird, which got out of its cage at sea, and flew overboard."

So much for the impossibility of bringing them out. As to the fear of their meeting no suitable sustenance here, I can only say that the nightingale is insectivorous; and I think that few of my hearers who know anything of the country districts of this colony, will feel inclined to fear any fatal scarcity for an insect-eating bird. Every tree swarms with life of one kind or other all through the year; and it seems absurd to suppose that a bird with little else to do but to feed itself, should have any difficulty in finding amply sufficient insects to keep itself in health and comfort. In the course of an experiment with the nightingales brought out by Mr. Brown, I had to take charge of one of them for several weeks, and watching its habits attentively, was very much struck by the activity and astonishing rapidity with which it would dart upon any insect that came near its cage. It takes a sharp bird to catch the house-fly, but the nightingale rarely missed it. I saw quite sufficient to convince me that in a country so beset with insects as this, there was very little danger of starvation for a bird that fed on insects.

The result of the experiment with these nightingales has not, I regret to say, been very successful, further than in furnishing us with some hints for future operations. And here I would repeat a remark that I made in my last Paper, that the most essential quality in those who undertake this kind of experiment, is the spirit to meet rebuffs. The original outlay, or the little thought or care required for an experiment, appear to me to be trivial matters, as compared with that dogged determination to succeed, which refuses to be daunted by difficulties, and is rather spurred on to greater efforts by even mortifying mishaps.

Having succeeded, by the aid of a very enthusiastic naturalist—Dr. Barry, of the Gardiner's Creek Road—in raising the necessary sum for the purchase of the five nightingales I have spoken of, they were conveyed to the Botanical Gardens, and placed in a large cage prepared for them. But almost the first night the native cats attacked them, killing one, and slightly injuring one of the others. Having made arrangements to prevent a repetition of the attacks, we left them for a few days, to accustom them to the cage, and we then let them out as quietly as possible. While watching them after their liberation, we found, to our great dismay, that only two out of the four could fly, and that the others ran along the ground in so helpless a condition as to render themselves very liable to injury from an enemy of any kind. With some little difficulty we caught these two again, and found their wings in so ragged a state from their restless habits in their small cages, that it was no wonder that flying was out of the question. We got their wings pulled, and I took charge of them till such time as the feathers had grown again. But one of them was either ill, or had got injured in being recaught, and died the next day; and the other, after having lived apparently healthy, but in a curiously ragged condition, for several months, seemed to find one of our frosty nights too cold for it, and, although eating heartily the day before and sheltered in a tolerably warm room, it was found dead in the morning. The two which were left in the gardens were seen once or twice, and upon several occasions passers on the river informed Mr. Brown that they had been heard to sing. For some time no news was received of them. The nightingale is, however, a very shy bird. It lurks in the most leafy recesses of the thicket, and scores of them might hide themselves in so suitable a place for their reception as is furnished by some portion of the Botanical Gardens, without giving any note of their whereabouts. A short time ago, however, I was delighted to hear that one of them had been both seen and heard singing, by Mr. Wilhelme, a German gentleman engaged at the Botanical Gardens. I called upon Mr. Wilhelme, and he showed me the precise tree near his cottage where it was perched. It appeared very healthy, sang cheerfully, and was undoubtedly a nightingale. Of this Mr. Wilhelme had no doubt whatever. He is a gentleman of education and respectability; has lived in parts of Germany in which the nightingale is quite common, and speaks quite confidently of the fact. Next to the pleasure with which I heard that one at least of the birds was doing well in the spot in which it was turned loose several months ago, was the surprise occasioned by the fact that it had allowed so large a portion of our winter to pass away, without showing any disposition to obey its natural instinct of migration.

An experiment on this small scale was scarcely likely to be very successful. Nature is profuse in her supply, and if we imitate or supplement nature we must be tolerably liberal too. At the same time, if we went systematically to work, and did not experiment upon more than one or two sorts of birds at a time, we might accord to each a fair trial without any very great individual efforts. We had to give Mr. Brown four or five pounds each for his nightingales, and considering that it was his peculiar business, I did not think the price an extravagant one. But if they were brought out in numbers direct, bought on reasonable terms in England or Germany, and entrusted to the care of some intelligent cabin passenger, with the paid assistance of a steerage passenger, in some of our clipper ships, I think they ought to be landed here at probably one-fourth of that sum. They should be examined on landing, their wings put to rights, and they should then be allowed to exercise themselves for a time in a moderate-sized room. The Botanical Gardens have many advantages as a place to set them free, and of course it would be of great importance to have them as near as possible to Melbourne, so that their song, if they ever did become established, might delight as large a number of hearers as possible. But close neighbourhood to town would be objectionable, as exposing them to destruction at the hands of the cockney shooters, who abound there, and who are apt to show themselves less anxious as to the size or value of their game, than glad to get something alive to shoot at. After some consideration it strikes me that the best place that could be selected, at which to set them free, would be amongst the well-grown umbrageous gardens and orchards on the banks of the Yarra about Heidelberg. The nightingale has qualities very favorable for diffusion. They are not gregarious. Intense jealousy of each other's song seems to separate them from one another. And as the notes of this astonishing little vocalist can be heard at the distance of a mile, there is every hope that if we can secure their being numerous, their haunts will soon extend over a considerable space. Started at Heidelberg, I believe they would soon make their way up and down the river, stationing themselves wherever they found an enticing thicket, and rapidly spreading further and further in accordance with their usual instinct. As winter comes on I think they would fly northward, and perhaps take up their quarters temporarily in some warm locality on the Murray, or still more northerly part. But if they *bred* with us they would return to their old breeding places in the spring, as they are particularly faithful to old haunts. Particular birds have been known to return to the same place for years in succession.

The experiment should be made in the spring, as soon as the warm days come round, and insects become numerous. To give it a fair trial I think that three relays of ten birds each, properly mated, should be turned out at intervals of a month, for three years in succession. Their favorite food should be left accessible, that they might be driven only gradually to find their own. If we could get them at anything like the price I have mentioned, this would cost us about thirty or forty pounds a-year, or a hundred or hundred and twenty pounds in all. But if it cost us twice that sum I think that properly divided amongst us it would be a very insignificant price to pay for such an addition to the general stock of happiness—such an addition to the various attractions of the colony, as this magnificent songstress would unquestionably be. Such interest do I take in the experiment that if it should be taken up by any one else, with a spirit likely to lead to its success, I would willingly subscribe to aid in giving it a fair trial; but in any event, I will try what I can do in that way myself, and, with life and health, it shall go hard with me if I do not succeed.

If it be deemed advisable to add to the stock of skylarks which may now be in the colony, I think that they would be much more easily managed. The neighbourhood of any corn field near town would suit them; although they should be let loose in a place where corn is left to ripen, not cut as hay, as the removal of the latter might destroy their nests. They should be bought cheaply enough. In one of the works to which I have referred, I find it stated that from the neighbourhood of Dunstable alone 4000 dozen of these birds are annually sent to London for the table; and if consigned in such numbers to so pitiable a fate, we surely might get cheaply a few dozens for conversion to a very much better purpose.

I am encouraged to think that these experiments would answer, as Mr. Brown tells me that he and his partners have already succeeded in introducing both the nightingale and the skylark into the neighbourhood of New York. He assures me that the one is heard constantly in the cemetery of that city, a place less suited for it than our Botanical Gardens, and that the other is heard carolling joyfully over the corn fields in that State, just as it does in England.

If we succeed with these, we might then proceed to other kinds, although it might be questionable how far it would be expedient to bring out some of them, particularly fruit-eating kinds. This will, I think, one day be a great fruit country, and such birds as live mainly upon fruit might become more a trouble than a benefit. They might even teach the native birds to imitate them, for some of my country friends have told me that many of the indigenous birds are quite sufficiently disposed to be troublesome in this way, as soon as they find out what the fruit is.

Incidental to this subject, I may mention that a very interesting list was lately sent me by some intelligent man connected with the Botanical Gardens, of the various birds frequenting that locality. Many of my hearers will be surprised to learn that nineteen different kinds of water-birds, and no fewer than sixty-three kinds of land birds, are to be seen at one time or other in these gardens. The list is very carefully prepared, showing the arrival and departure of such as are migratory, and the time of building of many; and also attaching to each the volume and page in which it figures in Gould's great illustrated work. The list is very well worthy of publication.

The committee appointed by the Legislative Assembly to consider the subject of the introduction of new animals, has just brought up a report recommending the annual expenditure of three thousand pounds in experiments of this kind. I trust that the House will give encouragement to this sort of enterprise. But I regret to notice that the mention of such a scheme is but too apt to provoke what I cannot but consider a very ill-placed levity. Considering the resources of the country, and its not only undeveloped but unknown capabilities, I do not think that a moderate amount could be more beneficially bestowed, than in the introduction of new and interesting animals. I have no idea of living in a half-furnished country, when, with a little spirit, it could be amply supplied with almost all that could contribute to our enjoyment. Would it not be worth the while of this Institute to keep an eye upon this probable annual grant, and, if confirmed by the Assembly, endeavour to secure some voice in its application? Perhaps it might not be out of place to petition Parliament to set apart a sum for such a purpose. The expression of opinion of the Philosophical Institute would have considerable weight, and might have a beneficial tendency towards checking that disposition to sneer at undertakings of the kind, to which I have already alluded as so singularly characterising our Legislature.

Mr. Chairman and Gentlemen, there is a principle in social organisation which appears to me to have been hitherto very imperfectly developed, but which, if developed, I think would lead to very astonishing results. I allude to the principle of *combination.*

By combination of effort we achieve most satisfactory and often wonderful effects. But we do not seem to systematise and adopt this as we should do; or elevate it in our estimation to anything like its proper position. I will endeavour to show what I mean by one or two familiar illustrations. If any one of us desired to possess a Crystal Palace, like that now glittering at Sydenham, the desire would be a hopeless one. Indivividual effort would not supply it. Yet by combination the Crystal Palace is there, and any working man may have the use of it for a shilling. If any of us wanted to send a letter to England within fifty days, it would cost him several thousand pounds. By combination it is taken safely and rapidly for sixpence. If life and death depended upon the instantaneous transmission of a message to Sydney, as an individual effort it would be all but impossible. By combination it is done easily for five shillings. Yet is all this combination to a great extent unconscious and involuntary. The principle is not intelligently systematised and made the most of. Government is a form of combination, and one that I believe to be capable of very much more perfect development than the world has ever yet seen. But all Government is sadly apt to run into jobbery, extravagance and mismanagement. Could we divest it of this peculiarity we should attain an organisation of a very effective character, through whose agency most surprising results might be educed. At present, for instance, contributing eight or ten pounds each to the national revenue, the taxes press very lightly upon us all. Suppose that without adding to the disposition to extravagance and waste, we determined to contribute twice that amount, which I believe we easily might do, what a magnificent fund would be at our disposal, to multiply rapidly amongst us all the enjoyments of civilised life! With a good Government, taxation is not a drain upon our individual finances, but a very economical investment for the multiplication of conveniences. And for my part I think it indicative of something very like stupidity, for people to be contented to live in a country but half supplied with the requirements of civilisation, when most of them are readily enough attainable, if we choose to have them.

But failing satisfactory Governmental combination, much may be done by combination under other auspices. And in the elaboration of this principle I believe that there is an undug field very well worthy the attention of the inquiring mind. It seems to me that the essence of effective combination is to be found in the general appreciation of its power, and the deferential homage consequent upon that warm appreciation. Thus, when asked to combine for any object, we ought generally less to dwell upon the particular object itself than to indicate our fidelity to a great principle of acknowledged value. By such aids the whole surface of the earth might rapidly be changed, improved and beautified; and the air, the earth, and the water might be made to swarm with everything calculated to be useful, interesting and attractive. By aid of this principle of combination, not only my friends the nightingale and the skylark could be added to the birds of this colony within a year, but every other British singing bird, at the cost of a penny per head to each member of our present population.

Art. XII.—*On a Suggestion for a new Mode of Life Insurance.*

By Professor Wilson, M.A., Melbourne University.

[Read before the Institute 5th August, 1857.]

The object of this paper is to bring forward a suggestion for increasing the advantages offered by insurance offices. It does not propose any alteration in the present modes of insurance, but the addition of another to those already existing.

According to the most usual system of insurance, a person wishing to secure a certain sum of money, to be paid to his representatives at his death, contracts to make to the office annual payments called premiums, the amount of which depends on his age and state of health.

There are various subsidiary arrangements by which, in some instances, the successive premiums are gradually diminished, in some the amount insured is increased, and in some instances the payment of premiums ceases after a finite term of years. In some instances, to which I shall more particularly refer afterwards, the payment at death is secured by the payment of a single premium.

It not unfrequently happens that from one cause or another persons who have insured are unable to continue the payment of their premiums, and, to avoid forfeiture, are compelled to sell them, a process which always involves considerable loss.

The arrangement which I propose is as follows; and in stating it I will, in the first instance, waive all considerations arising from the necessity of guarding against fraud or unsound health.

Let a table be formed showing, for every age, the single payment equitably equivalent to £1 to be paid at death. In other words, a table of single premiums payable to insure £1.

On a person of any age making a payment into the office let him be credited with a sum, calculated from this table, as the equivalent payment to be made at death. And so for any other payments he may make at regular or irregular intervals.

If at any time he should wish to draw any sum of money from the office, let his account be charged with the corresponding sum, calculated from same table, as the equivalent payment at death.

The series of transactions will thus partake of the character of a deposit account at an ordinary bank, inasmuch as payments are made into the office, and drafts made against the amount standing to the insurer's credit in the office; and it will partake of the character of an insurance, inasmuch as the whole of the accounts between the office and the insurer will have reference to one date, viz. the death of the insurer. There will be no calculation of interest, but the insurer will secure for his representatives, on any sum remaining till his death, the accumulation of interest corresponding to the average duration of life.

This system, so far as regards the payments made into the office, would differ little from the system of securing a policy by a single premium. The principle of each is the same. Since, however, it contemplates smaller and more frequent payments, it would be necessary for arrangements to be made for effecting these payments without the trouble and formality of taking out a fresh policy on every occasion.

The peculiarity consists in the proposal of one scale of prices according to which the office will either sell or purchase an insurance; and by which, consequently, the depositer or insurer may know precisely the amount he is entitled at any time to draw without the necessity of making any bargain.

Since the idea of buying and selling according to the same scale of prices seems, at first sight, to leave nothing for expense of management and profit, it will be necessary for me to enter into a short calculation in order to show how this profit may be secured, while the buying and selling from one table is still adhered to.

Let, then A_n be the present value of an annuity of £1 a year to continue during the lifetime of a person (say John Styles), whose age next birthday will be n years, the first payment being due one year hence.

r the interest of £1 for one year.

Then, on a principle explained by De Morgan in the article

"Reversion," in the Penny Cyclopædia, the present value of £1 payable at the settling day next after the death of John Styles is

$$\frac{r}{1+r}\left(\frac{1}{r}-A_n\right) \text{ pounds.}$$

John Styles, therefore, on paying $\frac{r}{1+r}\left(\frac{1}{r}-A_n\right)$ into the office, will be credited with £1 payable to his representatives at his death.

After m years from this transaction, the present value of £1 payable at the death of John Styles, who will then be $n+m$ years old, will be

$$\frac{r}{1+r}\left(\frac{1}{r}-A_{n+m}\right)$$

and, in the event of John Styles wishing to draw the £1 standing to his credit as payable at his death, this is the sum to which he will be entitled.

This exceeds his original payment by

$$\frac{r}{1+r}\left(A_n-A_{n+m}\right)$$

which represents the profit he derives from the investment of his original deposit during m years.

The accumulation of interest on the original deposit during these m years, which will be obtained by the office, is

$$\frac{r}{1+r}\left(\frac{1}{r}-A_n\right)\left(\overline{1+r}|^m-1\right)$$

and if from this we deduct the increase obtained by John Styles there remains to the office a balance of

$$\frac{\overline{1+r}|^m-1}{1+r}-\frac{r}{1+r}\left(A_n\,\overline{1+r}|^m-A_{n+m}\right)$$

Now supposing that the tables of the duration of life adopted in calculating the value of A_n could be strictly depended on, and supposing also that the assumed rate of interest could always be obtained, and no higher rate, then this balance would exactly represent the risk of loss to the office during the m years which would accrue by the death of John Styles; and, if a sufficient number of cases were taken, would exactly make up these losses, leaving no margin for expense of management, loss by bad investment of money, depreciation of interest, or profit.

With the view of supplying this margin, let $A_n\ (1-x)$ be used instead of A_n throughout the previous calculations, *i.e.*, let the accurately calculated present value of Annuities be all reduced in the ratio $1 : 1-x$ before they are used to form the table referred to; we shall then have the following sums corresponding to a policy of £1 payable at the death of John Styles:—

Original deposit $\qquad \dfrac{r}{1+r}\left\{\dfrac{1}{r}-A_n\,(1-x)\right\}$

Increase or profit on that deposit when withdrawn after m years $\qquad \dfrac{r\,(1-x)}{1+r}\left(A_n-A_{n+m}\right)$

True risk incurred by office $\qquad \dfrac{\overline{1+r\,|}^{\,m}-1}{1+r}-\dfrac{r}{1+r}\left\{A_n\overline{1+r\,|}-A_{n+m}\right\}$

as before, and

Margin to cover expense of management, profit, &c.,

$$\frac{r\,x}{1+r}\left\{A_n\,\overline{1+r\,|}^{\,m}-A_{n+m}\right\}$$

To this profit must be added any that may be derived from investing the money at a higher rate of interest than that assumed for the basis of the table.

The table which would be required is a table of the value of

$$\frac{r}{1+r}\left\{\frac{1}{r}-A_n(1-x)\right\}$$

or all values of n.

The most obvious objection to the plan is the trouble arising from the necessity of a medical examination, which, since every deposit is, strictly speaking, the opening of a new policy, should precede every such deposit. I think, however, that sufficient security might be obtained for the office without this.

The object of the plan is to afford a ready, secure and highly unspeculative investment for savings, which furnishes a certain and easily calculable but small profit thereon, in case of withdrawal; and some of the security of a life insurance, in case of death.

It is not to be expected that any large sums would be so invested, because the return would be less than could be obtained in other ways, and would only be realised on withdrawing the capital.

It would, therefore, most probably be found sufficient security for the office if the insurer were required to undergo a strict medical examination before opening his account with the office, and if he were required to attend personally for the purpose of making each deposit, and to hold himself on all such occasions ready to submit to a further medical examination if it were thought necessary.

If this were the case any unusually large deposit would naturally excite suspicion, and the reception of the deposit would be deferred till after such examination. The medical adviser of the office would also, of course, be provided with a list of depositers, and would keep a general lookout as to any indication of disease.

It would also probably be necessary to require a notice of three or six months before the withdrawal of any large sum.

In conclusion, I wish to state that this suggestion is not to be judged of as one claiming to do great things, but merely as an additional convenience to those persons whose incomes are so fluctuating as to deter them from encumbering themselves with a regular life insurance, and who, at the same time, are desirous of investing their savings in a way as advantageously as possible for their relatives in case of their early death, yet in such a manner that they may readily realise them without loss in the event of their requiring them.

P.S.—Since reading the preceding Paper I have been informed by W. H. Archer, Esq., that the proposed system has been adopted by more than one office ; but I have not been furnished with the names of the offices or the details of their arrangements in time for press.

W. P. W.

Sept. 23, 1857.

ART. XIII.—*On a General Introduction of Useful Plants into Victoria.* By DR. FERD. MUELLER.

[Read before the Institute, 30th September, 1857.]

IN responding on this occasion to numerous inquiries, I wish to draw attention to some of the most useful plants deserving either introduction into this country or a wider diffusion throughout our territory.

But I cannot hope to do within the limits of these pages justice to a subject so important and hitherto so scantily regarded, but rather desire to excite the co-operation of abler men, and the interest of the community for this purpose.

During the first periods of colonisation, the immigrants are but rarely enabled to direct their labours beyond immediate wants ; and in a colony like ours, where the multitude of inhabitants were engaged in occupations foreign to husbandry, it encountered at least in some of its branches double embarassment.

But since now a large proportion of our population is returning gradually from a migratory life to the firm abodes of settled communities, the time has arrived, when our thoughts should be directed, not only to the means of our present, but also of our future prosperity. We ought to be encouraged in these views, particularly in regard to tillage, when, considering the extensive fertility of this colony, not less than when reflecting on the great advantages of our climate, which neither exposes us to the enervating influences of a most tropical heat, nor to the inclemency of the severe winters of higher latitudes.

Thus rarely favoured, we possess the means of appropriating to our colony, not only all the plants of the warm temperate, but also many of the colder and even some of the equinoctial.

When, however, pointing to the possibility of cultivating in this country, the products of so different zones, it remains to be remembered, that not all tracts of the colony are sharing equally and simultaneously this advantage, but on the contrary many of its portions are destined for a distinct vegetation.

It must suffice to describe on this occasion the climatical conditions of the colony quite superficially, but henceforth we will be better guided in our tillage operations, by inquiries into the local peculiarities of our climate, commenced by Mr. Smyth with so much zeal and ability.

In the northern parts of the colony, from the borders of the

Alps to the western desert we experience, as may expected, a drier and warmer temperature, many tracts of it being highly adapted for the growth of vine, and probably also of Tobacco, Orange, Olive.

In the southern portion of the colony, under a cooler and a moister air, we are invited, particularly in the coast vicinity, to the culture of the field-plants of Great Britain.

In the south-eastern part of our territory the prototypes of a tropical vegetation become of such frequent occurrence, that probably at a later period, when labour is to be obtained at a more equal rate with that of other countries, and (as Mr. Savage ingeniously pointed out), under the aid of machinery, these tracts of land may furnish, if not for export, at least for local consumption, some of the products of less tender plant now obtained from Indian plantations.

Such supposition may appear hazardous, when we reflect on the far southern extra tropical position of our colony; but it is evident, that the isothermal lines are bending at our eastern frontiers southward to a degree quite unusual, as indicated by the occurrence of palm-trees of enormous size (Livistona Australis), in the parallel of Melbourne, accompanied by manifold members of a tropical flora, which in vain would be searched for in our immediate vicinity.

I venture to ascribe the serenity of the climate of Eastern Gipps Land, already alluded to in an official report on my travels, to a combined cause—namely, to the shelter, which the high mountain-chains of Van Diemen's Land afford to our opposite coast against the cold and antarctic breezes, and secondly, to an increase of heat or a mitigation of the winter temperature, resulting either directly from the southern current of the Pacific Ocean, along the coast of New South Wales, or from the indirect influence which so vast an expanse of water in ample contact with a wide tropical sea must exercise upon the coast tracts. The country referred to is, however, not directly available; dense forests and extensive morasses form obstacles at present even to a traveller. But with better access to it hereafter, its great humidity, together with much facility for irrigation, will render it doubtless eminently adapted for the growth of rice and other culture plants of sub-tropical countries; rice being grown under the same isothermal line in Carolina and some parts of South Europe. If the Breadfruit (Artocarpus incisa) which is cultivated a little beyond the tropics in South America, adapts itself to our climate, it will be at these localities.

Two other tracts of country, essentially different from the former ones, are of so great an extent, as to attract our notice on this occasion, one being the north-western desert, the other our subalpine plains and gullies.

Although, probably by their cultivation little is to be achieved of importance, yet a boon may be conferred upon these wildernesses, if we endeavoured to naturalise there apt plants of utility. Thus, from the distribution of the date, which in some of the arid parts of Egypt, Persia and Arabia, forms one of the principle means of subsistance to the population, we might at once benefit from the oases of the Australian deserts. My attention was directed by Dr. Greeves, who always evinces so much interest for the development of this country's resources, to the following passage in Burton's el Medinah (*Vol. II. p.* 203), in regard to the successful cultivation of this palm :—" One of the reasons of the excellence of the Medinah Dates, is the quantity of water they obtain ; each garden or field has its well, and even in the hottest weather the Persian well floods the palms every third day. It has been observed that the Date Tree lives in barren and dry spots, but it loves the beds of streams and places where moisture is procurable. The Date-palms scattered over the other places of Medinah plains, and depending solely on rain-water produce less fruit, and that of inferior quality."

The Doum-palm (Typhaene thebaica), which might be consociated with the Date, yields to the inhabitants of the territories adjacent to the Red Sea, also an edible fruit, and received from the taste of its rind the vernacular name Gingerbread-tree. Its resin is not without utility, and called the Egyptian Bdellium.

One of the Lotus plants of the ancients (Zizyphus Lotus, which occurs on the edges of the African desert, might likewise be tried for cultivation on our barren north-western plains for the sake of its excellent berries, whilst another desert plant, the Argan-tree (Argania Sideroxylon), from Morocco, has already been introduced through the liberality of her Majesty's Home Government into Australia ; and it is much to be regretted, that this plant, which once might become of some importance to the Murray runs, seems to be of such a tardy growth.

Not less is the vegetation of the subalpine plains capable of improvement. Many of the fruit-shrubs, restricted to the moors, heaths, and forests of the colder zones, or to the high mountain-regions of warmer countries, might there be reared to advantage.

It is, perhaps, not so easy to obtain for this purpose seeds of the various fruit-bushes of the arctic or antarctic countries, or from the Himalayan mountains or the Cordilleras; but the settlers, occupying the pastures of the Australian Alps during the summer season, might secure for introduction and diffuse over our higher mountains many of the wild fruits, which we enjoyed in our native countries, such as the northern brambles, the Whortleberries including Bilberries (Vaccinium myrtillus), the Bleaberry (Vaccinium uliginosum), the Cranberries (Vaccinium Oxycoccus) and similar North American species, such as Vaccinium tenellum and V. macrocarpum.

But returning to matters of more immediate advantage, we might at least in the warmer parts of the colony, with same prospect of success, experiment on the cultivation of the mountain Rice, which neither requires irrigation nor such a degree of heat as requisite for the common rice. Amongst grains I may also briefly allude to the Chinese Sugar-grass (Holcus saccharatus), of which the Caffir variety has been lately distributed throughout the country by Mr. Archer's assiduity, under a desire of adding to the vegetable treasures of the colony. This plant can only be regarded for the present as a prolific fodder-grass, but the time is, perhaps, not distant, when we will profit from any experiments instituted on its yield of sugar, and from ascertaining how its saccharine produce is dependent on climate and soil. The Indian millet (Holcus Sorghum), which is closely allied to the Sugar-grass, is, according to the oldest historical documents of the Chinese, if not the most antique, at least the first extensively used culture-grain of that Empire. The Sorghum must indeed have been praised in the early ages of China, when weight and measures of that country were framed by the standard of millet grains. Besides the many annual varities of this grass, an allied species with perennial root, the Haleppo Holcus and the saccharine Pampas Gynerium recommend themselves to our notice. Amongst numerous fodder-herbs deserves the Italian Clover (Trifolium incarnatum) prominently to be adopted at our farms, and no doubt, by the dissemination of perennial and nutritious grasses, for instance, the European Rye-grass (Lolium perenne), the Timothy-grass (Phleum pratense), the Dogtails-grass (Cynosurus cristatus), and the common English Meadow-grass (Festuca pratensis), our pastures could be greatly enriched. Highly spoken of are likewise two Abyssinean cereal grasses, (Eleusine Tocussa and Poa Abyssinica,) and also of the spurious Canada Rice (Zizania aquatica).

It seems unlikely that the Tea-plant ever will advance to commercial value in this country, considering the amount of manual labour requisite for the preparation of its leaves, a process at present not to be achieved sufficently lucrative beyond its native country or other densely-populated States, such as the North-Western Provinces of India. It is, however, not quite improbable, that the plant would be once an acquisition to the settlers far in the interior, for obtaining independently their own supply of tea, perhaps not so much to save its transit, but rather to avoid its uncertainty.

The plant ranks fully as an ornamental bush, and affords its first harvest at the third year of growth. It may be multiplied by seed cuttings or layers, and succeeds best in a loamy soil, but according to other writers, also in a slight stony soil. The introduction of Sugar-cane was lately recommended to the colonists. I will not deny that it might be grown here, but it remains questionable whether we can grow it to advantage, except perhaps on our south-eastern frontiers, and on a few other favourable spots.

The lowest mean temperature ascertained by Humboldt, as requisite for its growth (64° F.), exceeds yet by 5 or 6 degrees the medium heat hitherto fixed for Port Phillip, whilst a temperature from 70—77° is stated to be necessary for its profitable cultivation. The very fact, that North European Cerealia are grown advantageously in Victoria, seems to preclude the possibility of a lucrative culture of Sugar-cane in this country.

Adverting to another and not less important part of our subject, the introduction on a larger scale of ornamental and useful trees, we find a field equally fertile and extensive open for our operations. Amongst the endless number of forest-trees, which we should desire to call henceforth our own, the oaks are entitled prominently to our consideration.

According to a celebrated Mexican traveller, the late Prof. Liebmann, of Copenhagen,* more than 250 species of Oaks, chiefly from the northern hemisphere, have been discovered, and he points to the remarkable circumstance of their absence in Australia and extra-tropical South America, notwithstanding the occurrence of beeches in these parts of the world, with which they are often consociated in the north.

The Sunda Islands possess 37 species of oaks, Japan 20, India 21, South Europe 14, but a much larger number than this aggregate inhabits North and Central America; of these

* America's Ege-vegetation (Copenhagen, 1851), Wallich in Hooker's Kew Miscellany IV. 321.

80 alone belong to Mexico, all without exception distinct from those of the eastern hemisphere.

Unlike our home oaks, most of these are evergreen, ruled by that law of nature, which imparts to the forests of the winterless zones an eternal verdure. How great an acquisition would these trees be to this country!

Even the oaks of tropical America and of India, will probably endure our climate, if reared on moist and sheltered localities, most of them being restricted to elevated tracts of the country. But these oaks are not alone for their handsome forms and (what we are missing so much in Australia) for their shade deserving admiration; but also we may in choosing from such a host of species unite beauty with utility.

Esculent fruits are produced by some of the Mediterranean Oaks (Quercus Ilex, Q. Ballota, Q. esculenta.)

An other species (Q. Hindsii), of Upper California, furnishes according to Colonel Fremont's narrative the principle vegetable winter food to the Indians.

The American Oak Chesnut (Quercus Prinos) yield acorns comparatively of large size and also edible, but the leaves of the tree are deciduous. The fruits of any of the species form a staple of food for various animals.

The foliage of the North American Quercus coccinea and Quercus rubra assume a magnificent hue of red in autumn. It may guide in the cultivation of the American Oak, that according to Professor Liebmann's observations a heavy ferruginous clay, free of limestone, prevails in their forests.

Of the Mexican species probably those wooly leaved kinds from higher mountain regions (Quercus spicata, Q. reticulata, Q. chrysophylla, Q. pulchella, &c.) are best calculated for this country.

We may farther recommend the Willow Oak (Q. Phellos), the Live-Oak (Q. virens), and the Grey Oak (Q. cinerea), from North America. Quercus Skinneri is remarkable for its large acorns, measuring nearly six inches in circumferences. Major General Macarthur, with the same foresight, which he displayed here in lining some of our public roads with Blue-Gumtrees (Eucalyptus globulus) introduced the kork oak many years ago into New South Wales, where bearing now already fruit it may afford the means of raising extensive korktree plantations. The outerbark, which forms the kork, is removed from the stem according to circumstances between every four and ten years. This operation commences after about fifteen years, the tree attaining an age of at least one century.

Equal to the Oaks, if not superior to them in importance, are the pines. In whatever view we regard them, no other trees have greater claims on our attention. Quick growth, graceful forms, evergreen foliage, utility of their timber and value of their resinous secretions are in most of them admirably united, and in some instances the produce even of esculent seeds adds to their importance.

To the last category belong the beautiful Japanese Ginko (Salisburia adiantifolia), Pinus longifolia from Nepaul, Pinus Cembra from Siberia, Pinus Lambertiana, Pinus edulis and Pinus Fremontiana from North West America, and likewise the European Stone pine (Pinus pinea). The latter, which abounds in Italy is particularly recommendable in our climate. Edible kernels are likewise produced by the Moreton Bay and the Chili Araucaria (Araucaria Bidwilli and A. imbricata). The former (known as the Banya Banya tree) attains not rarely in the mountains of subtropical eastern Australia, a height of 150 feet, and must be counted with all its congeners to be the most gorgeous productions of the vegetable empire. All thrive well in this colony, and whoever has had an opportunity of admiring the grandeur of such forests can not sufficiently regret, that these noble trees are not more extensively planted in this country.

Some of the beautiful Himalayan Pines, such as Pinus Webbiana, Pinus Brunoniana, P. longifolia, P. Khutrow, P. Pindrow, P. Deodara, the European Silver-fir (Pinus picea), the venerable and gigantic Libanon Cedar, the turpentine-yielding Larch (Larix Europoea) well adapted for barren and exposed localities, and of quick growth, the Norway Spruce (Pinus Abies), the pendulous black Larch from North America, the Canadian Balsam Pine (Pinus balsamea), although of colder regions, the Weymouth Pine (Pinus Strobus) which attains in North America a height of 200, Pinus canadensis, called the Hamlock spruce, several of the huge Californian pines, such as Pinus Lambertiana, which is satified with the poorest soil, Pinus Douglassii, Pinus nobilis, Pinus insignis, the rapidly growing Sequoia sempervirens and Wellingtonia gigantea are deserving a place in any larger garden. The last mentioned pine is justly celebrated by Professor Lindley as the Monarch of the Californian forests, the height of one tree having been ascertained by actual measurement to be 450 feet with a proportionate diameter of stem ! I cannot conclude these remarks on the introduction of coniferous trees without alluding to the broad-leaved Chinese Pine (Cunninghamia lanceolata), to the Japan Cedar (Cryptomeria japonica), to the splendid oriental Pinus Nordmanniana of unusual celerity of growth, to the Californian Cupressus macrocarpa, to Pinus cephalonica from Mount Enos, which greatly resembles an Araucaria, attaining a considerable height, and finally to the straight stemmed Kaurie-pines, or Dammaras, which are represented by a magnificent species on the East coast of Australia and others in New Zealand, East India and the Pacific Islands, exquisitely adapted for avenue. Taxodium distichum (the North American Swamp Cypress) is well qualified for surrounding the margins of lagoons.

Mr. Hyndman, of this city, who possesses great experience in forming public plantations, has favoured me with a list of pines practically known to him as recommendable for a general introduction, and I have gladly appended his enumeration at the end of this paper.

For further information on the different trees alluded to on this occasion, I beg to refer to the valuable and everywhere accessible works of Loudon.

In the selection of trees for avenue, evergreen kinds should, in a winterless country, like ours, receive preference to deciduous ones. New Zealand and the whole East coast of this continent abound in splendid umbrageous forest-trees, for us most easily obtainable. The Eucalypti, which are utterly wanting in New Zealand exhibit in the coast tract of Eastern Australia less of their otherwise vast prevalence in this continent, being replaced by a great variety of trees with horizontal leaves, which impart to their forests an appearance strikingly different to the effect produced by the generally pendulous foliage of the Eucalyptus. In these woods our attention would be attracted by many trees highly acceptable for shading our public promenades: for instance several arborescent species of Grevillea (G. robusta, G. Hillii, &c.), the red Cedar (Cedrela Australis), several large figtrees with leathery shining leaves, some beautiful sapindaceous, meliaceous and myrtaceous trees, and arborent species of capparis, Elaeocarpus, Alphitonia, Mappa, and other genera. The flame-tree of Illawarra (Brachychiton acerifolium) of mapple-like habit and adorned with brilliant blossoms can for the above purpose hardly be surpassed, if planted on rich soil, unless great rapidity of growth should be required. A variety of foreign Lauri might be associated with the former, such as the evergreen species from North America (Laurus Borbonia and L. Carolinensis) from the Canary Islands, (L. Canariensis, foetens and Indica,) and the Champhor-tree from Japan, and also the noble Lophostemon, Acmena, and our blackwood Acacia (A. melanoxylon). Still, as a quick growing tree, the native Blue Gum (Eucalyptus globulus) remains hitherto unrivalled.

But in preference to an immense array of merely ornamental trees desirable for this country, we shall at this opportunity review rather some of those plants, which would enrich our orchards or our economic fields. The European and the smaller North American Chesnut-trees (Castanea vesca and pumila), the different Walnut-trees, including the Pekan-nut of North America (juglans oliviformis) and the black Walnut, and the shell bark Hickory (Carya alba) of the same country, claim, notwithstanding their deciduous foliage, our advertance. From the borders of the Mediterranean Sea should be transplanted to us the Manna Ash (Ornus rotundifolia), the Liquorice-plants (Glycyrhiza glabra and G. echinata), the Pistacia-tree, with its almond-like fruit (Pistacia vera), the Mastix-tree (Pistacia Lentiscus), and the Turpentine Pistacia (P. Terebinthus). China might provide us with the Wampee (Cookia punctata), with the Kum Quat (Citrus japonica), and with an another small fruit of the Orange-tribe (Glycosmis citrifolia, also with the eatable berries of Hovenia dulcis, some of the edible Eugenias and jambosas, particularly the Malay Apple-tree (E. Malaccensis), which in all probability will prove hardy in Victoria, further with its indigenous Quince (Cydonica Chinensis), the date-like Kaki (Diospyros kaki) yielded by a fine evergreen tree, with the Jujub, Litchi, and Logan fruit, (zizyphus jujuba, Dimocarpus, Logan et Lichi), of which, the latter two are exported to Europe, and the produce of ornamental sapindaceous trees. It remains to be ascertained, whether not of the different Custard-apples, the Peruvian Cherimoyer (Anona Cherimolia) will show itself hardy in our climate.

The Eugenia Ugni, from Peru, lately introduced to Europe, has been praised for its delicious fruit, and some of the oxotic Berberries are recommended on similar grounds. We may add yet the North American and South European Date-plum (Diospyros Virginiana and Diospyros Lotus).

How far the Mate or Paraguay tea, furnished by a kind of holly (Ilex Paraguensis) will succeed under cultivation in this country, and whether this beverage will meet with the approbation of the colonists is yet to be ascertained.

The Corob-tree (Ceratonia Siliqua), yielding an edible pod, known as St. John's Bread, forms a most eligible and useful plant for shrubberies, and the same may be said of the Strawberry-tree of South Europe (Arbutus Unedo) a lovely bush with eatable fruits. On the island of the Lake of Killarny, it forms, according to Mr. Hyndman, as magnificent a tree as can be beheld. Its wood is much esteemed for ornamental work. The lovely Arbutus canariensis and A. Andrachne ought to obtain their place.

I fear it would be premature to recommend the cultivation of dye-plants under the present circumstances of the colony, as probably foreign markets will supply us for a long time yet with articles of dye at a less expensive rate than at which they could be produced in Australia. Still we might diffuse such plants as the Chinese Indigo (Isatis indigotica), the common Woad (Isatis tinctoria), the Saffron (Crocus sativus), the Carthamus and the Madder (Rubia tinctorum), of which the latter many years ago became introduced and cultivated by Mr. Edw. Wilson of this city.

Many of the colonists may be desirous to surround themselves with some of those plants, which, although devoid of practical importance to us, are of the greatest value to their respective native countries, such as the Varnish-tree (Elaeococca vernicia) from the seed-oil of which the Chinese Varnish is prepared, the Grass-cloth plant (Boeheria nivea), the Rice-paper plant (Panax papyrifer), the Tallow-trees (Stillingia sebifera and the Litsaea Chinesis), all from the Chinese Empire, and which, consequently will flourish without protection, at least in the warmer parts of our colony.

The general distribution of the Chinese yam, Dioscorea Batatas), which found its way recently into this country, remains desirable: the Spanish Scorzonera, the sweet potato (Convolvulus Batatas) and the Jerusalem Artichoke (Helianthus tuberosus) ought to be its companions; the leaves of the latter being even useful. The cultivation of Arum Colocasia, well-known for its edible tubers, extends now from Portugal to China, and the plant is therefore well-deserving of our notice.

Through Dr. Embling, who always evinced such a lively interest for adding to our stores of the animal and vegetable kingdoms, seeds of the Cotton-plant have been placed at my disposal. I gladly invite the colonists, chiefly those residing in the milder parts of the country, to subject the plant to a fair trial, even if it were only to establish the fact, that it endures the vicissitudes of our temperature without being impaired in its productiveness. Enterprise of future days may avail itself of the experience gained at present. Most cultivators of cotton recommend for its growth light fertile soil, of slight humidity.

Porter even observes that it may be cultivated on soil of so moderate fertility that it would often be difficult to procure from it any other harvest.*

A double interest attaches itself to the culture of the various kinds of Rhubarb, their roots being of medicinal value, and their leafstalks offering an wholesome acidulous vegetable. If cultivated for its root, dry shady mountain localities ought to be chosen. One species (Rheum nobile) lately discovered in the Indian Highlands belongs to the grandest objects of vegetation imaginable.

The Chinese esteem as potherbs—Cacalia procumbens, Amaranthus polygamus, the sweet root (Sium Sisarum), and Aralia edulis, the root of the latter also serving as salad ; and a kind of Cabbage peculiar to that country (Brassica Chinensis) remained also yet a desideratum of our gardens.

The Okro and the red Sorrel of West India (being the fruit of Hibiscus esculentus and Hibiscus Sabdariffa) are to be regarded as culinary acquisitions.

The cultivation of medicinal plants did not receive hitherto the attention which it justly deserves. It is intended to retain a portion of our Botanic Garden for the culture of those officinal herbs, of which the seeds will be acceptable to the gardens of country practitioners.

Some of the Cinchonas, or Peruvian bark trees, occur on the slopes of the Andes, under a mean temperature little exceeding that of Port Phillip, and are even ascending to an elevation of 10,000 feet, and their introduction to favourable humid spots in this colony will therefore probably not be attended with great difficulty.

South Europe and the Orient furnish in some sorts of Astragalus—the Gum Tragacanth (Astragalus Creticus, A. verus, A. gummifer). These plants should be secured, being of beauty, of utility, and of easy cultivation, the officinal Senna-Cassias of Arab, and the handsome Aloe plants of South Africa might well be associated with them.

The preparation of Arrow-root, Tobacco, and of Opium is probably reserved for later days of the colony. The Manihot, or South American farina (Jatropha Manihot), is cultivated somewhat beyond the tropics. It is, therefore, well deserving a place in our experimental gardens, particularly with the weight of a recommendation, according to which the produce of the Manihot exceeds sixfold that of wheat.

* G. R. Porter's "Tropical Agriculturist," p. 9.

Camellia Sasanqua and oleifera can be considered as the Oil trees of the Chinese. Being elegant plants, content with a climate which ripens the grape and with a meagre soil, and yielding tea, they seem to be eminently calculated for a profitable introduction.

The white Mulberry is employed in South Europe much in the manner of the British pollard elm, and is, with good right, recommended for field hedges or garden walls in the colony. Probably, in later days, the production of indigenous silk will become remunerative, and we might already act, preparatory to this branch of industry, in adopting, even regardless of its fruit, the white Mulberry for the needful enclosures of cultivated ground. The red and white Mulberry-trees produce, whilst young, generally only flowers—a circumstance which may have disheartened many in their cultivation; but the fruitfulness of these trees increases with advancing age. The most nutritious variety for the silkworm is the Lee Mulberry (Morus intermedia). I ought finally to suggest that no efforts should be spared to acquire those gorgeous water-plants, which not only tradition, and historical monuments of the remotest antiquity, have pointed out as sacred in the dark ages of the past, and as a tribute of mythical veneration, but in which also the enlightened genius of the present age recognised the emblems of majesty.

The Nelumbo, or sacred Pythagorean Bean (Nelumbium speciosum), will be probably easily naturalised, particularly when already Sir George Stounton informs us of its occurrence in the north of China.

The equally useful and grand Nelumbium luteum of North America exists, according to Mr. Hyndman's information, even in Lake Erie, within the isothermal zone of England.

It seems that the roots, protected by the unfreezing depth of the water, retain vitality, and thus send annually forth their leaves and lovely blossoms.

The endeavours of transplanting the incomparable Waterlily, of the Amazon River, and other waters of Central America (Victoria Regia) to our lakes and lagoons may less likely be crowned with success.

Since, however, this brilliant plant has been flowering at Mauritius, no difficulty can arise in securing it, with many other tropical water plants, at least, for the warmer parts of Eastern Australia.

Far from having exhausted my material, I conclude these remarks for the present, and venture to hope that I shall not in vain appeal to those colonists who have had an opportunity of visiting, besides Australia, other extra-European countries, to favour us with their observations on culture plants, of which every country has its own, and many yet eligible for us. Thus any friends of progress might amply enrich our fields. I did not attempt to enumerate even the principal plants which would enhance the beauty of our gardens. But, in the warmer parts of the country, the Bamboo and the Nile-papyrus ought to line the water-courses. Nor should in vain the charming Rhododendrons, the Kalmias, Liriodendrons, the palm-like Encephalarti, the magnificent Luculias, Magnolias, Photinias, and an endless number of equally beautiful shrubs solicit in our gardens for a place. Nor can I suppress a hope of seeing the fanciful varieties produced by horticulture recede before the simple grandeur of Nature itself, and seeing in the choice of foreign plants for introduction, variety and beauty combined with utility, and views adapted in our own permanent selection from the floral treasures of the world, of which a future generation will approve.

Useful and Ornamental Pines recommended by Mr. Hyndman for introduction.

Libocedrus tetragona, a beautiful tree, introduced by Mr. Lobb from the Andes of Patagonia, attains a height from eighty to a hundred feet. It grows very fast; timber good.

Cupressus torulosa.—It is said, by those who have seen it growing on the Himalayas, to rival almost the noble Deodar Cedar, in size and beauty. By Major Chadden, a very clever English botanist, who has spent a number of years in India, I have been told that its timber equals that of the Deodar.

Cupressus Uhdeana.—This species differs in appearance materially from all the other kinds of Cypress, and it grows with extraordinary rapidity. It is a beautiful tree, and a native of Mexico.

Cupressus majestica.—It has a noble habit, grows quick, and is of easy culture.

Cupressus macrocarpa (Large-fruited Californian Cypress).—This is a very beautiful species, with horizontal branches, and bright green foliage. It grows very rapid, and attains a height of 100 or 150 feet, and 9 feet in circumference. Mr. Hartweg, the introducer of this species, says, "It resembles the Cedar of Lebanon it its style of growth." The timber is good.

Chamœcyparis sphœroidea (the white Cedar of New England) is a beautiful tree, grows in swampy places, attains a height of eighty or ninety feet. The timber is light, soft, fine grained, and easily worked ; it resists the alternation of dryness and moisture longer than the wood of any other tree growing in America.

Taxodium distichum (Bald Cypress).—This is a beautiful tree. In its native country (Florida) it grows to about 150 feet high, and from 90 to 100 feet in circumference ; the timber is good, but soft. There is a specimen of this in Chatsworth 80 feet high.

Pinus mitis.—This tree furnishes the Yellow Pine of Commerce. It has long slender leaves and large cones : it is a very handsome tree. The young shoots are covered with a velvet-coloured bloom. It grows on the poorest soils of America ; grows quick.

Pinus Fremontiana.—This is a handsome dwarf-growing Pine, and is well worth cultivation, as its seeds are very nutritious and pleasant flavoured, having the taste of Almonds, and the cones are produced in great abundance. It grows on the Sierra Nevada, or great Californian mountains.

Pinus ponderosa, a very remarkable species, and very ornamental. The buds are large, pointed, and free from resin. The branches are horizontal at first, but generally drooping at the extremity.

Pinus Benthamiana, a noble species. It sometimes attains the height of 200 feet, with a stem 28 feet in circumference ; it grows very quick, and the timber is very valuable. It grows on the mountains of Santa Cruz in California.

Pinus Australis (Syn. P. palustris) has leaves as long as P. longifolia, but of a beautiful brilliant green ; and it has the advantage, not only of being a very ornamental tree, but of producing better wood than almost any other kinds of North American Pine, the wood being durable, fine-grained, and susceptible of a very high polish. It has also the recommendation of growing well near the sea, where there is only a thin stratum of mould covering the sand. Its wood is that known in commerce as the red Pine.

Pinus insignis.—This Pine has been well named, its general appearance being indeed remarkable, and quite different from that of every other species yet introduced. It is a tree of great beauty, with leaves of a rich grass green colour, and grows with great rapidity ; the wood also is good.

Pinus radiata.—This species is very nearly allied to P. insignis, but the cones are nearly three times as large. It was found growing almost close to the sea beach in California, attaining a height of 100 feet, with a straight stem feathered down to the ground with branches. It is said to afford excellent timber, which is very tough, and admirably adapted for boat-building: it is also well adapted for planting near the sea coast. The leaves are of a dark green, and very slender.

P. macrocarpa.—The leaves of this species are from ten to fourteen inches long. The trees are of tapering form and regular growth, attaining a height of 150 feet; the timber is good. The cones are furnished with hooks three or four inches in length, and very strong. The leaves are of a beautiful glaucous hue.

Pinus Sabiniana.—Is very like P. macrocarpa, but the cones are not hooked; they are prickly, hence the names of Prickly-coned Pine and great hooked Pine. Both are from California.

P. Montezumae, a very handsome tall tree, with rather long leaves and large cones. The timber is said to be good: it grows to sixty feet high. It is from Mexico, near Ajusca.

Pinus macrophylla, remarkable for its very long leaves, which are nearly twenty inches long; the timber is good, but the plant is rather rare yet. It is a native of Mexico, on the Ocotilla.

Pinus Grenvillea.—This Pine is also remarkable for its long leaves and large cones, which are sometimes sixteen inches long. The natives call it "Ocote macho, or the Male Pine," on account of its robust habit of growth and noble appearance. It grows from 80 to 100 feet high; the timber is said to be good. It grows on the Terra de San Juan (or Saddle Mountain), in Mexico.

P. cembra, a beautiful pine. It grows rapidly, with a straight trunk, and smooth bark. The wood is soft, but has very fine grain, and it is very much used by the shepherds of Switzerland and the Tyrol for carving those curious little figures of men and animals which are known all over Europe. The seeds produce oil abundantly, and the shells of the kernels yield a fine red colour.

Pinus excelsa.—This is an Indian pine, which the natives call the King of the Fir Tribe. It grows to 100 feet high, and is remarkable for its drooping branches, from which peculiarity it has been called by travellers in the Himalayas the "Weeping Pine." It yields a great quantity of turpentine, and its timber is excellent. There are very fine trees of this species in England.

Cedrus deodara.—Is found on the Himalayas, at an elevation of from 7,000 to 12,000 feet. It is decidedly the most ornamental coniferous tree ever introduced, and, from its great beauty, rapid growth, perfect hardiness, and valuable timber, it is exceedingly well suited for being extensively planted in parks and pleasure-grounds. Dr. Falconer gives the dimensions of a fallen Deodar, which he saw on the Himalayas, as 36 feet in circumference at the base, and 130 feet in length. The same authority states that timber of the Deodar, taken from a temple, supposed to have existed at least 1000 years, was, to all appearance, as sound as when first placed there, not affording a dwelling even to a solitary insect. "The wood of the Deodar," Mr. Loudon has remarked in his *Arboratum Britannicum*, "has a remarkably fine close grain, capable of receiving a very high polish—so much so, indeed, that a table formed of the section of the section of a trunk four feet in diameter, sent by Dr. Wallich to the late Mr. Lambert, has been compared to a slab of brown agate! But, unfortunately, all the plants of this tree, grown in this colony, are from layers; and none of the coniferæ ever make good plants, unless grown from seed, except the Cypress, which may be advantageously increased by cuttings.

Araucaria imbricata is decidedly the most remarkable species of the genus. It has a very singular appearance; the trunk is quite straight; its bark is thick, and in old trees corky. The wood is also not only very strong and good, but it is full of beautiful veins, and is capable of being polished and worked with the greatest facility. The seeds, which resemble that of an almond, but is double the size, is reckoned wholesome food; when roasted they taste something like chestnuts. There are some plants of this to be seen in England 40 feet high. It grows to 150 feet in Chili.

Araucaria brasiliana is a very handsome tree, but is much more tender than A. imbricata.

Sequoia sempervirens.—The Bastard Cedar was first discovered by Mr. Menzies in 1796, and was seen growing by my late lamented friend, Dr. Coulter, about 40 years afterwards, but it was not introduced to England until 1843, when plants of it were sent to London by Dr. Fischer, of St. Petersburgh. One of the trees seen by Dr. Coulter measured 270 feet in height, and 55 feet in circumference, at 6 feet from the ground. This tree is called by the American settlers "The Giant of the Forest." The wood is beautifully red, fine, and close grained: it grows very quick.

Podocarpus chilina.—This tree is called in Chili, Maniqui. It is a beautiful tree, producing excellent timber; it grows to 50 or 60 feet high.

Torreya taxifolia is a tree from 40 to 50 feet high, which has a very disagreeable smell when burnt. The wood, though of small dimensions, is very durable, and not liable to the attacks of insects. It is a very pretty tree. In Japan an oil is made from the kernel of the nut of T. nucifera, and used for culinary purposes. It is a very handsome tree.

Art. XIV.—*On Railway Gradients.* By William Austen Zeal, Esq., C.E., Melbourne.

[Read before the Institute, 2nd September, 1857.]

Mr. President and Gentlemen,—The discussion of a subject of so much importance to every colonist in Victoria, cannot be considered at a more opportune time than the present; and, no Institute in this province, can with greater advantage to the public express its opinion at this particular crisis, than this Society can now do.

Impressed with this idea, I have written this paper, being convinced no undertaking will have more influence on the future well-being of this great country, than the extension of Railways throughout its length and breadth. This I conceive to be a sufficient incentive for my claiming for it all the publicity so important a question demands.

Victoria, in fact the whole Australian continent, must rely upon, and find in Railways the one great means by which the interior will be rendered available for colonization. Denied the advantage of water carriage, like that possessed by all other countries, an artificial mode of intercommunication must be resorted to, and the Railroad will be called upon to undertake the united duties of Road and River; and from all former experience no better agency can be employed, no more expeditious mode of transit could here be initiated, than that offered by the Railway system.

It is well-known when Railways were first introduced in Britain, the observance of this fundamental law was rigorously enforced;—that the surface of the Rails should form as nearly as practicable a horizontal line and for a lengthened period it was deemed impossible to ascend an incline by locomotive power, except under the most favourable circumstances.

Corroborative of this fact, is an instance patent to all conversant with Railway History; viz.: the virulent opposition the English South Western Company experienced at the hands of the

Great Western proprietary and opposing Landowners of the District, on account of the introduction of inclines scarcely perceptible to the eye. So formidable a character did the opposition assume, that Dr. Lardner was commissioned by the first-named Company, to undertake a series of the most elaborate experiments on the economical working of Railway Gradients. Much time and research were expended in investigating a subject ridiculed by opposing partizans; and, in reviewing the subject it is interesting to observe the bias and prejudice that interested motives will lend to questions demanding the utmost calmness and deliberation in discussion. The inclines, about which so great a controversy arose, were those of 1 in 250. Dr. Lardner, in carrying on his experiments, proved, that in the working of a Train, the velocity acquired by *Gravity* alone in descent, was a compensating feature in favour of grades, producing a result nearly equivalent in value to the increased power incurred in performing an ascent of equal ratio: recent experience has established this an axiom.

Tracing the growth of Railways, and their gradual extension into remote mountainous districts, it is pleasing to note how readily the Locomotive adapted itself to circumstances; how the opponents of severe inclines modified their views, and became the foremost in the van of improvement.

As an example of level lines in England, the London and North-Western, and Great Western, stand pre-eminent. On the latter it has been frequently remarked that the cuttings are so level they are with difficulty drained.

In the United Kingdom, as a general rule, Gradients of a very favourable character prevail, and only in exceptional cases the reverse is the case.

In the United States of America there are Railways upon which inclines of unprecedented severity have been introduced: and American Engineers have in these cases, with national energy, outstript all previous experience. I shall presently quote the cases to which allusion is made; before doing so, however, I would observe that, as a rule, Gradients on American lines are of a favourable character.

On the continent of Europe some interesting innovations of Railway experience have been made; long steep Gradients have been adopted with entire success. Such are found to be capable of economical working, with heavy goods trains, and this, too, combined with speed; results highly encouraging to the Engineer in countries possessing physical difficulties.

The particulars of these, and other successes of engineering skill and enterprise, I shall notice, and produce data to prove that in Victoria the difficulties the engineer has to encounter have been far surpassed in Europe and America; and, I will endeavour to show that we have everything to hope for, and nothing to fear, in the extension of Railways over the entire surface of this province.

Gradients are practically injurious and detrimental to the efficient working of a Railway, when they involve such an increase of power as to render it necessary to resort to the heaviest engines—most substantial permanent Way and Works—greatly reduced rate of speed with increased risk and loss of time to the passenger.

A very severe descent may be accomplished with speed and safety, if the direction of the Railway be in a straight line; but, if combined with curves of small radii, as is often the case, the utmost caution is necessary to prevent the engine leaving the rails. I am fully aware that the limit of grades and curves is a debateable point with engineers, and shall therefore confine myself to laying before you an epitome of British and Foreign Gradients, and describe the result of my own experience, commencing with a brief description of British lines.

The Railways of the United Kingdom are singularly free from abrupt inclines, no expense having been spared in their construction; consequently, they are capable of being worked at high speeds, and with little excess of power beyond what a perfectly level line would require. The economy of this is questionable: for if on a line of 100 miles it can be proved that by the introduction of more severe inclines, both time and money can be saved, I think it will be generally conceded that the economical method is preferable.

The question hence arises, what shall be the limit to inclines? This must be governed by the physical contour of the country. I should not hesitate, however, to introduce a severe gradient where necessity required it, in preference to following a more circuitous route, for, taking the increased length of line into consideration, the extra length of road to lay down, and keep in repair, it will be found far cheaper and preferable to introduce a gradient of (say), 1 in 50, over a distance of two miles than to extend a Railway over three times that length for the purpose of obtaining a gradient of 1 in 150.

The opponents of severe inclines urge, and with some apparent truth, that the increased weight of the engine, competent to work a severe gradient, (say) 1 in 50; so destroys the road as to render it necessary to relay the same, and at intervals renew it with frequent repairs. If it were imperative upon Railway Companies to have these heavy engines, I fully admit there would be every reason in such argument: but when daily experience entirely controverts this fallacy, little weight should be attached to it. The fact is patent to all who have thoroughly investigated the question, that the rails on severe inclines, are but little more subject to wear and tear than those on the most modern ascents.

On a gradient of 1 in 50, two engines of 25 tons*, and 29 tons* respectively, will draw as heavy a load as a single engine of 54 tons.* They can be so constructed that one driver and stoker can attend to both and have also this great advantage over a single engine, that the weight of 54 tons* can be diffused over twice as many wheels as the 54 ton* engine can possibly have. In case of accident likewise, two engines are far safer; one engine being sufficient to control the train, should it be necessary from accident, to return to the starting place.

On the Birmingham and Gloucester Railway;—the Lickey incline,—a gradient of 1 in 37; two engines weighing respectively 35 and 32 tons, or together 67 tons, took up with ease a load of 240 tons at a speed of nearly 7 miles per hour; and on the Turin and Genoa Railway two engines of 25 tons, or together 50 tons, took a load of 100 tons, or inclusive of engines 150 tons, up an incline of 1 in 36 for 6 miles at a uniform speed of 15 miles per hour.

In addition to instances bearing so directly on the economical working of heavy grades, I am enabled to add the results of experiments, undertaken on behalf of the East Lancashire Railway Company by Mr. Perring.

The Accrington Incline is 2 miles in length, composed of the following heavy gradients:—

1 in 40	1.125
1 in 38	.60
1 in 47	.275
	2. miles.

The Report states the experiments were conducted with great care, and extended over a period of three months during the most inclement season of the year.

As it would take much too lengthened a time to analyse each

* Inclusive of tender.

result, I shall give a summary, deduced from experiments made by a single engine, and by a leading and assisting engine, combined :—

GOODS TRAINS.					
SINGLE ENGINE.			TWO ENGINES.		
No. of Trips.	Mean Load in Tons.	Speed. Miles pr hour.	No. of Trips.	Mean Load in Tons.	Speed. Miles pr hour.
196	57.1	5.73	74	117.2	5.49

The weight of the heaviest engine used was 26.25 tons, tender 16.75 tons, 18 inches cylinder, two feet stroke, six five feet wheels, all coupled.

PASSENGER TRAINS.					
SINGLE ENGINE.			TWO ENGINES.		
No. of Trips.	Mean Load in Tons.	Speed in Miles pr hour.	No. of Trips.	Mean Load in Tons.	Speed in Miles pr hour.
24	23.26	19.33	99	28.41	18.89

The heaviest leading engine used weighed 18.5 tons ; tender, 12.5 tons ; 15 inches cylinder ; 1 ft. 8 inches stroke ; 6.5-feet 6 inch wheels, four coupled.

The average weight of the assisting engine was 21.5 tons.

The conclusions deducible from these experiments are, that, where heavy trains have to be moved at low speeds, two engines will perform a duty equal to that undertaken by one engine with half the load ; but in the case of passenger trains, where the power of one engine is equal to the efficient propulsion of the train at a speed of (say) 20 miles per hour, the use of two engines is rather disadvantageous than otherwise.

This is conclusive evidence that the working of severe Gradients has frequently been but imperfectly considered. The following severe Gradients on British, European, and American lines are daily worked. The results may be relied on, great care having been taken to ensure accuracy :—

	Railway.	Length of Grade	Grade.	Load.	Speed.	Weight of Engines.	Total Load.
		Miles.		Tons.	Miles pr hr.	Tons.	
A	Virginian Central .	2	1 in 20	40	7	30	70
B	Oldham Incline .	1.75	1 in 27	52	15	27	79
E	Turin and Genoa Giovi Incline .	6	1 in 36	100	15	2 {50} engs	150
B	Lickey Incline .	2	1 in 37	250	$6\frac{1}{2}$	2 {67} engs	317
B	Accrington Incline.	2	1 in $41\frac{1}{2}$	71	6.31	26.25	114
A	Pennsylvania Central	9.75	1 in 55	125	25	29	154
E	Semmering Incline .	2.5	1 in 40	110	11.5	38.75	$165\frac{1}{4}$
B	Durham and Sunderland . . .		1 in 60	100	15.5	25	125
B	South Devon. . .	2	1 in 62	95	17.	28	134

B signifies "British." A "American." E "European."

This Table is compiled from Parliamentary Papers; the Transactions of the Institute of Civil Engineers; and, Memoranda gleaned by myself. The results unquestionably prove that a Gradient of 1 in 50 may be worked with an engine of 27 tons, and carrying a passenger train of 70 to 80 tons, at the rate of 15 to 20 miles per hour, and this with perfect ease. Assuming these data as a guide, it is evident that it is not only practicable, but it is in every way preferable, to have Gradients of 1 in 50 to 1 in 60, than to follow a circuitous, and most frequently an equally expensive route, for the purpose of obtaining an incline of 1 in 100 to 1 in 150.

Under peculiar circumstances, it would doubtless be advisable to lengthen grades, where, in ascending table land, the surface of the country on either side of the proposed Railway is tolerably uniform; but, in the majority of cases in which I have been engaged, the longer line would have been infinitely the most expensive one, on account of the table land being traversed by deep ravines, gullies, and creeks—imposing a large outlay in the item of Bridges, Culverts, &c.

In the working of inclines, the natural forces to be overcome, viz., *Atmospheric resistance, friction, and resistance due to gravity,* are constants pretty accurately known; hence, the Engineer in estimating the required power of his engines, does so on calculations proved by experience.

Atmospheric resistance, increasing with the square of the the velocity of the moving body, assumes a power on a carriage moving at a speed of one hundred miles per hour, equal to that expended in overcoming the inertia of 180 tons on a level. It is to be regretted, this subject has not received, at the hands of engineers, that amount of consideration its importance demands.

Mr. H. Bessemer gives an account of a series of experiments on the opposing power of the atmosphere. The conclusion he arrived at was, that the resistance of the atmosphere equalled on the leading carriage of a train, a power of 10 to 4, as contrasted with the resistance offered individually by each trailing carriage. Continuing these experiments he states—this latter force was completely neutralised by filling in the spaces between the ends of each carriage with hoods, making the train in appearance one long carriage.

This report is singularly at variance with the statements of Mr. Wood, published by the British Association. There it is stated, "the form of the front," (*i.e.*) the leading carriage of a train "has no observable effect, and that whether the engine and tender be in front or two carriages of equal weight, the resistance will be the same."

It is further shown, that "converting the train into one unbroken mass," by filling in the spaces between each carriage, as adopted by Mr. Bessemer, was a "*disadvantage*" rather than otherwise, and Mr. Wood concludes, "it is certain that no additional resistance is occasioned by leaving open spaces between the carriages."

How such conflicting accounts can be reconciled, is a question I will not discuss. Possibly Mr. Wood's experiments were made on a comparatively calm day, with the motion of the air uniformly with that of the train.

I am inclined to think, that with a head wind, however slight, the theory of Mr. Bessemer is the most accurate one, though, doubtless, the results quoted are much exaggerated.

According to the Chevalier de Pambour, the resistance of the atmosphere to the passage of a train may be found thus :—

V=Velocity of moving body, $V^2 \times \cdot 002688$=Atmospheric resistance in lbs. avordupois per square foot.

On a level well laid line of railway, *Friction* retards motion to the extent of 6lbs. per ton for carriages. This may be assumed as a constant.

The resistance due to *Gravity*, when the line of traction is parallel to the incline, increases in uniformity with the grade, and equals, in an incline of 1 in 50, 44.8 lbs. per ton; hence, the surplus of traction in a train of 150 tons, ascending an incline of 1 in 50, on account of grade, is 6720 lbs., or equivalent to the force an engine requires to exert in moving 840 tons on a level.

It would be but travelling over ground, thoroughly investigated, to enter fully into the question. of resistances Peculiarities of climate and temperature occur in every habitable portion of the globe. In England, the frosts, fogs, and mist, are very detrimental to the expeditious ascent of inclines, and involve a serious loss of power on the average working of Trains.

In Victoria, I do not anticipate from these causes, any material loss, the climate is more genial, clear, and dry; in summer the heat of the furious Sirocco from its rarifying qualities, will assist, rather than retard the engine, in climbing the steep sudden ascents peculiar to this country.

The full solution of the subject of gradients involves the consideration of the question:—what incline gives practical assistance to a descending Train?

The *angle of Repose* has been assumed by various authorities of inclinations, varying from 1 in 280 to 1 in 380; the latter is an American standard.

This is a question of great mathematical interest, and would require too much time to enter upon fully. I am, however, inclined from continued observation, to think the angle of repose should be more acute than either of these inclines. It is true, in practice, it cannot be supposed that any machine or moving body can be made so perfect in form and finish, that it will from a state of rest, move by force of gravity on an incline more acute than 1 in 280, and run downwards with accelerated velocity; still, I have no hesitation in affirming, that the time will come when the practice and theory of this subject will much more closely assimilate than they now do.

The Irish Railway Commissioners assumed, that a descending grade of 1 in 140, imparted an impetus to a train, of practical value, but with a greater incline no advantage was gained as regards speed. From my own experience, I am led to infer, that this standard is far too high, and should be about 1 in 100.

The compensating power of descending planes, is an element in their favour of the greatest importance, it being found that the cost of the additional power required of an engine in ascent, is nearly counterbalanced by an equivalent obtained in descent, where a greater speed at a reduced cost is a natural consequence.

I need but refer to home authorities confirmatory of this assertion, and point to what Engineers, formerly adopting the "level theory," have in later years done.

Mr. Brunel, in a report to the Great Western Directors, dated December, 1838, strenuously advocates "the great superiority of a line "approaching the level," and further states, "On gradients of 16 feet per mile, the engine during half the time is barely doing more than driving itself." In 1850, we find him adopting gradients of *eighty-five and one hundred feet per mile with entire success.*

Regarding the expense of working inclines, Mr. Vignoles, in a paper read in 1840, before the members of the British Association, states, "he had analysed railway expenses of working, and reduced them to a mileage, &c., as deduced from several years experience &c., under different circumstances, and with greatly different gradients;" and he adds, the result of "this average seemed to hold good *irrespective of gradients or curves.*"

Dr. Lardner gives an elaborate analysis of the working of railway gradients: the result is so well known, I shall but allude to it. He asserts that "a compensating effect is produced in descending and ascending gradients, and that a variation of speed in the train is the whole amount of inconvenience that will ensue; that the time of performing the journey will be the same in both cases." I must, however, admit that the gradients, to which the learned doctor alludes, are of the class now known as "*favourable,*" or flatter than 1 in 140; still, I fearlessly assert, that even on ascending and descending planes, where gradients of one hundred feet per mile are used, the loss of time and speed will not amount to more than 30 per cent., under disadvantageous circumstances, as contrasted with a level line. This result I obtain from the working of English railways.

In 1845, the Board of Trade report that "such gradients as were before thought objectionable, are now adopted every day as a matter of course; and as the capabilities of the locomotive have been enlarged, gradients of a class which would have been a few years ago altogether impracticable, have come into general use."

Many statements have been hazarded relative to the increased friction of descending planes on curves, contrasted with a direct line. No practical result, however, of sufficient moment has been elicited that will decide this question.

From my own experience I am clearly of opinion, where the permanent way is well laid, sufficient play being allowed between the flanges of the wheels and the gauge of way, and the outer rail sufficiently raised to counteract centrifugal force, that the difference of friction on an inclined plane, by curves of not less than half a mile radius, or by straight line, is of very trifling value, and would be, perhaps, barely perceptible.

I have purposely refrained from entering at length upon the working of gradients, contenting myself with furnishing the most striking results of experiments on lines bearing analogy to those of Victoria; and, shall now commence a description of the physical peculiarities observable, in prosecuting the railway surveys in this province.

Having been professionally engaged for two years, examining this colony for the purposes of railway communication, I feel I am entitled to speak in a more authoritative manner, than I should otherwise be justified, and shall now give a hasty sketch of the features of the country examined in selecting the routes of our railways. I most sincerely hope that the discussion of this subject will be full, free, and explicit; as it will tend to throw much information on what is now a vexed question.

Before entering upon an exposition of the necessary inclines on the trunk lines of railway in this province, it will be imperative upon me to describe the physical peculiarities which exist in various localities.

A very general conviction has hitherto existed amongst all classes, professional and otherwise, that this country is peculiarly adapted for railways, on account of its level character. In illustration of this, I beg to refer you to the report upon Internal Communication, by the Commissioners appointed by Mr. La Trobe; in which you will find this statement fully verified. I shall hereafter show how incorrect has been this supposition, and how entirely the reverse is the case. One gentleman has lately written a very able pamphlet on railway economy, and has endeavoured to prove, that because a point inland 47 miles, is 1886 feet above low water, Hobson's Bay, the "*necessary gradient*" is only 1 in 131. The point in question, to which allusion is made, is the apex of the dividing range near Mount Macedon; and by the rule the author lays down, the necessary gradient should be 1 in 118, as neither the height nor length is correctly stated; the former being 1911 feet, and the latter 43 miles. Again, the "*necessary gradient,*" on the line to Kilmore, is stated to be 1 in 208, it should be 1 in 138 the length being 31 miles and height 1188 feet. It is further stated, "there is no necessity to go over the ranges at the high points selected." This is an assumption not in the power of the writer to prove, as I fearlessly assert that in all adopted lines permanently surveyed, the lowest crossing of the range has been a desideratum imperatively enforced. The lowest *practicable* crossings of the range *have been found.*

In another pamphlet, addressed to the Melbourne Chamber of Commerce, the writer in sketching out proposed routes of lines to the Gold Fields, states :—" It is evident therefore, that the best course would be by Keilor to Gisborne, letting the line diverge from Gisborne to Ballaarat, as near as possible to Blackwood on one side, &c."

I imagine, the author could not at the time of writing this, have ever left the immediate vicinity of Melbourne: as I venture to declare that a more impracticable country than that from Gisborne to Ballaarat *via* Blackwood, cannot be found on the face of the earth: range towers above range, and precipitous gullies are replaced by broken craggy cliffs and rocky chasms. Examining this country from the valley of the Lerderderg, this truth is strikingly apparent, and every one who knows the locality will fully acquit me of the slighest exaggeration.

Persons having a knowledge of the interior of this country, are aware how singularly abrupt and sudden is the rise of the table land. I cannot offer a better illustration corroborative of this fact, than the country in immediate contiguity to Bacchus Marsh, where the table land rises from an elevation of 500 feet, to an altitude of 1330 feet above low water, Hobson's Bay; and this occurs in a distance of $6\frac{1}{2}$ miles. The ruling gradient, according to a rule before quoted, is here 1 in 41.

The Gold Fields of Victoria, are nearly all situate to the north of a high mountain range traversing this province from east to west. Possessing the attractions of wealth, population, and enterprise, they naturally constitute a most important feature in considering the routes of lines; and, as no railway can approach them without first crossing this high land, familiarly known as the *Coast Range*, it becomes a matter of great interest and no small moment to the engineer, to know which is the most favourable point for doing so. In describing the contour of Victoria, on either side of the mountains, I shall commence by glancing at the country immediately south of them, taking Melbourne as the great centre from which all lines will radiate.

Melbourne appears, on a cursory examination of the map of this colony, to be the centre of a vast amphitheatre, the outermost confines of which is the Dividing Range, most distinctly marked in the distant horizon. To the north-east is Mount Disappointment and the Plenty Range, ending a view at once bold and picturesque; to the north-north-west towers Mount Macedon, the Olympus of the forest: massive, abrupt, and grand, even in shadowy outline, beyond whose heights the eye cannot wander; to the west is Mount Blackwood looming in the distance, a landmark almost as familiar as Macedon itself. These mountains are all situate and form the apex of the Watershed, from whence all the rivers in Victoria take their rise; those to the north draining into the Murray, and those to the south following their various ducts to the sea.

Between the Coast Range and Melbourne, another peculiarity in the features of the country occurs, presenting an outline scarcely less marked than the coast range. This has been found an equal, if not a greater obstacle to encounter. What I allude to is the sudden elevation of the Table Land at the extreme boundaries of the plains and entrance to the timbered country. This singular freak of nature is more prominently marked in some localities than others, but still preserves its entirety of character, approach it in whatever direction you may. To the north, it stands up in high relief and bars the way; at Sunbury, or north-west, it is again observable, and here prominently so, the plains on the south-west side of Jackson's Creek being 1209 feet above low water, Hobson's Bay; whilst, in a northerly direction, 4 miles distant, a rise of 300 feet has been effected. In the west at Bacchus Marsh, it forms the Pentland Hills; is again observable at the Anakies; then at the Moorabool, and still in the far west.

As I before stated, this sudden rise in the table land presents to the Engineer a difficulty second only to the passage of the dividing range, and is a point to which I will especially draw your attention.

I now ask you to follow me, whilst endeavouring to pourtray the salient features of the country, between the coast range and the Murray.

The Murray forms the channel into which all the waters of North Victoria drain, and presents on all sides the lowest ground in the interior: hence, it may be inferred, that the summit of the hills being passed, no obstacles will present themselves in following a northern route.

This, however, is not the case, as will be apparent to any one who has possessed himself of the information on this head, in the Railway Report of the Honorable the Surveyor General; there, it is most clearly shewn, that the difficulties of ascent and descent do not cease, until the level plains are reached; a point some miles north of Bendigo. On the summit of Mount Alexander this opinion can be readily tested; from it will be seen the intricacies of the country, extending from Mount Beckwith on the west, to a point many miles east of Mount Camel.

This large tract of country appears broken and rugged; is traversed with ranges and gullies of a most formidable character; and many of the abrupt declivities far exceed those on the seaboard side of the mountains.

North of Bendigo, from east to west, the plains extending to the Murray afford every facility for the construction of Railways. In illustration, I may state, that on a line of upwards of 46 miles, the descent is only 204 feet, giving a ruling gradient of 1 in 1199.

Having as briefly as possible glanced over the features of the country, between Melbourne and the Murray, I will describe the leading difficulties to be contended against, and shew the means adopted to insure the most perfect routes.

In conducting the Railway Surveys in Victoria, two large parties were established under the guidance of the Engineer-in-Chief. The instructions in all preliminary surveys were to obtain the most efficient working gradients and if time did not permit the survey of alternative lines, transverse sections of the country were to be taken, with a view to the ultimate improvement of routes, when the permanent survey was decided upon. If a great difficulty of obtaining an easy gradient arose; as at Sunbury, Bacchus Marsh, the Moorabool and again on the "Range" as at Kilmore, East Macedon, Woodend, the heads of the Loddon and Werribee, and Jowerrk Jowerrk, near Ballaarat, the most extended surveys were made, and lines run in every possible direction to ensure the most favourable passage of the mountains. Professional men will believe this, when I state, that a transverse section of the country has been taken between Macedon and Mount Blackwood and over all points upon which a doubt could be raised. Many minor features, have doubtless, not as yet received that attention they require, from the fact, that the permanent survey in those localities has not been decided upon. When that has been done, I have no hesitation in affirming, that the best workable line will be the one selected.

As in theory, the most perfect line is that which is uniformly straight and level: so have the permanent surveys of Victorian lines been laid down, to approximate as closely as circumstances would admit, to this standard.

In Victoria, many difficulties intervene between points which cannot be overcome by either a long cutting or a tunnel; and in exemplification of this I would instance the country immediately south of the Pentland Hills. To obtain a line from Melbourne to Ballaarat this point *must* be passed; and a sudden rise of 800 feet has to be overcome in $6\frac{1}{2}$ miles: and even after this summit is attained, the rise continues for some miles at an inclination of 1 in 100. The most natural conclusion for the public to arrive at is—*circumscribe the hills, and lengthen the gradients.* This would be perfectly true and in accordance with all precedent could it be successfully carried into practice; but in the instance quoted, at Bacchus Marsh, we were placed in this dilemma :—On the north bank of the Werribee a most impracticable country occurs from Bacchus Marsh to Ballan, between the Werribee and Glenmore (Griffith's station), a distance of $1\frac{1}{2}$ miles. A high flat topped mountain ridge intervenes, intersected with a deep ravine bearing a perfectly serrated appearance, and precluding the possibility of "winding round the hills" as has been frequently suggested. The valley of Glenmore then occurs, flanked on either side by basaltic cliffs, descending precipitously several hundred feet; and, branching off to the south-west, a mountain range springs up and stays all progress there.

It has been found at this point, after surveys of the most elaborate character have been undertaken, that it is impossible to ascend from the Barwon Creek, to the Iron Bark range, near Ingliston, except by the introduction of gradients of not less than 1 in 50, to 1 in 60.

In England, a watershed like this, rises suddenly and abruptly. Generally speaking, it can be pierced with a tunnel and there the difficulty ends; but in Victoria, the Railway, must rise with the table land, and have its contour governed by it. From Melbourne to Bacchus Marsh, no difficulties of gradients occur; the rise is most favourable and gentle, and from Ballan towards the coast range, no difficulty arises, demanding special comment.

At Sunbury, close to Clarke's special survey, a difficulty of similar character to that at Bacchus Marsh occurs, which must be overcome by the introduction of a steep incline. After this the table land ascends uniformly easy till Gisborne is approached.

Between Gisborne and Woodend the Macedon range has to be crossed, a ride through the Black Forest acquaints the traveller of its peculiarities better than any written description will do. It has the same peculiarity of ascent previously noticed; and although the most careful surveys have been made, and the country thoroughly explored for miles on either side of the mountains, it has been found necessary in the crossing of this natural difficulty, to adopt a steep incline.

It would take too much time to describe the various summit levels occurring near Kilmore, on the north eastern line—at Elphinstone, at the Porcupine and the Alexandrian range, on the Mount Alexander line—at the head of the Werribee, at Daylesford and Mount Franklyn on the North Western line—at Jowerrk Jowerrk, Yandoit, and the Limestone Creek on the west line and at the Moorabool, Buninyong and Warrenheip, on the Geelong and Ballaarat line. This information is obtainable in the report of Captain Clarke; suffice it, therefore, to say, they partake of a similar nature to those previously enumerated, and are difficulties in the way of obtaining a comparatively perfect line which cannot be overcome.

Some idea of the importance attached to the subject of Railway Gradients in Victoria, may be gleaned from the extended surveys made. The public cannot be aware of a tithe of the information collected. When I state, however, that more than 120 miles have been permanently surveyed, 1200 miles of Railway temporarily surveyed, and nearly 2000 miles of tranverse sections taken, it will be conceded, I think, that the question has not been slurred.

Many of these sections have been taken over ground not previously surveyed, and an estimate may be formed of the difficulties the engineer had to encounter in travelling over ground little known; nevertheless, the coast range has been thoroughly examined, from a point some miles east of Mount Disappointment to the country far west of Ballaarat; and its most favourable crossing for Railway purposes has been by gradients of 1 in 60 to 1 in 78, near Kilmore. Unfortunately, this is on a line far to the east of the direct approach to the Gold Fields, and would involve a most circuitous route to be made available for that purpose.

It is evident, that the disadvantages Victorian Railways will labour under, are those of heavy inclines; experience, however, has fully proved, that grades far more severe, occurring in Europe and America, have been, and are daily worked to advantage; and, it is not too much to hope that the improvements daily making in the rolling stock of railways, will enable the most unfavourable inclines, to be worked with far greater speed and less loss of power than at present they can be.

That Railways will do much for Victoria has never been denied:—that her resources will increase and multiply beyond all precedent:—that her mineral wealth will be developed to an extent unparalleled in the world's history is not too much to be expected.

Her beautiful park-like scenery, clothed with a velvet sward, and luxuriant with vegetation; her plains abounding in the richest soil now wild and tenantless and her lightly timbered woods and forest land, where the prolific virgin earth has never been disturbed, offer inducements to the settler unknown to other colonies, but now rendered unavailable for want of communication with populated districts.

In conclusion, I would add, that I have written this paper with the hope that more attention will be paid to the subject of Railways than has hitherto been done, and to describe the physical peculiarities existing in Victoria, probably unknown to a majority of the inhabitants of Melbourne.

ART. XV.—*Recent Discoveries in Natural History on the Lower Murray.* By WILLIAM BLANDOWSKI, ESQ.

WITH FOUR PLATES.

[Read before the Institute, 2nd September, 1857.]

[*Preliminary Report (No. IV.), Addressed to the Honorable the President of Public Lands and Works. By order, handed over to the Philosophical Institute.*]

GENTLEMEN,—The Honorable the President of the Board of Public Lands and Works has permitted me to lay before you the results of my investigations from the 1st of December, 1856, to August, 1857. It would be impossible for me to give you, at this present moment, a full account of all my observations; therefore, accept the brief outlines I now offer to you according to your request made to the Government.

In order that you may understand more fully the nature of the country which I have traversed, and the difficulties with which I had to contend, and what prospects I had on leaving Melbourne, I beg to read to you an extract of a single page from Surveyor White's Report, dated May 28th, 1849, who surveyed the district visited by me: which document was officially handed over to me before I undertook my late tour.

October 30, 1849.—" Again encamped at Messrs. Baird and Hodgkinson's, having been so fortunate as to obtain a small supply of water by digging in the sand at a certain spot—thus, having been eleven days without water, succeeded in saving the bullocks, with the exception of four, that died, and in bringing *them,* the drays, and the remainder of the equipment out of the scrub.

November 6. — "Left party to ride through the scrub to the Murray, in the direction that the South Australian Boundary will take, taking two horses, intending to return the same way.

November 12.—"On the sixth day after leaving the camp, one of the horses was unable to proceed, not having had water for four days: compelled to leave him. Led on the other horse some distance, when he also gave in, and lay down; took the saddle, &c., off him, and lay down beside him, being scarcely able to stand, the day intolerably hot; bled the horse, and drank about half-a-pint of his blood, which was black, thick, and unhealthy-looking, and had the same bad smell as his breath. Got up; staggered on with the greatest difficulty; and reached the river in a state of extreme exhaustion in the afternoon."

From this extract you will perceive what were my hopes. Nothing, however, could make me in the least faint-hearted in the execution of my self-selected duties, and which, it appeared to me, would be of very great interest as regards the scientific investigation of a country hitherto considered a barren desert.

I. On the 2nd of December, 1856, I received orders from the Government to proceed to the junction of the Darling and Murray Rivers, for the purpose of making investigations on the natural history of that district, and also, with a view of collecting as many specimens as possible for the National Museum, and marking the distribution of animal life along my route.

I left Melbourne on the 6th December, 1856, with a very complete field equipment, consisting of five horses, two bullocks, two drays, four tents, a full set of tools and implements, and also a photographic apparatus. Four men were allowed me as my staff, and I had before long to regret that I had made a bad selection. The hardships, roughnesses, and privations of bush life were unknown to them, and I was soon deserted and left to myself, being, in consequence of this, exposed to innumerable delays and inconveniences, so that I had very great difficulty in fulfilling the duties which were expected of me.

It would, however, be unjust on my part were I not to acknowledge services, rendered to me by my assistant, Mr. G. Krefft, who, from the beginning to the end of my undertaking, most faithfully shared my lot. I may also mention a former faithful servant of mine, James Manson, who, when written to by me, joined my party at Mount Hope. He is one of those trustworthy Scotchmen who, in this respect, have raised the fame of their nation. Krefft and Manson were all, that held out my cause from eighteen persons, successively engaged by me for the Government service.

On the 27th December I arrived at Kew's Swamp, between the Murray River and Mount Hope, about 170 miles N. by W. from Melbourne. On the 3rd of March, having re-organised my party, I started towards Lake Boga and the junction of the Murrumbidgee and the Murray Rivers, in a N.W. direction, about 130 miles distant from the former station. I was deceived in my expectations even here, and I therefore left my party, pushing forward alone to the junction of the Darling and Murray Rivers, where they arrived safe, but in a most deplorable condition, on the 8th of April. This being their ultimate destination, they formed a permanent encampment at a place called by the natives Mondellimin, about 400 miles from Melbourne, and opposite the junction of the Darling and Murray Rivers.

I myself started alone, for the purpose of examining the banks of the river westwards along the Murray, to the neighbourhood of Moorundee, and rejoined my party at Mondellimin, after having been absent three weeks, and ridden, in that short period, over 600 miles of country, crossing the river several times, which has a width of from 500 to 600 feet.

From Mondellimin I started again on a more extended excursion on the 27th of May, in a N.E. direction, up the Darling River towards Mount Murchison, a distance of 300 miles, and returned, after an absence of 24 days, to my encampment, having been obliged to swim the Murray twice, the Darling seven times, and several smaller streams. The distance traversed by me in that period was 700 miles.

On the 6th of August I left my camp in charge of Krefft and Manson, and proceeded to Melbourne, taking with me the valuable collection of specimens of Natural History, which had been accumulating in my tent during my stay at Mondellimin, to the extent of twenty-eight boxes and parcels, containing in all about 16,000 specimens, registered under 2,000 different numbers.

I went down the Murray River in the steamer "Albury" to Port Goolwa; from thence by the steamer "Corio" through the mouth of the Murray River to Adelaide; from thence to Melbourne by the "Havilah;" and arrived safe here, together with my collection, on the 18th August, having travelled a distance of about 1300 miles.

II. Having thus given you a brief outline of my proceedings, and the country I have travelled, I now beg to lay before you the result of my labours, observing, in the meantime, that the mechanical part—viz., that of preserving the specimens—was done by my white laborers alone, whilst the specimens were obtained by the assistance of the aborigines, to whom I am indebted for all the information and discoveries I have made, so that I can but claim a small share of the credit of having, with my party, been successfully exploring the desert of Australia for eight months.

I can add but little to the description given by Sir Thomas Mitchell of the physical character of the country which I have traversed, and which he visited before me, but allow me at least to give you an outline of the most prominent features of the same.

Having passed the bold and steep Dividing Ranges at Lancefield, I descended into the rich and extensive grassy plains between the Campaspe and Loddon Rivers, which are strikingly similar to the Gawler Town plains, in South Australia, and which are destined at some future period to supply the Victorian market with fat cattle, when the benefits of irrigation are better understood by our colonists, and when, by means of a railway, access to Melbourne from the Murray District will be rendered easy.

Mount Hope and Mount Pyramid, characterised by their picturesque appearance, arising from enormous blocks of granite, towering in bold relief, one above the other out of the alluvial flats, will at some future day be the Madeira and Oporto of Victoria. No spot offered to my eye a finer prospect of success in wine growing in Victoria, than this small area of about 30,000 acres of splendid soil.

The remainder of the country in the neighbourhood of the Murray, consists of barren, stiff and firm clay flats of remarkable evenness, partly covered with box-trees or salsolae bushes, and in other parts with dense, impenetrable mallee scrub, easily distinguished at a great distance by its dirty looking, dark olive green leaves. Wherever the Mallee Scrub is met with, the soil is interspered with numerous nodules of limestone. The bright green of cypress forests, with the duller aspect of the oak, growing on sand hummocks interrupts the monotony of the box-tree flats. Now and then a cluster of Eucalypti growing along the banks of the Billibong, and ornamenting the banks of the slowly flowing Murray, occasionally relieve the weary traveller with their refreshing looks, and remind him, that ultimately the sheep and cattle of those regions will have to make room for flourishing dairy stations, silk growing plantations and wine producing farms.

Peculiar looking dried up lakes of several miles, in diameter, in the neighbourhood of Lake Boga, and having their north-east shores considerably elevated in the form of an amphitheatre, above the remaining portion of the soil, extend between the Lachlan and the Darling, and sweep around Candilla Lake in the direction of Lake Torrens, of which they appear to be the ancient remains. Before the Murray and its tributaries were able to break through the limestone cliffs, near the overland corner, in longitude 140° and from the present channel of that river, a chain of high, picturesque, but barren sand hummocks, appear to have been formed, characterising the last violent struggle, which took place between a shallow sea and a large accumulation of sweet rainwater in the valley of the Murray, leaving on the one side now and then a fresh water lake, which by means of an open channel had communication with the newly formed River Murray, and on the other side now and then a concentrated saltwater lake, which, when dried up in summer, forms a crust of salt, covering its bottom, and which might tempt a skater to try his skill on the icy looking surface.

The Golgol Ranges exist only in name and the charming blue of a high mountainous district appears for the first time, after having passed Laidley Ponds, and even here at a great distance.

The Anna branch of the Darling has its junction at least fifty miles higher up the river, than is shown by Arrowsmith's map.

Extensive polygonum flats, and the absence of reed-beds, are characteristic of the banks of the Darling. I may also mention the remarkable fact of a strange disease, prevailing in that district on an extensive scale amongst the horses; a kind of madness befalling these animals, which causes them to rise and plunge, rear high into the air, and in most instances finish by committing suicide, either by falling over the banks into the river or breaking their necks. The disease commences with a dullness; shortly afterwards the animal shies at any object, thereupon gets completely mad, and if it should recover, loses its former tone of voice, which changes into the cry of a mule; while, all the qualities for which the horse is so justly esteemed are lost.

In latitude 32° south, a new vegetation begins. The Atriplex plains disappear, and zebra-like spotted wood and native orange trees grow in the richer soil. The whole country, as regards vegetation, is at least three months in advance of the southern portion.

Arrived at Mount Murchison, the last outpost of civilization, the station there belonging to the brothers H. and B. Jamieson, I made an excursion of twenty-five miles to the north into the untrodden district of Eastern Australia. The panorama which there presented itself to my view from the summit of a high hill, called by me Mount Jamieson, was grand. The whole horizon was closed in with high blue mountains and picturesque hills, and my feelings then can only be understood by one, who himself has been on the verge of civilization, (in this case 700 miles from Melbourne), and gazed into the unknown wilds expanding before him.

III. Concerning the geological features of the country, I have but little information to give to some of you, as beyond the dividing ranges, with the exception of coarse grained granite at Mount Hope and Pyramid Hill, nothing peculiar exists on Victorian ground along the Lower Murray, but a pale yellow mallee sandstone, which is superseded from the junction of the Murrumbidgee to the Darling by brown colored ferruginous sandstone, and in the neighbourhood of the latter place by a dirty, yellow limestone, like sandstone, which appears to form the connecting link with the Murray limestone cliffs at Overland corner. I was not able to discover any fossils in Victoria, but thousands of the most beautiful in form are washed out of their original matrix on the South Australian side of the river. The hard outside crust of the fossils has resisted the action of the water and atmosphere to a surprising degree, and shows the most elegant forms imaginable in a perfect state of preservation.

Nothing remarkable besides this appeared to me, except at Mount Murchison the zig-zag, rugged, projecting rocks, apparently of the Silurian era. The quartzose sandstone, admirably adapted for millstones will at some future period supply this article to this colony. The natives obtain their supply in this respect from here, and within a radius of 600 miles get furnished from this district with stones for grinding various seeds. This is the district of which the natives gave Captain Sturt the account (generally believed to be fabulous) " That the sharply pointed stones and great rocks would fall down upon and crush visitors, and that even if they escaped from this danger, they would be killed by the heat, and that neither grass, water, nor wood are to be met with ; that the wells are very deep, and that the cattle are unable to drink out of them, and, finally, that the water is salt, and that the natives drop down bundles of rushes to soak it up. This is no fiction but reality, described in the original language of the natives as relating to Mount Murchison.

IV. In the River Murray and also in Reedy Lake, I have found sweetwater sponges in great quantities. I am not aware of the existence of sponges in sweetwater in other countries ; I therefore mention to you this fact.

I had opportunities of collecting a large number and variety of spiders, a beautiful species of spined lobster, and two other varieties of crawfish, and three kinds of shrimps—all found in the Murray. Concerning the insects collected, I need only say, there are 3000 delivered to the Museum, where all orders are represented which exist in the country.

Only two mussel shells were known to exist in the Murray. I have the pleasure of informing you that I have found eight bivalves, belonging to Unio family, and six univalves, belonging to Lymnea, Succinea, and Physa, of which three are viviperous. I have preserved a large number of them in spirits of wine, and they can be seen at the Museum.

There were only three kinds of fish known to exist in the Murray, and of which, Sir Thomas Mitchell gives good drawings. I beg to lay before you nineteen different forms of fish living in the waters of the Murray and Billibong.

FRESH WATER FISH, FROM THE MURRAY RIVER, IN VICTORIA.

DELIVERED BY W. BLANDOWSKI.

PLATE I.

Fig. 1. H

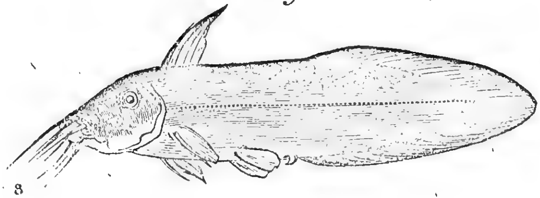


Fig. 2

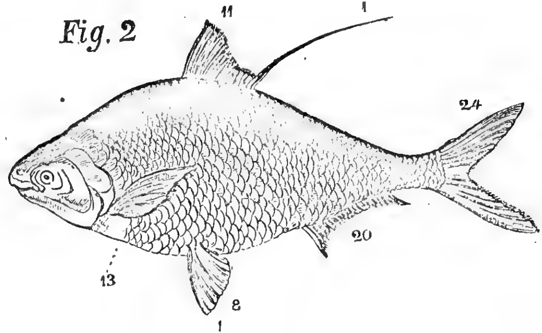


Fig. 3. C

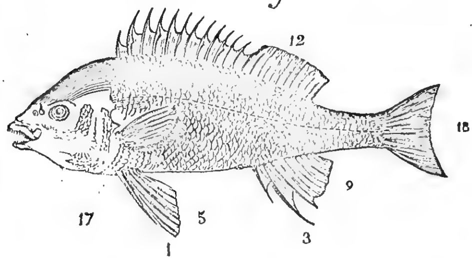


Fig. 4 B

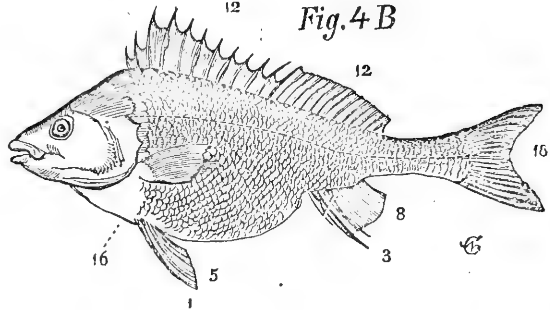


PLATE I., FIG. 1.—*Plotosus tandanus.* *(H.)*

Eel-fish or "Kenaru," of the Yarree Yarree.

An olive-green coloured fish, with eight long feelers round its mouth. Eyes yellow. An Asiatic form of fish, which lives here in the Murray and in Billibongs. Is very much esteemed by the natives as food, and prohibited to their young men. Swims with great rapidity, even in shallow water. Ploughs the water with its powerful dorsal fin, and is therefore easily recognised and speared by the natives. They often hurt their fingers on the sharp back fin, and then say it is a "saucy fellow." It is unquestionably the best eating fish in the Murray, and grows to the size of two feet, weighing from 7 to 8 lbs. It lives principally on very small shells, and muddy spots are its favorite places of abode. It is not scaled.

PLATE I., FIG. 2.—*Megalope Caillentassart.* *(D.)*

"Manur," of the Yarree Yarree.

A fish found in the neighbourhood of Boston. Is of a silvery colour, and has on the back, behind the dorsal fin, a very elongated and elastic backray. Leaps frequently out of the water, and is easily caught by its elongated ray in thin fine nets, laid by the natives horizontally on the water. The fish gets entangled in the twine, and cannot escape. Is most numerous in the Darling, but is also found above and below the junction of the Murray and Darling Rivers. In June and July it is considered a delicacy by the natives and forms their principal food during these two months. The young women are not permitted to eat them, from a belief, that if they did, all fish in the river would die; but in reality, because it is thought to be an aphrodisiac, this fish being very fat and nourishing. It is also placed on the top of graves, to point out the direction in which he lives, who caused the death of the inmate. Therefore, this fish is highly esteemed. It is remarkable that this fish contains an uncommon quantity of small soft bones. It grows only from 10 to 14 inches.

PLATE I., FIG. 3.—*Cernua Bidyana.* *(C.)*

"Baggack," of the Yarree Yarree.

Sir Thomas Mitchell has already given a good drawing of this fish. It grows to about 18 inches in length.

PLATE I., FIG. 4.—*Cernua Eadesii.* *(B.)*

"Buruitjall," of the Yarree Yarree.

A fish easily recognized by its low forehead, big belly and sharp spine.

PLATE II., FIG. 5.—*Cernua Nicholsonia.* *(T.)*

"Karpa," of the Yarree Yarree

Lives on crawfish. Fishes 3, 4 and 5 are all difficult to distinguish from each other. They live in the Murray and its Billybongs. Grows to the length of 14 inches.

PLATE II., FIG 6.—*Cernua Ifflaensis.* *(Q.)*

"Bipe Purritjall," of the Yarree Yarree.

Is a little fish from two to three inches in length, and only found in the waters of the Billybongs. Colour dirty greenish ; irregular dotted lines running over the upper part of the body ; body silvery.

PLATE II., FIG. 7.—*Cernua (?) Wilkiensis.* *(P.)*

"Mallupit," of the Yarree Yarree.

This fish is very small, and lives in the Billybongs.

PLATE II., FIG. 8.—*Kohna Mackennæ.* *(L.)*

"Kohn," of the Yarree Yarree.

A fine little fish, which seldom grows to the length of three inches.

PLATE II., FIG. 9.—*Turruitja Achenson.* *(M.)*

"Turruitje," of the Yarree Yarree.

Is found in the Murray and adjacent Billybongs.

PLATE II., FIG. 10.—*Jerrina Dobreensis.* *(K.)*

"Jerrin," of the Yarree Yarree.

This bright coloured fish soon attracts the attention of the little black children by its pinkish breast and dark greenish body, with twelve intense bluish stripes, running longitudinally along the body, commencing a little beyond the middle and pointing towards the tail. The dorsal and ventral fins are of a yellow colour. The tail is orange. This fish very seldom grows larger than five inches, and is roasted together with the other little fishes by the natives in the following manner :—They take a few hot stones and some clods of clay, throw in the whole lot of fishes, turn them round for a few minutes, then take out again the hot stones and eat the whole mess like "bubble and squeak" from a piece of bark, on which these little fishes have been previously prepared. The Billybongs are the principal abodes of this fish.

FRESH WATER FISH, FROM THE MURRAY RIVER, IN VICTORIA.

DELIVERED BY W. BLANDOWSKI.

PLATE II.

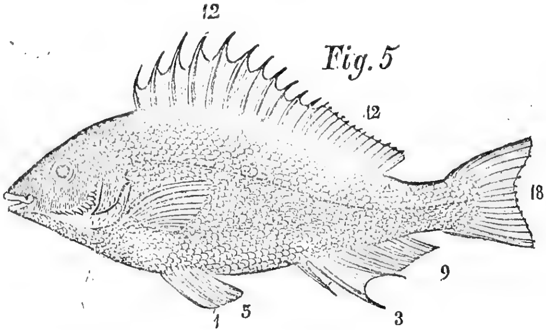


Fig. 5

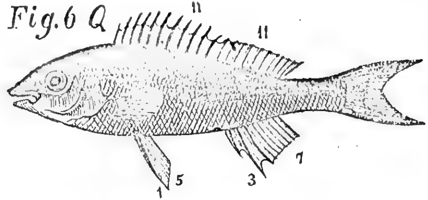


Fig. 6 Q

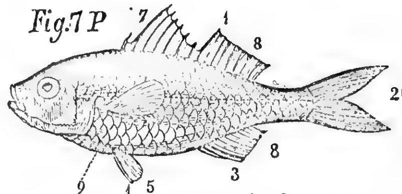


Fig. 7 P

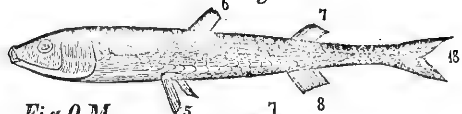


Fig. 8. L

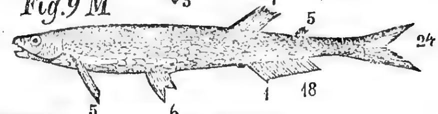


Fig. 9 M

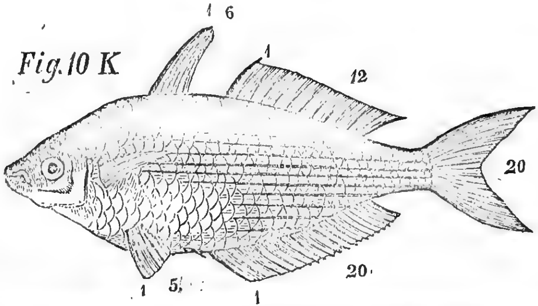


Fig. 10 K

FRESH WATER FISH, FROM THE MURRAY RIVER, IN VICTORIA.
DELIVERED BY W. BLANDOWSKI.

PLATE III.

Fig. 11. E

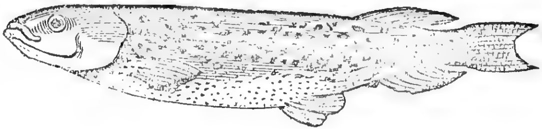


Fig. 12.

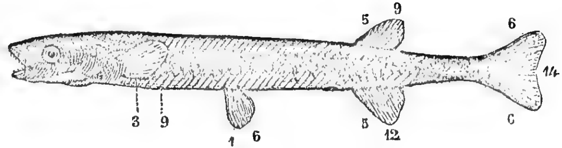


Fig. 13. S

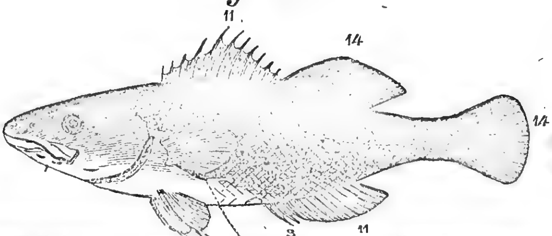


Fig. 14. J

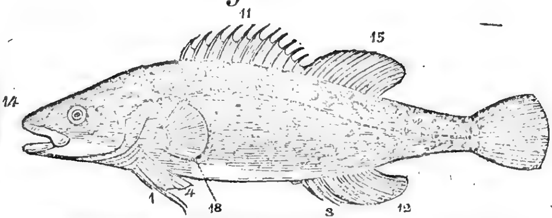


PLATE III., FIG. 11. *(E.)*

"Poke," of the Yarree Yarree.

This little spotted trout is a delicious eating fish, and is not only found in the Billybongs and the River Murray, but also observed by me in the Yarra Yarra, near Melbourne. It is nearly transparent, of a slightly greenish colour, with blackish spots of large size on the back, and of a smaller description on the belly. Becomes a fat, plump little fish, seldom larger than six or seven inches.

PLATE III., FIG. 12.—*Uteranka Irvingii.*

"Uterank," of the Yarree Yarree.

This long thin fish seldom grows larger than seven inches, and is caught by the boys in the Yarra Yarra, in great numbers. Is considered a very fine eating fish, but appears to be rare in the Murray, and only serves to support the fish drawn at figure 15, which principally feeds on it.

PLATE III., FIG. 13.—*Gristes Macquariensis.* *(S.)*

"Yaturr," of the Yarree Yarree.

Is of a dirty green colour and has less spots, than Gristes Peelii. In both the scales are small and covered by an epidermis. Both are characteristic forms of the Murray River and its tributaries, and the principal fishes on which the natives subsist during the greater part of the year. They grow from 36 to 40 inches in length. In winter, when the river overflows it banks, the natives spear them at night by firelight, while sleeping behind an old log; in the summer season, from January to June, when the river is low and the water clear, this fish sleeps in the river, behind a log or stone. The native, spear in hand, (now an iron rod of about six feet in length), dives, head foremost, to the bottom of the river, where the fish sleeps and there spears it, an exciting sport even to the white man.

PLATE III., FIG. 14.—*Gristes Peelii.* *(J.)*

"Barnta," of the Yarree Yarree.

This fish, as well as the preceding, No. 13, have both been already observed in America. I may as well allude here to Mr. Edward Wilson's experiment of transferring these fishes to the rivers joining the sea on the southern side of the range, and I believe them likely to prosper, if they find ample food in those rivers!

Plate IV., Fig. 15.—*Tilka Wilsonia.* *(A.)*

A fish of middling size, grows from 14 to 18 inches; is finely scaled. Is known to the Gunbower natives as "Pollugunder," and to the Loddon tribe as "Birnnett." Lives in the Murray and Billybongs.

Plate IV., Fig. 16.—*Collundera Mülleriana.* *(O.)*

"Collundera," of the Yarree Yarree.

This fish does not grow above three inches, and lives principally in the Billybongs. Is of an olive-green colour, has white eyes, and has large scales for its size.

Plate IV., Fig. 17.

"Loetj," of the Yarree Yarree.

The smallest sized fish, which I have observed in the Australian waters. Lives in the Billybongs, and is only two inches in length and rarely grows larger.

Plate IV., Fig. 18.—*(R.)*

Kurrina Macadamia.

A bluish-green small fish, with dark green stripes on the head, and spotted with darker dots, particularly visible on the tail and fins. Lives principally on little crawfishes. The "Koerin" or Kurrin," takes its abode in the hollows of the banks of the Billybongs, there watching for its prey.

Plate IV. Fig. 19.—*(N.)*

Brosmius Bleasdalii.

A slimy, slippery fish. Lives in the mud. Is of a violet bluish colour on the belly. The whole upper surface is of a dirty olivish-green colour, with numerous irregular dark patches. Principally found in Billybongs, but also found by me in the Yarra Yarra River. The Yarree Yarree natives name it "Paltk." It grows to about seven inches in length.

Fig. 16. O

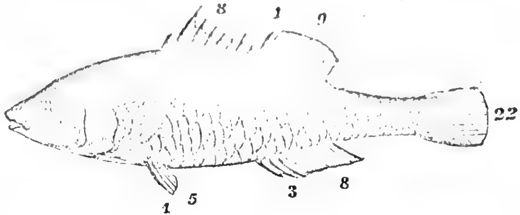


Fig. 15 A

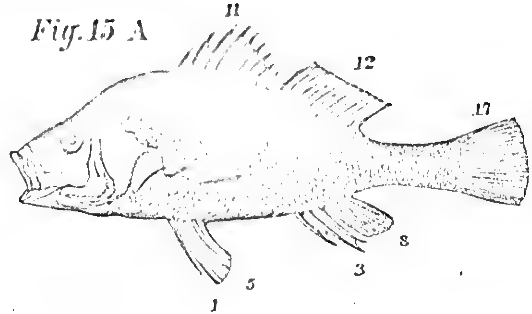


Fig. 17

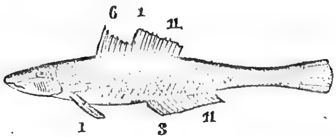


Fig. 19 N

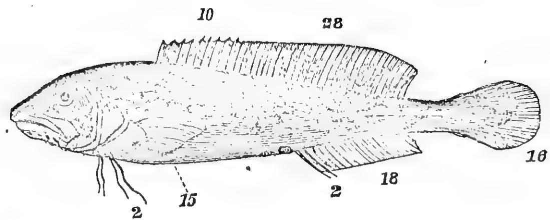
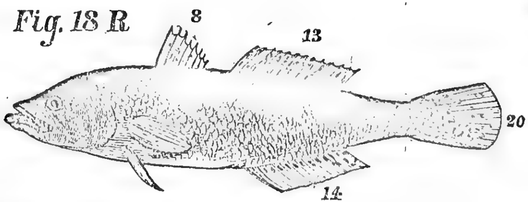


Fig. 18 R



GROSSE

Drawings of nine different kinds of frogs are before you. Five of them at least are new.

Of snakes I have observed, and gathered twenty-four distinct species, and of which sixteen will be found to be entirely new. Amongst them I have to mention to you, that I have discovered the Boa Constrictor of Australia,* being in its character exactly alike to that of South America. It is much smaller, but climbs trees, and is harmless to human beings, waiting for its prey in the topmost branches of high gum trees, from which it pounces upon and crushes its prey, devouring the whole. I was inclined to make before you an experiment with a live snake, but as I have had to deliver up the specimen to the National Museum I am unable to do so.

At Lake Boga I was exposed to some danger in presence of

NOTE.

Pages 131 to 134 inclusive, with four Plates, are omitted from this volume of the Transactions, by an order of the Council, of date, 7th April, 1858.

‡ Beyond the Dividing Range the Bee Eater and Red-rumped Parrot line begins and extends far to the north.

The Eos, or rose-bellied Cockatoo appears not to overstep 143° longitude westwards, and begins to make its appearance with 35° latitude northwards.

The crested Pigeon begins to appear in the latitude of the Murrumbidgee and extends northwards.

The peaceful ground Dove appears at the junction of the Darling and Murray, also the porphyric-crowned parrakeet, and Bourke's grass parrakeet.

* Its scales round the head, and the thorns on the vent very nearly identical with the Boaviridis, or Bojobi of the Brazilians.—Bl.

† Just published by Mr. Gould in his last supplementary number on the Birds of Australia.

‡ This bird is not new. It should have been named brown red throat, or Pyrrholœmus brunneus.—Bl.

Fig. 16. O

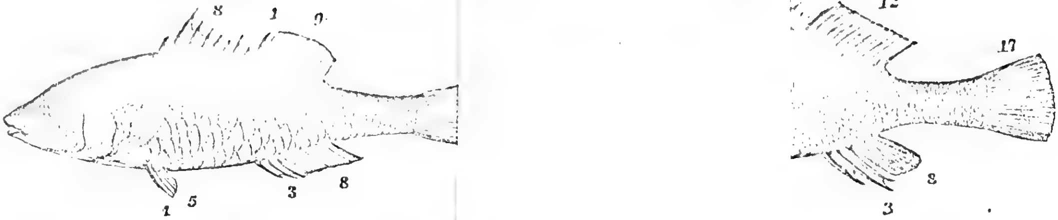


Fig. 17

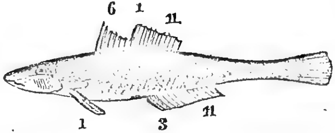
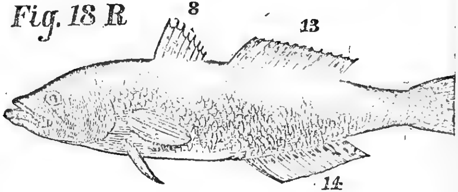
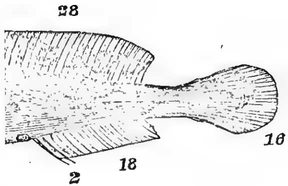


Fig. 18 R



9 N



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At Lake Boga I was exposed to some danger in presence of my men, by a very poisonous snake, on which I had inadvertently placed my feet.

Of Lizards I have seventeen species, some are of a very remarkable form, and as I have never seen more than six kinds, I believe my assertion that eleven new species are added to the natural history of this country, will be found correct. The drawings are now before you.

Three different kinds of Turtle are known to exist in the Murray and Darling. I have found two of them, and forwarded eggs, young and old specimens, alive and dead to the Museum.

Of Birds I have only been able to discover three new forms; of which I beg to lay before you drawings and specimens of the brown-capped Pomatorihnus,† the rufus-tailed Cuckoo, and the brown-throated Acanthiza.‡ Beyond the Dividing Range the Bee Eater and Red-rumped Parrot line begins and extends far to the north.

The Eos, or rose-bellied Cockatoo appears not to overstep 143° longitude westwards, and begins to make its appearance with 35° latitude northwards.

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‡ This bird is not new. It should have been named brown red throat, or Pyrrholœmus brunneus.—Bl.

In all, I have marked eleven distinct lines of the distribution of birds, which will be of utility in geographical illustrations.

High up the Darling I was informed that the red-crested black Cockatoo exists, but as I have not seen it myself, I can merely give you from various parts the corroborated information of the inhabitants.

Of quadrupeds I have found twenty-six different species, of which eleven are not marsupial, and of which I have the pleasure of announcing to you that five are entirely new to me. A great many of these, according to Gould's work, are only uniquely represented in the London Museum, and in my belief these unique quadrupeds are not the same, which I have brought with me. Most of these quadrupeds I have collected in large numbers, and they are entirely the results of the exertions of my friends the Yarree Yarree Aborigines, and for which I have given them flour, sugar, tea, blankets, clothing, and other small presents, amounting in all to about £200 in value.

On the Darling I discovered a small animal which digs up the dead bodies of the natives and devours them. It is called by them Yakoo.

V. Concerning the natives, I could communicate many new and interesting particulars to the Philosophical Institute but time forbids me entering upon the subject at present. The Loddon tribe or Gunbowers are of an athletic figure, wild, resisting civilisation well; but even they diminish in numbers in a most deplorable manner. Nearly all of them now possess firearms. They live principally on jypha or calamites roots, which they bake. In January they collect in large numbers to enjoy the fishing season on the Murray. Playing at sham-fights, is their amusement. In February they commence to fight in earnest with the neighbouring tribes, and have several hard combats. Their burial grounds are of a long oblong form, like their shields, and from 100 to 120 yards in extent.

At Swan Hill I have seen a native of a truly enormous size, and well proportioned, his breadth being in harmony with his great height.

The fisher tribes in the neighbourhood of the junction of the Murrumbidgee and Murray, are distinguished by great scars or gashes along their backs, and which they inflict upon themselves with burning sticks. It would require the stoical resignation of a Mucius Scaevola to endure the terrible pain, to which they expose themselves on losing a relative, when they burn their backs. Near the junction of the Darling the women make large gashes in their thighs, breasts, and arms; the men cut their heads with tomahawks. The graves are huts, covered with the "Manur" nets of the deceased, in which the Currincles have to sleep at night; and the female relatives of the departed enter the tomb every morning before daybreak, giving expression to the most melancholy lamentations. On the Darling, they pile upon the top of the grave a large heap of Wood, light a little fire in front of it and cry bitterly. On leaving, the widow plants a green bough on the grave.

At Goolwa, I saw a black fellow smoked and roasted after death on a scaffold, which performance was accompanied with many fantastic ceremonies.

On the whole I have but to make the most deplorable statements concerning our natives. Extermination proceeds so rapidly, that the regions of the Lower Murray are already depopulated, and a quietude reigns there which saddens the traveller who visited those districts a few years ago.

ART. XVI.—*On the Astronomy and Mythology of the Aborigines of Victoria.* By WM. EDWARD STANBRIDGE ESQ., of Wombat.

[Read before the Institute, 30th September, 1857.]

I beg to lay before your honorable Institute the accompanying paper on the Astronomy and Mythology of the Aborigines, and in doing so I am sensitive of its imperfectness, but as it is now six years since I made any additions to it, and as my occupation does not lead me to that part of the country where I should be able to make further additions, I have presumed to present it to your society, hoping that it may be a means of assisting others to gather further traces of the people that are so fast passing away.

This statement of the Astronomy and Mythology of the Aborigines is, as nearly as language will allow, word for word as they have repeatedly during some years stated it to me. It is in the language of, and has been gleaned from, the Booroung Tribe, who claim and inhabit the Mallee country in the neighbourhood of Lake Tyrill, and who pride themselves upon knowing more of Astronomy than any other tribe.

The Aborigines in the neighbourhood of Mount Franklin have names and Mythological Associations for a few of the stars, which names and associations are the same as those in use with the Booroung's, who say that the earth is flat and was in darkness before the Sun was made by Pupperrimbul, (the little bird with the red patch above the tail), when it became light. He was one of the race that then inhabited the earth, and who are called Nurrumbunguttias or old spirits. They possessed fire and were of the same characteristics as the present race, but were translated in various forms to the heavens, before the present race came into existence.

The Nurrumbunguttias still possess spiritual influences upon the earth; whether of darkness, of the storm, or of craters, all the evil spirits are of them. They have also spiritual representatives in some creatures, as, for instance, if a pupperrimbul were to be killed, there would be a fearful fall of rain.

All the stars, as well as all appearances in tyrille (space) are supposed to have emanated from the Nurrumbunguttias.

Gnowee (Sun), an Emu's egg prepared and cast into (tyrille) space by Pupperrimbul before which the earth was in darkness. Some say the Emu's egg was prepared by Berm-berm-gle and carried into space (tyrille) by Penmen, (a small bird which they do not willingly destroy).

Chargee Gnowee (Venus), sister of the sun and wife of Ginabongbearp.

Ginabongbearp (Foot of Day), (Jupiter) a chief of the Nurrumbunguttias, and husband of Chargee Gnowee.

Mityan (Moon), who falls in love with one of Unurgunite's wives, and while trying to induce her to run away with him, is discovered by Unurgunite, when a fight takes place ; Mityan is beaten, and runs away, and has been wandering ever since.

Marpeankurrk (Arcturus), mother of Djuit and Weetkurrk. The discoverer of the Bittur, and the teacher of the Aborigines when and where to find it. When it is coming into season with them it is going out of season with her. The Bittur is the larvae of the wood ant, which is found in large communities, and of which the Aborigines are very fond. They subsist almost entirely upon it during part of the months of August and September. When she is in the north at evening, the Bittur are coming in season, when she sets with the sun the Bittur are gone and (Cotchi) summer begins.

Djuit (Antares), son of Marpeankurrk. The stars on either side are his two wives.

Neilloan (Lyra), (a Loan flying), the mother of Totyarguil and discoverer of the Loan eggs, which knowledge she imparted to the Aborigines. When the Loan eggs are coming into season on earth, they are going out of season with her. When she sits with the sun the Loan eggs are in season.

Totyarguil (Aquilla), the son of Neilloan, and who, while bathing was killed by the Bunyips, his remains were afterwards rescued by his uncle Collenbitchick. The stars on either side are his two wives.

Karik Karik (the two stars in the end of the tail of Scorpio), a male and a female Falcon.

Berm-berm-gle (two large stars in the fore-legs of Centaurus). Two brothers who were noted for their courage and destructiveness, and who spear and kill Tchingal. The eastern stars of Crux are the points of the spears that have passed through him, the one at the foot through his neck, and that in the arm through his rump.

Tchingal (Emu), (the dark space between the fore-legs of Centaurus and Crux), who pursues Bunya until he takes refuge in a tree, and who is afterwards killed by Berm-berm-gle.

Bunya (Oppossum), (star in the head of Crux), who is pursued by Tchingal, and who, in his fright lays his spears at the foot of a tree and runs up it for safety. For such cowardice he became an oppossum.

Tourtchinboionggerra (Cornua Berenices), a flock of small birds drinking rain water, which has lodged in a hollow in the fork of a tree. (Each star had a separate name, but, through the intercourse of the aborigines with the white people, the names are forgotten.)

Kourt-chin (Magellan Clouds).—The larger cloud a male, and the lesser cloud a female Native Companion.

Warring (Galaxy).—The smoke of the fires of the Nurrumbunguttias. Another account is, that only a part of the Galaxy is the smoke of the fires of the Nurrumbunguttias, and that the other part is two Mindii, enormous snakes which made the Murray (Millee).

Kulkunbulla (the Stars in the Belt and Scabbard of Orion).—A number of young men dancing. (A coroborree.)

Larnankurrk (Pleiades), a group of young women playing to Kulkunbulla.

Gellarlec (Rose, or Eos Cockatoo (Aldebaran), an old man chanting, and beating time to Kulkunbulla and Larnankurrk.

Warepil (Male Eagle) (Sirius), a chief of the Nurrumbunguttias, and brother to war.

Collowgullouric Warepil (Female Eagle) (Rigel), wife of Warepil.

Won (Corona), a boomerang thrown by Totyarguil.

Weetkurrk (Star in Bootes, west of Arcturus), daughter of Marpeankurrk.

War (Male Crow) (Canopus), the brother of Warepil, and the first to bring down fire from (tyrille) space, and give it to the aborigines, before which they were without fire.

Collowgullouric War (large red star in Rober Carol, marked 966) (Female Crow), wife of War. All the small stars around her are her children.

Yerrerdetkurrk (Achernar). — Nalwinkurrk, or mother of Totyarguil's wives. The Nalwinkurrk never allows her son-in-law to see her.

Otchocut (Dolphinus), Great Fish.

Collenbitchick (a species of Ant) (Double Star in the head of Capricornus), uncle to Totyarguil, and the rescuer of his remains from the Bunyips. The double star is his fingers feeling for the bank of the river.

Yurree (Castor), Wanjel (Pollux), two young men that pursue Purra and kill him at the commencement of the great heat, and Coonartoorung (Mirage) is the smoke of the fire by which they roast him. When their smoke is gone Weeit (Autumn) begins.

Purra (Kangaroo) (Capella), who is pursued and killed by Yurree and Wanjel.

Unurgunite (a small star marked 5th Mag 22, between two larger ones in the body of Canis Major). He fights Mityan and makes him run away for having tried to induce one of Unurgunite's wives to run away with him. The stars on either side of Unurgunite are his two wives; that farthest from him is the object of Mityan's affections.

Porkelongtoute (Shooting Star), which portends evil to those that have lost a front tooth, to avert which they stir the fire and cast about firebrands.

Tourte (Star).

Weeit (Autumn), the first season of the year.

Myer (Winter), the second season.

Gnallew (Spring), the third season.

Cotchi (Summer), the fourth season.

ART. XVII.—*On Extensive Infusoria Deposits in the Mallee Scrub, near Swan Hill, on the Lower Murray River, in Victoria; and, on the Presence of Fucoidae in Silurian Rocks, near Melbourne.* By WILLIAM BLANDOWSKI, ESQ.

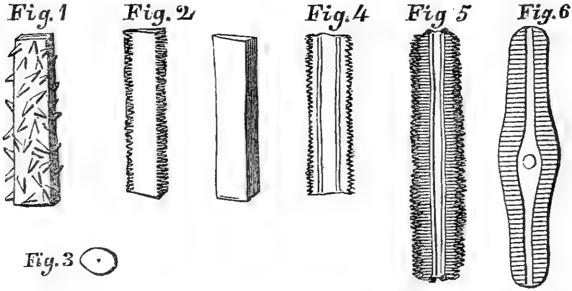
WITH ONE PLATE.

[Read before the Institute, 11th November, 1857.]

WHEN passing Swan Hill, on my late excursion to the Lower Murray, Mr. Beveridge drew my attention to an extraordinary geological formation in the Mallee Scrub. He accompanied me in the middle of summer for about twenty or twenty-two miles, in a westerly direction from his residence. We travelled under a burning sun; not a single drop of water was to be found on the whole journey, but only dense bushes of Eucalypti dimosæ, with low sandy limestone ranges alternating with dried up grassy open patches of good land, sometimes of a few miles in extent, which relieved the weary minds of the riders. Now and then a Leipoa started from the dense brushes, or a lizard from the sandy places, but not a single kangaroo interrupted the monotony of the scene. The rapidity with which we rode compelled us to keep a sharp look-out for all branches and crooked stems of the Mallee Scrub, to avoid serious accidents. We, nevertheless, arrived sooner at our destination than I had expected.

Here, low dry channels wound their course to the N.W. for an apparently indefinite distance, through a dreary-looking country, in which scarcely any vegetation covered the sterile slightly undulating ground. Suddenly our horses were plunging through a brownish black crust into a pale yellow mass of flour-like mineral. Clouds of dust surrounded horses and riders, leaving a deep track behind along their route, similar to that we should have made on crossing a slightly frozen shallow lagoon. Every step of our horses formed a separate mark on the ground. I examined the mass under our feet. I dug with my hands a deep hole and tied up about twenty pounds of it in my pocket handkerchief, and sent a bagful as a specimen for our National Museum, which was delivered some time ago to that Institution, and numbered 1172.

I recognised in this flour-like, fine powdered earthy mass of a pale yellow uniform colour, the well-known "Kieselguhr" or "Bergmehl," of the German mineralogists; but, not having a powerful glass with me, I postponed a closer examination of it until a short time ago. The mineral, loose in itself, is like a kind of flour, and forms an extensive belt of many miles in length by a width of from one quarter to one mile, and a depth of many feet; soft, and a little soapy to the touch; is not affected by acids; and, when exposed with soda to the blow-pipe, it rapidly moves on the surface of the soda pearl, suddenly dissolves and unites with it forming a kind of glass. Under a magnifying lens of 350 diameters, this powder has the appearance of elongated flat bodies, ornamented with triangular spurs irregularly projecting in every direction. (Vide fig. 1.) Some specimens only have a rugged appearance on both sides (vide fig. 2), and not unfrequently small round bodies with a spot in the centre. (Vide fig. 3.) This is all that I could detect.



Mr. Foord, chemist in Mr. Clarke's Assay Office, in Elizabeth-street, has given me his aid in these examinations; and, as he had a specimen of a similar mineral, forwarded to him by a digger at Albury, we compared his sample specimen with mine; but the forms exhibited by it were without the pyramidical triangular spurs (vide fig. 4), and only slightly rugged on the outer margin of the body of the Infusorium. In this inner part I observed on each side two lines forming, as it were, a channel longitudinally through the body of these little animals.

Professor Ehrenberg's work on the Infusoria has just arrived at the public library, and at page 191, sec. 254, you will see Eunolia granulata (vide fig. 6) very nearly identical with the specimen obtained near Albury and belonging to Eunotia or Eunotie genus (Prachtshiffchen). It is found in the moors of Germany at Franzensbad but not alive, in a fossil state at Santafiora, and under similar circumstances to those in the Mallee Scrub.

Ehrenberg says, that these Eunolia Infusoria are distinguished by having elongated bodies with independent movements or by single or double bodies, having single, double, or more shells of a prismoid shape, which seldom form more than two or four joined chains, having four openings or two on each side; on the neutral side flat, on the dorsal side convex, and very often prettily indented.

There are three of these families alive, and ten fossil specimens have been found since 1837, when this genus was first discovered in Siberia.

The specimen obtained by me in the Mallee Scrub will surely interest men of science like Professor Ehrenberg, as being imbedded in our Australian Upper Tertiary formation and forming another connecting link in that chain of strata which I had the honor to delineate in my 2nd Report to you for 1854, and published in the Transactions of the Institute for 1857, page 32, Nos. 1, 2 and 3. I therefore beg to communicate through you to the scientific world these observations as one of those small results of my investigations of this year in our desert, particularly as Mr. Foord believes they arise from stagnant pools in which a great mass of the green confervaceae is formed, and that if the latter are carefully dried, burnt and the ashes exposed to view under a powerful glass; similar siliceous forms would be seen. Dr. Sconce and I have made experiments which showed us similar bodies, but after consulting Lindley's Vegetable Kingdom, I cannot agree with Mr. Foord's hypothesis as applicable to the case in question. The result of my inquiries has convinced me that such an enormous mass of siliceous molecules could not have been aggregated as the result of the igneous destruction of confervae. First, because they contain so small an amount of silica; and second, because the ashes of burnt or desiccated confervoid growth would have been dispersed by the winds. The substance I am describing contains a large quantity of silica, and the boundaries of the mass are comparatively defined.

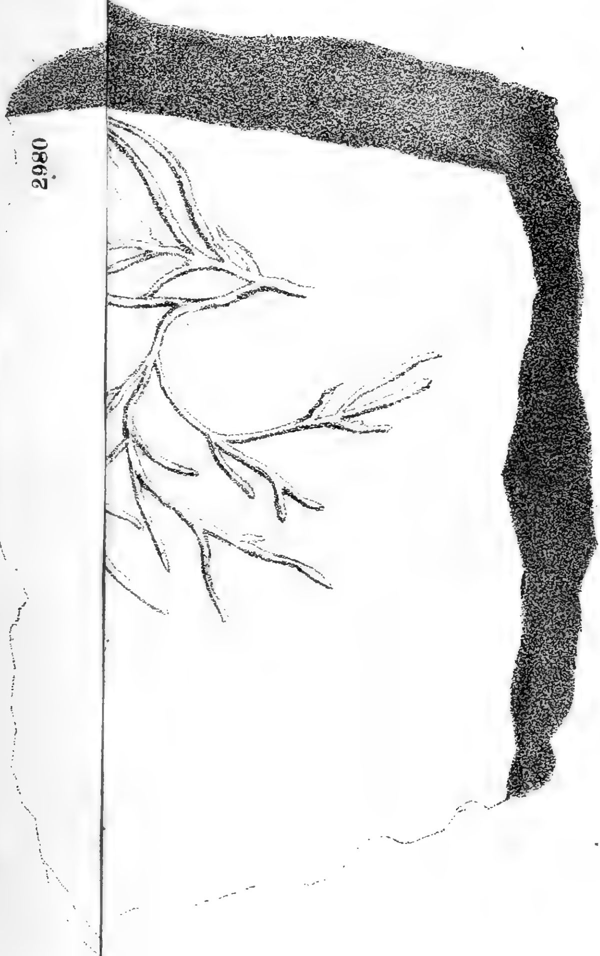
The great importance of such a geological phenomenon is evident. I believe that organic life has alone caused these enormous deposits of infusorial masses. Considering that only 30 years have elapsed since minute scientific investigations into this department were made, and believing that little is known as to what share organic life has had in the alteration of the component parts our globe, I conceive that any addition to our stock of information on this subject must prove acceptable.

The celebrated Professor Ehrenberg, of Berlin, whose pupil I am proud to have been, informs us that one cubic inch of such earth contains more than 41,000,000 of individuals. One species is able to produce in a few hours one million of others, and in four days some species produce 140 billions or 2 cubic feet of solid stone, taking an abstract view of the question. This animal moves at the rate of one mile in four weeks. One hundred millions weigh about one grain.

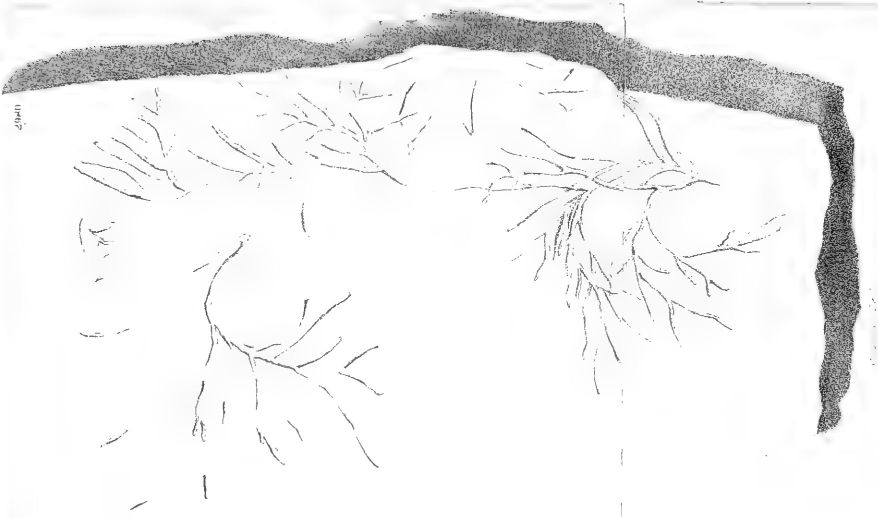
They have the qualities of organised animal life. Reflect upon the difference of size of such a minute creature as compared with planets, with the velocity and size of any of which bodies, what extremes of magnitude, what difference of purpose and function are presented for the reflection of the philosophic student of nature. On the one hand we have microscopic organisms so minute that although their size may be expressed in figures, the mind is unable to appreciate the minuteness of their structure; on the other hand, we have bodies whose proportions are so gigantic that the mind vainly endeavours to grasp the idea of their magnitude. But if you consider that each animal has its parasite, how much smaller must be the lice which prey and live upon these little infusoria, and which lice, says Ehrenberg, are again covered with still infinitely smaller parasites, which consider the backs of the lice their natural home. These little animalculæ form here in our Mallee Scrub for hundreds of miles, a deposit of such an extent that we shall be compelled at some fure day to acknowledge its existence as a formation on our geological maps!

You will, I hope, forgive me if I connect another observation of mine with the present one, which if not distinctly appertaining to our subiect, is nevertheless connected with it, and which I have made only a few days ago in the Silurian strata near Melbourne, viz., the existence of fucoidae in a fossil state, of which I have the honour to lay before the members of this Institute a magnificent specimen. As it is exactly sixteen years ago since I discovered the first fucoidae in the limestone of Tarnowitz, in Upper Silesia, belonging to the Upper Trias Formation, and which are now in the possession of Professo Goeppert in Breslau, I feel assured you will excuse me if I inform you of a few details concerning them.

Five years ago I found the first fossils in our Melbourne



rian formation
11th 1857.



FUCOIDEÆ in pale yellow micaceous slaty sandstone of the Cambrian or Lower Silurian formation
Discovered at the BOTANICAL GARDENS Melbourne, by W. Blandowski, Nov 11th 1857.

2981

Calvert, Litho

Silurian micaceous sandy slate, which were unjustly claimed afterwards another person as his discovery, and whose unfounded claim to priority of observation have been improperly acknowledged even by the Government Geological Surveyor in his report. In justice to myself, I must claim publicly to have been the first observer of the same, and Mr. Edward Wilson and others, as well as the Government Geologist himself, I doubt not, will bear me out in this assertion. I had secured the first specimens found by me in the Police Paddock, and subsequently placed them in the Museum. One of them disappeared when that institution was under my charge, the other specimen must be there still.

The specimen of fucoidae here in question, (vide plate, natural size), I found in the quarry near the gates of the Botanical Gardens, in the same stone in which I detected in 1851 the fossils, drawing of which I have embodied in the transactions of our society for 1855, *vide* page 222, fig. 301 to 305.

My attention was drawn to about a dozen flat stones, laid by order of our gallant Director of the Botanical Gardens, Dr. Mueller, in the dirt, to assist the ladies in crossing a muddy spot in the lower walk along the banks of the Yarra. Our learned friend did not, I suppose, anticipate the valuable fossil he thus caused to be exhibited.

The fucoidae are plants of a very peculiar character, and so nearly allied to the Infusoria already above described, that it is only very recently that they have been considered plants and not animals. But still, they form the third division of the Algae, which are the transition forms between animal and vegetable life. They live principally in saltwater, and are not uncommonly divided into a kind of trunk and leaf-like blade. The form here in question may be the remarkable "Hydrogastrum." Infusoria have neither bones nor muscles; neither bloodvessels nor nerves, but still they have independent motion; they feed by means of a mouth, and hunt for their prey.

The confervae swim in water with great activity, have no mouth, and contain starch, which cannot be detected in infusoria or other animals. Very conflicting opinions have been entertained by different naturalists on this subject, but the existence of Albuminous matter may be taken as a guide. Whereever this is found we have good grounds for assigning the product to the vegetable kingdom, and where its non-existence can be shown to classify the product under the animal section.

There exist plants which have cells independent of each other like Infusoria, or united into simple threads (confervae), and these are succeeded by others, in which the threads begin to collect into nets (Hydrodietgon), like the example before you.

This simple plant shows no distinction between leaf and stem and is also destitute of flowers. The fucoidae characterize the lowest zone of animal life, that it is to say, where these plants are found, are also to be detected the animals at the lowest range of the Zoological kingdom. If you, therefore, take into consideration that the Graptolite, a kind of Zoophyte, exists in abundance near Keilor, you will not for a moment doubt that our strata belong to the oldest neptunic era of the world, and were deposited in the ancient marine beds which have been subsequently upheaved by internal volcanic action, forming here the cambrian or lowest silurian formation of Victoria.*

Art. XVIII.—*Observations on the Saw Fish.* By Thomas E. Rawlinson, Esq., C.E.

[Read before the Institute, 11th November, 1857.]

I beg to submit for the consideration of the members of this Institute a brief description of a saw-fish and young taken in the Port Phillip waters.

This is no new discovery with which to startle you, and to the professed naturalist is perhaps no great novelty. Yet I have ventured to submit to you the few facts of which I have become possessed, in the hope, that such may be at least interesting to the many, and useful as a memorandum to the naturalist in his more abstruse and elaborate researches.

The fish, which is the subject of this notice, is that generally known as the saw-fish, from the peculiar saw like snout with which the fish is armed. Naturalists class it in the Ray family, although in external appearance it more nearly resembles the shark tribe. Some of the saw-fishes have been known to attain the length of from 12 to 15 feet.

This specimen taken in Hobson's Bay was, however, only 3 feet 6 inches in length from the end of the snout to the extreme end of its tail. Of this the snout occupied nine inches, being two and a half inches wide at the base, and tapering to one half inch in width at the extremity, whilst its thickness was inconsiderable. Along

* Vide Transactions Philosophical Society, 1855, p. 228, "On the Primary Upheaval of the Land round Melbourne, &c." By this Author.

each edge it was armed with tooth-like spines, even in line, but irregular in length, varying from one-sixteenth to one-fourth of an inch.

The pectoral fins, when extended, measured from tip to tip fourteen inches.

Two tentacula projected from the underside of the snout, three inches in length, and equi-distant from the end.

The mouth Chevron-shaped, and situated under the base of the snout.

Upper and lower maxillaries armed with several rows of canine teeth, recurved towards the interior of the mouth.

The nostrils one and a half inches forward of the mouth, and also situated on the underside of snout,—one and one-fourth inches apart,—the cochleated orifices oval, with curled process on outer free margin of openings.

Gill openings, five in number, having a ventral aspect.

Vent opening, situate between the posterior insertion of the ventral fins.

There are pectoral and ventral fins, but no anal fin. Two dorsal fins (the first being situate over the vent), and a caudal fin of moderate size.

Eyes large and oval, the greatest diameter being in the direction of the length of the fish.

Spiracles situated close upon and posterior to the orbits.

The shape slender, and tapering gradually to the tail. The cross section of the fish through the first dorsal being nearly a triangle with the apex rounded off, the underside of the fish being flat throughout.

The general colour, light greyish brown on the back, and greyish white on the belly. The skin, as usual in members of the Ray and Shark families.

The fins soft as usual.

This fish was captured alive near to Gellibrand's Point in a net, and was immediately placed in a tub of water, where it lived for four hours. Before death it gradually ejected a large quantity of blood through its gill-openings.

About ten minutes after the capture of the parent fish it parted with fifteen young and well-developed fish, each of which began to swim about feebly, immediately upon passing from the mother.

The young fish were born with a vitellus attached to the abdomen, the generally assumed use of which, is to afford nourishment to the young animals until they have attained sufficient strength and vigour to provide for themselves. I have great pleasure in presenting to the members two specimens of the young for their Museum.

I am indebted to my friend Mr. Ellery, for the present opportunity of presenting the Institute with specimens of the young, and also for the facts in connection with this paper.

Art. XIX.—*An Historical Review of the Explorations of Australia.* By Dr. Ferdinand Mueller.

WITH TWO PLATES.

[Read before the Institute, 25th November, 1857.]

If additions to the geographical knowledge of the globe in every age and in every country elicit the deepest interest, how much greater claims have the exertions of our own explorers on the citizens of Australia.

If a traveller's progress through a country, densely occupied by native races, domiciled and more or less advanced in industry, is still watched with pleasure or anxiety, even should he gain no space for widening the dominions of the Anglo-Saxon race, of how much more importance is any new information then on *that* country, which we adopt as our home, and which supports, notwithstanding its almost equal size to that of Europe less inhabitants than many of the capitals of European states? And if the wandering through the low and humid regions of an equinoctial zone, through regions little qualified for the lengthened exercise of our physical strength, still insures the interest of all, how much more deserves our enquiry into the nature of a country which is well adapted for the exercise of our labour, all the sympathy of a young and onstruggling nation?

Our desire to unveil the remaining unknown portions of Australia is not limited at this moment by demands on our patriotism or our progress alone; its future exploration is likewise claimed by our humanity, and by our honour as a nation.

With the discovery of gold a new epoch commenced in our history; and whilst in former days a wider occupation of pasture-ground was rendered by the increased transit distance to the coast, often hardly remunerative, we find now that the daily influx to our agricultural and mining population renders such extension quite imperative. Again by Cadell's enterprise, judiciously encouraged by Sir Henry Young, the navigation of the Murray stream has been achieved, and has, by the facilities which it offers for a wider inland communication, conquered for settlement a tract of country previously all but unavailable. Deprived of many navigable streams of the interior, we may expect that also by a railroad system vitality will be diffused in later days through many of the dormant wastes of Australia.

And lastly a noble zeal manifests itself all through this country for a renewed endeavour to dissipate the doubts in which the fate of Dr. Leichhardt's party has been involved for nearly ten years, and the early appeal of Captain Sturt, the venerable and the greatest of all Australian explorers, to search with equal ardour for the wanderer of the desert, as for the wanderer of the pole, raised a renewed echo in many a feeling heart. However faint the hope of finding any of Leichhardt's little band amongst the living, we would, responding to the call, redeem our debt at least to their memory. No one can more deeply deplore than myself, that it has not been the destiny of the last Australian explorer to gain any tidings of the missing party, although when crossing the country between East Australia and the north coast, our hope of learning of their fate was not less justified than ardent.

But it would be needless to explain the necessity of unceasing labours for a final and complete exploration of Australia. Yet since it fell to my share to participate in the work of a former expedition, I thought the Institute in fostering these projects, might indulgently accept my own impressions, as to the best accomplishment of such a task.

In order to obtain a clearer view of what remains to be achieved yet by geographical research, a rapid glance will be needed over the respective labours of those great men, to whom not we alone, but the whole world of science is indebted for all we know at present of the nature of Australia.

But as the question brought before the Institute has reference alone to inland exploration, I have excluded from this summary all that relates exclusively to maritime survey, moreover since an admirable memoir on the examination of our shores has been furnished in the ever valuable work of Flinders, to which the lucid notes of Count Strzelecki on King's and other navigator's labours, may serve as a supplement.

To Mr. Oxley's early labours (in 1817), I can but briefly allude, containing only limited evidence for conclusion on the nature of the interior. He extended the geographical survey already in 1817 to the marshes of Macquarie and Lachlan, to the Castlereagh, and to the tributaries of the Darling as well as over a great extent of the mountain ranges of New South Wales; Mount Seaview, being the loftiest of those which he examined, attaining an elevation of 6000 feet.

Our acquaintance, however, with the Lachlan and Macquarie Rivers, dates from an earlier period, and we are indebted to Mr. Evans for the first account of them. Had Mr. Oxley been able to extend his journey for one day farther to the south-west, the Murrumbidgee, and probably with it the Murray, would have been discovered.

Mr. Allan Cunningham was the first who reached the sources of the Darling from Liverpool-plains, and had the first glimpse of the splendid pastoral country, now generally known as Darling Downs. The highest elevation examined by him is Mount Lindsay, in the vicinity of Moreton Bay (5700 feet).

Messrs. Hume and Hovell performed the first overland journey from New South Wales to Port Phillip, determining thereby the western limits of the Alps and crossing all the rivers rising on the western side of those gigantic mountains.

Captain Sturt, accompanied by Mr. Hume, discovered in 1829 the Darling, a river of such great importance as regards the wide extent of its tributaries. Where it was struck (in lat. 30° S.) it proved saline. The discovery of the Bogan (or New Year's Creek), of Oxley's table land and other features of the interior, resulted likewise from this expedition.

Major, afterwards Sir Thomas Mitchell, in three expeditions, undertaken in 1831-32, 1835 and 1836, added to our information on the Darling and many of its tributaries, discovered Mount Hope, the Loddon, the Grampians, the Wimmera, the Glenelg River, the Pyrenees, Hopkins River, Campaspe, Mount Macedon, Fuller's Range; indeed the greatest inland portion of our colony. But our enterprising citizens Messrs. Henty, were the harbingers of colonisation on these shores. Bearings were likewise obtained by Sir Thomas Mitchell to some prominent points on the western outskirts of our Alps, for instance, to Mount Buller and to Mount Aberdeen.

The exertions of this celebrated man, which tended so materially to our early welfare, have not been, we must confess, sufficiently appreciated by this colony.

Lieut. (now Sir George) Grey, Governor of South Africa, landed towards the end of 1837, at Hanover Bay, whence he discovered and explored to some extent the Glenelg River. It is a stream of some importance, probably navigable near its mouth, winding either through sandstone table land, or a fine basaltic country, highly adapted for cattle runs, not only on account of its luxuriant meadows, but also as being within reach of three harbours, and enjoying likewise a climate quite salubrious. He also examined the elevated watershed between the Glenelg and Prince Regent's River, (the latter previously revealed by the late Admiral King), and the occurrence of a species of Araucaria (probably distinct from any other kind), could not fail to attract the attention of such a keen observer as Captain Grey. His and Lushington's journey terminated in a cheerless sandstone country, similar to that in which most of the rivers rise in North Australia.

He landed in February, 1839, in Shark's Bay, with whale-boats only, discovered the Gascoigne, a river, perhaps already known to Fleming, who visited the same locality in 1667. The alluvium in the neighbourhood of that river was fertile, and fresh water lagoons existed in undulating ground near the Gascoigne. This observation will be valued, when we learn, that south of Shark's Bay water can only be obtained as far as known, at a distance of forty miles from a native well. Rising land however, was nowhere observed, to cheer the travellers on towards the east. His party's return to the settlements of Western Australia was effected by a foot journey from Gantheaume Bay, attended with the severest hardships and privations, under which, one of the bravest of their companions sunk.

To this harrassing journey we owe also our first knowledge of the River Murchison, which forms at present the most northern limit of the colonisation of western Australia. Its upper course is yet unknown, and may, according to Mr. Gregory's opinion, afford yet, in a favourable season the means for examining the north-western interior of that colony, to our knowledge of which district the last labours of Mr. Austin have added also in a slight degree.

Instead, however, of detailing the results of Captain Grey's labours south of Shark's Bay, I insert gladly a comprehensive unpublished account of the physical geography of Western Australia, from the pen of my excellent and generous commander in North Australia, to whom also geography is indebted for the greatest amount of inland discovery in South West Australia.

"The general character of the known portion of Western Australia is that of a moderately elevated tableland, rising about 1200 or 1400 feet above the sea; the rocks are almost wholy granite, covered with a thin stratum of sandstone, the surface of which, by its decomposition produces barren sandy soil, which is one of the causes of the scrubby vegetation and small development of grasses. The edge only of this table land is drained by the rivers, the water in the interior forming shallow lakes of saltwater during the rainy seasons, some few of which overflow into the rivers, but others have no apparent outlet, while the small quantity of rain which falls in the interior is quite insufficient to balance the evaporation, which is excessive in consequence of the extreme dryness of the air."

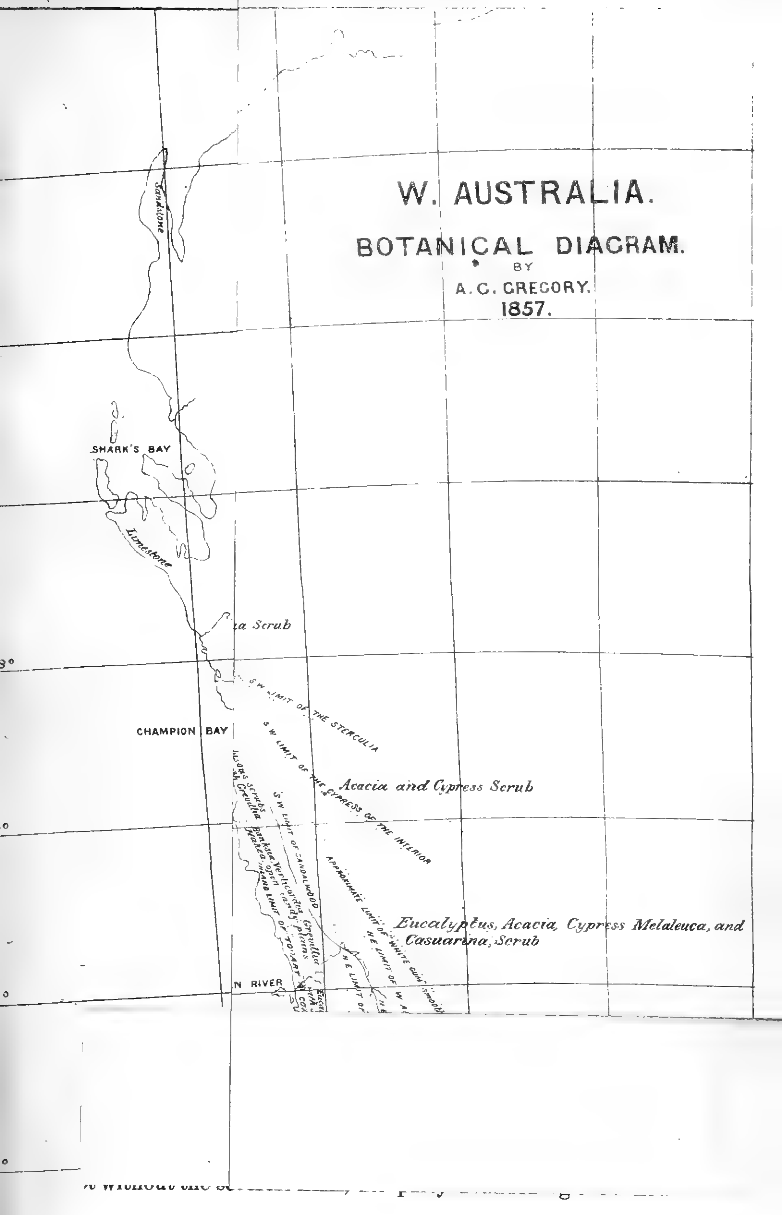
"On the western coast there is a narrow strip of lower land of sandstone formation which lies between the table land and the sea level, in lat. 33°, and rises gradually as it goes north to lat. 28°, where it is 800 or 900 feet above the sea, and nearly hides the escarpment of the interior table land. It is near this point that granite has protruded, and it is in this rock that the mines of lead and copper exist* ; the rock being intersected by numerous metallic veins, some doubtless, of great value, while the granite of the interior table land is almost destitute of mineral deposits." (See Plate.)

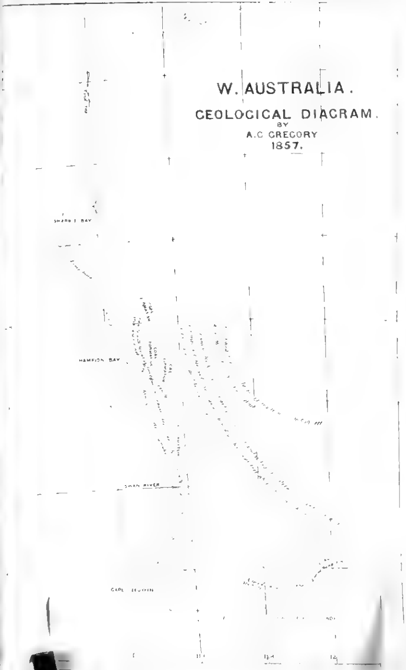
"Coal has only been found in the valleys of the rivers at the base of the table land, along which it probably extends for a great distance, but is covered by sandstones of a later period.

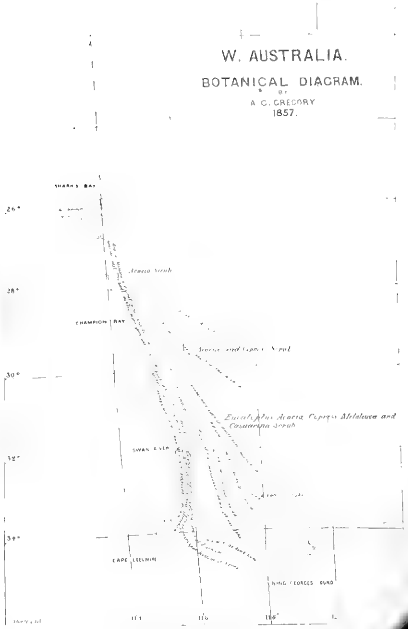
"Along the coast from Sharks Bay, nearly to Cape Leeuwin, there is a strip of limestone of recent formation. This has not been deposited in water but results from the constant accumulation of sand and broken shells which have been drifted from the sea beach by the force of the wind, and in course of time become indurated by the lime of the shells cementing the sand together, and forming a coarse rock, without any regular stratification and nearly destitute of fossils, this rock is still in course of formation, and may be seen in every stage of progress from distinct sand to compact limestone."

"The only hills of any elevation, are some small detached ranges of sandstone, which has altered so much that its age cannot be exactly determined, but either belongs to the carboniferous series, or is of older date. This rock forms hills near King George's Sound, and along the coast near Mount Barren, and rises to 3000 feet with rugged summits, which do not appear to have been covered by the ocean at the period when the sandstones, overlying the coal formation were deposited, and on their slopes above the limits of the sandstones which rest horisontally around them, long lines of waterworn boulders of rock present the appearance of sea beach, though now nearly 500 feet above the ocean."

* These mines were discovered by Mr. Gregory.


W. AUSTRALIA.
BOTANICAL DIAGRAM.
BY
A. C. GREGORY.
1857.
Sandstone
SHARK'S BAY
Limestone
Scrub
S.W. LIMIT OF THE STERCULIA
CHAMPION BAY
S.W. LIMIT OF THE CYPRESS OF THE INTERIOR
Acacia and Cypress Scrub
S.W. LIMIT OF SANDALWOOD
APPROXIMATE LIMIT OF WHITE GUM
Eucalyptus, Acacia, Cypress Melaleuca, and Casuarina, Scrub
RIVER


W. AUSTRALIA.
GEOLOGICAL DIAGRAM.
BY
A.C GREGORY
1857.
SHARK'S BAY
CHAMPION BAY
COAL
SWAN RIVER
CAPE LEEUWIN


W. AUSTRALIA.
BOTANICAL DIAGRAM.
BY
A. C. GREGORY
1857.
SHARK'S BAY
26°
Acacia Scrub
28°
CHAMPION BAY
30°
Eucalyptus Acacia Cypress Melaleuca and Casuarina Scrub
SWAN RIVER
32°
34°
CAPE LEEUWIN
KING GEORGES SOUND
118°

"As every other part of Australia which I have yet examined shews distinct evidence of having been submerged at the period when these beaches were formed, it would be highly interesting to investigate, how far the remarkable prevalence of forms peculiarly Australian, in the flora of this portion of the continent may be connected with the fact of these hills having been islands during the period when the inundation of the greater portion of Australia must have destroyed the ancient vegetation of the country."

The flora of the South West Australia is more replete with quite endemic forms than that of any other portion of the globe, and its vegetation is more universally restricted to locality than that of any country hitherto examined. This fact quite unimportant as it may appear, deserves a serious consideration in any theory on the interior. The question arises, is it likely that many mountains exist eastward of and similar to those of West Australia. (See Plate.)

If so I think the plants destroyed by any great deluge, would have re-descended from such elevations, allotting thus a wider range to the species than they are known to possess.

To Count Strzelecki is due the credit of having ascended and measured for the first time (in 1840) many of the principal north east mountains of our Alps. As his account of some of the elevations stands in discrepancy to those measurements instituted in 1852 by the Rev. Mr. Clark, I draw attention to the following scale of Alpine heights kindly furnished for this paper by the rev. gentleman. Mount Kosciusko 7308′, second height of the Munyang Mountains 7064′, Rams Head 6838′, Bagong mountains at the sources of the Tumut River 6763′, Bald Hill at the head of the Gungarlin River (tributary of the Snowy River) 5337′, Marragurall or Mount Murray (head of the Murrumbidgee) 6987′ Tollula (head of the Murrumbidgee) 6934′, Mount Gungarlin (Head of the Gungarlin River) 5337′, Crakenback Hill 4697′. Other alpine mountains, near the sources of the Hastings have been measured by a member of this Institute, Mr. Clement Hodgkinson. Accompanied by Messrs. Riley and Macarthur, the Count completed the discovery of Gipps Land, into which my enterprising friend Mr. Angus M'Millan had led the way before. The whole of the watercourses east and north of the LaTrobe River had been crossed and named by M'Millan (in his advance to the coast from Lake Omeo in search of a southern harbour, whilst the first overland journey was accomplished by Strzelecki from Gipps Land into Western Port, and this not without the severest trials, the party abandoning their horses three weeks previous to their arrival at Western Port, hardly able to force their way on foot through extensive and almost impenetratable forests, intersected by swamps, creeks, and morasses. The exertions of Capt. Wickham and Stokes, the commanders of H.M.S. the Beagle between 1837 and 1843, by which manifold additions were gained to inland discoveries are praiseworthy in a high degree, particularly when we recollect that in the engagements for maritime surveys, the means for land exploration can be but limited in the extreme. The finest stream of tropical Australia, justly bearing a royal name, was then discovered. But since I contemplate to lay the principal results of the last North Australian expedition, to which I was attached, in a special paper before the institute, I will not dwell on this occasion on the importance of that discovery. The Adelaide river, winding through a level country, and doubtless rising in the same low table land as the South Alligator River, was found to be navigable upwards of fifty miles, and into fresh, offering thus to the fine pastures of Arnheim's Land, a favourable access. The tall Bamboo imparts to this river quite the aspect of an Indian stream. The discovery of the Albert, the Flinders and the FitzRoy Rivers resulted from the same expedition. Adansonia reaches its western limits on the FitzRoy.

In 1840 an expedition was fitted out conjointly by the Government and the colonists of South Australia for the exploration of the northern interior of that colony, under the command of the talented Mr. Eyre, now Governor in West India, who in the year previous had gained the highest reputation as an explorer by his discovery of Lake Torrens, Mount Remarkable, and many other mountains and several of the rivers of South Australia; Mount Eyre forming the northern limit of his researches in 1839.

No one can read the lucid account of this journey without admiring his skill, his perseverance and courage, or without sympathising with his sufferings and bitter disappointments. Inhospitable tracts of country along the Flinder's Ranges were reconnoitered by Mr. Eyre, merely accompanied by a native boy, on one occasion 120 miles ahead of his party. A desperate push over a difficult country was necessary on more than one occasion to reach water, fifty miles to and fro to be travelled without a refreshing drink to either animals or men, and this at a season of the year (August), when it would have been abundantly expected. Travelling partially by night alone rendered it possible for him to regain the camp of his party. Although in the subsequent advance of the squatters permanent watering places were discovered, it does not detract from the merits of the first and less fortunate explorer, who led the way into these regions.

In the months of June hardly any water existed on the western side of Flinders Range.

He discovered in this tour, Mount Serle, one of the highest mountains in the northern tracts of that colony, rising to about 3000', afterwards more specially examined by Mr. Sinnett, of this city. From the summit of that mountain the view to the N. and N.W. presented an almost unbroken horizon, whilst Mr. Eyre's progress to the north was utterly impeded by the circular expansion of Lake Torrens, a vast salt morass, the water where examined, proving perfect brime. The Mundy, the Burr, and the Frome Rivers were discovered, the water proved, however, in the lower portion of the Frome, to be perfectly saline, an observation confirmed afterwards also by Mr. Sinnett; and, at Mount Distance the springs even were salt; brime springs having been found also by Captain Sturt previously in the Darling, in nearly the same latitude.

Undaunted by endless embarassment and unparalleled hardships, Mr. Eyre did not entirely abandon his task, but crossing the country to Baxters Range (a chain composed of Conglomerate), he opened for the first time the overland communication from the head of Spencers Gulf to the settlements of Port Lincoln, passing a sandy scrub-tract with a few granitic hills. He rejoined his small party, which on his former track of discovery along the almost waterless naked granitic ridges of Gawler Range, had reached Streaky Bay. Salt lakes, saline flats, and scrub, alternating with sandy ridges, completed also here the type of the genuine Australian desert, neither watercourses nor timber existing even under the high rocky declivities of Gawler Range.

The pages of Mr. Eyre's journal afterwards relate even severer trials of his endurance and sufferings. Pushing on often through dense scrubs he forced, by sinking wells in the loose sand, his way to the great bight, but when endeavouring to round that dreadful portion of the country, the limestone rocks prevented him from obtaining water by digging. For twenty-four days he in vain endeavoured to reach the head of the bight, being obliged after reaching it within twelve miles to abandon three horses his dray and provisions, and toiling unsuccessfully for seven days subsequent to their discovery.

It must, however, not be forgotten, that the season was unfavourable for his enterprise. Open grass plains were isolated and rare, the surface rock being invariably an oolitic limestone. Mountains were nowhere seen for encouraging the traveller to deviate from his coast route inland, not even trees were observed. Permanent surface water was totally absent around the bight, and the natives denied also its existence inland. From the head of the bight, westward for 300 miles, water was only obtained on one locality in the sand-ridges, the universal extent of the limestone formation frustrating every attempt of getting it by digging.

The dew-fall, together with humidity of the sea air, alone saved the remainder of Mr. Eyre's sheep and horses from perishing.

Our surprise and sympathy are equally raised, when we learn that these poor animals could have travelled six and seven days, over a generally scrubby country, in long stages, perfectly deprived of water. Away from the humid coast air this would have been an imposibility. I will not detain the Assembly with relating all the horrors attending the murder of Mr. Eyre's companion, further than observing how careful a traveller should be in placing implicit reliance in the attachment of natives, however kindly treated, to their masters. But let us sufficiently value the evidence of Mr. Eyre in our theories of the Australian interior, when he establishes the startling fact, that from Russell Range, discovered on this occasion to the termination of Spencers Gulf, a coast line of more than 800 miles, not a single river enters the ocean, a fact without parallel in any part of the globe.

The first journey of Dr. Leichhardt performed in 1844 and 1845 will ever be recorded as a triumphantly successful exploit, performed by slender means. The line of his wanderings extends over 3000 miles of unexplored country, and for the first time a land journey from the eastern settlements of this country to the extremity of the north coast was prosperously accomplished.

We learned from Leichhardt that in about lat. 18° S. the division takes place between the waters of the Gulf Carpentaria and those of the east coast. We learnt from him the unexpected existence of numerous, although insignificant rivers falling into the Gulf of Carpentaria. We learnt from him the extensive fertility of Arnheim's land, and of eastern tropical Australia and that a salubrious climate pervades the greater part of Northern Australia. The life of Mr. Gilbert, a meritorious contributor to the works of Gould, was sacrificed in the journey in which he shared for pursuing his favourite science.

The expedition performed in 1846 by the late Sir Thomas

Mitchell was also replete with great results, and may be regarded like that of Sturt as very conclusive of the probable nature of Central Australia.

The Darling tributaries were further examined and in about 25° S. high ranges discovered, from whence the waters are flowing to the Burdekin, towards Lake Torrens, to the Darling. Fine grazing districts stretch along many of these watercourses. Mr. Kennedy traced subsequently the Barcoo or Victoria River discovered by Sir Thomas Mitchell, found it identical with Cooper's Creek and traced likewise the Warrego until it seemed to be lost in the desert. Between the Warrego and Calgoa he encountered a waterless country for 80 miles.

The Barcoo is an excellent example of the nature of the generality of the Australian desert rivers. From a fine water-course with large pools it spreads, as soon as it leaves the suddenly terminating sandstone ridges, into countless channels over a depressed country devoid of vegetation, until with reappearance of hills, the drainage once more collects in channels retaining permanent water.

In the subsequent year Dr. Leichhardt, accompanied by Mr. Bunce, connected his former route as far as Peak Ranges with some of the northerly positions gained by Sir Thomas Mitchell.

During the years 1844, 1845, and 1846, the discoverer of the Murray River again took the field for geographical research under the auspices of the British Government. Assisted by Messrs. Poole and Brown, he found on his way to central Australia the Barrier Ranges, a chain of low mountains, formerly, perhaps, an island in the ocean. Favoured by rainshowers Captain Sturt's officers reached the east wing of Lake Torrens. Mount Lyall, the highest in the eastern vicinity of Lake Torrens, measuring 2000′ was examined, and the Grey Ranges, (flat topped mountains denuded of forest vegetation, in which it seems slate rocks predominated), emanating from a very depressed desert, became also known. The thermometer rose in December to 131° Fah. in the shade, and to 154° under direct exposure to the sun-rays. Captain Sturt proved here the cessation of high land to the east and north-east within a considerable distance.

Deprived of water all around, beyond the friendly glen, to which he was led by Providence, he found himself imprisoned for many months at a solitary pool of Frome Creek, on the western side of Grey-range, lat. 29° S., until the brief rainy season reappeared, surrounded "by one of the most gloomy regions that men ever traversed, the stillness of death reigning around them." Captain Sturt further examined the N. E.

part of Lake Torrens, and his companion Mr. Browne, in a letter to myself, affirms again after the late discovery of fresh water in the Torrens Basin, that it was where they tasted it indisputably salt. Sturt's brave associate, Mr. Poole, fell on this lonely spot a victim of the scurvy. At last released by rain, Captain Sturt and Mr. Brown proceeded in August 1845, to the N.W., and encountered all the singular phenomena of the desert; low hills raised to gigantic mountains by refraction, the deceptive mirage, the extraordinary changes of the temperature from burning heat at day time to freezing cold at night. He proved by a gallant dash into the interior, worthy to have been crowned with an equally brilliant success, the non-existence of high ranges north of Lake Torrens for at least 300 miles, traversing nothing but a seemingly endless desert, which in its more depressed places appeared like a dry recess of the sea. From sand ridges, like the waves of the ocean in endless succession, interspersed with salt lakes, he returned from his most northern position, within one degree of the tropics, two long days journey away from the last water, without any prospect of finding it by further advance.

Still the desert with all its horrors could not deter the intrepid Sturt from a new attempt of reaching the centre of the continent. Travelling in October, somewhat to the eastward of his last track, he was fortunate enough to intersect the channels which radiate from Cooper's Creek, a delightful oasis in the desert, formed by the drainage of the country declining to the south-west. This watercourse has bye-channels, like most of the North Australian Rivers, and is likewise lined with arborescent melaleucas. Some of the pools were salt. Beyond it only saltlakes and arid country occurred, the shallow stony desert intercepting his progress. "From the last sandhill his eye wandered hopelessly for some bright object on which to rest: the appearance of the desert was that of an immense sea beach." Returning along his track guided by a lamp at night, he accomplished his journey back to Cooper's Creek (92 miles), receiving relief of thirst only by one of his wells; had this failed to supply the element of life, the destruction of the horses would have also sealed the dreadful fate of the explorers.

Captain Sturt is of opinion that the fall of the sub-tropical interior is to the westward, and that large tracts of it are occasionally inundated, bringing fish to the isolated parts of such waters as O'Halloran Creek. Disappointed in all his hopes, prostrated by scurvy, and seemingly cut off again by the dryness of the season from his retreat to the Darling, a distance of 270 miles; it required the fortitude of a Sturt to bear up with his fate. However, by a skilful plan and by the most praiseworthy perseverance of his companions, the retreat was effected in safety, the country being previously reconnoitered for water by Mr. Browne as far as Flood's Creek, a then waterless distance of 118 miles. A supply for men and animals was carried part of the way in hides, and the retreat was achieved in two days and three nights. On two occasions again the heat exceeded 130° in the shade, and approached to 160° in the sun. The water evaporated in the creeks at the rate of 1 inch per day.

The exploration of Cape York peninsula in 1848, under Mr. Kennedy, although not fruitful in important results, stands on record as one of the most dreadful in the annals of geography, ending, almost at the point of its accomplishment, in the loss of one of the most talented and philanthropic explorers of which Australia can boast, and in the consequent almost total destruction of his party.

Mr. Kennedy landed in Rockinham Bay; but, such was the difficulty of forcing his way through the jungles and morasses, and such the unhealthiness of the climate, that, after two months' struggling with endless impediments, he found himself yet within thirty miles of his landing-place. At last he succeeded in crossing the coast swamps and the scrubby dividing range, and in the progress of his journey northward he was rewarded with the discovery of the main branch of the Mitchell River, and many of its tributaries.

Leaving the granitic ridges behind him, he followed the waters of the Kennedy River to Princess Charlotte Bay.

At the depot at Weymouth Bay, only two of his followers survived their sufferings, the rest sinking under illness and starvation.

The young and accomplished leader fell under the spears of the savages, near Port Albany, and his faithful native alone reached the vessel awaiting them at Albany Island. Two of the party, left behind to attend to a dying man, were also never rescued, whilst only two of those encamped at Weymouth Bay were saved when on the brink of death.

During part of the years 1848 and 1849, Lieutenant Roe, Surveyor-General of West Australia, accompanied by Messrs. H. Gregory and Ritly, extended his survey as far as Russell Range, a low granitic chain, on the west point of the Australian Bight, many tracts of Western Australia having been opened, also by Mr. Roe's labours in former years. Brewer Range and Dundas Hills were the northernmost points attained, and coal was discovered on the Fitzgerald River. The grassy country soon failed him, after leaving Cape Riche, and a barren scrub land with saltlakes took its place. The view from Fitzgerald Peak (1000' above the plains), presented a vast sea of dark scrub, intersected by broad belts of salt lakes and samphire marshes, winding through a country almost level. Between Fitzgerald Peak and Mount Ritly only a rain shower saved the party from destruction. On several occasions water was collected from bushes after dew, an expedient to which Mr. Gregory likewise repeatedly resorted, in his West Australian travels, and which is effected best by the means of drawing blankets over the bushes loaded with dew. The whole northern horizon from his last position was perfectly unbroken.

The expedition of Mr. Gregory (1855-1856), was attained in its beginning with so many disasters, that a less energetic and experienced leader would have failed, perhaps, to extricate himself from his difficulties. The transport vessel carried by the tide out of its course struck a coral reef near Point Keates, from which an escape was effected only after the lapse of seven days, and extreme suffering of the horses, arising from the oblique position of the vessel. Pressed also by this unfortunate delay for want of water, and having lost the guidance of our schooner in a dark night, we were compelled to land the horses at Point Pearce, indeed under those gloomy rocks, from which Captain Stokes was so successfully assailed by the savages. Fresh water was at last found after a long search over the dreary sandstone country. Having recruited our horses as far as circumstances would permit, we crossed in about three weeks, he country between our landing place and the Victoria River, on which tour also, the survey of the Fitzmaurice river, a romantic stream, became greatly extended.

The small schooner, sent to co-operate with the exploring party, was wrecked on its voyage up the Victoria River, a misfortune which shortened the North Australian exploration considerably, not only by the loss of a vast quantity of provisions, but also in rendering it unlikely, even after a superficial repair of the vessel at our camp, to receive afterwards any aid in the exploration of the country around the Gulf of Carpentaría, from whence alone by the re-establishment of a fixed camp the exploration could have been extended to Central Australia.

Mr. Gregory continued his survey in November and December, 1855, along the upper part of the Victoria River, and over the adjacent country, the climate and fertility of the country improving with our advance inland. Indeed, a luxuriant pastoral country was discovered, the sandstone table land having to a great extent receded before ridges and plains of basaltic origin.

The tropical rain season set in under thunder showers in November, advanced to regular daily rains in December, but ended in January. Thus, at the season desirable for inland travels, Mr. Gregory advanced with the whole of his horses to the fine grass land of the Upper Victoria River, forming on one of its eastern tributaries a depot in about lat. 17° S., from whence a lightly equipped party of four, in which I had the honour to be included, traced the river to its sources in lat. 18° 12′ S. L. and 130° 39′ E. L.

With a desire of advancing in a south-easterly direction into Central Australia, we crossed the dividing table land, from whence the country gradually sinks towards the interior and the coasts, its elevation, however, on the points of culmination rarely exceeding 1200 to 1400′. The only watercourse which was discovered in this direction, and which bears now the name of my venerable patron, Sir William Hooker, was found to fade after a short course in the all-absorbing desert, notwithstanding our arrival on its banks at the most favourable season. From hence, on a westerly course, Mr. Gregory reached, not without difficulties, an inland water-course, formed by the drainage of a wide, and for the greater part fertile valley of the low sandstone table land, the valley sloping almost imperceptibly towards the interior. But since, neither the regular tropical rain showers, nor those of the southern season reach to this latitude, occasional rain-clouds from either direction being almost constantly dissolved by the dryness of the atmosphere, it will not be surprising that along this faint and frequently obliterated watercourse, distinguished by Mr. Gregory as Sturt's Creek, but few localities can be relied on for permanency of water; and we observed lastly, the drainage when forced through saline flats converted into brine.

It may suffice to say, that we noticed here the same features of the desert, so vividly described by all its former explorers.

The ferruginous drift sand, which extended along the lower part of Sturt's Creek, and surrounded the large. and at the time of our visit, waterless salt lake on its termination, stretched in long regular waves east and west. Thus terminated our journey towards Central Australia, in lat. 20° 20′ S. L., and 127° 35′ E. L., at an elevation of 900′ above sea level. No watercourses could be discovered east, south or west of termination Lake; no ranges to cheer us further on in our difficult path, a country of unbroken barrenness before us.

The distance between Mr. Gregory's furthest point and the Great Bight was nearly 800 miles; to the Fitzroy River 300 miles; to the entrance of the Victoria River 400 miles; to the settlements of Western Australia 950 miles; and to Captain Sturt's farthest position inland 700 miles; but we approached 100 miles nearer to the last locality when at the termination of Hooker's Creek, and came to within 450 miles of it, when reaching afterwards the sources of the Nicholson.

When leaving the Victoria River at the end of June, 1856, the dry season had so far advanced, that Mr. Gregory's plan of crossing Arnheims Land in an south-east direction became frustrated; and only by a deviation to the north did we gain the systems of water belonging to the Gulf of Carpentaria. Nor could we postpone this journey till a more favourable season, as many of the vessel's crew already suffered severely from scurvy. Mr. Gregory reached at the end of August the Albert River, on the southern extremity of the Gulf of Carpentaria, after having determined the length of all the rivers which enter that basin from S. W., none rising at a greater distance than 100 miles from the the coast, none except the Albert being supplied by springs, all conveying merely the drainage of a sterile sandstone-plateau, which, contiguous to the table land of the same formation occupies such a vast extent of Australia, here, with an elevation more frequently below than above 1000′. The extensive flat summits of this formation are true desert.

Foreseeing the improbability of obtaining additional supplies from our ill-repaired schooner, Mr. Gregory continued his journey to the eastward, whilst water became exceedingly scarce, in the scrubby tract of country which we traversed.

At a more favourable season of the year a passage over the dividing table land from the sources of the Flinders or Leichhardt River towards the Burdekin, would in all likelihood be practicable. But travelling south-east of the Gulf of Carpentaria during the month of September, we gained the waters of the east coast only by a circuitous route into York's Peninsula, crossing Newcastle-range, in which granitic and porphyritic rocks prevail from the sources of the Gilbert or perhaps Van Dieman River, the ranges still at their highest point not exceeding 2500′. Continuing our journey along the Burdekin to the Belyando, Mr. Gregory proved the identity of the latter river with the Suttor of Dr. Leichhardt. This journey from the N. W. coast into the East Australian settlements was performed within five months, and with a judicious choice between the better parts of Mr. Gregory's and Dr. Leichhardt's route, and by avoiding many of the angles in both, a light party may cross the continent in a similar direction, now almost within four months. And gradually the distance between the fair grassy country of Eastern and North-western Australia will still be shortened by the extension of squatting stations on the Burdekin, where the open character of the country, its salubrious climate, predominance of grass, the supply of water offered by an uninterrupted current of the river, and its constant proximity to the harbours of the east coast hold out the greatest facility for settlement. By the water, which the Burdekin receives from between 18° and 24° S., probably a stream will be formed navigable near the sea, by which the otherwise difficult transit across the jungle morasses of the coast would be obviated. This interesting and highly important question remains yet to be solved.

In a scientific point of view the investigation of the high mountains scattered along the tropical east coast, such as Mount Abbott, Mount Dryander, Mount Hinchinbrooke (easy of access) Mount Bellenden Ker, rising to the elevation of 5000' would also be highly desirable.

The enterprise evinced by South Australia has led in the course of this year, likewise to a few new geographical discoveries.

Mr. Swinden and his companions found Lake Torrens disconnected with Spencer's Gulf, and a wider extension of the former to the westward. Low stony hills extend along the south-west flank of the lake. Water, seemingly permanent, was discovered.

Mr. Hack proceeded from Streaky Bay to the Gawler Ranges and found some stretches of new pastoral land, although saltbush country and scrub-land with salt-lakes, predominated. No hills of any size were observed in a north-westerly direction at least for fifty miles beyond the Gawler Ranges. Fair grassy country with springs was traversed at the eastern side of Gawler's and toward's Baxter's Range.

I cannot with silence pass the last observations on Lake Torrens by Mr. Goyder. Not only because its waters where found to be fresh in the northern part of the lake, but also as a warning to travellers,—how little we can rely on the permanency of water, which in an open desert country so rapidly evaporates!

Mr. Oakden was repelled in 1851 from his position on fresh-water lakes, west of Lake Torrens, filled by thunder showers at the summer season, but changing afterwards by evaporation, and by the solution of saline particles from the soil to salt-lagoons.

From a little Island in Lake Torrens, Captain Freeling found the view desolate in the extreme, the shallow waters, low islands and mud extending around three parts of the horizon.

From the evidence of the preceding pages, it will appear that any large unknown rivers, which would afford the means of penetrating far inland can no where be expected to exist, unless between the FitzRoy River in North-western Australia and Shark's Bay on the Western Coast.

With the extent of the Murray and its mighty tributaries we are now fully acquainted.

Mr. Eyre's researches proved the absence of large rivers from the head of Spencer's Gulf to Russell Range in West Australia, and Captain Sturt's observations are conclusive as regards the want of large watercourses to the northward of Lake Torrens, although the improbability of any great mountain drainage, entering the north-west side of that lake, remains yet to be proved. In eastern tropical Australia the ranges dividing coast and inland waters are nowhere very distant from the sea, the western slope of the inland ranges not leading extensive water currents into the interior, one instance excepted, that of the Barcoo.

The length of the watercourses entering the southern part of the Gulf of Carpentaria has been determined, either positively, or may, as in the instance of the Leichhardt and Flinders Rivers be assumed from analogy not to exceed about 150 miles, whilst the absence of high mountains as far as 18° south throughout the whole interior precludes the possibility of any large river occurring in the southern vicinity of that parallel. The want also of large westerly tributaries to the Burdekin, to the Belyanda and Barcoo Rivers render the existence of high, extensive, and well-watered ranges in the unexplored portion of the eastern tropical interior quite unlikely.

Still the Cape River and the Clarke River, both untravelled, may perhaps afford the means of penetrating with facility to one degree westward of the Burdekin. From the observations of Eyre, Sturt, Mitchell, Kennedy, and Gregory, we may infer, that the deserts observed by these explorers at such distant points of the interior, yet found to be of so great general resemblance, are contiguous. Cheerless as this prospect must appear to the labours of future travellers, it must not be forgotten, that not only is the monotony of these immense desert-tracts broken occasionally by oases, destined in future to afford the means of communication throughout the continent, but that saline flats and isolated patches of grass land seem to be scattered everywhere through the interior, and will, in many instances where water can be obtained permanently, become available as pasture when gradually inland settlements advance. The dip of the country directs the drainage, however scanty, often into defined channels, in which alluvial deposits and humidity combine, to produce invariably a luxuriant vegetation, but where on account of excessive evaporation water is not always procurable. Of such oases Cooper's Creek, the Warrego Sturt's Creek, and Eyre's Creek, are instances. Nor is it to be doubted that some isolated ranges in the probably extensively depressed interior will offer a stronghold in years of drought. Centuries may elapse before the requirements of Australia will demand the occupation of many distant portions of our continent, but encouraging it must be for us to know that a day will arrive when settlements will be scattered, at least sparingly over its whole extent, and when a coast line of more than 5000 miles will not remain unoccupied. Tracts of pasture land, which in the early days of our colonisation were regarded as worthless, are sought for eagerly at the present day. Thus, every new stepping stone found in the wilderness will more extend the path of civilisation, and almost every discovery of permanent waters will lead to the establishment of fixed homes.

But to achieve this progress, we should avail ourselves judiciously of the experience gained by former explorations, and should select with care what would appear the most promising field for future operations. The main questions which geography requires us yet to solve, are to determine the length and extent of the southern fall of waters, descending from the table land around the Gulf of Carpentaria. It will, in all probability, be found to be very inconsiderable.

A question of not less importance remains yet to be answered. Extends the desert from Lake Torrens uninterruptedly, and far inland to the Great Australia Bight, and is it contiguous to that of Western Australia, which stretches according to Mr. Gregory's investigations, north at least as far as Shark's Bay? And thirdly, is the country between Shark's Bay and the Fitzroy River really destitute of streams entering the sea? Maritime surveys alone, even if carried out with the accuracy of a King, a Wickham or a Stokes will never completely disclose all the estuaries on a mangrove lined shore. Thus, for instance, it was reserved to Grey's Land exploration to find the Glenelg River in North Western Australia, which had escaped the scrutiny of the commander of H. M. S. Beagle.

The employment exclusively of packhorses for conveyance, will always ensure a rapid progress, and the straightest line for a traveller. His starting-point should be established at the remotest station previous to the rainy season, to recruit men and animals before trials of the journey commence. The number of the party should be very limited, not only as involving the least delay, but also as on many places, water might be procured by them, where it would not be obtainable for a large caravan, and as the great expense of providing for a large party might be employed with more advantage for the longer scrutiny of a larger tract of country by fewer individuals. The survey should be exact, and independent of the use of chronometers ; and above all, the positions of permanent waters should be marked with scrupulous accuracy. On this may depend the lives of those who may steer for the positions of a former explorer after the obliteration of his track, particularly in our depressed interior where bearings are not always to be secured. Mechanical skill should be at command for the repair of instruments, which on a journey through a wilderness are so liable to be injured.

The use of camels in our deserts has been recommended, but when it is considered that much of the Australian interior is of a stony, and not of a sandy nature, that these animals require a management of their own, and cannot roam about by night to find food, being deprived only of their freedom by the hobble chain—I still believe that horses will remain preferable, if kept shod constantly.

The country to the westward and north-west of the subtropical settlements of New South Wales is assigned to the new exploration of Mr. Gregory, as that in which probably Dr. Leichhardt met his early fate. Should the enterprise be favoured by the season on this occasion, we may depend on a wide survey of North East Australia by that accurate explorer.

From past experience we are, however, not entitled to anticipate the existence of a well-watered country in that direction. This opinion receives additional weight when we consider that none of Dr. Leichhardt's animals of burden returned from the supposed locality of his destruction at the source of the Maranoa, and we can but fear that the unfortunate traveller advanced beyond the systems of the rivers of the east and north coast, being under the impression of a much wider extent inland of the Carpentaria streams than Mr. Gregory has proved it to exist, and that he thus, with his whole party and animals, met a dreadful fate in the waterless wastes of the north-east interior.

The examination of the country north-west of Lake Torrens, we should leave to its own colonists after the noble manifestations in South Australia for enterprises of this nature. To the northward, however, of this colony, we may observe a large extent of country situated between the Lachlan and the Darling, and a greater still enclosed by the Darling, the Warrego, the Barcoo and Grey and Barrier Ranges, an area, indeed, equal in extent to that of the whole colony of Victoria, hitherto almost totally unexplored.

This country, although belonging politically to New South Wales, will on account of its geographical position hereafter supply its produce to the auriferous northern districts of our own province, and claims, therefore, particularly since the Lower Darling navigation has been accomplished, our full attention. I am aware that what we know of the interior in that direction seems discouraging to any future exertions, although, perhaps, not more so than in any other line of exploration, which we could adopt with equal facility.

Nor must we forget, that neither Sturt nor Kennedy traversed the outlines of this district at a favourable season, or in a favourable year. Moreover, if we trust to aboriginal traditions for a clue to Leichhardt's fate, we may have many chances of success when enquiring for him in that direction. And should the season favour the enterprise, features may be disclosed eastward of the stony desert which may serve hereafter as a key for investigating fully the nature of Central Australia.

It would, perhaps, not be needless to examine, previous to an attempt to cross the Continent from east to west, west, along its middle part, a distance of 2500 miles, the country north of the Great Bight (perhaps from Fowler's Bay) and east of Shark's Bay (perhaps from the Gascoigne). Without these precautions the undertaking seems, if we value existing testimony to be one not only of imminent risk, but also possessing limited chances of success.

The limit assigned to this paper does neither admit of entering into all the special merits nor into further details of former discoveries. Much has been done for extending the field of geography: more than one man has sunk in the struggle for such a noble purpose. Whoever listens to the special accounts of those, to whom Providence destined a safe return, will rejoice in their addition to our knowledge, will sympathize with their sufferings, and will admire their wise arrangements and their perseverance, or, will learn from their experience how to guard in future against the difficulties which beset their path, or how success may be secured by those who boldly volunteer to resume their labours.

Much has been done, but much remains to be achieved! And if the greatest genius which ever mankind possessed, after his most brilliant achievements, left us, with the modesty which always characterises a son of science, an immortal and self-denying word, we may regard the labours of our own great explorers only as leading stars for future discoveries, and we may apply to them Newton's philosophic words, "I have played like a child with the pebbles on the shore while the great ocean of truth lies unexplored before me."

ART. XX.—*Observations on some Metamorphic Rocks in South Australia.* By the REV. JULIAN EDMUND WOODS, Catholic Missionary, Penola.

[Read before the Institute, 25th November, 1857.]

There is no part of the science of Geology which is in a more unsatisfactory state than that portion which has to do with metamorphic rocks. While one section of scientific men propound various theories as to the manner in which metamorphism is effected, others are questioning the very facts upon which they generalise, and not a few are found who give a very reluctant consent to the results which long investigations on the subject have produced. This state of things is, no doubt, owing to the want of a systematic series of observations in those countries in which metamorphism is most strongly manifested, and until this is accomplished we may be certain that the present difference of opinion will prevail. With a view therefore to call attention to a country where observation is most wanted, I am induced to lay before the Institute the result of some investigations among metamorphic rocks in the northern settled districts of South Australia, and while I state that I believe I have been labouring in a place which offers a wide field for an experienced geologist, I must premise that what I have to offer is but a little thing in itself, and compared to what could be effected, scarcely anything more than a few facts imperfectly generalised.

The whole of South Australia is, however, with few exceptions, a vast array of metamorphic rocks. Whether at Cape Jervis, in the South, where the slate rocks form huge and majestic cliffs ; whether at Mount Lofty, near Adelaide, where immense ridges are formed of schist slates and eurite ; or whether at Mount Remarkable, far north, the same phenomenon of metamorphism is constantly represented, and the intervening country everywhere gives the same appearance, with all the various gradations of form, colour, or mineral structure. To attempt to sum up all the evidence here offered, would require the patient investigation of ages : we can only make remarks on peculiarities here and there, and bring them before the notice of those better able to form theories from facts. Some twelve months ago, I was for some time residing not very far from the celebrated Burra Mines, and for some time occupied myself in recording the wonders of the rocks to be seen there. I saw enough to convince me that all the mineral deposits, whether iron, or copper, or lead, of that rich mining country, were all found amongst rocks that had been once stratified, but had since been altered by heat. One phenomenon however, I saw, gave me ample room for speculation, and occupied my attention for a considerable time, and being something more curious and singular than anything I have observed in this country, I wish to make it the subject of a paper to the Institute. I repeat, however, that it is but a small thing in itself, perhaps hardly worth more than a passing notice.

About four miles south of the little township of Clare, in the hills which render Minaro, Shiligolee Creek and the vicinity so beautifully picturesque, one notices a most singular appearance along those hills which extend their ridges in a northerly direction. On every hill and in the gaps where the chain is for a moment broken, ascending and descending, there is a band of broken stone about two yards, or sometimes less in width, which is traceable without the smallest interruption, as long as the chain continues. These bands present the appearance of a roadway metalled with large fragments of stone, and though they are found on every chain of hills which runs in the same direction, they *never* run along the summit, but always a little to the right or left. As seen from the top of a hill they form so prominent a feature in the landscape that they cannot escape attention, and their regularity, their uniform width and compact appearance make it difficult at first to realise that they had not been laid down by human hands.

Had South Australia been longer inhabited, these bands would have been invested with some traditionary history. Some legend would probably give us a satisfactory reason for these royal roads, perchance calling in the assistance of the giants who balanced the rocking stones on the coast of Cornwall, or who fought with boulders at Stonehenge. The country where the phenomenon is most apparent, may be included in a square bounded on the north by Clare, on the south by Watervale, on the west by the Wakefield scrub, and on the east by Mintaro and Farrel's Flat. This tract encloses some of the most beautiful scenery in the colony. The hills, sometimes abrupt and sometimes gently undulating, are covered with a rich vegetation, bearing large trees, which, raising their branches in the air, throw their shadows on some huge rock, which seems like a gem embedded in the shrubs and ferns below. Grassy slopes break out here and there, and these combined with a multitude of flowing brooks, bring back to one's recollection that union of peace and sublimity which is so common at home.

To return to the bands of stone. In trying to account for them I was led into a series of observations, which would carry me much beyond the limits of an ordinary paper to attempt to describe. I must endeavour then to give only what bears upon the subject, and all imperfect as my solution is, I am encouraged by knowing the matter must fall into abler hands than mine: for it is too remarkable to be left alone for any length of time, being in my opinion, quite as singular and as unparalleled as the far-famed parallel roads in the Highlands of Scotland. I have said the bands run a little on one side of the top of the chains of hills. They are also found in the valleys or troughs between the ridges, only with this difference, that the band, which in its passage goes along the hills, is composed of small fragments of stone, while those which run in the valley are composed of boulders. The higher the chain too, the smaller are the fragments and *vice versa.* Both bands and hills run parallel, and the direction is north 12° west, and though the bands are continued over the hills, and in the valleys, wherever a gap or break in the chain occurs, they never are on the highest part of the ridges or anticlinal axis, but always at an equal distance away from it, perhaps about ten yards. At first sight, it would be said these are volcanic dykes. Had they been so, there would have been nothing remarkable in their appearance in such a form, and I should have been spared any investigation. The stone, however, of which they are composed is not of volcanic origin, but is a quartzose granular stone, probably eurite, and though crystalline, bearing distinctly lines of former stratification. Taking this fact into consideration, a great many difficulties arise in the way of an explanation of the origin of these bands. There is something so different in these appearances from any geological observations made elsewhere, something altogether so original, that the experience of others becomes useless as a method for finding a clue, and one must set to work entirely unaided. Fortunately the rocks in the immediate neighbourhood help us a little. On either side of the chains of hills (and it must be remembered that there are at least a dozen running parallel), except in the aforesaid bands, on the plains for a long distance, the only rock that is visible is clay slate, inclined at nearly right angles to the horizon, dipping to the west on the western side, and to the east on the eastern side. This slate is extremely fissile, and the stroke is N. 7° W. or five degrees more northerly than the hills. This latter fact is of much importance, as it tends to show that whatever force upheaved the hills, it was different from the one which upheaved the slate to its present highly inclined position.

On the east side the latter rock is more fissile, often possessed of veins of segregation, composed of either quartz, laterite, carbonate of lime or specular iron, and containing throughout small cubical crystals of the above named iron ore, or hœmatite in such numbers, that where the slate has decomposed and given rise to surface soil, the ground after a shower of rain is literally covered with these crystals, most beautifully exact in form.

On the west side the slate is entirely schistose, so highly laminated as to crumble into scales when rubbed, and so micaceous, that it looks like delicate silk. The strata have become finely waved and exceedingly brittle. Sometimes on both sides the slate passes into an aluminous shale slate, soft and unctuous to the touch, and containing innumerable veins of dolomite and steatite. The latter is found in such quantities in one spot, as to form an article of food for the natives, when pressed by extreme hunger.

I think there can be little doubt that heat has produced here a chemical change, to cause these appearances both on the east and west sides of the hills. For in a deep crevice or gully on the western side, which descends precipitously to the base of the hill, one sees (at the base), the extraordinary alteration the strata have undergone. The schist has become contorted, so as to make immense curves, doubling back upon itself and making large folds, taking most wonderful forms. In fact, I can compare it to nothing else than the contortions of strata in the largest of the Cyclopian Islands as described by Sir Charles Lyell. The schist always contains the little crystals before alluded to, is very brittle, of a dull green colour, and always preserving that beautiful silky appearance. Now, as such contortions are known to have been caused by heat and volcanic action in the Cyclopian Islands, we may reasonably argue from analogy, that the same cause has operated here, though not apparent. In no part of the slate, wherever it is met with, is it entirely free from alteration, for in the valleys it is sometimes met with, where the strata become crystalline (eurite), which pass into slate and again into eurite alternately, for some distance. The crystalline portions bear the marks of stratification, with segregated veins of quartz, and the slaty parts are intersected with veins of carbonate of lime, running at right angles to the plane of stratification. Here then, we have something which throws light upon the subject of inquiry. We have evidence first of a force which upheaved the slate into its present position. A force distinct from that which raised the hills, because it has been exerted in a more northerly direction. Secondly, we have evidence of heat which altered the strata so raised. We are sure that the heat was subsequent to the upheaval, because it caused the veins of segregation partly, if not entirely, which run through several strata in an almost unbroken line, and if upheaval occurred afterwards, such line must necessarily have been disturbed, which is not the case. There can be but little doubt, that the heat which altered the slate, also crystallised the bands of stone, but whether this was before the upheaval of the hills, on which the most of them run, or afterwards, we have yet to inquire.

The theory which I am inclined to adopt for the origin of the "bands," would be in favour of the heat having preceded, and the best explanation of the reasons on which this is founded, will be to give the theory. Supposing, after the upheaval of the slate, and before it had commenced to decompose, certain portions of it running in parallel lines were exposed to the influence of caloric coming from the depths of the earth, either by longitudinal and parallel cracks in the crust overlaying some subterranean igneous mass, or by the flow of currents of trap in underground channels. The rock so exposed would be crystallised, and the surrounding strata more or less affected, provided we can suppose a narrow opening happening in the under crust without reaching the upper surface. The crystalline portion would not be liable to decomposition while the latter would. Let ages do their work then on the uncrystallised portion, and the strata will become decomposed into surface soil, and so disappear ; but the really altered rock would be unaffected, except, perhaps, rounded and weather-worn, and would stand out in ridges of boulders. Upheaval now begins, at a centre a little removed from them, and they become broken from the under-pressing force, much more, of course, in proportion as the upheaval is greater, and then we have the bands precisely in the state in which we find them now. Be it observed, that everything bears out this view. For in the first place, the soil has formerly been composed of slate. Fortunately the plough has never yet broken the turf, and we have but to dig a foot or two to find the truth of this. The soil on being uncovered, shows the former marks of stratification as plain as possible. Again, the bands are broken smaller in proportion as they go over a higher ridge.

But as to the cause of the crystallisation, I know great exception may be taken. It may be said that on the supposition of parallel cracks, I am calling to my assistance phenomena that have never been observed elsewhere. This is true. But are not these appearances in question such as have not been observed elsewhere ; and are we not as yet in ignorance of the greater portion of geological phenomena in the world ? And to answer all objection, let me say that here are appearances (the bands), which are clearly not dykes, nor due to anything that in our present state of geological knowledge we can account for ; and I only take upon myself to say they might be caused by such or such an agent, at the same time showing, as far as evidence goes, my theory is borne out. If, notwithstanding everything, I am not correct in my views, at least it will be admitted that a cause has been in operation which we are not cognisant of, and it is some slight advantage to geology to know that there are more things in the earth's crust than its present philosophy can account for. If it can be shown, however, that the upheaval was prior to the crystallisation, then my theory falls to the ground. But nothing seen supports such a view. It is true that some of the hills which are the very highest (where their height, if they existed previously, would keep them more out of the reach of subterranean agents) the bands are less crystalline and sometimes unaltered, but this is occasionally observed in the bands of the valleys, and again in some very high hills they are the most completely crystallised of all, though still preserving former lines of stratification, so that this difference must be entirely attributed to mere local causes. Now as to the probability of parallel cracks. If these were made at all, they would probably give rise to dykes of trap. But if owing to some unknown cause, the cracks only extended through some strata, and not through others (more moderately tilted, for instance), the trap would stop some distance from the sur face, and crystallise the stone above. I know this appears far-fetched, but we must remember that far less probable theories have been verified by investigation.

There is, however, another cause to which the bands may be attributed. They may have arisen from under-ground flows of lava, prior to the raising of the hills. This view has only two circumstances to support it. There is an extinct volcano about thirty-seven miles to the N.N.W., above the river Broughton, and we know from experience, that lava occasionally flows underground. The volcano I allude to, which I never had an opportunity of examining closely, appears to have greatly disturbed the features of the country around; and may probably be not yet quite extinct, as shocks of earthquakes are frequently felt at Mr. Fisher's home station at Bundalier (some of which have shaken the walls of the house); and what is of more importance just now, this volcano has given rise to immense quantities of lava. It is not difficult to suppose lava to have flowed under ground for such a distance, and if it did it would have given rise to such appearances as the bands. I may mention a case by way of illustration. In a paper I have published about the geology of Mount Gambier, I have shown that the lava has there flowed under ground. At Mount Schank it has come to the surface, and though it appears in the form of trap rock, it runs in a band similar to the one we are here speaking of. But the resemblance is more striking even than this. At Mount Schank, where a second flow of lava has occurred the uppermost flow has been forced into upright boulders, and appears in form exactly like one of the bands which occur in a valley. Now, as from a second flow of under trap, we should expect an appearance like the bands, from the way the cool trap would be tilted up: the trap in this case occupying exactly the place of the metamorphic rock. The similarity is, to say the least, very remarkable.

But supposing neither theory to be the true one, we are not entirely at a loss to suggest a cause. There is evidence of upheaval nearly in the same direction at distinct periods, showing a uniform disturbance in the same place at different times.

Such a disturbance must have had some particular cause to make it exert itself in so uniform a manner. Thus, there is upheaval of the slate, crystallisation of the same, and upheaval of the hills in nearly the same direction. We are not at present aware of the mode in which hills are upraised, but the general supposition is, that fire causes the disturbance : and if fire was so long an active and yet so partial an agent, as to cause the same disturbance, at the same places, at different times, it can easily be imagined to have been equally partial in affecting the slate, though the manner in which it did so is not patent. Or to make it plainer, if it upheaved parallel and narrow chains of hills, leaving sometimes wide valleys between, it can be easily understood to have altered some part of the slate and spared others. If these facts should hereafter be looked into, the idea that mountains are upheaved through igneous agency, will become something more than a mere supposition.

I have one more question to settle, that is the age of these rocks. They are very (geologically) ancient, but enclose no fossils. Had they done so formerly such remains would, of course, have been obliterated by the metamorphic action. They are probably of either the Cambrian or Silurian formation, but this is mere guesswork, supported by little more than resemblances in mineral character, &c. That they have existed for ages in their present position cannot be doubted, for it takes no small time to decompose hard slaty rock into a surface soil, sometimes many feet deep. Veins of segregation too, as I have observed, are common. Some of them are of quartz, and have doubtless been formed in many cases by silica filtering into crevices already made in the metamorphic rock. This is a fact where observation is much wanted, as it is not at the present moment in any way clear, to what we are to attribute the quartz veins which occur so commonly in rocks. In the instances I am mentioning it is difficult to attribute them to heat, and yet though filtration is the only resource to explain them, the peculiar manner in which it is exercised in these cases is but very imperfectly understood. The Dolomites I have mentioned have doubtless been formed in the wet way, by the re-action upon each other of carbonates of lime and magnesia. The same may be said of the steatite. The altered rock where the crystallization has been perfect is a light granular stone, with white flour-like feldspar disseminated through it. It is sometimes of a pure white colour, sometimes a pinkish yellow, and again a deep red and highly ferruginous. The specific gravity ranges from 2.4 to 2.86.

There is one rock which is so rich in magnesia as to give rise to great beds of steatite, and another is so aluminous as to affect the taste of water in the neighbourhood, which water gives large quantities of alumina on analysis. In both the rocks the stratification is perfect, and their composition gives one an idea of the singular state of the ocean from which they were deposited. Sulphur is also present. I exposed a large quantity of the powdered rock, to heat in a retort, and the quantity of sulphur that sublimed was quite surprising. I could detect no sulphates. At a place, east of the hills, so often alluded to, there is a vein of iron ore, and the strata on each side are variegated with most singular colours. I have one specimen where the rock is changed to a most beautiful blue, of the finest hue that could be imagined, so distinct was the colour that I actually analysed a portion to detect copper or cobalt before I became aware that this was owing merely to the influence of heat.

In conclusion, it may be said to those who are fond of regarding South Australia as a country, the whole of which has been recently raised from the sea, that these rocks at least, and a great portion of the country immediately around, were certainly dry land at a time when the sea rolled over the spot where Adelaide now stands; and if, as I believe it may be proved, the south coast of South Australia was under water at a recent period, tracts of country such as Clare, and the Mount Lofty ranges formed an Island Archipelago. The sea beat overland where the busy hands of men have now raised a city,, using for that purpose the very spoils which the ocean left behind, but while it did so, it spared a spot where fire had exerted its underground ravages ages before, leaving rocks and stones to tell to man, the magnitude and power of the earth's Great Framer.

PROCEEDINGS.

REPORTS OF COMMITTEES.

REPORT OF THE PROCEEDINGS OF THE OBSERVATORY COMMITTEE OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

Adopted by the Observatory Committee, and received at the General Meeting of the Institute, held on the 7th of December, 1857.

Mr. President and Gentlemen,

The Committee was appointed to wait on Her Majesty's Government, and take such other steps as they might deem necessary to promote the establishment of an Astronomical, Magnetical and Meteorological Observatory, on a scale commensurate with the importance of the colony.

The Committee, having discussed the subject at several meetings, agreed to the following Memorial, which was presented to the Hon. the Chief Secretary, on the 24th November last.

MEMORIAL.

Sir—Towards the end of last year a Committee of the Philosophical Institute had the honor of drawing the attention of Her Majesty's Government to the great service which would be rendered to Astronomical Science by the establishment of an Observatory provided with a reflecting telescope of large optical power for the examination of the nebulæ of the Southern Hemisphere.

In the memorial presented on that occasion, a copy of which is appended, the interest attaching to this branch of investigation was set forward, and the general nature of the work to be done.

We have now the honor to renew the recommendation, and in doing so we beg to lay before you, more in detail, the nature of the arrangements which it is desirable to carry out, and an estimate of the probable expense.

For the Astronomical work the instruments required are—

First, a reflecting telescope, with mirror of four feet aperture, mounted equatorially, with clockwork movement; this instrument, with 12 eye pieces, micrometers of the most improved construction, &c., would cost £4,200.

An extra speculum, in case of accident, and a polishing machine would cost about £700 more.

Secondly, a Transit Circle.

For this we recommend an instrument having a telescope of about five feet focal length and five inches aperture, with two circles three feet in diameter, one roughly graduated for setting and clamping, the other graduated to intervals of 5′ and read by six microscopes. This instrument, with all the necessary microscopes for reading, telescopes for collimating, illuminating apparatus for wires and field, &c., constructed by Messrs Troughton and Simms, would cost £800.

The work to be done by the large telescope was fully explained on a former occasion* ; the transit circle should be employed in determining the position of the southern stars with the same accuracy as has been arrived at in the northern hemisphere.

Another important service which it would render would be the more accurate determination of the co-efficient and law of refraction, by observations on the zenith distances of stars, taken in combination with observations of the same stars in the observatories of the northern hemisphere.

As subsidiary instruments in the Astronomical Observatory, there should be a sidereal time clock, a mean time clock, and a chronometer. The cost of these would not exceed £150.

As a record of the state of the atmosphere, at the time of every observation, must be made, in order to determine the proper correction for refraction, the Astronomical Observatory should also be provided with a standard barometer and a stand of thermometers : and since a large part of the work of a meteorological observatory would thus necessarily form part of the Astronomical Observatory, it would require no addition to the staff of assistants if the set of meteorological instruments were rendered complete, by the addition of a self-registering anemometer, an apparatus for determining the electrical state of the atmosphere, and a few minor instruments.

No observations, so far as we are aware, have yet been made in the colony for the determination of the electrical state of the atmosphere, and as there is reason to believe that this is intimately connected with the prevalence of dust storms, and as it undoubtedly exercises an important influence on the progress of vegetation, we consider its examination of great importance.

As regards the Magnetic Observatory, we beg to call to your recollection the unparalleled exertion which was commenced many years ago to ascertain the magnetic phenomena of the earth.

* On presenting the Memorial, the Committee stated that since it had been drawn up the mail had arrived, bringing a report of the meeting of the British Association at Dublin this year, that the British Association were renewing their application to the Imperial Government for the large Southern Telescope.

Numerous fixed observatories were established throughout the civilized world, and were not reduced in number until they had accomplished the objects for which they were immediately intended. One of these was established at Hobart Town, and the observations made there contain all that is to be expected from constant observations in this region of the world, until the instrumental means of observation shall have been made more nearly perfect than is at present the case.

Contemporaneously with the working of these fixed observatories, magnetic surveys were made by sea and by land.

As regards the importance of a magnetic survey, and the progress already made in various parts of the world, we cannot better express ourselves than in the words of Major-General Sabine, in an article on terrestrial magnetism, written by him for the edition of Johnstone's Physical Atlas, published in 1856. He says:—

" Originating in recommendations from the British Association for " the Advancement of Science . . . the observations required " for the delineation of the three magnetic elements corresponding " to the present epoch over the whole accessible surface of the globe, " both on land and on the ocean, have received the assistance of our " own and foreign governments in a measure which is second only " to the aid afforded to Astronomical research."

And again:—

" The first in chronological order of these undertakings was the " Survey of the British Islands executed in the years 1834-8." . . " Similar surveys have been executed in the extensive Austrian " States in the years 1846-54, by Mr. Kreil, and in and around Ba- " varia in 1849-53 by Dr. Lamont. . . The Magnetic Survey " of the British Dominions in India by the MM. Schlagintweit, is " now in progress, as is that of the United States of America by " American observers under the superintendence of Dr. Bache. . . " We may expect that other States in which the physical sciences " are held in esteem and cultivated will ere long follow these ex- " amples, and that in proportion as the importance of obtaining a " correct knowledge of the phenomena is recognised, provision will " be made for a repetition of the observations from time to time"*.

* The Committee here stated that they had heard by this mail that, as regards magnetical observations, instruments had been sent to the Consul at Mozambique, that the Austrian Government had commissioned Dr. Hochstätter to superintend magnetical observations during a scientific voyage, and that Dr. Hochstätter had visited the Kew Observatory to receive instructions in the use of his instruments.

That magnetical instruments had been furnished to Dr. Baikie and Lieutenant Glover for the expedition to Africa.

That magnetical instruments had been supplied to Lieut. Blakiston, R.A., for a magnetic survey of British North America.

That magnetical instruments were supplied for the North Polar Expedition just fitted out by Lady Franklin.

And that a second magnetic survey of England and Scotland was being commenced by Sir J. C. Ross and Mr. Welsh respectively, a sufficient time having elapsed since the previous survey in 1834-38.

Whilst the surveys of Sir J. Ross and Captains Moore and Clerk have given us the disposition of the lines of the three magnetic elements in those parts of the southern hemisphere which are accessible to navigation, *the Continent of Australia remains a blank upon the map.*

The Imperial Government has done its part in the Hobart Town Observatory, and we do not think that the Government of Victoria should withhold its contributions to the great scientific enquiry of the day, by neglecting to institute a survey of the colony.

A gentleman is now in Melbourne, with instruments supplied for that purpose by the King of Bavaria, who has both liberally maintained a well known fixed observatory at Munich, and also caused his kingdom to be surveyed. This gentleman has had a share in the latter work, and is well qualified for the employment. We hope that the Colonial Government will not allow a foreign prince to do a work for us which other governments have done for themselves, but will both purchase the instruments and be at the whole expense of the survey, taking advantage of the knowledge and experience of Professor Neumeyer, should he be willing to enter into such an arrangement.

Should such a survey be decided on, it will be necessary to have a fixed observatory to take observations contemporaneously with the Surveyor, in order to guard against error from magnetic disturbances. This would require observations of the three chief instruments at short intervals during two hours daily, at the time when the Surveyor should by agreement be making certain of his observations, which would be sufficient to guard against errors arising from the survey observations being taken during the time of a magnetic disturbance.

We recommend that the survey should be at first limited to the country between the meridians of 144° and 145° 30′.

The expenses would be the salaries and travelling expenses of the Surveyor and an attendant to put up his tent, &c., &c.

The fixed observatory need involve but small expense. An excavation 20 feet square, with a thatched roof, so as to suffer as little as possible from changes of temperature, with four stone pillars for the instruments, is the whole building required. The observations might be made by the observer of the transit circle.

If the Astronomical and Magnetical Observatories were in juxtaposition, the staff would be—1st. A Director, whose duty should be to take observations with the reflecting telescope, and to have the general superintendence of the other observations. This gentleman should have some amount of scientific attainments. From all we can learn, however, we have no doubt that a very suitable person could be obtained for £600 a year. 2nd. A Transit Observer, who should also have charge of the meteorological observations, and those few magnetical observations made in the fixed observatory. And

3rd. Two Attendants. For these persons no education would be requisite except that of reading and writing easily, and performing the ordinary operations of arithmetic with facility, and we are of opinion that a non-commissioned officer and two privates of the Sappers and Miners would be most suitable for these posts, or men of that class.

As a site for the observatory, we recommend a spot in the western portion of the Royal Park, clear of trees, on the brow of the hill overlooking Flemington. As regards an observatory this spot is unobjectionable; and in the event of a Trigonometrical survey of the colony being carried out, would form a most suitable starting point. It commands an uninterrupted view of Station Peak and Mount Macedon, which would form with it an admirable fundamental triangle, having Keilor Plains, the most suitable place for measuring a base line, within it.

The buildings requisite for the Astronomical Observatory would be—

1. A foundation and enclosure for the large telescope, which would not be covered in.
2. A transit room, 16 feet square.
3. A calculating room, or library.
4. An attendant's room, which might be used as a bed room.

We do not recommend that there be a residence provided in the observatory buildings. A residence for the observer, if provided, should be in a detached building, not far distant.

We are also of opinion that it would be desirable that these should be strongly and substantially built of wood, in order that the building may differ in temperature from the surrounding air as little as possible.

We wish it to be borne in mind that in recommending to the Government the establishment of an observatory the Philosophical Institute is not asking anything for itself, but is only coming forward, as similar institutions at home have always done when there was any great national scientific work to be undertaken, to urge upon the Government to undertake, in its own way, what they believe to be a great national work; and to proffer to the Government any assistance in their power in pointing out the objects which are in their opinion most deserving of attention, and the best mode of attaining them.

There is one more point to which we wish to draw attention, viz., the necessity for providing such scientific control for the observatory and the magnetic survey as shall ensure that the exertions of all connected with it are profitably directed, and secure to the colony the results of those observations; and at the same time will avoid the evils arising from fettering the free action of the director and surveyor. Without presuming to prescribe how this should be done, we beg to recommend to the consideration of the Government the following extract from the Regulations of the Royal Observatory at Greenwich, published as an appendix to the observations of 1852 :—

"A Board of Visitors of the Royal Observatory is appointed by "warrant under the Royal Sign Manual. The constitution of this "board has once been changed; at present it is as follows :—The "President of the Royal Society, and all who have held that office, "the President of the Royal Astronomical Society (not being Astro-"nomer Royal), and all who have held that office, the Savilian "Professor of Astronomy at Oxford for the time being, and the "Plumian Professor of Astronomy and Experimental Philosophy at "Cambridge for the time being are, *ex officio*, visitors. Five Fellows "of the Royal Society, and Five Fellows of the Royal Astronomical "Society, were appointed by name in the warrant, and on the occur-"rence of a vacancy a successor is appointed from the society, from "which the last member had been selected, by the President of that "society for the time being. The number of members of the board "at this time is sixteen.

"The Board of Visitors is authorised to direct the Astronomer "Royal to make such observations as the board shall think proper; "to inspect the instruments, and communicate with the Lords of the "Admiralty upon the arrangements for maintaining them in efficient "order; to make any suggestions to the Lords of the Admiralty "touching the observatory; to require from the Astronomer Royal "every three months a copy of the observations made, with a view "to the printing of them; and to meet at the observatory on a cer-"tain day in every year, and to meet at such other times as may "seem expedient to the Lords of the Admiralty."

Under this control the Greenwich Observatory has been unsurpassed by any in the world for the efficiency with which it has carried on its work.

In asking you to place upon the estimates a sufficient sum to carry out this work we may add that inasmuch as the construction of the instruments would occupy a considerable time, probably two years, the whole of the money would not have to be disbursed at once, but merely sufficient to justify the people in England to whom it was entrusted to proceed with the work.

APPENDIX I.

Estimate of Expense of Observatory.

FIRST COST.

Reflecting telescope, with extra speculum and polishing machine, complete	£4,900
Transit circle	800
Clocks, &c.	150
Meteorological apparatus	150
Buildings	1,000
	£7,000
Package, freight, &c.	

ANNUAL COST.

Director	£600
Three assistants	500
Incidental expenses	200
	£1,300

The cost of magnetical instruments and the magnetic survey is not included.

The annual cost would most probably not be required for three years.

The payment of the the £7,000 might be spread over three years, thus :—

1st year—On account of reflector	£2,200	
Transit circle	800	
		£3,000
2nd year—On account of reflector	£2,000	
Buildings	1,000	
		3,000
3rd year—Balance		1,000

APPENDIX II.

Copy of a Memorial presented to the Chief Secretary, December, 1856.

Sir,—We have the honor, on behalf of the Philosophical Institute of Victoria, to draw your attention to a subject in which the colony is able to render a most important service to science, and in which we are convinced that we shall meet with the hearty co-operation of the Government, so far as is consistent with the other claims of the public service.

The object we have in view is the establishment of an Astronomical Observatory, to be commenced on a small scale which will enable it, when completed, to rank with the first observatories in Europe as regards those instruments which are generally found only in National Institutions, and to possess at the same time a telescope such as those which have been in one or two instances only constructed by the wealth munificence and zeal of private individuals.

As regards an Astronomical Observatory generally, it is unnecessary to do more than draw your attention to the fact that, while upwards of seventy observatories, public or private, are at work in the northern hemisphere, two or three only exist in an efficient state in the southern hemisphere, from which you will at once perceive how great an amount of astronomical work still remains, which can only be done in a southern latitude.

But while thus urging the importance of establishing an observatory generally, we desire to bring more especially under your notice the peculiar interest which is attached to the department of nebular astronomy. "The mysterious forms on which it is employed are at "present objects of universal curiosity, from their position (outworks "as it were of the universe), their evident analogy to the system of "which we are a part and which we may hope to study in them, "and the dynamic questions which the marvellous arrangements of "many of them suggest." Its history may be briefly given :—

"About 68 nebulæ had been ill seen and worse described when the elder Herschel was led to explore them by the encouragement "and aid of his sovereign, George III.

"To those previously known he not only added 2500 more, but "by classing them, by clear and methodical description and directing "attention to the relations which connect them with other portions "of the universe, he gave this branch of astronomy its powerful "vitality.

"His no less distinguished son, following his example with even "greater success, has not merely extended the list of northern "nebulæ to an extent which would have ennobled any other name, "but has given the whole work complete precision by an accurate "determination of the positions of all contained in his own and his "father's lists, thus placing them fully within the reach of subsequent observers.

"Not content with this, he transported to "this" hemisphere those "instruments which had done such good service in "Europe," and has "thus enriched astronomy with 1,600 more, equally well observed, "but beyond the reach of European astronomers.

"Yet, powerful as those instruments were, a much nearer "approach to the limit of useful optical power has been made by "Lord Rosse; it was therefore to be expected that his telescope "would add considerably to our knowledge of the nebulæ, and this "has been fully realised."

Many of the nebulæ observed and described in Herschel's catalogue presented a totally different appearance when viewed by the superior power of Lord Rosse's, and many details were disclosed, previously unknown and invisible in telescopes of lower power.

The work, therefore, which is required to be done is "a minute re-"examination of at least all the brighter nebulæ of Sir John Her-"schel's catalogues, embodied in drawings based on micrometer "measures, and so correct that each of them may be referred to "without doubt by future astronomers as an authentic record of the "original's appearance at a given epoch.

"Of such drawings we at present possess very few. Most of the "sketches by the Herschels are stated by them to be made merely by "the eye, and even those that were accurately taken by them are "found to require amendment when compared with the appearances "in more powerful telescopes."

The work derives additional interest from the fact that many of the most important nebulæ, and those involving the solution of some of the most perplexing problems in physical astronomy are to be found in the southern hemisphere.

The construction of a telescope sufficiently powerful to carry out these observations efficiently, together with the expenses incident to its transport to this colony, would involve an outlay of about £5,000, and a committee of gentlemen, consisting of Lord Rosse, Dr. Robinson, Mr. Lassell and others, have expressed their willingness to superintend it while in progress.

A suitable transit circle, with other minor instruments, would cost about £1,000 more, and the expense of the requisite buildings would not exceed £1,500. We have reason to believe, however, that there is already in the colony a transit circle which would be available for this purpose, in which case the expense of this instrument might be deducted from the estimate.

In urging this recommendation on the attention of the government we feel greater confidence from the fact that the Royal Society of London and the British Association for the advancement of Science have already preceded us in pressing the subject on the attention of the government at home.

The first memorial on the subject, from which some of the preceding statements are quoted, was presented to Lord John Russell in 1850, and after some delay, arising from the proposal not being in a sufficiently definite form, a favourable answer was finally obtained from Lord Aberdeen in 1854.

Almost immediately afterwards the war commenced, and left no funds at the disposal of the government at home for new scientific undertakings.

In this position the matter rests at present; and we venture to submit to the government that in the present flourishing condition of the finances of this colony, it will be hailed with universal satisfaction that the government should step forward and establish an institution which, on the one hand, will render such important service to science, while on the other, it will redound highly to the credit of the colony both in Australia and in Europe.

An observatory has already been established in Sydney, and a gentleman charged with the task of its superintendence has arrived from England. It is, we believe, also in contemplation to establish an observatory in South Australia, and we trust that we shall not be considered as suggesting an improper rivalry when we say that the first of the Australian colonies in wealth and importance should not be the most backward in the promotion of science.

The Chief Secretary received the Committee with great courtesy, conversed freely on the subject, expressed himself as favourable to the establishment of an Observatory on a proper footing, and stated that he considered it had strong claims on the Government. That of course he could give no positive assurance without consulting his colleagues, and that it must depend on the manner in which the estimates for revenue and expenditure turned out, whether any sum could be placed on the estimates for the year 1858.

REPORT, *drawn up by a Committee of the Council, on the subject of* Mr. A. K. SMITH'S *Paper on Wood Pavement, received at the Monthly General Meeting of the Institute, held on the 3rd of June*, 1857.

GENTLEMEN,—Having been appointed by you, at your last meeting on the 29th of April, a committee for the consideration of a paper on Wood Pavement, read before the Institute on the 4th of March last by Mr. A. K. Smith, in connection with which the charge of plagiarism has been brought against him, we beg to submit the following report :—

The question resolves itself into two heads.

1. Did Mr. Smith intend, in using Mr. Hope's paper, to claim as his own any credit that might result from it ?

2. If he had not any such intention, did he use the proper means to indicate the extracts from Mr. Hope's paper as such ?

With reference to the former of these two heads, we have received the following evidence :—

1. A letter from Mr. Donaldson, Collingwood, clerk to Mr. A. K. Smith at the time the paper was prepared, but who has since left his employment, stating that he acted as Mr. Smith's amanuensis for twelve months, during which time he copied from notes and wrote from dictation some sixty different papers, official reports, &c., and amongst

others his paper on Wood Pavement; that the quotations of Mr. Hope's experiments were made from an abstract of his paper in the *Practical Mechanics' and Engineers' Journal*, which were marked for him to copy, and proceeds thus:—"I can further bear witness to the fact, that Mr. Smith was anxious to acknowledge that quotation, having given me instructions to be particular about it; and in my anxiety to carry out his wishes I did personally alter the pronoun 'I' into 'Mr. Hope,' and in other instances changed the sense of the first person."

2. A letter from the Hon. N. Guthridge, M.L.C., stating that Mr. Smith's paper, complete, I think, as far as the end of the third part, was in his hands in the month of February, prior to its being read before the Philosophical Institute.

3. A letter from Mr. Smith himself, stating that after the paper was in the hands of Mr. Guthridge, he had a conversation with Mr. E. Snell, Engineer-in-Chief to the Melbourne and Geelong Railway, on the subject, and that during the conversation Mr. Hope came in, and Mr. Smith, addressing him, said, he had been quoting from a namesake of his (Mr. Hope's) on the subject of wood pavement, whereon Mr. Hope said, that he himself was the person in question.

To verify the statement of Mr. Smith, we wrote to Mr. Hope and to Mr. Snell, but have received no answer from either of these gentlemen, but:—

4. In a letter dated April 10th, 1857, and published in the *Argus* of April 12th, Mr. Snell thus writes:—

"About four months ago, they (Messrs. Hope and Smith) had a conversation in my presence on wood pavement, in which Mr. Smith announced his intention of quoting Mr. Hope's experiments, to which I don't think Mr. Hope at the time made any objection."

5. On the 6th of April, 1857, an article appeared in the *Argus*, praising Mr. Smith's paper; on the 7th, he (Mr. Smith) wrote a letter addressed to the Editor of the *Argus*, both the rough and the fair copy of which are before us, in which the following words occur:—"The experiments made by Mr. D. Hope (now in Melbourne, and late of the firm of Hope, Mackenzie, and Co., contractors) which I give *in extenso* from an abstract of a paper read by him to the Scottish Society of Arts, and communicated by him to the *Practical Mechanics' and Engineers' Magazine.*

6. A letter from Mr. William B. Downe, of 10 A'Beckett-street, accompanying the rough copy above alluded to, and saying:—"I beg to certify that the enclosed is the document prepared by Mr. A. K. Smith on the 7th April last, and handed me to copy. Mr. Smith stated the reason why the letter was not sent to the paper for publication.

The reason, doubtless, was the appearance, on April 8th, of the article headed "Stop Thief."

7. In the paper itself Mr. Smith states, that so far as he knows, no experiments have been made in Victoria; the experiments quoted are evidently one series, made by the same person, and are spoken of by Mr. Smith as being Mr. Hope's, as follows:—

"Mr. D. T. Hope, in a paper read before the Scottish Society of Arts;" and again, further on, "I will, therefore, further refer to the experiments of Mr. Hope;" and Mr. Hope's name is again repeated.

Having considered this evidence, we have concluded, as regards the first head, that Mr. Smith had no intention to claim as his own, either Mr. Hope's experiments or any credit that might result from them.

As regards the second head, we invite your consideration of the following points:—

1. The paper in question was prepared originally as a report for a committee of the Town Council, and before it was read Mr. Smith applied to the Council of the Philosophical Institute for permission to read it, without forfeiting the right to print it separately. Mr. Smith distinctly states that it was headed "An Essay" without his knowledge or consent.

2. The paper was directed to the question of the propriety of using wood pavement in Melbourne.

The whole as printed, consists of about 450 lines, and is divided as follows:—

1st—The history of its introduction into Britain.

2nd—Some accounts of various patents.

3rd—Practical experiments.

1. On the best position of the fibre.
2. On the durability of wood as a material for street paving.
3. On the efficiency of wood for paving when necessarily subjected to wet and dry weather.
4. Traction on wood pavement as compared with granite pitchers or macadamised roads.

4th—Wood pavement might be used with greater advantage in the streets of Melbourne than of London.

5th—General remarks.

Of these five headings the third, "Practical Experiments," contains all the quotations from Mr. Hope's paper.

At this point, however, it is necessary to draw attention to an error introduced into the paper as printed.

The heading "III. Practical Experiments," is placed in the middle of the fourth subdivision of that head, where it obviously has no meaning at all. But in the manuscript there is a blank of half a page left for the heading where no blank of any kind appears in the printed copy,—viz., immediately before the words "Mr. T. D. Hope in a paper, &c." near the bottom of page 4 of the printed copy. Mr. Smith assures us that being much engaged at the time he neglected to correct the proofs, and takes blame to himself for this neglect.

The whole of the division, "Practical Experiments," consists of one series of experiments, to which Mr. Smith refers as Mr. Hope's, and which is quoted almost verbatim from the paper in the *Practical Mechanics' and Engineers' Magazine.* This we have compared with the paper communicated to the *Edinburgh Philosophical Journal*, and find them identical.

The whole quotation (altered as stated by Mr. Donaldson) occupies about 150 lines, one-third of the printed paper, and forms the whole of division third.

No quotations from Mr. Hope occur in any other part of the paper.

On this we may remark, that Mr. Hope's experiments having been published in three journals, viz., the *Practical Mechanics' and Engineers' Magazine*, *Jamieson's Edinburgh Philosophical Journal*, and the *Transactions of the Royal Scottish Society of Arts*, were public property, at the disposal of any one for quotation, with the view of inferring results from them. Mr. Smith seems to us to have quoted them thus, leaving out any collateral evidence. Mr. Smith distinctly states, on making his quotation, that, so far as he knows, no experiments have been made in Victoria, and therefore refers to Mr. Hope's experiments, and quotes them in such a manner as shows that they are one series, by one person.

3. As some stress has been laid on the fact, that a small part of the extract is marked in inverted commas, and that the major part is not so marked, we have to state that no inverted commas at all appear in the manuscript, and that Mr. Smith states that no authority was given by him to the printer for their introduction.

From the consideration of these points we conclude that, to any one reading the paper carefully, there is sufficient internal evidence of the acknowledgment of the experiments quoted, but we consider that Mr. Smith is blameable for negligence in allowing the paper to be printed without his personal revision, and in introducing, among the results of Mr. Hope's experiments, several quotations, amounting together to about forty lines, containing statements of opinion by Mr. Hope, which, not being results of his experiments were liable to be attributed to Mr. Smith, and while acquitting him of any intention to appropriate Mr. Hope's labours, we the more regret and condemn his negligence, inasmuch as the very alterations introduced by the amanuensis, in consequence of Mr. Smith's anxiety and direction that the experiments should be acknowledged as Mr. Hope's, make those general statements of opinion appear to be Mr. Smith's.

W. P. Wilson, M.A., F.C.P.S., Professor of Mathematics in the University of Melbourne.

M. H. Irving, M.A., Professor of Classics in the University of Melbourne.

John Macadam, M.D., Lecturer on Natural Science in the Scotch College, Melbourne.

REPORT OF THE "EXPLORATION" COMMITTEE OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA,

Drawn up by Drs. Wilkie, Mueller, *and* Macadam, *adopted by the Committee, and received at a* Special General Meeting *of the Institute, held on the 22nd December,* 1857.

The Committee appointed at an Ordinary Meeting of the Philosophical Institute of Victoria, held on the 11th of November, 1857, for the purpose of inquiring into the practicability of fitting out in Victoria an expedition for traversing the unknown interior of the Australian Continent from east to west, beg to offer to the members of the Institute this, the First Report of their Proceedings, and the results arrived at in their inquiries; and beg likewise to suggest such a modification in the plan originally proposed as a careful investigation of the evidence and opinions of former Australian travellers has induced them to adopt.

At the first meeting of the Committee, held on the 14th of November, a strong desire manifested itself to foster, and that speedily and with all means within their reach, the project brought under their consideration. The desirability of Victoria taking a share in the labors of revealing the unexplored portion of the interior of Australia was unanimously acknowledged, and many members of the Committee supported on that occasion, the motion of Dr. Wilkie, namely, to adhere to the line of the tropic of Capricorn as far as the nature of the country and other circumstances would permit. A resolution was adopted to the effect that an appeal be made for pecuniary support, both to the Government and the public, as also that a meeting of the colonists should be held in furtherance of the project. Mr. Bonwick was instructed to apply to A. C. Gregory, Esq., the commander of the North Australian Expedition, for the opinion of that gentleman on the proposed route, and generally, to request the advice which his valuable experience would dictate.

At the second meeting of the Committee, held on the 23rd November, the business was, on the motion of Edward Wilson, Esq., postponed, in order that the members might have the opportunity of hearing Dr. Mueller's forthcoming paper before the Institute, on the subject of "Australian Exploration."

At the third meeting of the Committee, held on the 30th November, Dr. Mueller moved, pursuant to previous notice, that the starting point, originally fixed to be Port Curtis, should be changed for the Darling, because it seemed unadvisable to send almost simultaneously an expedition from Victoria to the subtropical east coast, whilst the New South Wales Government had already intrusted to Mr. Gregory the command of an expedition in search of Dr. Leichhardt, which is to proceed from Port Curtis to the westward. He pointed also to the additional chance which would thereby offer itself of gaining information as to the fate of Dr. Leichhardt (who it was said had fallen, with his party, into the hands of the natives, near the sources of the Maranoa.) By adopting the Darling as a starting point, Dr. Mueller said, a new and large portion of country in close proximity to the northern gold-fields of the colony of Victoria, and probably in part available for pastures, would be opened. Further, it seemed preferable to explore a new tract of country on the route to the Victoria River (of Sir Thomas Mitchell), and situated between the Darling, Grey Range, and the Warrego, than proceeding over the well known country to the Victoria River from the eastward.

Mr. Blandowski objected to this alteration in the proposed route, on account of the greater distance to be traversed ere a position on the Victoria River would be reached. He explained the difficulty of obtaining horses fit for an exploring party in the northern parts of this colony, and referred to the existence of poisonous herbs on the Darling as dangerous to such animals.

Dr. Mueller contended that poisonous herbs were not restricted to some portions of the country near the Darling, but had proved destructive to horses and other animals near Lake Torrens, in Western Australia, Arnheim's Land, and other parts of this continent, and would probably be encountered on many other lines of the country.

Dr. Mackenna, considering that already New South Wales and South Australia were engaged in new enterprises of a kindred nature, moved that Victoria should carry out the objects in view without the co-operation of the neighboring colonies. This proposition received the sanction of the Committee. It was also agreed to establish, in the event of the plan of the exploration, in its fullest extent, meeting with the approbation of the Government and the colonists, a depôt, as had been previously urged by Edward Wilson, Esq., on the junction of the Thomson with the Victoria River, in lat. about 25° S. and long. 143° E., and to convey provisions, &c., to that locality, sufficient for the party during the space of two years. The decision on the best route for accomplishing this object was postponed on the motion of the Hon. Mr. Hodgson, M.L.C., until a reply would be received from Mr. Gregory.

At the fourth meeting of the Committee, held on the 7th December, the Hon. Secretary, Dr. Macadam read the answer in reply to the communication to Mr. Gregory, which the Committee deem it necessary to insert *verbatim* in this report, as an important document, based on unrivalled experience.

66, Macquarie-street, Sydney,
25th November, 1857.

Dear Sir,—I had the pleasure of receiving your letter of the 16th inst., referring to the proposal of the Philosophical Institute of Victoria to initiate proceedings for the formation of an exploring expedition, having for its object the determination of the character of that portion of the Australian interior which has as yet baffled the attempts which have been made to penetrate it.

With reference to the line suggested, simply viewing it on the map, no line could appear better chosen than that proposed, viz., the line of the tropic, from E. to W. The question, however, is, can this be effected with the means at present available?

Now it has been demonstrated that a party well equipped can perform a journey of equal length with that contemplated; but it is not the number of miles, but the character of the country to be traversed in which the real difficulty consists, and we should therefore inquire what is the probable nature of the country under consideration.

First. The principal tract which is unexplored is comprised between the meridians of 115° and 140°, and the parallels of 20° and 32° of latitude, or 1,600 miles long by 800 miles wide. Its circumference is 4,500 miles, of which only 800 miles (on the N.W.) remain unexamined. Along the whole line examined (extending to 3,700 miles) the universal character of the country along the boundary is level sandy desert or worthless scrub, without any sign of change in advancing into the interior beyond that of increasing sterility, caused by the greater aridity of the climate, while not one single stream emanates from this inhospitable region, to indicate ranges of hills, better soil or climate, beyond the limits of actual examination.

At what conclusion can we therefore arrive, from a consideration of the premises, except that the interior is equally barren and forbidding with its exterior limits?

I therefore consider that it is almost hopeless to attempt to traverse this tract of country from east to west, and that the only prospect of success would be to penetrate it in the direction of its shorter diameter (north or south).

But at what point is this practicable? The whole coast of the Australian Bight, from Streaky Bay to Cape Arid, is so barren that neither sufficient water nor grass exist at any spot for the formation of a depôt from which a party could start, and the result of the expedition from Streaky Bay is very discouraging. Thus it only remains to attempt to penetrate on the northern side. But even here there is scarcely any prospect of success until that coast shall have been settled, when by forming a depôt on the border, or rather on some of the creeks within the limits of the desert, early in the season, light parties might be pushed a considerable distance into it during the short continuance of the rains.

This is certainly a somewhat gloomy view of the subject, but it is, I conceive, our duty to ascertain, as far as possible, the nature of the difficulties to be met before encountering them, as failure must be the result unless judicious preparations are made to overcome the obstacles which interpose.

Thus reduced to the alternatives of either awaiting the sure but slow development of Australian geography, which must result from a steady adherence to the system of keeping our explorations 400 or 500 miles a-head of the settlements and gradually reducing the limits of the Australian *terra incognita*, or else to resort to the very doubtful, but, if successful, more brilliant mode of making energetic endeavours to accomplish the result without delay. Prudence would teach us to pause where undue haste may be disastrous.

Now, as regards the route of any party which might start, under present circumstances, from the east coast, they must of necessity be prepared to return to it, as it is only for a few weeks in each rainy season that they could approach the colony of Western Australia, as it is bounded on the east by a waterless scrub, which has been penetrated at several points some 200 miles ; and this tract of country, which perhaps extends as much further into the interior, can only be traversed in the wet seasons, when a little water collects on the bare rocks which exist at wide intervals, there being no water-courses, and the lower parts of the valleys occupied by salt marshes and lakes of brine. Even in following the coast to Shark's Bay I was nearly four days without water while crossing the scrubby plains north of the settlement, and only found one well of water during a search of thirteen days' duration.

Moreton Bay thus becomes the most eligible point for the organisation of an exploring party, and by following down partially the Victoria River of Sir T. Mitchell, a good position for a depôt could be selected, from which a lightly equipped party could push to the westward by taking a sweep to the north of Sturt's furthest point.

I expect shortly to visit the country to the N.W. of Moreton Bay, with a view of searching for traces of Dr. Leichhardt and his party, and, if possible, to ascertain the fate of that unfortunate explorer : and should any important features of the country be discovered, a knowledge of which might be of use to an exploring party, I shall feel pleasure in communicating all information relative thereto, as I apprehend that if the expedition is undertaken it could not start before the period of my return, as the preliminary arrangements and organisation of the party would occupy several months.

An opinion is prevalent that the range of hills which gives Eastern Australia the singular character of large streams descending into a depressed interior, will be found to extend along the north and west coasts. This is not the case, as the mountain range terminates at Cape York, and except the small track of hills in South Australia, no ranges exist to the west of the 142nd meridian, the whole of the western portion of the continent being only a sandy table-land, the edges of which are serrated by small watercourses which descend its slope to the coast. Thus in forming an estimate of the difficulties to be encountered in that portion of Australia, we must not adopt any experience of the country within the occupied portion of it. Were the obstacles so insignificant, Australia ere this had ceased to be a field for exploration.

In conclusion, I beg to assure you that I shall ever feel a warm interest in whatever may tend to the development of the resources of this continent.

And believe me to remain,

Yours very truly,

A. C. Gregory.

In reference to the statement made by Mr. Gregory as to the prevalence of salt water in many districts, particularly of the western interior, Mr. Blandowski expressed an opinion that this circumstance should not of itself deter an explorer, since in other districts of Australia fresh and salt water lakes were frequently found in proximity to each other.

Dr. Mueller explained that under the rapid evaporation in the dry atmosphere of the desert, combined with the solution of salt particles from the soil, stagnant water became entirely undrinkable, and this even after heavy thunder showers. Such waters might be comparatively fresh, and he deduced in illustration the experience in this respect of Mr. Oakden in the country west of Lake Torrens. Dr. Mueller at the same time admitted that drainage water collecting in a sandy or not saline ground might always afford a supply of fresh water, as in the instance of Lake Benanee. From previous experience, however, large depressed tracts of saline country of recent formation might be expected in the interior desert, which, it might be anticipated, would be but scantily provided with fresh water.

Dr. Mueller thought that the "Second Darling" (The "Paroo") described by the natives to Mr. Blansdowski, as existing to the north of the River Darling, would probably prove to be a continuation of the Warrego Creek, and if so would greatly facilitate an expedition northward from the Darling. Such, at least, would yield an oasis in the desert, similar to those on Eyre's Creek, Cooper's Creek, and Sturt's Creek, and which will always be of the highest importance to travellers proceeding towards central Australia.

Dr. Wilkie and Mr. Blandowski urged that the route selected should be that from Port Curtis, proceeding to the junction of the Victoria and Thomson Rivers, at or near the junction of which a depôt should be established.

Dr. Mueller, in supporting the amendment to this motion, contrasted the facility for the transit of stores furnished by the Murray steam navigation, almost to the point of unexplored country, with the difficult and partially mountainous route to be traversed when transporting, under not less expense, large quantities of stores from the east coast to the junction of the rivers named. He pointed out, also, that in selecting the Darling route a direct line of communication would most probably be established between our own colony and the Victoria River.

The amendment was supported by the Hon. Mr. Hodgson, in consequence of Mr. Blandowski's remarks on the existence of permanent water not far north of the Darling, which seemed to augur so favorably for that route. Mr. Hodgson expressed himself as influenced, also, in his decision, by Mr. Gregory's communication. The amendment was carried.

On the motion of the Hon. Mr. Hodgson, it was unanimously resolved to organise at once a light party for the exploration of the country from the Darling to the junction of the Victoria and Thomsom Rivers. Mr. Blandowski, in reply to a question from the Hon. Captain Clarke, R.E., stated that, in his opinion, a period of eight months (five of which to be employed in actual exploration) would be sufficient for this purpose. He adverted to the necessity of immediate despatch in the necessary preparations, in order to reap the full advantage of the next rainy season. The sum of two thousand pounds was deemed sufficient for efficiently crrrying out this exploit.

Your Committee having thus reviewed the evidence that was before them, with respect to the practicability of fitting out in Victoria a geographical expedition to traverse this continent from east to west, as near the tropic of Capricorn as the features of the country would permit, have to state that they are unanimous in opinion that the route indicated is, without doubt, that which would prove in every point of view the most valuable in its results, if it could be accomplished.

In order to make the attempt, however, with any prospect of success, it would be necessary to form, at or near the junction of the Thomson and Victoria Rivers a depôt, amply furnished with stores and cattle sufficient for a period of at least two years. The expedition would necessarily be a costly one, and your Committee fear that even under the most favourable circumstances it would be a hazardous undertaking. For these reasons your Committee are not prepared to recommend that immediate steps should be taken to organise an expedition for this great line of exploration, but they entertain the confident hope that the time is not far distant when this desirable object may be successfully undertaken by an expedition fitted out in Victoria.

In recommending a less important and a less expensive expedition to be first undertaken, your Committee have had in view, first, the fact that Mr. Gregory is at present engaged in organising an exploring party in search of Leichhardt, and that he will in all probability traverse the country between the east coast and the proposed depôt in the Victoria River, and on his return may be able to furnish important information for guiding us as to the future exploration of the interior; secondly, that it is at present uncertain whether it would be better to reach the proposed depôt from Victoria by the Darling, or from the east coast, as considerable difficulties would have to be encountered in either case.

Your Committee have, therefore, arrived at the conclusion that, under all the circumstances, it would be better that a preliminary exploring expedition should be undertaken by Victoria, for the purpose of opening up, if practicable, a line of communication between the Darling and the Victoria Rivers. They recommend that the expedition for this purpose should consist of a light party, and that their primary objects should be—first, to discover any available country for depasturing stock; secondly, to examine the nature of the country near the junction of the Thomson and Victoria Rivers, with a view to determine the practicability of forming a suitable depôt, with permanent water, for ulterior exploration.

Your Committee recommend that the exploring party should reach the Darling River before the beginning of March; and, according to the evidence already stated, they hope that the party will be able to accomplish this route to the Victoria River and back in less than five months. By that time Mr. Gregory will most likely have returned from his expedition in search of Leichhardt, and we should also be in possession of important information respecting the country to the north-west of Lake Torrens, the exploring of which is at present engaging the attention of the South Australian Government. We shall thus it is hoped, be in a much better position to undertake the more difficult and hazardous expedition afterwards through Central Australia. In recommending to the Institute this shorter and less expensive expedition, preparatory to the more important exploration of the interior, your Committee hope that the Institute will thus more readily obtain the support of the Government; nor can they feel indifferent to the advantage of leading the path of civilisation into a portion of the interior which, although politically belonging to New South Wales, may, commercially, be regarded as an enlargement of the Victorian territory.

Your Committee would also express the hope that the proposed expedition may possibly gain from the natives some traditional information respecting Leichhardt's fate, and would recommend that the expedition be specially instructed to embrace every opportunity of searching on their route for traces of that ill-fated explorer. Your Committee are of opinion that in the proposed expedition from the Darling the number of the party should be limited to four and a leader, in order to secure a more certain and speedy progress, and that the pack-horses may be safely reduced to twelve with two saddle-horses, which, with judicious arrangements, would carry an ample supply of provisions and all the requisites for an exploration of this tract of country during one rainy season; and as Victoria is now for the first time invited to take part in the honorable task of exploration, your Committee indulge the hope that the liberality of the colonists of Victoria, aided by a grant from the Legislature, will enable the Philosophical Institute to take immediate steps to carry out the object contemplated.

Your Committee refer with pleasure to Mr. Gregory's letter, which they have embodied in their report, and they are desirous to express their acknowledgment of the valuable information which it has afforded them. While Mr. Gregory, from long practical experience as an explorer, takes a somewhat desponding view of the probable nature of the unexplored country in Australia, and of the difficulties and dangers that would have to be encountered in any attempt to penetrate the great interior desert from east to west, your Committee are glad that he does not altogether dissuade them from making the attempt. On the contrary, he suggests Moreton Bay as the most eligible place under existing circumstances for fitting out an expedition for this purpose, and recommends that a depôt should be formed at an advanced point on the Victoria River, from which a light party might be pushed to the westward, shaping their course to the northward of Sturt's furthest point; thus strengthening the opinions already adopted by your Committee on the best mode of exploring the vast interior of this continent.

The uncertainty and scarcity of water is the grand obstacle to all future exploration; but even if it should be impossible to penetrate the desert to any great distance from the depôt on the Victoria River, from the total want of surface water, your Committee think it would perhaps be practicable for a light party to discover some favorable spot for securing permanent water from the tropical rains by artificial means, and thus to form more advanced outposts in the desert, from which further explorations could be made, with the hope of ultimately succeeding in penetrating through the whole continent from east to west.

However discouraging the exploration of this desert may appear, your Committee attach great importance to the information communicated by Dr. Mueller, that there are in these inhospitable regions occasional heavy falls of rain, and the salt lake in latitude 20° south, into which Sturt's Creek empties itself, although dry when discovered by Mr. Gregory, indicates by its immense size (being thirty miles in circumference) that a very large body of water must flow into it at certain times. From the general nature of the surface, the rain-water is very rapidly lost by absorption and evaporation; but there are reasons for believing that it will be possible in some grassy flats and in some clay soils to secure for the purposes of outposts an artificial supply of permanent water.

Your Committee have had under their consideration a lengthy communication from Mr. Belt, a member of the Institute, who proposes to undertake alone an expedition from the Gulf of Carpentaria to Adelaide. All that he requires is to be landed at the mouth of the Albert River, with five horses, provided with water-bags and a small supply of provisions and oats.

He expects to be able to reach Sturt's furthest point without difficulty, and then to follow his track to Adelaide.

Your Committee need only observe that the hostility and rapacity of the natives would render it extremely hazardous for one man to undertake such an expedition, not to mention the impossibility of one man leading or driving five horses through a scrubby, and it may be a waterless, country. They cannot, however, withhold their admiration of the zeal and courage displayed by Mr. Belt in thus offering single-handed to undertake so difficult and hazardous an expedition.

It only remains for your Committee to recommend the appointment of an Exploration Committee, with full powers to carry out the proposed object, and with authority to make an immediate application on behalf of the Institute to Her Majesty's Government to place the sum of £2,500 sterling on the Estimates to aid the expedition.

A list of articles required for this expedition has been kindly furnished to your Committee by Dr. Mueller, and is appended to this report.

LIST OF ARTICLES RECOMMENDED FOR THE EXPEDITION BY DR. MUELLER.

5 saddle horses.
12 pack horses.
12 ditto saddles.
5 saddles.
17 saddle cloths.
24 saddle bags.
5 revolvers.
5 carabines.
1 sextant.
1 artificial horizon.
Nautical Almanack.
1 telescope.
Compasses.
34 pairs of hobbles, with nails.
34 sets of horse shoes.
2 Aneroid barometers.
2 thermometers.
1½ tons of provisions (one year's provision for five, sugar, tea, flour, meat).
Ammunition.

2 very light canvas tents.
Straps and spare saddlery.
Hammer and other implements for shoeing horses.
Tomahawks.
A few thin iron pots, pannikins.
Waterproof bags for carrying water.
Spare boots (a pair for each individual.
Material for preserving skins of animals.
Paper for drying plants, half a ream.
Ropes, spring scales.
Spurs, clothing and blankets.
Matches, soap.
Fish-hooks, cordage.
Writing paper, note-books, &c.
Spade and pick, knives, bells.

MINUTES OF THE MEETINGS OF THE INSTITUTE.

(AS CONFIRMED.)

ANNUAL GENERAL MEETING.

14th January, 1857.

Professor Wilson, Vice-President, in the Chair.

The Minutes of the last meeting were read and confirmed.

A letter was read from C. Hodgkinson, Esq., C.E., Vice-President, stating that he would not wish to be put in nomination again for that office, and that he resigned his place, and his connection with the Institute, on account of the pressure of official business.

The Hon. Secretary then read the Report of the Council for the past year. (See " Transactions " for 1856.)

It was moved by Dr. Mackenna, seconded by R. Wadsworth, Esq., and carried, " that the Report be received."

The Treasurer brought up a balance sheet, which he stated had not been audited.

The meeting agreed to postpone discussion on this matter until Dr. Wilkie's motion respecting the appointment of an Auditing Committee would be brought on.

The ballotting for the officers was then proceeded with, and the following persons were duly elected.

The Scrutineers appointed were Dr. Mackenna and the Hon. Secretary.

President.

The Honorable Andrew Clarke, Captain, R.E.

Vice-Presidents.

Professor Wilson and Dr. Wilkie.

Treasurer.

D. E. Wilkie, Esq., M.D.

Honorary Secretary.

R. Brough Smyth Esq., F. G. S.

Council.

Dr. Iffla.
Rev. A. Morison.
L. Becker, Esq.
Professor Hearn.
Professor Irving.
A. R. C. Selwyn, Esq.
John Macadam, Esq., M.D.
Rev. John J. Bleasdale.
Thomas E. Rawlinson, Esq., C.E.,
William Blandowski, Esq.
Dr. Mackenna.
Frederick Acheson, Esq., C.E.

Dr. Wilkie made some observations respecting the methods adopted by the Scrutineers, which were replied to by the Hon. Secretary.

Dr. Wilkie then, in pursuance of notice, moved—

"That the sum of £25 be voted to Mr. Wekey, in consideration of "past services."

This was seconded by Dr. Goethe.

Professor Hearn moved the previous question.

Seconded by Mr. Wadsworth.

After a discussion Professor Wilson left the chair, and it was taken by G. Holmes, Esq.

After a long discussion an amendment was put, and the meeting decided that Dr. Wilkie's motion should not be put.

Dr. Wilkie then moved, "That he be allowed to amend his paper on a new form of Propeller." After a long discussion, Dr. Wilkie withdrew this.

Dr. Wilkie then moved,—

"That a Committee be appointed to examine and report on the "balance sheet, prepared by the auditors for 1855, but not adopted "at the time by the Institute; also, to examine and audit the Trea- "surer's account for 1856; such Committee to consist of Mr. Dobree, "Mr. G. Holmes, Mr. F. Acheson and the Treasurer."

Professor Wilson spoke at some length in reply to Dr. Wilkie.

The Committee was agreed to, but the names thereon were altered, and the following gentlemen were elected,—Dr. Wilkie, Messrs. Farewell, Dobree, and Holmes, and Professor Wilson.

Mr. Smyth's name was on the amendment, but withdrawn at his request.

It was moved by Mr. Dobree and seconded by Mr. Rawlinson,—

"That a Committee be appointed to wait upon Archibald Michie, "Esq., one of the Members for the City, to request that he would "take the necessary steps to move in the Legislative Assembly, that "an address be presented to His Excellency Sir H. Barkly, K.C.B., "to place on the estimates for 1857, a sum not exceeding £500, in aid "of the Philosophical Institute of Victoria.

It was moved as an amendment by Dr. Becker, and seconded by Mr. Elliott, that the amount be £1,000.

The motion so amended was carried.

Dr. Iffla asked for leave to postpone the motion standing in his name.

Leave granted.

Mr. Dobree gave notice that he would move,—"That henceforth the Transactions be published every half year."

4th February, 1857.

MONTHLY MEETING.

The Reverend Alexander Morison in the chair.

In the absence of Mr. R. Brough Smyth, Dr. Macadam officiated as Honorary Secretary.

On the Minutes being read, several objections were stated; amongst others, that the Auditing Committee was incorrectly represented.

After some discussions, it was moved and seconded—"That the Minutes be expunged;" but ultimately an amendment, proposed by Professor Hearn, and seconded by Dr. Wilkie, to the effect—"That "the confirmation of the Minutes be postponed until the next "meeting, so that the Secretary might revise them," was carried.

The list of the gentlemen composing the Auditing Committee was corrected by Dr. Iffla, the mover of the committee, and stood thus:—Professor Wilson, Dr. Wilkie, and Messrs. Holmes, Dobree, and Farewell."

The Chairman read letters from Professor Wilson and Dr. Wilkie respectively, resigning the office of Vice-President, in order that the offer of one of the Vice-Presidentships might be made to Dr. Ferdinand Mueller, as suggested by a member at the previous meeting.

Dr. MacKenna moved, and Mr. Acheson seconded,—

"That the resignations be not accepted."

Mr. Farewell moved as an amendment, seconded by Mr. Edwards,—

"That the resignation of Dr. Wilkie be accepted, because of his "occupying two offices."

The motion was carried.

The Chairman then read a letter from R. Brough Smyth, Esq., resigning the office of Honorary Secretary. Mr. Smyth gave as a reason, "His differing from certain members of the recently-elected Council as to the position which such an officer ought to occupy."

Professor Wilson and Dr. Macadam explained the nature and necessity of the resolution of Council, which bore upon the time to be given to authors as three days at furthest for returning printers' proofs for the transactions of the Institute, now in progress of publication, and not leaving the time to be fixed for each author by the Honorary Secretary.

Mr. A. K. Smith moved, and Mr. Edwards seconded,—"That the resignation be not accepted."

The Rev. Mr. Bleasdale moved as an amendment, and Professor Hearn seconded,—

"That Mr. Smyth's resignation be accepted, and that the thanks "of the members be given to Mr. Smyth for his past services to the "Institute."

The amendment was carried.

Dr. Wilkie moved,—

"That Dr. Macadam, who had been appointed by the Council to "edit the 'Transactions,' be Acting Honorary Secretary."

This was seconded by Dr. Iffla, and carried.

Professor Wilson read the audited balance sheet of the Treasurer, showing a balance of £212 19s. 1d. against the Institute at the close of 1855, and a balance in favor of the Institute, at the close of 1856, of £177 2s. 9d., exclusive of £75 4s. of unpaid subscriptions.

Dr. Iffla moved,—

"The adoption of the report."

Seconded by Professor Hearn, and carried.

Mr. A. K. Smith moved, and Dr. Mackenna seconded,—

"That a vote of thanks be tendered to the Treasurer, Dr. Wilkie, for the manner in which he had discharged his duties."

This was carried.

A vote of thanks was also passed to the Auditing Committee.

The balance sheet was laid upon the table.

Professor Wilson reported that a deputation appointed by the Council, and consisting of Drs. Wilkie, Iffla, Becker, and Macadam, with himself, had that day waited by arrangement upon His Excellency Sir Henry Barkly, K.C.B., and read a memorial, requesting that His Excellency would be pleased to become Patron of the Institute. His Excellency, in a highly complimentary reply, which, with the memorial, has been filed, had accepted the proffered title, and assured the deputation that his services would on all occasions be at the command of the Managing Committee of the Institute. His Excellency had also accepted an invitation to meet the members at dinner.

Dr. Iffla moved,—

"That a Committee be appointed to carry out the necessary "arrangements to receive His Excellency in a manner suited to the "occasion, to consist of Professor Wilson, Drs. Mackenna and "Macadam, and the mover."

This was seconded by Professor Hearn, and carried.

A communication was read from J. Wood Beilby, Esq., of Gipps' Land, in reference to Dr. Becker's paper on the Lyre-bird, and submitting some additional particulars as to the habits of this bird.

Dr. Becker explained that when his paper was published, Mr. Beilby's remarks would be found corroborative, in all points, of the statements already made by him to the Institute.

On the motion of Dr. Becker, seconded by Professor Hearn, the Secretary was instructed to send the thanks of the Institute to Mr. Beilby for his communication and his promise to present the Institute with a nest of the bird referred to.

Professor Hearn moved, that Mr. Dobree's motion be put to the meeting, to the effect, "That henceforth the Transactions be published every half year." This was over-ruled on the shewing that by the laws this matter came within the province of the Council only.

Professor Wilson verbally communicated the particular phenomena attending an instance of *mirage,* which he had seen on two successive Sundays, viz., the 11th and 18th January last, on the Sydney road, North Melbourne. The observations were very interesting, and Professor Wilson undertook to supply the Secretary with written details for filing.

Dr. Wilkie then read certain amendments and additions to his paper formerly communicated, on a "new Propeller."

A discussion ensued as to whether Dr. Wilkie's paper in the amended form could appear in the Transactions of the Institute for 1856.

Professor Wilson and Dr. Macadam shewed that Dr. Wilkie had withdrawn his paper from the Transactions of 1856, even when the offer of an appendix or annotation to it had been given him, preferring to exclude certain portions and make additions and re-read.

The matter was left to the Council.

After a vote of thanks to the Chairman the Institute separated.

4th March, 1857.

MONTHLY MEETING.

Professor Wilson, Vice-President in the Chair.

The Minutes of the meetings held on the 14th of January and the 4th of February were read, and after some slight alterations, were confirmed.

His Excellency the Governor arrived at this stage and took part in the proceedings.

A letter from Dr. Ferdinand Mueller was read, expressing his sense of the honor done him by the Society, in the proposal to offer him the office of one of the Vice-Presidents, but respectfully preferring to remain one of the humblest members of the Institute.

The President, Captain Clarke, moved,—

"That the honorary secretary be instructed to acknowledge the "receipt of the letter, and to convey to Dr. Mueller the appreciation "of the Institute of his labours, and the sympathy of its members in "his scientific researches, as also the expression of a hope that ere "long the Institute would be favored by Dr. Mueller's presence and "co-operation."

His Excellency Sir Henry Barkly seconded the motion, and amongst other eulogistic remarks, stated that Sir Wm. Hooker of the Botanic Gardens at Kew, had expressed to His Excellency his high opinion of Dr. Mueller, in the terms "That his merits as a Botanist were only superseded by his modesty as a man."

The motion was carried by acclamation.

The following gentlemen were admitted ORDINARY members of the Institute.

Rev. John Barry, D.D., Melbourne.
John S. Miller, Esq., Melbourne.
John V. A. Bruce, Esq. Contractor, Gisborne.
Richard Hall Budd, Esq., B.A., Inspector of Denominational Schools, Melbourne.
Thomas Skilling, Esq., Melbourne.
J. D. Pinnock, Esq., Melbourne.
Dr. W. M. Turnbull, Melbourne.
Joseph Schneider. Esq., Architect, Melbourne.
Charles Kennett, Esq., Melbourne.
George Ulrich, Esq., Melbourne.

Dr. Wilkie proposed John Macadam, M.D., as Honorary Secretary to the Institute. This was seconded by Dr. Iffla, and carried unanimously.

Professor Irving was elected Hon. Treasurer to the Institute, and R. Brough Smyth, Esq., and Thomas Skilling, Esq., Members of Council.

Sizar Elliott, Esq., read a paper on the *Cestracion Phillippi* (Port Jackson Shark), *Trigonia* and *Terebratula* of the Australian seas, illustrated by diagrams and specimens.

The thanks of the Institute were given to Mr. Elliott for his communication.

The Honorary Secretary read a paper from Dr. Ferdinand Mueller on the "*Octoclinis Macleayana*," a new Australian Pine, accompanied by a specimen of part of the tree.

The Secretary was instructed to convey to Dr. Mueller the thanks of the Institute.

The Hon. Secretary read a paper from Mr. R. Brough Smyth on a new mineral from MacIvor, sent him by P. Chauncey, Esq., District Surveyor.

The thanks of the Institute were given to Mr. Smyth.

Mr. Alexander Kennedy Smith. C.E., then read a paper on Wood Pavement, and its comparative value as compared with granite-paved and macadamised roads.

A discussion ensued, in which his Excellency, Mr. Rawlinson, Mr. Acheson, and others took part.

The thanks of the Institute were given to Mr. Smith for his communication.

His Excellency here left the meeting.

Dr. Iffla moved as follows :—

"That the Museum Committee be instructed to wait upon Henry "Langlands, Esq., one of the members for the city, to request that "he would take the necessary steps to move in the Legislative As- "sembly, that an address be presented to His Excellency Sir Henry "Barkly, K.C.B., to place on the Estimates for 1857, a sum not ex- "ceeding 20,000*l.*, towards the erection of a National Museum, in "connection with the Public Library, as originally intended. The "Committee to adopt such further steps as they may deem neces- "sary to secure the co-operation of the representatives of the people "in furthering this important national object."

This was seconded and carried.

8th April, 1857.

MONTHLY MEETING.

Dr. Iffla in the chair.

The Minutes of the previous monthly meeting held on the 4th of March were read and confirmed.

The Honorary Secretary read a letter from Dr. Mueller, sent in reply to the commuication of the Institute as agreed on at the former meeting.

Dr. Mueller expressed his sense of the honor the Institute had done him, and his determination to advance its interests by frequent contributions.

The members present who had been elected at the previous meeting, were introduced to the Institute by the Chairman.

The Honorary Secretary then read a letter from Mr. A. K. Smith, C.E., having reference to a charge of literary larceny ascribed to him by the "*Argus*" newspaper. The charge bore upon the paper on wood pavement, read by Mr. Smith at the former meeting.

Mr. Smith denied the validity of the conclusions drawn by the journal named and expressed his desire and intention to bring the whole matter before the Council of the Institute.

The following gentlemen were ballotted for and admitted ORDINARY Members of the Institute :—

John Millar, Esq., C.E., F.S.A., Geelong.
George Neumayer, Esq., Melbourne.
Rev. Wm. Henderson, Williamstown.
Robert Nalder Clark, Esq., B.A., Cambridge, Melbourne.
R. H. Horne, Esq., Melbourne.
John Kruse, Esq., Chemist, Melbourne.
The Hon. W. C. Haines, Melbourne.

Edward Snell, Esq., Engineer-in-Chief, Geelong and Melbourne Railway.
Rev. T. P. Fenner, M.A., South Yarra.
Andrew Burn, Esq., Geelong.
E. G. Fitzgibbon, Esq., Town Clerk, Melbourne.
John Shillinglaw, Esq., St. Kilda.
John Joseph Shillinglaw, Esq., Melbourne.
Charles Wilhelmi, Esq., Assistant Government Botanist, Melbourne.
David Purdie Maclean, Esq., Surgeon, Williamstown.
The Hon. Francis Murphy, Speaker of the Legislative Assembly.
Charles Watt, Esq., Melbourne.
Robert Knaggs, Esq., Surgeon, Melbourne.
Anthony C. Brownless, Esq., M.D., Melbourne.

Edward Wilson, Esq., then read a paper "On the Murray River Cod, with particulars of experiments instituted for introducing this fish into the Yarra." Specimens of the fish were exhibited.

A discussion ensued as to whether the fish named was a sea-seek ing fish, and as to the effect of this in militating against the ultimate success of Mr. Wilson's experiments.

Professor McCoy considered that salt water was not essential to the life of sea-seeking fish. The value of the fish ladders, invented by the late Mr. Smith, of Deanston, Scotland, in enabling sea-seeking fish during the spawning season to surmount the obstacle of water falls and weirs in the rivers inhabited by them, was also alluded to as being suitable, if necessity demanded it, for assisting the Murray Cod over the falls of the Yarra, under Prince's bridge. Reference was also made to the mode of preserving fish alive for some days by surrounding them with moistened moss.

Professor Irving moved a vote of thanks to Mr. Wilson for his communication, which was seconded by Mr. Acheson, and carried unanimously.

A paper was read by John Millar, Esq., C.E., Engineer-in-Chief to the Geelong Water Commission, "On the Supply of Water to the town of Geelong." The paper was illustrated by very beautiful maps of the gathering ground proposed, as also sections of the projected reservoir at Wormbete. Specimens of the water intended to be supplied were also exhibited.

An animated discussion ensued, in which Mr. Acheson, Professor McCoy, Mr. Rawlinson, Mr. A. K. Smith, Mr. Edward Wilson, and the Honorary Secretary took part.

A vote of thanks to Mr. Millar, for his elaborate and interesting communication was proposed by Professor McCoy, seconded by Dr. Macadam, and unanimously carried.

The Hon. Secretary laid upon the table the following contributions to the Institute,—

1. Printed Report of the North Australian Exploring Expedition, with the maps of the route. Presented by Dr. Mueller.

2. No. 2, Vol. XVII., of the Transactions of the Royal Astronomical Society.

3. Three volumes presented by the Smythsonian Society of America, through Mr. Lord, Collins Street; two volumes on Patents bearing on Mechanics and one on Patents relating to Agriculture.

Mr. Rawlinson gave notice of motion for the next meeting,to the following effect,—

"That a Committee, consisting of the President, Professor McCoy and Edward Wilson, Esq., be appointed to examine and report as to the necessity (if any such exists,) of aiding Mr. Edward Wilson in bringing to a successful issue his experiments on the introduction of the Murray River Cod fish into the Yarra Yarra and its tributaries."

The Institute then separated.

6th May, 1857.

MOHTHLY MEETING.

The Hon. Captain Clarke, R.E., President, in the Chair.

The Minutes of the previous monthly meeting were read and confirmed.

The new members elected at the preceding meeting were introduced by the President.

The Honorary Secretary read a communication from His Excellency the Governor, in acknowledgment of the letter of condolence forwarded to His Excellency by the Council on the occasion of the much lamented death of Lady Barkly.

The following gentlemen were balloted for, and admitted ORDINARY members of the Institute,—

Martin Sholl, Esq., Secretary G. and M. Railway.
Charles Edward Strutt, Esq., Melbourne.
John Lanktree, Esq., Sec. S. and W. Commission, Melbourne.
Wm. Farrage, Esq., Surgeon, Collingwood.
D. T. Hope, Esq., Contractor, Melbourne.
Wm. Austin Zeal, Esq., C.E., Melbourne.
Samuel V. Kemp, Esq., C.E., St. Kilda.
Robert Adams, Esq., C.E., Prahran.
Albert Purchas, Esq., Architect, Melbourne.
Benjamin F. Kane, Esq., Secretary N.B. of Education, Melbourne.
Patrick Hayes, Esq., Operative Chemist, Sandridge.
Henry Stevenson, Esq., North Melbourne.
John Musson, Esq., Contractor, St. Kilda.

The Honorary Secretary intimated that the "Transactions" of the Institute, for 1856, were printed, and that he only waited for final instructions from the Council to publish the same, in order that copies might be distributed to the members.

A paper was read by Frederick Acheson, Esq., in the absence of the author, R. Brough Smyth, Esq., C.E., &c., "On the Construction of an Instrument for ascertaining the Dew Point." The paper was accompanied by a sketch of the proposed instrument.

Professor Wilson made some observations on the probable value and practicability of the instrument, but the discussion was postponed on the suggestion of the President, until Mr. Smyth would have had made one of the proposed instruments and be thus enabled to exhibit its practical utility.

Professor Neumayer (commissioned by the King of Bavaria to conduct Magnetical Observations in this colony,) then read a paper "On the Theory of Terrestrial Magnetism, and the newest steps "taken for its advancement and completion," with "an explanation "of the most approved instruments constructed for the conducting "of such researches." The paper was illustrated by diagrams, and an extensive collection of magnetical instruments.

Professor Wilson spoke at considerable length during the discussion which ensued and considered that the establishment of a Magnetical Observatory had now become indispensable, and indeed, was a point of national honor. He referred to the efforts of the British Association in recommending the British Government to take advantage of her extended Colonial empire to further such researches. The Professor also adverted to the insufficiency of the thermal action of the sun to explain the phenomena of terrestrial magnetism, and advanced as an argument in favor of his view, that the existence of the spots on the sun's disc, and the changes to which these were subject, had no influence upon the intensity of the earth's magnetism. He quoted results obtained at the magnetical observatories of Toronto, St. Helena, Munich, and Hobart Town. Professor Wilson, on moving a vote of thanks to Professor Neumayer, expressed his earnest hope that the Government of Victoria would soon furnish the necessary means for establishing a Magnetical Observatory.

Dr. Iffla seconded the motion, and the President, Captain Clarke, in supporting it, referred to the practical bearings of magnetic science, and alluded to the value of these observations in the correcting of the existing definitions of boundaries and in navigation. The President further intimated that Colonel James was now sending out to this colony magnetical instruments, to be worked contemporaneously with the meteorological observations. In conclusion he passed a high eulogium on Professor Neumayer, and hoped that the Government would aid him to aid us.

Thanks to Professor Neumayer were then given by acclamation.

From the lateness of the hour, Mr. F. C. Christy's paper on "Railways in Victoria," announced in the notice paper, was postponed in its reading till next monthly meeting.

Mr. Rawlinson then brought forward the motion standing in his name, which was seconded by the Rev. Mr. Bleasdale.

Mr. Edward Wilson remarked that as he might leave the colony, the adoption, if necessary, of his experiments by the Institute might tend to encourage well disposed persons to protect the fish in the early stages of their developement.

The motion, after being modified, stood thus, and was passed, viz,—

"That a Committee consisting of the President, Professor McCoy, "and Edward Wilson, Esq., be appointed to take any steps that may "seem requisite in bringing to a successful issue Mr. Edward Wilson's "experiments on the introduction of the Murray River Cod fish into "the Yarra Yarra and its tributaries."

The Institute then separated.

3rd June, 1857.

MONTHLY MEETING.

The Hon. Captain Clarke, R.E., President in the Chair.

The Minutes of the previous monthly meeting were read and confirmed, and new members elected on that occasion were introduced by the President.

The following gentlemen, on being balloted for, were admitted ORDINARY members of the Institute, viz,—

B. C. Aspinall, Esq., M.L.A., East Melbourne.
James Smith, Esq., Collingwood.
Wm. Edward Bryson, Esq., C.E., Melbourne.
Edward C. Symonds, Esq., Melbourne.
William Schultz, Esq., Melbourne.
James Macoboy, Esq., solicitor, Melbourne.
William Elsden, Esq., C.E., Engineer to the M. and H. B. Railway Company.
J. B. Pounds, Esq., Surgeon, Pentridge.
Henry Joseph, Esq., Melbourne.
Thomas H. Rawlings, Esq., Epping.
A. E. McCracken, Esq., Saltwater River.
Robert Savage, Esq., St. Kilda.
John C. Cochrane, Esq., Moonee Ponds.
George B. Pennell, Esq., C.E., Gisborne.
Francis Thomas Gell, Esq., Solicitor, Melbourne.
H. F. Eaton, Esq., Melbourne
Henry Smith, Esq., C.E., F.G.S., Ballaarat.
Dr. John Gemmell, Woodville, East St. Kilda.

The Rev. William Scott, M.A., F.C.P.S., Astronomer of New South Wales, and late Fellow and Lecturer of Sydney Sussex College, Cambridge, was, on the proposal of Professor Wilson, seconded by Dr. Macadam, elected by ballot a CORRESPONDING MEMBER of the Institute.

The Honorary Secretory laid upon the table a communication from

Wm. Henry Archer, Esq., enclosing a prospectus of Dr. Petermann's Geographical Journal, published in Hamburgh, and soliciting in the name of the Hamburgh Consul and on behalf of this Journal, contributions bearing upon meteorology, terrestrial magnetism, the distribution of plants, &c.

The communication was remitted to the Council.

Professor Wilson read the report drawn up by the Committee appointed by the Council of the Institute, to enquire into the circumstances relating to Mr. A. K. Smith's paper on "Wood Pavement." Professor Wilson then moved that the report be received. This motion was seconded by Thomas E. Rawlinson, Esq., and unanimously carried. (See "Reports of Committees, page x.")

The Honorary Secretary intimated that the "Transactions" of the Institute for 1856 had been published, and that copies were upon the table for distribution to such members as were not in arrear of subscription. He also requested the contributors to furnish him with a list of any errors existing in their papers, as published, with the view of issuing, if necessary, a table of *errata*.

A paper was read by F. C. Christy, Esq., C.E., "On the Construction, Working, and Management of Railways in Victoria." The paper was illustrated by a large colored map, exhibiting the proposed inland railway routes from Melbourne and Geelong respectively, as also the summit levels of each when crossing the dividing range. The following subjects were adverted to, viz., features of country—effects of inclines and curves—laying out of stations and workshops—permanent way—rolling stock—construction of locomotives and permanent works—fuel—general management, and tramways or feeding lines. Mr. Christy recommended the use of flange rails which could be laid down without the use of wooden sleepers, since, in his opinion, wood might be expected to decay rapidly from atmospheric influence, and was, besides, objectionable from its liability to the ravages of the white ant, as also to combustion either from falling fuel or from bush fires. Mr. Christy believed that Barlow's plate rails would be found serviceable in this colony when fairly tried, and was inclined to disbelieve that any untoward influence from expansion would ensue.

A lengthened discussion followed. Mr. Rawlinson objected to the use of iron sleepers, because of the rigidity of the road and consequent increased wear upon the rolling-stock. He doubted the freedom of Barlow's rails from the effects of expansion.

Mr. Elliot questioned the influence of the white ant.

Dr. Mueller confirmed the opinion stated as to the destruction of hard woods by this insect, and cited his own observations in North Australia, and even far southward. He had found the white ants in great numbers in growing wood, particularly in the medullary rays, in which their ravages apparently first began.

Mr. Swyer believed that, under certain circumstances, larch sleepers would wear out the iron rails, and referred to local illustrations to prove that the period of duration for wood as given by the essayist was much too short.

Mr. Holmes considered that the woods of the colony had not yet been fairly tried.

Captain Clarke stated that Barlow's rails had been tried under the best circumstances on the Sydney and Parramatta Railway. The rails had proved a failure there, having began in a short time to buckle, even when three sleepers for each one recommended were used. Captain Clarke further thought that the best gradients had already been adopted for the proposed inland lines. He advocated single lines to begin with, and hoped that the general conclusions given in the paper read would not be accepted without proper investigation.

In answer to a question from Professor Wilson, Dr. Mueller stated that he believed that resinous sap preserved woods best, and added that one species of Eucalyptus, called the Mahogany Eucalyptus, peculiar to Western Australia, resisted the action of the white ant.

Messrs. Zeal, R. Brough Smyth, A. K. Smith and others, also took part in the discussion, after which a vote of thanks was given to the Essayist.

From the lateness of the hour, Mr. Edward Wilson's paper, on "the introduction of the British Song Bird," was postponed, and ordered to take precedence at the next Monthly Meeting of the Institute.

1*st July*, 1857.

MONTHLY MEETING.

The Hon. Captain Clarke, R.E., President, in the chair.

The Minutes of the previous Monthly Meeting were read and confirmed, and recently-elected members were introduced by the President.

The following gentlemen were elected ORDINARY members of the Institute by ballot :—

The Hon. James Cowie, Esq., M.L.C., Geelong.
Wm. Bennet Hull, Esq., C.E., Government Railway Department, Taradale.
Alexander Fisher, Esq., Surgeon, 83, Stephen-street.
Robert Lawson, Esq., 2, Royal Terrace.
Rev. Donald M'Donald, A.M., Emerald Hill.
Henry Moors, Esq., St. Kilda.
George Allan, Jun., Esq., Melbourne.
George Mackay, Esq., L.L.D., Melbourne.
Lieut. Henry Amsinck, R.N., Melbourne.

J. G. Knight, Esq., Architect of the Houses of Parliament.
Edgar Ray, Esq., Melbourne.
Wm. B. Hamilton, Esq., Melbourne.
Matthew William Hawkins, Esq., Government Railway Offices.
John Watson, Esq., 37, Bourke-street, Melbourne.
Wm. Henry Green, Esq., C.E., Government Railway Offices.
Thomas Hepburn, Esq., Smeaton House, Creswick.
Robert Watson, Esq., C.E., Government Railway Offices.
Rev. W. A. Fletcher, M.A., St. Kilda.

The Hon. Secretary laid upon the table the following contributions, viz. :—Vocabulary of Dialects of Aboriginal Tribes of Tasmania, by Joseph Milligan, Esq., F.L.S. ; the Second Meteorological Report for Victoria, by the Government ; Meteorological Tables for Tasmania, from January to May inclusive, by the Royal Society of Tasmania.

Edward Wilson, Esq., then read a paper " on the introduction of the British Song Bird." Mr. Wilson specially adverted to the sky-lark and nightingale. The essayist suggested that the Institute should take a special interest in the disposal of the grant about to be given by the Government for aiding the introduction of new animals into the colony, and give the movement its countenance and advice.

A discussion ensued, in which Dr. Iffla, Dr. Knaggs, the Rev. Mr. Bleasdale, Dr. Eades, Mr. Hough, Mr. Elliot, &c., took part.

Information was derived that many birds, as the linnet, bullfinch, thrush, and others, could be safely brought here from the mother country

The Rev. Mr. Bleasdale moved, and Mr. Acheson seconded, a vote of thanks to Mr. Wilson for his communication, which was unanimously carried.

Mr. Wilson then moved,—

" That a Committee be appointed to consider the question of the " introduction of the British Song Bird, as contained in the paper " just read, and recommend to this Society the steps desirable to " be taken. The Committee to consist of the President, Dr. Knaggs, " the Rev. Mr. Bleasdale, James Smith, Esq., the mover, and the " honorary secretary."

This was seconded by Dr. Knaggs, and carried.

From the lateness of the hour, Mr. A. K. Smith's paper announced for this meeting was postponed, and it was suggested that the Council should appoint an extra evening to receive the arrears of papers in the Secretary's hands.

15*th July*, 1857.

Extra Meeting.

Professor Wilson, Vice-President, in the Chair.

A paper was read by Alexander Kennedy Smith, Esq., C.E., " On the Application of Machinery and Mechanics to Agriculture."

A discussion ensued, in which Mr. Stevenson, Mr. Skilling, Mr. Savage, Dr. Macadam and others took part.

Dr. Mackenna moved a vote of thanks to Mr. A. K. Smith, for his paper. This was seconded by Thomas Skilling, Esq., and carried.

5th August, 1857.

MONTHLY MEETING.

Professor Wilson, Vice-President, in the Chair-

His Excellency Sir Henry Barkly, K.C.B., Patron of the Institute, was present.

The minutes of the general monthly meeting, held on the 1st of July, and those of the extra meeting, held on the 15th of the same month, were read and confirmed.

Several recently elected members were introduced by the President.

A ballot was held and the following gentlemen were elected ORDINARY members of the Institute :—

The Hon. John B. Bennett, Esq., M.L.C., St. Kilda.
George Dill, Esq., Collins Street.
Thomas Francis, Esq., Watchmaker, 130 Brunswick Street, Collingwood.
D. A. Hughes, Esq., M.L.A., Prahran.
E. J. Thomas, Esq., 102 Lonsdale Street West.
Joseph Oppenheimer, Esq., Merchant, Melbourne.
Rev. G. O. Vance, M.A., Oxon., Rector of the Geelong Grammar School.
D. Baillie, Esq., Contractor, 120 Flinders Lane East, Melbourne.
Alexander John Skene, Esq., District Surveyor, Geelong.
James Bonwick, Esq., Inspector of Denominational Schools, Kew.
George Hicks, Esq., Commercial Editor, *Argus* office.
A. B. Orlebar, Esq., M.A., Inspector of National Schools.
W. Lockhart Morton, Esq., Agricultural Machine Maker, Elizabeth Street.
Francis A. Corbett, Esq., Census Office, Melbourne.
Thomas Belt, Esq., Meteorological Observer, Mount Egerton.
Wm. Henry Ritchie, Esq., Patent Agent, Chancery Lane.
Edwin Jones, Esq., Mathematical Instrument Maker, Melbourne.
The Hon. John O'Shanassy, Esq., M.L.A., Melbourne.
The Hon. Daniel Joseph Tierney, Esq., M.L.C., Melbourne.
Wm. E. Stanbridge, Esq., Wombat, Hepburn.
James B. Houghton, Esq., Merchant, 71 Flinders Lane West.
Paul Howard Macgillivray, Esq., A.M., Surgeon, Williamstown.

The honorary secretary laid upon the table the following contributions, viz. :—" The Meteorological Table of Tasmania, for June," by the Royal Society of Tasmania ; the first and second numbers of the " Sydney Magazine of Science and Art," and the first number of the " Month" by the publishers.

Dr. Ferdinand Mueller, the Government Botanist, then read a paper, being " An Account of some new Australian Plants," with an exhibition of Specimens. The Plants produced had been collected principally during the Northern Expedition, and included several New Genera.

Dr. Wilkie, Vice-President, having taken the Chair, Professor Wilson read a paper on " Life Insurance."

A short discussion followed, in which His Excellency and others took part.

A paper was read by Robert Savage, Esq., " On the Advantages to be derived from the use of Machinery in Victoria."

George Frederick Verdon, Esq., gave notice of motion, for next monthly meeting, as follows :—

" That it is expedient to organize a system of combined action amongst all the Scientific Societies throughout the Colony."

" That, to effect this object, it is advisable to prepare a series of propositions affirming the necessity of, and setting forth the advan-" tages to be derived from uniformity of procedure, and stating " generally the principles upon which the union should be based."

" That such propositions shall be prepared by a Committee, to " consist of ——— and having been approved by the Society shall " be submitted to the various Mechanics' and other kindred " Institutions in Victoria, for adoption."

2nd September, 1857.

MONTHLY MEETING.

Professor Wilson, Vice-President, in the Chair.

The Minutes of the previous monthly meeting were read and confirmed and several new members were introduced to the Institute by the Chairman.

A ballot was held and the following gentlemen were duly elected ORDINARY members of the Institute, viz. :—

Alexander Thomson, Esq., M.D., Mayor of Geelong.
Thomas Mason, Esq., Chairman of the Municipal Council, Williamstown.
Captain H. Butler Stoney, H. M. 40th Regiment.
William Hosking, Esq., Mining Engineer, 100 Brunswick Street, Collingwood.
William Weire, Esq., Town Clerk, Geelong.
William Randle, Esq., Railway Contractor, Melbourne.
James Robertson, Esq., M.A., M.D., 205 Swanston Street.

Frederick A. Stratford Esq., Sub-manager of the E. S. and A. C. Bank, Williamstown.

Count John Dembinski, Melbourne.

William Wright, Esq., Railway Contractor, Melbourne.

Lieut. C. A. D. Pasco, R.N., Resident Magistrate, Williamstown.

Alexander Fyfe, Esq., M.L.A., Geelong.

Alexander Morrison, Esq., M.A., Principal of the Scotch College, Melbourne.

Robert Campbell, Esq., Merchant, 172 Collins Street, East.

William Hamilton, Esq., Teacher, John Knox's School, Melbourne.

Lieut. William Dowman, H. M. 40th Regiment.

Charles Broad, Esq., Senior Assistant Immigration Officer, Williamstown.

W. F. Preshaw, Esq., Surgeon and Coroner, Castlemaine.

— Migeod, Esq., Physician, Bourke Street, East.

The honorary secretary laid upon the table two contributions, viz., Abstract of Meteorological Observations, taken in Victoria, during the quarter ending 30th June, 1857, by the Government, and a Copy of the first newspaper printed in Port Phillip (the *Melbourne Advertiser*) by R. W. Wrede, Esq.

A paper was read by W. A. Zeal, Esq., C.E., on "Railway Gradients." This paper was illustrated by diagrams, and the thanks of the Institute were awarded to Mr. Zeal for his interesting communication.

William Blandowski, Esq., then read a paper, containing an account of his "Recent Discoveries in Natural History on the Lower Murray." The paper was accompanied with several elaborate portfolios of sketches of objects of natural history, taken by the author during his sojourn in the district named. A specimen of the Australian Boa Constrictor was exhibited.

An animated discussion followed the reading of the paper.

Thanks were voted to Mr. Blandowski for his communication.

From the lateness of the hour, Dr. Mueller, with the consent of the members, postponed the reading of his paper on "A general introduction of useful Plants into Victoria.': The paper, however, to take precedence at the next general meeting.

For the same reason, George Frederick Verdon, Esq., postponed the moving of his resolutions on the union of Scientific Societies in the Colony.

The Rev. J. J. Bleasdale gave notice of motion to the following effect :—

"That the Institute apply to the Honorable the President of the "Board of Land and Works, for a general order to enable the Institute "to obtain from the national collections, at present located in the University, any specimens necessary for illustrating subjects treated on "in papers read before the Institute; provided, that such specimens "or preparations be transferred on the day of meeting at the expense

"of the Institute and returned on the following day at hours conve-
"venient to the Curator of the Museum.—And further, that the
"specimens sought for, be of such a nature, as shall not be injured
by such removals if conducted with care."

25th September, 1857.

SPECIAL GENERAL MEETING.

David E. Wilkie, Esq., M.D,, Vice-President, in the Chair.

The object of this meeting being convened, was to consider the draft of new rules drawn up by the Council, and with the view of obtaining the sanction of the members generally to the adoption of the code submitted. A copy (printed) of the proposed rules had been sent to each member of the Institute for perusal.

The proposed rules were read by the honorary secretary, and discussed *seriatim.*

Several alterations were made, and the rules, fifty-eight in number, were then adopted.

The rules were ordered to be printed, as amended and distributed to the members. (See copy of rules in appendix.)

Professor Wilson gave notice of motion for the next monthly meeting to the effect—

"That a Committee be appointed to wait on Her Majesty's Govern-
"ment, and take such other steps as they may deem expedient, for
"promoting the establishment of an Astronomical, Magnetical, and
"Meteorological Observatory, on a scale commensurate with the
"importance of the colony. The Committee to consist of the Hon.
"Capt. Clarke, R.E., R. L. J. Ellery, Esq., R. Brough Smyth, Esq.,
"Professor Neumayer, and the mover."

The Institute separated at near midnight.

30th September, 1857.

MONTHLY MEETING.

Professor Wilson, Vice-President, in the Chair.

His Excellency the Governor was present.

The Minutes of the previous meeting, and of the Special General Meeting, held on the 25th of September, were read and confirmed.

New members, present for the first time, were introduced by the President.

The following gentlemen were duly elected ORDINARY members of the Institute, by ballot, viz. :—

The Hon. William Roope, Esq., M.L.C., Geelong.

The Hon. Robert C. Hope, Esq., M.L.C., Melbourne.

W. Wade, Esq., Agriculturist, Bedford, Kew.

The Rev. Adam Cairns, D.D., Melbourne.

The Rev. J. Divorty, A.M., South Yarra.
S. W. McGowan, Esq., General Superintendent of Electric Telegraphs.
Dr. James Macrae, Napier Street, Collingwood.
Thomas Chirnside, Esq., Werribee.
John Thomson, Esq,, 39 Collins Street, West.
Richard Nash, Esq., Acting Colonial Storekeeper.
Matthew William Taylor, Esq., Solicitor, Collins Street, West.
Dr. Barry, Gardiner's Creek Road.
Captain R. B. Matthews, Melbourne.
Barnard Matthews, Esq., Melbourne.
Allan Spowers, Esq., *Argus* office.
James H. Dow, Esq., Foundry, Flinders Street.
Alfred Ross, Esq,, Melbourne.
James Gill, Esq., Melbourne.
Wm. Paterson Muir, Esq., Flinders Street.
— Dauglish, Esq., of Messrs. Raleigh & Co.
James Jackson, Esq., Engineer, North Melbourne.

The Secretary laid upon the table the following contributions, viz., " Description of a Valuator of Gold with quartz, by John Phillips, Esq., C.E.; "Papers on an alleged new Motive Power," by N. L. Kentish, Esq.; " Meteorological Table, for July, 1857" by the Royal Society of Tasmania; Parts 1st, 2nd and 3rd, of the "Transactions of the Cambridge Philosophical Society" (Vol. IX.) from that body.

The Secretary announced the publication of Part 1st, of Volume II., of the "Transactions of the Institute," as also of the new Code of Rules.

Mr. Verdon brought forward his motion bearing on the Union of Scientific Societies. A discussion ensued, in which Professor Hearn, Drs. Maclean, Eades, Macadam, and others, took part. Ultimately the motion was carried, as far as the appointment of a Committee to enquire into the feasability of the project was concerned.

The Rev. Mr. Bleasdale's motion, in reference to the obtaining of Specimens from the National Collections, was carried unanimously.

Professor Wilson's motion was carried. The Committee appointed to consist of the Hon. Captain Clarke, R.E., Mr. Archer, Mr. Orlebar, the Rev. Mr. Bleasdale, Dr. Howitt, Mr. Edward Wilson, and the mover.

Professor Wilson read letters approving of, and strongly urging the subject of the motion, from the President of the Royal Society of London, from the Rev. Mr. Robinson, and from Lord Rosse.

Mr. Edward Wilson gave notice of motion, to the following effect,—

"That Dr. Barry and Allan Spowers, Esq., be added to the "Committee appointed to facilitate the introduction of the "British Song Bird."

Dr. Mueller read a paper on a general introduction of useful plants into Victoria.

Wm. Edward Stanbridge, Esq., of Wombat, read a paper on "The Astronomy and Mythology of the Aborigines of Victoria.'

Discussion followed the reading of both papers.

The Secretary announced that, in accordance with the new rules, the future meetings of the Institute would take place every three weeks, and that the hour would be altered from 8 o'clock to half-past 7 o'clock.

21*st October*, 1857.

ORDINARY MEETING.

Professor Wilson, Vice-President, in the Chair.

The Minutes of the previous meeting were read and confirmed.

Recently elected members, present for the first time, were introduced to the Institute by the Chairman.

The Secretary read the names of seventeen candidates for membership, to be balloted for at the succeeding General Meeting, in accordance with the mode of election laid down in the new rules.

The Secretary read a communication from Dr. Frederick Tamnau, jun., of Berlin, in which that gentleman solicited Australian Mineralogical Specimens in exchange for a collection of Specimens illustrative of the Mineralogy of Europe.

In consideration of the Institute not yet being in a position to respond to Dr. Tamnau's request, the Secretary was instructed to forward a copy of the communication to the Curator of the national collections at present located in the University.

Mr. Rawlinson, on behalf of Mr. Verdon, requested permission for the postponement of the appointment of a Committee to consider the proposed Union of Scientific Societies throughout the colony, which was acceded to.

Mr. Edward Wilson moved that Dr. Barry and Allan Spowers, Esq., be added to the Committee appointed to facilitate the introduction of the "British Song Bird," which was seconded, and carried unanimously.

Dr. Wilkie gave notice of motion to the following effect,—

"That a Committee be appointed to consider and report on the "practicability of fitting out in Victoria a Geographical Expe- "dition, for the purpose of carrying out the great idea of the "lamented Leichhardt, of exploring the vast interior of Australia "from east to west, and for the purpose, if possible, of gathering

"some tidings of the fate of Leichhardt and his party. The pro-
"posed expedition to start from Curtis Bay on the east coast and
"to make a direct course westward in the latitude of the tropic of
"Capricorn to Shark Bay on the west coast, embracing at the
"same time, any fitting opportunity of exploring the interior both
"to the north and south of this line."

Mr. Clarson gave notice of motion to the following effect,—

"1st. That the Council of the Institute, having obtained permission, on the 29th of August, from the President of the Board "of Land and Works, that Mr. Blandowski should be allowed to "prepare a paper, to be read before the Institute, containing a "short statement of his recent discoveries on the Lower Murray "river, and Mr. Blandowski having accordingly read such paper at "the monthly meeting of the Institute held on the 2nd of September last; and the Council of the Institute having, at a meeting held on the 14th of October thereafter, resolved to publish "such paper in the forthcoming volume of the "Transactions," "and having voted also the sum of £30 for engraving the plates "to accompany such paper, and Mr. Blandowski having entered "into an agreement with an engraver for this purpose, and the "plates being already in hand; this meeting regrets that the "Council at an extraordinary meeting, held on the 20th of October, "came to the determination to rescind their former resolution to "publish Mr. Blandowski's paper, and to cancel the vote of £30 "granted for the purpose of engraving these plates, without assigning other reason to Mr. Blandowski than that they now "consider the above paper as the property of the Government."

2nd. "That this meeting considers that the paper read by Mr. "Blandowski must in accordance with the rules be considered as "the property of the Institute; and in justice to Mr. Blandowski, "who was requested by the Council to prepare the above paper for "the Institute, they recommend the Council to publish the paper "in the forthcoming volume of the "Transactions," in accordance "with their first resolution."

Sizar Elliot, Esq., read a paper on "The Preservation of Animal Substances." illustrated by specimens of preserved meats, which had been kept in a proper state of preservation for ten years.

Dr. Eades explained to the Institute his inability to read his paper on "The distinctive characters of the Diamond and Crystallized Boron," from the circumstance of his not having at his command Crystals of Boron, but he hoped to be able at an early period to present his communication.

Mr. James Jackson read a paper on "Railways in Victoria."

The Secretary repeated the announcement of the publication of Past 1st, Volume 2nd, of the "Transactions of the Institute."

11*th November*, 1857.

ORDINARY MEETING.

Dr. Wilkie, Vice-President, in the Chair.

The Minutes of the previous meeting were read and confirmed.

Several new members were introduced to the Institute by the Chairman.

The Secretary read the name of one candidate for membership, viz., Richard Gibson, Esq., Road Engineer, Tarraville, proposed by Frederick Acheson, Esq., C.E., and seconded by Dr. Macadam.

The following gentlemen were elected, by ballot, ORDINARY members of the Institute.

John Wilkins, Esq., M.B., J.P., District Surgeon and Coroner, Williamstown.

Joseph Geary, Esq., Inspector of Denominational Schools, Melbourne.

Arthur Davitt, Esq., Principal of the National and Model Training Schools.

Patrick Whyte, Esq., B.A., of T.C.D., National and Model Training Schools.

Henry Elder, Esq., Jeweller, Great Bourke Street, East.

Robert MacKay, Esq,, Tide Inspector, H. M. Customs, Williamstown.

J. S. Mackenzie, Esq., H. M. Customs, Williamstown.

Joseph Bosisto, Esq., Chemist, Richmond.

Robert Wharton, Esq., J.P., 3 Queen Street, Melbourne.

Lieutenant W. C. Bancroft, A.D.C.. H. M. 16th Regiment, Toorak.

Richard Thomas Tracy, Esq., M.D., Brunswick Street, Collingwood.

Robert Graham Gilmore, Esq., of Messrs. G. W. Cole & Co., Merchants, Melbourne.

Lewis Vieusseux, Esq., Principal, Ladies' College, Victoria Parade, Melbourne.

John Cairns, Esq., Merchant, 21 Queen Street, Melbourne.

Thomas Bibbs, Esq., Draughtsman, Government Survey Offices.

The following Committees were re-appointed, viz. :—

The "Museum" Committee; the Committee for "Superintending the iutroduction of the British Song Bird into Victoria, and the Murray Cod fish into the Yarra;" the "Mining" Committee, and the Committee to carry out the "Establishment of an Astronomical and Magnetical Observatory."

The name of the Rev. J. J. Bleasdale was added to the Museum Committee.

G. F. Verdon, Esq., through Thomas E. Rawlinson, Esq., nominated as a Committee on the subject of the "Union of the Scientific Societies of the Colony,"—Drs. Eades, Macadam, Maclean, and Messrs. Macgillivray, Sinnett, Ellery, Rawlinson and Verdon, and the Rev. William Henderson.

The Committee was agreed to.

The Secretary read a communication from Mr. Clarson, withdrawing the notice of motion standing in his name.

Dr. Wilkie having vacated the chair, which was taken by Dr. Iffla, brought forward his motion on the subject of Australian Exploration, and nominated as a Committee, the following gentlemen, members of the Institute :—The Hon. Captain Clarke, R.E., President; the Hon. W. C. Haines, M.L.A.; the Hon. John O'Shanassy, M.L.A. ; the Hon. John Hodgson, M.L.A.; the Hon. the Speaker of the Legislative Assembly; the Hon. R. C. Hope, M.L.C.; Professors Wilson, Irving, McCoy and Hearn; Drs. Mueller, Iffla, Macadam, Gillbee, Knaggs, McLean and Turnbull; the Rev. Messrs. Bleasdale and Morison; Professor Neumayer; Messrs. Selwyn, Edward Wilson, Rawlinson, Blandowski, Knight, Dobree, Bonwick, Elliot, Bland, Farewell and Acheson, and the mover, with power to add to their number.

Dr. Wilkie, in bringing forward his motion, stated that the geographical exploration of the interior was a subject of great national importance. On scientific grounds it was peculiarly the province of the Institute to promote this great object. The proposed search for Leichhardt would, he felt assured, command the warmest sympathy of the members and the public. In no part of the world was there so wide an extent of available country for the future settlement of the surplus population of the old world. The exploration of the interior was, therefore, fraught with the most important results. He referred to the indomitable courage displayed by Dr. Livingston in Africa, and to his extraordinary success as an explorer. He referred, further, to the valuable results of the exploring expeditions of Sturt, Leichhardt, Mitchell, and Gregory. He recommended that the proposed expedition should follow the northern boundary of Sturt's desert, which, he believed would be found not far north of the tropic of Capricorn; the beautiful country on the Victoria river, near this latitude, favored this opinion. There was every probability of gaining some tidings respecting Leichhardt's fate by exploring this route. Six thousand pounds would be necessary to organize and maintain a suitable exploring party for a period of two years, which would suffice for the proposed objects. New South Wales had fitted out many exploring expeditions; South Australia and Swan River had also had their exploring parties. The Royal Geographical Society of London and the Home Government had contributed large sums for the same end. Victoria, alone, had hitherto seemed to forget the claims of science and the future interests of Australia, but ought, from her unexampled wealth, and her large and rapidly increasing population, to take the lead in geographical discovery. The present was the most auspicious occasion for Victoria to contribute her share in this honorable work. Her Majesty's Representative, Sir Henry Barkly, was the friend and patron of science and he ventured to hope that His Excellency would aid the cause of geographical discovery. Sir W. Denison was at present organizing an exploring party in search of Leichhardt. This expedition being equipped for six months only, ought not to interfere with the Victorian expedition, which was intended to embrace far wider objects. He had no doubt that Victoria would now endeavor to emulate the noble example of the other colonies. If the proposed expedition should be successful in exploring the central regions of Australia from east to west, this disinterested contribution of Victoria to the cause of science would be honorably remembered in Australian history.

Dr. Wilkie's motion was seconded by Mr. Dobree.

Dr. Macadam moved an amendment to the effect,—

"That the subject be postponed until the results of the expe-
" dition now being organised by the Government of New South
" Wales for a similar purpose should be known."

This was seconded by J. D. Pinnock, Esq.

The Rev. Mr. Bleasdale moved, as a second amendment,—

" That the Philosophical Institute appoint a Committee to devise
" the best means to co-operate with the promoters in New South
" Wales of the search for Leichhardt, and the exploration of the
" interior of Australia, in order to enable the party to pursue their
" explorations entirely across the Continent of Australia, as near
" to the Tropic of Capricorn as possible."

This was seconded by Dr. Mueller.

Dr. Gillbee moved a third amendment to the effect,—

"That the discussion be postponed till the next Ordinary
" Meeting," which was seconded by Mr. Broad.

The amendments were severally put and negatived. The original motion was carried, as also the Committee, nominated by the mover.

The Secretary read a communication from J. Brache, Esq., C.E., requesting permission to give notice of motion of his intention to bring forward the report of the "Mining Committee of the Institute."

W. Blandowski, Esq., read a paper on " Extensive Infusoria De-
" posits in the Malee Scrub, near Swan Hill, on the Lower Murray,
" River, in Victoria." As also, " Observations on the Existence
" of Fucoidæ in a Fossil State in the Silurian Rocks near Mel-
" bourne, as in the neighborhood of the Botanic Gardens." Mr. Blandowski exhibited specimens and drawings.

Thomas E. Rawlinson, Esq., C.E., read a paper entitled,
" Observations on the Saw-fish, with Young, taken in Hobson's

" Bay, near Gellibrand's Point, in October, 1857." He exhibited specimens of the young, and presented them to the Museum of the Institute.

25th November, 1857.

EXTRA MEETING.

The Hon. Capt. Clarke, R.E., President, in the chair.

His Excellency Sir Henry Barkly, K.C.B., was present.

The Minutes of the previous Ordinary Meeting were read and confirmed.

The Secretary laid upon the table the following contributions:— 1st. "Half-yearly Report of the Superintendent of the Astronomical Observatory, ending 30th June, 1857," by the Government. 2nd. "Nos. 47, 48, 49, and 50, of the *Quarterly Journal* of the Geological Society of London," presented by the Society. 3rd. "Meteorological Tables for August, September, and October, 1857," by the Royal Society of Tasmania. 4th. "Abstract of Meteorological Observations taken in Victoria during the quarter ending 30th September, 1857," by the Government.

Dr. Ferdinand Mueller read a paper entitled, "An Historical Review of the Explorations of Australia."

An animated discussion ensued, in which His Excellency, the President Captain Clarke, Mr. Blandowski, Dr. Mueller, and others, took part.

Thomas Belt, Esq., Meteorological Observer, Mount Egerton, read a paper on "An Enquiry into the cause of Whirlwinds."

A discussion took place, in which Professor Wilson and others expressed their views.

The Secretary then read a communication from the Rev. Julian Edmund Woods, Catholic Missionary, Penola, entitled, "Observations on some Metamorphic Rocks in South Australia."

The President announced that this meeting was the concluding one of the present session for the reading of papers; that the GENERAL MEETING of the Institute for receiving the ANNUAL REPORT would be held on Monday, the 7th of December following, and that the Meetings for Ordinary Business would be resumed in March ensuing.

7th December, 1857.

THE GENERAL MEETING.

Professor Wilson, Vice-President, in the chair.

Several members, recently elected, were introduced to the meeting.

The business, as set forth in the notice paper, was "For the purpose of receiving from the Council the Report of the Proceedings of the Institute during the past year, embodying the Balance Sheet, duly audited, and a statement of the present position of the Institute."

The Honorary Secretary (Dr. Macadam) read the Third Annual Report of the Institute as drawn up by the Council.

Professor Wilson moved,—

"That the Report now read be received and printed."

This was seconded by Dr. Mackenna, and unanimously carried. (See Annual Report for 1857 in the following pages.)

The Balance Sheet, audited by Charles Farewell, Esq., and Francis T. Gell, Esq., showing a sum to the credit of the Institute on the 1st of December, 1857, of eleven hundred and ninety pounds, fourteen shillings and eleven pence sterling, was also read by the Secretary. received by the meeting, and ordered to be printed. (See Balance Sheet for 1857, p. liv.)

The Treasurer's and Secretary's accounts of petty expenses were laid upon the table.

Professor Wilson having vacated the chair, which was taken by Dr. Iffla, read the Report of the "Observatory" Committee, which was received by the meeting, and ordered to be printed in the "Transactions" of the Institute. (See Reports of Committees.)

The Institute then separated.

21*st December*, 1857.

Special General Meeting.

Dr. Wilkie, Vice-President, in the Chair.

The object of the meeting, as set forth in the notice paper, was to receive the Report of the Committee appointed to consider and report on the practicability of fitting out in Victoria a geographical expedition, &c.; as also for the confirmation of the Minutes of the meetings held on the 25th of November and 7th of December.

The Minutes of the last ordinary meeting, and of the recent general meeting were read by the Secretary and confirmed.

From the attendance of members being limited, no doubt, because of the season of the year and the lengthened notification for general meetings required by the rules, Mr. Elliot proposed, "That the meeting should adjourn till the following evening, and that the Secretary be instructed to give publicity to the circumstance by public advertisement."

The motion was seconded and carried.

22nd December, 1857.

ADJOURNED SPECIAL GENERAL MEETING.

Dr. Wilkie, Vice-President, in the Chair.

The Secretary read the Report drawn up by the "Exploration" Committee.

A discussion ensued, in which Messrs. Bonwick, Rawlinson, Acheson, Blandowski, and Drs. Eades and Macadam with others took part; after which the Report as read, was received, and a Committee appointed to carry out the objects contemplated. (See Report of Exploration Committee.)

The Institute then separated.

ANNUAL REPORT FOR 1857.

THIRD REPORT *of the* COUNCIL *of the Philosophical Institute of Victoria, presented to the Members at the General Meeting, on the 7th of December,* 1857.

THE Council, in submitting their Third Annual Report, congratulate the members on the continued prosperity of the Institute.

The position and prospects of the institute are highly satisfactory for the present and most encouraging for the future. One of the gratifying features in its history during the past year has been the great extension of the roll of membership; the number of members having more than doubled since the date of the last annual report. Since that time 155 gentlemen have been elected by ballot Ordinary Members and one gentleman as a Corresponding Member of the Institute. The Council feel justified in referring to this as an indication of the amount of public confidence reposed in the Institute and they have no doubt but that many of the newly-elected members will, from their scientific attainments, prove valuable accessions to the Institute.

Another circumstance indicative of the increased appreciation of the objects of the Institute, was the large number of papers presented on subjects legitimately within the province of the Institute. The Council refer with great pleasure to their experience in this particular, as it removed a difficulty that has in great measure heretofore existed, and they trust that their successors in office will have their duties lightened, and their anxieties relieved in a similar manner. The Council have, with much deliberation, exercised their discretion in selecting for publication in the "Transactions" of the Institute such of these papers as appeared in their judgment to be most original and likely to prove most useful.

The Council recommend to the consideration of their successors in office, the system recently adopted, of printing the "Transactions" at periods not exceeding six months, since, by this practice, the proceedings of the Institute receive earlier publicity.

Another feature, not less gratifying, consists in the numbers of contributions forwarded to the Institute from kindred societies. The Council have placed themselves in communication with the leading British and Foreign Scientific Associations, with the view of exchanging copies of their "Transactions," and many of these have already evinced a ready reciprocity. The Council look forward with hope to the time when this element of mutual benefit will yield the most beneficial results in forming the nucleus of a valuable scientific library of reference for the members. It may here, however, be stated that the Institute is as yet unprovided with accommodation for their property. This is matter of regret, as the Council are aware that if such were supplied, many valuable contributions of specimens would be presented to the Institute. This deficiency is more to be regretted, as some collections presented by members cannot be taken possession of until suitable accommodation is provided for their reception. This subject has indeed, for a long time, engaged the earnest consideration of the Council. They have, in the meantime, applied to the Government for a site on which to erect a suitable building for the Institute, and so favorably has their application been received by the Honorable the President of the Board of Land and Works, that they were invited by that gentleman to name trustees, and give other details. This has been done, and the Council anxiously wait to receive intimation of the site bestowed,* when they would recommend to their successors in office to lose no time in erecting such accommodation as would serve the immediate wants of the Institute, with the view of future extension.

For this purpose there is at present available a large sum, which will be further augmented by the subscriptions of the members now becoming due.

The financial condition of the Institute is in the highest degree satisfactory. From the necessary expenditure in the printing of the "Transactions" for the years 1856 and 1857, this result would have been otherwise, had not the Government with a spirit of liberality, placed upon the Estimates the sum of one thousand pounds sterling, which amount has been received by the Treasurer. The Council refer with pleasure to this grant made to the Institute by the Government and Legislature, and they feel assured that their earnest desire to render the Institute worthy of such encouragement will continue to be appreciated. It will be gratifying to scientific men in all parts of the world to observe that in Victoria the claims of science are not overlooked. Indeed, it is worthy of notice that the present era is remarkable for the high appreciation and ample encouragement generally afforded to scientific and learned societies.

Various committees have been nominated for the purpose of enquiring into and carrying out subjects of local and general interest. Among other results, it may be stated that arrangements have been made for the reception of an extensive collection of British Song Birds, presented to the Institute by an English Lady, in furtherance of the project brought under your notice in a paper read on the subject of "the introduction of such birds into

* A site has, since the reading of this report, been granted for the purposes of the Institute by His Excellency the Governor in Council. (See Correspondence, &c., in the "APPENDIX.")

the colony." An aviary in a suitable locality (the Botanic Gardens) is in process of construction, and the arrangements have been placed under the superintendence of an efficient sub-committee.

An active sub-committee was appointed to revise the rules of the Institute, and after several meetings a code of rules was submitted to the Council and approved of. At a Special General Meeting the code was received and adopted with slight alterations. The rules were afterwards printed, and placed in the hands of the members.

The subject of the obtaining of a Royal Charter has from time to time engaged the attention of the Institute, but the Council regret to state that no definite steps have as yet been taken towards this object. They consider, however, that the period has now arrived, when an immediate application with this view should be made to Her Most Gracious Majesty the Queen, and they would particularly recommend to their successors in office the carrying out of this desideratum.

Your Council feel that they would be but imperfectly performing their duty, did they fail to bring prominently before the Institute in this report, the valuable services of the Secretary, Dr. Macadam; services which, in their opinion, have greatly contributed to the success of the Institute; and, when it is further considered how much valuable time the Secretary has given to his gratuitous labours, they feel that justice demands this acknowledgment at their hands.

In thus submitting their Annual Report or *Resumé* of the proceedings for the past year, the Council would again congratulate the members on the prosperous career which the Institute has enjoyed, and the prospect of increasing usefulness which is expanding before it. They would strongly urge the members to a continuance of that individual influence and exertion which alone will enable the Institute to maintain and strengthen the position it now occupies. And, in now resigning the the trust committed to them, the Council sympathise with their successors in office on the important duties which will devolve on them when energetically carrying out the noble objects of the Institute, and rendering it, in the fullest sense, a "National Institution," and an honor to the land we live in.

BALANCE SHEET OF THE PHILOSOPHICAL

THE TREASURER IN ACCOUNT WITH

1st January, 1857 to

Receipts.		£ s. d.
To Government Grant in Aid		1,000 0 0
,, Subscriptions for 1857, 186 at £2 2s.	£390 12 0	
,, Do., Half-yearly, 7 at £1 1s.	7 7 0	
		397 19 0
,, Entrance Fees, 7 at £2 2s.		14 14 0
,, Life Subscriptions—		
A. K. Smith, Esq.	10 0 0	
J. Macadam, Esq., M.D.	10 0 0	
S. Iffla, Esq,, J.P.	10 0 0	
Rev. J. J. Bleasdale	10 0 0	
		40 0 0
,, Subscriptions for 1856, 20 at £2 2s.		42 0 0
,, Sale of Transactions to Dr. F. Mueller		5 0 0
,, Interest on Bank Account (Sept. 30th)		0 3 4
		£1,499 16 4
Cr. Balance 1st Jan., 1857		177 2 9
		1,676 19 1

M. H. IRVING, Treasurer.

INSTITUTE OF VICTORIA FOR YEAR 1857.

THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

1st December, 1857.

Expenditure.		£ s. d.
By Expenses of Management in 1856, paid in 1857—		
Expenses of Museum Committee	£6 19 6	
Walsh, Messenger	2 0 0	
Franklyn, Printing Circulars	6 0 0	
Secretary, Petty Cash	3 2 2	
Jones, Copying Report of Council	2 10 0	
		20 11 8
,, Publication of Transactions for 1855-1856, 300 copies—		
Goodhugh and Hough, Printing	99 7 6	
Detmold, Binding	20 0 0	
De Gruchy and Leigh, Lithographing	18 0 0	
		137 7 6
,, Expenses of Management during 1857—		
Secretary, Petty Cash	50 0 0	
Treasurer, do.	15 0 0	
Glasborow, Messenger	0 15 0	
Franklyn, Printing Circulars	23 14 6	
Do., Advertising	1 10 0	
Mechanics' Institute, Hall for Meetings from July to December, 1857	18 16 0	
Fairfax, Printing New Rules	22 0 0	
		131 15 6
,, Expenses of Furniture—		
Thwaites for Ballot Box	2 2 0	
Paxton and Allan, Cabinet	5 0 0	
		7 2 0
,, Grants to Committees—		
E. Wilson, Chairman Song Bird Committee	30 0 0	
D. E. Wilkie, Chairman Exploration Committee	5 0 0	
Secretary, Expenses incidental to the dinner given to His Excellency the Governor	17 7 0	
		52 7 0
,, Publication of Transactions for 1857, Part I., 500 copies—		
Goodhugh and Hough, Printing	54 0 0	
Detmold, Binding	6 5 0	
Becker, Lithographing	26 0 0	
Hamel and Locher, do. and Printing	11 15 6	
Friend, Printing	9 0 0	
		107 0 6
,, Illustrations for Transactions for 1857, Part II.—		
Grosse, Wood Engraving		30 0 0
		486 4 2
Cr., Balance, 1st Dec., 1857		1,190 14 11
		£1,676 19 1

We have examined the accounts and vouchers of the Treasurer of the Philosophical Institute, and find them to be correct, the balance to the credit of the Institute on the 1st Dec., 1857, being £1,190 14s. 11d.

CHARLES FAREWELL, }
FRAS. T. GELL, } Auditors.

APPENDIX.

AUSTRALIAN EXPLORATION.

A Public Meeting was held yesterday evening, at the Mechanics' Institute, for the purpose of taking into consideration a series of resolutions to be submitted by several members of the Philosophical Institute of Victoria, with a view of securing the co-operation of the public in carrying out the design of the Institute, to fit out a Victorian Expedition for the exploration of the interior.

Over the platform, at the upper end of the room, was a map of the whole Australian continent, executed on calico, and occupying some 150 superficial feet. By this means the different routes for exploring parties were readily illustrated. The number of persons present was very great, but that it was not even greater, was most probably due to the excessive heat, and violent dust-storm which prevailed about 7 o'clock, and prevented many from venturing out.

The chair was taken by Captain Clarke, who read the notice convening the meeting. The Chairman said that the immediate object of this meeting was, to consider the propriety of supporting a proposition recently made by Dr. Wilkie to the Philosophical Institute, viz., to make an exploration of a portion of the interior by a preliminary party, and endeavor also to trace the fate of the unfortunate but gallant Leichhardt. Besides these reasons were others, which rendered the exploration of Central Australia very important. It was true it could bring to this colony but little territorial increase, but the further they got away from the Murray to the interior, the more valuable their land became. The Philosophical Institute, as an organised body devoting itself to questions of this kind, was the most fitted to bring it before the public. It was true that one of the resolutions involved an expenditure of public money, but this expense would be for the good of the country generally, and therefore they felt justified in urging on the public to press upon the Government the need of acting in this matter. When they obtained this object, and the question was taken up by the public, they had achieved all in their power.

Dr. Wilkie moved the first resolution—

"That this meeting expresses its conviction of the great importance of exploring the interior of Australia, and deems it most desirable that an attempt should be made, at as early a period as practicable, to penetrate through Central Australia, from east to west, for the purpose of connecting the previous discoveries of Mitchell, Kennedy, Sturt, Gregory, and Grey." He was pleased to see so large a meeting, considering the nature of the weather. He felt that he had no need to urge upon them the claims their chairman, Captain Clarke, had on their attention, from the able manner in which he had always furthered the cause of exploration in the interior. He had, when Surveyor-General, actually projected the very line of exploration now proposed. (Hear.) In order to carry out their scheme, they could only impress its value on the public by such means as they were then adopting. The expedition now sent out by the Government of New South Wales, to explore the country and search for the remains of Leichhardt, had its origin at a meeting held in Sydney, in September last. That exploration of the interior had occupied, to a great extent, the attention of scientific gentlemen connected with the Philosophical Institute of Victoria, and an extended exploration of the interior was considered desirable. It was seen, however, that it would be necessary to postpone that scheme for a year, until they could have the advantage of learning the results of Mr. Gregory's exertions. According to what they had heard, the unexplored tract in the centre of this country was 1,600 miles in length by 800 miles in breadth: and, considering the vastness of this great region, they need not be surprised at the scientific interest attached to its exploration, nor at the amount of care necessary to send a party through it. The Geographical Society of London had taken up this subject with considerable interest, and had even despatched an exploring expedition here. It was said that the cost of this was something like £20,000. The result of that attempt had convinced him of the inexpediency of employing vessels in expeditions of this kind. In this case the steamer which was to convey supplies to the party missed them altogether, and necessitated their return into the settled districts. He thought that land expeditions were best. New South Wales and South Australia had done much in the question of exploration of the interior, and the wealthy colony of Victoria, although not so much interested in it, should be in the van in all that concerned the future welfare of the Australias. It was a matter of surprise elsewhere that the energy of the English population here should be content with the examination of the mere borders of their adopted country. It was true that Mr. Gregory doubted the power of any exploring party to pass through the central desert. In this opinion he did not concur. No great rivers flowed from this region, but many Australian rivers were lost in lakes, and marshes in the interior, and it was quite possible that a large river might be discovered on the west coast. He thought that Eyre's Creek might be a branch from some large river which Captain Sturt had failed to discover; what reason could lead any one to infer that the interior districts of Australia are not watered by heavy periodical rains? Sir Thomas Mitchell and Dr. Leichhardt desired to penetrate Australia from east to west, and they planned a line from Moreton Bay to Port Essington at the same time, but no immediate effort was made by the Government of the colony, and Leichhardt took the necessary steps and carried out the plan himself, without Government assistance. On his return to Sydney, Sir Thomas Mitchell took the command of an exploring expedition, and discovered a large river believed to penetrate to the centre of Victoria. That river was afterwards found to turn suddenly and unexpectedly to the south. It was, however, the proper spot for the establishment of a depot for an exploring party towards the centre. If his theory, that Eyre Creek was merely a continuation of a large river to the north, was found to be correct there was no doubt that the solution of the problem of vast importance—the penetration of this country from east to west—would have been attained by Victoria. He begged to propose the resolution he had read.

Mr. Jas. Bonwick seconded the resolution. The great question first to consider was, the propriety of exploration of the interior of Australia. Of that there was no doubt; and next came the question of the route to be tried. The first which was proposed was the route from east to west, in pursuance of which many good points might be selected. The difficulties of the undertaking were certainly great, but, as Dr. Wilkie thought it was not a justifiable assumption to suppose that the interior was all desert, they might not be insuperable. It was said that the centre of Arabia was a desert;—true, but Arabia had no such fertile borders as Australia. And again, flocks had penetrated 800 miles towards the interior. their owners found the land good. Of South Africa it was generally supposed by the natives that the interior was a desert. There was a desert to be crossed, but Dr. Livingstone crossed it, and they were all familiar with his success. Captain Sturt was of opinion that something might even yet be done towards removing the veil from Central Australia. The want of water was a difficulty to be overcome; but that was not insuperable. Eyre's Creek did not, doubtless, arise from sands in the interior, but might come from some large water north of the sands. The Colorado, in California, pursued a subterranean route through land for 200 miles. This might be found to be the case in some rivers and creeks here. The great discoveries of this world had never been accomplished without an effort, and sometimes a despairing effort. (Cheers.) People lived for twenty-six years in Sydney before the Blue Mountains were pierced, and the magnificent country beyond discovered. Mr. Surveyor Oxley gave it as his opinion that the whole of the country south, down to the sea, was utterly uninhabitable by man. This condemned district included the whole of the country of Port Phillip. Captain Sturt, however, by his judicious operations, descended the Murrumbidgee to the Murray, and traced its outlet to Lake Victoria, and the result was the discovery of the plains of South Australia, and afterwards of the beautiful plains of Western Australia, on which, however, Messrs. Batman and Fawkner had already settled ? Count Strzlescki explored the Australian Alps at much personal suffering. (The speaker here gave a brief sketch of the various exploring expeditions since 1830, and all of which are, of course, familiar to the public) The object to be gained was a grand one, viz., a caravan road from Victoria to the Gulf of Carpentaria, and thus in time Victoria might command the trade of the Indian seas. To commence, let them establish a basis of operations at Cooper's Creek. The expedition could then explore the stony desert, and find the line of Eyre's Creek. This could be made another basis of operations, from which the party could work gradually to the interior and across, by establishing other bases where they found water. This would occupy years, but could be done, and the dark riddle which had so long puzzled them be solved, viz., the exploration of Central Australia.

A Person in the body of the meeting here obtained permission to make a few remarks. He said he was proud to see the working classes and scientific bodies associated in works of this kind. These works should be rapidly extended, but should be carried out as Captain Sturt's had been, without bloodshed. (Hear.) Their explorers should be impressed with the necessity of kindly treating the natives. (Hear, hear) He regretted that the Government here should take the land from the natives and not pay for it, as they did to the more warlike races in New Zealand. (Cheers.) The natives there were willing to sell for small sums, and it was a shame for them to reflect that this had not been done here, and means adopted to save the lives of the inhabitants.

Mr. Blandowski said that at present the runs along the Murray River were very valuable—£250 for a running mile, and £150 per running mile on the banks of the Darling. Between Kennedy's track and Mr. Sturt's, there was a district of 400 miles unexplored, and this land might turn out to be extremely valuable. The idea of the *Argus* to send the exploration party to Cooper's Creek was, in his opinion, impossible, considering that the preliminary expedition would consist of only four men and a leader. They could not cross the country for want of water. The soil was of a spongy kind, which rapidly absorbed rain, and there was no stream of sufficient importance to throw a branch across their track.

The resolution was then put and carried.

Dr. Mueller moved the second resolution.

"That this meeting recommends the formation of a light preliminary expedition, to explore the country between the Darling and the Victoria rivers with a view of opening up a line of communication between this colony and Central Australia, and for the purpose of selecting a suitable site for establishing a depot, to serve as the basis of future explorations."

The reasons why this limitation of the first proposition was recommended were that, although there were no doubt many oases in the supposed central desert, yet it might be at first very difficult to get from one to the other. Experience was required to undertake a task of such magnitude as the exploration of Central Australia, and the preliminary expedition seemed likely to confer that experience. In order to avail themselves of Mr. Babbage's expedition to the west of Lake Torrens, they had limited themselves to a mere reduced exploration at first. Again, any valuable country opened to the north of this colony must be of material importance. Another reason for limiting the exploration was that it would take the party through different tribes to those through which Mr. Gregory had passed, and thus existed a better chance of throwing some light on the fate of the unfortunate Leichhardt. This plan could not be carried out with the limited means at the disposal of the Institute, and in asking for Government assistance he had no doubt they would meet with the support of the people of this colony. It would give him pleasure to relate the progress of Mr. Gregory's exploration, in which he had been engaged; but as this was not immediately in connection with the topic in hand, he would do so after the meeting had terminated, if called on.

Dr. Macadam thought that the great exploration of Australia, from east to west should be preceded by an exploration of the land from the Darling to the junction of the Victoria and Thompson rivers. There were difficulties which had to be overcome by investigation before they involved the lives of so many of their fellow-creatures in this gigantic work. The preliminary expedition would give them the range of an unexplored country, extending 450 miles in length by 200 in breadth, and from which brief excursions could be taken towards the interior when they established a depot where provisions could be conveyed to them. The leader of the party could thus try his men, for they need not be absent more than five months. At the end of that time they might be in possession of the results of Mr. Gregory's and Mr. Babbage's expeditions, and an important plan of action could be devised for the great scheme.

The resolution was then put and carried.

Mr. Hodgson, M.L.C., moved the third resolution—

"That this meeting recognises the duty of the colonists of Victoria to co-operate with the Philosophical Institute in carrying out the scheme of exploration proposed."

He was sure that this must meet with their hearty concurrence; and as so much had already been said, he would simply move the resolution he had proposed.

Dr. Eades seconded the resolution. From what he had heard, it seemed that the preliminary expedition was the most reasonable plan of action. It was too great a responsibility for them to risk the lives of their fellow-creatures in so tremendous an attempt as that to explore the Australian Continent from east to west, especially as there was reason to believe that the country was of an extremely difficult and dangerous nature in some parts.

Mr. Hough supported the resolution. The scheme they were asking the meeting to endorse was now so fully recognised to be the best and safest, that he need not say much on that head. The question was, would they wait any longer before they followed in that course of progress which was now so universally developing itself. There was a great destiny before this country, and it was time that they endeavored to regard their material and political interests, which could be done effectually by these efforts. He did not think that there was much to regret in the recession of the black races, for it seemed to be an inevitable natural law; and even the native races in New Zealand had remarked and admitted it. He did not think that they should not do all they could to conserve the native races, but it seemed to him that the lands of the colony were destined to be occupied by the Anglo-Saxon race, and it was foreign to the object of their meeting to consider how the effect of the population of Australia by this race would affect the Aborigines.

Mr. Sizar Elliott said that this question had a very important commercial bearing. The larger the amount of land, stock, and agriculture, they possessed, the more extended would be their commercial relations ; and, of course, so would they rise in power and in the progress of civilisation.

Mr. F. Sinnett moved the fourth resolution—

" That a deputation, consisting of the Hon. Captain Clarke, M.L.A , the Hon. John Hodgson, M.L.C., Dr. Wilkie, Dr. Macadam, and R. H. Bland, Esq., wait upon His Excellency, to request his favorable consideration of the proposed expedition ; and that they afterwards wait upon the Hon. W. C. Haines, the Chief Secretary, to submit to the Government the resolutions of this public meeting, to solicit their support of the important object contemplated by the Philosophical Institute, and to request that they would be pleased to place the sum of £2,500 on the Estimates in aid of the same."

He excused himself from making any lengthened remarks on this topic, as the resolution had only just been put into his hand. He thought that the fact that the lands to be explored were far beyond the boundaries of the colony ought not to check them in their efforts ; and he trusted that there would be no difficulty in obtaining the grant of the sum they sought.

Mr. Mortimer seconded the resolution, which was put and carried.

A vote of thanks to the chairman closed the proceedings.—*Argus, 5th January,* 1858.

CORRESPONDENCE IN REFERENCE TO A SITE FOR THE BUILDINGS OF THE INSTITUTE.

Philosophical Institute of Victoria.

Melbourne, 27th October, 1857.

To the Honorable the President of the Board of Land and Works,

Sir,—We have the honor to submit to you, on behalf of the Philosophical Institute of Victoria, this application for a Grant of Land on which to erect a building for the purposes of the Intitute, viz., to hold its meetings and to preserve its property,

The objects of the Institute are,—the Advancement of Science, Literature and Art, by the Reading of Papers based on original observation and research, and the formation of a Library and Museum. The Institute has been formed on the same plan, and with the same objects as the Royal Society of London, which is regarded as the highest scientific institution in Europe, and which has always been liberally endowed by Government.

We might here add that the Royal Society of Tasmania is endowed to the extent of £1.000 sterling annually, and has had bestowed upon it a large grant of land for experimental gardens.

We would respectfully submit to you the important position which the Institute has now attained, its increasing importance, and the truly Victorian character of its objects. It numbers, at present, about two hundred and fifty members, comprising those in the colony most distinguished for scientific and literary attainments.

At the end of the Session, after defraying the expense attending the publication of its Transactions, and other contingencies, the Institute will be in possession of about £1,300 sterling, for building purposes. With this sum it is proposed to erect, at once, a Hall for the meetings, with space for future extension.

The Institute have nominated, with consent, the following gentlemen as Trustees: The Hon. Andrew Clarke, R.E., M.L.A., President; Professor Wilson, and David E. Wilkie, Esq., M.D., Vice-Presidents; Professor Irving, Treasurer; Dr. Iffla, J.P., and the Rev. John J. Bleasdale.

We have the honor to be, Sir,

Your most obedient servants,

(Signed) DAVID E. WILKIE, M.D.
PROFESSOR IRVING.
S. IFFLA.
JOHN MACKENNA, M.D.
JOHN MACADAM, M.D.

Signed on behalf of the Council of the Institute.

P. S. The following allotments of land are named in the order of their suitability:—

1st. An allotment situated between the Exchange building, and the new Savings bank in Market Square.

2nd. An allotment fronting Russell street, and at the rear of the Public Library.

[One or other of these allotments had been destined by a former Government, for the purposes of the Institute.]

3rd. A triangular allotment at the intersection of Lygon and Victoria streets.

4th. A triangular allotment at the intersection of Victoria and La Trobe streets.

(Signed,) JOHN MACADAM, M. D.,
Hon. Secretary, Phil. Institute of Victoria.

REPLY.

DEPARTMENT OF PUBLIC LANDS,

Melbourne, 14th January, 1858.

SIR,—Referring to an application made on the 27th October last, on behalf of the Philosophical Institute of Victoria, for a portion of ground on which to erect a building for the purposes of the Institute, I have the honor to inform you that His Excellency the Governor in Council has been pleased to approve of a reserve of 0A. 1R. 6P., being made for the above purpose at the junction of Victoria-street with Latrobe-street, Melbourne, as shown on the accompanying tracing.

I have the honor to be, Sir,

Your most obedient servant,

J. HODGKINSON,
Acting Surveyor-General.

John Macadam, M.D., Honorary Secretary for the
Philosophical Institute of Victoria.

LIST OF MEMBERS,

AND

LAWS OF THE INSTITUTE.

MEMBERS OF

THE PHILOSOPHICAL INSTITUTE OF VICTORIA,

31ST DECEMBER, 1857.

(Those whose names have * or † prefixed are Life or Honorary Members respectively.

A'Beckett, His Honor Sir William
Acheson, Frederick, Esq., C.E.
Adams, Robert, Esq., C.E.
Agg, Alfred J., Esq.
Allan, George, jun., Esq.
Amsinck, Lieutenant Henry, R.N.
Archer, William H., Esq.
Aspinall, B. C., Esq., M.L.A.

Baillie, D., Esq.
Bancroft, W. C., Esq., A.D.C.
Bardin, Rev. C. P. M.
Barker, Edward, Esq., M.R.C.S.L.
†Barkly, Sir Henry, K.C.B., His Excellency the Governor, Patron.
Barry, His Honor Mr. Justice
Barry, Rev. John, D.D.
Barry, M., Esq., L.R.C.P.L.
Baxter, Rev. W., M.A.
Becker, Ludwig, Esq.
Belt, Thomas, Esq.
Berndt, Adolphus, Esq., M.D.
Bennett, The Hon. J. B., M.L.C.
Bibbs, Thomas, Esq.
Black, Joseph, Esq., M.R.C.S.L.
Blackett, C. R., Esq.
Blackburn, James, Esq.
Bland, R. H., Esq.

*Blandowski, William, Esq.
*Bleasdale, Rev. John I.
Bonwick, James, Esq.
Bosisto, Joseph, Esq.
Broad, Charles, Esq.
Brodribb, K. E., Esq.
Brooke, J. H., Esq., M.L.A.
Brownless, Anthony C. Esq., M.D.
Bruce, J. V. A., Esq.
Bryson, William E., Esq.
Budd, Richard H., Esq., B.A.
Burn, Andrew, Esq.

†Cadell, Captain
Cairns, Rev. A., D.D.
Cairns, John, Esq.
Campbell, Colin, Esq., M.L.A.
Campbell, Major Norman, Registrar-General.
Campbell, Robert, Esq.
Chirnside, Thomas, Esq.
Christy, F. C., Esq., C.E.
Clark, Robert N., Esq., B.A.
Clarke, The Hon. A. Capt. R.E., M.L.A.
Clarson, William, Esq.
*Clow, Rev. James
Cochrane, J. C., Esq.
Cope, T. S., Esq.
Corbett, Francis A., Esq.
Cowie, The Hon. James, M.L.C.
Crawford, J. F., Esq.
Cutts, William H., Esq., M.D.

Dauglish, Henry W., Esq.
Davitt, Arthur, Esq.
Dembinski, Count John
Dickson, John E. I., Esq.
Dill, George, Esq.
Divorty, Rev. George, A.M.
*Dobree, Arthur, Esq.
Dow, James H., Esq.

Dowman, William, Esq., Lieut. H.M. '40th Regt.

Eades, Richard, Esq. B.A., M.D.
Earley, J., Dr.
Eaton, H. F., Esq.
Edwards, Henry, Esq.
Elder, Henry, Esq.
Ellery, R. L. J. Esq.
*Elliott, Sizar, Esq.
*Elliott, S., jun., Esq
Elsden, William, Esq., C.E.

Farewell, Charles, Esq.
Farrage, William, Esq., Surgeon
Fenner Rev. T. P., M.A.
Fisher, Alexander, esq., M.R.C.S.E.
Fitzgibbon, E. G., Esq.
Fitzpatrick, Very Rev. J., D.D.
Fletcher, Rev. Richard
Fletcher, Rev. W. R., M.A.
Ford, Frederick T. W., Esq., M.R.C.S.
Foxton, J. G., Esq.
Franklyn, J. B., Esq.
Fyfe, Alexander, Esq.

Gell, Francis T., Esq.
Gemmell, J., Dr.
George, John, Esq.
Gillbee, William, Esq., M.R.C.S.E.
Gilmore, Robert G., Esq.
Goodhugh, J., Esq.
Goold, The Right Rev. J. A., D.D., His Lordship the Catholic Bishop of Melbourne
Green, William H., Esq., C.E.
Griffith, Charles J., Esq., M.L.A.
Guinness, Rev. W. N.

Haines, The Hon. W. C., M.L.A., Chief Secretary
Hamilton, William B., Esq.
Hamilton, William, Esq.

Hawkins, Matthew W., Esq.
Hayes, Patrick, Esq.
Hearn, Professor, M.A., LL.D.
Henderson, Rev. William.
Hepburn, Thomas, Esq.
Hicks, George, Esq.
Higinbotham, George, Esq.
Hodgkinson, Clement, Esq., C.E.
Hodgson, The Hon. John, M.L.C.
*Holmes, George, Esq.
Hope, D. T., esq.
Hope, The Hon. R. C., M.L.C.
Horne, R. H., Esq.
Hosking, William, Esq.
Hough, G. S., Esq.
Houghton, James B., Esq.
Howitt, Godfrey, Esq., M.D.
†Howitt, William, Esq.
Hughes, D. A., Esq., M.L.A.
Hull, William B., Esq., C.E.

*Iffla, Solomon, Esq., J.P., M. D.
Irving, Professor, M.A.

Jackson, James, Esq.
Jones, Edwin, Rsq.
Joseph, Henry, Esq.

Kane, Benjamin H., Esq.
†Kay, Captain J., R.N.
Kemp, Samuel V., Esq., C.E.
Kentish, N. L., Esq.
Kershaw, William, Esq.
†Kilgour, Dr.
Knaggs, Robert, Esq., M.R.C.S.L.
Knight, J. G., Esq.
Kruse, John, Esq.

Lanktree, John, Esq.
Lawson, Robert, Esq.

*Macadam, John, Esq., M.D., F.R.S.S.A.
McCoy, Professor, F.G.S.
McCracken, A. E., Esq.
Macdonald, Rev. Donald, A.M.
Macgillivary, P. H., Esq., A.M.
M'Gowan, Samuel W., Esq.
Mackay, George, esq., L.L.D.
Mackenna, J. William Esq., M.D.
Mackenzie, J. S., Esq.
Maclean, David P., Esq., M.R.C.S.E.
Macrae, James, Dr.
Matthews, R. B., Captain
Matthews, Barnard, Esq.
Mayne, E G., Esq.
Millar, John, Esq., C.E., F.S.A.
Miller, John S., Esq.
Moors, Henry, Esq.
Morison, Rev. Alexander
Morrison, Alexander, Esq. M.A.
Morton, William L., Esq.
Muir, William P., Esq.
†Mueller, Ferdinand, Esq., M.D., Ph.D., F.R.G.S.
Murphy, The Hon. Francis, M.L.A.
Musson, John, Esq.

Neumayer, Professor George

O'Hea, Rev. Charles
Oppenheimer, Joseph, Esq.
Orlebar, A. B., esq., M.A.
O'Shanassy, The Hon. John, M.L.A.

Pasco., Lieut., C.A.D., R.N.
Pasley, The Hon. C., Capt., R.E.
Pennell, George B., Esq.
Perry, The Right Rev. C., D.D., Lord Bishop of Melbourne
Pinnock, J. D., Esq., Chief Immigration Agent
Pounds, J. B., Esq.
Powlett, F.A., Esq.

Preshaw, W. F., Dr. J.P.
Purchas, Albert, Esq.

Randle, William, Esq.
Rawlins, —, Esq.
*Rawlinson, Thomas E., Esq., C.E.
Ray, Edgar, Esq.
Richardson, E., Esq.
Robertson, James, Esq., M.A., M.D.
Ross, Alfred, Esq.

Savage, Robert, Esq.
Schultz, William, Esq.
†Scott, R., Esq.
†Scott, Rev. William, M.A., F.C.P.S.
Selwyn, A. R. C., Esq.
Sheil, Very Rev. L.
Sholl, Martin, Esq.
Sinnett, Frederick, Esq.
Skene, Alexander John, Esq., C.E.
Skilling, Thomas, Esq.
Slade, Edgar, Esq.
*Smith, Alexander K., Esq., C.E., F.R.S.S.A.
Smith, Henry, Esq., C.E., F.G.S.
Smith, James, Esq.
Smith, L. L., Esq.
Smyth, Robert B., Esq., F.G.S.
Snell, Edward, Esq.
Spowers, Allan, Esq.
Stanbridge, William E., Esq.
Stawell, Sir William F., His Honor the Chief Justice
Stevenson, Henry, Esq.
Stoney, Captain Henry B., H. M. 40th Regt.
Stratford, Frederick A., Esq.
Strutt, Charles E., Esq., M.R.C.S.L.
Swyer, C. R., Esq.
Symonds, Edward C., Esq.

Taylor, Matthew W., Esq.
Teale, Goodman, Esq.

Thomas, E. J., Esq.
Thomson, Alexander, Esq., M.L.A.
Thomson, John, Esq.
Tierney, The Hon. Daniel J., M.D., M.L.C.
†Todd, Charles, Esq.
Tracy, Richard Thomas, Esq., M.D.
Turnbull, William M., Esq., M.D.

Ulrich, George, Esq.

Vance, Rev. G. O., M.A.
Verdon, George F., Esq.
Vieusseux, Lewis, Esq.

Wade, W., Esq.
Wadsworth, Robert, Esq.
Watson, John, Esq.
Watson, Robert, Esq., C.E.
Watt, Charles, Esq.
Weire, William, Esq.
Wharton, Robert, Esq., J.P.
Whyte, Patrick, Esq., B.A.
Wilhelmi, Charles, Esq.
*Wilkie, David E., Esq., M.D.
Wilson, Edward, Esq.
*Wilson, Professor, M.A., F.C.P.S.
Wright, William, Esq.

Zeal, William A., Esq., C.E.

LAWS

OF

THE PHILOSOPHICAL INSTITUTE

OF

VICTORIA

ADOPTED 1857 SEPTEMBER 25

Melbourne:
1857.

LAWS.

I. The Society shall be called the "Philosophical Institute of Victoria." Name.

II. The Philosophical Institute of Victoria is founded for the advancement of science literature and art, with especial reference to the development of the resources of the country. Objects.

III. The Philosophical Institute of Victoria shall consist of Members and Honorary Members, all of whom shall be elected by ballot. Members and Honorary Members.

IV. His Excellency the Governor of Victoria for the time being shall be requested to be the Patron of the Institute. Patron.

V. There shall be a President two Vice-Presidents a Treasurer and a Secretary of the Institute, who with twelve other members shall constitute the Council. Officers.

VI. The Council shall have the management of the affairs of the Institute. Management.

VII. The ordinary meetings of the Institute shall be held every third week during the months from March to November inclusive. Ordinary Meetings.

VIII. In the first week in December there shall be a General Meeting to receive the report of the Council, and in the first week in March there shall be the Anniversary Meeting to elect the Officers of the Institute for the ensuing year. General and Anniversary Meetings.

Annual Dinner.

IX. During the month of March there shall be an Annual Dinner of the Members of the Institute, after which the newly elected President shall read an address.

Retirement of Officers.

X. The President the Vice-Presidents the Treasurer the Secretary and six senior ordinary Members of Council shall retire from office annually at the Anniversary Meeting. The Officers so retiring shall be eligible for the same or any other offices then vacant.

Election of Officers.

XI. The President the Vice-Presidents the Treasurer and the Secretary shall be separately elected by ballot, in the above-named order, at the Anniversary Meeting, and the six vacancies in the Council shall be then filled up together by ballot.

Members in arrear.

XII. No Member whose subscription is in arrear shall take part in the election of Officers or other business of the Meeting.

Vacancies.

XIII. If any vacancy occur among the Officers notice thereof shall be inserted in the summons for the next Meeting of the Institute, and the vacancy shall be then filled up by ballot.

Duties of President.

XIV. The President shall take the Chair at Meetings of the Institute and of the Council, regulate and keep order in all their proceedings, state questions and propositions to the Meeting, report the result of ballots, introduce newly elected Members, and carry into effect the regulations of the Institute. He shall deliver an address at the annual dinner of the Institute.

In the absence of the President the Chair shall be taken by one of the Vice-Presidents, the Treasurer, or an ordinary Member of Council.

Duties of Treasurer.

XV. The Treasurer shall receive all money paid to the Institute and shall deposit the same in the Colonial Bank of Australasia to the credit of an account opened in the name of the Philosophical Institute of Victoria, all cheques against which shall be signed by himself and countersigned by the Secretary. He shall make all payments ordered by the

Council, on receiving a written authority from the Chairman of the Meeting, keep a detailed account of all receipts and expenditure, prepare a balance sheet to be laid before the Council and included in their Annual Report, and produce his books if called on by the Council.

The Treasurer shall issue the Notices required by Rules xxv and xxvi.

Duties of Secratary.

XVI. The Secretary shall conduct the correspondence of the Institute and of the Council, attend all Meetings of the Institute and of the Council, take minutes of their proceedings and enter them in the proper books; he shall inscribe the names and addresses of all Members in a book to be kept for that purpose, from which no name shall be erased except by order of the Council; he shall issue Notices of all Meetings of the Institute and of the Council, shall have the custody of all papers of the Institute, and under the direction of the Council superintend the printing of the Transactions of the Institute, and the correction of the press.

He shall make all preparations for the Meetings of the Institute.

Meetings of Council.

XVII. The Council shall meet one week before every ordinary meeting of the Institute. Notice of such meetings shall be sent to every member at least two days previously. No business shall be transacted at any meeting of the Council unless five members be present.

Special Meetings of Council.

XVIII. The Secretary shall call a Special Meeting of Council on the authority of the President or of three members of Council. The notice for such meeting shall specify the object for which it is called, and no other business shall be entertained.

Annual Report.

XIX. The Council shall annually prepare a report of the proceedings of the Institute during the past year embodying the balance sheet duly audited and a statement of the present position of the Institute. This report shall be laid before the Institute at the General Meeting in December. No paper shall be read at this meeting.

Expulsion of Members.

XX. If it shall come to the knowledge of the Council that the conduct of a member is injurious to the character of the Institute, and if two-thirds of the whole Council shall be satisfied after an opportunity of defence has been afforded to the member that such is the case, they shall request him to resign, and in case of his not doing so may expel him from the Institute.

In every case all proceedings shall be entered upon the minutes.

Special General Meetings.

XXI. The Council shall call a Special General Meeting of the Institute on receiving a requisition in writing signed by twenty-four members of the Institute, specifying the purpose for which the meeting is required; no other business shall be entertained at such meeting. Notice of such meeting and the purpose for which it is summoned shall be sent to every member at least ten days before the meeting.

Election of Members.

XXII. Every candidate for membership shall be proposed and seconded by Members of the Institute. The name the address and the occupation of every candidate with the names of his proposer and of his seconder shall be communicated in writing to the Secretary, and shall be read at a meeting of Council, and also at the following Meeting of the Institute, and the ballot shall take place at the next following ordinary meeting of the Institute. When the number of voters in favour of any candidate shall be five times the number of those against him, he shall be declared duly elected, and not otherwise.

Members shall sign laws.

XXIII. Every newly-elected member shall, at the first Meeting of the Institute at which he may be present, sign a declaration, in a book provided for that purpose, that he will observe the laws of the Institute.

Honorary Members.

XXIV. Gentlemen not resident in Victoria who are distinguished for their attainments in science literature or art may be proposed for election as Honorary Members on the recommendation of an absolute majority of the Council. The election shall be conducted in the same manner as that of ordinary members, but nine-tenths of the votes must be in favour of the candidate.

XXV. Members of the Institute resident in Melbourne or within fifty miles thereof shall pay two guineas annually, and members resident beyond that distance shall pay one guinea annually. The subscriptions shall be due on the 1st of January in every year, and notice thereof shall be sent to every member during the preceding December. **Subscription.**

If the subscription of any member be not paid before the 1st of March, his name shall be posted at the next ordinary meeting of the Institute and at the two following ones should his subscription remain so long unpaid; and a second notice shall be sent informing him that this will be done.

After the third meeting notice shall be sent to him that he has ceased to be a member of the Institute, but that he may be restored on furnishing in writing to the Council a satisfactory reason for his delay, and paying arrears within one month.

XXVI. Newly elected members shall pay an entrance fee of two guineas, in addition to the subscription for the current year. Those elected after the 1st of July shall pay only half of the subscription for the current year. If the entrance fee and subscription be not paid within one month of the notification of election, a second notice shall be sent, and if payment be not made within one month from the second notice the election shall be void. **Entrance Fee, &c.**

XXVII. Members may compound for all annual subscriptions of the current and future years by paying twenty guineas. **Life Members.**

XXVIII. At the ordinary meetings of the Institute the Chair shall be taken punctually at half-past seven o'clock and shall be vacated not later than half-past ten o'clock. **Duration of Meetings.**

XXIX. At the ordinary meetings business shall be transacted in the following order:— **Order of Business.**

Minutes of the preceding meeting to be read, amended if incorrect, and confirmed.

New Members to enroll their names and be introduced.

Order of Business.

Ballot for the election of new Members.
Vacancies among Officers, if any, to be filled up.
Business arising out of the minutes.
Communications from the Council.
Presents to be laid on the table and acknowledged.
Motions of which notice has been given to be considered.
Notices of motion for the next meeting to be given in, and read by the Secretary.
Papers to be read.

No vote of thanks to any Member for his paper shall be proposed.

Immediately after each paper the Chairman shall call on the Members for any remarks they may wish to make or questions they may wish to ask.

No Member shall speak more than once on any paper or for a longer period than five minutes, unless called on by the Chairman, who however shall not allow him to exceed ten minutes on the whole.

When no member has any further questions to ask or remarks to offer, the Chairman shall call on the author for his reply to such questions and remarks, which shall terminate the discussion.

Strangers.

XXX. No stranger shall speak at a meeting of the Institute unless specially invited to do so by the Chairman.

Business to be notified.

XXXI. No business shall be entertained at any meeting which has not been inserted in the summons for that meeting.

Additional Meetings.

XXXII. The Council may call additional meetings whenever they may deem it necessary.

Visitors.

XXXIII. Every Member may introduce two visitors to the meetings of the Institute by orders signed by himself.

Members may papers.

XXXIV. Members shall have the privilege of reading before the Institute papers containing accounts of experiments observations and researches conducted by themselves, on subjects within the scope of the Institute.

XXXV. If a Member be unable to attend for the purpose of reading his paper, he may delegate to any Member of the Institute the reading thereof and his right of reply. Or depute other Members.

XXXVI. Any Member desirous of reading a paper shall give in writing to the Secretary ten days before the Meeting at which he desires it to be read, its title and the time its reading will occupy. Members must give notice of their papers.

The Secretary shall lay this communication before the Council at its next Meeting. Papers shall be read in the order in which such notices are received by the Secretary.

XXXVII. The Council may permit a paper of a nature similar to the above, not written by a Member of the Institute, to be read, if for any special reason they shall deem it desirable. Papers by strangers.

XXXVIII. Every paper read before the Institute shall be the property thereof and immediately after it has been read shall be delivered to the Secretary and shall remain in his custody. Papers shall be the property of the Institute.

XXXIX. At the Meeting of the Council next following the reading of a paper the Council shall decide whether it shall appear in the Transactions of the Institute. Council shall decide as to publication.

XL. No paper shall be published in the Transactions which in the opinion of the Council does not consist mainly of original matter as regards the facts or the theories enunciated. Papers must be original.

XLI. Should the Council feel a difficulty in deciding on the publication of a paper, they may refer it to any member or members of the Institute, who shall report on the same. Council may refer papers to Members.

XLII. Should the Council decide not to publish any paper it shall be at once returned to the author. Rejected papers to be returned.

XLIII. The transactions of the Institute shall be published in parts at intervals not exceeding six months. Transactions to be published half-yearly.

nstitute to have priority of publication.

XLIV. No member shall publish or consent to the publication of any paper read before the institute, until it shall have been published in the Transactions or returned to him by the Council.

Members may have 50 copies of their papers.

XLV. The author of any paper which the Council have decided to publish in the transactions may have any number of copies of his paper, not exceeding fifty, on giving notice of his wish in writing to the Secretary with his paper and on paying the extra cost of such copies.

Members to have copies of Transactions.

XLVI. Every member whose subscription is not in arrear and every honorary member is entitled to receive one copy of the Transactions of the Institute as published. Newly-elected members shall, on payment of their entrance-fee and subscription, receive a copy of the volume of the Transactions last published.

Property.

XLVII. Every book pamphlet model plan drawing specimen preparation or collection presented to or purchased by the Institute shall be placed in the museum of the Institute.

Museum.

XLVIII. The museum shall be open to members of the Institute and the public at such times and under such regulations as the Council may deem fit.

Legal Ownership of Property.

XLIX. The legal ownership of the property of the Institute is vested in the President the Vice-Presidents and the Treasurer for the time being, in trust for the use of the Institute; but the Council shall have full control over the expenditure of the funds and management of the property of the Institute.

Committees elect Chairman.

L. Every Committee appointed by the Institute shall at its first meeting elect a Chairman who shall convene the Committee and bring up its report.

Report before Nov. 1st.

LI. All Committees and individuals to whom any work has been assigned by the Institute shall present to the Council, not later than the 1st of November in each year, a report of the progress which has been made; and, in cases where grants of money for scientific purposes have been entrusted to them, a statement of the sums which have been expended and of the balance of each grant which remains unexpended.

Grants expire.

LII. Grants of pecuniary aid for scientific purposes from the funds of the Institute shall expire on the 1st of November next following, unless it shall appear by a report that the recommendations on which they were granted have been acted on, or a continuation of them be ordered by the Council.

Additional Grants.

LIII. In all cases where additional grants of money are made for the continuation of researches at the cost of the Institute, the sum named shall be deemed to include as a part of the amount the specified balance which may remain unpaid on the former grant for the same object.

Personal expenses not to be paid.

LIV. In grants of money to committees and individuals, the Institute does not contemplate the payment of any personal expenses which may be incurred by the members.

Chairman to draw grants.

LV. The Chairman of each Committee is the person entitled to call on the Treasurer for such portion of the sum granted as may from time to time be required.

LVI. Every committee shall cease to exist on the day of meeting next following the 1st of November, unless then re-appointed.

Alteration of laws.

LVII. No new law or alteration or repeal of an existing law shall be made, except at the General Meeting in December, or at a Special General Meeting summoned for the purpose as provided in law xxi., and in pursuance of notice given at the preceding ordinary meeting of the Institute.

Cases not provided for.

LVIII. Should any circumstance arise not provided for in these laws, the Council are empowered to act as may seem to them best for the interests of the Institute.

TRANSACTIONS

OF THE

PHILOSOPHICAL INSTITUTE

OF

VICTORIA,

FROM JANUARY TO DECEMBER, 1858, INCLUSIVE.

VOL. III.

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Melbourne:
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Philosophical Institute of Victoria.

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CONTENTS.

TRANSACTIONS

OF THE

Philosophical Institute of Victoria.

Anniversary Address of the President, His Honor Sir William Foster Stawell, Knight, Chief Justice of Victoria, &c., &c.

[Delivered to the Members of the Institute, 12th April, 1858.]

YOUR EXCELLENCY AND GENTLEMEN,

I KNOW very well that I have not been selected for the high office which I occupy in consequence of any scientific attainments which I possess. I have been always engaged in the work of a very laborious profession—always too jealous of my devoting myself to any other studies than those immediately connected with it; and thus I am the more indebted to your kindness in having placed me in this position. It is, perhaps, in consequence of my holding another office that I have received this honor, and feeling that in doing honor to the office you do honor to the man, I beg to thank you, gentlemen, for both; I also feel, and I trust I am not wrong in the supposition, that a suggestion may have operated on the minds of some members in selecting me, as I have always understood that a society of this kind does, in no country, merely tend to the improvement and cultivation of science, but also creates a social intercourse; and I, therefore, regard this as neutral ground upon which we can all meet. Gentlemen, I am debarred, as you are aware, from participation in the politics of the country, and I dare not express a single opinion upon any subject which is likely to come before me in my capacity as a judge; but, fortunately, this is a subject upon which I am free to enter and express an opinion. I am right well aware that there is much for us to do, and, on behalf of this society, I very cordially thank his Excellency for the frank, open, and manly way in which he pointed out what we ought to do. It is a true friend who tells us what our failings are, and who not merely praises us. But he will allow me to say, that he has not seen the troubles through which we have gone, recognizing, as I may, in this instance, those difficulties which every society in its infancy has to encounter. I cannot help congratulating the Institute on the progress which it has already made. Some few years ago, I well remember, when I was in office, absenting myself from an early meeting of what was the first Institution, on the plea of urgent official duties. And I remember that my hon. friend, who sits on my immediate right, and who was my predecessor in the chair which I have now the honor to occupy, told me that the encouragement of such societies was of as much importance as official or any other class of duties; that the influence which such institutions were calculated to produce on the state of society was just as of much importance as any motion which I might have the honor of submitting to the Assembly; or any case which I might have the responsibility of conducting in court. Although I was not then sufficiently impressed with the truth of his observations, I am now confirmed in a belief which I afterwards entertained, that all he said was true. At that time, the society, I confess, had not any very pleasing or encouraging prospects—it numbered only a very few members—and its meetings were held in a small room in the Assay Office. It had also, at that time, a most formidable rival, whilst but few of its own members interested themselves very strenuously in its progress. Now, however, the two bodies have become united, and I am rejoiced to say, that by union strength has been produced. Gentlemen, let us compare the numbers in this hall with those few men who sat in that little room, and recall, for example, the paper on the Yan Yean Water Works. I know of no subject more likely than that to interest the uninitiated; and, although the prophet was in that instance at fault, he does not the less deserve our thanks for the calm and philosophic way in which he pursued his subject. He might have been wrong: but let these instances operate as beacons for our future guidance. Compare the subjects then brought under consideration with those now discussed. Those most interesting to the more scientific members may not be interesting to the general reader; but there are still some couched in simple language, which I myself can not only understand, but appreciate—most interesting papers on scientific subjects, embracing geography, mineralogy, physics, botany, and a number of others, which I merely mention as those which are of interest to the general reader. I regret, that in taking a hasty glance over the transactions and occurrences of the last year, that I have to allude to the loss of one—a loss, indeed, not only to the society, but to the profession of which he was an ornament, and to many friends with whom he was intimate, and by whom he was greatly respected. Passing over that unfortunate event, let me congratulate the Institute on the amount of interest which the Government now evidently takes in its progress and success. I rejoice to see so many members of the Government present. Occupying the position that I now do, it is of very little consequence to me who is in and who is out of power, although, notwithstanding that I am debarred from interfering with political matters, I cannot, as a citizen, exclude myself from taking some degree of interest in the actions of those who are in power; and I hail, as a good omen, the fact of so many of my honorable friends supporting this Institute by their presence this evening; and I trust that they will be prepared to support it, if necessary, by other and more substantial proofs of their regard. Not that I wish for State aid to an institution of this kind. On the contrary, I would wish to see the voluntary principle applied to it, although I would not for other things. I would fain see science with some recognised habitation—where scientific men could meet together and exercise some influence on society, because, as it is, the world, I fear, is too apt to look upon the Institute as a wanderer upon the face of the earth, who has no known habitation; and, perhaps, it may be necessary to trouble the friends of the Institute, in order to establish it. So far, and no farther, would I wish to see a demand made upon the public purse. If the Legislature of this country chooses to place funds at the disposal of the society, it will, I have no doubt, expend them judiciously and honestly. What we want, are persons with a helping and a lending hand. This is required in the old country, and how much more is it needed here. I do not know the reason why, but, perhaps, it originates in the matter-of-fact disposition which is our main characteristic, Art, instead of following, precedes science. Observe, for example, the Exhibition, and look at art as compared with merely scientific institutions—the one is regarded as a subject of the greatest interest by the people, whilst the other is only tolerable. It is not so in other countries. In Germany, for instance, the *savans* are satisfied to promote science for the purpose of eliciting truth and making discoveries in their various branches. But, with an Englishman, unless you can bring home to him the conviction that it is of some practical advantage, he will do little more than tolerate it. Surely, gentlemen, science should precede art—and not art, science. Surely, science, instead of pointing out some discovery, brought out by some mere manipulator, should itself point out the mode in which the particular principle might be applied to the particular object. If, gentlemen, that principle is true at home, is it not with tenfold force true in this country? Assume that all such were based on scientific principles, I ask what would be the probability of success? I need not enlarge upon those influences, for I have already alluded to them, though briefly. Look at education, as applied to the youth and to the adult. To the adult, what salutary effects it must produce; it will show him how little he knows and how much remains to be known. What docility and what patience it will require to convince him that amongst the few grains of truth which he has acquired, there is an extensive sea of error. How much better, therefore, he must be prepared to make allowances for all the errors of his brethren, when he is capable of recognising his own. Observe also, gentlemen, the influence which it is likely to exercise in unfolding the works of the Creator himself, and the praise which, in prosecuting these discoveries, he is involuntarily offering up to the Creator, in the truths which he is unfolding to the world. Gentlemen, I proposed to have said much more to you, but I feel that, for an inaugural address, instead of writing, I have trusted too much to memory. I thank you for the patience with which you have heard my remarks, and for the honor conferred upon me, as well as the manner in which you have received the toast with which my name has been coupled. I trust that when I shall be rendering up an account of my stewardship, you will think I am deserving of as enthusiastic a reception as that which you have now been good enough to accord me.

Art. I.—*Some Facts determining the rate of the Upheaval of the South Coast of the Australian Continent.* By Ludwig Becker, Esq.

[Read before the Institute, March 24th, 1858.]

In October, 1855, I had the honor to read before the Philosophical Institute a paper containing some remarks on the changes in Australia, by upheavals. I then called attention to the fact that the land is still gradually rising, and expressed a hope that, with the assistance of tide-gauges, results might be gained, telling us how much the ground has risen in a given time.

Since that paper was read, I directed my attention more closely to this subject, gathering as many observations as possible concerning these upheavals; and the result of these observations made by myself and others, here and elsewhere, I have now the honor to lay before the Philosophical Institute.

The bottom of Hobson's Bay rose, in twelve months, four inches, according to the lines drawn on sheets of paper by the self-registering tide-gauge at Williamstown. These papers were kindly placed before me by Mr. Ellery, the talented superintendent of the Williamstown Observatory. That gentleman also told me, that, five years ago, he noticed many times that the foot of the old Williamstown flag-staff, which was only a little lower than the present one, was washed by high water, while, at present, the whole space surrounding is covered with a green vegetation, and tents and other dwellings are now built on ground which was, a few years back, periodically flooded by the waters of Hobson's Bay. Between the old pier and the lighthouse, as is well known, a foot below the road, the ground consists almost entirely of dead shells, deposited there by the sea. I find embedded between the horizontal layers of these shells the skulls of sheep and bullocks, filled with clayey matter containing dead shells. The spot where these bones are still to be seen is at least four feet above the average level of the Bay. These remnants were not deposited there lately by human hands, but thrown into the sea when the water, close at hand, offered itself as the nearest place for getting rid of the useless fragments. These observations were made on the west shore of Hobson's Bay, where no deposit of the river Yarra influences the change of the ground. A deposit from that river does influence a similar change, which is more visible on the south-east from the mouth of the river, along Sandridge, St. Kilda, and nearly as far as Brighton. The beach along these places appears even more upheaved; but it is impossible to draw a certain conclusion therefrom because of the interference of the Yarra deposit.

In South Australia, so I learned from Captain Cadell, the railway between the City of Adelaide and the Port of Adelaide rose, in the first year after its construction, nearly four inches.

Flinders, in 1802, found ten fathoms of water on a certain point in Lacepede Bay, where, on a late survey, only seven fathoms of water were found.

The newspapers, a few days ago, brought word that the Government of South Australia have considered it necessary to re-survey the whole sea-coast of that colony, and have started a vessel to commence the work forthwith.

It appears, therefore, that since the expedition of Flinders, the soundings of that navigator are rendered useless by the action of subterranean powers.

All these figures, when reduced to inches and months, show a rise of the land of about four inches per annum. The motion of the earth's crust in the southern part of Australia, so far as yet ascertained, is at present slowly upwards and permanent. Whether sudden rises, during or after an earthquake, have happened, I cannot say at present.

We hear that Melbourne was formerly visited by great floods, but the wharves near Flinders-street, the lowest part of the city, have not, in recent times been inundated by the Yarra, although rain and snow in the mountains have lately sent down great bodies of water. But if the wharves at Melbourne have risen about six feet during the last twenty years, their present freedom from floods is quite natural.

I thought it worth while to draw the attention of the Philosophical Institute to these few facts. If further observations should confirm what I have stated here, useful conclusions might be drawn therefrom, and the practical advantages become evident. I need only point out that care must be taken in forming piers, dams, breakwaters, &c., in Port

Phillip and in similar places along the rising coast; and also in the selection of places for townships, wharves, and docks; and, lastly, that it is important that our own coast be re-surveyed for the sake of the life and goods in ships approaching it.

ART. II.—*On the Reclamation and Cultivation of Batman's Swamp.* By ALEXANDER KENNEDY SMITH, Esq., C.E., F.R.S.S.A.

[With a Plate.]

[Read before the Institute, May 5th, 1858.]

MR. PRESIDENT AND GENTLEMEN—In preparing this paper upon the reclamation and cultivation of Batman's Swamp, I have endeavoured to make it more a practical digest than a theoretical essay.

Residing upon a portion of the Swamp, and having erected the City Gas Works there, I have had a greater interest in, and a wider field for observation, than those who casually or occasionally visit that locality. The result of these observations is contained in this paper, which I have endeavoured to condense as much as possible, consistent with bringing the evil and its remedy fairly before your notice.

This swamp is situated at the west end of this city, and is bounded by the Murray River and Mount Alexander Railway on the east and north; by the Salt Water River and Footscray on the west; and by the Yarra Yarra on the south. (See Plate.)

All that portion of it that lies north of a line forming the continuation of Victoria-parade, or Victoria-street, running due west to Footscray, has been disposed of by the Government, and the extent of the major and remaining portion, after allowing a margin of three chains in breadth along the Yarra Yarra and the Salt Water River, and also allowing a reserve of 20 acres near the Powder Magazine and Railway Station for docks, is 1030 imperial acres.

The surface of this large plain is lowest in the centre, by an average depth of 10 inches, and has no outlet either to the Yarra Yarra or Salt Water River. This hollow or basin is therefore the receptacle of surface water, and is principally supplied by the Moonee Ponds district.

When a heavy rain falls, this basin is filled, and overflows into the Yarra and Salt Water Rivers. In the summer time the water is evaporated from this basin, again to be filled by the collected storm water in the rainy season; or if a southerly breeze, a freshet in the Yarra, and a full moon should simultaneously occur, the greater part of the marsh, and in some cases the whole of it, has been overspread with water to a depth of several feet. In November, 1849, a combination of the above circumstances covered the swamp to a depth of 5 feet, and destroyed a considerable quantity of property and goods in the wharf stores, and in the lower levels of Flinders-street west. From marks made at the time of the flood, I find that the average depth of water over the swamp amounted, as said, to five feet.

To reclaim this land from the inroads of the sea or bay, it will be necessary to guard its confines by an embankment to prevent a similar occurrence. This would do, as far as regards reclamation from the waters of the bay, but if used for cultivation, it must also be kept free, by drainage and pumping, from the storm water descending into the basin alluded to.

In the ordinary state of the bay and river there is sufficient fall to drain the basin, and to keep the entire surface of the swamp free from water; and it would only be in the event of having a continued rain, on the one hand, or the rising of the River Yarra, either by floods or the waters in the bay being ponded back, on the other, that arterial drainage by machinery would have to be resorted to.

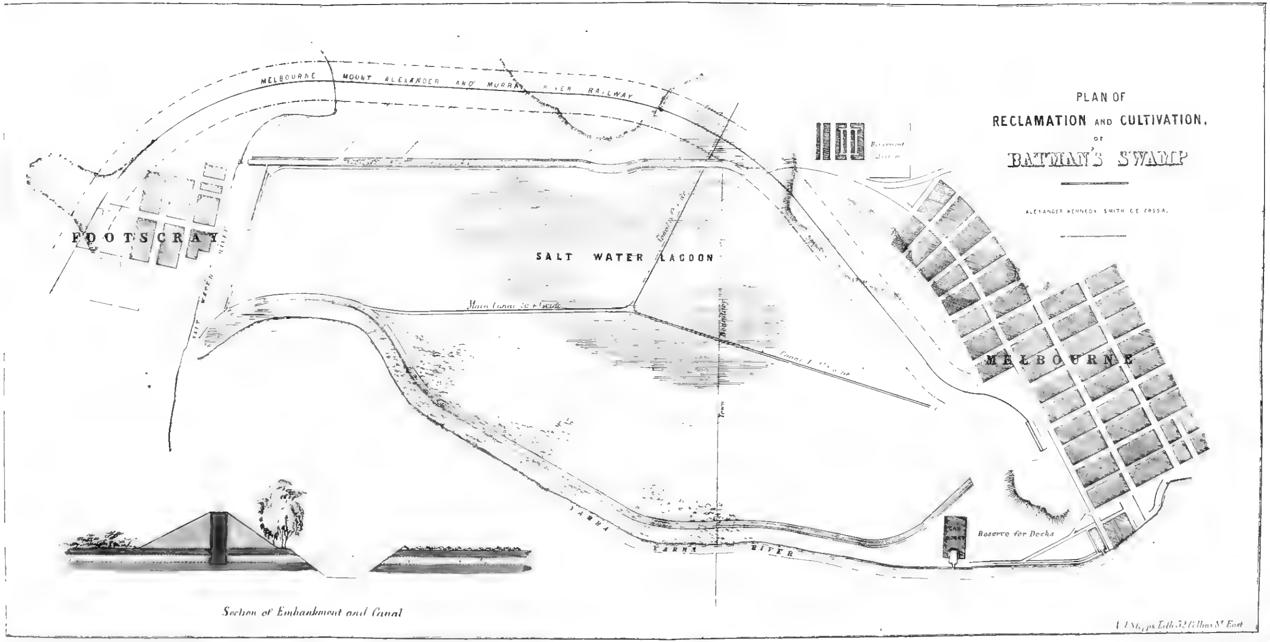
I will therefore advert to—

1st. The method and cost of protecting the swamp from the inroads of the sea, and

2nd. The method of keeping the reclaimed land free from storm water, and the cost of so doing.

Upon measuring the irregular boundary of the entire marsh, as shown on the accompanying plan, I find that it is equal to 460 chains, or $5\frac{3}{4}$ miles, but as an embankment, for reasons to be hereafter given, would only require to be constructed from the railway reserve, opposite the west end of Little Collins-street, round by the Gas Works, the banks of the Yarra, and the Salt Water River, to the punt, it would only measure 250 chains, or $3\frac{1}{8}$ miles.

The soil of the swamp varies from 12 to 26 inches in depth, and is composed of stiff alumina or argillaceous earth, strongly impregnated with salt and gypsum. Immediately beneath this, a stratum of sand, varying from six inches to two feet,


PLAN OF
RECLAMATION AND CULTIVATION,
OF
BATMAN'S SWAMP
ALEXANDER KENNEDY SMITH C.E. F.R.S.S.A.
MELBOURNE MOUNT ALEXANDER AND MURRAY RIVER RAILWAY
FOOTSCRAY
SALT WATER LAGOON
MELBOURNE
YARRA YARRA RIVER
Reserve for Docks
Section of Embankment and Canal

occurs; after this sand is passed, a black retentive clay appears, and continues for at least a depth of 24 feet, but how much further I am unable to say, having only excavated to that depth.

In order to make the whole of the swamp available for cultivation, it will be necessary to embank it on the south and west by an embankment 24 feet wide at the base, and five feet in height, thereby giving a total height of about eight feet above the ordinary level of the Yarra, when the surface level of that river is uninfluenced by unusual causes.

In the formation of this embankment it is necessary, first, to cut a trench three feet in width through the top soil and the underlying stratum of sand, until the stiff retentive clay is reached; this would be at a depth of about three feet, at an average. The material thus excavated would form part of the embankment above the surface level. After setting off a distance of 13 feet 6 inches on the inner or swamp side of the trench, I propose to excavate a canal 24 feet wide by 5 feet deep, for the threefold purpose of, first, obtaining the material to form the embankment; secondly, to drain the swamp itself; and thirdly, that when partially full it may be used as a canal for the transport of manure and produce, in flat-bottomed barges. Care must be taken that the trench first mentioned is filled up with the stiff retentive clay, excavated from the canal, and that a wall of the same description be carried up in the centre of the embankment to its full height.

This embankment in its course intersects some patches of the tea-tree scrub, as shown on the plan, which would necessarily have to be cut down. This scrub, judiciously used, could be incorporated in the bank, so as to prevent the softer material slipping, and also afford considerable protection to the bank itself, in the event of the river rising to an unusual height. The tea-tree scrub, either in the form of fascines or otherwise, would be used on the river side of the embankment only.

By referring to the section of the embankment, it will be seen that to make this, the least costly method is to excavate the material upon the spot, and that its construction thus leaves the canal or drain, or both, fit for their intended purposes, without any extra expense having been undergone for their formation.

I also propose to use the sand excavated (or a portion of it) to dress the top of the embankment, so that in all seasons there would be an excellent footpath from the city to the Salt Water River.

At the present time, a considerable number of the inhabitants of the city go down the river to fish, but owing to the almost impassable state of the small creeks in the scrub, their sport is curtailed, and their pursuit rendered a questionable pleasure.

To make this embankment, main drain, canal, and raised footpath, would only require about £5000, or even less in the present state of the labor market, or about £5 per acre for the reclamation of above 1000 acres.

This expense would have been considerably increased were it not for the possibility of another plan of a road being constructed to Footscray, as a continuation of Victoria and Spencer streets to that rapidly-increasing township, and which I had the honor to suggest to a committee of its inhabitants.

The construction of this road would enable another canal to be cut direct between the Salt Water River and the Moonee Ponds Creek.

As a sum of money will, in all probability, be placed upon the Estimates of 1859 for the construction of this road, it will not be necessary to advert to it more, than by saying that it will protect the swamp on the north from any inundation caused by the rise of the water in the Salt Water River, and that it will shorten the road between Footscray, Geelong, and Melbourne by 3½ miles.

The plan I produce shows the proposed road and the relative position of the places to be benefited thereby.

Having adverted to the method of construction and cost of embankment, I will now proceed to describe the means to be used in keeping the swamp free from surface water, and the cost of doing so.

In the ordinary state of the river, the arterial drains, or small canals shown on the plan, will have a sufficient fall or inclination to keep the marsh sufficiently dry for cultivation. As before described, the side canal from which the embankment is formed, is proposed to be cut to a depth of five feet, that is, an average of three feet beneath the layer of sand before mentioned; this sand, underlying the alluvial soil, will allow the water to percolate through the same, and drain off into the main channel.

This will answer during the dry season, but during the rainy season, or a prevalence of southerly gales, the level of the river would rise so much as to pond the water back upon the surface of the marsh.

In order to prevent this occurring, it would be necessary to have fly valves upon the main outlet; such valves would allow the egress of the water whenever the surface level of the river subsided below a certain point, and would effectually prevent its ingress when rising.

The water, then, with which we have to deal in draining the swamp, is simply that of the rain fall over its own surface, together with that from the higher levels which drain into the swamp and Moonee Ponds.

This could be ascertained by taking the dividing point, commencing at Batman's Hill, and passing along the ridge of the high ground by the Exhibition Building, Parkside, and crossing the Castlemaine road near the University, passing along by the new Cemetery towards Phillipstown, and heading Moonee Ponds creek, returning by Essendon and Flemington. The extent of this watershed I am unable to estimate, even approximately, not knowing the whole locality alluded to; but from observation, I have found that during heavy rain storms, the whole of the water brought down from the Moonee Ponds district has been discharged from the swamp into the Yarra and Salt Water Rivers within the course of a few days, and here it must be borne in mind that this discharge is effected over a wide surface of uneven ground, partly covered with scrub, grass, and other obstructives, and without any regular channel to allow its free discharge.

That the swamp might be successfully cultivated, it would be necessary to guard, as far as possible, against any and every contingency that might arise. With this view, I propose, at the main outlet from the swamp to the river, to have two windmills erected, to work scoop wheels when the level of the river is above the level of the water in the swamp. This would very seldom occur, and the difference of the level caused by the rise and fall of the tide, would allow a great portion of the retained water to flow away by its own gravity at low water.

The constancy of the wind here, as a motive power, is generally admitted, and there are few days in the year without sufficient breeze to work the wheels alluded to.

But here again I would adopt another precautionary measure, viz., to erect a steam engine of sufficient power to lift the maximum amount of water ever known to have fallen upon a given drainage area in this district, in a certain time.

As there are few days in the year when this engine would be required to work, its maintenance, as a motive power, would be comparatively small. Steam could be got up in about two hours, and whenever the barometer indicated a heavy fall of rain, the fires could be lighted, and the engine be in effective working order as soon as the waters could accumulate and render its assistance necessary; but this would only be required in the event of not having sufficient wind.

The limited height the water would require to be raised, seldom or ever exceeding three feet, would allow an engine of 30-horse power to discharge water, with an average lift of 18 inches, to the amount of 95,000,000 gallons per day, and this without allowing for any variation of tide. If to this we add the work that could be performed by the windmills in question, and also the quantity of water discharged by gravitation, it may fairly be presumed, that under even extraordinary circumstances, that the swamp would be kept as dry, if not more so, than other low-lying lands under successful cultivation.

The cost of erecting machinery for the purpose I have indicated would not exceed the sum before-named (£5,000) for raising the embankment, making a total of £10,000 for the reclamation of, say, 1000 acres of ground, and this adjacent to and partly within the bounds of the metropolis of this colony.

This would amount to £10 an acre on the ground thus reclaimed, and it may be well here to inquire what inducements are held out for this expenditure? There are many, apart from its cultivation, and yet necessarily connected therewith.

In the report of the Local Board of Health for the city of Melbourne, for the year ending December 31st, 1857, it is stated that—

"The position of the present manure depot, and the possibility of its removal to a more isolated locality, have been subjects of serious consideration with the City Council, by whom a committee was appointed to deal with them, but the difficulties have been found so great, as to prevent any action being taken in the matter. The committee have under consideration a scheme for laying a pipe track from the depot, for carrying off the drainage so as to prevent noxious exhalations therefrom, but the expediency or otherwise of putting the plan into operation, of course depends on whether or not any alteration can be advantageously made in the site of the depot."

Most of you are, I dare say, aware, and certainly our friends from North Melbourne and the University, that the immediate neighborhoods of North Melbourne, Parkside, the University, and the southern confines of the Royal Park, have been a long time, and are at present, polluted by the City Manure Depot. Night-soil and offal are sent out in large quantities from the city to that locality, and there stored in vast heaps and left to give off malaria throughout the neighbourhood, and no effective means have been taken to retain the valuc of the manure thus deposited by fixing the ammonia with charcoal. On the contrary, the sun, wind, and rain rob it of its fertilizing powers, and a useful and valuable manure becomes a positive and dangerous nuisance. The material stimulants necessary for the proper growth of vegetables and cereals for the support of the animal economy, become, from mismanagement and misapplication, a nursery for the seeds of disease, and are changed to a curse instead of a blessing.

Referring to the last clause of the paragraph before quoted, "Whether or not any alteration can be advantageously made in the site of the depot?" I would suggest the removal of the whole of the offensive material for the purpose of increasing, by proper application, the fertilizing power of the ground thus reclaimed.

You will observe from the plan that I have shown, two main drains or canals, one for carrying down the flood waters of the Moonee Ponds district, and the other from the west end of Little Bourke-street, for the purpose of transporting the fluid sewage of the city, or upon it by a flat-bottom barge, the more solid material and other offal.

By having a depot in the locality, the night-carts could be emptied of their contents into barges prepared for the purpose, and transported by means of these canals to any required portion of the swamp.

This easy means of getting rid of the night soil and other manure in the more immediate neighbourhood of the city, would in itself confer a benefit upon the public at large, inasmuch as the cost of cleanliness would be considerably lessened, whilst any existing nuisance would be turned to a useful and reproductive purpose.

In a previous paper, read by me before this Institute, I suggested the propriety of the Sewerage and Water Commission conveying the whole of the storm water, falling north of La Trobe-street, into the swamp, by means of a tunnel running underneath the high ground at the west end of the city. The whole of the fresh water discharged by means of this tunnel, during the heavy or prolonged rain falls, would be got rid of in the manner before described, but certain advantages would accrue from its presence under ordinary circumstances, for the better cultivation of the swamp.

The effectual drainage of the swamp would prevent the washing away of the embankment of the Mount Alexander and Murray River Railway. At present these banks are seriously injured during a high wind, by the wash of the water in the swamp, and although a considerable portion of the earthworks of this line, thus exposed to the action of the water in the event of floods, has been changed into a timber viaduct, owing to the unsoundness of the foundation, yet still there are other portions of the same line, the permanency of which would be greatly endangered, if not destroyed, by the recurrence of the floods of 1840 and 1849.

It will thus be perceived that the Government have a direct interest in the reclamation of the swamp for the better protection of their own works.

I may here add, by way of parenthesis, that if at any subsequent period a greater area than I have set aside should be required for docks, the fact of the land being cultivated would in no way interfere with its appropriation for that purpose.

The same motive power applied to the drainage of the land, during storms, could be, with little or no extra cost, used for the purpose of irrigating the soil during the summer months.

That the quality of soil in the swamp is worthy of cultivation, may be generally admitted; that its cultivation, as a sanatory measure, would be of benefit to the public, cannot be denied; but, in order to remove any opinions to the contrary, I may state that I have made some experiments with regard to the capabilities of the soil.

In the latter end of May, 1857, I prepared a piece of ground, by simply ploughing and harrowing, for a crop of Cape barley. This crop did exceedingly well, and the major part of it gave, after being cut, an after-growth equal to the first crop. No manure of any kind was used.

In the month of December last I had the same ground dug over with the spade, into which I transplanted some orange globe mangold-wurzel, and this at the hottest part of the whole summer. The plants took the ground kindly, and have produced roots of which those now exhibited are specimens, weighing, in some instances, 7lbs. each.

An argillaceous soil is best adapted for the growth of this root, and the presence of chloride of sodium still further augments the produce. The major part of the swamp being of that description of clay, heavy crops might be confidently expected. If to that soil we add other fertilizers rich in soluble potash, such as the refuse of the city and its suburbs, crops of from 30 to 40 tons per acre might be realised, more especially as this root requires potash in large quantities for the perfection of both leaves and bulbs.

The quantity here stated approximates in weight to the results of the experiments I have made, making suitable allowances for drainage and the application of manure.

The cultivation of this root is successfully carried on in the comparatively warm climate of the south of England, but being less hardy than the turnip, it is easily affected by frost —a disadvantage in Scotland, which I apprehend would not be felt here.

I write with deference to the opinion of others better qualified to judge, when I say, that the cultivation of this root would result in greater advantages to the producer in this colony than in the British Isles.

The scarcity of green meat caused by the arid heats of summer in this colony, renders the growth of this kind of food an object of importance, more especially to the proprietors of dairies in the neighbourhood of large towns.

By proper attention, a succession of crops of Cape barley and mangold-wurzel may be obtained from the swamp, two in one season, the one immediately following the other, and by the application of liquid manure, the quantities per acre might be increased in no ordinary degree.

Both in a sanatory point of view and as a remunerative speculation, the forming of an embankment round, and the draining and cultivating of the swamp, would result in advantages to the community at large, as well as to those who might invest their money for that purpose.

I am not aware whether the present Government has the power of leasing the swamp in question; but, in the event of its being able to give a lease, the duration of which would hold out sufficient inducements to capitalists, I doubt not of being able, in a few days, to form a company and raise the necessary amount of capital for carrying out the object in view.

The removal of the manure depot from North Melbourne, &c., would meet with the cordial support of the medical faculty, who here, as in all countries, are foremost in advocating the cause of sanatory reform, and who, with a total abnegation of self-interest, spend both time and money in endeavoring to prevent the consequences that must inevitably arise, either from the ignorance or culpable carelessness of those who are most interested.

Having pointed out the evil and its probable remedy, I would observe that, totally independent of the benefits that would arise from the cultivation of the swamp in a monetary point of view, it is a matter of paramount importance to get rid of existing and dangerous nuisances.

I lay these suggestions before the Institute, trusting that, in the importance of the subject, any imperfections will be overlooked; and that, in a short time, some active steps will be taken to remove those causes which, sooner or later, will operate with fearful effect in decimating our population.

ART. III.—*On the Hirudo Australis.* By JOS. BOSISTO, Esq., President of the Pharmaceutical Society of Melbourne.

[Read before the Institute, 5th May, 1858.]

THE difficulty of maintaining leeches in a healthy condition, away from their native waters, has induced me to make some experiments on the subject.

I have succeeded beyond my expectations, not only in preserving them from disease, and lowering the per-centage of deaths to a trifle, but also in their production apart from their native haunts.

This being the time of year when they yield their ova or cocoons, I thought, as the subject was novel, and partook of a scientific character, it might not be unpleasing to exhibit specimens of some kinds of leech to be met with in this country, and the cocoons of the Hirudo Australis, as well as give the result of my observations on the preservation of the leech in general.

Leeches are to be found in most of the lagoons, pools, and creeks of this country, and although these contain a fair description of the blood-sucking leech, yet there are to be found those allied in appearance, as well as in the incapability of perforating the human skin, termed by Savigny the "Hœmopis Sanguisorba," or horse-leech.

The two descriptions of leech in general demand for blood-sucking are what are termed in Europe the green and the speckled, the latter being always preferred.

The description given of the former, by acknowledged authorities, agrees nearly with the green leech *found here*; whilst the speckled or true medicinal leech of Europe varies in appearance from that of the medicinal leech of Australia, whilst its capabilities for drawing blood, without causing inflammatory wounds, renders it equal, if not superior, to the one of northern Europe.

The green leech* is to be found in abundance in most of the swamps and pools, intermixed greatly with those of other genera; and in some instances the true Australian medicinal leech is also found intermixed, requiring therefore great attention in the sorting of them.

The best description of the medicinal leech in this country is to be found in the river Murray and its tributaries, and in no one instance have I met with, from these rivers, any description but that of the Hirudo Australis.

General Characters:*

Back, dark olive, and sometimes approaching black, with four well marked bright yellow longitudinal lines, quite dorsal, the two outer dorsal lines being much wider than the inner ones. The marginal lines of the back partake of the same color as the belly, which is a deep ochre yellow, occasionally intermixed with olive green spots, but generally without them. Eyes, at least eight; body, narrow, oval, with about 100 segments; belly, flat.

On comparing this with the medicinal leech of northern Europe, it will be observed that it varies somewhat.

A third kind of leech, often met with, a species of horse-leech, is characterised as follows:* back, light brown umber, with a jet black longitudinal line down its centre, with six scarcely perceptible lines of a slightly darker brown than the back, three on each side of the centre. Belly of the same color as the back. Eyes, ten. The leech, on the whole, oval.

The plan usually recommended and adopted by the continental leech gatherers for preservation for *a length* of time entirely fails in this country. They recommend keeping them in wooden or earthenware vessels half-filled with water, having a layer of turf moss and charcoal at the bottom;

* *Vide* plate accompanying Dr. Becker's Notes on Australian leeches in the present Volume.

others recommend water alone, changing it every second or third day.

Leeches, although very tenacious of life, become sickly soon, should the temperature be below 50 deg., or above 90 deg. Fah. Under 50 deg. they are liable to a disease which appears in the shape of a ring round the body, gradually tightening until it destroys life. Exposed to a high temperature, the water becomes speedily tainted and impure, as each leech throws off a slimy coat every fifth day; this alone is sufficient to destroy life, as the decomposition of animal matter is very rapid in a temperature so variable as ours.

The object of the charcoal is undoubtedly to prevent the rapidity of decomposition, as well as to assist them in extricating themselves from their worn-out coats; and the turf moss is useful for the same purpose as well as for food.

I am under the impression that their food consists not only of animalculæ and larvæ, but also of the coloring matter of the marls or clays. I have noticed that after remaining for some time in the yellow or blue clay, they assume a strong shade of either color.

The plan I adopt for their preservation is simple, natural, and every way successful. For their preservation and cultivation on a large scale, sink into the earth, in a place protected from the sun and weather, a given circle; bank well up the sides, and half fill with the finest red or blue marl or clay, made into the consistence of thick mud (the red clay is preferable), and in this place the leeches; cover it over with thin canvas or calico, to exclude from them the extreme rays of light, and occasionally sprinkle the top of the clay with fresh rain water. The leeches will make no attempt to rise above the surface of the clay, but suit themselves to the temperature by rising or sinking accordingly.

By this simple plan of keeping them, they are not only able to clear themselves of their mucous coat, but can supply themselves with such food as improves their condition, and renders them more fit for the purpose required of them.

The low lands of Germany, the lakes of Siberia, Bohemia, and other parts of Europe, which have supplied the markets for so long, are becoming rapidly exhausted.

The demand for leeches on the Continent, and also Great Britain, continues to be enormous. It has been computed that 600,000 are monthly imported into London, over 7,000,000 annually; and that 3,000,000 are annually consumed in Paris.

Having succeeded in adopting a plan for their preservation that requires no labour and but little attention, I see no reason why they should not prove a remunerative article of export from these colonies.

All that is required to ensure a safe passage to Great Britain for 1000 dozen is, that the clay should be of good quality, obtained some few feet from the surface, so as to be free from any impurity of the upper earth, moist, and packed in a half-cask of the diameter of 3 feet, the clay being 8 inches high, and occasionally moistening the top of the clay to prevent it becoming hard. Should any die, they will always be found on the surface, so that a change of clay is only necessary about every six months.

The cocoons I have the honour to exhibit to the members of this Institute this evening, are the production of the Murray leech, obtained from my own small conservatory, as before described—a proof sufficient that the plan I adopt is more in accordance with their mode of life than that I have previously mentioned.

They bury themselves in the clay, some 6 inches from its surface, when they deposit their ova, which, being attached to a small pebble or to the sides of the reservoir, gradually increases in size.

Dr. Johnson says the leech fixes itself to some object, and with its mouth fashions it into an oval body, called a cocoon.

These cocoons are said to contain from 3 to 18 leeches. I have not observed more than 3 or 4 enveloped in a brownish jelly-like fluid, at first appearing like small, black spots, but as the time approaches for their piercing the cocoon, they are found lying attached on the whole length of the inner side of the capsule, with the posterior sucker attached to the thinnest end of the cocoon, and in this manner they leave the capsule.

The cocoons, when perfect, vary in size from $\frac{5}{8}$ to 1 inch in length, the smallest weighing about 8 grains, and the largest 25 grains. They generally pierce the cocoon in about 40 days, if under a moderate temperature, but longer if kept at a low temperature.

Their weight, immediately after piercing the cocoon, is one grain; their appearance of a brownish red color. If taken then and kept in water, they die generally in a few days. Their growth is said to be very slow, and must be so, for my own observation shows them to increase at the rate of about 4 or 5 grains per annum.

Some of the cocoons now exhibited contain a less amount of the spongy coating over the capsule than others, evidently showing that one of its uses is to supply nourishment during their imprisonment, for by placing one of these in the sun for a day or two, the young leeches penetrate the cocoon.

I may state, in conclusion, that my observations have extended over five years.

ART. IV.—*Diagnostic Notes on New or Imperfectly Known Australian Plants.* By DR. FERDINAND MUELLER.

[Read before the Institute 26th May, 1858.]

OLACINEÆ.

Ximenia exarmata.

GLABROUS, thornless; leaves herbaceous, ovate or oblong, almost blunt; peduncles generally 3-7-flowered, rarely 1-2-flowered; petals outside smooth.

On low stony ridges near the rivers Sutter and Mackenzie.

A tall shrub with spreading branches. Leaves flat, 1-2 inches, petioles 3-4 lines long. Petals lanceolate, yellowish, 2½ lines long, inside white-bearded. Filaments hardly 1 line long, glabrous. Anthers 1½ line long, linear. Style short, glabrous.

Evidently, according to Forster's brief description, allied to the New Caledonian Ximenia elliptica. The genus was previously unknown as Australian.

ERYTHROXYLEÆ.

Erythroxylon Australe.

Glabrous; stem shrubby; leaves small, obovate or oblong, cuneate, blunt, flat, opaque, nearly membraneous, with indistinct areolate veins, and a short petiole; their lower side paler; stipules membraneous, deciduous, as long or shorter than the leafstalk, combined into a solitary deltoid binerved one; peduncles as long as the flowers, solitary or in fascicles, at the base with two deltoid or round bracteols; lobes of the deeply five-cleft calyx deltoid lanceolate; petals ovate-orbicular; styles 3, rarely 4, free; stigmas hemispherical; drupe ovate, red, three-celled.

In the Brigolow Scrubs of East Australia, as far north as the Burdekin River.

A shrub several feet high, with compressed angulate branchlets. Leaves alternate or fasciculate, pale-green, 4-8 lines long. Calyx in æstivation valvate, one line long. Petals yellowish-green, as long as the calyx, with two ovate denticulate scales, $\frac{1}{4}$ line long, at the base. Anthers one-sixth of a line. Styles one line long. Drupe succulent, half an inch long.

The nearest related species seems E. hypericifolium. Its wood probably yields a dye like that of many of its congeners.

HIPPOCRATEÆ.

Hippocratea barbata.

Glabrous, climbing, leaves on rather short petioles, chartaceous, ovate, rarely lanceolate, blunt, repand-crenulate, much longer than the cymes; petals yellowish, lanceolate, five or six time longer than the calyx, inside above the middle bearded; anthers four-lobed.

On the banks of rivers near Moreton Bay. Hill and Mueller.

A tall climber. Leaves from $1\frac{1}{2}$ to 3 inches long. Flowers scented, with 5-6 petals. Anthers yellow. Style conical-subulate, green.

The plant is allied to Hippocratea obtusifolia and pauciflora, particularly in respect to its large flowers, but cannot be identified with any described Indian species. It is the only representative of the order hitherto discovered on this continent.

VINIFERÆ.

Cissus opaca.

(Sect. Ampelopsis.)

Shrubby; leaves palmate, often on long stalks, with 3-5 leaflets, which are herbaceous, oblong, or cuneate-lanceolate, rarely ovate or linear, entire or sometimes in front toothed, sessile, opaque, beneath glaucous; umbells in paniculate cymes; corolla three times longer than the calyx, green; style short: stigma depressed; berries black.

In the Brigolow scrub of Eastern Australia.

A tall vine, generally glabrous, sometimes slightly downy. It differs from Cissus Australasica (Transact. Phil. Soc.

Vict. I. p. 8, C. hypoleuca Asa Gray, in Wilk. United States Explor. Exped.) in its smaller neither leathery nor stalked leaflets and pentamerous flowers. On this apt occasion I am anxious to describe another Australian vine, mentioned already by Captain Stokes, which yielded in its young branches a pleasant acid antiscorbutic vegetable to Mr. Gregory's exploring party in North West Australia, viz.:—

Cissus acetosa.

(Sect. Ampelopsis.)

Erect, not climbing, herbaceous, soon glabrous; leaves pedate, consisting of from 5 to 9 herbaceous undotted leaflets; the lateral ones sessile on the secondary petiole and distant from the stalked middle one; all oblong or cuneate-obovate, blunt, mucronulate, entire or in front minutely crenate-denticulate, beneath paler; panicle compound, contracted; petals much longer than the calyx, inside dark purple; stigma sessile; berries ovate-globose, black.

Stems several feet high, not shrubby, rather succulent. Petioles short. Length of leaflets 4 inches or less. Stipules broad triangular. Petals 1 line, berries 3 lines long.

This remarkable plant forms the transit from Cissus to Vitis, differing from the latter genus in the solution of the petals, from the former in the absence of a style.

SAPINDACEÆ.

Arytera foveolata.

Branchlets, petioles and panicles more or less covered with a rust-brown velvet; leaflets 4-6 on short stalks, ovate or lanceolate-ovate, blunt, entire, or repand-dentate, glabrous, on both sides of almost equal colour, beneath at the base of each lateral nerve slightly bearded and furnished with a foveole; flowers small in wide racemose panicles; anthers almost velvety, cordate-ovate; carpels 2-4, beyond the base disconnected, broad-ovate, turgid, blunt; valves thick, coriaceous, outside velvety, inside glabrous; seeds nearly black, turgid, broad-ovate, perfectly involved in the arillus.

In the forests of Moreton Bay. Hill and Mueller.

A tall tree. Leaflets generally alternate, thin-coriaceous, 2-4 inches long, 1-1½ broad, with spreading nerves and numerous veins. Calyx shorter than one line, 5-cleft. Stamens 6-8. Filaments very short, style rather thick, one line long, simple. Carpels 4-5 lines, seeds $2\frac{1}{2}$ lines long.

Arytera divaricata.

Branchlets, petioles, and panicles covered with a thin rust-brown velvet; leaflets 2-4 on short stalks, ovate or ovate-lanceolate, blunt, entire or slightly repand, glabrous, nearly of equal colour on both sides; panicles compound; carpels oblong, blunt, 2-3, beyond the concrete base divaricate, outside glabrous, inside densely tomentose.

In the woods around Moreton Bay. Hill and Mueller.

Similar to the preceding species. Flowers unknown, The immature carpels already 4-5 lines long, 2 lines and less broad, and considerably compressed.

Arytera semiglauca.

(Nephelium semiglaucum, Ferd. Muell. coll.)

Branchlets, petioles and panicles thin velvety, leaflets 2-4, almost sessile, ovate or lanceolate-ovate, blunt, entire, above glabrous, beneath glaucous and slightly downy, flowers small, in compound panicles; carpels 2-3, brown to the middle concrete, round-ovate, compressed, outside and inside glabrous; seeds brown, turgid, ovate, covered with a thin arillus.

In the forest near Moreton Bay. Hill and Mueller.

A middle-sized tree. Leaflets thin, coriaceous, $1\frac{1}{2}$-3″ long, with thin spreading nerves, veined; carpels about $\frac{1}{4}$-inch long, tardily dehiscent, and sometimes also laterally bursting, for which reason the genus might be united with Spanoghea, and both again as subgenera with Nephelium. Seeds two lines long, shining, smooth, with fragile testa. Cotyledons a little bent. Radicule directed towards the hilum.

Spanoghea nephelioides.

(Nephelium leiocarpum, Ferd. Muell. coll.)

Nearly glabrous; leaflets 4-6, ovate-lanceolate, acuminate, entire beneath pale; flowers paniculate; style enclosed within the lobes of the fruit; carpels 2-4, almost globose, outward and inward glabrous, above the middle disjointed; seeds large, depressed-spherical, shining black, except the summit enclosed in a red cupular arillus.

In the forests near Moreton Bay. Hill and Mueller.

A middle-sized tree. Leaflets thin-coriaceous, with prominent spreading nerves and numerous anastomosing veins, 2-4 inches long, often alternate, contracted into a short petiole. Calyx persistent, puberulous, 5-parted in fruit, with ovate-lanceolate segments ½ line long. Carpels measuring 3-4 lines, coriaceous, smooth, breaking irregularly transversely. Seeds 2½-3 lines in diameter, polished, with a fleshy acidulous arillus, the red colour of which contrasting beautifully with the black crustaceous testa. Endopleura fulvid, membraneous. Cotyledons irregularly turned and folded. Radicule pointing to the hilum.

This genus, as mentioned before, might be referred to Nephelium, and includes the Neph. tomentosum.

Spanoghea connata.

(Nephelium connatum, F.M. coll.)

Leaflets 2-4, oblong or lanceolate-ovate, blunt, entire; beneath, as well as the branchlets, petioles, and panicles covered with a grey very thin velvet; flowers paniculate; style quite exserted; carpels 3-4, outside at last glabrous, connate into a depressed capsule, with blunt lateral lobes, downy inside; seeds small, shining-black, enclosed in a red, cupular arillus.

In wooded valleys near Moreton Bay. Hill and Mueller.

A tree 30 to 40 feet high. Leaflets thin-coriaceous 2-4 inches long, alternate or opposite, subsessile, above shining and glabrous, beneath opaque, with spreading nerves and netted veins. Fruit-bearing calyx short, with five deltoid lobes. Fruit about three lines long, 4-5 lines broad. Seeds measuring 1½ line, depressed-globose. Arillus vividly red.

Harpulia pendula.

(Planchon in herbar. Kewens.)

Leaflets 2-6, chartaceous, glabrous, lanceolate-ovate, somewhat acuminate, entire; calyx deciduous; cells of the capsules as long as broad, inside glabrous.

In the forests near Moreton Bay.

Harpulia Hillii.

Branchlets and panicles covered with a thin rust-brown velvet; leaflets 2-12, coriaceous, glabrous, oval, blunt, entire; calyx persistent; cells of the capsule broader than long, inside tomentose, outside puberulous.

In the virgin forests of Durando. W. Hill.

A tree 60 feet high; leaflets sometimes, when fully grown, 8 inches long and 2 broad, above more intensely shining than beneath, obliquely tapering into a short petiolule, with spreading nerves and netted veins. Panicle 6 inches or less long, simple. Pedicels often shorter than half an inch, with a basilar linear bracteole. Sepals imbricate in æstivation, broad ovate, 2-2½ lines long, outside and inside covered with a yellow-brown velvet. Petals 5, glabrous, oblong (white, according to Mr. Hill), 3 lines long; no scale at their base. Stamens 5, with very short filaments. Anthers sagittate, one line long. Hypogynous disc very short, sinuate, with velvety margin. Style 1 line long, smooth, at last twisted. Ovary velvety. Capsule heart or kidney-shaped, carnulent, coriaceous, vitellinous, turgid, about one inch broad, bursting along its vertex.

Cupani Onervosa.

Branchlets and panicles glabrescent; leaflets 2-7, lanceolate, acute, repand-denticulate or entire, without dots, with spreading prominent nerves, on both pages glabrous; flowers small, paniculate, apetalous; calyx small, repand-denticulate; capsule woody, roundish-trigonal, inside tomentose.

Along the Richmond River. C. Moore. About Moreton Bay. Hill and Mueller.

Leaflets 2-6 inches long, generally alternate, on short stalks, above shining, beneath opaque. Capsule ½-1 inch long.

Closely allied to the following species, still distinct.

Cupania xylocarpa.

(All. Cunningham's Herb.)

Branchlets and panicles almost velvety; leaflets 2-5, ovate, somewhat blunt, repando-denticulate or with remote sharp teeth, without dots, above glabrous, beneath at the base of the spreading prominent nerves bearded; flowers small, crowded in racemose panicles; calyx deeply five-cleft; stigma sessile; capsule woody, globose-trigonal, at last outward glabrous, inward velvety; seeds ovate, shining-black, three times longer than the pale bilobed arillus.

On various parts of the east coast of Australia.

A middle-sized tree. Tomentum thin, brown-yellow.

Leaflets generally alternate, thin-coriaceous, on very short stalks, above shining, below opaque. Calyx about one line long. Capsule measuring 8-10 lines, inside often purple. Seeds two lines long, slightly compressed, with a red arillus.

It appears nearer in its affinity to C. subcinerea, than to the other Australian species, viz.: C. Pseudorchus, C. Cunninghami, and C. anacardioides.

Besides these and the preceding noble sapindaceous trees, two species of Schleichera, and many others belonging to this order, occur along the humid east coast of Australia, all as evergreen with horizontal umbrageous foilage, highly adapted for avenues, unless trees of greater rapidity of growth were needed.

CELASTRINEÆ.

Denhamia.

(Meisn. gen. 18. Leucocarpon Ach. Rich. voy. de l'Astrolabe, II. 46. Sert. Astrol., 18, non Bridel.)

Calyx 5-cleft, persistent; lobes semi-ovate, as well as the corolla with imbricate præ-florescence. Petals 5, ovate, alternate, with the lobes of the calyx inserted beneath the disk. Stamens 5, opposite to the lobes of the calyx, inserted to the slightly sinuate disk. Filaments subulate-linear. Anthers cordate, affixed above the base, introrse, two-celled, bursting longitudinally. Stigmas 3, very short, sessile, somewhat clubshaped, long cohering into a cone. Ovules ascending in two rows along the septa. Capsule bony, with loculicidal dehiscense, 3-5 valved, 3-5 celled, or, through imperfect development of the dissepiments, one celled, few-or many-seeded. Seeds ovate, perfectly enclosed in the succulent arillus. Embryo straight, in the axis of a fleshy albumen. Cotyledons flat. Radicle very short, next to the hilum.

Smooth shrubs or small trees inhabiting the warmer parts of Australia, with alternate flat coriaceous ovate or lanceolate net-veined leaves, which are entire or toothed and destitute of stipules, and with small minutely bracteolate paniculate flowers.

Denhamia xanthosperma.

Branchlets almost terete; leaves lanceolate, acute or acuminate, with rather long petioles, entire, beneath pale from a powdery at last separating pellicle; flowers paniculate; filaments as long as the anthers;

capsule trivalved, one-celled, large; seeds yellow, many along each of the imperfect septa.

In dry plains and rocky declivities of Arnhem's Land.

A tall shrub or small tree, with generally pendulous branchlets. Leaves pale green, 1½-3 inches long, one-nerved. Panicles axillary, or terminal, often not as long as the leaves; secondary peduncles angular, generally cymose. Pedicels about as long as the calyx, with deltoid lanceolate bracteoles at the base. Lobes of the calyx ½ line long. Petals pale greenish-yellow, smooth, 1½ line long. Filaments measuring only ½ line. Anthers almost white. Ovary globose-ovate, imperfectly three-celled. Capsule ovate or nearly globose, 1-1½ inch long, shining yellow, with three slight furrows, smooth. Dissepiments very narrow, with eight or less seeds to each, which are ovate, 3-4 lines long, and perfectly involved in a beautifully red arillus. Testa wrinkled-papillose.

Denhamia heterophylla.

Branchlets almost terete; leaves ovate or lanceolate, acuminate, entire or acutely toothed, or both pages of equal colour, provided with conspicuous petioles; flowers paniculate; filaments as long as the anthers; capsule 3-5-valved; seeds black, one or a few on each septum.

On scrubby ridges from the Gilbert River to the Burdekin River.

Similar in almost every respect to the preceding species. Bark grey, wrinkled. The leaves are as variable as in some of the Capparis species, resembling in the young plants those of Xylomelum. Hence this tree occurs under that name in Dr. Leichhardt's journal, and in D. C., prod. xiv., p. 422, adnot. Capsule pale orange, arillus red.

Denhamia oleaster.

(Melicytus? Oleaster, Lindl. in Mitch. Trop. Austr., p. 383.)

Branchlets nearly terete; leaves linear- or narrow-lanceolate, tapering into a short petiole; flowers racemose; filaments longer than the anthers; style short, cylindrical.

On the Balonne River. Sir Th. Mitchell.

A shrub several feet high. Leaves pale green, 1½-2½ inches long, ⅓-½ inch broad, acute. Racemes on short peduncles. Lobes of the calyx semiovate, ciliolate, ½ line long. Petals white, nearly 2 lines long. Filaments exceeding somewhat 1 line in length. Anthers cordate. Style 2 thirds of line long. Stigma minute trilobed.

Denhamia pittosporoides.

Young branchlets angular; leaves oblong-lanceolate, gradually tapering into a short petiole, crenate denticulate, on both pages of equal colour; capsule small, four-valved, four-seeded, perfectly four-celled.

In the Araucaria Ranges on the sources of the Burnett River. C. Moore.

Leaves more intensely green and stronger veined than in any of its congeners, 2-4 inches long, 6-10 lines broad. Calyx normal. Valves of the capsule about ½ inch long, as well as the dissepiments bony.

To Mr. Black, the intelligent keeper of the Hookerian Herbarium, I am indebted for identifying the two first species of this genus with Leucocarpon, an information which, without reference to authenticated specimens, hardly could have been obtained, since Richard described the fruit as subcarnose. Mr. Black even believes, that Denhamia xanthosperma is identical with Leucocarpon obscurum; but the latter being found on the sub-tropical Eastern coast, and the former only hitherto on the fall of the waters to the north coast, I deem it preferable to hold the two distinct, until flowering specimens are procured of the Leucocarpon from the locality mentioned by Richard. Denhamia Oleaster and D. pittosporoides are too imperfectly known to render their position in this genus certain. I have referred all these plants to Celastrineæ, since the flowers seem to point out a closer alliance to that order than to Bixaceæ. If this view be adopted, the genus Denhamia will be placed near Putterlickia.

Celastrus Cunninghami.

(Catha Cunninghami, Hook. in Mitch. Trop. Austr., p. 387. Sect. Catha.)

Unarmed, glabrous; leaves scattered, coriaceous, lanceolate or narrow-linear, entire or rarely towards the apex denticulate; pedicels axillary, solitary, fasciculate-racemose, or rarely paniculate; capsules small, obovate, turgid, bivalved, one-celled, one seeded; seeds ovate-globose, shining-black, enclosed in a pulpy arillus.

From Port Jackson (where it was found by W. Woolls, Esq.), extending as far as North-west Australia.

A tall shrub, or small tree, with black wrinkled bark and numerous branchlets. Leaves 1½-2½ inches long, 1-6 lines broad, generally acute, gradually narrowed into the base, veined; the floral ones deciduous, leaving thus frequently a racemose inflorescence. Sepals nearly orbicular, ½ line long. Petals ovate or round, pale greenish-yellow, twice as long as the calyx. Filaments very short, inserted to the outside of the disk. Anthers basifixed, ovate-cordate, ¼ line long. Stigma subsessile, bilobed. Ovary two-celled. Seeds 1½ line long, neither compressed nor angulated.

Celastrus dispermus.

(Sect. Catha.)

Unarmed, glabrous; leaves thinly coriaceous, scattered, broad or lanceolate-obovate, entire, paler beneath; racemes lateral and axillar, few or many-flowered; calyx four-cleft; capsule obcordate-ovate or roundish, bivalved, compressed, two-celled, two- rarely four-seeded; seeds ovate, brown, only at the base covered with a thick fleshy arillus.

In the Araucaria Forests, near Moreton Bay.

A small tree similar to the following species; capsules about 3 lines long, rarely three-valved; seeds a little longer than one line.

Celastrus bilocularis.

(Sect. Catha.)

Unarmed, glabrous, leaves scattered, thin-coriaceous, ovate or broad-lanceolate, obscurely crenulate or sharp-teethed, distinctly net-veined, below paler; racemes axillary and lateral; capsule small, bivalved, ovate-globose, slightly compressed; cells one- or two-seeded; seeds enclosed in a thin arillus.

On the shrubby banks of the rivers Dawson and Burnett.

A small tree; leaves mostly 1½-2 inches long; capsules 2 lines long.

With Catha I refer also the genera Eucentrus and Polyacanthus again to Celastrus. Besides the Celastrus Australis and the above-described celastrinaceous plants, I am acquainted with several other Australian ones belonging to this order, none of which, however, has been obtained in a state sufficiently perfect for description.

Art. V.—*On the* Weir Malleè, *a water-yielding Tree, the* Bulrush, *and* Porcupine Grass *of Australia.* By John Cairns, Esq.

[Read before the Institute, 16th June, 1858.]

In compliance with the wish expressed at our last meeting, I have endeavoured to embody, in as few words as possible, the remarks I made on that occasion, on the subject of the Weir Malleè, the bulrush, and porcupine grass of Australia; and I would beg at once to acknowledge the great kindness of Dr. Mueller, to whom I am indebted for *all* the botanical descriptions which follow.

The water-yielding Malleè, called the Weir Malleè, was known to the natives long before the arrival of the whites, who, however, in their explorations, have often sustained life by its use, and it is mentioned particularly by Mr. Eyre, in his work on Australian exploration.

The water-yielding Eucalyptus is one of the many species which pass under the name of Eucalyptus Dumosa, extending from the desert tributaries of the Murray, westward, as far as Swan River, constituting those almost impenetrable scrubs called Malleè. Hitherto, it is by no means proved that only one solitary species of Eucalyptus yields water, and the subject is well worthy of further investigation. Any species of Eucalyptus inhabiting the scrub, not attaining the height of a tree, but of a low scrubby growth, is usually comprised under this name, thus rendering it difficult to identify with botanical precision the species which yields water.

Dr. Mueller informs me that in the tropics of Australia, the Malleè Eucalypti have not yet been found, whilst in Central Australia only two species of Eucalyptus of shrubby growth exist, and these differing from those met with in the South.

The existence of the Weir Malleè with its invaluable supply of water, is universally known by old bushmen, though I have met with some who never saw it to know it positively, not having taken the trouble to find out from the blacks which really is the tree. It is not met with in the dense scrub, but only on the edges of the plains with which the scrub is dotted, sometimes only of small extent, whilst on the contrary some present a vast open space of considerable width. During a recent visit to the Murray, where I had often heard of this useful shrub, my friend, Mr. Peter Beveridge, rode with me into the Malleè, accompanied by one of his native stockmen, who, on our approaching the edge of one of the plains, at once pointed out the tree. It grows upwards of twenty feet high, and scarcely differs in appearance from those around to the eye of a stranger, but easily to be detected on the brownish tinge of its leaves being pointed out. Our black immediately proceeded to cut a yam stick about five or six feet long, which he pointed with his tomahawk, and then, tracing the roots by a slight crack discernible on the surface of the ground, he dug underneath it till obtaining space enough for the point of his stick, he pushed it under and then prized up the root as far as he could. Going further from the tree he repeated the operation until he had, perhaps, fifteen or twenty feet of the root laid bare. He now broke up the roots into lengths of three to four feet, and, stripping off the bark from the lower end of each piece, he reared them against the tree, leaving their liquid contents to drop into a pannikin. On holding a piece of root horizontally no water is to be seen, but the moment it is placed in an upright position a moisture comes over the peeled part, until the pores fill with water which drops rapidly.

The natives when travelling in search of water, on finding the tree, usually cut off a large piece of the bark to serve as a dish, which they place at the foot of the tree, leaving the broken roots to drain into it, whilst they smoke a pipe or light a fire. The root, on being broken, presents to view innumerable minute pores, through which the water exudes most copiously; from a pint to a quart of pure water being procurable from a root of twenty to thirty feet long. Some roots which we carried with us to the home-station, gave out a little moisture the next morning, but the weather being excessively warm, rapid evaporation had no doubt taken place. The water which I now exhibit, is just as it drained from the root, in the month of March last, into a pannikin, the bottle never having yet been opened, and the results of the chemical analysis of the contents of a second bottle will no doubt be laid before us by Dr. Macadam, who kindly took charge of the same, with this view, at our last meeting.

Mr. Peter Beveridge ascertained that water was procured from the roots of the Beefwood tree, a small tree described by Dr. Mueller, in the 14th volume of Professor De Candolle's Prodromus, as the "Hakea Stricta," but the quantity produced therefrom is so small as to render it, comparatively speaking, worthless; in fact, the root must be sucked to obtain any moisture at all, which, as already described, is not the case with the "Weir Malleè."

Many explorers have been much surprised to find natives existing where there was apparently no water to be found, either in roots or otherwise; but their surprise has been changed into admiration at another wonderful provision of nature, in the "murn," so called by the natives, but "malleè oak," by the whites. This tree is very like the "she oak," but with bark less rough and more silvery in color. The wood is very hard, like lancewood, and capable of taking a fine polish. When the trunk attains a diameter of about six inches, it becomes pipy, thus forming a natural reservoir, into which the rains of the wet season are collected—the branches of the tree, which join at the top of the stem, acting as conducting pipes. The narrow aperture prevents much evaporation, and the natives know how to obtain water here, where an inexperienced traveller would never dream of searching for it. To procure this water, the native ties a bunch of grass to the end of his spear, and then climbing the tree, dips his primitive piston rod—if I may so call it—into this singular well. Drawing it up again, he squeezes the water from the grass into his bark dish, and thus proceeds until he obtains sufficient for his present requirements.

At our last meeting, Mr. Blandowski made some very interesting remarks, throwing considerable light on the subject of the nature of the soil on which the water-yielding malleè is generally found, and had I not been much pressed for time, I should have taken the liberty to apply to him for a few particulars on that point, which would have been a valuable addition to this paper.

The kumpung, or bulrush, which I exhibit, was brought before the notice of this Institute some time ago, by Mr. Blandowski, and I merely call attention to it under an impression that it might be advantageously brought into use as an article of export, capable of being manufactured at home into fabrics, where strength of material is required. It grows in considerable quantities in vast beds, extending over miles of country, and much of it being on the banks of the Murray, its shipment would be easy.

Mr. Peter Beveridge informs me that the "kumpung springs up from the root, *through the water*, about the end of

August, or as soon as the weather becomes slightly warm. When about a foot in length above the water, the natives pull it up and eat it for food in an uncooked state. In flavour it is very insipid, but extremely satisfying, and in this state is termed by the natives "joutey." It is full grown, or nearly so, by the time the waters recede, and remains green until the frosts come round, when it becomes quite brown, and, if not destroyed by fire, continues so until the young shoots spring up the following season; and so it goes on from year to year, until it becomes so thick as to be impervious to the sun, thus rendering the ground quite swampy and impassable for stock, therefore useless or worse than that." In the summer the natives dig up the roots, which they either roast or boil, and after masticating it and obtaining all the starch therefrom, they retain the stringy, fibrous parts in lumps, which the lubras carry about with them in their nets or bags, like careful housewives, until such be required for making strings or threads, which they afterwards net into bags, girdles, and other useful articles. The nets used for catching wild ducks, of which Mr. Blandowski gave us so interesting a description at the last meeting, must be of considerable size and strength, which convinces me that this is an article of commerce well worthy the attention of exporters.

Dr. Mueller describes it as rather remarkable that this particular kind of Australian bulrush should have proved identical with the species found in Switzerland, the "typha shuttleworthi," and consequently its utility, as an article capable of manufacture, may be easily proved in Europe. There are only two species found in Australia, but this particular variety has been found all over this vast continent, and used by many explorers as an article of food, on account of the starch it contains. The seed, consisting of a mass of soft down—called sometimes the "Murray down"—is very useful for stuffing mattrasses. The coolness of this material admirably adapts it for this purpose in a hot climate.

The needle, or "porcupine grass," exhibited on this occasion, which has so very well been called by explorers "Spinifex," on account of its forming such thorny barriers to travellers in the Australian deserts, does not, Dr. Mueller informs me, belong to the particular genus described by Linnæus under that name, but is the "triodia irritans," and he states, on the authority of Mr. Gregory, that it is generally absent in the otherwise similar desert scrubs of Western Australia, although like species are encountered in Northern Australia.

Art. VI.—*A few notes on two kinds of Australian Leeches.* By Ludwig Becker, Esq.

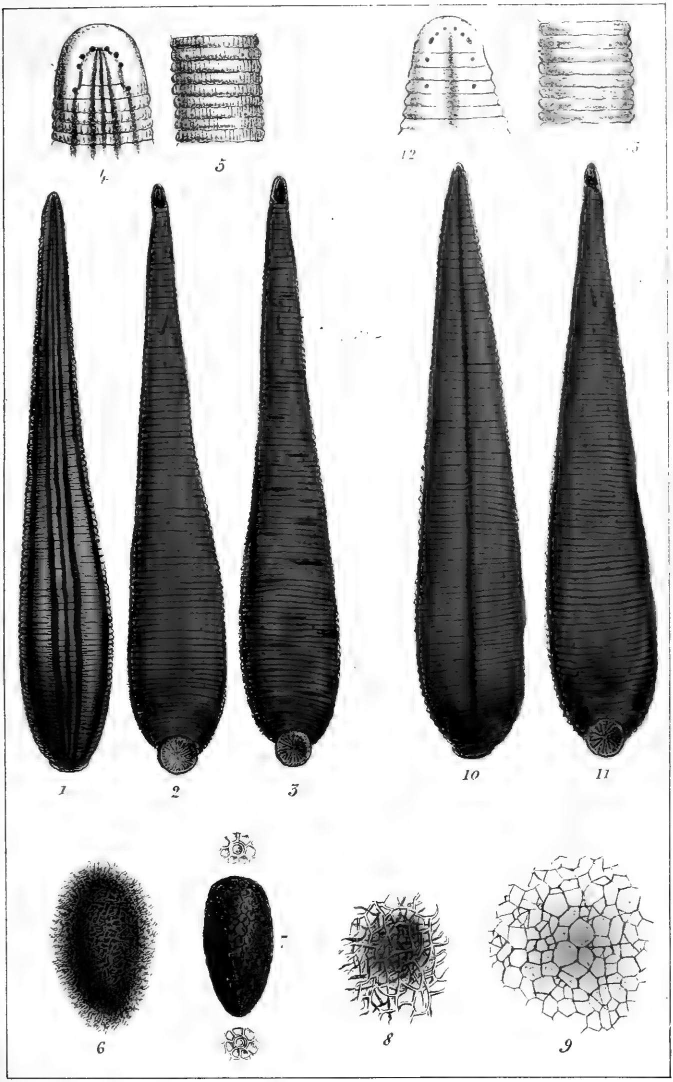
[With a Plate.*]

[Read before the Institute, 28th July, 1858.]

While I was engaged in drawing Australian Leeches of two kinds, for the illustration of Mr. J. Bosisto's descriptive paper, I made a few observations whic. I think, will be found not quite valueless for distinguishing the true Australian medicinal leech from others.

Fig. 1 represents the back of the hirudo medicinalis of Australia; three black lines are running longitudinally over the middle part of the back, and one black line along each side. The ground-color of the upper half of the body is a yellowish brown, while the under side (Fig. 2) is of a deeper, more rusty, hue. On some specimens, small black lines are seen across the belly, as in Fig. 3; but these are accidental and do not indicate a different species. The body of the true Australian medicinal leech is divided into 97 rings, and each ring is again very regularly divided by transverse folds (vide Fig. 5, showing part of the under side magnified). It is provided with four pairs of eyes, placed near the end of the head, as seen in Fig. 4 (magnified). The skin upon the inferior surface of the body has eighteen pairs of pores, exuding a mucous secretion; four rings are between each pair of these pores (Fig. 5). The cocoon (Fig. 7, nat. size) is covered with a sponge-like tissue, of an olive-green color (Fig. 6, nat. size). Part of this tissue is magnified in Fig. 8. The cells, or meshes, of this tissue appear to be formed by flattened threads of a skin-like membrane, joined together in such a manner as to produce cells or meshes of different angular forms. That part of the sponge-like tissue which is nearest to the cocoon, has its meshes closed by a layer of skin, serving as the epidermis of the cocoon. Fig. 9 shows part of the epidermis, magnified. The cocoon is filled with a dark brown fluid, which is visible through the semi-transparent inner skin forming the

* Since the completion of this Plate, it appears, after the examination of various specimens, that the following emendation is necessary. Fig. 10, besides the central line of a jet black color, there exists three faint brown parallel lines on either side.—[Ed.]



Ludwig Becker del. & lith.

Hamel & Locher, impr.

Australian Leeches.

sac or capsule of the cocoon. The two magnified ends of the capsule are seen in Fig. 7.

The so-called Australian horse-leech is represented in Fig. 10,* showing the upper part of its body, where there is only one longitudinal black line in the middle of the back; while the rest of the leech, above and below (Fig. 11), is of an uniform dark rusty color. The body of this species has only 94 rings, which are not longitudinally divided (as seen in Fig. 5), but have large, irregular folds, of no distinct character (Fig. 13, magnified). The horse-leech has five pairs of eyes (Fig. 12, magnified), but has the same number of pores on the under-side of its body as the medicinal leech.

The tenacity of life which leeches of these two kinds have shown, while under my examination, is worth noticing. To enable me to make exact drawings, and to observe correctly, it was necessary, to keep the animal quiet, but it was also necessary to avoid the risk of a change in the color and other essential characters of the animal, by death. Sulphuric ether was therefore tried, no chloroform being at hand; but, a wrapper of linen, fully saturated with the ether, was found to be ineffective. It was necessary to plunge the leech in a vessel full of that fluid; and, even after a few minutes immersion, the further addition of strong spirits of wine was required to render the animal motionless. By this time, however, it appeared actually dead; a good deal of leech-blood was discharged, and the body was covered with a thick layer of the mucous substance. In this state it was cleaned and laid under the microscope. The process of observing and drawing had been continued for an hour or so, when the eyes, or rather the eye-lids (if that expression might be used), were observed to be in a peculiar opening and shutting motion, by which, each time, a minute drop of a fluid was squeezed out. The same operation was performed afterwards by the eighteen pairs of pores, which are in connection with glands yielding the mucous matter; but this time they discharged sulphuric ether and alcohol which had entered the body, and very little of the mucous matter was perceptible. The leech was again placed in fresh water, and, after a very short time, it swam about as if nothing had happened. The horse-leech, especially, showed this great power of resisting destructive influences from without, which, perhaps, may be attributed to the greater mass of mucous matter it is able to surround itself with.

Having put the specimens under observation into a bottle full of strong spirits of wine, they soon died; and here I found another sign by which to distinguish the true medicinal leech from the horse-leech, viz.: the former, in the spirit, changes his natural color little or not at all, while the skin of the horse-leech becomes grey, like ash.

Melbourne, July 3rd, 1858.

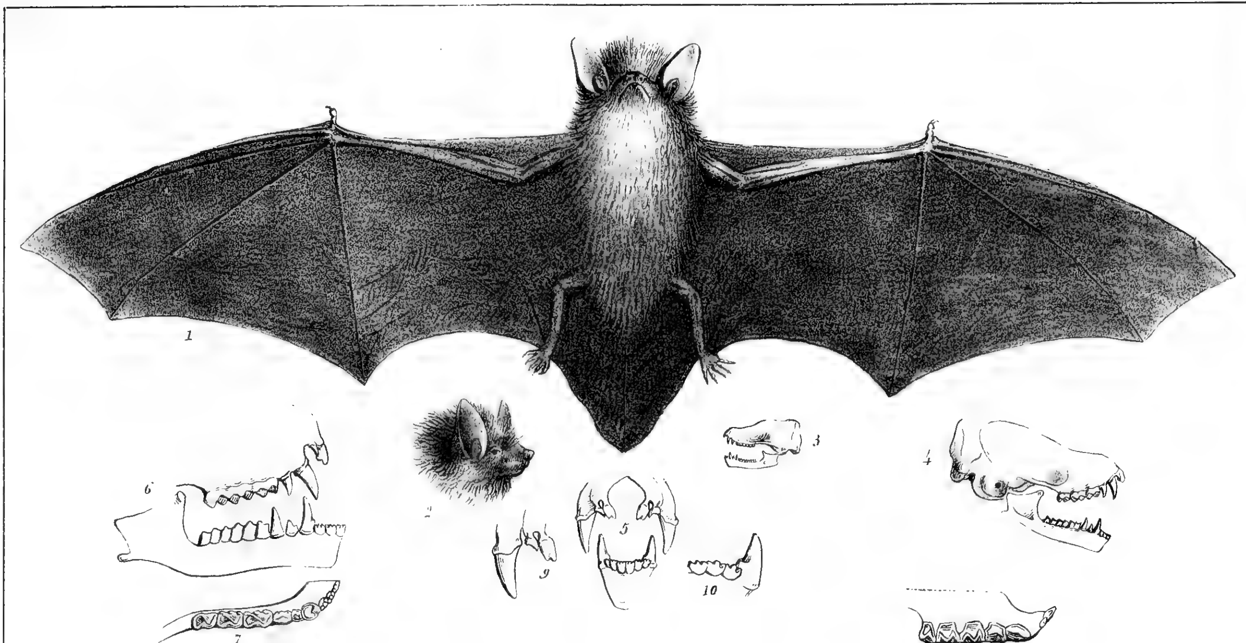
Art. VII.—*On an Australian Bat.* No. I. By Ludwig Becker, Esq.

[Read before the Institute, July 28th, 1858.]

[With a Plate.]

On the 14th of June last, I received a bat, which showed some peculiarities in habit as well as in its anatomical proportions. I thought it worth while to figure it, and to make an exact outline of the skull and teeth. I know that I risk bringing before you to-night an animal perhaps already known to some here or "at home," but it was and is new to me, and as I have not found it figured or described, either in Gould's work or in any other work accessible to me, I have made the venture.

Some gentlemen, while sitting round a chimney fire, at Oakleigh, near the Dandenong Ranges, were struck by the appearance of a little creature, emerging from a log of wood lying in the fire. The smoke and heat had awaked the animal and driven it from the resting place, which it had selected for its winter-sleep. It was caught and secured in a pickle-bottle, still containing some fluids and other matters not at all suitable to a flitter-mouse's palate. Some days afterwards it was placed in my hands, and I was glad to deliver it from its certainly unpleasant confinement. After putting it in a warm bath, and after drying and warming it, I found it as lively as if fire and pickles had never exercised any influence upon it. When thrown in the air it flew about in my room for a short time, and then settled in a dark corner, where it was soon very busy combing its fur with the hind-feet, and then drawing them, or rather the nails on them, in quick succession through its mouth, to clean them. With the lips, teeth, and tongue, the wings, or the membranes between the extremities, were cleaned, stretched, and arranged. When replaced on a table, it walked about with



AN AUSTRALIAN BAT.

Ludwig Becker, del & Lith.

Hamel & Cº Imp.

great rapidity, trying to shun the light; and if laid hold of behind, and detained from reaching a shaded nook, turning round the head and biting at the detaining object with an angry hissing and whistling noise. It refused food and water, and when an insect or a small bit of meat was forced into its mouth, it was, as quick as possible, rejected. The moment the bat found itself in shade or under shelter, it fell asleep. The temperature of the inner portion of the mouth was $52\frac{1}{2}°$ Fah., while the surrounding air was 52°. The body showed 140 regular pulsations during the space of a minute; but whether these arose from the action of the lungs or the heart, I was unable to ascertain.

The extraordinarily small size of this specimen of vespertilio induced me to weigh and to measure it. The following was the result:—While alive (on the 18th June) the bat weighed two pennyweights and seventeen grains; eight days later (on the 26th June) while still alive, the weight was only two pennyweights and eight grains; there being a loss of nine grains, or about one grain in every twenty-four hours. It died on the last-mentioned day, and the *post mortem* examination gave many indications that, although the organs and tissues were in full and good condition, the proximate cause of death was probably starvation and unseasonable disturbance of the animal's natural state of hibernation. The specimen was a male one. The body had the following proportions:—whole length, from tip of nose to root of tail, not quite one inch and half; length of tail, one inch; extreme span of wings, six and three-quarter inches. The colour of the body, dark brown on the back, grey on the under side, and lighter grey under the chin; feet black; membrane of the wings and tail, purplish-brown in color, and not covered with hair, with the exception of a few near the root of the tail. Dentition as follows:—

$$in.\ \frac{2.\ 2.}{3.\ 3.} \qquad c.\ \frac{1.\ 1.}{1.\ 1.} \qquad f.\ m.\ \frac{1.\ 1.}{2.\ 2.} \qquad m.\ \frac{3.\ 3.}{3.\ 3.}\ \Big|\ \frac{14}{18} = 32$$

Incisors: upper, the first, two lobed; the second, simple and smaller; the lower, three lobed and very small. Canine: upper, strong, a little curved; lower, like the upper, but only half the size of it. False molars: above, longer than the true molars, sharp-pointed; below, the first, two lobed and smaller than the true ones, the second, sharp-pointed and larger. True molars: above, first and second nearly equal, with three sharp tubercles externally and a low sharp ridge internally, the third with only two and half tubercles, but otherwise like the two first. The lower molars have two sharp-pointed ridges externally, and three ditto internally.

It appeared to me that this bat is very likely the smallest of its kind yet known in Australia, and indeed, perhaps, even the smallest mammal yet anywhere discovered. I compared it with Gould's "Scotophilus picatus," of which he says:—"This pretty little bat, which is the smallest and one of the most interesting of the true scotophili, inhabiting Australia, &c.;" and Captain Sturt, on the same subject, says—"This diminutive little animal flew into my tent at the depot, attracted by the light.... ;" but the specimen before you is full half an inch shorter in the body, and two inches smaller between the wing-ends.

Should it be found that the specimen here in question is a member of a yet undescribed species, I venture to propose for it the name—Vespertilio pygmæus.

EXPLANATION OF PLATE:

Fig. 1, 2, 3, natural size; 4, magnified about double natural size; 5, 6, 7, 8, ditto four times; 9, 10, ditto eight times.

Melbourne, July 1858.

ART. VIII.—*Some hitherto unknown Australian Plants.* Described by DR. FERDINAND MUELLER.

[Read before the Institute 18th August, 1858.]

STERCULIACEÆ.

Methorium integrifolium.

Clothed with starry velvet-hair; leaves oval, almost entire, short-stalked, beneath net-veined; stipules subulate, deciduous, shorter than the petioles; cymes axillary, sessile, few-flowered; teeth of the calyx acute, three or four times shorter than its tube; column of stamens straight.

On rocky declivities of the sandstone table-land of the Upper Victoria River.

Leaves 1½-2 inches long, generally 1 inch broad, on both pages of equal color. Cymes several times shorter than the leaves. Calyx about ¼ inch long, exceeding the linear-subulate bracteoles. Laminæ of petals $1\frac{1}{2}$ line long, exserted; claws biauriculate. Tube of filaments enclosed. Anthers kidney-shaped. The fruit has not been found.

HALORAGEÆ.

Myriophyllum dicoccum.

Lower leaves pinnate, with capillary opposite or alternate segments; upper leaves alternate, linear or lanceolate, entire, toothed or pectinate; flowers axillary, sessile; fruit consisting of two carpels, which are glabrous, truncate, round at their back and hardly tubercled.

In lakes, rivers, and lagoons towards the Gulf of Carpentaria.

The habit of the plant is that of certain forms of M. variifolium. Flowers at least in part hermaphrodite. Stigmas purple, long bearded. Stamens seemingly 4. Fruits solitary, about $\frac{3}{4}$ of a line long, slightly tapering upwards, rounded at the base, in exceptional cases augmented to 3 or even 4 carpels.

PORTULACEÆ.

Calandrinia uniflora.

Annual, glabrous; stemless, or with an erect naked stem, producing a bunch of leaves at the apex; leaves longer than the stem, terete, acute, glaucescent, without any furrow; peduncles terminal, thin-filiform, thickened at the apex, one-flowered, twice or thrice longer than the leaves, with 2 or 3 cordate-lanceolate acuminate remote deciduous bracts; petals 8-11, lanceolate, almost three times longer than the orbicular-cordate sepals; stamens numerous; style none; stigmas 3-6; capsule as far as the middle four-valved.

On arid plains and ridges on the Victoria River.

Root pale, descendent, simple, with few fibres. Stem often red, $\frac{1}{2}$-$1\frac{1}{2}$ inch long, at times undeveloped. Leaves and peduncles united, as the case may be, in a radical or terminal fascicle; the former 4 inches or less long, hardly thicker than one line. Peduncles erect, or adscendent, smooth, producing the bracts chiefly in their lower part. The latter hyalinous, clasping, very tender membraneous, scarcely one line long. Sepals measuring two lines, rather acute, dropping in age.

Petals pink, about 5 lines long, persistent when faded. Filaments considerably shorter than the corolla, of unequal length, white, capillary. Anthers sagittate-ovate, white, fixed between their lobes, several times shorter than the filaments. Pollen yellow. Stigmas white, filiform, about one line long, adscendent. Capsule ovate or nearly globose, $\frac{1}{4}$ inch long. Seeds numerous, with their white funicles affixed to the basilar placenta, shining, black, perfectly polished, lenticular, measuring $\frac{2}{3}$ of a line.

MYRTACEÆ.

Calycothrix arborescens.

Glabrous; branchlets numerous, slender, spreading; densely torulous-cicatrisate; leaves very small, densely imbricate, cordate- or rhomboid-lanceolate, acuminate, with broad sessile base, above flat, beneath convex and somewhat keeled; stipules exceedingly minute, subulate, much shorter than the cicatrix, and to its centre inserted; flowers polyandrous; bracteoles free, orbicular-cordate, acuminate, not much longer than the pedicel, but nearly three times shorter than the cylindrical calyx-tube; lower portion of the calyx-lobes almost ovate, upper part drawn out into a long acumen, but without a proper bristle, somewhat scabrous, not reaching beyond the lanceolate pointed white petals.

In arid bushy plains towards the sources of the Roper and Limmen Bight rivers.

A tall, most beautiful shrub, sometimes forming a tree fully 25 feet high. Leaves, in drying, extremely deciduous, those of the younger branchlets $\frac{2}{3}$-1 line, those of the older ones 1-2‴ long, all spirally arranged, their fall rendering the thin branchlets like those of C. microphylla, strangely sculptile by the innumerable little grooves of the cicatrices. Bracteoles greenish, scarcely longer than one line. Tube of the calyx tapering towards the base, yet not towards the apex; segments of the limb pale yellowish-green, 2-$2\frac{1}{2}$‴ long. Anthers roundish-cordate, terminating in two glands. Style longer than the white filaments.

The nearest allied species is Cal. microphylla, A. C. In C. arborescens and the following species is a clear transit to Lhotzkya observable, which genus may well be united with Calycothrix.

Calycothrix brachychaeta.

Leaves linear-triangular, crowded, glabrous or pubescent, almost blunt, stalked; flowers sessile, collected in leafy spikes; bracteoles free, dilated at the truncate and ciliate apex, as long as the silky-downy tube of the calyx, or but little shorter, pointed by the apex of the keel; lobes of the calyx lanceolate, outside downy, gradually terminating in a ciliate acumen, but scarcely in a distinct bristle; petals white, lanceolate, acuminate, almost as long as the calyx-lobes; stamens 15-20.

On stony ridges along the rivers Victoria, Fitzmaurice and Roper.

A tall shrub. Leaves 2-3 lines long. Tube of the calyx 1½-2 lines long, slightly contracted towards the summit, hardly longer than the lobes.

This species bears, amongst its numerous congeners, only comparison with C. conferta and the following one.

Calycothrix achaeta.

(Sect. Lhotzkya.)

[Lhotzkya cuspidata, Ferd. Meuller, in Hooker's Journal of Botany, 1856, page 324.]

Hirtellous; branchlets very short, crowded; leaves on short stalks, very minute, densely imbricate, oblong-triangular, almost blunt, above one nerved, beneath scarcely keeled; stipules, none; flowers sessile; bracteoles free, obcordate, fringed, keeled, apiculate, ⅓ shorter than the calyx-tube; lobes of the calyx ciliate, ovate or cordate orbicular, cuspidate by a short acumen, not much shorter than the ovate silky-downy tube, without manifest bristle; petals white, narrow, oblong-lanceolate, of twice the length of the calyx-limb; stamens 12-17; gland of the anthers conspicuous, double.

On the sandstone table land of Arnhem's Land.

A shrub 5-8′ high. Leaves never much longer, often shorter, than one line. Tube of the calyx about one line long. Anthers round, yellowish. Style of equal length with the longer filaments.

Referring to Chamælaucieæ, I may mention, on this occasion, that the Homaloxalyx ericæus is to be combined with Tryptomene, as Tr. homalocalyx.

Melaleuca symphyocarpa.

(Sect. Asteromyrtus.)

Branchlets almost terete and petioles slightly downy; leaves alternate, shining, oblong-lanceolate, flat, blunt, 5-9 nerved, thinly veined, tapering into a broad but very short petiole; flowers in free axillary and lateral heads; lobes of the calyx deciduous, nearly semiorbicular; phalanges penicillate polyandrous, orange, with a long and thin claw; capsules boney, perfectly united in a globose head, three-celled; valves short-exserted; seeds wingless.

On the sandy or gravelly banks of the Roper, Limmen Bight and Macarthur rivers, also on sometimes inundated localities of the neighbouring plains.

A large, very handsome bush, sometimes attaining the size of a small tree. Bark fissured, black, not lamellar. Leaves bright green, generally $1\frac{1}{2}$-$2\frac{1}{2}$ inches long and 6-9 lines broad. Flowers varying from 8 to 15 in each head. Tube of the calyx already in early age connate, yellowish or red, more or less velvety; lobes green. Bracteoles downy. Petals spathulate-orbicular, $1\frac{1}{2}$ line long, glabrous, yellowish, half surpassing in length the calyx-lobes. Columns of the stamens 3-6 lines long, with the free portions of the filaments, which are 2-3 lines long and fasciculately but not flatly arranged, forming exactly a brush, at last deciduous. Anthers about $\frac{1}{4}$ line long, purplish red, after fœcundation black, didymous, fixed with their back, terminating in a small gland. Pollen almost free of color. Style smooth, orange or yellow, hardly as long as the stamens. Stigma green, peltate. Fruit heads measuring about half an inch, beautifully areolate by the vertex of the capsules. Seeds brown, 1 line long, clavate-filiform, truncate.

There exists no character by which Schauer's genus Asteromyrtus can be separated from Melaleuca. The same intenability of generic distinction is manifest between Symphyomyrtus and Eucalyptus, and the limits of the genera Leptospermum and Fabricia are likewise so far infringed, that I do not hesitate to unite them respectively.

M. globifera agrees in its brief specific characteristics, offered by R. Brown, with Mel. symphyocarpa, but the former is restricted to the south coast; nor does it fully accord with the generic note promulgated by the immortal R. Brown, in Aiton's Hort., Kew, iv., 410.

Melaleuca minutifolia.

Glabrous; branchlets numerous, generally opposite, extremely slender; leaves very small, opposite, sessile, ovate or lanceolate, acuminate, towards the base incurved, crowded, slightly spreading, deciduous; capsules spicate along the branches, globose-ovate, truncate or in age almost hemispherical, three-celled; seeds wingless.

In barren localities of North Western Australia.

A tall shrub. Leaves about $\frac{3}{4}$-$1\frac{1}{2}$ lines long, in drying remarkably deciduous. Branchlets at the insertion of each pair gradually contracted, with rather conspicuous cicatrices.

It differs from Melaleuca tamariscina, its nearest congener, as follows: the arrangement of the leaves is not a spiral one, and after their fall the branchlets do not assume in consequence that truly screwlike appearance which characterizes Melaleuca tamariscina, although they are also singularly grooved and often more slender still; the leaves are neither closely appressed, nor are any of them blunt and subcordate, nor is the fruit-rachis velvet-downy. I have not yet seen ripe fruit of M. tamariscina, nor the flowers of either species, from which, probably, many other marks of discrimination may be derived.

Cucurbitaceæ.

Cucumis jucunda.

Leaves cordate, undivided, somewhat angular, with minute and remote teeth; petioles shorter than the leaves, or at least of equal length with them; tendrils simple, their lower portion hispidulous; lobes of the calyx filiform-linear; ovary velvety; fruit small, ovate, powdery-downy, at least three times shorter than the peduncle; seeds numerous, their length that of the third or fourth part of the fruit diameter; funicle very short.

In Arnhem's Land and on the Gulf of Carpentaria, particularly on the banks of rivers, also in eastern tropical Australia, and in Central Australia observed with certainty as far south as Cooper's River.

Stems long, trailing or climbing, as well as the branches, with 5 blunt angles. Petioles, peduncles, stems and branches hispid with short, spreading bristles. Leafstalks angular, cylindrical, with a superficial furrow. Leaves $1\frac{1}{2}$-4 inches long and broad, above hispidulous-scabrous, beneath along the nerves and veins imperfectly hispidulous, otherwise scabrous-downy. Tendrils 1½-3 inches long, upwards spiral. Flowers monœcious, a few congregated and arising from the leaf-axis, with short peduncles. Lobes of the calyx 1-1½ line long, appressed; tube villose, in the male flowers longer than the lobes. Corolla yellow, deeply five-cleft, inside glabrous, outside slightly downy or a little hispid; the lobes ovate, apiculate, ¼-⅓ inch long. Stamens of the male flowers gyrose, connate with the rudimentary pistil; anthers 5, in 2½ pairs, almost sigmoid. Disk of the female flower yellow, patellar. Style green, smooth, upwards thickened. Stigmas three, greenish, scarcely longer than 1 line, nearly ovate, flat in front, convex at the back, each separable into two. Rudimentary stamens wanting. Pepo rather sweet, of a pleasant taste, exactly egg-shaped, irregularly six-celled, scarcely longer than one inch, not angular, simply green, covered with very minute almost powdery hair, which causes an acrid irritant sensation to the taste, but are almost spontaneously lost in age, when the fruit assumes a pale colour. Seeds ovate-cuneate, about 2½ lines long, surrounded by a slightly tumid margin.

This cucumber is the Cucumis pubescens mentioned in Sir Th. Mitchell's Trop. Austr., p. 110, but evidently not the true Willdenowian plant, as pointed out in the report on Mr. Gregory's plants from Cooper's Creek. The genuine may be sought, perhaps, in the following species. It is possible that the C. pubescens of Asa Gray, Unit. Stat. Expl. Exped., p. 646, belongs to this species.

Cucumis picrocarpa.

Leaves in circumference cordate, 3-5 lobed, their lobes repand-denticulate, somewhat angular; petioles as long as the leaf, or at last somewhat longer; tendrils undivided, everywhere hispidulous; lobes of the calyx filiform-linear; ovary villous-woolly; fruit subtrigonal-ovate, with some minute scattered bristles, not half as long as the peduncle, which is tumid at the apex; seeds very numerous, many times shorter than the fruit-diameter; funicle long.

In many parts of tropical Australia.

It differs from the preceding, besides in the above characters, also in the lobes of the calyx and corolla, which are of twice the size, in finely white-and-grey-spotted fruit, which is constantly 2-3 inches long, regularly six-celled, of extremely bitter taste, whilst the seeds, notwithstanding the double or triple size of the fruit, are barely as long as those of Cucumis jucunda, and are attached to a funicle which exceeds their own length.

Rubiaceæ.

Canthium vaccinifolium.

Glabrous; branchlets in two rows, recurved, more or less spinescent; leaves thick coriaceous, small, orbicular or ovate; peduncles axillary and terminal, 1-2-flowered; pedicels shorter than the calyx; corolla to the middle four-cleft; faux bearded; filaments shorter than the oblong anthers; stigma bifid, with blunt base; berry black.

In barren scrubby localities near the rivers Burdekin, Suttor, M'Kenzie, Dawson, and Burnett, accompanied by Canthium oleifolium.

A shrub 6′ high or still higher, with numerous spreading branches. Leaves blunt or emarginate, flat, entire, 2-5 lines long, above slightly shining, beneath paler and opaque, one-nerved, hardly veined, their stalk $\frac{1}{2}$-$\frac{3}{4}$ line long. Stipules $\frac{1}{4}$-$\frac{1}{2}$ line long, 1 line broad, entire, deciduous, with a very short acumen. Peduncles one line or less long. Pedicels sometimes obliterated, at the base with extremely minute bracteoles. Calyx tube half-ovate, without ribs, scarcely one line long, with four very small acute teeth, one or the other sinus occasionally producing also a minute tooth. Corolla pale yellow, funnel-shaped, outside glabrous, inside above the middle of the tube white bearded; lobes lanceolate-ovate. Stamens inserted between the lobes of the corolla. Filaments very short, glabrous. Anthers sulphur-yellow, blunt, at the base a little emarginate, $\frac{3}{4}$ line long. Pollen bright yellow. Style filiform, green, smooth, $1\frac{1}{2}$ line long. Stigma ovate, bifid, $\frac{1}{2}$ line long. Berry globose, succulent, 2-3 lines long, rather sweet, with two nuts, which are nearly ovate, black, slightly tubercled, very convex at the back, slightly so in front, about $1\frac{1}{2}$ line long.

The plant may, with equal right, be referred to Canthium or Psychotria.

Canthium coprosmoides.

Glabrous; leaves thinly coriaceous, ovate, flat, entire, blunt at the apex, tapering into the petiole; peduncles none;

pedicels axillary, solitary or two or three together, scarcely as long as the calyx; lobes of the corolla 5, rarely 4, half as long as the tube, above thin velvety; faux bearded; anthers ovate, almost sessile; stigma hemispherical; berry red.

In scrubs on ridges along the rivers Dawson, Mackenzie, and Brisbane.

Shrub from 6-10 feet high. Leaves 1 to $2\frac{1}{2}$ inches long, their stalk $1\frac{1}{2}$-3 lines long, above dark-green and shining, beneath a little paler, finely veined. Stipules from a broad base subulate, $1\frac{1}{2}$-2 lines long, deciduous. Calyx at first bell-shaped, scarcely longer than one line, with five acute and very short teeth. Corolla funnel-shaped, outside glabrous and yellowish; its tube $\frac{1}{4}$ inch long; its lobes ovate. Anthers $\frac{2}{3}$ line long. Style bristlelike, glabrous, not exserted. Stigma slightly concave in the centre, half a line in diameter. Berry naked, 3-4 lines long, upwards a little broader, with two nuts.

Homalineæ.

Blackwellia brachybotrys.

Leaves ovate or rhomboid, or round-ovate, tapering into a short petiole, smooth, their margin repand; raceme short, almost spicate; flowers small, slightly downy; tube of the calyx hemispherical; its lobes 6-7, linear, rather acute; petals but slightly or nearly half-exserted, oblong-lanceolate; glands velvety; stamens 6-7; styles 4-6, below their apex slightly downy.

On granite rocks, near the origin of the Gilbert River—rare.

A small tree with spreading branches; branchlets grey, brown, at last blackish, terete. Petioles 3-4 lines long, almost terete; leaves thin-coriaceous, one-nerved, net-veined, opaque, on both sides of equal color, 1-2 inches long. This species is closely allied to Blackwellia axillaris (Lam. illustr. 412); it differs principally in its short racemes, and in in the form of the petals and calyx-lobes. Racemes terminal and lateral, rarely longer than one inch, often shorter, on short peduncles, with several or many flowers. Bracteoles at the base of each pedicel ternate, brown, triangular, persistent; all, but particularly the lateral ones, very minute. Calyx 1 line long, its lobes not touching each other with their margins in æstivation, at last spreading, as well as the ribless tube pale yellow green. Petals 6-7, sessile, white, at least for a long while persistent. Filaments capillary, smooth, one line long. Anthers minute, didymous, white-yellow, affixed betwixt the cells. Styles white, about a half line long, subulate, divergent, with united bases. Vertext of the ovary free. Ovules several, pendulous. Ripe fruit unknown, but only 1 or 2 ovules advancing to maturity.

Mr. Allan Black, the custos of Sir Wm. Hooker's herbarium, first pointed out the position of this plant in Homalineæ, justly alluding to its resemblance with Homalium, and observing that the homalideous order had not been previously noticed in Australia.

Lythraceæ.

Ammannia crinipes.

(Sect. Cornelia.)

Annual; stems adscendant or procumbent; branches thread-like; leaves linear or oblong, blunt, somewhat fleshy, slightly scabrous, tapering into a very short petiole; peduncles axillary, solitary, one-flowered, capillary, crowded towards the summit of the branchlets, twice or many times longer than the leaves; calyces tetragonous-campanulate, bluntly four-lobed; sinus-teeth indistinct; petals four, white, ovate; capsules very tender, nearly ovate, perfectly immersed in the calyx, irregularly bursting.

In moist, sandy flats, and on the sandy-gravelly banks of rivers in Arnhem's Land.

A singular little plant, from a few inches to a span high, sometimes rooting along the stems.

Leguminosæ.

Bauhinia Carroni.

(Sect. Lysistemon.)

Leaflets oblique-ovate, glabrous, longer than the petiole, free to the base; corymbs few-flowered, nearly sessile; pedicels and calyces brownish-silky; tube of the calyx campanulate, with attenuated base; its teeth 5, short; petals imbricate, unequal, ovate and ovate-oblong, two or three times longer than the calyx, not spreading, outward scantily silky; filaments unequal, exserted, all fertile, free; anthers oval; pods oblong, flat, few-seeded; their stalks not adnate to the calyx.

From Newcastle Range to Darlings Downs, chiefly in the Brigalow Scrubs.

A large shrub, or more frequently a small tree. Bark of the branchlets smooth, at last black. Leaflets about twice as long as the terete petiole, $\frac{1}{2}$-$\frac{2}{3}$ inch long, rather tender, green, opaque, 4-5-nerved, finely veined. Stipella in the sinus of the leaflet-pair, shorter than one line, rusty brown. Corymbs terminating the branches, but when the latter are reduced to mere innovations apparently axillary or lateral, few-flowered, with a short or no peduncle. Pedicels crowded, solitary, 2-3 lines long, upwards gradually thickened, at the base provided with three lanceolate-subulate bracteoles, which are shorter than one line, brown, silky, and early falling, calyx 4-6 lines long, sometimes teethless and oblique truncate, not membranous. Petals dark red, free, upper one ovate, about $\frac{1}{4}$ inch long, on both sides scantily silky, tapering into a claw shorter than one line. Lateral petals of the form of the upper one, which they cover, but a little larger, and inside glabrous. Lower petals oblong-ovate, 4-5 lines long, outside silky, inside nearly glabrous, with a claw measuring $1\frac{1}{2}$-2 lines. Stamens all fertile, free, the upper ones but little, the lower ones long exserted. Filaments filiform, dark or pale red. Anthers oval, versatile, hardly one line long, yellow with red margin. Pollen golden-yellow. Stalk of the ovary longer than the petals. Style pink, 2-4 lines long. Stigma convex, oblique terminal. Pods two to four inches long, one inch broad, blunt at the apex, acute at the base; their stalk slender, often fully an inch long. Seeds compressed, roundish-ovate, brown, smooth, 3-4 lines long, slightly angular.

I name this stately plant to acknowledge permanently the arduous services which were rendered by Mr. Carron in the last disastrous expedition of Mr. Kennedy. A perusal of the sorrowful account, published by Mr. Carron, of this unfortunate journey, will likewise render evident how far he, in throwing so much light on the vegetation of North-East Australia, deserves the small tribute of botany paid to him on this occasion.

Bauhinia Leichhardtii.

(Sect. Lysistemon.)

Leaflets orbicular- or broad-ovate, as long as the petiole, free to the base, at last glabrous; corymbs few-flowered on very short peduncles; peduncles, pedicels, and calyces covered with a brown velvet; teeth of the bell shaped calyx almost deltoid, as long as the tube; petals ovate and ovate-oblong, velvet-silky, not spreading, with short claws; filaments free, all fertile; pods oblong, flat, few-seeded, their stalk not adnate to the calyx.

Not rare in Arnhem's Land and around the Gulf of Carpentaria.

A small or middle-sized tree. This species, which I have named in memory of Dr. Leichhardt, who, like Allan Cunningham, referred to it repeatedly in his journal, resembles very much the Bauhinia Carroni, but differs, besides in the above notes, by the following characters:—

The leaves are downy whilst young, somewhat larger, the pedicels longer, the pods broader, and the seeds larger. Bauhinia Carroni commences with the Brigalow Scrub to occur where Bauhinia Leichhardtii ceases to exist. Whether the differences pointed out between the two species are, as it seems unlikely, caused by the diversity of the climate in the respective tracts which they occupy, remains yet to be ascertained.

Bauhinia Hookeri.

(Sect. Lysistemon.)

Leaflets broad-ovate, glabrous, as long as the petiole, free to the base; peduncles, pedicels, and calyces somewhat downy; corymbs few-flowered, on very short peduncles; calyx funnel-shaped, its oblong lobes scarcely shorter than the tube; petals orbicular, spreading, outside slightly silky, nearly three times longer than the calyx-lobes; filaments free, all fertile, and exceeding the petals; anthers hastate-oblong; pods oblong, flat, few-seeded; their stalks not adnate to the calyx.

In the Brigalow scrubs from Newcastle Range to the Burnett River; also sometimes on trachytic rocks, between basalt boulders, and in the dry gravelly beds of rivers.

A tree of small size, sometimes a shrub.

Branchlets terete, smooth, glabrous, gray. Leaflets $\frac{2}{3}$-1″ long, opaque, 5-7-nerved, veined. Stipella, lanceolate-subulate, spadiceous, about 1 line long. Corymbs terminal, solitary or twine, on short peduncles, few-flowered, of agreeable scent. Pedicels solitary, 3-4 lines long, downy. Basilar bracteole ovate-lanceolate, about 1 line long; the two lateral ones inserted a little above the base of the pedicel, opposite, somewhat smaller, lanceolate-subulate, all deciduous. Calyx green, not membranous, almost funnel-shaped, scantily downy, valvate in æstivation, equally 5-cleft; its lobes lanceolate-oblong, three-nerved, 3-4 lines long; tube oblong-cylindrical, very indistinctly ribbed, about half an inch long. Petals imbricate in æstivation, nearly of equal form, 9-10 lines long, pale red or nearly white, bi-lobed at the base of the lamina, inside almost glabrous, their claw $\frac{1}{4}$ inch long. Filaments compressed filiform, almost of equal size, about $1\frac{1}{2}$ inch long, glabrous, towards the base pale, towards the apex dark red. Anthers attached in the middle of their back, 2 lines long, hastate-oblong, yellow with red margin. Pollen golden yellow. Style compressed filiform, red, about half an inch long, smooth. Stigma peltate, smooth, green. Stalk of the ovary downy, $\frac{1}{2}$-$\frac{2}{3}$ inch long. Pod oblique-oblong, compressed, 2-4 inches long, about one inch broad, 3-6-seeded. Seeds shining-brown, smooth, oblique, kidney-shaped or roundish-ovate, compressed, varying in length between 4 to 7 lines.

I have in grateful veneration attached to this noble plant the illustrious name of the Nestor of botanists, who has given in our science one of the very few examples of unremitting, ever disinterested labours continued to the most venerable age.

It is yet unknown which species of Bauhinia extends to extra-tropical latitudes on Cooper's River, where one member of this genus was observed both by Captain Sturt and Mr. Gregory.

Bossiæa phylloclada.

Glabrous, leafless; branches broad-winged; branchlets compressed, leaf-like, long-lanceolate, blunt, with alternate remote large teeth, with a thick midrib and spreading nerves; pedicels arising from the apex of the nerves, solitary, naked towards the summit, provided at the middle with two opposite bracteoles which are widely remote from the basal bracts; keel and standard twice as long as the wings; the former as well as the calyx woolly fringed; pods stalked, oblique-oblong.

On the edges of the sandstone tableland, and on stony declivities, and barren bushy undulations of Arnhem's Land.

A good-sized shrub, with many spreading branches; calyx 3 lines long; its upper lip large, with blunt lobes, the lower one with narrow lanceolate teeth; corolla yellow, petals of the carina spathulate-obovate, below the middle and at the apex disjointed, $\frac{1}{2}$ inch long, with long claws; wings ovate; column of stamens slit in front; style capillary, glabrous; stigma minute.

Mirbelia aotoides.

Branchlets terete, with appressed downs; leaves scattered, or fasciculate, linear, entire, scabrous, with refracted margins, and a very short recurved mucro; peduncles wanting; pedicels solitary or twin, shorter than the calyx; bracteoles linear, very short, fixed to the base of the pedicel; upper lip of the silky calyx broad, emarginate, or with two very short blunt lobes; lower lip with three deltoid teeth; wings about as long as the standard, longer than the keel; pod smooth, short-stalked, perfectly two-celled, two seeded.

On sterile mountain ranges near the Burnett River.

A diminutive erect shrub, resembling somewhat the smaller forms of Aotus villosa. Leaves 4-6 lines long, $\frac{1}{2}$-$\frac{2}{3}$ line broad, on very short, almost obliterated petioles, not distinctly veined; calyx about 2 lines long; flowers seen in a faded state only, apparently of the color of Mirbelia grandiflora; vexillum broader than long, smooth; keel blunt; ovary and style glabrous, the latter $1\frac{1}{2}$ line long; pods measuring nearly three lines; the septa arising from both sutures touching each other.

This ambiguous species forms a transit to Aotus on account of its bractless calyx, and to Phyllota, which produces also no strophiole. Amongst its congeners it is evidently in nearest contact with Mirb. grandiflora, which seems, according to the figure in Bot. Magazin. f. 2771, to be also devoid of calycine bracteoles, but it differs in the form of the calyx and leaves, and in a smooth ovary. No ripe fruit being found, it is not certain whether the endocarp separates in the manner of other Mirbeliæ. In some points it agrees with Mirbelia floribunda. I may remark on this occasion, that the genus Oxycladium is to be placed in the section Mirbeliæ, next to Leptasema, differing from that genus and the allied ones in a persistent replum of the pod, by which an approach of it is manifest to Carmichælia. No species of Mirbelia have hitherto been detected in the territory either of the colony of Victoria or of South Australia, although many species are known from East and West Australia.

Psoralea pustulata.

Suffruticose, erect, covered with short appressed hair and conspersed with glandular tubercles and minute warts; stems simple; petioles almost as long as the leaflets; stipules large, hastate- or lanceolate-ovate, acuminate; leaves consisting of three leaflets, except the uppermost, which are simple; leaflets ovate or lanceolate, blunt, with a short mucro, perfectly entire, ribbed by conspicuous lateral nerves; racemes rather dense, on short peduncles, axillary, solitary, twin or ternate, hardly three times longer than the leaflets; bractea nearly round, acuminate; pedicels ternate, several times shorter than the calyx; teeth of the latter acute, the lowest a little longer than the rest; pod laxly enclosed in the calyx, kidneyshaped ovate, compressed, rostellate, covered with sessile scutellar glands, connate with the seed.

On the banks of the rivers Victoria and Nicholson.

Stems several from each root, 5-10 feet high, flexible, terete, without furrows, rarely branched, sometimes decumbent, as well as the petioles, peduncles and leaves tubercled; petioles 1-2 inches long; stipules 5-6 lines long; leaflets cuspidate, $1\frac{1}{2}$-$2\frac{1}{2}$ inches long, $\frac{3}{4}$-$1\frac{1}{2}$ inches broad, with pinnate nerves, grossly dotted with immersed glands, flat, of equal color on both sides; racemes rarely divided; bracts 2-3 lines long, ciliolate, otherwise glabrous, glandulous; calyxes about 4 lines long, glandulous-tubercled, green, with bleaching tube, upper lip bifid; vexillum round, glabrous, outside pale, inside purplish, obscurely callous, with its deltoid unguis 4-5 lines long, surpassing a little the length of the wings and of the carina; wings purple, oblong, with a roundish white, basilar appendage, and a narrow unguis; carina straight, blunt, adherent to the wings, divided towards the base, white with purple summit; anthers round-didymous; stamens diadelphous, 9 connate to near the apex; style smooth; pod smooth, glandulous, 2-3 lines long; radicle half as long as the cotyledones.

Psoralea leucantha.

Suffruticose, erect, glabrous, branched, dotted with glandular points; petioles almost as long as the leaflets; stipules lanceolate-subulate; leaves consisting all of three leaflets, which are narrow-lanceolate, rather acute, mucronulate, with entire or slightly repand or denticulate margin, and thin lateral nerves; racemes on short peduncles, axillary, solitary or 2-4 together, at last as long as the leaflets; bracts broad· or lanceolate-ovate, acuminate; fruit bearing pedicels nearly as long as the calyx; teeth of the calyx acute, those of the upper lip short; pods brown, kidney-shaped, ovate, rostellate, compressed, wrinkled by sessile glands, longer than the appressed calyx, connate with the seed.

On the sandy, sometimes inundated, banks of the Victoria River, and its tributaries.

A strong-scented plant, several feet high, closely allied to the preceding species. Corolla white; the keel with a blueish spot at the apex.

Psoralea balsamica.

Shrubby, erect, covered with innumerable small brown glandular warts; petioles about half as long as the leaflets; stipules from a broad base linear-subulate; lower leaves trifoliate, upper ones simple; leaflets oblong or ovate, blunt, emarginate, ribbed by prominent lateral nerves, terminated in a short mucro, irregularly denticulate, as well as the branchlets and petioles scantily downy; corymbs hardly as long as their peduncle, axillary and terminal with several crowded pedicels; the latter ternate and much shorter than the calyx, as well as their axis clothed with soft spreading down, almost glandless; bracts small, glandulous, ovate-roundish, acuminate; calyx downy, tubercled; its upper lip deeply bifid, a little longer than the lower one; teeth all nearly lanceolate, acute; pods broad-ovate, velvet-silky, compressed, not rostellate, laxly enclosed in the calyx, connate with the seed.

On the margin of rocky creeks flowing into the Nicholson and Van Alphen rivers.

A shrub, 4-8 feet high, not spreading, of a strong balsamic odour. Leaflets 1-1½ inch long, densely conspersed with glandular tubercles and subtile dots. Peduncles 1-1½ inch long, bearing flowers only towards the summit. Calyx nearly 3 lines long. Flowers blueish. Anthers cordate-ovate. Filaments diadelphous, connate to almost the apex. Style 1 line long, glabrous. Pods measuring scarcely 2 lines.

Zornia chætophora.

Glabrous, densely dotted with glands; stems erect, perennial, many branched; leaflets twin, long or narrow lanceolate, acute; stipules minute, triangular-lanceolate, acuminate; spikes terminal, on long peduncles, with numerous flowers; bracteoles lanceolate, almost five-nerved, with slightly ciliated apex and an acute protracted base; pods 3-5-jointed, with copious long upwards scabrous bristles, and also hispid; joints broad-semiorbicular; seeds quite smooth, shining, brown-black.

On sand ridges and on the sandstone table-land in the interior of Arnhem's Land, and thence towards central Australia.

A herb 1-2 feet high, with many dichotomous, slender stems. Petioles often an inch long. Leaflets 1-$1\frac{1}{2}''$ long, 1-$4'''$ broad. Peduncles 2-$5''$ long, erect, or slightly spreading. Bracteoles 3-$4'''$ long. Flowers yellow. Calyx membraneous, whitish, ciliate, on the lower side somewhat downy. Stamens only towards the base connate. Anthers of the shorter filaments oblong-linear, of the longer ones ovate. Joints of the pod $1\frac{1}{2}'''$ long. Seeds measuring 1 line.

Compositæ.

Pluchea. Cass.

(Sect. Oliganthemum.)

Involucre cylindrical, with narrow-lanceolate scales. Female flowers 2-3, hermaphrodite sterile ones 1-2. Pappus bristles of the fertile acheniums numerous, indistinctly biseriate; those of the barren acheniums with no or only one or two bristles.

Pluchea filifolia.

(Oliganthemum filifolium, Ferd. Mueller's herbar. North Austr. Expd.)

Annual, glabrous; leaves thread-like; flowerheads axillary and terminal; hermaphrodite flowers three-toothed, female ones with an exceedingly narrow ligule; fertile acheniums densely fulvous-silky.

In arid localities in the south-eastern part of Arnhem's Land.

Root undivided, slender, often flexuose, a few inches long. Stems a span long or shorter, spreading-branched, slightly scabrous. Leaves alternate, very narrow linear, curved, in consequence of their revolute margins filiform, $\frac{1}{2}$-1 inch long, awnless. Peduncles more or less shorter than the involucre, which is 4-5 lines long; its scales in a few rows, green, at last brownish, sessile, with scarious margin, glabrous, the outer ones very short, the inner ones gradually longer, the innermost linear and running out in a subulate acumen. Receptacle very small, convex, tubercled. Corollas about 2 lines long, whitish; female ones extremely thin, with widened base, their ligules two-toothed, shorter than the capillary branches of the style. Hermophrodite corollas filiform; their style short-exserted, undivided. Fertile acheniums scarcely longer than one line, with attenuate base and truncate summit; their pappus 2 lines long, brownish-yellow. Barren acheniums diminute.

Calotis plumulifera.

(Sect. Acantharia.)

Annual, dwarf, slightly hispid; stem erect, branched; leaves oblong-lanceolate, perfectly entire or remotely toothed, tapering at the base, the upper ones sessile; flowerheads small, pedunculate; scales of the involucre lanceolate acute; receptacle conical; ligules white; acheniums on both sides woolly with plumose downs, at the margins expanded into an acutely dilated wing, which is fringed with feathery hair; awns numerous, capillary, shorter than the achenium or nearly as long as it, unequal, in their whole length ciliated by short spreading or recurved hair.

On the Murray plains.

An herb 2-4 inches high, with the habit of a Brachycome. Root thin, simple, flexuose. Leaves $\frac{1}{3}$ to $\frac{2}{3}$ of an inch long, 1-2 lines broad. Peduncles axillary and terminal, sometimes an inch long, often shorter, bracteate by one or the other, small leaf. Flowers in each head numerous; the inner ones about 1 line long, perfectly barren, although hermaphrodite, with undivided style; the outer ones varying from 10 to 20 in number, of which some are occasionally abortive. Ligules with a lamina 1-1$\frac{1}{2}$ line long, $\frac{1}{4}$-$\frac{1}{3}$ line broad. Achenium-wings with a sinus descending from the vertex to the outer or middle point, thence tapering wedge-like, glabrous on their sides. Bristles of the pappus generally more than 20, the longest one line long.

Calotis tropica.

(Sect. Acantharia.)

Glabrous or slightly hispid; rhizome perennial, fibrillous; stems numerous, erect, much-branched, angular; leaves linear, acute, tapering into the base, the upper ones gradually smaller, all entire; scales of the involucre linear, acute, scabrous; ligules white; acheniums small, hispidulous, with a thick ciliolate margin; awns 8-10, unequal, retro-aculeate, the longest three times shorter than the achenium.

In North-West Australia, generally in dry beds of rivers.

An herb, about one foot high. Leaves from ½ to 1½ inch long, ½-1½ line broad. Flowerheads small. Receptacle broad-conical. Inner flowers sterile.

It is evidently allied to Calotis breviseta, of which the brief diagnosis does not suffice for recognition. If the C. tropica should prove a variety of that species, then still the above record of this plant will be acceptable, as not only its precise habitat was unknown, but also in showing how great changes this species is apt to undergo. All the other species of Calotis are restricted to extratropical latitudes.

Erigeron ambiguum.

(Sect. Euerigeron.)

Erect, branched, glandulous and hispidulous downy; leaves sessile, lanceolate, quite entire or grossly and remotely toothed; capitules corymbose, on long peduncles, hemispherical; scales of the involucre linear, acuminate, imperfectly fringed, almost as long as the ligules; central flowers few, indistinctly toothed; acheniums linear-oblong, moderately compressed, scantily appressed-hairy, half as long as the pappus; bristles of the latter 15-17, free, scabrous.

On the Gilbert River.

Probably a perennial herb. Lower leaves about 1½ inch long, upper ones gradually shorter. Outer scales of the involucre ½ line, inner ones about 1 line long, scarious at the margin. Female flowers very slender, with a short narrow ligule, apparently white. Achens fulvous, scarcely longer than half a line. Pappus white.

Amongst Indian species nearest to E. Wightii, otherwise resembling E. Philadelphicum and purpureum.

Ozothamnus decurrens.

(Sect. Euozothamnus.)

Leaves linear, short, spreading, truncate, with entirely revolute margin, in a double line decurrent, wrinkled, rough, shining; corymbs compound, terminal; flower-heads ovate-cylindrical, at last bell-shaped, yellowish-white, homogamous, with about 11 flowers; scales of the involucre blunt, with slightly tomentose back and hyaline margins; achenes scabrous-papillose; bristles of the pappus 21-25, a little thickened at the apex.

In the desert scrubs on the Murray and Darling rivers, and near Lake Alexandrina.

Branchlets angular and green, on account of the decurrent leaves. The latter generally only from 2-4 lines, sometimes half an inch long, hardly 1 line broad; the velvet of their lower page only visible in the midrib. Peduncles thinly tomentose. Flowerheads scarcely 3 lines long.

It differs from Ozothamnus retusus in shorter, more wrinkled leaves, with broader decurrent lines, in neither shining, nor glabrous, nor heterogamous flowerheads, and in more copious pappus-bristles.

Oz. adnatus, to which Dr. Sonder referred this plant doubtfully in the Linnæa, 1852, p. 511, differs, according to D. Candolle's note of that species, in shorter and appressed leaves, and in ovate scarcely yellowish flowerheads, being besides not a desert plant.

Asclepiadeæ.

Bidaria erecta.

Stems erect, shrubby; branches with appressed hair; leaves linear, nearly sessile, glabrous or somewhat ciliate at the margin; umbels on very short peduncles, solitary or twin; flowers small; faux of the corolla bearded; stigma conical, longer than the stamens; follicles nearly terete.

On stony ridges along the Victoria River.

A shrub several feet high. Leaves from 2 to 4 inches long, 1-2 lines broad. Corollas nearly white.

Bidaria leptophylla.

Climbing; branchlets slender as well as the peduncles covered with velvet hair; leaves linear, slightly downy; peduncles as long as the umbel; corolla small, urceolate; its teeth blunt, three times shorter than the tube.

At the sources of the Burdeken River.

A milky plant, several feet high. Stems terete, sometimes rather silky. Leaves acute, opposite or, through imperfect development of the branchlets, fæsciculate, at last glabrous, 1½-2 inches long, 1-2 lines broad, with flat margin. Umbels with several or many flowers, solitary or twin. Peduncles half an inch long or shorter. Pedicels longer than the linear-subulate unequal bracteoles. Calyx with fine appressed downs, scarcely longer than one line; its lobes lanceolate, acute, appressed. Corolla 2½ lines long, outside glabrous; tube ovate; inside with a line of hair; limb spreading only half a line long with orbicular-ovate blunt lobes. Anthers terminated in a white membrane. Stigma white conical.

SCROPHULARINÆ.

Vandellia clausa.

(Sect. Bonnaya.)

Glabrous; stem simple, erect, producing leaves only at the base, sometimes with a pair of small bracts near the middle; leaves broad-ovate, repand or denticulate, the lower ones the smallest; racemes terminal, solitary or twin, with several or many flowers; bracteoles solitary, or the lower ones opposite, lanceolate or linear subulate, several times shorter than the pedicels; the latter twice to four times as long as the calyx, and about as long or not much longer than the capsule; calyx deeply five-cleft, with linear-subulate segments; tube of the corolla nearly cylindrical, almost three times as long as the calyx; faux closed; sterile stamens totally adnate, forming two slightly prominent carinas; anthers of the two fertile stamens one-celled, coherent; capsules linear-elliptical, rather acute, longer than the style; seeds black, nearly ovate, angulate, transversely streaked.

On sand-plains, subject to occasional inundations, on the Victoria River and its tributaries.

An annual herb, generally less than one foot high. Largest leaves ½ inch long. Bracts measuring in length about one line, broader than the bracteoles. Corolla purple, hardly half an inch long; the upper lip nearly semiorbicular, slightly emarginate, half as long as the lower one; middle lobe of the latter round-cordate, lateral ones orbicular-ovate. Sterile stamens white, enclosed. Anthers one-celled, but perhaps only by the confluence of divaricate lobes, but certainly not so clearly two-celled as in Vandellia scapigera, which bears to V. clausa the greatest resemblance, still is furnished with 4 fertile stamens, as an examination of specimens collected at Macadam Range has proved; two of the filaments in Vandellia scapigera are furnished at the base with a short filiform glandulous appendage. Its corolla is white. The anthers are coherent in pairs. Lamels of the stigma sometimes unequal. Capsule 3-4 lines long, about three times longer than the calyx.

Vandellia lobelioides.

(Sect. Bonnaya.)

Glabrous; stem simple, erect, provided with leaves only at the base, but towards the middle with one or two distant pair of bracts; leaves broad-ovate, repand or quite entire, the lowest the smallest; racemes few-flowered, the terminal one solitary, in addition to which sometimes a lateral one, shortened to a corymb and occasionally reduced to a single flower; bracteoles all opposite, linear-subulate, many times shorter than the pedicels; the latter four to six times longer than the calyx; tube of the coralla upwards widened, twice as long as the calyx; sterile stamens totally adnate, forming two very prominent carinas; faux open; fertile stamens with coherent one-celled anthers; capsule ovate, shorter than the style; seeds brown-yellow, angular, transversely wrinkled.

A companion of Vandellia clausa, to which it stands in close affinity.

An annual herb, with the habit of a Lobelia, from a finger to a span long. Bracts narrow-lanceolate, 1-1½ line long, never missing, broader than the bracteoles. Segments of the calyx linear-subulate. Corolla nearly half an inch long, blue, rarely pink or white; its upper-lip semiovate, with two short and acute teeth, or emarginate, plicate, often whitish, three times shorter than the lower one; lateral lobes of the lower-lip round-ovate, middle one round kidney-shaped, near the faux with a white spot. Sterile stamens white, like those of V. clausa without anthers; their apex exserted, yellow and bent outward into a very short lobe. Lamels of the stigma equal. Capsule about 2 lines long.

Vandellia plantaginea.

(Sect. Bonnaya.)

Leaves all radical, glabrous, narrow- or spathulate- or ovate-lanceolate, slightly repand or entire; scape rather long, furrowed, with prominent angles, bractless, or about the middle with a solitary pair of bracts; raceme short, terminal dense, almost forming a spike, glandulous-downy; bracteoles longer than the pedicles; the latter shorter than the calyx; capsule ovate, acute, of the length of the calyx, shorter than the style.

In moist meadows near Macadam Range.

The root short, thick, and fibrillous, possibly perennial. Scape one foot or less high. Leaves ½-2½ inches long, generally short-stalked. Raceme measuring ½-2½ inches. Corolla blue. Capsule about 2 lines long.

This species is extremely rare, and the only flowering specimen which was found is deposited in Sir Wm. Hooker's herbarium, at Kew. It may possibly not be a congener, in the strictest sense of the two preceding ones. In the botanical collections of the North Australian Expedition, I referred all three to Bonnaya, combining at the occasion with it the genus Ilysanthes. I proceed now a step further, and unite these plants and all the species of Lindernia, Ilysanthes, and Bonnaya to Vandellia, because on the same grounds as those which led to the separation of the above genera, others also of this order (for instance, Gratiola) ought then to be divided.

Mimulus debilis.

Annual, glabrous; stem slender, decumbent, quadrangular; leaves small, distant, lanceolate-linear, entire, somewhat scabrous, gradually pointed; pedicels thin-filiform, four or many times longer than the calyx; flowers yellow.

In humid meadows and around swamps at Macadam Range, Providence Hill, and the M'Arthur River.

A flaccid herb, about a span long. Leaves 3-4 lines long. Pedicels measuring between one and two inches, the corolla about half an inch.

LENTIBULARINÆ.

Utricularia fulva.

Vesicles and radical leaves wanting; stem simple, erect, with distant bractlike-scales; racemes with remote flowers, flexuose; bracts almost cordate; bracteoles setaceous; sepals round, acuminate, longer than the pedicels; upper lip of the corolla bluntly bi-lobed, lower one indistinct three-lobed; palate bearded; spur horizontal, subulate, not compressed, capsule globose.

Around stagnant water near Macadam Range; rare.

An herb, from a span to a foot high. Corolla fulvous, except the palate, which is yellow and dotted with red spots.

The U. chrysantha, which occurs in grassy flats on the Victoria River, is a much taller plant, with bright yellow flowers, and a differently shaped lower lip.

ART. IX.—*Mr. J. T. Gellibrand's Memoranda of a Trip to Port Phillip in* 1836. *Addressed to His Excellency the Lieutenant-Governor. From a MS. Copy presented to the Philosophical Institute of Victoria by the* HON. CAPT. CLARKE, R.E.*

[Read before the Institute, 8th September, 1858.]

Campbell Street, April 18th, 1836.

SIR—I have much pleasure in transmitting to your Excellency, conformably with my promise, a transcript of the memoranda of my late trip to Port Phillip . . .

. . . .

document that it was only intended for the information of the parties immediately interested, and was not intended as an official document, but your Excellency is at perfect liberty to make such use of it as you may consider the public interests of the aborigines may require.

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* The MS. was unfortunately injured by a fire at the printers. Portions which were quite illegible are left blank; doubtful words are marked with a ?—J. M., ED.

There are some passages of a personal nature, which I might have omitted; but I have refrained from doing so, as the document would then have been only an extract, and not a transcript.

Having thus the opportunity of drawing your Excellency's attention to many of the circumstances connected with the settlement at Port Phillip, I cannot refrain pressing upon your Excellency's consideration the extreme importance of at once combining with the first rays of civilization the inestimable advantages of religious instruction. The intercourse with the aborigines has hitherto been conducted upon a friendly footing, and they have evinced, as far as I have been enabled to judge, those traits of character which are calculated to realise the prospect of their imbibing the best feelings towards the whites; and looking to the progress which has been made within the last few months, and the friendly feeling which is maintained with all the tribes, I am firmly impressed with the opinion that the foundation may be laid at Port Phillip for spreading the truths of Christianity through the whole continent of New Holland, and I am happy to know that I am not singular in this opinion; for Mr. Reed, of Launceston, who has recently visited Port Phillip, went alone and unarmed with a large body of natives up the country, and was with them several days and nights; his intercourse with the natives was highly gratifying to him, and when he left them, the women and children parted from him with tears. I have received a letter from Mr. Reed, offering a donation of £20 towards building a mission-house and school-rooms, and an annual donation of a like sum for the support of a missionary; and I know several gentlemen who are prepared to contribute to the same extent, and I hope in the course of a few days to lay before you a plan for the permanent establishment of one, if not two missionaries at this interesting and important colony.

I have the honor to be, &c., &c.,

(Signed) J. T. Gellibrand.

MEMORANDUM OF A TRIP TO PORT PHILLIP.

Sunday, Jan. 17.—I embarked this morning, with my son Tom, on board the "Norval," for Port Phillip, in company with Mr. Wm. Robertson, Mr. Gardiner, Mr. Leake, Mr. Malcolm, and Mr Mudie (the latter gentleman having the management of the sheep on board, the property of Captain Swanston). After making Point Grant, we encountered a severe gale of wind from N.W., and the vessel lay to for three nights and two days, under close reefed topsails. The vessel drifted about 70 or 80 miles to the S.E., and on Sunday morning (Jan. 24) at daylight the ship was again off Point Grant, and beating up to the westward of Cape Schank, and distant about 20 miles.

In consequence of the improper manner in which the vessel was fitted up for the stock, about 115 sheep perished by injuries and suffocation during the gale and the day afterwards. The greater portion of the hay had been destroyed, in consequence of there not being any proper racks, and on Saturday, the 23rd, the passengers were under the necessity of assisting Mr. Mudie in feeding the sheep with flour and water. The captain stated that he should not be able to make Port Phillip without two or three tacks; and even if he succeeded in getting into Port Phillip that evening, it would most probably take him two days to reach the settlement. He also stated that the ship was under demurrage, at £10 per day, and would be so until she came to anchor at Western Port, where she was engaged to take in a cargo of bark for the owner. Under these circumstances, and feeling convinced that if a change of wind took place, and the vessel was again driven from the land, the sheep must perish, and there not being any means of even keeping them alive for three days, and believing that the sheep could be landed at Sandy Point that day, the passengers were unanimously of opinion that it would be for the interest of the charterers to proceed at once to Western Port, land the stock, and drive the sheep across to the settlement at Port Phillip. The captain then, at the request of Mr. Mudie, made Western Port, and about twelve o'clock the vessel came to anchor near Sandy Point. About one, the captain, Mr. Mudie, Mr. Robertson, Mr. Gardiner, Mr. Leake, and my son proceeded to the shore, for the purpose of selecting a proper place to land the sheep. I remained on board for the purpose of getting the long boat out, and the sheep ready for disembarkation. In about three hours the boat returned, and the parties stated that it was impossible to land sheep, as there was nothing but heath and scrub, and no appearance of water. A person of the name of Thorn was on board the vessel, for the purpose of acting as pilot at Western Port, and superintending the shipment of the bark, who was well acquainted with Western Port. He represented that there was a beautiful tract of land and plenty of water about ten miles further up the bay, and near the government settlement, which had been abandoned in 1827. After some deliberation and hesitation on the part of the captain, it was determined that a party should proceed at daylight to Phillip Island, to examine that station, and if we could not find good land and water, to proceed at once to the spot pointed out by Mr. Thorn.

Jan. 25.—Went on shore at daylight, with Mr. Malcolm, Mr. Robertson, and Mr. Mudie, to Phillip Island, and returned in about an hour, finding Phillip Island totally unfit for the purpose required. Got the vessel immediately under weigh, and proceeded to the spot pointed out by Mr. Thorn, and came to anchor within a quarter of a mile from shore, about nine o'clock in the morning. The long and other boats were immediately loaded with sheep, and Mr. Mudie, Mr. Gardiner, Mr. Leake, Mr. Malcolm, Tom, and myself, and two shepherds went ashore with the first boat. Mr. Robertson staid on board for the purpose of superintending the sheep, and it was arranged that Mr. Mudie and the shepherds should wait on the beach and receive them, and that the others should examine the tract of land, and decide upon the most eligible spot as a temporary settlement. When the sheep were landed they endeavoured to drink salt water, and were inclined to wander (as sheep always do in a strange place). They were landed upon a point of land with abundance of grass, and 300 acres of land might be enclosed by a line of 150 yards.

When I landed I particularly cautioned the shepherds not to let the sheep stray, and to keep them from the salt water. We then proceeded to examine the land, and found abundance of grass, and in some places it was six feet high, but we did not find any water. In passing through one of the valleys I found the gleams of heat extremely oppressive, and which brought on violent palpitation and a determination of blood to the head. We were then distant about three miles from the vessel. I walked back, supported by Mr. Gardiner and Mr. Leake, about one mile, but was unable to proceed any further. I then lay down under a tree, Tom and Mr. Leake remaining with me, and Mr. Gardiner and Mr. Malcolm proceeded to the vessel to procure assistance. They returned in two hours with a boat, and I reached the vessel about three o'clock, and found all the sheep, amounting to one thousand and nine had been landed. In the evening, Mr. Robertson, Mr. Leake, and Mr. Gardiner went ashore and found the shepherds near the point, and that the sheep had strayed away. They went in search of them, and brought back to the Point about 800, which they placed in charge of the three shepherds who were then on shore.

Tuesday, Jan. 26.—Mr. Robertson and the other gentlemen went on shore at daylight, and found that the shepherds, instead of being stationed back in the bush, so as to keep the sheep on the neck, had in fact wholly neglected their duty, and had slept at the extreme point on the beach close to the vessel; and on searching for the sheep, only two or three, which were in a dying state, could be found. The gentlemen then proceeded in search of the sheep, and returned about eleven o'clock to the ship to breakfast, having walked about 15 miles in a fruitless search after the sheep. Mr. Robertson having found, from Mr. Thorn, that there was a fine river, about nine miles from the Point, was extremely anxious to proceed, in search of the sheep, as far as the river, under the expectation of finding them, and Mr. Thorn promised to meet him in the evening, with the long boat, near the mouth of the river. Mr. Robertson, Mr. Leake, and Mr. Mudie again left the vessel about twelve o'clock, to proceed as far as the river. The captain and my son left the vessel about the same time, and proceeded along the beach on the other side of the Point, and as far as the late settlement. The captain and Tom found the tracks of sheep along the beach, and about two miles from the landing place, a muddy, salt water creek, and the carcases of about two hundred and eighty sheep in and near the creek. Mr. Robertson and the others reached the vessel about eleven o'clock at night; they had been unsuccessful in their search—they were worn out with fatigue and anxiety. Mr. Mudie went into violent hysterics. Mr. Robertson and Mr. Leake were both taken exceedingly ill, and, in fact, nature appeared quite exhausted.

Wednesday, Jan. 27.—We this morning took into consideration our own situation, and what course should be pursued. Having suffered from the heat on Monday, I did not think it proper to expose myself to the dangers of a journey overland, and I intimated my intention of staying on board until a better opportunity of proceeding, either backwards or forwards, presented itself; but finding that one or two of the gentlemen would follow my example, and that the others would proceed overland to Port Phillip, and thinking that three or four might be exposed to dangers which eight might prevent, and knowing also the anxiety I should feel in the uncertainty of their fate, I at length determined that we should all proceed by the first opportunity to Port Phillip. We were all anxious, however, before we quitted the vessel, to conclude some arrangement for the establishment of Mr. Mudie, until we could send him assistance from Port Phillip; and as the late government station appeared the most eligible for that purpose, on account of its situation and supply of water, we proceeded this morning, in the whale-boat, to that station, and made arrangements which appeared satisfactory to Mr. Mudie, who then determined to remove all his stores, and also the wives of the shepherds out of the vessel, and fix his station there, so that we might direct a party where to find him. On my return to the ship, the party were all busily engaged in making arrangements for the proposed journey, and I was busily employed in making calomel pills, in case any of the party should be taken ill. This day was extremely sultry, and we were waiting some hours in anxious expectation of the sea-breeze, as we were desirous of reaching Sandy Point that night, so that we might start upon our journey by daylight. About five o'clock a slight breeze set in, and we bid farewell to the "Norval," each person taking one bottle of water, and trusting to Providence for such further supplies as we might require in our passage to Sandy Point. Mr. Gardiner shot a swan, and Tom another. We were unable to reach Sandy Point before dark, and about three-quarters of a mile from our landing-place, the boat grounded on a sand-bank with a rapid ebbing tide, and we remained aground, high and dry, all night. At daylight the tide was flowing, and in an hour and a half the vessel was afloat, and about six o'clock we landed and saw many tracks of the natives upon the beach. We made a fire and roasted the swans for breakfast, which proved very acceptable; and after having remunerated Mr. Thorn for his trouble, and obtained from him a promise to return to the same spot on the following Sunday, in case we should be unable to accomplish our purpose, Mr. Thorn took his departure in the boat, and we commenced our journey. The party was eight in number; all carried arms except myself, and all knapsacks, except Tom and myself. Mr. Robertson most kindly carried the greater portion of my provisions, and Mr. Leake the blankets, and the remainder was carried by my shepherd. Mr. Gardiner was chosen conductor, and in case of any appearance of the natives, the gentlemen were all pledged to act under my directions. We pursued a course N.W., and we found the country, for the first three miles, heath and low scrub. We then got into a thin forest, and after we had walked about nine miles, I felt the same effects from the heat that I had experienced the previous Monday, and, in consequence, the party halted in the forest. I lay down for about two hours, and finding the heat very oppressive, I took three grains of calomel, and in half an hour afterwards took another pill. Whilst we were in the forest, Mr. Leake had exhausted his supply of water, and at this time he was determined to leave us in search of water, and accordingly Mr. Leake and one of the men left us and were absent upwards of an hour. We became much alarmed at their absence, but at length we heard a cooey, and they returned with the intelligence that they had fallen in with about one hundred native huts, and near the huts had discovered water. We then packed up our things and proceeded on our course, and in about a quarter of an hour came to a few waterholes, surrounded by a thick scrub. The party dined at this place, and although it was extremely hot, we remained there till five o'clock, under the shelter of a blanket tent to protect us from the rays of the sun. Having filled all our bottles with water, we then proceeded on our journey, and supposing the distance across to the Bay of Port Phillip to be only a few miles, we were induced to hope we should reach the bay that night. Several times we fancied we could discern the sea, and so kept on walking till ten o'clock at night when we got into a piece of open scrub, and thinking it safer to lay down in an open place, we determined to stay there that night, and those who had blankets spread them out and lay down to rest, affording part to those who had none. We were too tired either to make a fire or eat. We rose at daylight and proceeded on our journey without any breakfast, under the hope of making the bay. We came to two or three very scrubby places, but without water, and at this time I do not think there was a bottle of water amongst the whole party. One or two of the gentlemen were of opinion that we were making too much north, which prevented us from reaching the bay, and as that seemed to be the object of our desire, our course was altered a point or two more west, and about eight o'clock in the morning we came upon a salt water creek, which led to Port Phillip Bay. We found a fire burning at two native huts, and every appearance of their having been occupied the previous night. On the beach we found tracks of natives proceeding towards Arthur's

Seat. We rested here and made a fire. Some of the party proceeded in search of water, which, however, was very brackish. We had our breakfast and consumed what little water was left—two bottles of the brackish water was boiled with tea, in the event of not finding better water.

After resting at this place about half an hour, we proceeded on our journey about five miles, and then discovered several native huts, and, to our great joy and gratitude, found a creek with an abundant supply of water. We rested at this place about two hours, filled our bottles, and proceeded on our journey about six miles, and came to some more waterholes and native huts. We dined at this spot, took a fresh supply of water, and proceeded on our journey, and came to an open, sandy bay, about thirty or forty miles long. We continued walking until about six o'clock, when the weather became squally and wet. We walked for about half an hour, and had intended to do so until late at night, but the rain increasing, we thought it most prudent to get some shelter before it was dark. We then went into the scrub and found a sheltered spot. We made a blanket hut to protect us from the rain, with a large fire in front. We soon found a large quantity of blue ants on the ground which we had selected for our resting place, and I therefore, as it was too late to move our tent, spread the ashes all over the ground, which had the effect of driving them away. It continued raining till about two o'clock, but as we were lying on a sand bank the rain was all absorbed.

Jan. 30.—We started this morning about half an hour before daylight, and continued walking till eight o'clock, without finding any fresh water. We then rested, and had our breakfast and about half a pint of tea to each person, which was all the water we had left, and we then continued our journey, expecting at every turn of the bay that we should discover the river. We continued walking till twelve o'clock, when Mr. Leake and Tom laid down, declaring they could not proceed any further till they got water. We had now quitted the shore and got upon high land again. After resting on the hill about half an hour, I urged upon the party to proceed, and after some difficulty we were all upon the march, but some of the party were a considerable distance behind. We were now upon a native track, and the advantage of following those tracks was soon experienced. The track continued along the margin of the hill, and ultimately led us to the beach, and near the beach we found a few native huts and one native well. Upon discovering the well, Mr. Gardiner gave the welcome shout, "Water," which was immediately repeated by the others, and in a few minutes the weary ones in arrear came rushing down, anxious to quench their thirst; but by the time they had reached the well, Mr. Gardiner reported the water to be bad.

Mr. Robertson, however, examined the well, and thinking it had been choked up, he got an oyster shell and cleaned it out and deepened it, expecting that the fresh water would be good. The party were now obliged to wait with much anxiety, watching the rising of the water in the hole, and at length Mr. Robertson was enabled to distribute to each person half a pint, and in about an hour a second supply of a pint each was distributed for dinner, and we were enabled when we quitted, at four o'clock, to take with us three bottles of water. At four we continued our course along the beach, Mr. Gardiner and myself making the first start, and in about ten minutes we saw a dog on the beach, advancing towards us. At length he stopped and then ran back again and turned into the bush, from which we concluded that the natives were at hand. We waited till some of the party came up, and then advanced and found on the beach part of a Boomah kangaroo, and we saw the tracks of several natives on the beach, and several tracks of dogs. We fully expected this night to reach the settlement, and we pushed on until seven o'clock; we then came to a point which we fully expected would be the head of the river. We crossed over the point and found a stack of wattle bark, and we also found the hut where the barkers had lived, and the tracks of a cart. It had been raining about three quarters of an hour, and we were nearly wet through. We felt assured that we were near the settlement, and that the bark had been obtained by Mr. Fawkner's party, but we could not see the river. It was near night, and every appearance of a wet one, and we therefore considered it most prudent at once to make a blanket hut for the night, and make a fire before the bark and grass were too wet, and which we accordingly did. Two of the party went in search of waterholes, but without success, and Tom went to the beach to shoot a duck, and in about ten minutes he returned, having found waterholes near the beach, and where we again obtained an abundant supply of good water. This night was very wet and the most uncomfortable one we had experienced.

Jan. 31.—Although we were satisfied that we were near the settlement, we considered it most prudent to keep the bay until we reached the river, and after walking about seven miles further, we at length discovered the mouth of the river. My feet had been for the last two days very much blistered, and I felt quite unable to walk any further, and I therefore proposed that half the party should proceed to the settlement and send a boat or a horse to my assistance; and Mr. Gardiner, Mr. Leake, Mr. Malcolm, and Tom proceeded to the settlement. I hobbled along, with the assistance of Mr. Robertson, about three miles, and then waited for the horse or boat. In about half an hour a boat, manned with blacks, came down the river. We hailed them, and after ascertaining where we had come from and who we were, they came to our assistance. We found they were going to the Heads to fish, but they immediately proceeded with us to the settlement, and we arrived at the settlement about twelve o'clock.

The settlement consists of about a dozen huts, built with turf, on the left bank of the river Yarra-Yarra. The river, from the mouth to the settlement, is about eight miles long; it is salt for about six. For the first two miles it is about 500 yards wide, for the next three miles it is about 300 yards, it then becomes gradually narrower, and is about 60 yards wide at the settlement, with deep and precipitous banks, and vessels of sixty tons burthen can with safety proceed to the settlement, close to the shore, and discharge a cargo. As it was of importance that immediate assistance should be rendered to Mr. Mudie, I made arrangements with Mr. Batman to despatch, on the next morning, four Sydney natives, who it appears were well acquainted with Western Port, and who upon questioning them, appeared to be quite confident that they would be able to find the sheep and bring them to Port Phillip.

I felt very much vexed in learning that the natives, with the exception of two, had left the settlement on a hunting expedition, a few days previous, and would not return for some time.

Feb. 1.—I had this morning a long conversation with Buckley, and explained to him very fully the desire of the association in every respect to meet his views, and to make him superintendent over the native tribes, for the purpose of protecting them from aggressions, and also acting as an interpreter in imparting to them not only the habits of civilization, but also of communicating religious knowledge. It appears, from his statement, that the tribes are most peaceably disposed, that they fully understand the nature of the grants issued by them, and that they are looking forward to the time when the blankets, tomahawks, and flour will be distributed.

Buckley appears to be of a nervous and irritable disposition, and that a little thing will annoy him much; but this may arise from the peculiar situation in which he has been placed for so many years. I am quite satisfied that he can only be acted upon by kindness and conciliation, and that by those means he will be an instrument, in the hands of Providence, in working a great moral change upon the aborigines. He is not at all desirous of occupying any land or having sheep, but is highly pleased at the idea of being appointed superintendent of the natives, with a fixed stipend, so that, to use his own expression, "he may know what he has to depend upon, and be enabled to make a few presents to his native friends." I told him that I intended, on the following day, to proceed to Geelong, and inquired whether he would like to visit his own country. He seemed much pleased at the idea, but stated he did not think he could walk so far. I then proposed he should ride, which seemed to gratify him very much, and, in consequence, I engaged a large cart-horse of Mr. Fawkner's for that purpose.

My feet were so bad I could not walk, and as I was desirous of seeing No. 12, I had my horse taken to the fording place and round to the salt-water creek, and about ten o'clock Mr. Gardiner, Mr. Robertson, Dr. Cotter, myself, and Linfield went in the whale-boat to the creek. I took Linfield with me for the purpose of making him acquainted with that section, as I intended to stock it. After passing over about six miles of the section, we came upon a large salt water river, which Dr. Cotter was of opinion communicated with a chain of fresh water ponds, which he had recently crossed on that section. Dr. Cotter and myself therefore proceeded to trace up the river, and I requested the remainder of the party to trace it down to the sea. Dr. Cotter and myself then traced the river up to the chain of ponds, and I was quite satisfied there was plenty of water on the grant. We then made across to the point at which the ships lay, and the stock was landed, and we found all the party with the exception of Linfield, who it appeared had stayed behind. We waited for him about three quarters of an hour, and as it was six in the evening, the gentlemen were anxious to return, and I therefore desired the man to take the horse round the point, find Linfield, and bring him home by the fording place. About ten o'olock at night the man returned home with the horse, and stated that he could not find Linfield anywhere, and as I felt very uneasy about him, I desired Mr. Batman to send the boat at daylight the next morning in search of him.

Feb. 2.—The boat returned this morning about seven o'clock with Linfield, who, finding he had lost us, proceeded to the Salt Water Creek, where he had been landed, and being, as I imagine, very much afraid of the natives, sat up in a tree all night, and seeing the boat come down the river he cooeyed to them.

Mr. Fawkner's vessel arrived this morning from Georgetown, and I considered it advisable to send assistance to Mr. Mudie in the removal of the women, stores, and rams from Western Port, and I therefore engaged the vessel for one trip upon Captain Swanston's account. In consequence of Mr. Fawkner's people being engaged with the vessel, we were unable to obtain the horses for our journey until about four o'clock in the afternoon, when we started (seven in number), intending to reach Captain Swanston's station, on the River Exe, that night. The journey from the settlement to the ford on the Saltwater River is most beautiful, and some of the spots quite enchanting; the grass had been burnt about a month previously and it was then quite green and beautiful. The land is very rich, and consists of a succession of gentle hills and dales, and the first view of the Saltwater River and its windings is beautiful beyond description. We reached the ford about half-past six, and found the country quite changed. When we crossed the ford the land was quite flat and rather rocky, and from the ford to the station on the Exe, a distance of fourteen miles, and in fact up to Geelong harbour, consisted of open plains with a thin coating of grass, and exposed to the cold winds. We did not reach the station till half-past ten at night, and were compelled for the last seven miles to follow a cart-track, which we were fortunately enabled to do as it was a starlight night.

Feb. 3.—As Mr. Furgesson had not found the sheep, and we were proceeding in the direction where they had been lost, he proposed to accompany us in our visit to Geelong, and we started this morning about seven o'clock.

At noon we came upon a chain of ponds which appeared to come from the Debackarite, and which I accordingly noted in my chart. We halted at this chain of ponds and dined, and towards evening we came upon some native wells near the point of Geelong harbour, which we called Geewar, and as there was good feed for the horses, we determined on staying here for the night.

Feb. 4.—We started from Geewar about six o'clock, and shortly afterwards entered the section No. 16, which we found to contain a tract of most excellent land, fit for agricultural or pastoral purposes. After travelling about fourteen miles we came to some more native wells, on the margin of the bay and close to the line which divides 16 from 17. We stayed at this place and dined, and then proceeded across the Bellerine Hills to the settlement of Indented Head. The Bellerine Hills contain about twenty thousand acres of land of the finest description. They consist of hill and dale, and although we did not see any water in the valleys, I am satisfied water could be easily obtained. The land is thinly timbered, the soil appeared very rich and fit for any purpose; the kangaroo grass was up to my middle, and with a thick bottom. It is as fine a tract of land as any I have yet passed over.

We reached the settlement about four o'clock, and I learned to my extreme mortification that some of the natives had that morning, and the others the day previously, quitted the settlement, in consequence of the threats made use of by the man at the station that he would shoot the natives. I found that the natives had a few nights previously stolen about a sack of potatoes out of the garden. They had pulled up the roots and taken the potatoes, and then planted the roots in the earth again, thinking they should not be discovered, and to prevent a repetition of this conduct, the threats had been made use of without the slightest intention of carrying them into execution. I find that although there are abundance of fish at Indented Head, yet that there are no means of catching them, and that the natives have no idea of making small boats or catamarans.

Feb. 5.—We started very early this morning under the expectation that we should see the natives, and in order that they should not be frightened, I directed Buckley to advance, and we would follow him at the distance of a quarter of a mile. Buckley made towards a native well, and after he had ridden about eight miles we heard a coocy, and when we arrived at the spot I witnessed one of the most pleasing and affecting sights. There were three men, five women, and about twelve children. Buckley had dismounted, and they were all clinging round him, and tears of joy and delight running down their cheeks. It was truly an affecting sight, and proved the affection which this people entertained for Buckley. I felt much affected at the sight myself, and considered it a convincing proof of the happy results which will follow our exertions, if properly directed.

Amongst the number were a little old man and an old woman, one of his wives. Buckley told me this was his old friend, and with whom he had lived and associated thirty years. I was surprised to find this old man had not a blanket, and I inquired the cause, and was much concerned to learn that no blanket had been given him because he did not leave that part of the country and proceed to Doutigalla for it. I could ill spare my blankets for him, but I could not refrain from giving one of them to Buckley in order that he might give it to his friend, with an assurance that he should have further clothing after our return. The men seemed much surprised at the horses. I, however, after some little persuasion, induced the youngest man to put his foot in the stirrup and mount my grey mare, and I led the horse round a few paces, to the great delight of the whole party. I then coaxed the mare, put my face to her's, to show them they need not be afraid, and then prevailed upon a young girl about thirteen years of age, also, to have a ride. As soon as the horse began to move she seemed very much alarmed, and her countenance bespoke her fears, but she continued silent. We gave them a few presents, and then left them to proceed on our journey. I may here mention that so soon as Buckley crossed the Saltwater River, and obtained a view of his own country, his countenance was much changed, and when we reached Geelong he took the lead and kept us upon a trot. He seemed quite delighted and proud of his horse. When we quitted the natives we directed our course to the head of the Barwon River. This river is about two miles wide. There are breakers on each side and the Heads like Port Phillip, and it appeared to me that there was a channel in the centre. We then proceeded through a fair country near the margin of the river, until we arrived at a flat where the river is at least eight or nine miles wide. At this flat there are some very good native wells called Yan-Yan. We dined at this place, and continued our course near the river until we had crossed over a very extensive marsh on the banks of the Barwon, the extremity of No. 16. We stopped at this place all night, shot some wild fowl, which we had for supper. Tom shot a large musk duck, which Buckley had for his supper.

Feb. 6.—We started this morning about seven o'clock (?)

and when we had reached the marsh we saw Geelong harbour, and ascertained the distance of the harbour at the neck was not more than four miles. We continued our course upon some high land until we reached the junction of the Yallack and Barwon rivers. We then descended into a marsh on the Yallack, left our horses there, crossed the Yallack by a native track, over a large tree, and went across the Barwon, to a spot called Buckley's Falls. We found a large basin, and the river somewhat resembles the cataract and basin at Launceston, but upon a smaller scale. Buckley showed us the hollow tree in which he used to live, and the places where they used to catch the fish in the winter season. Mr. Gardiner, Mr. Leake, Mr. Robertson, myself, and Mr. Malcolm crossed over the cataract for the purpose of examining the Barabool Hills, which had presented a most inviting appearance. In our progress up the Barwon River, we passed over about eight or nine miles, and we kept upon the high ground, in order that we might see the surrounding country. We found the herbage to be very good, and I think the best sheep country we had passed over, and I believe the other gentlemen were of the same opinion. We were compelled to recross the Barwon at the same (place?) and I should think, from the appearance of the country, that the Barwon is a deep river, about 60 feet wide for many miles up. In the winter a large body of water passes down it. We then crossed the Yallack, and dined, and proceeded about twelve miles further up the river, for the purpose of inspecting the country and searching for tracks of sheep, but without success. We stayed in a small marsh on the banks of the Yallock that night. The Yallock at this part is only a small running stream. Having a few spare potatoes, we planted them in the marsh near the fire.

Feb. 7.—As soon as we made the rising ground this morning we took an observation of the Villamanata and Annikie Hills, and found that they were not correctly laid down. We then proceeded direct for the Annikie Hills. We passed over a tract of very fine land. We found some water-holes at the foot of the Annikie, and the herbage for miles around, and even up to the top of the Annikie, is of the finest description. We reached the summit of the highest hill, from which we had a beautiful view of the land extending up towards the Exe, which appeared to be very fine and well-timbered, also of the Barabool Hills and of the land in and about Geelong. We descended upon the north side, passed a long flat ground between the Annakie and Villamanata Hills, left them about four miles on the right, and then came upon the Debackarite, which enabled me to continue the chain of ponds, and where we dined, and after dinner we rode across to Captain Swanston's station, which we reached at sundown.

Feb. 8.—We passed this morning over to the upper part of No. 12, in order to continue the chain of ponds which we traced up to and over No. 11. We dined at the stock hut at the ford. After dinner, passed over five miles along the side line of No. 9, and then made an angle across to the settlement, which we reached about four in the afternoon, and found that the vessel had arrived during our absence.

Some of the natives came to me and reported in the evening (?) that a ship was coming in. They made us understand that they had tracked us on the beach, and followed us many miles, and they had also seen the places were we had slept.

Feb. 9. — At daylight this morning we heard the report of guns from the ship, and shortly afterwards the natives reported that a vessel was at anchor with three masts; and concluding that it was the "Caledonia," Mr. Furgesson went down the river with Mr. Batman's boat. About eleven o'clock, Captain Symers, of the "Caledonia," came up to the settlement. I then arranged with him for a passage to Georgetown, to be on board on Saturday afternoon; and at — o'clock, Mr. Furgesson, Mr. Stewart, Mr. Robertson, and I, with some of the native blacks, left the settlement for the purpose of proceeding to the northward, and exploring that part of the country. We took with us four days' supplies, and only two guns. My object in taking Stewart was to prevent the possibility of any collision with the natives, and that he might act as an interpreter. We proceeded in a straight line through the lands reserved for the settlement, and over No. 9. In passing over No. 9, we crossed a chain of ponds extending a little to the N.W.; when we had reached the extremity of No. 9, and were entering No. 7, it was nearly dark, when we observed a tier of sheep hills .

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. . . . moved to the right, and passed over about four miles of very fine (land ?), and just at dusk came upon a chain of ponds, as we expected, where we stayed all night.

Feb. 10.—We started this morning at daylight, bearing to the right and ascending the Sheep Hills, so that we might be enabled to obtain an extensive view to the north-east. We travelled in this direction about four miles, and from the summit of the hill we had an extensive view of the country, composing Nos. 3 and 4 and part of No. 8. The country appeared rather thickly wooded towards No. 4, and particularly so over No. 8, and we were enabled clearly to trace the course of the river Yarra-Yarra by the white fog rising from it. We then . . . . on until we came to the chain of ponds, which I had particularly traced through No. 9, and the line of which I was then enabled to continue. This chain of ponds I considered to be within a mile of the side line between No. 7 and No. 6.

The country and pasturage is here very fine, and presents a desirable spot for a homestead. As I intended to come back over No. 1 and No. 2, and within a few miles of this spot, I marked down on the chart two sugar-loaf hills. The weather was exceedingly hot this day and we rested under a blanket tent for several hours at the ponds. In the afternoon we proceeded in a direction across the plain. We then ascended a hill, and from the summit obtained one of the most beautiful views I ever saw, commanding a full view of the junction near the settlement, of the Bay, Geelong, Villamanata, and the Barabool Hills. I think it must have been from this spot Mr. Hume had the first view of Port Phillip. After taking observations and the bearings of these several places on the chart, we continued our course over No. 6 until we reached the Salt Water River, or the river Arundel, as called by Mr. Hume. We found the land highly timbered and fully equal to our anticipations as to quality . . .

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suited for an extensive sheep run. We continued our course on the high ground and near the river for about five miles, and then descended into a small marsh near Gam's Corner.

We this morning crossed the Salt Water River, and took a westerly direction to the summit of a flat-topped hill, which Stewart stated was the hill from which Mr. Batman saw the native fires on his first visit, and which he called Mount . . amo . ? ; we then proceeded over a running stream which nearly ——— No. 5.

We were detained . . . . .

. . . . I told him that as we were limited to time it was necessary we should push on, and I proposed that he should mount Stewart's horse, and that

Stewart should lead his horse to the settlement. My object in doing this was to afford him the opportunity of inspecting Nos. 1 and 2, in order that he might report thereupon to Capt. Swanston, and to accomplish this purpose I should have deprived myself of Stewart's assistance. Mr. Furgesson, without even thanking me for the offer, observed that black men were very careless, and that he should not trust his horse

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. Mr. Furgesson . . . him the gun, and he then wished me good morning. During the whole of our journey through the bush, the fires had been produced by phosphoric matches which Mr. Furgesson had, independent of which he also carried a steel with prepared punk. I felt much surprised at his conduct, and not knowing whether we might experience any difficulty in obtaining fire, I said to him—If you leave us, what shall we do without your matches?" He simply replied—"O, you will have no difficulty in obtaining fire and . . .

. . . . . Mount Cotterill was in full view, and he could have easily reached home that afternoon. We then proceeded N.W. about two miles, and as we were desirous of seeing the land to the westward, we left our horses with the servants, and ascended the summit of the Sugar Loaf Hill, about half a mile distant. We had now only a single-barrelled gun for our protection. We then altered our course nearly due N., and passed over some very good plains, and near the foot of a tier of hills. We crossed over two or three rivulets, beside one of which we dined. We then . . . .

. . . last, on our way from . to the line extending to the Villamanata Hills. We passed over two other creeks which appeared to flow in a southerly direction. We continued our course until we again reached the Salt Water River. The land of No. 1 is very good, and is well watered. We crossed three chains of ponds, about three miles distant from each other. We stayed on the banks all night, and as we did not reach the river till near dark and were fatigued, we did not . . hut

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. . About twelve at night we . . upon the hills to avoid the mosquitoes, and when we had descended into the bottom we found the fire almost out. We roused the party, and were at length, with the greatest difficulty, enabled to make the fire burn. It continued burning till daylight, and we then dried our clothes, had some hot tea, crossed the river and proceeded on our journey. We now altered our course, for the purpose of passing between the two hills which I had marked down on the 10th, and we arrived at the spot within a few minutes of the time we expected, so that the . . . .

. . . . a beautiful vale, extending apparently several miles to the northward, and extending over part of Nos. 6 and 7. This vale contains about 20,000 acres of the richest quality and of the finest herbage we saw, and in my opinion, superior to any of the land upon No. 9, or any of the sections. We found the continuation of the rivulet, and that it wound round the flat-topped hill, thereby affording a most eligible situation for a homestead. We then continued our course to another hill, near the margin of No. 7, which we ascended, and from this hill we . . .

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course about eight miles across fine feeding land, and came upon a rapid stream of water flowing, like all the other rivers, from the N. to the S. We called this river the river Plenty, as it is the only stream, except the Barwon, deserving the name of a river. We dined at this river, and afterwards proceeded about one mile down it, in order to form an opinion as to its course; and as we were desirous of reaching, if possible, the river Yarra-Yarra that afternoon, we then crossed the river, and made an easterly course through forest land, about six . . . .

. . . . . We then proceeded about a mile south-east, when we were again stopped by a small stream, and found the land very boggy. After proceeding about half a mile south, and then ascending along a high ridge, we determined to cross, if possible, the stream, and which, after much labour, we accomplished, but finding it impossible to continue our course, and the land between us and the Yarra-Yarra being very heavy and thickly wooded, we . . again to recross. . . . .

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secure tent to protect us from the wet.

Feb. 15.—When we awoke this morning, we found to our dismay that the horses, with the exception of one mare, which had been tethered, were missing, and in about an hour Stewart returned, informing us that he had discovered the track, and that the horses were all gone. We were under engagement to return to the settlement by twelve o'clock, and we calculated that we were distant seventeen miles in a straight line. . . . . .

. . . . following their tracks, and here the instinct of that noble animal was most powerfully exhibited. The horses had been a circuit of at least 120 miles, and had never been within ten miles of the spot where we were stationed that night, and yet, instead of proceeding back upon their track, the horses made a direct course for the settlement round the hills, with as much care and sagacity as could have been manifested had they .

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. . . We then saddled, and crossed the river and continued the course to the settlement, which we reached at five minutes past twelve. Upon my arrival at the settlement, I found about one hundred and fifty natives, and I learned with much concern that an act of aggression had been committed upon one of the women, which required my immediate attention. Without waiting to refresh myself, or refit, I proceeded to the native huts, and ordered the person . . . .

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a violent contusion upon the back part of her head, and which I understood had been inflicted upon her by her husband. It appeared that she was one of . . and that the tribe had lately been on the Saltwater River, and near the shepherds hut on No. 10; that this woman was proceeding towards the settlement to see her mother, and fell in with one of the shepherds, who laid hold of her, brought her to the hut, tied her hands behind her, and kept her there all night, and . . .

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expecting to obtain redress. The natives are particularly jealous respecting their women, and they consider any intercourse of this kind is a contamination, and in every case punish the women fearfully, even to death. The natives, men, women, and children, assembled around me. I explained to them, through Buckley, our determination in every instance to punish the white man, and to protect the native to the utmost of our power, but we were not allowed to beat them . .

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. who had illtreated her . . she replied, "No;" and I then enquired whether she had ever seen them before, she replied, "Yes, they were in the hut when the other man brought her in with her hands tied." I then enquired of the overseer, and found that a third man was at the hut, but had not been brought down. I then explained to the two men the wickedness of their conduct, and how justly they would be punished if the natives had inflicted an injury upon them; and gave orders .

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. . . . the woman identified him as the aggressor, that he would be removed from the settlement by the first ship, and be publicly taken away as a prisoner. I directed Buckley to explain to the whole tribe the course which I had directed to be pursued, and I could perceive by the expression of their countenances that they were highly satisfied. I then endeavoured to make the poor woman understand how much I commisserated with her situation, and I tied round her neck a red silk handkerchief, which delighted her exceedingly. . .

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. All of the party . . and we all went in the captain's boat to the mouth of the river, and reached the . . .

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Feb. 16.—By daylight this morning we were visited on board by four of our own tribe, in Mr. Batman's whale boat. The natives appeared much pleased with their visit, and surprised at the appearance of the vessel. They remained on board about a quarter of an hour, when having obtained a supply of biscuit, they left us. At — o'clock the vessel was under weigh . . . . .

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. . . and proceeded towards the sea. Mr. Escoart came to anchor near the settlement at Indented Head. When we were near Arthur's Seat it became necessary to work the vessel through a narrow passage, about four miles long. This passage is not more than a mile and a half wide in some places, and the . .

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in the evening, so that the captain was afraid to proceed to sea that night, lest we should be driven upon Cape Otway, and in consequence came to anchor about three miles from the heads, under the lee of the land.

Feb. 17.—We got under weigh at daylight, and made a safe passage between the heads of Port Phillip .

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about eleven o'clock at night we reached White's Hotel, at Launceston.

OBSERVATIONS.

The natives are a fine race of men, many of them handsome in their persons, and all well made. They are strong and athletic, very intelligent, and quick in their perceptions .

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preparing meat . . . The women, and especially the young ones, are particularly modest in their behaviour, and also in their dress. They all appear to be well disposed, and very fond of bread and potatoes. In the winter season they live principally on fish and game. Upon the .

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appearance of the country, I feel persuaded that they must exert themselves considerably in obtaining subsistence, and from their extreme partiality to bread and potatoes, I feel not the slightest doubt but that they may be all brought to habits of industry and civilization, when the mode of obtaining potatoes and wheat . . . . .

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country is generally . . open, flat, champaign country, with abundance of verdure, and well watered. It far exceeds my expectations, although I was prepared to expect something very superior. I consider the representations of Mr. Batman fully borne out, and from the account given by Buckley, I am disposed to believe . .

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. . I this day . . settlement at Port Phillip, having taken a trip over in the "Adelaide" with some of my sheep; I found the young woman before spoken of living at the settlement with her husband and his other wives. She had quite recovered from the contusion, and her husband was again reconciled to her.*

Art. X. — *Remarks on a Tertiary Deposit in South Australia.* By the Rev. Julian Edmund Woods, Penola, South Australia.

[Read before the Institute, 29th September, 1858.]

I propose in this paper to describe briefly to the Institute a tertiary formation, which is only interesting inasmuch as it furnishes clear evidence of immense changes occurring in this continent during the tertiary epoch. I have chosen it as a subject for the facility of its description, and because its leading features can be done justice to within moderate limits. There are no fossils to be described, nor any difficult arrange-

* The Editor hopes that the thread of the narrative will be pursued, notwithstanding the many spaces that exist. Each space represents the proportionate amount of text wanting.—J. M., Ed.

ment of rocks requisite. I have merely to give a few plain facts, patent to the most superficial observer, and to draw very intelligible inferences from them. If the paper should appear incomplete, it is because I wish to do no more than allude to details, the knowledge of which more competent men may hereafter extend.

The few fossiliferous rocks that South Australia possesses, are all, with one exception, of the tertiary epoch. That one exception is at Willunga, where the formation is clearly silurian. None of the tertiary beds have been as yet described, but their classification will not, I apprehend, be a matter of much difficulty. As they are connected with my subject, I will here indicate where they occur, as far as the colony is at present known, beginning with the most recent. All round the coast from Adelaide to Port Augusta, and from the Coorong to the mouth of the Glenelg, shells of existing species are found, loosely imbedded in sand or mud to some distance above the sea level. Where the country is flat (as near Guichen Bay), this is continued sometimes seventeen miles from the shore. The sea has left this most recent formation as the land has been slowly upheaved. Where the deposit goes to any depth, the same shells are found imbedded in limestone, and what would be thought a different bed, is shown by the included fossils to be of the same geological age. Immediately under this, at Adelaide, another very recent bed, containing shells, is found. The inclosed *testacea* are all species now existing near Adelaide, or on the adjacent coast in a more northerly direction. They generally show a more genial climate than that which obtains at present, but as the deposit is a very small one, this difference may be owing more to local circumstances than to any great variation of the physical geography of the locality. Next to this again, and immediately following, as far as I can ascertain, though my researches are not sufficiently extensive to assert that no other deposit intervenes, there occurs a quartzose limestone-bed, whose extensive cross or diagonal stratification shows it to have been deposited from a deep sea current. This contains no fossils, at least such as can with certainty be determined. The next beds in succession, and the last as far as we know, are the Mount Gambier deposits, which contain shells, mostly of extinct species. It is not quite certain whether these latter should be called upper Eocene or lower Miocene, but more extended investigation will, doubtless, prove them to belong to the former. I say this because I have found fossils which properly belong to the London clay, and it would be difficult to imagine uncommon shells having so wide a range as the lower Eocene in England, and the lower Miocene in Australia. I have in the list of tertiary rocks just detailed, omitted those beds which are found on the banks of the Murray, particularly at the north-west bend. I have never had an opportunity of examining these deposits, but from specimens forwarded to me I think they are contemporaneous with the Mount Gambier limestones. There is a great variety of *nautilidæ, terebratulæ* and *pyrulæ* of extraordinary size. I have also seen one specimen of the *plagiostoma spinosum* of the same species as that which occurs in the chalk at home. More extensive data will enable future enquirers to determine the precise position of these strata, and I am sure they will well repay the trouble of any one who shall investigate them hereafter.

The deposits I wish to call attention to on this occasion are those already described as owing their origin to deposition from a deep sea current. They are found from Lacepede Bay, (as far as I have ascertained) to Rivoli Bay. Patches also occur at Mount Gambier, and at some places near the mouth of the Glenelg. Where they are seen most to advantage is, however, at Guichen Bay; and it is to observations made in that locality, I shall confine myself more immediately. The whole eastern and northern sides of Guichen Bay are composed of low sand-hills, scarcely rising thirty feet above the water level; but on the southern side quite a change takes place. The sand is replaced by rough, craggy rocks, which, though not rising very high, are bold and abrupt, sometimes presenting a perpendicular face to the heavy surge which beats upon that coast. Seen at a distance, one would imagine that these rocks were divided into huge strata, fourteen or sixteen feet thick, but on a closer inspection, another, though less distinct kind of stratification is discernible. In addition to the great divisions (which are so distinct as almost to lead one to suppose that three or four huge slabs of stone were laid upon one another,) there is cross stratification. This is a lamination which divides the beds into strata about two inches thick, but they are never horizontal, like the great divisions, are seldom parallel to each other, and never continuous across the divisions spoken of above. Now all these appearances, taken in connection with the mineral composition which I shall just now describe, are clearly indicative of deposition from an ocean current. I need not go through all the reasons which make this conclusion apparent. It will be sufficient to say that the want of horizontality in the smaller strata is due to the force of the current, and the greater divisions are caused by an alteration in the direction of the stream, which, before it would deposit any new matter, would carry away the lighter superficial particles, and wear down to a smooth surface all inequalities. The material of the rock would appear, at first sight, to be a coarse-grained sandstone. I should call it a calcareous sandstone. Under the microscope it is found to consist of small particles of shells, worn by attrition into thin scales and small grains of quartzose sand. It is freely acted upon by weak acids, and on a qualitative analysis showed a large proportion of silica, lime and magnesia (carbonates), with small proportions of sesquioxide of iron and sulphate of lime, but no appreciable quantity of phosphates nor organic matter. It would not be difficult to show that the formation was deposed in deep water, perhaps at some considerable distance from the coast; for anything but a slow-moving large body of water out of the influence of land would certainly carry down larger fragments of shells than what are here seen. From the great attrition the particles have been subjected to, one can gather that they were carried a long distance. The place where the deposit is seen to best advantage is in a small bay on the southern side of Cape Lannes, which with its projecting reef forms the termination of Guichen Bay on the south. Here the rocks are seen in bold sections, over fifty feet in thickness. This little bay is very deep, so that the water washes the foot of the cliffs nearly all round. In some places the wearing of the surf has undermined the cliffs and caused them to fall in, or the spray has eaten into their soft, friable texture, giving them a wild jagged outline. These features, united with irregular cross stratification, the dark hue of the stone, the heaps of ruins which are scattered about, and the boiling of the surf as it breaks heavily against the rocks, even on the calmest day, would make a grand and sublime scene, were it on a somewhat larger scale. However, even as it is, it is wild and desolate, and the little verdure which the Mesembryanthemum give as they creep down the surface of the rock, or hang swaying in the wind, tends little to soften the savage aspect of the place. There are, as I have before stated, no fossils, but the summit of each cliff is topped by a stratum of compact limestone, horizontally deposed, and lying unconformably. This, I presume, is the relic of the last coast action before the deposits were upheaved to their present position; and from the fact that the same stone, lying in the same manner further inland, contains fossils of existing species, I have little doubt that it is of the same age as the very recent beds spoken of before, as existing all round the coast.

The current from which the deposits under consideration arose must have been of very wide extent, and have deposited its sediment very equally, because the upheaval which has raised the land portion, has given rise to rocks of the same height all along the shore, sometimes at a considerable distance from it. Thus there is an archipelago of small rocks encircling Guichen Bay, which rise out of the sea like patches of table land, and a reef called Cape Jaffa Reef is a chain of such flat-topped rocks, which run twelve miles out to sea. I have said that the stone is soft and friable, and that the sea easily corrodes it away. Many singular instances of this decomposition are perceptible. At a small distance from Cape Lannes there is a narrow strip of tubular rock, narrower at the middle than at the ends. The surf has undermined the centre part, so that a natural bridge of stone, supported by two buttresses, is now the result. Again, the constant action of water has made deep caves at the bottom of some of the cliffs, and in some instances the beating water has bored a sort of chimney up to the surface, giving rise to the well-known blow holes. One of these is pretty large, and when the tide is high, and a heavy swell on, the spray is dashed to a considerable height out of the dry rock, with a roar that may be heard a long way off. But there is, perhaps, no more singular effect visible than that which is caused by the action of the spray in those rocks most exposed to its influence. The tops of such are covered with pinnacles as delicate and varied in form as reef coral. A mere description could scarcely do justice to the strange appearance they present. It seems at first sight as if the rocks were covered with slender stone shrubs, tapering gradually to a point, or as if the roof of a cave, studded with stalactites, were turned upside down and placed on the sea coast. Anything but spray must have long ago broken them to pieces, and even then, how they have been spared, while the surrounding rock has been worn away, does not appear very plain. It would appear to me that they must be the result of concretions of the lime and sand, caused by the percolating of water through the beds prior to upheaval. This would, and did in fact, in other places harden certain portions, and enable them better to resist the wear of water. Instances of this concretion are very common where the action of the spray has not destroyed the surrounding matrix. At one cliff out of reach of the sea, where portions of the rock have fallen away, concretions are very numerous. The sides of the rock are covered with them running through the strata like roots, or hanging down from the roof so as easily to be mistaken for stalactites, if they were not a little too crooked and irregular. Their appearance is just that of bent coral, about half an inch or more in diameter. The outside of these concretions is just like the rock itself, that is, are composed of small fragments agglutinated together; but on breaking them the inside is found to be hard and compact, like cherty limestone or dolomites. They are usually formed in concentric rings. I do not suppose that the action of the water in causing them has been merely mechanical. I suspect, from the large quantity of magnesia contained in them, that a doubly basic salt of carbonate of lime and magnesia is formed by chemical decomposition. Slow filtration of water might alone be a sufficient cause, because it is certainly from something of this kind that the layers of flint in the Mount Gambier limestones are chiefly owing. This is a department of geology where investigation is much required, for the "pot stones" in the chalk at home, which owe their origin to filtration of some kind, are by no means clearly accounted for. In addition to the corrosive action just described, the wearing of the strata by waves is very considerable, and thus we may see that the ocean is here indemnifying itself for the losses occasioned by the upheaval of the land. There can be no doubt that the sea will not be long destroying the beds within its reach, if the work of destruction proceeds as quickly as it has within a comparatively short space of time. We may, therefore, witness two phenomena not often associated together, namely, the land rising and the sea encroaching rapidly. It is interesting to observe how the sea soon replaces what it removes, and the seam of limestone which tops the rocks unconformably, answers the question which may be asked: what has become of the immense masses of rock which have been already destroyed? Such, for instance, as those portions which must have joined the coast with the rocky islands which fringe it. However, no conception of the great work of denudation which has taken place can be gathered from the comparatively small ravages in Guichen Bay. My belief is that the whole coast, perhaps as far as the mouth of the Glenelg, and as far inland as Mount Gambier, has been covered with the same deep sea deposit now described, and it has afterwards been removed by coast action as the land slowly rose. My reasons for this opinion are founded on having noticed, at various parts of the country, little hillocks of rock, of small extent, and about fourteen feet in thickness, so identical in composition (even to the concretions) with the Guichen Bay formation, as to leave little doubt on my mind of their having been continuous with it. At Mount Gambier there is such a deposit. It is situated at a place called the Cave Station. Though rather more ferruginous, and containing occasionally rather larger fragments of shells, and sometimes even a whole oyster shell, there can be little doubt of its identity. It lies of course upon the limestones of Mount Gambier, where there is every reason to believe all the rest of the formation rests. The hillock now alluded to has formerly been studded with concretionary pinnacles, but of course much water worn, and barely jutting out from the surface. What with the hardening consequent on chemical action, and the ferruginous cement, the rock is almost as hard as granite, contrasting strongly with the soft white rock on which it rests. The hardness is doubtless the cause of its preservation. Another place where a patch is seen is at a station not far from the western bank of the mouth of the Glenelg. In this place (to which I regret I could only afford a passing examination) perfect shells are found, mostly species of *Astarte, Ostrea, Pecten,* and *Cardium.* The strata, though not apparently so thick, were quite as compact as those just mentioned. I noticed also above the cliffs at Portland a thin deposit of oyster shells. The colour and mineral structure of the rock in which they are, as seen from a short distance, seemed to me to be very like the same deposit, but I would hardly venture to say that it was really such. It is rather singular that it should rest upon a deposit which, if not identical with the Mount Gambier Eocene, is at least very close in succession. The *Spatangus Forbesii* occurs at both Portland and Mount Gambier, and many *Terebratulæ* and *Pectens* are identical; but the cellepora coral present in the latter has not as yet been found in the former. This latter fact may be due to local circumstances, and I have very little doubt that the beds will eventually be found to be contemporaneous.

And now having given a description of the beds at Guichen Bay, their structure and other features, as well as what I consider to be portions of the same elsewhere, let me briefly describe the evidence they afford. We know that the land is rising at present, and we have fossiliferous rocks of the present period where the water has recently receded. These are our latest Australian tertiaries. Our earliest in South Australia are, as far as we know, the beds previously alluded to as Eocene. While these latter were forming, the land was sinking, and we obtain the knowledge of that fact by many reasons, such as the following I now give. Darwin has justly remarked that very thick fossiliferous beds are only formed during subsidence, and this is borne out by the thinness of the beds lately formed during a period of upheaval. The same illustrious geologist has proved that the whole bed of the Pacific is sinking, and that the subsidence is giving rise to coral islands far away from land. Now at this part of South Australia we have very thick beds, and those too of coral, which I have traced 100 miles inland without any break or sign of land during the epoch of their formation. I think there can be little question that the sea bed must have subsided where any great thickness of coral is found, because it will not live below 30 fathoms, and must soon have perished unless the lowering of the bottom kept pace with its building operations, or at all events would not give rise to thick strata, unless during subsidence. We have, then, evidence of subsidence and upheaval. Between these periods we find beds deposited from a deep sea current, which have afterwards been washed away, probably by the denudation they were exposed to during their uprising. I apprehend, therefore, the series of changes which have taken place to be somewhat in the following manner: the land was sinking slowly during the Eocene period, and the coral animal made up for the subsidence by its continual labours, just as it does now in the Pacific. Though this would prevent any very deep water being found on the site of the former land, yet the subsidence would, of course, remove the reef further and further away from the land, and render it more exposed to the action of the sea. Extensive changes in the relative position of the land would give rise to changes of temperature, and new ocean currents would be the result. Now the coral would not have stopped building as long as the animal could keep pace with the subsidence, but any current bearing sediment would kill it speedily. Darwin, and other voyagers, give many instances of this; but a stream of sediment, did, according to the evidence we have, break over the coral and terminate its existence. This deposit was, therefore, stopped by a new one taking its place, which was of quite a different nature, being that which we find at Guichen Bay. How long after this the land continued to subside cannot be guessed, for we do not, and cannot, now know the extent of the beds formed subsequently. We see, however, that a change came at last, and upheaval followed, but so slow that coast action had time to remove successively, except in one or two places, all that the deep water current had thrown down, leaving only the dead coral exposed to view. All the facts given above bear out the correctness of these views, but of course I am far from claiming adhesion to them as perfectly certain. Indeed I have rather occasion to warn the Institute that neither my attainments nor habits of inquiry at all constitute me an infallible guide, and I shall consider myself fortunate if future and more experienced enquirers find nothing to correct in my theories. With regard to the nature of the rocks at Guichen Bay, I will just remark that though ocean currents generally seem to be clear water on the surface, they must carry sediment along the bottom, and that wherever soundings have been taken in them, the bottom has been found to consist of shells and fine sand. Sometimes, however, currents are found charged with sediment at the surface, such as those proceeding from the mouths of rivers, and then the water occasionally has a muddy tinge even at great distances from the coast.

I would extend this paper beyond reasonable limits, were I to give all the facts I have noticed connected with the subject. I will, therefore, conclude by calling attention to the vast operations of nature which are here disclosed. It is not alone the enormous subsidence which at first caused a deep coral reef and then an open sea (which must have maintained for ages to give rise to such a thickness of sedimentary rock), which must excite surprise. Nor is it the long period of upheaval. But the immense amount of denudation which has removed hundreds of square miles of thick beds of rock, is certainly a work of such magnitude as to excite wonder and amazement. At all events there is a fine agricultural country over the spot where such changes were operated, and the Mount Gambier volcano is a witness as to the cause which rescued land from sea. Many interesting questions remain to be asked, which can only be answered by very extended investigation. We might enquire whether the subsidence was very general in Australia. Also, whether the bed of the

Pacific, now submerged, was then a continent. If so, we might further ask, is its disappearance a compensation in the earth's crust for the extensive elevation we experience here? These enquiries may never be answered, but at least they let us know that there are more things in the earth than are accounted for in our present philosophy, and all the little facts we gain bring us nearer to that ocean shore where we gaze towards the boundless horizon of the omnipotence of that God who made these things which we pry into but cannot understand.

Art. XI.—*Description and System of Working of the Flagstaff Observatory.*—By Professor George Neumayer.

[With three Plates.]

[Read before the Institute, 20th October, 1858.]

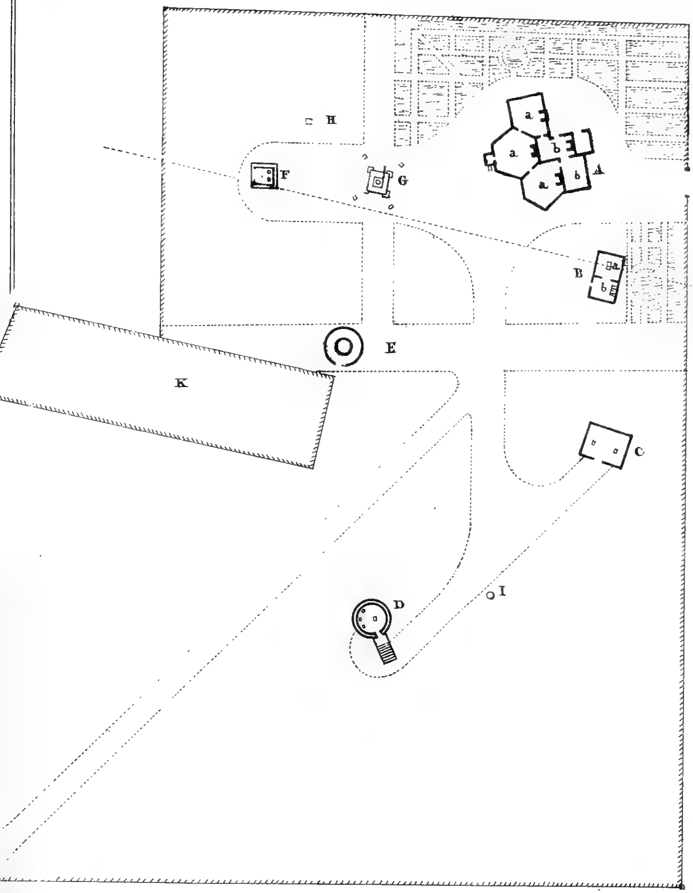
When the first proposition was made by me to the Government of this colony to establish a Magnetic Observatory, I proposed to select, for the site of the same, a spot on the southern side of the Yarra. I made that selection because the geological formations were more favourable there than on this side of the river, and preliminary observations on the magnetic elements had established the superiority of that ground over any other round Melbourne; further, the business part of the city, being more remote, was not likely to cause disturbances and inconvenience; and, lastly, the greater vicinity of the harbour was well calculated to facilitate the communication with masters of ships—an important condition required for the entire success of the Observatory.

It was only after some hesitation on my part, and after having selected two other places near that originally proposed, that I followed the suggestion made to me by the Government, to investigate the suitability of the Flagstaff Hill, with a view to making it a site for the proposed Observatory, as the buildings within the enclosure of the late signal station would be available for that purpose. The fact that the Flagstaff Hill stands upon decomposed basalt, covered to depths from 10 to 20 feet with tertiary gravel, prompted me to be cautious, and a long series of preliminary observations, made within the enclosure and on the surrounding ground,

MAGNETIC OBSERVATORY FLAGSFAFF HILL

MELBOURNE

Plate Nº 1



GENERAL PLAN OF THE BUILDINGS AND THE ENCLOSURE

Scale 60 feet to one Inch

To accompany Prof: Neumayer's paper read before the Phil: Inst: Oct 1858

T E Rawlinson Del. — Hamel & Co. Imp. — A J Stopps lith.

showed at once that the spot was not altogether free from local disturbances, and that only the portion towards the northern limit of the hill could be made available as a spot on which to erect a house for determining the absolute values of the magnetic elements. In short, I arrived at the conclusion that the locality might be made use of, provided an addition were made to the ground of the former station; at the same time I was aware that, to give the magnetical observations their full value, an additional amount of labour would be required, of a nature calculated to keep a perpetual check on the working of the instruments indicating the horary variations. Taking further into consideration its magnificent position for meteorological observations and the propriety of selecting it as a site for an Observatory connected with nautical matters, which site is likely to facilitate the labours having for their aim a successful system of meteorology at sea, I thought myself justified in making an application for the locality as a site for an Observatory.

The facts which are calculated to illustrate this matter, and to justify my final choice, do not come within the scope of this paper, but will form part of the first printed report emanating from this institution; still I could not venture to give a description of the Observatory intelligible to every one, without introducing the subject by some remarks bearing upon the position chosen for the establishment.

Proceeding now to the object of this paper, I shall commence with the description and examination of the different buildings and contrivances which form the Observatory.

The essential parts of the magnetic department are as follows:—

The House for Observation on the horary motions in the three magnetical elements, declinations, or variation of the needle, inclination or dip of the needle, and horizontal intensity, is erected, or more properly speaking, sunk into the ground nearly in the centre of the present enclosure, (*vide* D, plate No. 1). The hill inclines towards the south-east. By placing this building in the centre, the object in view was to prevent accidental disturbances as much as possible, and still to facilitate the communication with the different other buildings of the Observatory. The foundation is laid 12 feet below the surface, and consists of strong timber; upon this are resting the double walls of a room containing the instruments for horary variations. The ground plan of the room represents a polygram of 16 sides, with a diameter of 12 feet, and the door towards N.E. A skylight in the centre of its pyramidal roof throws the light upon the mirrors underneath, and a flight of steps leads to the surface (*vide* plate No. 2).

The stands whereupon the instruments are placed consist of sandstone, and are fixed in such a manner as to make it impossible that any motion could be communicated to them, through the floor or the walls of the house, from wind and other accidental vibrations. The principal object in placing the instruments in this underground building is to prevent sudden changes in temperature, which wouldnecessarily have an influence upon the readings, although compensation for temperature is applied to the deflecting magnets. This object is so well attained that, while the open air shows at times a daily range of 35° F., the greatest range as yet registered in the room is 14° F., and on a common day the range is hardly exceeding 4° or 5° F.

The stone pillar carrying the tubes for the different instruments is placed nearly in the centre of the room, and a second pillar is placed outside, for the purpose of putting thereupon a collimator, for the purpose of checking the unchanged position of the tubes and mirrors intended for the registration of the instruments.

The material of this house, as well as that of the next one, is wood, and the joinings, nails, &c., are of copper and brass, iron having been carefully avoided.

The House (*vide* C, plate No. 1) for measuring the absolute values of the magnetic elements, is situated near the northern boundary of the enclosure, in a north-west direction from the former one.

The ground plan of this building is a parallelogram; the axis of the same parallel with the longer side is in the magnetic meridian, and the entrance is towards the east.

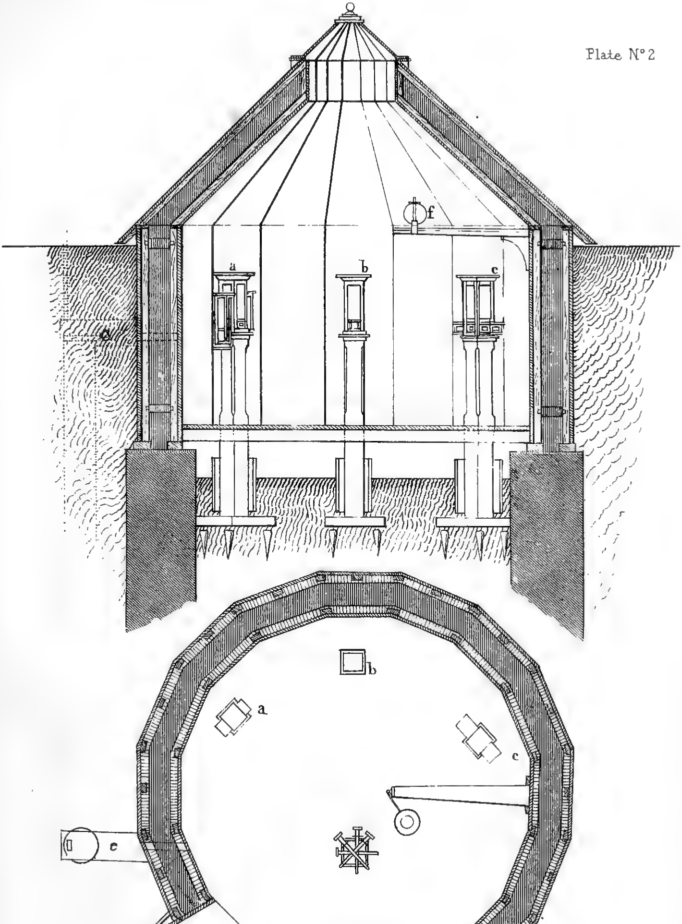
Two square stone pillars are erected in a similar way to those in the house before described.

The instruments put upon these stones are a magnetic theodolite and a dipping circle, which receive the light necessary for reading them by a large skylight in the roof of the building. Although great care was taken in erecting this room, the construction was not a matter of so difficult a nature, as changes in temperature are of no consequence in reference to the observations made therein, because such changes must be observed and brought into calculation when reducing the original readings.

The small dimensions of the magnets in use, according to

MAGNETIC – OBSERVATORY – FLAGSTAFF – HILL
MELBOURNE

Plate N° 2



PLAN & SECTION OF THE HORARY HOUSE.
Scale $\frac{3}{16}$ of an Inch to one Foot
To accompany Prof: Neumayer's paper read before the Phil: Inst: Oct 1858

J. E. Rawlinson Delt — Hamel & Co. imp — A. J. Stopps Lith

the system of instruments we have adopted, greatly facilitate the determination of this temperature, as they rapidly and thoroughly follow every change which may take place, thus preventing any serious error arising from sudden changes in which the magnets could not thoroughly participate. Different little openings are made through the walls for the purpose of enabling the observer to take bearings towards well-defined distant objects, the azimuths of which, having been once carefully ascertained, will assist us in arriving sooner at a correct value of the declination than would otherwise be possible. One of those little openings brings this house in connection with

A Little Brick Tower (*vide* E, plate No. 1), situated in the astronomical meridian passing through that pier in the absolute house which supports the magnetic theodolite. In the centre of this circular room a stone pillar is erected, upon which is placed a universal instrument, which is principally made use of for ascertaining the astronomical meridian, and transferring it afterwards to the magnetic theodolite. The instrument is placed at such an elevation as to prevent the possibility of the observer's view being obstructed when engaged in taking terrestrial objects, and the revolving nature of the roof admits of observations being made in any part of the sky, and towards any direction on the horizon.

To enable the eye to be brought to the level of this instrument, a circular flight of steps leads up to it. A second isolated pillar is erected near the steps, upon which are placed the chronometers, to bring them within reach of the observer.

The three buildings I have just described form the essential part of the magnetic observatory, in addition to which I have only to mention the computation room, to which purpose one of the rooms of the dwelling house is appropriated.

Proceeding to the further arrangements of the institution, I commence with the description of the house containing the transit room and the room for photometrical measurements (*vide* B, plate No. 1). In reference to the former I hardly need make any remark, as the construction of a transit room is familiar to every one. With regard to the contrivances for a successful management of photometrical measurements, it is chiefly required that the instrument should be placed in such a position as to admit of observations being made over the whole sky. To fulfil this requisite condition the photometer is raised upon a high stone pillar, by means of which its mirrors are brought close to the roof, and this again can be removed, so as to expose the instrument entirely to the open air. Round the top part of the just mentioned pillar runs a stage, to which a flight of steps leads from below.

On the highest portion of the enclosure, distant from all buildings,

A Meteorological stand (*vide* G, plate No. 1, also plate No. 3) is erected. The little house, if I may call it so, which contains the thermometers, is in its principle of construction similar to that of Lawson's, but it received such alterations and additions as to make it respond to the demands of this country, in which the soil attains so high a temperature. To prevent all influences of the soil, the stand is raised upon a platform five feet above the level of the surrounding ground, the bulbs of the thermometers thus assuming a height of ten feet above the soil, the smallest distance which can be given them to prevent the effects of radiation. To protect the thermometers against sun, rain, and wind, the upper part of the meteorological stand is moveable round the flagstaff, which passes through its bottom and roof. A wooden disk, fastened to the bottom of the little house, serves as a *limbus,* with the help of which, in addition to a small quadrant attached to one of the sides in a perpendicular plane, we are enabled to ascertain, by equal altitudes, the meridian passing through the centre, thus obtaining an excellent means for registering the wind by the vane on the top of the flagstaff. A tin box, of a cylindrical form, containing the ozone paper, is hoisted up to the top of the mast for ozonometric measurements.

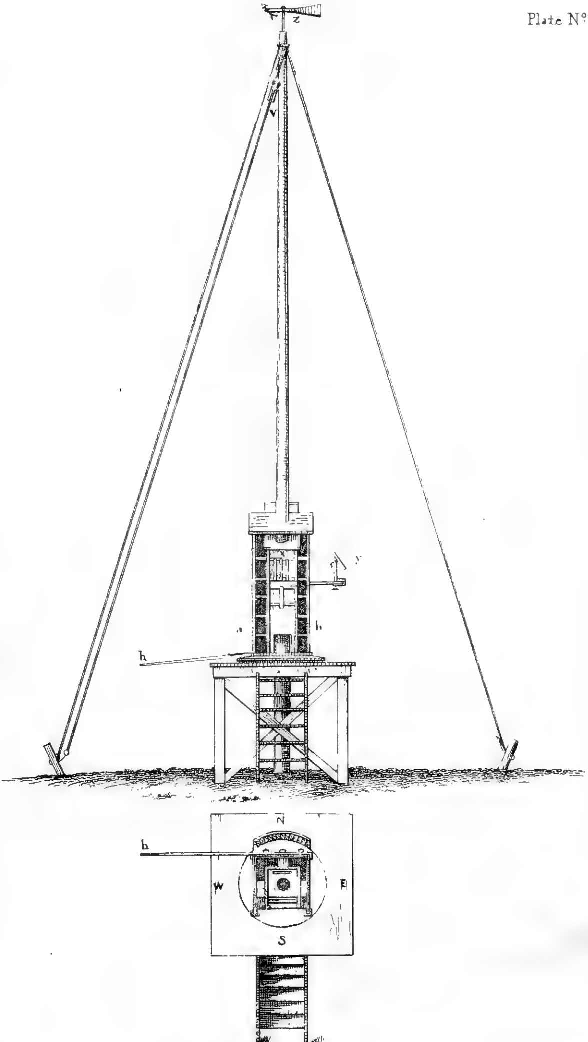
In the close vicinity of this meteorological stand, the Rainguage (*vide* H, plate No. 1) is placed, and also the thermometer for temperature of soil and radiation; and farther towards the south arrangements have been made for correcting the sextants of captains, with regard to eccentricity and the error of division (*vide* F, plate No. 1).

The Dwelling-house (*vide* A, plate No. 1) is chiefly taken up by the offices for computation. The only apartments of particular interest are the front-room, appropriated for barometrical observations, the comparison of meteorological instruments belonging to masters of ships, and to the electric telegraph, which brings the Flagstaff Observatory in immediate connection with the Astronomical Observatory at Williamstown. In addition, a little room up stairs should not be forgotten, in which arrangements are made for electrical observations; the stand for the electrometer is fixed to the wall in a per-

MAGNETIC OBSERVATORY FLAGSTAFF HILL

MELBOURNE

Plate No. 3



PLAN & ELEVATION of METEOROLOGICAL STAND

Scale 8 feet to one Inch

To accompany Prof. Neumayer's paper read before the Phil: Inst: Oct: 1858

T. E. Rawlinson Del.t

A. J. Stopps Lith.

fectly steady manner. From this room a communication is established with a platform on the roof, to enable the observer to descend with the least possible delay from the roof down to the stand for the electrometer.

Part of the same room is devoted to the photographic apparatus, and part to a small mechanical workshop, intended for keeping the instruments constantly in repair.

I have now accomplished the task I proposed in describing the buildings of the Observatory, and in connection with them it remains only for me to explain my reasons for scattering them over the whole ground, instead of uniting them in one compact whole.

The explanation is simply this; I had to make use of the buildings of the late signal station, as I found them, in the best possible way, and the circumstances referred to in the beginning of this paper did not admit of my free disposal of the ground, and I was compelled to select certain portions for the building of the magnetic department. The plan of arrangement ultimately adopted being in no way injurious to the magnetic observations, I felt no hesitation in following it.

Before leaving the exclusively descriptive part of this paper I have still to enumerate the different instruments which are in use in the observatory. They are as follows:—

In the Horary House—

Differential Declinatorium.
" Inclinatorium.
" Apparatus for h. intensity.

(According to Lamont's construction, and executed in the workshops of the Royal Observatory in Munich.)

In the Absolute House—

A Magnetic Theodolite, with all appurtenances for determining the three magnetic elements, apparatus for deflections and oscillations, and differential inclinatorium.

(As above.)

A Dipping Circle, with four needles and apparatus for inverting the poles.

(From the atelier of Inspector Meyerstein, in Göttingen.)

In the Circular Brick Tower—

A Universal Instrument.

(From the Mechanical Institute of Ertel and Son, in Munich.)

In the Transit House—

A Transit Instrument from Potter, London.

A Photometer, according to Steinheil's principle.
(Executed in the Optical Institute of C. Steinheil, Munich.)

A Six-feet Refractor, as above.

In the Dwelling House—

An Electrometer on Quetelet's principle.

A Telegraphic Instrument, executed by E. Merfield, Melbourne.

A large Photographic Apparatus, for charts, maps, &c.

A Small Photographic Apparatus, for scientific objects.
(From the atelier of Messrs. Lerebour et Secretan, Paris.)

Chronometers, sextants, barometers, thermometers, tubes, heliotropes, balances, microscopes, turning lathe, tools, &c.

Having given an outline of the circumstances which led to the selection of the Flagstaff Hill as a site for a magnetical and nautical observatory, and having given a sketch of the different buildings and their construction, I now arrive at the second part which forms the subject of this paper, namely, *the system of working.*

To be successful in illustrating the labors undertaken by me, and the methods I have applied, I cannot begin in a better manner than by stating in a few precise terms the objects of the Flagstaff Observatory.

First amongst these comes the advancement of the science of Terrestrial Magnetism in its theoretical and practical scope, and more especially in reference to those investigations which will ultimately give us a clue by which to connect the phenomena of meteorology and magnetism. Further, to assist the great systems of observations carried on at sea, with a view to improve ocean navigation, and to endeavour to establish and support similar institutions on the Australian coast and adjacent seas.

By carefully weighing and realizing the full purport of the foregoing ideas, we perceive at once that they are all closely connected with each other; in fact, that while we are all pursuing any one of them, we can hardly exclude the others, if we have clearly defined views as to the best means which can be adopted. We further perceive at once that it must be one of the first principles of an institution of this kind, that the simultaneous nature of phenomena should be recorded and established, and that an Observatory, aiming at such a high position in reference to the general system, must keep hourly registers on meteorology and magnetism.

These were the conclusions which guided me in forming my plans as to the mode of registration; and as no institution of a similar nature has as yet been established in the southern hemisphere, I did not for a moment doubt but that my efforts would be crowned with success; consequently I took measures adapted to place the Observatory, from the beginning, upon a right footing: a system of hourly observation and registration having been organised, which has gradually come into operation.

The meteorological instruments have been registered hourly from the 1st of March, 1858. The atmospheric-electrical tension has been hourly observed from the 15th of April last, and other horary variations in terrestrial magnetism from the 1st of May. The delay in starting some of the operations was owing to the fact that the different buildings became only gradually available for the purpose, so that complete hourly registrations have only been carried out in every department from the 1st of May.

The order in which the registrations are made at present is as follows:—

At 1 m. 30 s. previous to the full hour the barometer is read.

At the hour itself, the instruments for horary variations in terrestrial magnetism.

At 1 m. 30 s. after the hour, the dry and wet bulb, black and white bulb, and soil thermometer are read.

At 2 m. wind, rain, clouds, &c.

At 5 m. the electrical tension of the atmosphere is observed.

Thus we bring the whole set of readings within the short space of 6 m. 30 s., and this time is strictly adhered to, both night and day.

This plan of observing is only changed at times of great disturbance, either in magnetism, electricity, or in the atmosphere generally—all necessary instruments being then recorded from 5 to 5 minutes, and even, if required, from minute to minute. If we now take into consideration that 550 observations are thus registered in a day, it will be at once evident that we must take such steps as will keep all the accumulating facts continually in view, and this is effected by making the most necessary reductions at once, and winding up every five days' work by determining the means for every hour, and from them again the means for the period. It must be borne in mind that, while doing so, it is incumbent on the staff of the Observatory to copy all single registrations again, for the purpose of classifying them. It can only be by means of such an arrangement that we are enabled to keep our registers in such order as to have them ready for publication whenever it may be desirable.

With the systematically registered observations, we may further enumerate the whole series of absolute measurements in terrestrial magnetism, which are accomplished at the beginning of every month, and which occupy, under the most favourable circumstances, one day and a half of consecutive observations. These observations are chiefly intended to keep a constant check over the instruments in the horary house—a precaution we cannot be too particular in adhering to, especially in a country like this, where no observations of the kind have hitherto been made.

The magnetic part of the Observatory will, in its working, furnish the facts on which to base a magnetic survey of the colony, which will be carried out with the staff and the instruments of the Observatory, a large addition to which is expected early, namely, those used by Professor Lamont in making the magnetic survey of Spain.

The collating of ships' logs is also carried on systematically, and those received are commonly of a two-fold nature; either it is an abstract log issued by the Board of Trade or Lieutenant Maury, or it is a common ship's journal. In the latter case the log is thoroughly copied, but in such a way as to classify the meteorological facts at once, according to geographical position, and for that purpose the ocean is divided, on Maury's principle, into squares of 5 degrees longitude and 5 degrees latitude, each to receive the facts recorded as having happened therein. In the former case only facts of a peculiar character are extracted therefrom, and these facts are classified according to Melbourne mean time, in order that we may be able to recognise simultaneous occurrences in nature.

With regard to our coasts, I am happy to say that my proceedings have been largely appreciated by the masters of ships trading thereon, and that as the common form of log is devoid of matter of interest for scientific investigation, I was requested to issue forms which would facilitate the registration of meteorological facts, and a largely-signed petition from masters of coasters was handed to me, which I hope will lead to the organization of a meteorological system on this coast.

As it was my desire only to illustrate the mode of registering the systematic observations, I will not allude to the large amount of additional labor incurred by astronomical, photometrical, and other observations, which are partly undertaken with the view to assist Mr. Ellery, the astronomer of the colony, in his important and useful labors.

It only devolves upon me to add, that with two assistants I am at present keeping this extensive system of observation going, which certainly cannot be done without considerable self-denial from the parties concerned therein.

In conclusion, let me express a hope that the Institution we have called into existence may continue to flourish, and that its labours may be replete with results of the highest value to science and the happiness of mankind.

October 20th, 1858.

NOTE.—Since the time this paper was first read, the collection of instruments of the Observatory has received some valuable additions, namely—a self-registering anemometer, on Oesler's construction, was put up in one of the upper rooms of the dwelling house, and will greatly add to the completeness of the meteorological observations; besides this, I may state that an arrangement has been made to connect a clock in the telegraphic room with the absolute and horary house, by electric currents, whereby signals are given, rectifying the time of registration as well as greatly facilitating the obtaining of simultaneous readings in the horary and absolute houses.

Art. XII.—*Some Facts illustrative of the Meteorology of the month of August*, 1858.

[According to observations taken at the Flagstaff Observatory, appr. latitude 37° 48′ South, longitude 145° East.]

By Professor George Neumayer.

[With Four Plates.]

[Read before the Institute, 8th November, 1858.]

Table I.—(Vide Plates Nos. 1 & 4.)

DAILY MEANS OF THE DIFFERENT METEOROLOGICAL ELEMENTS FOR THE MONTH OF AUGUST, 1858.

Days of the Month.	Mean direction of Wind.		Pressure of Air.	Temperature of Air.	Temperature of Soil.	Pressure of		Rain.		Hours of		Force of Wind.	Amount of Clouds.	Electricity and Ozone.	
						Vapour.	Dry Air.	Inches.	Hours.	Fog.	Dew.				
	°	′	Inch.	Deg. Fah	Deg. Fah	Inch.	Inch.	Inch.	h.	h.	h.			Electr.	Ozone.
1	187	36	29·996	45·23	45·39	0·268	29·728	0·0	0·2	0·0	6·0	2·13	5·21	3·55	3·0
2	196	7	29·753	47·04	47·21	0·281	29·472	0·014	4·7	0·0	0·0	4·00	7·67	1·12	—
3	120	29	29·774	48·48	49·66	0·294	29·480	0·048	3·8	4·0	0·2	1·33	6·98	3·01	3·5
4	231	7	29·856	47·43	50·00	0·324	29·532	0·010	0·2	11·0	0·0	1·00	6·04	5·53	2·5
5	257	56	29·756	48·66	52·07	0·312	29·444	0·003	0·0	6·0	3·0	0·77	5·48	3·84	—
6	190	35	29·696	48·29	49·19	0·265	29·431	0·000	0·0	0·0	6·0	3·67	3·54	2·99	—
7	149	48	29·762	53·25	53·82	0·300	29·462	0·010	0·5	0·0	0·0	3·04	6·37	2·07	2·5
8	208	12	29·966	50·81	53·53	0·329	29·637	0·002	0·3	1·0	1·5	1·46	5·77	3·88	4·0
9	218	45	29·818	53·37	53·31	0·316	29·502	0·000	0·2	0·0	0·0	2·42	9·33	2·56	2·5
10	202	43	29·397	52·00	50·85	0·336	29·061	0·112	10·2	0·0	0·0	2·83	9·56	0·83	—
11	50	5	29·460	49·39	48·83	0·344	29·116	0·389	14·8	0·0	0·0	4·14	9·75	1·16	—
12	75	59	29·672	49·12	47·25	0·298	29·374	0·064	3·55	0·0	0·0	6·58	8·42	1·56	—
13	59	36	29·788	48·20	46·20	0·296	29·492	0·012	3·15	0·0	0·0	5·21	9·75	1·52	—

TABLE I.—(CONTINUED.)

Days of the Month.	Mean direction of Wind.		Pressure of Air.	Temperature of Air.	Temperature of Soil.	Pressure of Vapour.	Pressure of Dry Air.	Rain. Inches.	Rain. Hours.	Hours of Fog.	Hours of Dew.	Force of Wind.	Amount of Clouds.	Electricity and Ozone. Electr.	Ozone
	°	′	Inch.	Deg. Fah	Deg. Fah	Inch.	Inch.	Inch.	h.	h.	h.			Electr.	Ozone
14	51	16	29·968	48·94	47·51	0·301	29·667	0·036	3·9	0·0	0·0	3·58	9·35	2·66	6·0
15	42	37	30·031	49·44	51·33	0·330	29·701	0·259	5·7	0·0	0·0	2·83	6·96	2·35	—
16	58	59	30·036	49·73	52·92	0·335	29·701	0·008	2·6	3·0	2·5	1·38	5·62	2·81	5·0
17	48	59	29·984	49·41	51·91	0·339	29·645	0·055	5·4	4·0	2·0	0·90	7·83	4·03	—
18	200	33	29·824	50·76	51·33	0·287	29·537	0·004	0·2	4·0	0·0	2·90	5·40	3·81	—
19	143	4	29·504	50·29	49·03	0·290	29·214	0·000	1·5	0·0	0·0	4·38	8·19	1·52	—
20	122	25	29·624	46·58	46·65	0·248	29·376	0·005	0·75	0·0	0·0	4·04	5·87	1·97	—
21	131	15	29·588	51·80	49·41	0·293	29·295	0·039	1·75	0·0	0·0	3·88	6·92	1·69	—
22	143	56	29·874	53·35	54·90	0·293	29·581	0·000	0·2	0·0	0·0	3·13	3·74	2·44	—
23	191	30	29·910	57·76	57·56	0·290	29·620	0·000	0·0	0·0	0·0	4·67	3·77	1·46	2·0
24	156	41	29·758	54·66	53·47	0·266	29·492	0·000	0·6	0·0	1·0	5·04	6·13	2·71	—
25	125	23	30·011	46·42	50·04	0·250	29·761	0·041	0·0	2·5	5·0	1·13	2·54	4·89	6·5
26	217	4	30·022	47·95	51·57	0·247	29·775	0·000	0·0	0·0	3·0	2·17	1·12	4·50	2·0
27	214	12	29·898	53·06	55·49	0·244	29·654	0·000	0·5	0·0	2·0	2·22	3·70	3·87	2·0
28	214	46	29·722	57·64	61·90	0·283	29·439	0·001	0·4	0·5	0·0	1·92	3·46	4·13	—
29	124	58	29·672	50·18	49·26	0·282	29·390	0·106	2·4	0·0	0·0	2·96	8·94	2·50	5·5
30	105	52	29·581	49·91	48·83	0·296	29·285	0·064	4·75	0·0	0·0	4·13	8·46	2·55	5·0
31	92	28	29·794	51·82	52·65	0·324	29·470	0·013	0·8	0·0	0·0	2·21	7·58	2·91	—
Me.	123	7	29.790	50·38	51·07	0.295	29·495	1·294	73·05	36·0	32·2	2·97	6·43	2·78	3.71*

* Mean Ozone for Night, 3·95; for Day, 3·67.

NOTE.—The mean direction of the wind is computed according to Lambert's formula, and the degrees given start from S. towards W., N., E., and S. again.

TABLE II.—(VIDE PLATE NO. 2.)

MAXIMA AND MINIMA IN THE DIFFERENT METEOROLOGICAL ELEMENTS, AND DIFFERENCES BETWEEN THE SAME AND THE DAILY MEANS, IN THE MONTH OF AUGUST, 1858.

Days of the Month.	PRESSURE OF AIR.		PRESSURE OF VAPOUR.		TEMPERATURE OF AIR.		DIFFERENCE BETWEEN MEAN AND					
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum of Pressure of Air.	Minimum of Pressure of Air.	Maximum of Pressure of Vapour.	Minimum of Pressure of Vapour.	Maximum of Temperature of Air.	Minimum of Temperature of Air.
	inch.	inch.	inch.	inch.	deg. Fah.	deg. Fah.	inch.	inch.	inch.	inch.	deg. Fah.	deg. Fah.
1	30·111	29·891	0·312	0·218	54·86	35·91	0·115	0·105	0·044	0·050	9·63	9·32
2	29·883	29·693	0·305	0·263	53·51	44·37	0·130	0·060	0·024	0·018	6·47	2·67
3	29·865	29·697	0·326	0·253	54·86	43·50	0·091	0·077	0·032	0·041	6·38	4·98
4	29·891	29·819	0·375	0·291	55·73	42·60	0·035	0·037	0·051	0·033	8·30	4·83
5	29·813	29·696	0·362	0·263	61·31	41·27	0·057	0·060	0·050	0·049	12·65	7·39
6	29·739	29·644	0·306	0·215	61·09	36·36	0·043	0·052	0·041	0·050	12·80	11·93
7	29·919	29·639	0·359	0·253	60·86	46·60	0·157	0·123	0·059	0·047	7·61	6·65
8	30·010	29·936	0·377	0·291	60·19	43·72	0·044	0·030	0·048	0·038	9·38	7·09
9	29·955	29·624	0·339	0·292	60·64	47·72	0·137	0·194	0·023	0·024	6·27	5·65
10	29·607	29·268	0·378	0·279	58·41	49·28	0·210	0·129	0·042	0·057	6·41	2·72
11	29·661	29·294	0·372	0·302	53·51	46·40	0·201	0·166	0·028	0·042	4·12	2·99
12	29·721	29·624	0·321	0·282	54·18	46·40	0·049	0·048	0·023	0·016	5·06	2·72
13	29·887	29·709	0·321	0·273	51·50	46·17	0·099	0·079	0·025	0·023	3·30	2·03

TABLE II.—(CONTINUED).

Days of the Month.	PRESSURE OF AIR.		PRESSURE OF VAPOUR.		TEMPERATURE OF AIR.		DIFFERENCE BETWEEN MEAN AND					
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum of Pressure of Air.	Minimum of Pressure of Air.	Maximum of Pressure of Vapour.	Minimum of Pressure of Vapour.	Maximum of Temperature of Air.	Minimum of Temperature of Air.
	inch.	inch.	inch.	inch.	degrees	degrees	inch.	inch.	inch.	inch.	deg. Fah.	deg. Fah.
14	30·034	29·891	0·324	0·256	53·75	45·50	0·066	0·077	0·023	0·045	4·81	3·44
15	30·059	29·986	0·380	0·303	55·31	44·85	0·028	0·045	0·050	0·027	5·87	4·59
16	30·070	29·999	0·362	0·308	57·08	44·82	0·034	0·037	0·027	0·027	7·35	4·91
17	30·035	29·940	0·398	0·293	59·09	42·82	0·051	0·044	0·059	0·046	9·68	6·59
18	29·945	29·707	0·321	0·258	60·21	39·92	0·121	0·117	0·034	0·029	9·45	10·84
19	29·677	29·375	0·335	0·230	58·86	42·59	0·173	0·129	0·045	0·060	8·57	7·70
20	29·664	29·561	0·291	0·223	53·73	40·82	0·040	0·063	0·043	0·025	7·15	5·76
21	29·726	29·510	0·423	0·242	60·64	46·60	0·138	0·078	0·130	0·051	8·84	5·20
22	29·945	29·729	0·327	0·252	62·42	45·50	0·071	0·145	0·034	0·041	9·07	7·85
23	29·979	29·792	0·321	0·236	65·43	49·50	0·069	0.118	0·031	0·054	7·67	8·26
24	29·925	29·664	0·325	0·225	62·42	43·49	0·167	0·094	0·059	0·041	7·76	11·17
25	30·063	29·934	0·299	0·215	56·86	38·59	0·052	0·077	0·049	0·035	10·44	7·83
26	30·076	29·960	0·279	0·208	62·54	35·46	0·054	0·062	0·032	0·039	14·59	2·49
27	30·000	29·820	0·300	0·194	68·11	38·36	0·102	0·078	0·056	0·050	15·05	14·70
28	29·841	29·581	0·329	0·243	71·10	48·83	0·119	0·141	0·046	0·040	13·46	8·81
29	29·721	29·623	0·319	0·225	58·64	43·49	0·049	0·049	0·037	0·057	8·46	6·69
30	29·721	29·519	0·343	0·237	56·19	45·27	0·140	0·062	0·047	0·059	6·28	4.64
31	29·907	29·680	0·366	0·281	60·19	45·27	0·113	0·114	0·042	0·043	8·37	6·55
Means	29·885	29·703	0·339	0·253	58·81	43·61	0·095	0·087	0·043	0·0405	8·42	6·42

TABLE III.—(VIDE PLATE No. 3.)

TABLE SHOWING THE HORARY VARIATIONS IN THE DIFFERENT METEOROLOGICAL ELEMENTS, AS DERIVED FROM OBSERVATIONS TAKEN IN MONTH OF AUGUST, 1858.

Time—Hours.	Pressure of Air.	Pressure of Vapour.	Pressure of Dry Air.	Temperature of Air.	Temperature of Soil.	Force of Wind.	Amount of Cloud.	Electric Tension.	Hours of Rain.	Hours of Dew.	Hours of Fog.
	inch.	inch.	inch.	deg. Fah.	deg. Fah.						
midnight	29·805	0·284	29·521	47·03	45·38	3·08	6·82	2·310	0·19	0·03	0·07
1	29·802	0·286	29·516	46·64	45·32	2·80	7·39	1·955	0·20	0·10	0·07
2	29·795	0·283	29·512	46·26	44·93	3·00	7·10	1·937	0·28	0·10	0·03
3	29·787	0·282	29·505	45·99	44·53	3·05	6·76	2·287	0·17	0·13	0·03
4	29·776	0·284	29·492	45·92	44·48	2·85	7·22	2·337	0·16	0·10	0·03
5	29·782	0·281	29·501	45·54	44·10	2·87	7·10	2·387	0·13	0·23	0·03
6	29·787	0·292	29·495	45·25	43·92	2·70	6·92	2·670	0·15	0·16	0·03
7	29·797	0·279	29·519	45·50	43·83	2·70	6·50	3·477	0·06	0·00	0.13
8	29·808	0·289	29·518	46·96	46·31	2·74	6·47	4·617	0·06	0·00	0·07
9	29·813	0·305	29·518	50.40	51·75	2·70	6·26	4·022	0·07	0·00	0·05
10	29·813	0·313	29·500	53.71	56·78	2·86	6·00	3·404	0·03	0·00	0·00

TABLE III.—(CONTINUED).

Time—Hours.	Pressure of Air.	Pressure of Vapour.	Pressure of Dry Air.	Temperature of Air.	Temperature of Soil.	Force of Wind.	Amount of Cloud.	Electric Tension.	Hours of Rain.	Hours of Dew.	Hours of Fog.
	inch.	inch.	inch.	deg. Fah.	deg. Fah.						
11	29·807	0·313	29·494	55·62	61·18	3·00	6·00	2·700	0·02	0·00	0·00
noon	29·790	0·308	29·482	56·75	64·04	3·42	6·00	2·442	0·07	0·00	0·00
1	29·773	0.312	29·461	58·21	65·54	3·55	6·00	2·051	0·03	0·00	0·00
2	29·762	0·316	29·446	57·40	63·72	3·35	6·30	2·177	0·07	0·00	0·00
3	29·760	0·305	29·455	56·86	63·50	3·30	6·00	2·130	0·03	0·00	0·00
4	29·760	0·302	29·458	55·40	58·54	3·10	5·70	2·327	0·06	0·00	0·00
5	25·767	0·307	29·460	52·70	53·46	2·87	5·24	3·368	0·07	0·00	0·00
6	29·780	0·300	29·480	50·94	49·43	2·52	5.00	3·455	0·07	0 02	0·03
7	29·793	0·297	29·496	50·18	47·97	2·70	5·20	3·486	0·08	0·08	0·08
8	29·800	0·293	29·507	49·65	47·14	2·84	5·50	3·253	0·07	0·08	0·10
9	29·810	0·290	29·520	48·96	46·73	2·82	6·63	3·026	0.08	0·05	0·13
10	29·810	0·290	29·520	48·29	46·19	2·95	6·78	2·656	0·11	0·00	0·15
11	29·799	0·287	29·512	48·17	46·40	3·14	7·28	2·357	0·14	0·00	0·15

TABLE IV.

NEGATIVE ELECTRICITY IN THE MONTH OF AUGUST, 1858.

Day.	Hour.	Amount.	Wind. Direction.	Wind. Force.	Amount of Clouds.	Amount of Ozone.	Remarks.
7	6 p.m.	3·85	West	2	9	3	Heavy clouds all round.
10	3 a.m.	0·50	North	5	9	...	Dark squally night.
10	8 a.m.	8·49	North-east	4	10	...	Heavy drops of rain.
11	8 a.m.	∞	West	1	10	2	Very heavy rain.
18	11 p.m.	2·38	North	2	10	2	Veil over the sky.
19	Midnight	4·42	North-north-east	2	9·5	3	Dense veil and strong gusts of wind (7-8).
19	1 a.m.	4·58	North by East	3	10	3	
19	2 a.m.	8·92	North	5	10	3	Masses of dust.
23	9 a.m.	1·43	North	7	1·5	2	Masses of dust.
23	4 p.m.	6·34	North	4	1	2	Clear evening.
24	8 a.m.	10·19	North-north-east	7	8	...	Masses of dust.

TABLE IV.—(CONTINUED.)

Day.	Hour.	Amount.	Wind.		Amount of		Remarks.
			Direction.	Force.	Clouds.	Ozone.	
24	1 p.m.	∞	West	7	8	...	Tremendous squalls from the west, masses of dust.
24	3 p.m.	7·54	West	7	9	...	Tremendous squalls from the west, masses of dust.
27	9 p.m.	∞	North-east	1	9	1	Dark night and lightning.
27	10 p.m.	7·79	East	1	10	1	Heavy drops of rain and lightning.
28	Midnight	∞	North-east	1	7	...	Thunderstorm, very heavy.
28	1 a.m.	∞	North-east	1	6	...	Lightning continuously.
28	2 a.m.	∞	East	1	7	...	Lightning continuously.
29	2 p.m.	6·28	North-west	3	7	5	Fine misty rain.
29	3 p.m.	2·94	North-west	4	9	5	Fine misty rain with squalls.
29	4 p.m.	∞	North-west	4	10	5	Fine misty rain with squalls, W. 5.
30	2 p.m.	3·00	West by South	7	9	5	Heavy rain.

N.B.—In this table the amount of ozone is given which was registered at the hour of registration nearest to the hour of registering electricity.

TABLE V.

SHOOTING STARS OBSERVED IN MONTH OF AUGUST, 1858.

No. of Register.	Days of Month.	Period of Observing.	Melbourne Mean Time.	Estimated Azimuth at Appeara.	Estimated Azimuth at Disapp.	Estimated Altitude at Appea.	Estimated Altitude at Disapp.	Stars in vicinity. Appearance	Stars in vicinity. Disapp.	Nucleus. Magnit.	Nucleus. Color.	Tail. Length.	Tail. Direction.	Duration of Nucleus.	Duration of Tail.
		h ′ h ′	h ′	°	°	°	°					°		S′	′
130	2	(Accidentally)	8 14	N 56 E	N 70 E	30	20	α Aquilæ	...	...	Light blue	...	...	3	...
131	3	6 30 to 7 0	6 35	N 30 W	N 35 W	25	20	Arcturus	...	...	...	...	...	...	...
132	3	6 30 7 0	7 0	N 25 W	N 30 W	25	20	...	...	...	...	...	...	...	...
...	3	8 0 8 30	...	...	...	...	...	...	...	...	...	...	...	...	...
...	3	9 0 9 30	...	...	...	...	...	...	...	...	...	...	...	...	...
...	4	6 15 7 0	...	...	...	...	...	...	...	...	...	...	...	...	...
133	4	7 20 8 0	7 50	Disappe	aring in	close	vicini	ty of α Aq	uilæ	4	...	...	...	1	...
134	5	5 30 6 40	6 25	N 30 W	N 5 W	28	12	Arcturus	...	...	White	...	...	3	...
135	5	5 30 6 40	6 35	N 40 W	N 30 W	40	32	Betw Bootes an	een d Virgo	...	...	...	...	2	...
136	6	12 30 12 50	12 36	...	...	...	...	Scutum	Sobieski	5	...	...	...	1	...
137	6	12 30 12 50	12 40	...	...	...	...	Scorpion	...	5	...	...	...	1	...
138	6	12 30 12 50	12 50	Centre of	its route	betwe	en b &	d Scorpii	...	1	...	...	...	1	...
139	6	(Accidentally)	2 15	...	...	...	...	Aquilæ	...	1	...	...	...	1	...
140	6	3 5 3 15	3 12	S 40 E	S 45 E	15	10	...	...	2	White	...	...	1	...
141	6	(Accidentally)	5 4	S 40 E	S 50 E	45	35	...	...	4	...	...	...	1	...

TABLE V.—(CONTINUED.)

No. of Register.	Days of Month.	Period of Observing.	Melbourne Mean Time.	Estimated Azimuth at Appeara.	Estimated Azimuth at Disapp.	Estimated Altitude at Appea.	Estimated Altitude at Disapp.	Stars in vicinity. Appearance	Stars in vicinity. Disapp.	Nucleus. Magnit.	Nucleus. Color.	Tail. Length.	Tail. Direction.	Duration of Nucleus.	Duration of Tail.
		h ′ h ′	h ′	°	°	°	°					°		′	′
...	6	6 15 6 30	...	...	...	...	...	...	...	...	...	...	...	...	...
142	5	8 0 8 45	8 38	...	...	...	...	...	...	4	...	...	...	...	...
143	5	9 0 9 45	9 4	...	...	...	...	...	...	4	...	...	...	...	...
144	5	9 0 10 30	9 55	In a vertical plane near the meridian, towards South. Both came down to 10° or 12° alt.						1	...	...	...	...	...
145	5	9 0 10 30	9 58							1	...	...	...	...	...
146	5	10 0 10 45	10 45	...	...	...	...	...	...	...	...	...	...	...	...
147	5	11 0 11 30	11 30	...	...	...	...	...	...	...	...	...	...	...	...
...	7	12 35 12 56	...	...	...	...	...	...	...	...	...	...	...	...	...
148	7	5 25 5 45	5 27	N 10 W	N 13 W	30	25	...	...	2	White	...	...	0·5	...
149	7	(Accidentally)	6 13 a.m	N 21 W	S 12 W	32	15	...	...	Like Jupiter	Orange purple & violet in tail	45	...	5	6
...	9	12 0 1 0	...	...	...	...	...	...	...	...	...	...	...	...	...
150	21	10 0 11 0	10 48	N	N 5 W	30	25	...	...	3–4	...	...	...	0·5	...
151	21	10 0 11 0	10 50	N 15 W	N 25 W	35	25	...	...	1–2	...	...	...	1	...
152	23	1 25 1 51	1 51	S	S 5 E	23	12	...	...	1	White	...	...	0·5	...
153	24	(Accidentally)	7 35 p.m	N 80 W	N 81 W	25	12	...	...	1	White	...	...	2	...
154	24	(Accidentally)	...	No particulars were registered				...	...	...	...	...	...	...	...
155	24	(Accidentally)	1 25	N 15 E	N 20 E	30	20	...	...	1	Red	...	...	3	3
156	24	9 0 1 0	9 49	S 15 E	S 15 E	80	10	...	E of Canopus	1	Very light	...	...	3	3
157	28	(Accidentally)	7 30	Few degrees towards the east of Vega, and in the same altitude.						2	Red	...	...	2	...

ZODIACAL LIGHT.—August, 1858.

August 4th, 7 h. p.m.—Very distinct.
August 31st, 7 h. p.m.—Not very well defined.

Whenever the sky was obscure, the Zodiacal Light was visible; but it was particularly well defined on the 2nd, 3rd, and 4th of August, so as to admit of ascertaining the position; and chiefly the southern edge was well defined, while the point and northern edge were less distinctly visible.

On the 3rd the following positions were taken:—

A. R.	South Edge.	North Edge.
Degrees.	Degrees.	Degrees.
203		
200	10·5 South Declination.	
195	14·0 South Declination.	5·0 South Declination.
190	15·0 South Declination.	4·0 South Declination.
185	15·0 South Declination.	2·0 South Declination.
180	15·0 South Declination.	2·0 North Declination.
175	16·0 South Declination.	8·0 North Declination.

The point was near Sproa apparently in A.R. 203°.

George Neumayer.

Flagstaff Observatory, *September*, 1858.

Art. XIII.—*Index of the Plants described in the Transactions of the Victorian Institute, of the Philosophical Society, and the Philosophical Institute of Victoria.* By Dr. Ferdinand Mueller.

The following abbreviations have been adopted, viz.:—

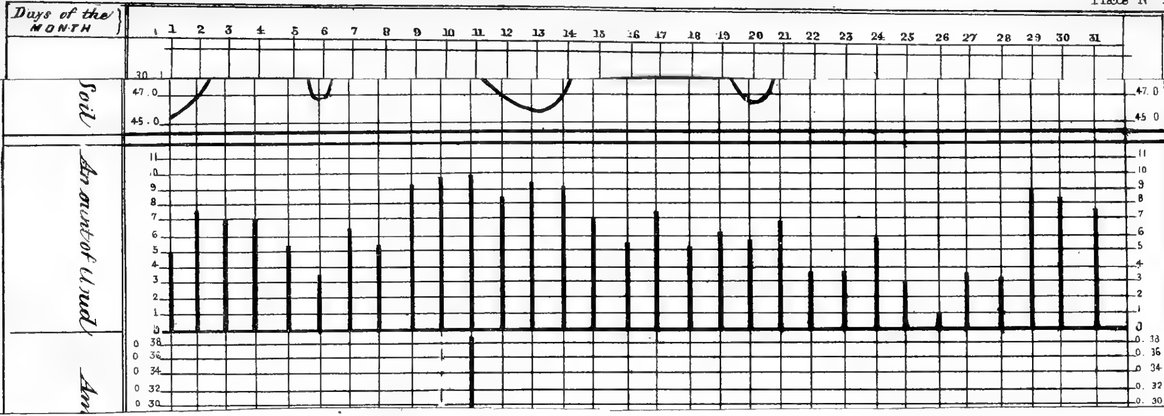
P.S. for Transactions of the Philosophical Society of Victoria.
V.I. for Transactions of the Victorian Institute.
P.I. for Transactions of the Philosophical Institute of Victoria.

MAGNETIC — OBSERVATORY — FLAGSTAFF — HILL — MELBOURNE

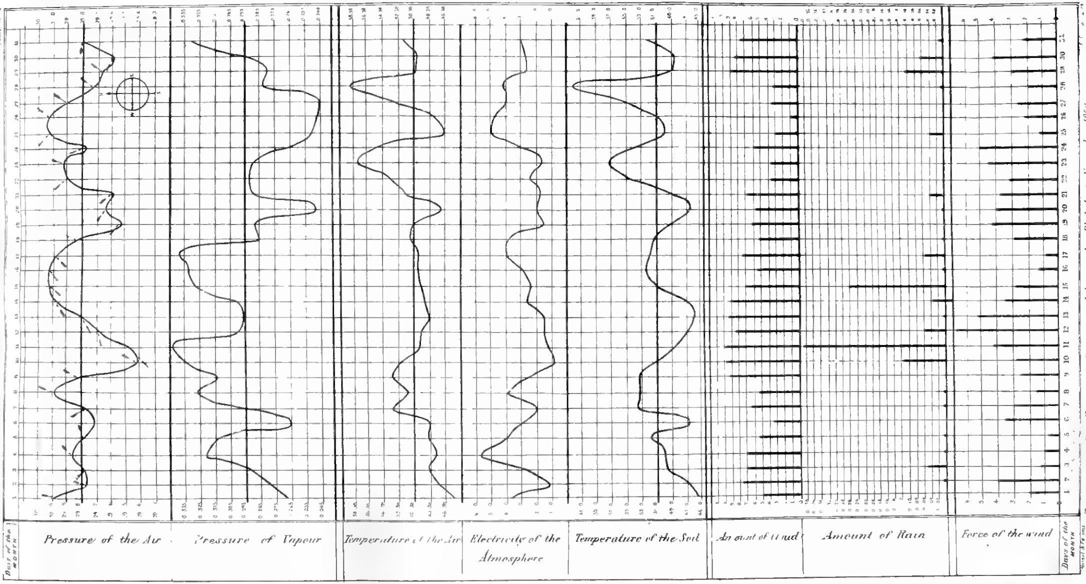
CURVES OF THE DAILY MEANS

FOR THE MONTH OF AUGUST 1858

Plate N° 1



MAGNETIC—OBSERVATORY—FLAGSTAFF—HILL—MELBOURNE



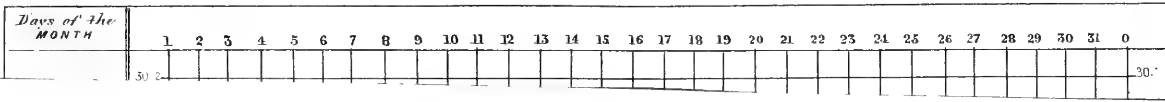
To accompany Prof. Neumayer's Paper read before the Phil. Inst. November 1858

MAGNETIC — OBSERVATORY—FLAGSTAFF—HILL—MELBOURNE

CURVES OF THE DAILY MAXIMA AND MINIMA

FOR THE MONTH OF AUGUST 1858.

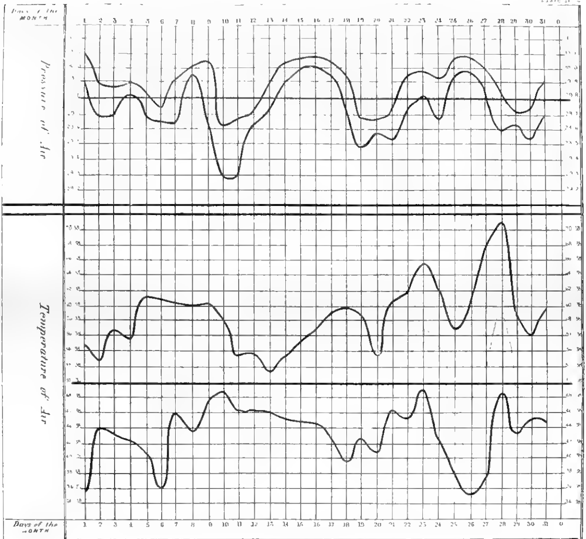
Plate N° 2



MAGNETIC — OBSERVATORY — FLAGSTAFF — MELBOURNE

FOR THE MONTH OF AUGUST 1858

Plate Nº 2

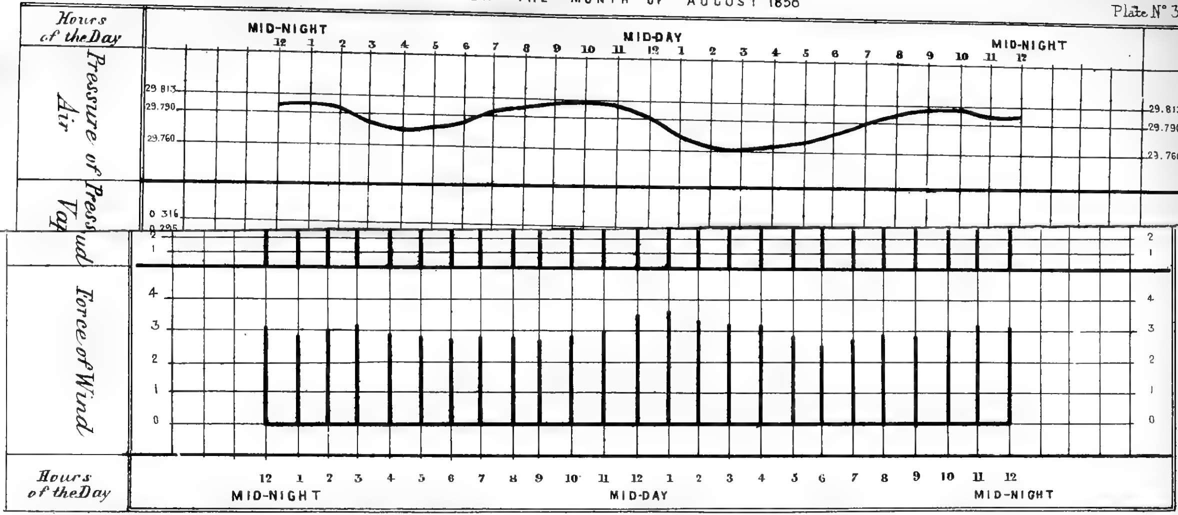


To accompany Prof Neumayer's Paper read before the Phil Inst November 1858

MAGNETIC—OBSERVATORY—FLAGSTAFF—HILL—MELBOURNE

CURVES SHEWING THE HORARY MOTIONS
FOR THE MONTH OF AUGUST 1858

Plate N° 3



T. E. Rawlinson Delt

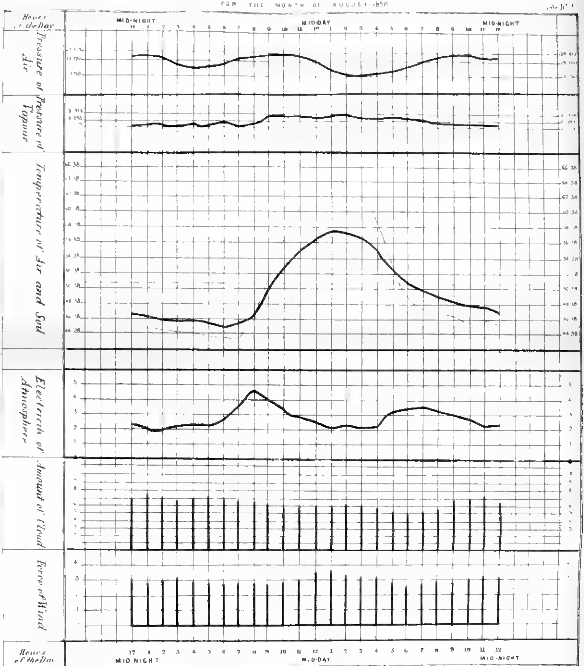
To accompany Prof: Neumayer's Paper read before the Phil: Inst: November 1858

A. J. Stopps Lith

MAGNETIC-OBSERVATORY-FLAGSTAFF-HILL MELBOURNE

SHEWING THE HORARY MOTIONS

FOR THE MONTH OF AUGUST 1858



To accompany Prof. Neumayer's Paper read before the Phil. Inst. November 1858

MAGNETIC—OBSERVATORY—FLAGSTAFF—HILL—MELBOURNE

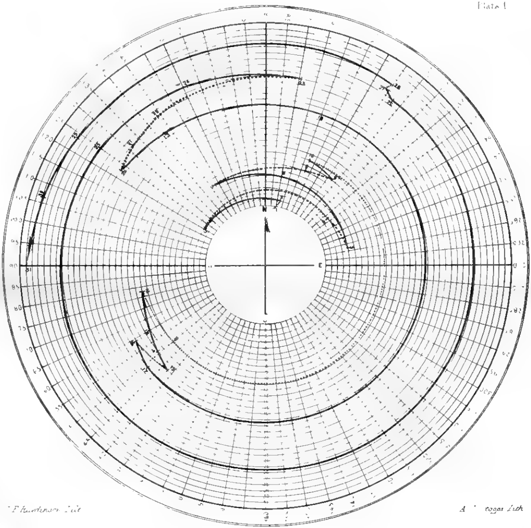
DAILY MEAN

MAGNETIC OBSERVATORY-FLAGSTAFF-HILL—MELBOURNE

DAILY MEAN D[illegible]RECTI[illegible]N [illegible] THE WIND

FOR THE MONTH OF A[illegible]

Plate I



T. Hutchinson Del — A. [illegible] Lith

To accompany Prof. Neumayer's Paper read before the Phil. Inst. November 1858

PROCEEDINGS.

PROCEEDINGS.

Anniversary Meeting of the Philosophical Institute of Victoria.

Wednesday, 3rd March, 1858.

The Hon. Captain Clarke, R.E., President, in the Chair.

The object of the meeting, as stated in the notice paper, was to elect the officers of the Institute for the ensuing year.

The Hon. Secretary read a recommendation from the Council of the Institute, to the following effect, viz.: That the six members of Council elected at this anniversary meeting, having the least number of votes, shall retire at the anniversary meeting in 1859, in order that rule 10 may then come into operation.

This was put forward as a motion, by Professor Wilson, seconded by Mr. Clarson, and carried.

The Hon. Captain Clarke, R.E., then thanked the Institute for the confidence reposed in him, as President, since the formation of the Institute, and stated his desire to retire, in order that a system of annual election of the President might be established. He considered that an annual change of the presidentship would be advantageous to the Institute.

An unanimous vote of thanks was passed to Captain Clarke for his long and valuable services.

A. K. Smith, Esq., proposed the Hon. Sir William Foster Stawell, as President for the ensuing year. This was seconded by Sizar Elliot, Esq. The Rev. Mr. Bleasdale proposed Professor Wilson, seconded by Dr. Eades. Professor Wilson proposed Dr. Ferdinand Mueller, seconded by Mr. Blandowski.

A ballot took place, and scrutineers were appointed. The result was—

Votes for Sir Wm. Foster Stawell... ...	28
,, ,, Professor Wilson	15

Sir Wm. Foster Stawell was declared duly elected.

Fred. Acheson, Esq., proposed Clement Hodgkinson, Esq., C.E., as a Vice-President of the Institute. This was seconded by A. K. Smith, Esq., C.E.

Mr. Rawlinson proposed Dr. Iffla; seconded by Dr. Mackenna,

Dr. Gilbee proposed Professor Wilson; seconded by Mr. Blandowski.

Dr. Macadam proposed Dr. Ferdinand Mueller; seconded by Mr. Clarson.

A ballot took place, and scrutineers, viz.—Messrs. Acheson and Clarson—were appointed. The results were—

Dr. Mueller	36
Mr. Hodgkinson	20
Professor Wilson	18
Dr. Iffla	14

Dr. Mueller and Mr. Hodgkinson were declared duly elected.

Professor Irving and Dr. Iffla were nominated for the office of treasurer.

Dr. Iffla requested his name to be withdrawn, in consideration of Professor Irving's past services, which was granted.

Professor Irving was then elected treasurer for the ensuing year.

Dr. Wilkie proposed that John Macadam, Esq., M.D., be appointed Secretary to the Institute for the ensuing year.

This was seconded by Professor Wilson, and unanimously agreed to.

The Secretary having distributed lists of the attendance of the Members of Council for the past year, as also printed lists of the members of the Institute, as at 31st December, 1857, amounting to two hundred and thirty-two; twelve Members of Council for the year 1858 were then elected by ballot, the six members having the highest number of votes to remain in office two years.

Professor Irving and Dr. Macadam were appointed scrutineers. The results were—

Professor Wilson	33
Dr. Eades	32
Dr. Iffla	30
Frederick Acheson, Esq., C.E.	30
Dr. Mackenna	28
Dr. Wilkie	26
Rev. Mr. Bleasdale	24
Hon. Andrew Clarke, R.E.	23
William Blandowski, Esq.	23
Thomas E. Rawlinson, Esq., C.E. ...	17
Dr. Gilbee	16
Professor Hearn John Millar, Esq., C.E. A. K. Smith, Esq. }	14

The latter three gentlemen then drew lots for membership, when the lot fell to Professor Hearn, who, with the former eleven, were declared duly elected as Members of Council.

The Institute then separated.

Ordinary Meeting of the Institute.

24th March, 1858.

The Treasurer, Professor Irving, in the Chair.

The minutes of the anniversary meeting were read and confirmed. Members, present for the first time, were introduced to the Institute by the Chairman.

The Secretary read the names of twenty-three candidates for ordinary membership, and the name of one gentleman for honorary membership, to be balloted for at the next meeting.

Richard Gibson, Esq., Road Engineer, Tarraville, was duly elected an ordinary member of the Institute.

Moved by Dr. Macadam, "That this meeting approves of the act of the Council in suspending Rule IX., so far as regards the date for holding the annual dinner the last week in March, during which, according to the rule, it ought to be kept, being Passion week.

Seconded by John Millar, Esq., C.E.. and carried unanimously.

The Secretary read a letter from Captain Timins, private secretary, communicating the circumstance that the day fixed by the Council for the annual dinner would be inconvenient for his Excellency and several others who desired to be present, and soliciting, if equally convenient for the Council, the appointment of another day.

The Secretary was instructed to make the necessary arrangements.

The Secretary read letters from the Hon. Sir William Foster Stawell and Dr. Mueller, respectively thanking the Institute for the honor done them in the recent elections.

On the Secretary announcing a ballot for two vacancies in the Council, caused by the resignations of Professor Wilson and the Rev. Mr. Bleasdale,

Mr. Farewell drew attention to the Rule XIII., and considered that the election was premature, as the resignations should be first accepted.

Mr. Clarson moved, "That the order of the day for a ballot be postponed till the next meeting, and that this meeting take into consideration the letters of resignation received."

Seeonded by Dr. Mackenna, and carried.

The letters of resignation given in by Professor Wilson and the Rev. Mr. Bleasdale were read by the Secretary.

The Secretary intimated the receipt of a second letter from the Rev. Mr. Bleasdale, addressed to the Institute through the President.

Lieut. Amsinck moved "That the letter be not read." Seconded by Frederick Acheson, Esq.

Dr. Knaggs moved, as an amendment, "That the letter be read." Seconded by Dr. Wilkie.

The amendment was carried and the letter addressed by the Rev. Mr. Bleasdale to the President, was read by the Secretary.

Lieut. Amsinck, R.N., moved "That the letter read, addressed to the President, be not entered on the minutes of this meeting."

This was seconded by Dr. Wilkie, and carried.

A discussion ensued as to the reasons assigned for resignation, and Mr. Blandowski requested that a committee of enquiry should be appointed.

Mr. Acheson affirmed that the dissatisfaction was confined to the two Members of Council resigning.*

Mr. Rawlinson denied this, and stated that the opinions expressed in the letters of resignation were shared in by other Members of Council.

Mr. Schultz moved, "That a committee of five non-Members of Council be appointed, with power to take evidence, for the purpose of inquiring into the circumstances connected with the resignations of Professor Wilson and the Rev. J. I. Bleasdale, and to report to the next ordinary meeting."

This was seconded by Dr. Wilkie.

Dr. Knaggs moved, as an amendment, "That this meeting pass on to the next order of the day."

Seconded by John Millar, Esq., C.E.

The amendment was put and lost, the votes being 13 to 10. The motion was carried, the votes being 13 to 6.

Mr. Schultz moved as a committee, three of whom to form a quorum: Lieutenant Amsinck, Arthur Dobree, Esq., G. S. Hough, Esq., Sizar Elliot, sen., Esq., and Dr. Knaggs.

This was seconded by Mr. Acheson.

Mr. Farewell moved, as an amendment, "That the committee be appointed by ballot."

This was seconded by Dr. Knaggs, and, when put, was carried, the votes being 11 to 10.

A ballot was then held, when the gentlemen having the highest number of votes were—

Dr. Knaggs	21 votes.
W. Schultz, Esq.	19 „
Lieutenant Amsinck	14 „
Sizar Elliot, Esq., sen.	14 „
John Millar, Esq., C.E.	10 „
Charles Farewell, Esq.	10 „

Mr. Farewell retired in favor of Mr. John Millar.

Dr. Macadam moved, "That the Secretary be instructed to supply the committee with all documents, &c., bearing upon the subject under investigation."

This was seconded by Dr. Mackenna, and carried.

The Secretary laid upon the table the following contributions, viz.: *The Sydney Magazine of Science and Art* from August to December,

* Mr. Acheson was absent during the confirmation of the minutes, and states that his remarks were to the effect: "That as only two members of Council had resigned, consequently, the remaining members did not consider it incumbent on them to do so."—J. M., Ed.

inclusive—by the publishers. *The Government Gazette* from 1st January, 1857, till date—by the Government. "Meteorological Observations for South Australia"—by Charles Todd, Esq. "Meteorological Observations for Victoria, for the Quarter ending 30th December, 1857, and Monthly Table of the same for January, 1858"—by the Government. "Meteorological Tables for November and December, 1857, and for January, 1858"—by the Royal Society of Tasmania. Parts 3 and 4, vol. XIII., of the "Quarterly Journal of the Geological Society of London," with copy of the President's Address, delivered at the anniversary meeting for 1857, and three Abstracts of Proceedings—by the Geological Society of London. One case Minerals, &c., from the Zoological Society of Berlin.

A paper was read by Dr. Ludwig Becker, entitled "Some Facts determining the Rate of Upheaval of the South Coast of the Australian Continent." [*Vide* "TRANSACTIONS."]

The Institute then separated.

14*th April*, 1858.

ORDINARY MEETING.

The President, Sir Wm. Foster Stawell, in the Chair.

The minutes of the previous ordinary meeting were read and confirmed, and new members, present for the first time, were introduced, by the President, to the Institute.

The Secretary read the names of fourteen candidates for ordinary membership, to be ballotted for at the next meeting.

The following gentlemen were duly elected by ballot, ordinary members of the Institute—Drs. Eades and Iffla acting as scrutineers.

Capt. J. E. N. Bull, Resident Warden, Castlemaine.

J. A. Panton, Esq., Resident Warden, Sandhurst.

W. H. Wright, Esq., Wimmera.

Thomas Higinbotham, Esq., C. E., Inspector-General of Roads.

Thomas William I'erson, Esq., Professor of Music, Geelong.

Robert Rowland Morgan, Esq., Office of Roads and Bridges.

Thomas John Forbes, Esq., Manager of Deeds Department, Crown Lands Office.

Thos. Gilfillan, Esq., Artist, Melbourne.

Samuel H. Merritt, Esq., Chief Draughtsman, Office of Public Works.

Alfred Lewis Smith, Esq., Architect, Albert Street.

James B. Motherwell, Esq., M.D., Collins-street east.

Wm. L. Chalmers, Esq., Manager of the Northern Assurance Co.

C. O. Helm, Esq., B.A., Oxon, Geelong Grammar School.

Charles John Braithwaite, Esq., C.E., Office of Roads and Bridges.

Wm. Thomson, Esq., M.R.C.S. Edin., South Yarra.

Christopher D'Oyley Hay Aplin, Esq., Assistant Geological Surveyor.

Wm. Findlay Main, Esq., Head Master National School, Castlemaine.

James Purves, Esq., Melbourne.
Ebenezer Syme, Esq., Editor of the "Age."
J. D. S. Heron, Esq., Warden, Fryerstown.
Edward Stone Parker, Esq., Mount Franklin.
John Scott Hamilton, Esq., 129 Bourke-street west.

A. C. Gregory, Esq., the Australian Explorer, was unanimously elected an honorary member of the Institute.

The Secretary laid upon the table the following contribution, viz., several numbers of the "Illustrated Journal of Australasia," forwarded by the publishers.

Dr. Knaggs, as Chairman of the Committee appointed by the previous meeting, with power to take evidence to inquire into the circumstances connected with the resignations of Professor Wilson and the Rev. J. I. Bleasdale, as Members of Council, brought forward and read the report of the Committee.

Lieut. Henry Amsinck moved—"That the report be received."

This was seconded by Sizar Elliot, Esq.

The Hon. Capt. Clarke, R.E., moved, as an amendment—"That the report be not received."

This was seconded by John Millar, Esq., C.E.

A lengthened discussion ensued, in which the proposers and seconders of the motion and amendment, and Professors Wilson and Irving, Drs. Eades, Maclean, Knaggs, Mackenna, and Macadam, the Rev. Mr. Bleasdale, and Messrs. Schultz and Blandowski, as also the Hon. the President took part.

On the amendment being put, it was carried by about forty votes to five.

A. K. Smith, Esq., C.E., then moved—"That the resignation of the Rev. Mr. Bleasdale and Professor Wilson be not accepted." This was seconded by Dr. Robertson, and carried unanimously.

Dr. Macadam moved—"That, from the lateness of the hour, the reading of papers by Messrs. Smith and Bosisto be postponed till the next ordinary meeting; these papers then to take precedence.

This was seconded by Dr. Iffla, and carried.

The Institute then separated.

5th May, 1858.

Ordinary Meeting.

The President Sir W. F. Stawell in the chair. His Excellency Sir H. Barkly, K.C.B., was present.

The minutes of the ordinary meeting, held on the 14th April, 1858, were read and confirmed, and members present, for the first time, were introduced to the Institute by the Chairman.

The Secretary read the names of nine candidates for membership, to be ballotted for at the next ordinary meeting.

The following gentlemen were duly elected ordinary members of the Institute, viz.:—

General Macarthur, C.B., Commander of the Forces, &c.

The Hon. H. S. Chapman, Esq., M.L.A., Attorney-General.

Charles Whybrow Ligar, Esq., Surveyor-General.

Patrick Higgins, Esq., Contractor, Moonee Ponds.

George H. Ryder, Esq., Charles-street, Richmond.

A. Childs, Esq., Melbourne.

J. C. Candler, Esq., District Coroner.

Joseph Wilkie, Esq., M.L.A., Melbourne.

Rev. James Nish, Presbyterian Minister, Sandhurst.

Capt. Ross, R.N., Marine Surveyor.

Rev. Geo. Mackie, Presbyterian Minister, Lake Learmonth.

Rev. J. E. Bromby, D.D., Principal of the Church of England Grammar School, Melbourne.

Rev. J. Swanton Waugh, Wesleyan Minister, Church-st., Richmond.

The Secretary laid upon the table the following contributions, viz.: Vols. I. and II. (for 1856 and 7) of the "Journal of the Proceedings of the Linnæan Society of London," also the "Anniversary Addresses" for 1855, 1856, and 1857, with the list of members, forwarded to the Institute by the Linnæan Society. The Secretary was instructed to acknowledge the receipt of these contributions, with thanks, the Hon. the President remarking that the recognition of the Institute by so old and important a society would be most gratifying to the members generally.

Alexander Kennedy Smith, Esq., C.E., read a paper entitled "On the Reclamation and Cultivation of Batman's Swamp." [*Vide* "TRANSACTIONS."]

A discussion ensued, in which Mr. Stevenson, Dr. Macadam, and others took part. The paper was illustrated by specimens and diagrams.

Joseph Bosisto, Esq., read a paper "On the Preservation and the Cocoons of the Hirudo medicinalis (Leech)." [*Vide* "TRANSACTIONS."]

This paper was illustrated by living specimens of the leech and cocoons.

A discussion ensued, in which his Excellency, Dr. Eades, Mr. Elliot, and Dr. Macadam took part.

Dr. Mueller laid upon the table, with explanatory remarks, the first number of his "Fragmenta Phytographiæ Australiæ," as a contribution to the Institute.

The Institute then separated.

26th May, 1858.

ORDINARY MEETING.

Sir Wm. Foster Stawell, President, in the Chair.

The minutes of the previous ordinary meeting of the Institute were read and confirmed, and several recently elected members were introduced to the Institute by the Chairman.

The Secretary read the names of seven candidates for membership, to be ballotted for at the succeeding ordinary meeting.

The following gentlemen were elected ordinary members of the Institute, by ballot, viz. :—

The Hon. John Hood, Esq., M.L C., Melbourne.
Cadogan Campbell, Esq., C.E., Engineer to the Geelong and Melbourne Railway.
John Randall Pascoe, Esq., J.P., &c., Melbourne.
George Francis, Esq., C.E., 72 Lonsdale-street, Melbourne.
Rev. Julian Edmund Woods, Penola, South Australia.
John McCutcheon, Esq., Wesleyan School, Richmond.
Henry Bolton, Esq., C.E., St. Kilda.
Richard Manuel, Esq., C.E., Mining Surveyor, John-street, Collingwood.

The Secretary announced the publication of Part II., Vol. II., of the Transactions of the Institute for 1857, and the members present were supplied with copies of the same.

The Secretary laid upon the table the following contributions from the Rev. Wm. Scott, M.A., Astronomer of New South Wales, viz., the Meteorological Table for March, of New South Wales, as also the Monthly Abstract for that month.

Dr. Wilkie, as chairman of the Exploration Committee, read the second report of that committee. The report stated that there was a probability that the enterprise would be entered upon, with the aid of the Government, when the explorations now in progress, under Messrs. Babbage and Gregory, had been completed. The report further held out the hope that Mr. Gregory might be prevailed upon to undertake the command of the Victorian expedition.

Dr. Wilkie moved, and Dr. Iffla seconded, the adoption of the report read, which was unanimously carried. [*Vide* "Reports of Committees."]

John Cairns, Esq., exhibited specimens of the Water Yielding Tree of the Malleè, and explained the mode adopted by the natives for extracting water from its roots. Mr. Cairns exhibited, also, a specimen of the water so obtained. The exhibitor, in his remarks, further referred to a variety of cotton, obtained from the root of a species of bulrush, found in swamps and lagoons in the interior. He also exhibited specimens of the Spear Grass. [*Vide* "TRANSACTIONS."]

A discussion followed, in which Dr. Mueller, Mr. Blandowski, and others took part.

Dr. Macadam undertook to conduct an analysis of the water exhibited, and made some remarks on the cotton fibre, with reference to its probable use in paper making. He stated that the scarcity of suitable materials for this purpose was becoming very great in England, on account of the Americans exhausting the rag-exporting localities in the Mediterranean. From the importance of an available fibre, Dr. Macadam suggested that Mr. Cairns should bring his observations before the Institute in a more permanent form. This suggestion was supported by Sizar Elliot, Esq., approved of by the members, and agreed to by Mr. Cairns.

Dr. Mueller exhibited and explained some specimens of new Australian plants. [*Vide* "TRANSACTIONS."]

The Institute then separated.

16th June, 1858.

ORDINARY MEETING.

Sir Wm. F. Stawell, President, in the Chair.

The minutes of the ordinary meeting of the Institute, held on the 26th May, were read by the Secretary and confirmed.

Several recently elected members were introduced to the meeting by the Chairman.

The names of six candidates for ordinary membership were read by the Secretary.

The following gentlemen were duly elected ordinary members of the Institute, viz. :—

The Rev. Irving Hetherington, minister of the Scotch Church, Collins-st. east.
John Jamieson, Esq., merchant, Melbourne.
Dr. Beaney, Russell-st.
Rev. James Ballantyne, Melbourne.
Joseph Brady, Esq., C.E., 41 William-street
Rev. William Jarrett, Brunswick.
Rev. Henry Higginson, 3 Wellington-terrace.

Professors Wilson and Irving officiated as scrutineers of the ballot.

The Secretary laid upon the table the following contribution, viz. :—Meteorological Tables for February, March, and April, 1858, for Tasmania—by the Royal Society of Tasmania.

On the motion of Lieut. Amsinck, R.N., the thanks of the society were voted to the Royal Society of Tasmania for their present contribution.

Sizar Elliot, Esq., inquired whether the various contributions were available to the members.

The Secretary stated that as yet the Institute was not possessed of suitable accommodation for rendering them accessible, but that the subject of the necessary accommodation was engaging the attention of the Council.

John Cairns, Esq., then read, as a paper, the substance of his communication given at the previous ordinary meeting of the Institute, and which he had then been requested to present in a more permanent form.

Professor Wilson exhibited a large model of the great four-feet reflector, which it is proposed to erect in Victoria for examining the nebulæ of the Southern hemisphere. The model had been constructed at the University, under his direction, from a drawing sent to him by the Rev. T. R. Robinson, D.D., Armagh Observatory. Before proceeding to describe the model, Professor Wilson gave a brief account of the principle of the reflecting telescope, as contrasted with the refracting telescope, with a description of the various constructions used since the time of Newton. After stating that a speculum afforded only as much light as a lens of about three-fourths its aperture, he went on to say, that the impossibility of procuring glass of a sufficiently uniform texture rendered it necessary to make use of reflecting telescopes when any very great optical power was required. The construction which it was proposed to use in this telescope was that recommended by Cassegrain, with this important improvement, that the small convex mirror was formed of an achromatic combination of lenses coated with a deposit of pure silver. It was found that this reflected 86 per cent. of the incident light, whilst speculum metal reflected only 62 per cent. The speculum, which was to be of a clear aperture of four feet, would weigh about one ton, and the whole moving part of the instrument would weigh something more than eight tons. The mode of mounting adopted, so as to secure at the same time ease of motion and perfect steadiness, formed the most beautiful part of the contrivance. The modes of mounting hitherto used might be divided into two classes, which might be termed the English and the German modes of mounting. In the English mounting the polar axis was longer than the telescope, and supported at both ends. This had the disadvantage that the polar axis, from its great length, was deficient in rigidity, and also that the view of the sub-polar portion of the heavens was partially interrupted by the support of the upper end of the axis. In the German mode of mounting the polar axis was supported only below the centre of gravity of the telescope, and consequently any flexure would have a greater tendency to produce an angular derangement of the instrument than a much greater flexure in the English mode. The mode proposed for this instrument combined the advantages of both. The polar axis was very short, and was supported at both ends, while the telescope commanded an uninterrupted view of every portion of the heavens. The weights of the various parts, also, were so counterpoised that there would be very little wear of the various bearing Y's from friction. Though the moving parts weighed more than eight tons, it was calculated that a force of twenty pounds, acting at a radius of five feet, would be sufficient to move the instrument in right ascension. The telescope was to be provided with a clock-work movement, so that when it was once directed to a star, the star would remain in the field of view without further exertion on the part of the observer. It is impossible to render the construction intelligible without diagrams. Professor Wilson, however, stated that he should be happy to explain it to any person taking an interest in it, who would pay the model a visit at the University. Professor Wilson read the tender of Mr. Grubb, of Dublin, offering to construct this instrument for £4200. Professor Wilson took that opportunity again to disclaim any desire of obtaining any appointment in connection with the Observatory. His duties at the University would not allow him to hold such an appointment. He was anxious for the accomplishment of a great scientific object, and would, as an amateur, give every assistance in his power to start it and carry it on.

The Hon. the President concurred heartily in the object contemplated, and considered that the Institute should endeavour to secure the co-operation of the Government as early as possible.

Lieut. Amsinck, Dr. Becker, Messrs. Rawlinson, Hough, and others, took part in an animated discussion which ensued, the desirability of the object being affirmed by the members generally.

Dr. Iffla exhibited specimens of submarine cable employed in telegraphic communication. Those shown were portions of the cable constructed for the Atlantic, and that for communication between England and the Hague.

On account of the lateness of the hour, the Rev. Mr. Bleasdale's paper on "Sections in the Institute" was postponed until the next ordinary meeting, as also the exhibition by the Secretary, on behalf of Gustav Joachimi, Esq., of Representations of wall Paintings of Pompeii and Herculaneum.

The Institute then separated.

7th July, 1858.

ORDINARY MEETING.

Dr. Mueller, Vice-President, in the Chair.

The minutes of the previous meeting were read and confirmed. Several new members were introduced to the Institute.

The Secretary read the names of the candidates for membership.

The following gentlemen were elected as ordinary members (Professor Wilson and Dr. Gillbee acting as scrutineers to the ballot) :—

Rev. Robert Bowman, Collingwood.
Peter Henry Smith, Esq., Melbourne.
James Hemming Webb, Esq., St. Kilda.
W. C. Cornish, Esq., (Messrs. Cornish and Bruce,) Melbourne.
John Langlands, Esq., Foundry, Flinders-street.
Richard A. Passmore, Esq., Melbourne.

The following contributions were laid upon the table, viz. :—Nos. 8, 9, 10, 11 and 12 of the "Sydney Magazine of Science and Art," presented by the publishers ; Meteorological Observations in South Australia, for 1857, also, the monthly tables for Feb. and March, 1858, by the South Australian Government; monthly tables of Meteorological Observations in Melbourne, for January, February, March, and April, 1858, by the Government; and Nos. 1, 2, and 3 of the "Pharmaceutical Journal of Victoria," by the Victorian Pharmaceutical Society. Thanks to the contributors were voted.

The Secretary read a letter from Professor Neumayer, inviting the members to visit the Observatory on the Flagstaff-hill, and inspect the arrangements for magnetic and other observations. Professor Neumayer further offered his services, gratuitously, in carrying out any series of observations the Institute might desire. The reading of the letter was warmly greeted by the members, and thanks were voted to Professor Neumayer.

The Rev. Mr. Bleasdale read a paper on the establishment of sections in the Institute, of which the following is the substance :—

"In societies whose aims and objects are cognate with, or analogous to, those of the Philosophical Institute of Victoria, the arrangement of the members in sections has been found to work well, and to have conduced largely to their efficiency. Were it desirable to refer to instances of this in Europe, the British Association of Arts might be adduced.

"Numbering as the Philosophical Institute now does, nearly 300 members, and receiving valuable additions to that number every month, I consider that the time has arrived when this Institute should introduce the same principle; and, for the better effecting all its important objects, enable the members to distribute and arrange themselves in as many sections as shall appear advisable.

"I deem this the more necessary now, because I firmly believe that union is strength, and that, in this instance, the parcelling out of the members under such heads as they feel are most congenial to their tastes and pursuits, will not only not be division, but the attainment of union itself. We shall thus know our available strength in any one department. In the course of this paper, which I mean to make as brief as possible, it will be my purpose to draw attention to this subject, rather than to attempt to submit a complete scheme for your adoption. I feel that this is a matter on which the Institute should take action, and that I shall be consulting the general good by throwing out any suggestions that seem to me likely to be of benefit, but leaving the ultimate moulding of the whole to the wisdom of the collective body. By adopting this course, I trust I shall best secure my main object, viz., to render the Institute as efficient as possible, by giving opportunity and direction to the talent within it.

"I consider that there is at present a large amount of talent lying dormant, or nearly so, among us. And I do not wonder at it; because it does not at all times fall to the lot of every individual member to be able to give sufficient time and attention to work up a subject, though he may desire to do so. Now, under the system of sections, all this scattered talent, and all these desires, which would terminate in the individual's own mind, might, by a little judicious management, become valuable property in the hands of a section.

"Among the most important objects now affecting the future well-being and practical utility of this Institute, one is the formation of a museum of objects, models, specimens, &c. This I conceive will be best accomplished by the sections, working as they will each with a view to its own particular aims and requirements. The members will then have a direct interest in the collection.

Thus in a direct way by writing, or collecting, or contributing objects and books; or indirectly by countenance and advice; in one way or another, the talent, energy, and sympathy of the members would be enlisted and drawn out, and turned to practically useful ends.

"It does not seem to me at all incompatible that the same individual should belong to more than one section; for it might, and very often will happen that the studies and pursuits of the same man will embrace the separate objects of two or more sections. For example, some members of the sanitary section might be able members in chemistry on one hand, and engineering on the other, whilst some of every section might be interested in astronomy, meteorology, or microscopic investigation.

"I will content myself with raising a few starting points, as a general idea of the grouping of subjects under sections. I am disposed to give precedence to the medical section; embracing all that belongs directly to sanitary science, water, air, ventilation, and drainage, and statistics.

"2. Engineering in all its branches; mining, and the supply of water to the gold-fields. A section devoted to the development of the material resources of the colony.

"3. Natural philosophy; and associate with it astronomy and magnetism.

"4. Geography, geology, and palœontology.

"5. Chemistry, botany, and microscopy.

"6. Agriculture, horticulture, and natural history.

"I believe that I am not over-estimating the strength of the Institute, when I calculate upon our being able to work the above six sections.

"Leaving the consideration of the number of members required for the formation of a separate section, I would suggest that for the present not less than twelve be deemed requisite.

"It is almost foreign to such a paper as this to attempt to lay down any rules for the guidance of the sections, or to enter upon the extent and limits of their privileges, or to advocate their representation, or the manner of their representation in the Council of the Institute.

"It has been my intention to inaugurate an idea which I trust will be of advantage to the Institute and the colony; and now, with a view to giving it effect, I give notice that I will move, at the next ordinary meeting, as follows:—That the whole question be referred to a committee, for consideration and report, both as to its merits and the most easy method of carrying it into effect. I propose the following gentlemen:—the Hon. Capt. Clarke, M.L.A.; Professors Wilson, Hearn, and Irving, of the University; Dr. Macadam, Mr. Orlebar, Dr. Eades, Mr. Thomas, E. Rawlinson, and the mover.

"I give also notice of motion to the following effect:—

"That a board be formed out of the members of the sections, to be a board of practical and theoretical science, to be open to take cognizance of and give advice upon matters connected with the development of any branch of material resources of the colony, more especially agriculture and mining."

The discussion on this paper was postponed till the next meeting.

Professor Irving read, on behalf of Herr Gustav Joachimi, some notes upon the "Wall Paintings of Herculaneum and Pompeii." A large number of prints, lately published in Berlin, representing these paintings, were exhibited. The paper was as follows:—

"These pictures are specimens of a work lately published at Berlin, containing nearly one hundred plates of copies of wall paintings of Pompeii and Herculaneum. The ancients did not know our cheap manner of papering the walls of their dwelling houses, instead of which they had the more substantial one of decorating them with paintings *al fresco*, and after being excavated and properly cleaned from dust and mud, these paintings have preserved the brilliancy of their colours, and appear as having just been finished from the hand of the painter. It is very interesting to see here what Art was eighteen centuries back in merely provincial towns of the great Roman empire, and what it can do now in coloured printing.

"*A Girl Writing.*—Very likely the portrait of a Pompeian beauty. She is thoughtfully pausing, and we do not know whether she intends writing poetry or a letter of love on her wax tablets.

"*Narcissus at the Fountain.*—The beauty of the Thespian youth, sitting at the edge of the fountain, languishing with love and silently consuming with an inward fire, is too simple and evident at the first glance to require more particular remark. The fable of his having conceived a passion for himself, and dying of love for the reflection in the water of his own image, from which he could meet with no response, is also well-known.

"*Dancing Girls.*—This picture contributed very much to spread the fame of ancient painting. It has been copied a thousand times, and at Naples, at a certain period, the house decorators were only employed in making copies of these dancers. Thus it was that the seductive Lady Hamilton, of unhappy memory, could revive this art. The custom of dancing at revels and banquets passed over from the degenerated Greeks to the Romans.

"*Achilles giving up Briseis.*—This may be said to be one of the most celebrated pictures that has been discovered in later days, and, indeed, at any time at Pompeii. It is very likely a copy of one of the most celebrated pictures of antiquity. Achilles is sitting near his tent, the ships being wisely omitted, the heralds, Talhybius and Eurybates, had come unwillingly, and from a feeling of respect are standing at a distance, and turning away. The hero gives them a friendly greeting, and bids them approach, as it is not their fault that they have been sent by Agamemnon. He then proceeds: 'Patroclus, bring the fair Briseis, and conduct my captive to the haughty king!' The wrath and indignation of Achilles is easily detected, where he takes the solemn oath never to assist Agamemnon in any difficulties. Thus commences Homer, in his Iliad, with the words:—

Μῆνιν ἄειδε θεὰ Πηληϊάδεω Ἀχιλλῆος.

That is:—

'Sing to me, O Muse, the wrath of Achilles, the son of Peleus.'

Briseis, who, according to Homer, follows the heralds unwillingly, is weeping while she is yet in his presence. It is impossible to mistake old Phœnix in this bald old fellow, and in the others, Achilles' Myrmidons watching the proceedings. Everything has been well-considered and arranged with care, and the entire space has been employed to the greatest possible advantage. Sir Edward Bulwer mentions this picture in his 'Last Days of Pompeii.'

"*Juno visiting Jupiter upon Mount Ida.*—Principal part of a large picture. This visit of Juno is described in the fourteenth book of the Iliad. She is with her attendant, Iris. Juno is remarkable for the size of her flaming eyes. Βοῶπις πότνια Ἥρη is she called by Homer, which signifies the gracious Juno with heifer's eyes. Her arms are left uncovered in honor of another epithet given to her by Homer: λευκώλενος, that is with white arms. If she was not according to the ancient poets, an always cunning and grumbling shrew, we could not understand why she was so much neglected by Jupiter.

"*Jupiter in the Clouds.*—The father of the gods is here couched on a bed of clouds, according to his character, cloud compeller, νεφεληγερετὰ Ζεὺς of Homer. On the other side, the eagle is seen, the inhabitant of the clouds and servant of Jupiter. The thunderbolt is ready at hand. Busy thought and a certain degree of annoyance are plainly expressed in Jupiter's widely open eyes and half open mouth. He is crowned with oak leaves, and the presence of Cupid may give rise to the idea that he intends some amusement with some of his lady subjects.

"*A Scene from a Comedy.*—The master leaving the house has charged the slave with some particular business, and the unfaithful steward has taken the opportunity of playing the master of the house, given a party, and ordered a flute-player. But during the very best merriment the master returns, and is just represented as being an unseen witness of the scene.

"*Phryxus and Helle.*—In this picture Phryxus, the son of Athamas, is represented in the act of being carried away, with his sister, from the sacrificial altar by the ram with the golden fleece, brought to him by Jupiter. It was from this ram that Helle fell into the sea, and gave her name to the Hellespont. Narrators themselves do not enter much into the manner in which the ram carried brother and sister. It is only mentioned 'a journey through the air.' But the wings which, according to this, must have been introduced in the picture, would have spoiled the whole arrangment, and the painter has therefore preferred letting the ram walk upon or through the waves. The moment is well chosen—Phryxus stretching out his hand to save his sister in the extreme moment before sinking, and is very nearly slipping off. Phryxus, after being safe, sacrifices the ram at Colchis, and suspends the golden fleece in a sacred grove. That gives the origin of the mythos of the Argonauts.

"*Medusa of Pompeii* (the plain one).—You will all know very well the narrative of Medusa, one of the monster daughters of Gorgo. She had serpents instead of hair, and her look petrified everything. This head is distinguished by the divided expression of anger breaking out into violence.

"*Medusa discovered at Stabiæ* (the colored one).—It is considered by all connoisseurs of art the best description of a Medusa head. It is perfectly consistent with the original character of the Gorgon, which is one of amazement and horror with those various forms of beauty given to her by Grecian art of early ages. The green color of the Salamander about the brown locks of her head is very favorable to the intended effect, as the pale complexion which contrasts so well with the blue color of the white of the eyes. It is interesting to compare this work, which may be considered a masterpiece of Grecian art, with two Medusa heads at Florenze Gallery, by Leonardo da Vinci and Michael Angelo da Caravarri, and it may be said to be certain that the ancients far surpassed the moderns *in effecting much by little means.*

"It remains only for me to add that a good part of these remarks is founded on the authority of Professor Ottfried Mueller and Professor Welcker, of Bonn, two of the most eminent explorers of antiquity.

"Mr. Chairman and Gentlemen—Not being a member yet of your Institute, which I intend and hope shortly to be, I trust you will excuse me for having trespassed so much on your valuable time, for the sake of this fine exhibition.

"GUSTAV JOACHIMI."

Dr. Mueller laid upon the table the second number of his "Fragmenta Phytographiæ Australiæ."

The Institute then separated.

28th July, 1858.

ORDINARY MEETING.

Dr. Mueller, Vice-President, in the Chair.

The minutes of the previous meeting, after some discussion, were confirmed as read, and new members were introduced to the Institute.

The Secretary read the names of eight candidates for ordinary membership.

The following gentlemen were elected ordinary members of the Institute, by ballot :—

Frederick Lloyd, Esq., M.D., Melbourne.

Nicholas O'Connor, Esq., Melbourne.

The Secretary laid upon the table the following contributions, viz. : No. 51, vol. XIII., of the "Quarterly Journal of the Geological Society of London," by the society ; the "Australian Medical Journal," from the commencement till date, by the Medical Society of Victoria ; Monthly Abstract for May, 1858, and, also, Meteorological Table for June, 1858, by the Government of New South Wales.

In pursuance of notice of motion, the Rev. J. I. Bleasdale moved "That the whole question of sections in the Institute be referred to a committee for consideration and report, both as to its merits and the most easy method of carrying it into effect. The following gentlemen to form the committee :—Hon. Capt. Clarke, R.E., Professors Wilson, Irving, and Hearn, Dr. Macadam, A. B. Orlebar, Esq., M.A., Dr. Eades, Thos. E. Rawlinson, Esq., C.E., and the mover." This was seconded by Dr. MacKenna and carried.

With the consent of the members, the Rev. Mr. Bleasdale, withdrew the second clause of the motion standing in his name.

Dr. Ludwig Becker read a few notes on two kinds of Australian Leeches ; and also a paper on a small Australian Bat. The author stated that the bat was, probably, the smallest known mammal. The specimen referred to weighed only 2 dwts. 8 grs. The communications were illustrated by drawings and specimens. [*Vide* "TRANSACTIONS."] In answer to a question, Dr. Becker stated that he believes the specimen to be that of an adult.

R. B. Smyth, Esq., F.G.S., then exhibited and verbally described some Hygrometrical Instruments, and particularly the instrument concerning which he had previously read a paper. The following is an abstract of the remarks made :—

He commenced by showing the method of using Daniell's hygrometer, and in the course of his remarks pointed out the errors to which we are liable in deducing the temperature of the dew point from it in warm, dry climates. He next exhibited the dry and wet bulb thermometers, and explained their action, giving the formula of Dr. Apjohn for computing the dew point, and also the Greenwich factors. Apjohn's formula and the Greenwich factors, he stated, were not applicable to a warm, dry atmosphere ; and quoting from the observations made by himself at the Melbourne Observatory, showed the differences which existed between the true temperature of the dew point as ascertained by direct experiment, and as obtained by the formula and the factors applied to the indications of the dry and wet bulb thermometers. These exhibited some remarkable discrepancies. Mr. Smyth recommended that in every country where there is a fixed observatory, it should be the first duty of the director to commence a system of daily observations with good standard Kew thermometers, and the best construction of hygrometer, with the view of accumulating data from which useful factors could be deduced; and he expressed the opinion that observations, extending over lengthened periods, from many observatories, would give, in all probability, factors grouped in such a manner as to be useful in every part of the world. He gave the results of some experiments which he had made to determine the effect of currents of air on the wet bulb, and expressed himself satisfied with the sufficiency of Mr. Glaister's theory. He concluded by exhibiting an instrument for ascertaining the dew point, after his own design, manufactured by Mr. Edwin Jones, of Collins-street east. It consisted of two cups containing cold and relatively warm water, respectively emptying through pipes into a third cup (of thin gold), in which the bulb of a Kew thermometer was immersed. Mr. Smyth explained that this was only a modification of an old and well-known principle, but he believed the mechanical arrangements which he had obtained, and the substitution of a large Kew thermometer for the small one generally used, would afford accurate results.

Mr. Smyth replied to some questions put by the members.

The Institute then separated.

18*th August*, 1858.

ORDINARY MEETING.

Sir W. F. Stawell, President, in the Chair.

His Excellency the Governor was present.

The reading of the minutes of the previous ordinary meeting was postponed, because of the unavoidable absence, during the early part of the evening, of the secretary, Dr. Macadam.

Recently elected members were introduced to the Institute.

The following gentlemen were elected ordinary members, by ballot, Dr. Gillbee and R. B. Smyth, Esq., acting as scrutineers:—

William Perry, Esq., Melbourne.
William Swan Urquhart, Esq., Tarradale.
William Robertson, Esq., Wooling, near Gisborne.
David Blair, Esq., M.L.A., Melbourne.
David Wilkinson, Esq., C.E., Prahran.
Edmund Sasse, Esq., Geelong.

Herr Gustav Joachimi, Melbourne.

Captain John A. Layard, H.E.I.C.S., Melbourne.

The Hon. Captain Clarke, R.E., was elected, by ballot, an honorary member of the Institute, on the recommendation of a majority of the Council. His name was proposed by Dr. Mueller, seconded by Dr. Iffla.

The Secretary laid upon the table the following contributions, viz. :—

Part I. Vol. XIV. of the Quarterly Journal of the Geological Society of London, and Vols. III., IV., V., and VI. of the Journal of the Geological Society of Dublin—by the Geological Society of London. Meteorological Table for New South Wales for July, with monthly abstract for June, 1858—by the Government of New South Wales.

R. B. Smyth, Esq., F.G.S., submitted, with explanatory remarks, "The Ozonometrical Observations," taken at the different meteorological stations of Victoria.

He exhibited some journals containing the actual slips of ozone test papers (Moffat's) which had been exposed day and night at Melbourne, and at several stations in the interior of Victoria. He likewise described the ozonometers of Moffat and Schonbein, both of which had been used for some length of time at the Melbourne Observatory, and for a short time simultaneously. The following table, showing the results for a portion of the year 1858, was handed to the members for their inspection :—

Mean amount of ozone, by Moffat's ozonometer, at Melbourne, Beechworth, and Sandhurst, from 9½ a.m. until 9½ p.m., and from 9½ p.m. until 9½ a.m.

1858.	Melbourne. Day.	Melbourne. Night.	Beechworth. Day.	Beechworth. Night.	Sandhurst. Day.	Sandhurst. Night.
January	2·8	3·7	3·0	3·1	...	...
February	3·4	4·8	3·6	4·5	1·2	2·0
March	3·0	4·4	2·2	4·4	1·1	2·1
April	3·9	5·4	3·2	5·2	2·4	4·2
May	4·5	6·2	5·8	7·7	5·2	7·3
June	4·1	5·3	5·9	7·7	6·9	7·9
July	5·3	6·8	...	...	7·3	9·0

Note.—At Flemington, in January, by Schonbein's ozonometer, the mean for the day was 2·2, and for the night 3·4. At Ballarat, in June, by Moffat's ozonometer, the mean for the day was 5·5, and for the night 5·7. The altitude of Melbourne is 94·5 feet above sea-level ; Beechworth, 1850 feet, and Sandhurst 714 feet.

He stated that observations were commenced in March, 1857, with Schonbein's ozonometer, at Melbourne ; and Moffat's ozonometer was shortly after received from England, but observations were not taken with it consecutively until nearly the end of 1857.

The next table showed the amounts of ozone (by Schonbein's ozonometer) registered at Flemington (about three miles north-west from Melbourne, and at an altitude of about 100 feet), and the approximate mean temperature of the months, in 1857.

1857.	Day.*	Night.*	Mean Temperature.
April	4·0	5·0	62·2
May	5·1	6·0	52·3
June	6·7	7·9	49·7
July	5·5	6·6	49·4
August	5·9	6·5	51·5
September	6·1	7·2	53·2
October	6·4	7·3	57·1
November	3·8	5·5	60·4
December	2·6	4·1	68·7

Mr. Smyth pointed out the necessity of obtaining the ozone test papers from well-known makers, guaranteed, if possible by the ininventors, and discountenanced the proposal for each observer to prepare his own, as likely to lead to results differing in consequence of the degree of saturation of the papers, the quality of the paper, &c.

In conclusion, he said, "The evidence at present before us seems to indicate, (1.) That in all seasons there is much more ozone during the night than during the day. (2.) That there is much more ozone during the winter than during the summer, or, more correctly, more ozone in the colder, than in the warmer months. (3.) At Melbourne, the westerly and south-westerly winds appear to be generally highly charged with ozone, and the northerly and north-easterly winds deficient. (4.) All the evidence goes to show that there is much more ozone at the stations in the interior (at considerable elevations) than at Melbourne, but until observations shall have been made on the sea-coast, at some distance from the disturbing influences of a large city, it cannot be said with certainty that the interior is in excess of the coast. (5.) Nothing really valuable can be known respecting ozone until we have the results of observations at some well-selected stations in the tropics, and at some very northerly or some very southerly points (within the artic or antartic zones.) Does the amount of ozone increase on approaching the artic or antartic circles ? Does it decrease and become almost inappreciable in the tropics ? These are the questions that require solution."

His Excellency asked some question respecting the effects of temperature on the action of the ozonometer ; and the President, and some of the members expressed their interest in the investigation.

Dr. Mueller exhibited specimens of, and described, some rare botanical plants. [*Vide* "TRANSACTIONS."]

After a short discussion on these communications, the Institute separated.

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* From 8 a.m. until 8 p.m., and from 8 p.m. until 8. a.m.

8th September, 1858.

ORDINARY MEETING.

Sir W. F. Stawell, President, in the Chair.

The minutes of the two previous ordinary meetings were read by the Secretary, and confirmed.

Several recently elected members were introduced to the Institute by the President.

The Secretary read the names of twelve candidates for ordinary membership, to be balloted for at the ensuing meeting.

The Secretary laid upon the table, as a contribution from the Hon. Captain Clarke, R.E., a MS. copy of Mr. Gellibrand's report on Port Phillip, dated the 18th April, 1836. The Secretary was instructed to communicate the thanks of the Institute to the donor for his valuable contribution.

The Secretary then read the report to the meeting, after which a desire was expressed by the members that the document should appear in full in the "Transactions of the Institute." [*Vide* "TRANSACTIONS."]

Ludwig Becker, Esq., exhibited and described some specimens of interest in natural history and the ethnography of Australia. The remarks of Dr. Becker were illustrated by several aboriginal skulls, shell necklaces, tomahawks and other native weapons, belonging to the true Australian race, the aborigines of Tasmania, New Zealand, New Guinea, and the Feegee Islands. Dr. Becker referred principally to the peculiarities of and probable relations subsisting between the aborigines of Tasmania and the Papua or New Guinea man; to the higher state of civilization the New Zealanders already were found to possess, when first discovered; and that our own aborigines, in Australia, are of a much higher class than as usually and wrongly stated in works treating of the same subject.

A lengthened discussion ensued. Professor Irving inquired if the natives of New Zealand were a separate and distinct race, or related to the inhabitants of any of the South Sea Islands?

Mr. Gilfillan stated that in conversing with a chief of one of the New Zealand tribes, he gave him to understand that the prevailing tradition was that two canoes were drifted on to the shores of New Zealand, and that cannibalism had sprung up from necessity.

Dr. Turnbull considered that there were two races in New Zealand, distinguished by crisp woolly hair, and long glossy hair.

The Rev. Mr. Jarrett differed from Dr. Becker in supposing that taste in ornamentation clearly indicated the stage of civilization.

Mr. Ligar, Surveyor-General of Victoria, gave some interesting information as to the habits of New Zealanders, derived from a long residence among them.

The Institute then separated.

29th September, 1858.

ORDINARY MEETING.

Sir W. F. Stawell, President, in the Chair.

The minutes of the previous meeting were read and confirmed.

The Secretary read the name of one candidate for ordinary membership, to be balloted for at the next meeting.

The following gentlemen were duly elected, by ballot, ordinary members of the Institute, Drs. Wilkie and Iffla acting as scrutineers, viz.:—

James Service, Esq., M.L.A., Emerald Hill.
John Miscamble, Esq., M.R.C.V.S., Melbourne.
Dr. Macgregor, Melbourne.
Geo. S. W. Horne, Esq., M.L.A., Melbourne.
Henry Wallace Lowry, Esq., Melbourne.
Hugh Lewis Taylor, Esq., Melbourne.
John Christie, Esq., Crown Lands Department.
William Edwards, Esq., Assistant Government Geologist.
Henry Davidson, Esq., Crown Lands Department.
Dr. John Murray, Lecturer on Geology, Melbourne.
Captain Thomas Robertson, Marine Artist, St. Kilda.
H. Hopwood, Esq., Echuca.

The Secretary laid upon the table, for the inspection of the members, a valuable collection of shells, contributed to the Museum of the Institute, by Captain John A. Layard.

The Secretary also read a letter from Captain Layard, stating his intention of contributing a further collection at the ensuing meeting.

Dr. Wilkie, as Chairman of the Exploration Committee of the Institute, brought forward and read the third report of this committee, and afterwards moved its adoption. This was seconded by Dr. Iffla, and carried unanimously. [*Vide* "REPORTS OF COMMITTEES."]

Dr. Macadam, as Hon. Secretary of the Exploration Fund Committee, lately appointed at a public meeting of the citizens of Melbourne, read a circular issued by the committee, and, afterwards, copies of the circular and subscription lists were distributed to the members present. The following is a copy of the circular read :—

Melbourne, September 15, 1858.

"Sir—At a public meeting held at the Mechanics' Institute, Melbourne, on the 1st inst., Sir W. F. Stawell in the chair, the undermentioned gentlemen were appointed a committee to take the necessary steps for raising £2,000 by public subscription, to be applied to the purpose of exploring the interior of the Colony; a donation of £1,000 having been made for that object, coupled with the proviso that double that sum should be subscribed by the public within twelve months from the present date. The committee, consisting of Sir W. F. Stawell, the Hon. J. Hodgson, M.L.C., Professor McCoy, Dr. Mueller, and Mr. James Smith, to which Dr. Macadam has been appointed Honorary Secretary and Dr. Wilkie Treasurer, was limited in number, for the sake of securing a greater amount of individual responsibility as regards its financial administration; but as soon as it has discharged the first duty delegated to it—that of collecting the sum specified above—it is pledged to co-operate with the Exploration Committee of the Philosophical Institute, in concerting measures for the prudent, economical and efficient expenditure of the Exploration Fund. That Fund there is every reason to believe will be augmented by a grant from Government; and the aggregate amount, it is confidently hoped, will suffice to prosecute the enterprise to a thoroughly successful issue. In the mean time I have to solicit, on behalf of the Committee, the exercise of your local influence (either by the formation of sub-committees, or otherwise) in procuring subscriptions to an object which is national in character, and must secure the approbation of every Australian who is anxious to promote the material prosperity of his country, to enlarge the boundaries of knowledge, to clear up the mystery which envelopes the fate of poor Leichardt, and to facilitate our intercourse with the other hemisphere. The Government have promised to place a sum of money on the estimates for the introduction of twenty or thirty camels, to be employed in traversing the sandy deserts ascertained to exist in the interior, and the time appears to have arrived when we may undertake the work of exploration under the most favorable conditions of success, and may worthily emulate the laudable example which has been set us by the adjoining colonies.

"To open up a communication with the northern shores of this continent, is an enterprise which should engage the sympathies and command the support of the merchant, the squatter and the miner, no less than those of the man of science; for such an enterprise promises to abridge the distance which separates us from the old world; to bring us, at an early date, in telegraphic communication with India and Europe; to open new avenues of commerce; to indicate how we may obtain access to vast areas of pastoral land from which we are at present cut off, owing to our ignorance of the intervening country; and to solve a geographical problem, which is as important as it is interesting.

"Under these circumstances the Committee confidently appeal to you for assistance in the way of soliciting contributions in the district in which you reside, and would feel obliged by your remitting any sums you may receive on this account to the Treasurer of the Exploration Fund—Dr. Wilkie, of this city—or to the account of the Exploration Fund at the Bank of Victoria, Melbourne.

"I am, Sir,
"Your obedient servant,
"JOHN MACADAM, M.D.,
"HONORARY SECRETARY."

The Secretary read a paper, contributed by the Reverend Julian Edmund Woods, of Penola, S. A., and entitled "Remarks on a Tertiary Deposit in South Australia."—[*Vide* "TRANSACTIONS."] The paper was illustrated by a chalk drawing of the localities alluded to.

A discussion ensued, in which several members took part.

Dr. Becker stated that Captain Cadell had found, about thirty miles inland, and parallel with the coast from the mouth of the Murray, towards Guichen Bay, a distinct line of granitic boulders, in the form of erratic blocks. Dr. Becker looked upon this as indicative of an ancient coast line, on which icebergs, coming from the south-west, had deposited, on stranding, their granitic cargo. Dr. Becker further referred to shells found near Moorundee, on the Lower Murray. He explained the conversion of the carbonate of lime of such shells into the glass-like sulphate of lime, by the action of ærated water on strata of bisulphuret of iron (iron pyrites) overlying the tertiary fossil-bearing limestone and yielding sulphuric acid. This agent wrought the chemical change on the shells. Dr. Becker added that a fine collection of such shells was deposited in the Public Museum at the University. Dr. Macadam described the coast line in the north of Scotland, as in Caithness, and referred to the identity of the appearances there found with some of those alluded to in the paper read, with the exception of the substitution of the old red sandstone, on the Caithness coasts, for the rocks existing on the South Australian shores.

The Secretary read a letter from Dr. Mueller, in reference to the song birds entrusted to his care by the Song Bird Committee, and which are located in the Aviary, situated in the Botanic Garden. Dr. Mueller stated that—"the birds are mostly prospering, and there are many young canaries, although the parental birds were only received in autumn." Dr. Mueller added that there were several nests vacant, and with the view of setting loose a large number of young birds for naturalization, he earnestly besought the members and their friends for donations of female goldfinches and linnets, also thrushes, blackbirds, and nightingales. The Secretary recommended the request of Dr. Mueller to the attention of members.

The Institute then separated.

20th Oct., 1858.

Ordinary Meeting.

Dr. F. Mueller, V.P., in the Chair.

The minutes of the previous meeting were read and confirmed, and several members, present for the first time, were introduced to the Institute by the Chairman.

The names of three candidates for ordinary membership, to be balloted for at the following meeting, were read by the Secretary.

Wm. Howitt, Esq., M.R.C.S. Edin., was duly elected, by ballot, an ordinary member of the Institute.

The Secretary laid upon the table, for the inspection of members, a second contribution of shells, presented to the museum of the Institute by Capt. John A. Layard; also part IV., vol. 1, of the "Quarterly Journal and Transactions of the Pharmaceutical Society of Victoria," presented by the society. A vote of thanks, on the motion of Dr. Macadam, seconded by Mr. Acheson, was accorded to Captain Layard, for his contributions on the previous and the present meetings.

Captain Layard explained the character and sources of the collections, the latter of which contained 160 specimens.

The Secretary read a communication from A. De Lacy, Esq., on the "Preservation and Silicatizing of Wood." The paper was illustrated by specimens and drawings.

Sizar Elliot, Esq., considered that the specimens were not sufficiently treated to be indestructable by fire. Dr. Mueller stated that the fabrics treated in a similar manner, usually were so. Dr. Macadam explained the difficulties the inventor laboured under, in securing efficient machinery, that required being of a very costly description. This was corroborated by the inventor himself, who in the discussion which ensued, and in which several members took part, stated that the process was applicable only to recently cut timber—certainly not to dead wood.

Professor Neumayer read a paper entitled—"Description and System of Working of the Flagstaff Observatory," accompanied with drawings.

The Chairman, Dr. Macadam, Messrs. Manuel, Hough, Clarson, and other members referred to Professor Neumayer's labors, and complimented him, in the highest terms, on the systematic prosecution of the inquiries committed to his charge. They further bore testimony to the value of his labors, and to the attention and politeness paid by Professor Neumayer to visitors, and particularly to the numerous captains of vessels, who readily handed over their ship-logs for the purpose of being copied, or who required Professor Neumayer's assistance in the correction of their chronometers. In answer to a question as to the most convenient time for members availing themselves of Professor Neumayer's kind invitation to visit the Observatory, the Professor stated that the time would be that suitable for the convenience of members.

Mr. Acheson having taken the chair, Dr. Mueller, in reference to his paper on "A new Plant from the Chatham Islands," said that the plant was not yet sufficiently developed in fruit for description, and requested that its consideration might be postponed till next meeting, which was willingly granted by the members.

Dr. Mueller intimated his intention of bringing before the Institute, on an early day, some specimens illustrative of the Flora of the Chatham Islands.

The Institute then separated.

8th Nov., 1858.

Ordinary Meeting.

Sir Wm. F. Stawell, President, in the Chair.

His Excellency the Governor was present.

The minutes of the previous ordinary meeting were read and confirmed, and several recently elected members were introduced to the Institute by the President.

The Secretary read the names of three candidates for membership, to be balloted for at the first ordinary meeting of the ensuing session.

The following gentlemen were elected ordinary members of the Institute, by ballot—Dr. Iffla and Professor Irving officiating as scrutineers, viz.:—

Dr. Thomas Black, St. Kilda.

H. J. Hart, Esq., St. Kilda.

James Smith, Esq., Solicitor, South Yarra.

The Secretary laid upon the table the following contributions to the Library and Museum of the Institute, viz.:—The Ninth Volume of the "Transactions of the Cambridge Philosophical Society"—presented by the Society. "Letters on the Cultivation of Lucerne in this Colony"—by the author, Henry Stevenson, Esq. The Third Number of the "Fragmenta Phytographiæ Australiæ"—by the author, Dr. Mueller. Curious form of "Squirrel," sent for examination and classification—by Alfred Currie Wills, Esq., Police Magistrate, Omeo.

The following committees were re-appointed:—

1. The "Museum Committee," on the motion of Dr. Iffla, seconded by Dr. Macadam.

2. The "Song Bird Committee," on the motion of Dr. Macadam, seconded by the Rev. J. I. Bleasdale.

3. The "The Murray Cod Committee," to consist of Professor McCoy, C. W. Ligar, Esq., Surveyor-General, and C. Hodgkinson, Esq., C.E.; on the motion of T. E. Rawlinson, Esq., C.E., seconded by Dr. Macadam.

4. The "Exploration Committee," substituting the name of C. W. Ligar, Esq., Surveyor-General, for the Hon. Capt. Clarke, R.E., absent from the colony; on the motion of Dr. Macadam, seconded by Dr. Mueller.

Professor Irving gave notice of motion for an alteration in rule XXVI., and Thos. E. Rawlinson, Esq., C.E., notices of motion for alterations in rules XI. and XXVIII., to be brought forward at the ensuing general meeting of the Institute.

The Rev. J. I. Bleasdale, as Chairman of the "Committee on the Formation of Sections in the Institute," read the report of the committee, and moved that the same be received. This was seconded by T. E. Rawlinson, Esq., and carried unanimously.—[*Vide* "REPORTS OF COMMITTEES."]

The Rev. Mr. Bleasdale then gave notice of motion for the ensuing general meeting, "For the adoption of the report, and the instituting of a series of rules embodying the recommendations of the committee."

Dr. F. Mueller read a paper on a new plant, the "*Anchusa Chathamica*," from the Chatham Islands—a living specimen of the plant was exhibited. Dr. Mueller also exhibited and described some dried specimens of the "Dendrobium Milligani," obtained from crevices in vertical rocks, at an elevation of from 1000 to 1500 feet high, in Tasmania. This plant was discovered by Dr. Joseph Milligan. A discussion ensued, in which His Excellency and others took part.

Dr. Macadam exhibited and described a complete set of apparatus for carrying out M. Gannal's process for embalming bodies. This apparatus had been obtained by Dr. Macadam, in his position of Government Analytical Chemist, with the view of facilitating medico-legal inquiries, as practised at the Morgue, in Paris.

In the unavoidable absence of Professor Neumayer, Mr. Osborne, his assistant, at the request of the Secretary, verbally communicated "Some facts illustrative of the Meteorology of August, 1858, in the Southern Hemisphere." This communication was accompanied by diagrams, showing, by curved lines, the variations of heat, electrical tension, barometric pressure, &c." A discussion ensued, in which Mr. Blandowski, Mr. Elliot, and others took part, and a desire was expressed that Professor Neumayer would furnish the facts to the Institute in a more permanent form.—[*Vide* "TRANSACTIONS."]

Dr. Ludwig Becker read a paper on "Native Wine and its influence, in warm climates, upon the physical, social, and moral condition of man." Dr. Becker began by stating that his object was to mitigate a great social evil that at present exists in this community. The axiom laid down was, that the human body required a certain quality of food containing a certain amount of carbon, as one of the means of reproducing the heat which is constantly given out by the body, in exact proportion to the temperature of the climate in which the man is placed. The average heat of the human body was assumed to be 100 degrees Fah., whether the person be at the pole or at the equator. In the former position it was contended that something more than warm clothing is required to sustain the internal heat of the body, and to this end, food, containing a greater amount of carbon, is sought for in cold climates, and therefore experience soon teaches man the kind of food that is most appropriate to the climate in which he lives. Under the tropics, rich animal food and strong wines are not required; and as we progress towards the poles the strength of each of these is increased, until at last we find men requiring fat and oily substances for their daily food, and pure alcohol for their beverage. In support of this opinion, passages from the works of Liebig were quoted. The essayist then applied this reasoning to the Australian colonies, in which people are collected who have been accustomed to a climate 20 degrees further away from the equator, and yet are inveterate in the preservation of the usages of the climate from which they came. The consequences are apparent: severe accidents, shattered bodies, madness, murder, suicide. It was argued that the principal effort should be directed to the training of the rising generation, and to this end the laws of nature and sound reason should be studied. Certain facts were then quoted that support these views of the case. The author of the paper then cited the mode of life in his country, and contrasted it with that of the people in this country. In Rhineland, in Germany, beer and wine are the general beverages. Drunkenness is seldom seen, and is, when seen, considered a social disgrace. The writer then glanced at the hospitals and gaols of Victoria, filled with the unhappy beings who have been morally and physically the victims of drunkenness. He pointed to the Lunatic Asylum—large enough to contain all the madmen of Rhineland, but scarcely large enough for the self-made lunatics of Victoria, who have drowned their reason in alcohol. A chief remedy for these evils was stated to be native wine. The writer wished to see encouraged the growth of native wine, for which Australia is preeminently fitted. Here, in many localities, where neither corn nor grass will grow, the vine will flourish, and the vinegrowers motto should be—

> "Where no plough can go,
> The vine will grow."

To promote vinegrowing, it was recommended that a number of men should be introduced into the colony acquainted with the mode of vine-cultivation. A number of propositions were then submitted to the Philosophical Institute for the diminution of a great national evil, which, like unsafe ship-building, involved a great amount of human life. Amongst others, that the import duty on foreign wines, spirits, and beers should be increased, and that it should be diminished on Australian wine imported from the neighbouring colonies, and that the Philosophical Institute of Victoria should offer a prize for the best efforts in vine-growing, &c. The paper concluded with a general appeal on the subject to the energy of the Institute.

The Rev. Messrs. Jarrett and Bleasdale, with others, commented on the views advanced by Dr. Becker.

The President intimated that the annual general meeting of the Institute would be held early in December.

After which the Institute separated.

8th Dec., 1858.

Annual General Meeting.

Sir W. F. Stawell, President, in the Chair.

Several newly-elected members were introduced to the Institute, by the President.

The Secretary read the name of one candidate for membership, to be balloted for at the first ordinary meeting of session 1859.

The Secretary laid upon the table the following contributions to the Library and Museum of the Institute, viz.:—twenty volumes of scientific transactions and publications, and a collection of petrifactions from the Miocene formation at Vienna, by the F. R. Geological Institution of Austria. The letter accompanying them was read to the members.

Professor Wilson moved the thanks of the society for such valuable contributions. This was seconded by the Rev. Mr. Bleasdale, and carried with hearty acclamation.

The Meteorological Tables for August, September, and October, 1858, also the Monthly Abstracts for July, August, and September, 1858, for New South Wales, by the N.S.W. Government, and the Geological Survey of Victoria Map for Ballarat, by the Government, were laid on the table by the Secretary as further contributions.

The Secretary read the fourth Annual Report (1858) of the "Council of the Institute."

The Report was adopted unanimously by the members.

The Treasurer read the balance-sheet for 1858, duly audited.

This was likewise adopted by the meeting.

The Treasurer laid upon the table—

1. Summary of members on December 2nd, 1858.—[*Vide* "List of Members."]
2. Suspense List.
3. Members resigned during 1858.
4. Return of members whose subscriptions remained unpaid on Dec. 2nd, 1858.
5. Return of members elected during 1858, showing those whose subscriptions are paid, and those who are in arrears.

The Annual Report and Balance-sheet for 1858 were ordered to be printed in the forthcoming volume of "Transactions."—*Vide* next and following pages.

The amendments on the rules, proposed by Professor Irving and Mr. Rawlinson, were severally brought under discussion, but in each case the amendments were negatived. Laws No. XI., XXVI., and XXVIII. were therefore allowed to remain as they were.—[*Vide* "Laws."]

The Rev. Mr. Bleasdale moved, as a series of rules, the seven recommendations in the Report of the "Sections" Committee.

An animated discussion ensued, in which the President, Professor Wilson, the Secretary, Drs. Eades, Iffla, and others took part.

The new rules were then passed seriatim.—[See "Laws."]

The Institute then separated for the session.

ANNUAL REPORT FOR 1858.

FOURTH REPORT *of the* COUNCIL *of the Philosophical Institute of Victoria, presented to the Members at the* GENERAL MEETING *held on the 8th of December*, 1858.

THE Council presents to the Philosophical Institute its fourth annual report, for the year ending 1st December, 1858.

As regards the number of its members, the Institute occupies nearly the same position as at the close of last year—the number of life members, and of members whose subscriptions for 1858 have been paid, being 236. In this number are not included those members absent from the colony, whose names have been placed by the council on a suspense list.

The financial position of the Institute is satisfactory. On the balance-sheet, audited and made up to 2nd December, 1858, there appears a balance in favour of the Institute of £1,350 19s. 6d. against £1,190 4s. 11d. at the corresponding period of last year. The expenses of the Institute have therefore been more than met by its ordinary revenue, and these expenses have not been at all below the average during the past year.

Besides the above amount, which may be fairly considered available for building purposes, the treasurer has yet to receive the sum of £2000, recently voted by the Legislative Assembly for this object.

At the twelve ordinary meetings of the Institute there have been read before the Institute twenty papers and other communications of varied scientific interest. Of these, twelve will shortly appear in the forthcoming volume of "Transactions."

The following committees have been in operation during the past year:—the Observatory, the Exploration, the Sections, the Museum, the British Song Bird, the Murray Cod, and the Union of Scientific Societies. The Observatory Committee has failed as yet in inducing the Government to take any steps for the erection of a large reflecting telescope. This is the more to be regretted, as at least three years must elapse from the order being given before the telescope and other apparatus needful for the Observatory can be supplied; and it appears to the council that it would be an honourable distinction for this colony to be the first to step forward and complete the astronomical work commenced by Sir John F. W. Herschel at the Cape of Good Hope. The Council has pleasure in stating that one recommendation of the Observatory Committee has been carried out by the Government, viz., the establishment of a Magnetic Observatory, under the superintendence of Professor Neumayer.

The Exploration Committee of the Institute has merged its efforts in those of a larger body, elected by the citizens of Melbourne, for forwarding the same object. It is pleasing to record the support given by Government, which has expressed an intention of procuring camels to aid.

Numerous valuable donations have been received during the past year, both to the Museum and to the Library of the Institute. The interchanges of "Transactions" with the learned societies of Europe and America, and those of the adjacent colonies, is rapidly increasing. The council regrets that the property of the Institute is not generally available to the members, from the want of accommodation, which, it is hoped, will soon be supplied.

On the 14th of January, 1858, the council received from the department of Public Lands the gratifying intelligence that his Excellency the Governor, in Council, had been pleased to approve of a reserve of one rood six perches at the junction of Victoria-street with Latrobe-street. The council, however, on conferring with architects, found that for the erection of buildings suitable for the Institute, a larger space would be required. Renewed application was therefore made in the proper quarter, and eventually (August, 1858) the whole triangular piece of ground (two roods six perches) lying between Victoria, Latrobe, and Rathdown streets, was reserved for the Philosophical Institute. This land has been fenced, a premium for the most suitable plan has been awarded, and it is the hope of the council that ere long the walls of the future home of the Institute will be rising. It will be possible, with the funds now at the disposal of the council, to erect a large hall, a museum, a library, a laboratory, and an apparatus room, and quarters for the keeper.

Directly after the reading of this report, there will be laid before the Institute a proposal, which the council strongly recommends to the approbation of the Institute, which cannot, however, be carried out until the Institute has premises of its own, viz., for the establishment of sections within the general body of members. The council feels, and believes that the feeling is shared by the members generally, that the Institute has not, during the past year, done as much work for science as might have been expected from so large a body. This is, probably, mainly attributable to the desultory nature of those efforts of individual members, which, by the proposed plan, will be directed aright to the cultivation of special departments of scientific research.

At the same time it will be no gain to the Institute thus to have subdivided its labours, if the members of these various sections forget that the object of all is one—"The advancement of Science, Literature, and Art."

The following officers and members of council will retire next March :—

President—His Honor the Chief Justice, Sir Wm. F. Stawell.
Vice-Presidents—F. Mueller, Esq., Ph.D., M.D.
C. Hodgkinson, Esq., C.E.
Treasurer—M. H. Irving, Esq., M.A.
Secretary—John Macadam, Esq., M.D.
Members of Council—Rev. J. I. Bleasdale, Hon. A. Clarke, Capt. R.E.; W. Blandowski, Esq.; T. E. Rawlinson, Esq., C.E.; W. Gilbee, Esq., M.R.C.S.; W. E. Hearn, Esq., LL.D.

Several letters, explanatory of the report, are appended.

Adopted.

WILLIAM F. STAWELL, Chairman.

December 8th, 1858.

M. H. IRVING, Esq., TREASURER, IN ACCOUNT WITH THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

Dr.

To Subscriptions for 1858—		
174 yearly at £2 2s.	£365 8 0	
24 yearly at £1 1s.	25 4 0	
15 half-yearly at £1 1s.	15 15 0	
		406 7 0
To Entrance Fees—		
55 at £2 2s.		115 10 0
To Subscriptions for 1857, paid subsequently to last Balance—		
13 yearly at £2 2s.	27 6 0	
5 half-yearly at £1 1s.	5 5 0	
		32 11 0
To Entrance Fees during 1857—		
5 at £2 2s.		10 10 0
To sale of Transactions to Dr. F. Mueller—		
32 copies Transactions Philosophical Society...	8 0 0	
3 ... ... Inst. I.	1 10 0	
9 ... ... II.1	2 5 0	
24 ... ... II.2	6 0 0	
		17 15 0
To Bank Interest—		
March 31st	10 10 0	
September 30th	14 10 0	
		25 0 0
		£607 13 0
Balance, as per audited Balance Sheet, Dec. 1st, 1857..		£1190 14 11
M. H. IRVING, Treasurer.		£1798 7 11

Cr.

By Expenses of Management, 1858—		
Secretary, postages, &c.	£54 5 3	
Treasurer, petty cash	10 0 0	
Rent of Hall for meetings	29 8 0	
Printing circulars	53 7 0	
Box for Transactions sent to England ...	1 2 6	
		148 2 9
By publication of Transactions, vol. II., pt. 2, 500 copies—		
Calvert, engraving	14 0 0	
Ray, printing	87 2 0	
Detmold, binding	31 5 0	
		132 7 0
By payments for Transactions, vol. III.—		
Becker, lithography	10 0 0	
Hamel and Locher, printing	7 10 0	
Riegg, coloring plates	3 15 0	
Becker, lithography	10 0 0	
		31 5 0
By Expenses of Building and Land—		
A. E. Johnson, Esq., plans	15 0 0	
Fencing	111 13 8	
Painting fence	4 0 0	
		130 13 8
By Secretary, petty cash for Recess		5 0 0
		£447 8 5
Cr. Balance		£1350 19 6
		£1798 7 11

We have examined the accounts and the vouchers of the Treasurer of the Philosophical Institute, and find them to be correct, the balance to the credit of the Institute on the 6th December, 1858, being £1798 7s. 11d.

CHARLES FAREWELL,
FRANCIS T. GELL, } *Auditors.*

REPORTS OF COMMITTEES.

SECOND REPORT OF THE "EXPLORATION" COMMITTEE OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

Drawn up by Drs. Wilkie, Mueller, and Macadam, adopted by the "Exploration" Committee, and received at the ORDINARY MEETING *of the* INSTITUTE, *held on the 26th May,* 1858.

At a special general meeting of the Philosophical Institute, held on the 22nd December, 1857, the First Report of the Exploration Committee was read and adopted, and the present committee was appointed, consisting of the following gentlemen :—

Dr. Wilkie, Chairman.
The Hon. Capt. Clarke, R.E., M.L.A.
The Hon. John Hodgson, M.L.C.
R. H. Bland, Esq.
Dr. Mueller.
George Higinbotham, Esq.
Dr. Macadam.
Rev. J. I. Bleasdale.
Rev. Dr. Sheil.
Charles Farewell, Esq.
Dr. Knaggs.
Dr. Mackenna.
Frederick Acheson, Esq., C.E.
Thomas E. Rawlinson, Esq., C.E.
Sizar Elliott, Esq.
William Blandowski, Esq.
Arthur Dobree, Esq.
Dr. Gillbee.
Lieutenant Pasco.
Dr. M'Gillivray.
Dr. Iffla.
J. Hough, Esq.
A. K. Smith, Esq., C.E.
James Bonwick, Esq., Hon. Secretary.

Your committee has the honor to report that several meetings were held with a view to devise the best means of carrying out the object of its appointment, and the unanimous conclusion come to was, that it was necessary to invite the co-operation of the public in the proposed exploration of the interior, and accordingly a public meeting was held at the Mechanics' Institution, on the 4th January last, when the following resolutions were proposed and unanimously adopted :—

1. That this meeting expresses its conviction of the great importance of exploring the interior of Australia, and deems it most desirable that an attempt should be made at as early a period as practicable to penetrate through Central Australia, from east to west, for the purpose of connecting the discoveries of Mitchell, Kennedy, Sturt, Gregory, and Grey.

2. That this meeting recommends the formation of a light preliminary expedition to explore the country between the Darling and Victoria rivers, with a view of opening up a line of communication between this colony and Central Australia, and for the purpose of selecting a suitable site for establishing a depôt, to serve as the basis of future explorations.

3. That this meeting recognises the duty of the colonists of Victoria to co-operate with the Philosophical Institute in carrying out the scheme of exploration proposed.

4. That a deputation, consisting of the Hon. Capt. Clarke, M.L.A., the Hon. John Hodgson, M.L.C., Dr. Wilkie, Dr. Macadam, and R. H. Bland, Esq., wait upon His Excellency Sir Henry Barkly, K.C.B., to request his favorable consideration of the proposed expedition, and that they afterwards wait upon the Hon. W. C. Haines, the Chief Secretary, to submit to the Government the resolutions of this public meeting, to solicit their support of the important objects contemplated by the Philosophical Institute, and to request that they would be pleased to place the sum of £2,500 on the Estimates in aid of the same.

For a report of the proceedings of the public meeting your committee would refer to the Appendix in vol. II., part II., of the Transactions of the Institute, just published.

The deputation, above named, accordingly waited upon His Excellency the Governor on the 14th of January, when, after hearing the resolutions read, His Excellency, with his usual urbanity and desire of promoting every object of public and scientific importance, replied that the object of the present deputation was one in which he took a very deep interest; that he should be most happy to further, as far as lay in his power, the object that the deputation had in view. He imagined the amount asked for, being so very small, there would be no difficulty in getting the assistance of the Government, although he considered it would have been better had the subject been mooted before the Estimates for the present year had been made up. He also considered that the view in which the deputation had put the question, was one of so much advantage to the commercial community, that the Government would not hesitate to assist them. His Excellency then stated that, if the deputation thought that it would be of any benefit to the object, he should be most happy to communicate with Mr. Babbage, who was about to start from Adelaide on a similar expedition.

After this interview with his Excellency Sir Henry Barkly, the Hon. Secretary transmitted a copy of the resolutions of the public meeting to the Hon. W. C. Haines, then Chief Secretary, and requested the favour of an interview on behalf of the deputation, but previous to the day appointed for receiving the deputation, Mr. Haines was unexpectedly called out of town. At the next meeting of the Exploration Committee, held on the 8th February, it was resolved that the Hon. Secretary should communicate with the Hon. the Chief Secretary, and again solicit an interview with him, in terms of the resolution of the public meeting. The deputation waited by appointment upon the Chief Secretary, who, after listening to an explanation of the objects of the deputation, pleaded the inability of the Government, at this late period of the Session, to place money on the Estimates for the proposed expedition. He thought the object not more pressing than many others, that the Government had been led into a much greater expenditure than had been contemplated, and that it would be impossible for any Government to conduct the affairs of the country if the expenditure was not limited to the ordinary revenue. He thought when the colonies were united under a federal government, that would be the best time to undertake the exploration of the interior by a combined effort. The Government, however, would be open to consider the expediency of the proposed expedition next Session, and Parliament would be in a better position to vote the necessary funds. He would place the arguments of the deputation before his colleagues, but he did not anticipate a more favourable result.

The deputation was also favoured with an interview with the Hon. C. H. Ebden, the late Colonial Treasurer, who listened with much attention to the objects contemplated by the Philosophical Institute, and thought it very desirable that Victoria should contribute towards the exploration of the interior, but considered it a very inconvenient time to get the necessary funds. He should like to see Victoria combining with the other Australian colonies in a systematic exploration of the interior, or that she should undertake it alone if the other colonies declined. He thought it not right that the colony of Victoria should send an exploring expedition into New South Wales territory, without communicating with the New South Wales Government on the subject. He advised that the Exploration Committee should put itself in communication with Mr. Gregory, with a view to ascertain if he would be willing to undertake the command of a Victorian expedition, and promised that the Government would give the most favourable consideration to a proposal of this kind next Session of Parliament, and that, personally, he would give it his warmest support; indeed, he thought he might say that there would be no difficulty in their carrying out the object.

Another meeting of the Exploration Committee was held on the 17th February to receive the report of the deputation, when it was agreed to prepare a statement of their proceedings in continuation of the former report, to be laid before an early meeting of the Institute.

Your committee has to express great disappointment at the result of their interview with the late Chief Secretary. The proposal that Victoria should take part in exploring the vast central regions of Australia had met with an unanimous response from the public, and had everywhere been warmly supported by the press, and your committee, therefore, had always entertained the hope that, by the liberality of Parliament, they would be enabled to despatch a small party to the Lower Darling, so as to be in time to start from Mount Murchison on the first approach of the winter rains, in April or May of the present year. Your Committee has only to regret the failure of its just expectations, and they feel that this disappointment of their hopes has been largely shared by all classes in the community.

In the contemplation of making a renewed effort this year in the cause of Australian exploration, your committee has received encouragement in the observations that fell from His Excellency the Governor at the late dinner of the Philosophical Institute; and your committee feels assured that in an object which so intimately concerns the welfare and future prospects of Australia, the Philosophical Institute may always depend upon His Excellency's warmest sympathies and most zealous co-operation.

Your committee has no less pleasure in adverting to the fact that Her Majesty's Ministers very kindly accepted an invitation to be present at the dinner of the Institute, and that the Hon. John O'Shannasy, the Chief Secretary, expressed a warm interest in the future exploration of Australia, and promised the concurrence and support of the Government in any practicable scheme of exploration that might be proposed by the Philosophical Institute.

Your committee earnestly hopes that on the return of Mr. Gregory from his present expedition in search of Leichardt, he may be induced to take the command of a Victorian expedition, and that thus the difficulty, suggested by the late Government, will be removed; and, if an exploring expedition shall be successfully organised in Victoria next season, under the able direction of Mr. Gregory, your committee will not regard as thrown away the long and anxious consideration which has been devoted to this subject.

It is confidently expected that Mr. Gregory will return to the settled districts about the end of this year; and, although Mr. Babbage will not have completed his exploration before the end of the rainy season of 1859, your committee is encouraged to believe that the valuable results of the labors of these explorers, during the present year, will greatly aid the Philosophical Institute in deciding as to the best route to be adopted for further exploration, and will greatly facilitate the labors of future explorers.

Your Committee has much pleasure in recording the valuable offer of F. C. Christy, Esq., C.E., to furnish an exploring party with any number of the best breed of carrier pigeons. Your Committee believes that with suitable arrangements these pigeons might become an invaluable aid in the exploration of the interior.

When the proper time arrives, your Committee will be prepared, with the sanction of the Institute, to take the necessary steps to obtain a vote of the Legislature in furtherance of the important object for which they were appointed; and, your Committee has every confidence that the applications, both to the Government and to the Parliament, will be attended with success.

Read and adopted at a meeting of the Exploration Committee held in the Melbourne Mechanics' Institution, on the 26th May, 1858.

D. E. WILKIE, M.D., CHAIRMAN.

THIRD REPORT OF THE "EXPLORATION" COMMITTEE OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

Drawn up by Drs. Wilkie, Mueller, and Macadam; adopted by the "EXPLORATION" COMMITTEE; *and received at the* ORDINARY MEETING *of the* INSTITUTE, *held on the 29th September,* 1858.

Your Committee has the honor to report that a meeting was held on the 3rd instant, to take into consideration the appointment of a Committee, at a public meeting held at the Mechanics' Institution, on Tuesday, the 1st instant, on the subject of Australian Exploration, and at which Sir William F. Stawell presided. It was agreed that a deputation, consisting of Mr. R. H. Bland, Dr. Macadam, and the Chairman, should seek an interview with Sir William Stawell, and draw his attention to the existence of the Exploration Committee of the Philosophical Institute, and to the present position of the Institute in relation to Australian Exploration.

The deputation was unfortunately unable to meet Sir W. Stawell at the time appointed by him, but, at the subsequent meeting of the Exploration Fund Committee, the following resolution was agreed to: "That while this Committee considers it to be its first duty to raise the sum of £2000 by subscription, in aid of the handsome donation of £1000 promised upon that condition, it is anxious to co-operate with the Exploration Committee of the Philosophical Institute in carrying out the objects which both Committees have at heart, and desires to impress upon the Exploration Committee of the Philosophical Institute the importance of urging upon the Government the necessity of placing a sum of money on the Estimates in aid of the Exploration of the Interior."

Your Committee is of opinion that the time has now arrived when an immediate application should be made to the Hon. the Treasurer to place on the estimates for 1859 the sum of £5000, to enable your Committee to co-operate with the Exploration Fund Committee, according to the terms of its resolution, in adopting the necessary steps to fit out, in Victoria, an expedition for the exploration of the interior, at as early a period as practicable.

Your Committee has every confidence that its application to the Government, on behalf of the Institute, will receive a favourable consideration.

Your Committee has much pleasure in recommending to the earnest attention of the members of the Institute the following circular which has been drawn up by the Exploration Fund Committee, and which it is intended to circulate largely throughout the colony, and ventures to urge upon the members the great importance of individually exerting themselves in promoting the objects which both Committees have in view.

DAVID E. WILKIE, M.D.,
Chairman, Exploration Committee.

The following is the circular :—

Melbourne, September 15, 1858.

"Sir—At a public meeting held at the Mechanics' Institute, Melbourne, on the 1st inst., Sir W. F. Stawell in the chair, the undermentioned gentlemen were appointed a committee to take the necessary steps for raising £2,000 by public subscription, to be applied to the purpose of exploring the interior of the Colony; a donation of £1,000 having been made for that object, coupled with the proviso that double that sum should be subscribed by the public within twelve months from the present date. The committee, consisting of Sir W. F. Stawell, the Hon. J. Hodgson, M.L.C., Professor McCoy, Dr. Mueller, and Mr. James Smith, to which Dr. Macadam has been appointed Honorary Secretary, and Dr. Wilkie Treasurer, was limited in number, for the sake of securing a greater amount of individual responsibility as regards its financial administration; but as soon as it has discharged the first duty delegated to it—that of collecting the sum specified above—it is pledged to co-operate with the Exploration Committee of the Philosophical Institute, in concerting measures for the prudent, economical and efficient expenditure of the Exploration Fund. That Fund there is every reason to believe will be augmented by a grant from Government; and the aggregate amount, it is confidently hoped, will suffice to prosecute the enterprise to a thoroughly successful issue. In the mean time I have to solicit, on behalf of the Committee, the exercise of your local influence (either by the formation of sub-committees, or otherwise) in procuring subscriptions to an object which is national in character, and must secure the approbation of every Australian who is anxious to promote the material prosperity of his country, to enlarge the boundaries of knowledge, to clear up the mystery which envelopes the fate of poor Leichardt, and to facilitate our intercourse with the other hemisphere. The Government have promised to place a sum of money on the estimates for the introduction of twenty or thirty camels, to be employed in traversing the sandy deserts ascertained to exist in the interior, and the time appears to have arrived when we may undertake the work of exploration under the most favorable conditions of success, and may worthily emulate the laudable example which has been set us by the adjoining colonies.

"To open up a communication with the northern shores of this continent, is an enterprise which should engage the sympathies and command the support of the merchant, the squatter and the miner, no less than those of the man of science; for such an enterprise promises to abridge the distance which separates us from the old world; to bring us, at an early date, in telegraphic communication with India and Europe; to open new avenues of commerce; to indicate how we may obtain access to vast areas of pastoral land from which we are at present cut off, owing to our ignorance of the intervening country; and to solve a geographical problem, which is as important as it is interesting.

"Under these circumstances the Committee confidently appeal to you for assistance in the way of soliciting contributions in the district in which you reside, and would feel obliged by your remitting any sums you may receive on this account to the Treasurer of the Exploration Fund—Dr. Wilkie, of this city—or to the account of the Exploration Fund at the Bank of Victoria, Melbourne.

"I am, Sir,

"Your obedient servant,

"JOHN MACADAM, M.D.,

"HONORARY SECRETARY."

REPORT OF THE COMMITTEE OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA "ON THE FORMATION OF SECTIONS."

Read and received at the Ordinary Meeting of the Institute, held on the 8th of November, 1858, *and adopted as a Series of Laws* [*vide* LAWS LIX.—LXV.] *at the* ANNUAL GENERAL MEETING, *held on the 8th December,* 1858.

The Committee appointed at an ordinary meeting of the Philosophical Institute of Victoria, held on the 28th July, 1858, and consisting of the mover (Rev. J. I. Bleasdale) Professors Wilson, Hearn, and Irving, the Hon. Captain Clarke, R.E., Drs. Eades and Macadam, and Messrs. Rawlinson and Orlebar, having taken into consideration the subject submitted to them, viz., the Formation of Sections in the Institute, have to report that they are of opinion—

I. That it is desirable that the Members of the Institute prosecuting particular departments of science shall have opportunities of meeting and working together with fewer formal restraints than are necessary at the ordinary meetings of the Institute.

II. That for this purpose it is desirable that Sections be established for the following departments, viz.:—

Section A—Physical, Astronomical, and Mechanical Science, including Engineering.

Section B—Chemistry, Mineralogy, and Metallurgy.

Section C—Natural History and Geology.

Section D—Medical and Microscopical science, including Physiology and Pathology.

Section E—Geography and Ethnology.

Section F—Social Science and Statistics.

Section G—Literature and the Fine Arts, including Architecture.

III. That the meetings of the sections be for scientific objects only.

IV. That there be no membership of the Sections as distinguished from the membership of the Institute.

V. That there be for each Section a Chairman to preside at the meetings, and a Secretary to keep minutes of the proceedings, who shall jointly prepare and forward to the Secretary of the Institute, prior to the 1st of November in each year, a report of the proceedings of the Section during the past year; such report to be submitted to the Council.

VI. That the Chairman and the Secretary of each section be appointed at the first meeting of the Council after its election in March, in the first instance from members of the Institute who shall have signified to the Secretary their willingness to undertake those offices, and subsequently from such as are recommended by the Section as fit and willing.

VII. That the first meeting of each Section in the year be fixed by the Council—the Section subsequently to arrange its own days and hours of meeting, provided these be at fixed intervals.

JOHN I. BLEASDALE,

Chairman.

LIST OF INSTITUTIONS, LEARNED SOCIETIES, &c., RECEIVING COPIES OF THE TRANSACTIONS OF THE PHILOSOPHICAL INSTITUTE OF VICTORIA, 1858.

BRITISH.

British Museum Library.
Meteorological Society of London.
Statistical Society of London.
Geological Society of London.
Museum of Economic Geology of London.
Royal Astronomical Society of London.
Royal Society of London.
Royal Society of Arts, London.
Institute of Civil Engineers, London.
The Royal Geographical Society of London.
The Linnæan Society of London.
University Library, Cambridge.
Philosophical Society, Cambridge.
Bodleian Library, Oxford.
Trinity College Library, Dublin.
The Royal Irish Academy.
University Library, Edinburgh.
University Library, Glasgow.
Royal Society of Edinburgh.
Royal Botanical Society, Edinburgh.
Royal Scottish Society of Arts, Edinburgh.

COLONIAL.

University Library, Melbourne.
Parliamentary Library, Melbourne.

Medical Society, Melbourne.
Registrar-General's Office, Melbourne.
Public Library, Melbourne.
The *Argus*, *Herald*, and *Age* papers, Melbourne.
Royal Society of Tasmania.
Philosophical Society of Sydney.
Adelaide Philosophical Society, South Australia.

EUROPEAN.

The Institute of France.
Linnæan Society, Paris.
Royal Society of Berlin.
Petermann's Geographical Journal, Hamburgh.
Scientific Institute, Brussels.
Imperial Academy, St. Petersburgh.
Royal Institution, Utrecht.

AMERICAN.

Smithsonian Society of America.
Natural History Society, Boston.

MEMBERS

OF THE

PHILOSOPHICAL INSTITUTE

OF VICTORIA.

MEMBERS

OF

THE PHILOSOPHICAL INSTITUTE OF VICTORIA.

31*st December*, 1858.

(AS FURNISHED BY THE TREASURER.)

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Mc Coy, Professor, F.G.S., H.M.C.P.S., Government Paleontologist and Director of Museums.
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Musson, John, Esq.

Neumayer, George, Professor, Government Meteorologist, and Director of the Magnetic Survey of Victoria.
Nish, Rev. J.

O'Connor, Nicholas, Esq.
O'Hea, Rev. Charles
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Sasse, Edmund, Esq.
Schultz, William, Esq.
†Scott, R., Esq.
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Selwyn, Alfred R. C., Esq., Government Geologist.
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Skene, Alexander John, Esq., C.E.
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Thompson, John, Esq.
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Tracy, Richard Thomas, Esq., M.D.
Turnbull, W. M., Esq., M.D., M.R.C.S.E.

Ulrich, George, Esq., Assistant Geological Surveyor
Urquhart, William Swan, Esq.

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*Wilkie, The Hon. David E., Esq., M.D., M.L.C.
Wilkie, Joseph, Esq., M.L.A.
Wilkinson, David, Esq., C.E.
*Wilson, Professor, M.A., F.C.P.S.
Woods, Rev. Julian Edmund

Zeal, William A., Esq., C.E.

SUSPENSE LIST.

MEMBERS ABSENT FROM THE COLONY.

A'Beckett, His Honor Sir William
Edwards, Henry, Esq.
Dickson, John E. I., Esq.
Griffith, Charles J., Esq., M.L.A.
Goethe, Rev. Dr.
Kentish, N. L., Esq.
Haines, The Hon. W. C., M.L.A.
Ray, Edgar, Esq.
Wilson, Edward, Esq.

MASON AND FIRTH, PRINTERS, ELIZABETH STREET SOUTH.

LAWS.

LAWS

OF

THE PHILOSOPHICAL INSTITUTE

OF VICTORIA.

ADOPTED 1857, SEPTEMBER 25.

[LAWS LIX. TO LXV. INCLUSIVE WERE ADOPTED ON THE 8TH DECEMBER, 1858.]

MELBOURNE:

PRINTED BY MASON & FIRTH, 16 ELIZABETH STREET SOUTH.

1858.

LAWS.

I. The Society shall be called "The Philosophical Institute of Victoria." Name.

II. The Philosophical Institute of Victoria is founded for the advancement of science, literature, and art, with especial reference to the development of the resources of the country. Objects.

III. The Philosophical Institute of Victoria shall consist of Members and Honorary Members, all of whom shall be elected by ballot. Members and Honorary Members.

IV. His Excellency the Governor of Victoria, for the time being, shall be requested to be the Patron of the Institute. Patron.

V. There shall be a President, two Vice-Presidents, a Treasurer, and a Secretary of the Institute, who, with twelve other members, shall constitute the Council. Officers.

VI. The Council shall have the management of the affairs of the Institute. Management.

VII. The ordinary meetings of the Institute shall be held every third week during the months from March to November, inclusive. Ordinary Meetings.

VIII. In the first week in December there shall be a General Meeting to receive the report of the Council, and in the first week in March there shall be the Anniversary Meeting to elect the Officers of the Institute for the ensuing year. General and Anniversary Meetings.

Annual Dinner.

IX. During the month of March there shall be an Annual Dinner of the Members of the Institute, after which the newly-elected President shall read an address.

Retirement of Officers.

X. The President, the Vice-Presidents, the Treasurer, the Secretary, and six senior ordinary Members of Council shall retire from office annually at the Anniversary Meeting. The Officers, so retiring, shall be eligible for the same or any other offices then vacant.

Election of Officers.

XI. The President, the Vice-Presidents, the Treasurer, and the Secretary shall be separately elected by ballot, in the above-named order, at the Anniversary Meeting, and the six vacancies in the Council shall be then filled up together by ballot.

Members in arrear.

XII. No Member whose subscription is in arrear shall take part in the election of Officers or other business of the Meeting.

Vacancies.

XIII. If any vacancy occur among the Officers, notice thereof shall be inserted in the summons for the next Meeting of the Institute, and the vacancy shall be then filled up by ballot.

Duties of President.

XIV. The President shall take the Chair at Meetings of the Institute and of the Council, regulate and keep order in all their proceedings, state questions and propositions to the Meeting, report the result of ballots, introduce newly-elected Members, and carry into effect the regulations of the Institute. He shall deliver an address at the Annual Dinner of the Institute.

In the absence of the President, the Chair shall be taken by one of the Vice-Presidents, the Treasurer, or an ordinary Member of Council.

Duties of Treasurer.

XV. The Treasurer shall receive all money paid to the Institute, and shall deposit the same in the Colonial Bank of Australasia, to the credit of an account opened in the name of the Philosophical Institute of Victoria, all cheques against which shall be signed by himself and countersigned by the Secretary. He shall make all payments ordered by the Council, on receiving a written authority from the Chairman of the Meeting, keep a detailed account of all receipts and expenditure, prepare a balance sheet to be laid before the Council and included in their Annual Report, and produce his books if called on by the Council.

The Treasurer shall issue the Notices required by Rules xxv and xxvi.

XVI. The Secretary shall conduct the correspondence of the Institute and of the Council, attend all Meetings of the Institute and of the Council, take minutes of their proceedings and enter them in the proper books; he shall inscribe the names and addresses of all Members in a book to be kept for that purpose, from which no name shall be erased except by order of the Council; he shall issue Notices of all Meetings of the Institute and of the Council, shall have the custody of all papers of the Institute, and, under the direction of the Council, superintend the printing of the Transactions of the Institute, and the correction of the press. Duties of Secretary.

He shall make all preparations for the Meetings of the Institute.

XVII. The Council shall meet one week before every ordinary meeting of the Institute. Notices of such meetings shall be sent to every member at least two days previously. No business shall be transacted at any meeting of the Council unless five members be present. Meetings of Council.

XVIII. The Secretary shall call a Special Meeting of Council on the authority of the President or of three members of Council. The notice of such meeting shall specify the object for which it is called, and no other business shall be entertained. Special Meetings of Council.

XIX. The Council shall annually prepare a report of the proceedings of the Institute during the past year, embodying the balance sheet, duly audited, and a statement of the present position of the Institute. This report shall be laid before the Institute at the General Meeting in December. No paper shall be read at this meeting. Annual Report.

Expulsion of Members.

XX. If it shall come to the knowledge of the Council that the conduct of a member is injurious to the character of the Institute, and if two-thirds of the whole Council shall be satisfied, after an opportunity of defence has been afforded to the member that such is the case, they shall request him to resign, and, in case of his not doing so, may expel him from the Institute.

In every case all proceedings shall be entered upon the minutes.

Special General Meetings

XXI. The Council shall call a Special General Meeting of the Institute on receiving a requisition in writing signed by twenty-four members of the Institute, specifying the purpose for which the meeting is required; no other business shall be entertained at such meeting. Notice of such meeting and the purpose for which it is summoned shall be sent to every member at least ten days before the meeting.

Election of Members.

XXII. Every candidate for membership shall be proposed and seconded by Members of the Institute. The name, the address, and the occupation of every candidate, with the names of his proposer and of his seconder, shall be communicated in writing to the Secretary, and shall be read at a meeting of Council, and also at the following meeting of the Institute, and the ballot shall take place at the next following ordinary meeting of the Institute. When the number of voters in favor of any candidate shall be five times the number of those against him, he shall be declared duly elected, and not otherwise.

Members shall sign laws.

XXIII. Every newly-elected member shall, at the first meeting of the Institute at which he may be present, sign a declaration, in a book provided for that purpose, that he will observe the laws of the Institute.

Honorary Members.

XXIV. Gentlemen not resident in Victoria, who are distinguished for their attainments in science, literature, or art, may be proposed for election as Honorary Members, on the recommendation of an absolute majority of the Council. The election shall be conducted in the same manner as that of ordinary members, but nine-tenths of the votes must be in favour of the candidate.

XXV. Members of the Institute, resident in Melbourne or within fifty miles thereof shall pay two guineas annually, and members resident beyond that distance shall pay one guinea annually. The subscriptions shall be due on the 1st of January in every year, and notice thereof shall be sent to every member during the preceding December. Subscription.

If the subscription of any member be not paid before the 1st of March, his name shall be posted at the next ordinary meeting of the Institute, and at the two following ones, should his subscription remain so long unpaid; and a second notice shall be sent informing him that this will be done.

After the third meeting, notice shall be sent to him that he has ceased to be a member of the Institute, but that he may be restored on furnishing in writing to the Council a satisfactory reason for his delay, and paying arrears within one month.

XXVI. Newly-elected members shall pay an entrance fee of two guineas, in addition to the subscription for the current year. Those elected after the 1st of July shall pay only half of the subscription for the current year. If the entrance fee and subscription be not paid within one month of the notification of election, a second notice shall be sent, and if payment be not made within one month from the second notice the election shall be void. Entrance Fee, &c.

XXVII. Members may compound for all annual subscriptions of the current and future years by paying twenty guineas. Life Members.

XXVIII. At the ordinary meetings of the Institute the chair shall be taken punctually at half-past seven o'clock, and shall be vacated not later than half-past ten o'clock. Duration of Meetings.

XXIX. At the ordinary meetings business shall be transacted in the following order:— Order of Business.

Minutes of the preceding meeting to be read, amended if incorrect, and confirmed.

New Members to enroll their names and be introduced.

Order of Business.

Ballot for the election of new Members.
Vacancies among Officers, if any, to be filled up.
Business arising out of the minutes.
Communications from the Council.
Presents to be laid on the table and acknowledged.
Motions, of which notice has been given, to be considered.
Notices of motion for the next meeting to be given in and read by the Secretary.
Papers to be read.

No vote of thanks to any Member for his paper shall be proposed.

Immediately after each paper, the Chairman shall call on the Members for any remarks they may wish to make, or questions they may wish to ask.

No member shall speak more than once on any paper, or for a longer period than five minutes, unless called on by the Chairman, who, however, shall not allow him to exceed ten minutes on the whole.

When no Member has any further questions to ask or remarks to offer, the Chairman shall call on the author for his reply to such questions and remarks, which shall terminate the discussion.

Strangers.

XXX. No stranger shall speak at a meeting of the Institute unless specially invited to do so by the Chairman.

Business to be notified.

XXXI. No business shall be entertained at any meeting which has not been inserted in the summons for that meeting.

Additional Meetings.

XXXII. The Council may call additional meetings whenever they may deem it necessary.

Visitors.

XXXIII. Every Member may introduce two visitors to the meetings of the Institute by orders signed by himself.

Members may read papers.

XXXIV. Members shall have the privilege of reading before the Institute papers containing accounts of experiments, observations, and researches conducted by themselves, on subjects within the scope of the Institute.

XXXV. If a Member be unable to attend for the purpose of reading his paper, he may delegate to any Member of the Institute the reading thereof and his right of reply. Or depute other Members.

XXXVI. Any Member desirous of reading a paper shall give in writing to the Secretary ten days before the Meeting at which he desires it to be read, its title and the time its reading will occupy. Members must give notice of their papers.

The Secretary shall lay this communication before the Council at its next Meeting. Papers shall be read in the order in which such notices are received by the Secretary.

XXXVII. The Council may permit a paper of a nature similar to the above, not written by a Member of the Institute, to be read, if for any special reason they shall deem it desirable. Papers by strangers.

XXXVIII. Every paper read before the Institute shall be the property thereof, and immediately after it has been read shall be delivered to the Secretary and shall remain in his custody. Papers shall be the property of the Institute.

XXXIX. At the Meeting of the Council next following the reading of a paper, the Council shall decide whether it shall appear in the Transactions of the Institute. Council shall decide as to publication.

XL. No paper shall be published in the Transactions which in the opinion of the Council does not consist mainly of original matter as regards the facts or the theories enunciated. Papers must be original.

XLI. Should the Council feel a difficulty in deciding on the publication of a paper, they may refer it to any member or members of the Institute, who shall report on the same. Council may refer papers to Members.

XLII. Should the Council decide not to publish any paper, it shall be at once returned to the author. Rejected papers to be returned.

XLIII. The Transactions of the Institute shall be published in parts at intervals not exceeding six months. Transactions to be published half-yearly.

Institute to have priority of publication.

XLIV. No member shall publish or consent to the publication of any paper read before the Institute until it shall have been published in the Transactions or returned to him by the Council.

Members may have 50 copies of their papers.

XLV. The author of any paper which the Council have decided to publish in the Transactions may have any number of copies of his paper, not exceeding fifty, on giving notice of his wish in writing to the Secretary, with his paper, and on paying the extra cost of such copies.

Members to have copies of Transactions.

XLVI. Every member whose subscription is not in arrear, and every honorary member, is entitled to receive one copy of the Transactions of the Institute as published. Newly-elected members shall, on payment of their entrance-fee and subscription, receive a copy of the volume of the Transactions last published.

Property.

XLVII. Every book, pamphlet, model, plan, drawing, specimen, preparation, or collection presented to or purchased by the Institute, shall be placed in the museum of the Institute.

Museum.

XLVIII. The museum shall be open to members of the Institute and the public at such times and under such regulations as the Council may deem fit.

Legal ownership of property.

XLIX. The legal ownership of the property of the Institute is vested in the President, the Vice-Presidents and the Treasurer for the time being, in trust for the use of the Institute; but the Council shall have full control over the expenditure of the funds and management of the property of the Institute.

Committees elect chairman.

L. Every Committee appointed by the Institute shall at its first Meeting elect a Chairman, who shall convene the Committee and bring up its report.

Report before November 1st.

LI. All Committees and individuals to whom any work has been assigned by the Institute shall present to the Council, not later than the 1st of November in each year, a report of the progress which has been made; and, in cases where grants of money for scientific purposes have been entrusted to them, a statement of the sums which have been expended and of the balance of each grant which remains unexpended.

LII. Grants of pecuniary aid for scientific purposes from the funds of the Institute shall expire on the 1st of November next following, unless it shall appear by a report that the recommendations on which they were granted have been acted on, or a continuation of them be ordered by the Council. **Grants expire.**

LIII. In all cases whese additional grants of money are made for the continuation of researches at the cost of the Institute, the sum named shall be deemed to include as a part of the amount the specified balance which may remain unpaid on the former grant for the same object. **Additional Grants.**

LIV. In grants of money to committees and individuals, the Institute does not contemplate the payment of any personal expenses which may be incurred by the members. **Personal expenses not to be paid.**

LV. The Chairman of each Committee is the person entitled to call on the Treasurer for such portion of the sum granted as may from time to time be required. **Chairman to draw grants.**

LVI. Every Committee shall cease to exist on the day of meeting next following the 1st of November, unless then re-appointed.

LVII. No new law or alteration or repeal of an existing law shall be made, except at the General Meeting in December, or at a Special General Meeting summoned for the purpose as provided in law xxi., and in pursuance of notice given at the preceding ordinary meeting of the Institute. **Alteration of laws.**

LVIII. Should any circumstance arise not provided for in these laws, the Council are empowered to act as may seem to them best for the interests of the Institute. **Cases not provided for.**

Sections.

LIX. In order that the Members of the Institute prosecuting particular departments of science may have opportunities of meeting and working together with fewer formal restraints than are necessary at the ordinary meetings of the Institute, Sections are established.

Names and number of sections.

LX. Sections are established for the following departments, viz.—

Section A. Physical, Astronomical and Mechanical Science, including Engineering.

Section B. Chemistry, Mineralogy, and Metallurgy.

Section C. Natural History and Geology.

Section D. Medical and Microscopical Science, including Physiology and Pathology.

Section E. Geography and Ethnology.

Section F. Social Science and Statistics.

Section G. Literature and the Fine Arts, including Architecture.

Meetings of sections.

LXI. The meetings of the Sections shall be for scientific objects only.

Members of sections.

LLII. There shall be no membership of the Sections as distinguished from the membership of the Institute.

Officers of sections.

LXIII. There shall be for each Section a Chairman to preside at the meetings and Secretary to keep minutes of the proceedings, who shall jointly prepare and forward to the Secretary of the Institute, prior to the 1st of November in each year, a Report of the Proceedings of the Section during that year, and such report shall be submitted to the Council.

Mode of appointment of officers of sections.

LXIV. The Chairman and the Secretary of each Section shall be appointed at the first meeting of the Council after its election in March, in the first instance from Members of the Institute who shall have signified to the Secretary their willingness to undertake these offices, and subsequently from such as are recommended by the Section as fit and willing.

LXV. The first meeting of each Section in the year shall be fixed by the Council, subsequently the Section shall arrange its own days and hours of meeting, provided these be at fixed intervals. Times of meeting of sections.

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