JUNE, 1902.

A meeting of the Royal Society of Tasmania was held on the 10th June at the Museum, Argyle-street. His Excellency the Governor, Sir A. E. Havelock, G.C.S.I., G.C.M.G., President of the Society, presided.

New Members.

Mr. J. H. Maiden, Director of the Botanic Gardens, Sydney, was elected a corresponding member, and Messrs. W. A. Finlay and F. Grove were elected members.

The Observatory.

Mr. A. Morton, the secretary, read the following communication from Mr. H. C. Kingsmill, M.A., Government Meteorologist, Tasmania:—

Observatory, Hobart, June 7, 1902. To the Secretary of the Royal Society. Dear Sir,—I shall feel obliged if you will submit for the consideration of the Council the following remarks on the meteorological service of Tasmania, having reference to its present condition, and its prospects under federation. I am led to request their attention for two reasons:—One, their readiness in the past to give their help, on all occasions when it was needed for this work; and the other is that there is a crisis at present, due to the advent of federation. Recognising that changes must be made the Acting Federal Premier has asked all the States for detailed information as to the cost and personnel of their Meteorological Departments. The publication of this news in "The Mercury" would seem to indicate that the Government of this State is leaving the way open to receive suggestions. The Royal Society is in a position to make suggestions that would, I believe, have great weight with the Government. It will be remembered that a deputation from the Royal Society, in 1895, prevailed on the Government to invite Mr. Wragge to make a report on the meteorological service of Tasmania, and that he accepted the invitation. The report, coming from one whose training and experience as a meteorologist are so widely known, had two objects in view. One, to give the colony of Tasmania the benefit of his observations on the local meteorological arrangements, and suggestions for increasing the efficiency of the same. The other, to at the same time benefit the meteorology of the mainland by obtaining more thorough details from Tasmania, which occupies a position of much importance to those engaged in forecasting. I therefore think that what has been so ably done, with the double object of ensuring local efficiency, and also federal benefit, in the matter of meteorological work, will be found the best guide on the present occasion in estimating the cost of the service now required. For Mr. Wragge's estimate, see General Remarks, page 15, paragraph 18, of his report. To those who know what the actual expenditure has been, it will be apparent that a mere answer to the Federal Premier of the question asked would not be a fair indication of the cost of an efficient meteorological service, as it would have to be worked under federal control. Moreover, it should be pointed out that Mr. Wragge's estimate is for meteorological work alone, and does not include the astronomical work of the department.

The character of this work, and the conditions under which it had to be done, are explained in a report furnished to Lord Normanston in 1894 by Admiral Bowden Smith. This report was prepared by Captain Cust, of H.M.S. Dart, who had been specially trained in astronomical work at the Royal Observatory, Greenwich. His suggestions are most valuable. They are a complete summary of the conditions necessary for the maintenance of an accurate time-service in an important shipping port; but he makes no estimate of the cost. These two reports, by Mr. Wragge and Captain Cust, are herewith enclosed. They cover all the present work of the Meteorological Department of this State, and they furnish data on the highest authority obtainable for estimating the cost of enabling it to work in line with the other States. I hope that the Council of the Royal Society will see their way to make some representation to the Government, and I shall be in readiness to give them further information if it is required.—Yours, etc., H. C. Kingsmill.

"Meteorological observations in Tasmania were begun by Sir John Franklin in 1840. Being Governor of the island, then called Van Diemen's Land, he sent home for instruments, and when Captain Ross arrived at Hobart in August, 1840, in command of the Erebus, an observatory was built near Government House, and three magnetometers, a transit, clocks, and other instruments set up. Lieut. Kay, R.N., was put in charge of the Royal Observatory, which was called Rossbank, lat 42.52, 27.4 S.; long. 147, 27.30 E. Mean magnetic dip, 70deg. 40.5; variation, 10deg. 24.24 E. Here Lieut. Kay took hourly

observations for eight years, Sir John himself helping in the magnetic observations. Mr. Francis Abbott, who had a private observatory in Murray-street, carried on observations tri-daily from 1841 to 1880. Being a member of the Royal Society, he supplied them with monthly meteorological reports, which are published in their yearly report. Observations were taken of barometer, temperature, humidity, clouds, and rain. In 1858, ozone was added. Observations were also started of rainfall, etc., by the Marine Board at the lighthouses under their care, and by gentlemen in different parts of the island, observations being taken in 1864 by Mr. J. Boyd at Port Arthur, Dr. Storey at Swansea, Mr. R. Henry at Tamar Heads. In 1865, by Mr. M. Duncanson at Ross, Mr. F. Belstead at Westbury, and Mr. W. E. Shoobridge at New Norfolk. Mr. Francis Abbott was obliged to relinquish his work in March, 1880, and in 1881 observations were taken only at New Norfolk by Mr. W. E. Shoobridge. In 1882, Captain Shortt was asked by the Royal Society to undertake the work. In March, 1883, a deputation from the Royal Society waited on the Premier, and asked him to establish a Government Observatory. This was done, and the present observatory in the Barracks started under Captain Shortt in 1883, lat 42, 53, 28.3, long. 147, 19.45 E. Captain Shortt remained in charge till his death in 1892."

Professor McAulay said he desired to impress upon the right quarter the very unsatisfactory state of the keeping of time in Tasmania, and the pressing practical importance of an improvement being made. Those who had to do with the keeping of time knew that it was a matter of life and death to some to know the correct time to the half second at least. Accurate time was of the highest importance to navigators, who, if they were a single second wrong in their time, might be out a quarter of a mile. It was a small thing to provide for the simple commercial matter of accurate time, but he did not think that the residents of Hobart at the present realised its importance. The observatory at Hobart had not a clock worthy of the name. The observatory depended upon a private citizen of Hobart, Mr. David Barclay, for reasonable time. There was an antiquated transit, and accuracy to the 100th part of a second could not be secured. The accepted way of announcing the exact time to the public was by the dropping of a ball, but it might be done at 9 o'clock at night by a single electric flash. Two or three instruments, two good clocks, a good transit, and a proper connection between the observatory and the ball would not cost more than £500, and an extra salary would, perhaps, be £50 or £100 more. It was unreasonable for the Federal Government to have taken over lighthouses if they did not provide for the keeping of accurate time in an isolated place like this as well as in other ports of call.

Mr. H. C. Kingsmill, Government Meteorologist, read some questions asked by the Acting Federal Premier in a circular addressed to the State Premiers on the subject of astronomical and meteorological establishments in the various States, and said that a bare answer to those questions would be exceedingly misleading to the Federal Government. Mr. Kingsmill then went on to say that the transit was certainly antiquated; and that when he took charge of the observatory he found the meridian mark out. He recommended that it should be changed, but the cost would be £3, and the money could not be got. (Laughter.) Yet, in spite of difficulties, the Admiral of the Australian station had acknowledged the accuracy of the time signals here. At Tamar Heads, the Melbourne Observatory had been connected with, and it was found that Victorian and Tasmanian time agreed "to the very tick" of the telegraph. This success had been obtained with an expenditure of labour, which would be altogether unnecessary if he had proper apparatus. Practically, the observatory standard time was Mr. David Barclay's clock, with which they had electric connection. As regarded meteorological work, they had ten stations, which sent in daily telegrams, and these were sent on to the mainland to enable the forecasts to be made. There was nothing mysterious about forecasts. They were simply the result of the combination of the barometer, the telegraph, and an army of observers, and were of great value to farmers and passengers by sea. There were 80 rainfall stations over the island, and these sent in monthly reports, and each year a map based upon them was made. Magnetic observations would be of great importance. An instrument in the Isle of Wight communi-

cated knowledge of earth-tremors in any part of the world. That was one of the additional pieces of work that the observatory staff would be glad to undertake, if placed in a position to do so.

Hon. N. J. Brown spoke of the efforts of the late Sir Joseph Abbott and himself at the Federal Conventions at Adelaide, Sydney, and Melbourne to have astronomical and meteorological observations included in the subjects to be dealt with by the Federal Parliament, and of the great benefit these observations were to persons engaged in pastoral and agricultural pusuits. Accuracy and continuity throughout the Commonwealth were important. It was now probable that the whole of the Barrack "Reserve" at Hobart would be placed at the disposal of the inhabitants, and the observatory would have to be removed. But this need not be regretted, as the accuracy of the instruments was interfered with by the ironstone rock of the place. He moved,—"That the Council be requested to arrange for a deputation of its members to wait upon the Hon. the Premier for the purpose of urging that the reply to be sent to the Acting Premier of the Commonwealth to the queries as to the present staff, cost, and equipment of the meteorological establishment of Tasmania should be accompanied with a statement that the present arrangements for astronomical and meteorological observations are altogether inadequate, and that in the general interests of the Commonwealth it will be necessary in the future to provide for a fuller equipment, and a better paid staff, as suggested by Mr. Clement Wragge in his report to the Tasmanian Government, dated August, 1895, and by Commander Purey-Cust, dated April 5, 1894, and laid upon the table of the House of Assembly on July 10, 1894."

Hon. A. Douglas seconded the resolution, which was adopted.

Tasmanian Conchology.

A paper by Mr. C. Hedley, F.L.S., entitled "Notes on Tasmanian Conchology" The author said : — "The study of Tasmanian conchology has been facilitated by an excellent catalogue published last year by the late Professor Tate and Mr. W. L. May in the proceedings of the Linnean Society of New South Wales. Therein certain species ascribed to Tasmania by the Rev. J. E. Tenison Woods were rejected from the fauna chiefly because no later observer had taken them. Though apparently of foreign origin, their exclusion could not be wholly justified until that origin was ascertained. At the invitation of Messrs. A. Morton and W. L. May I undertook their examination. From the result it appears that five West Indian species were supplied to Tenison Woods, which he erroneously described as Tasmanian, and as new to science."

On the "Advantages of Forest Conservation," by Mr. C. B. Target :—

Mr. C. B. Target read the following paper," On the advantages of Forest Conservation" : —

First, as to the term forest. In England a forest is a place reserved for wild beasts of the chase, and is not necessarily covered with timber. In Scotland many of the deer forests have few trees. On the contrary, on the Continent of Europe, a forest is an agglomeration of timber trees divided into two main classes—pure and mixed. The former is when the forest consists of only one species of timber; the latter when there are several kinds growing together.

It is in the Continental sense that the term is used in this paper; also, it relates more to sylviculture ,which refers to woods and forests, rather than to arboriculture, which deals only with woods and plantations. In the one the tree is the unit, and the wood is considered a collection of trees; in the other the wood is the unit, and the trees are considered only as its constituent parts.

In Britain shelter is the primary object of the woods; on the Continent of Europe the material, or pecuniary, product is of primary importance.

In an address by Dr. Tholard, he says:— When the mountains arose in the geological revolutions which gave them birth, they must have presented themselves in the condition of bare rocks or banks of solidified matter, without trace of vegetation. They first crumbled by the action of water; this was followed by a chemical action, due to carbonic acid, which, combining with the alkaline elements of the rocks, decomposed and dissolved them; thus was produced a layer of soil capable of sustaining vegetation; then the first forms of vegetable life ,of which the seeds were air-borne, the roots working downwards and assisting to crumble the rock, and by their decomposition, when they died, improving the soil, till at last large trees could be supported, the seeds of which do not germinate, except on soil which has been previously occupied and prepared for them by other vegetables.

Amongst other things, it has been noticed by Marsh that whenever a tract of country, once inhabited and cultivated by

man, is abandoned by him and domestic animals, and surrendered to the undisturbed influences of spontaneous nature, its soil, sooner or later, clothes itself with herbaceous and arborescent plants, and, at no long interval with forest growth for this three negative qualities, exemption from defect or excess of moisture, from perpetual frost, and from the depredations of men and browsing quadrupeds.

We thus see how the forest grew, and by continually shedding its leaves increased the depth of vegetable soil, till man made the forest give place to the garden and to the fruitful field, produced by man's device. We might thus assume that the sole use of the forest is to produce the soil for agriculture. But all is not gain. Evil as well as good has followed in the wake of the artificial change. Marsh says as follows:—With the extirpation of the forest all is changed. At one season the earth parts with its warmth, by radiation to an open sky; receives, at another, immoderate heat from the unobstructed rays of the sun. Hence the climate becomes excessive, and the soil is alternately parched by the fervours of summer, and scarred by the rigors of winter. Bleak winds sweep unresisted over its surface, drift away the snow that sheltered it from the frost, and dry up its scanty moisture. The precipitation becomes as irregular as the temperature; the melted snows and varied rains, no longer absorbed by a loose and bibular vegetable mould, rush over the frozen surface, and pour down the valley seawards, instead of filling a retentive bed of absorbed earth, and storing up a supply of moisture to feed perennial springs. From the soil being no longer protected, the action of the sun and wind dries up the surface, and forms dust which is washed into the streams, and tends to silt up the rivers forming bars at their mouths, and spoiling harbours made by nature. This state of affairs has been going on since long before the advent of Christianity, and numerous cures have been suggested, till scientific forestry has stepped in to remedy the evil, although vast tracts of forest have been destroyed by natural causes, such as frosts, drought, epiphetic and parasitic vegetable growths, and insects, birds, and beasts.

But to a far greater extent have forests been destroyed by reckless fellings in wasteful exploitations; to some extent have injuries been done by flocks and herds depastured in the woods; and to a great extent have forests been destroyed by fire applied to the clearing away of trees, in order that the ground may be obtained for agriculture, and by fires attributed to accident, but to accident attributable to the carelessness of man.

There must be conservation against destruction occurring irrespective of man's agency, against destruction through man's carelessness, against destruction through man's dishonesty, and with this an improved, more economic, and less wasteful forest exploitation; with which, again, may be conjoined forest restoration, reboisement as a preventive of the formation of destructive torrents and inundations, or to assist rainfall, or arrest and utilise drifting sand.

The climate of countries covered by forests is more equable than that of deforested countries. This benefit derived from forests has been proved in France, Germany, the Cape, and India by simultaneous records inside and outside forests. Where the land is densely wooded the rains may be diffused more or less equably over several months in the year, and may frequently be of a drizzling character, while in a land similarly situated, devoid of trees, rain falls irregularly in what seems like thunder plumps, and in extreme cases whole years may pass without rain, as is the case in the Karoo, South Africa, and Aden, South Arabia; and the rain in the forest land may fall pretty equably over the whole district, while in the land devoid of forests it falls now here, now there; falls, it may be, in torrents, deluging the land, while extensive districts are left dry—both occasioning great inequality in the distribution, even where the quantity of rain falling may be proximately equal; and the inequality in benefit from what falls is made still greater by the torrential occasional rains draining off rapidly to the river beds, and by them to the sea, while the woodlands absorb and retain a much larger portion of what falls on them. And thus is fulfilled what is written: "The earth which drinketh in the rain that cometh oft upon it bringeth forth herbs, meat for those by whom it is dressed, and receiveth the blessing of God; but that which beareth thorns and briars is rejected, and is nigh unto cursing."

The following, by Jules Maistre, would refer to the vine industry in Australia: —"The phylloxera has its propagation facilitated, or has the way prepared for it by the most powerful and most general enemy of this entire region. It is manifest that this is the enemy, which equally with that, or still more, should command our attention and our vigilant watchfulness, and that against which we ought to contend with our greatest energy."

With us it is the enemy not only of the vine, but of all culture: this enemy which successively and progressively has made the peasant to give up the culture of flax, of hemp, of maize, and of grain; this enemy which has constrained

us to substitute for the culture of cereals, which had become almost unproductive, that of the vine, an arborescent culture with deeper roots. This enemy which is increasing every day with greater damage than that caused by the phylloxera is drought.

In Coorg and the Wynaad, and also the Shimoger district of Mysore, India, it was found that the borer was worse where the bamboo had been cut ,so the planters have largely replanted the bamboo, with the result of keeping down the borer, which has helped destroy the coffee industry of Ceylon.

May not the entomologist find that the Californian scale on fruit trees is owing to its natural habitat being destroyed; for surely this pest was in the world before it began to damage apple trees?

Truly man cannot interfere with Nature without suffering sooner or later for his presumption. He may damage, but he has not learnt to improve. Nature will yield a portion of the surface for cereals, but when that area is encroached on too much, drought and floods destroy what man has done, but does not always, or rather seldom, restore the damage done by man.

Now, amongst the advantages derived from forests are the fol owing industries: —Sawmill, buildings, shipbuilding, engineering, farming, carving, paper pulp manufacture, match making, manufacture of cases, boxes for fruit, etc., frames of sieves and drains and cask hoops, wooden wire for table covers, and blinds, pencils, wooden nails, instruments, shovels, spoons, shoes, lasts, saddle trees, staves for barrels, brushes, harrows, gunstocks, furniture ,toys, timber for mines, railway sleepers, etc. In Germany these industries support 3,000,000 people, but owing to the greater frugality of the Germans, the longer hours of labour, and lower wages, no competition could be started against the import of the manufactured article. In wood pulp there is an exception. In a letter from Mr. Henri Ami, of the Dominion Geological Department, he states:—"There is no doubt a big future for Canada in the direction you mention; in fact, the world is looking towards Canada's coniferous forests for its supply of paper for the coming generation, and if Canada will only extensively and vigorously carry out a prudent, provident policy in connection with this industry, as well as lumbering, there is no doubt that we can control the output in years to come. British Columbia has, as you know, fine coniferous forests. May they be everlasting, and they can be so by careful attention, and judiciously enforced legislation." With reference to inquiries as to forestry in the United States, it shows that there was little systematic work carried on except in New York State, and the main conclusion arrived at was, "There were but poor depauperated forests left in the United States just south of us."

Again, from the "Journal of Commerce of New York."—"But the main ground of objection to the privilege Congress has given to the paper manufacturers—the letters of marque and reprisal which Congress has given to the paper trust to prey upon the book and newspaper trade of the country—being frankly stated, a second reason of a very substantial character, is that, although pulp woods are free of duty, for the profit of the paper trust, the duties on pulp and paper stimulate the ruinous consumption of American forests. When forests are cut for timber, the smaller trees are spared, but the pulp men cut everything down to six inches at the stump, so that the spruce forests, ravaged by the paper makers, are not perpetuating themselves."

The National Irrigation Congress, a year and a half ago, and the National Forestry Association, have urged that all public lands, more valuable for timber than for cultivation, should be absolutely withdrawn from sale by the general government.

The efforts now making on a wide scale to preserve the forests do not spring from altruistic regards for the well being of the next generation. So far as the future supply of timber is concerned, the destruction of our forests will only make timber more expensive, and lead to a freer use of metal for the purposes of construction. It is the farmers' need of rain, and the cities' need of drinking water that is inspiring the efforts, legal and scientific, State and National, to retard the destruction of our forests. In England, New York, and the older part of the West, the denudation of the soil has already proceeded, so far as to seriously diminish the volume of the rivers. This has unfavourably affected the water supply of some of our cities, and it is diminishing the evaporation upon which agriculture must depend for its rainfall. It is for the sake of the crops, and for the sake of the water supply of towns that efforts are now making to check the reckless destruction of the forests. The enormous profit the pulp paper men are making, evinced by the capitalisation of the Trust at £11,000,000 sterling, and absorption of mills at a valuation of £5,500 per ton of daily output, which mills, with entirely new machinery, can be erected at 30—40 per cent. of that, offer an immense premium upon the rapid destruction of the forests.

Forests and Reservoirs.—From American "Gardening," October, 1901.—F. H. Newell, Hydrographer, United States Geological Survey, makes a few remarks which should appeal to all who cultivate

the soil. He points out that the full development of the United States, especially of the arid West, rests upon a complete utilisation of the water for irrigation, power, and municipal, as well as domestic supply. Furthermore, as the evaporation of the water, and protection from pollution, both natural and artificial, rests largely upon the proper treatment of the forests at the head-waters of the streams, there can be no question as to the beneficial influence of these forests, although the extent of the influence may be, and still is, open to investigation and discussion. The forests, with the accumulation of vegetation upon the ground, serve to break the force of the rain, and regulate the run-off, excessive soil erosion is to a large extent prevented, and the waters drained from a forest are, as a rule, free from suspended mineral matter.

The Government has set about the protection of forests upon the head-water streams of the West, and Congress has under consideration legislation tending to promote the construction of large reservoirs within or adjunct to the forest reserves. Here are to be found at the head-waters of the streams many valleys whose outlets can be closed by a dam of moderate height, holding back the water from melting snow, or from occasional storms. These natural reservoir sites are being surveyed, and their capacity and cost ascertained. The amount of water available for storage is also being measured, and the facts recorded so as to make it possible to know definitely the benefits to be derived from the construction of these hydraulic works.

One of the sources of anxiety and uncertainty in regard to these reservoirs is the matter of silt and sediment.

The flood waters roll along sand, gravel, and even boulders, depositing them wherever the current is checked. These floods, entering the artificial reservoirs, are brought to a halt, and quickly lay down their load, forming a coating or layer of mud in the reservoir, tending to greatly diminish the storage capacity. If the waters come from forested slopes, where the soil is protected and held by roots, the amount of settlement may be negligible; but if, on the other hand, these forests are cut away, the underwood humus burned, the driving storms soon attack and move the loose earth and disintegrated rock, starting it on its journey down the slopes, to be finally caught in the reservoir below. Thus it happens that it is of the first importance for the prolonged life of the reservoir that every care should be taken to perpetuate the forest cover upon the catchment area, wherever this can assist in holding the soil.

It may be here mentioned, when re-afforestation is out of the question, that when the volume of water in the stream entering the reservoir is so great in proportion to the size of the reservoir that the inertia of the water in the reservoirs is insufficient to arrest the velocity of the stream entering, the remedy is either to make the reservoir larger, or to make a greater number of reservoirs further up the valley before the minor streams have formed one large stream beyond control as to power.

Monsieur Valle, in a work entitled "Etudes sur les inondations," gives a table of floods in the Seine from 1615, showing that the height of the floods has decreased from 8.39 metres to 6.47 metres, and makes this deduction, viz., that the felling of forests gives us—

More rain annually.

Less flood water.

More cultivated land.

But he omits to mention that the Forest Edict of Colbert, made in 1669, was owing to the denudation of forests in France, and that the since then forests have increased, especially the Communal Forests, in the beginning of last century, and the end of the 18th under Napoleon, when, for twenty years, all private felling, without permission was strictly prohibited.

Schlich states that—

The climate of forested countries is more equable than that of deforested countries.

The mean temperature is lessened.

The reduction of temperature may be hurtful where crops do not ripen in time, but very beneficial elsewhere.

As forests moderate extremes of temperature, plants grown under their shelter do not suffer so much from the effects of early frosts or drought as plants growing in the open.

There is an excess of from 3 to 10 per cent. of moisture in a forest.

After allowing for the water intercepted by branches, etc., running down the trunk, 12 per cent. may be allowed as stopped by the forest. Against this, the evaporation in a forest, where there is leaf mould, is only 22 per cent. of that in the open, and this more than compensates for the loss of rain reaching the ground.

As to the effect of forests on slopes, I will give the case of Hoshiapur, in the Punjab, where formerly the hills were covered with forests, but by the act of man, and the grazing of cattle, these forests have disappeared. The treading of sheep and goats has loosened the soil. The soil being no longer bound together by roots, ravines have been formed, the debris actually destroying a part of the town. This is what may possibly happen to any irrigation works started here.

The advantages of sylviculture are:—

1. To yield the timber necessary for certain purposes.
2. To produce the greatest quantity per acre per year.
3. To produce the highest possible money return per acre per year.
4. To produce the highest possible interest on the invested capital.
5. To influence the climate, to regulate the draining of the country, and prevent landslips and avalanches.

The following table gives the results of forest culture in several different countries as far as possible. Only the Crown forests are given, as the results of private forestry are not obtainable, so the areas given are very much less than those of the total areas under forest:—

Return of Crown Forests in Foreign Countries.

Country.	Area in acres.	Expenditure.	Revenue.	Profits.
		£	£	£
Baden	1,120,000	510,000	1,270,000	760,000
Bavaria...	2,500,000	1,230,000	1,800,000	570,000
Prussia	6,000,000	1,050,000	2,100,000	1,050,000
Austria	2,830,000	3,103,000	3,193,000	90,000
France	2,110,000	553,029	1,540,000	1,006,971
The expenditure in France includes roads and plantations.				
Sweden	4,000,000	35,789	56,807	21,018
Forest maintenance in Sweden is only recently started.				

India.

Year.	Area in acres.	£	£	£
95-96	9,657,000	911,161	1,660,504	749,313
96-97		933,855	1,733,869	799,911
97-98		667,617	1,159,676	492,059
98-99		660,478	1,229,912	569,434
99-00		730,175	1,235,425	505,250

The £ in the case of India has been taken, as in the official returns, as Rs. 10 for purposes of comparison. The profit from the forests in 1869 was only £139,971. Since then, although a large portion of the revenue has been spent on reafforestation, yet the revenue has largely increased.

In European countries, which have been chosen as their climate more nearly approaches that of Tasmania, the total acreage of Crown forests is 18,060,000 acres, with a net profit of £3,376,971, or 3s. 10½d. per acre. This net profit, capitalised at 5 per cent. would give £3 17s. 6d. as the average value of each acre, and this is including large areas, of which some are inaccessible, and some valueless for tree planting.

During the last 10 years the country lots of Crown lands sold in Tasmania amounted to 248,924 acres, at an average price of £1 7s. 4¾d.; this, at 5 per cent., would give 1s. 4½d. per acre, so that, even after allowing for the hours of labour being less, and wages being higher than in Europe, twice the amount of the revenue yielded by the investment of the money obtained by the sale would be obtained by a judicious system of forestry on the same land. All the best land is first selected for agricultural purposes, so the price of sale and the small return given for perpetuity is presumably for the best land, whilst the returns for European forests are for all the land, including bad, and in many areas thoroughly denuded of trees, this is especially the case with the Crown forests of Sweden.

According to information kindly given me by Mr. Counsel, the area of the button grass land, which is absolutely worthless for agricultural purposes, is not less than 1,150,000 acres, and as it has been shown that forests are necessary for the climate, which is said to have become colder during the last half century, whether due to the denudation of forests or not, may be questioned by some, but the excess of evidence shows that forests cause milder winters, whilst the intense heat of summer is moderated; for agriculture, grazing, etc., it is necessary to strip a large area of land of its covering of trees, but at the same time they may be replaced elsewhere.

On the basis of a net return of 2s. an acre, and a gross return the same as in Europe, a rise of 26 per cent. may be given for the wages, but as the age at which trees mature in Tasmania is said to be half that required in Europe (see "A Practical Treatise on Tree Culture in South Australia," by J. E. Brown, L.L.S.), the profit may safely be taken as double. The exact profit caused by quicker growth must be more or less left for experience, although the age of timber may be judged by the rings.

Taking the time required for the pine tree to mature in Europe to be 112 years, every £100 of initial cost of planting at

2½ per cent. per annum compound interest would amount to £1,600, whilst if the trees matured in 84 years the compound interest would be £800; but if Mr. Brown's figures be adopted, only £400 would have to be deducted from the sale of the timber planted at a first cost of £100. No allowance has been made for maintenance, as this is met from the sale of the thinnings. In England, where the cost of labour more nearly approaches the rates prevailing in Tasmania, Dr. Schlich, a forest authority, states that allowing 100 years for the growth of the pine and 2½ per cent. compound interest for the money laid out, the result is £185, equivalent to 7s. 6d. per acre per annum after all expenses are paid, so surely with the quicker growth in Tasmania the estimate of 2s. per acre is a very safe one, presuming the trees are allowed to come to maturity. But I would not suggest this, but rather that the button grass land be planted with spruce, Scotch fir, and, as suggested by Mr. Rodway, stringy bark, and that a twenty year rotation be adopted for the stringy bark, as the tree after this would not be suitable for pulp. Allowing only stringy bark to be grown, and assuming that the growth is only that of the spruce, it would take 71,400 acres to supply the American consumption of wood for the pulp industry, estimated at 90,000 tons yearly. Allowing the spruce to weigh when green 40lb. per cube foot, this would give 5,000,000, and the German yield of spruce, 20 years old, is given as 1,400ft. per acre.

For spruce and Scotch fir a rotation of 60 years might be adopted. This would give the yield per acre as 5,400ft., 57,300 acres to supply this requirement annually, and would enable a most profitable industry to be established; an industry that pays so well that the American Paper Trust can afford to give 30—40 per cent. more for an old mill than it would cost to erect a new one with up-to-date appliances.

It is very probable that the button grass land might require some open drains before it be planted, but the advantage would be that we should be exporters instead of importers of deal and pine woods, and also that the oak could be grown as well as the pine by having the tap roots cut when planted, it having been shown by Duhamel that this does not interfere with the growth of the tree, but on the contrary, when the subsoil is sour, the growth is hastened. This has been largely adopted with great success on the Landes in France.

On the sandy wastes on the North-West Coast of Tasmania the Pinus pinaster might be planted with advantage. This would arrest the sand, and large areas of ground recovered for cultivation, leaving belts of pine to prevent the sand again moving, and after the pinaster has run its course, the Scotch fir might be planted, as the soil would then be in a fit state to grow it.

One of the principal products of the Pinus pinaster is resin and turpentine, after which the wood is used for charcoal or firewood. It might, very possibly, having lost its resin, be also good for pulp.

The oak, as well as the pine, would serve to increase the exports, and in compartively few years stop the imports, and cause a large export trade. For, owing to the ruthless manner in which the forests in America are being denuded of timber, the price is almost certain to rise, thus increasing the profit on all timber trees that are now planted.

The oak will find a ready sale for staves for barrels, which are now imported into Australia for the wine industry, and it is to be hoped that the cider industry will soon increase under federation in Tasmania.

One of the principal difficulties in extending the timber trade of Tasmania is decidedly the uncertain quality of the timber. This would, in a great measure, be overcome by the introduction of a Forest Department, for then, instead of the present license system, the trees that would have to be cut would be marked, and sold by auction. The approximate quantity required being estimated by the department, by this means, the trees would be ringed at the proper time. I am informed that the period for the rise and fall of the sap varies with the ages of the tree. Facilities would be given for carting the timber, or else it would be felled by the department, and the tress taken to a depot, and then sold. This latter system is in force in many parts of India.

For maintenance the usual average is 5 days work per acre, or from 40—60 acres per man. This, on an estimate of 600,000 acres, being carefully looked after, would require 10,000 men; thus an extra population of 30,000 people would be supported, exclusive of sawmills; whilst making, preparation of turpentine, etc., would support some thousands more.

The total yield of an acre of spruce, 60 years old, after adding the amount given by the thinnings, may be taken at 8,250ft., so that after allowing 25s. a year for labour, any price over 2½d. per cubic foot would be profit (5d. per foot is allowed in England). No allowance has been made for the rapid growth of spruce in these colonies, as it has been left for a margin of safety, as these are

only approximate figures taken from the yield given in German forests.

There is one matter to which I must draw attention, that is the scale of charges levied to give animals a free right to destroy young trees, which varies from 1s. 6d. for a horse, to 3d. for a goat, one of the most destructive, if not the most destructive animal that can be turned into a forest, except, perhaps, a camel.

The great necessity for a Forest Department is to see that the young trees which make the forest of the future are cared for. Without this a forest is either destroyed by being cut down, or, in due course, it perishes naturally, and disappears of itself. In either case the result is deeply to be deplored, for when once a forest disappears it can only be replaced at a great expense of time and money.

As a proof of what has already been effected in India by forest officers educated in European schools, I may mention that in 1884 there were in that country 9,820,000 acres of reserved forests, the whole of which are managed on the principles taught in the European Schools of Forestry, and 2,493,000 which are protected from fire, as well as cattle and sheep grazing, and goats, and consequently are now in a condition to reproduce themselves, under the natural system, and as perhaps the most convincing proof, from a financial point of view of the value of the system, the forest revenue, which in 1870 was £357,000, of which £52,000 was profit, in 1830 reached £545,000 with a net profit of £215 000; and in 1900 the gross revenue was £1,235,425, with a net profit of £505,250. These figures speak so very eloquently that no comment is needed.

A Forest Act was passed in South Australia in 1878, and in 1883 a quarter of a million trees were planted out, and the forest revenue amounted to £6,517, against an expenditure of £6,200. Last year the revenue was £14,421; the expenditure, as far as can be seen from the Blue book, £12,675.

Why cannot we also secure the preservation of our forests, and plant, when forests are destroyed for the purpose of of agriculture, to restore, or rather maintain, what Nature has done to render the Tasmanian climate one of the most perfect in the world.

Adjourned Discussion.

A proposed discussion on Mr. Heyn's paper was postponed till next meeting.

Vote of Thanks.

On the motion of His Excellency, a vote of thanks was passed to those who had read papers.

The proceedings then terminated.

List of works presented to the Royal Society's Library during the month of June:—

Atti della Reale Academia dei Science, Roma, current numbers, from the Society.

Records of the Australian Museum, vol. VI., No. 6. From the Trustees.

Journal of the Linnean Society, London, vol. XXVIII., Zoology, No. 184, XXXV., Botany, No. 244. From the Society.

Proceedings of the Geographical Society of Australasia, 1st session, 1885-6, vol. I.

From the Society. Notes sur les Fourmis et les Guepes Extracts des Comptes rendus des Seances de l'Academie des Sciences. Rapports des Animaux. Myrmecophiles avec les Fourmis, 1897. Liste des Travaux Scientifiques. Les habitations a Bon Marche dans Villes les de Moyenne Importance. Sur l'Emploi de Desinences. Caracteristiques dans les Denominations. des groupes etablis pour les Classifications. Recherches sur L'Anatomie de la Fourmi et essai sur la Constitution. Morphologique L'Esthetaque dans les Sciences. De la Nature. From the Academie, Paris.

Contribution to Canadian Palæontology, vol. II., part 2. "Canadian Fossil Insects," by S. H. Scudder. Additions to the Coleopterous fauna of the Interglacial clays of the Toronto district. With an appendix, by A. D. Hopkins, on the Scolytid borings from the same deposit, vol. IV., part 2. A revision of the genera and species of Canadian Palæozoic Corals, the Madreporaria aporosa and M. rugosa, by L. M. Lambe, F.G.S. Catalogue of the Marine Invertebrata of Eastern Canada, by J. F. Whiteaves, LL.D., F.G.S. From the Geological Survey of Canada.

Journal of the Agricultural Department of Victoria, vol. I., part 6, 1902. From the department.

A Trencsen Varmegyei Termeszettud Qmanyi Egylet, 1900-1. From the Society.

The Quarterly Journal of the Geological Society, vol. LVIII., May 15, 1902, No. 230. From the Society.

The "Emu," vol. II., No. 1. From the Society, Melbourne.

The Indicator on Gold Mining, No. 3,

the Creswick Field and its Mining, by W. Bradford. From the editor, Ballarat.

Bulletin of the Museum of Comparative Zoology at Harvard College, vol. XXXIX., No. 2; "Chiriqui Mammalia," by Outram Bangs, vol. XL., No. 1; Changes accompanying the migration of the eye, and observations on the Tractus opticus and Sectum opticum in Pseudopleuronectes americanus, by S. R. Williams. From the Society, Mass.

The Gums, Resins, and other vegetable exudations of Australia; Useful Australian Plants; Notes on Eucalyptus trees, from the point of view of the Bee-keeper; Some Australian Vegetable Fibres; The Cork Oak (Quercus suber), a useful tree for New South Wales; Records of the Sydney Botanic Gardens, by J. H. Maiden, Director of the Botanic Gardens, Sydney. From the author.

A list of plants collected in the vicinity of the Jenolan Caves, by W. F. Blakely and J. C. Wiburd. From the Director of the Sydney Gardens.

Memoirs and Proceedings of the Manchester Literary and Philosophical Society, vol. 46, part 5, 1901-2. From the Society.

The Geographical Journal, May, 1902, vol. XIX., No. 5. From the Society, London.

Catalogue of New and Recent Books, April list. From Henry Froude, London.

The Scottish Geographical Magazine, vol. XVIII., No. 5, May, 1902. From the Society, Edinburgh.

Journal of the Society of Arts, May, 1902. From the Society.

The Year Book of the Royal Society, London. From the Society.

The Ibis, April, 1902.

The Victorian Naturalist, vol. XIX., No. 2, June. From the Society.

Proceedings of the Royal Society of Queensland, vol. II., parts 1 and 2, vol. III., vol. V., parts 3 and 4, vol. VIII., parts 2, 3, and 4, vol. XI., vol. XVI. From the Society.

Proceedings of the Royal Society, London, vol. LXX., No. 459, May 12, 1902. From the Society.

Monthly Notices of the Royal Astronomical Society, vol. LXII., No. 6, April, 1902. From the Society.

HOBART OBSERVATORY AND ITS WORK.

DEPUTATION TO THE PREMIER.

A large deputation, representing the Royal Society of Tasmania and other public bodies at Hobart, waited upon the Premier, the Hon. N. E. Lewis, C.M.G., on Tuesday, June 17, 1902, with respect to the work of the Hobart Observatory.

The Hon. Nicholas Brown said it was known that the Federal Government had been in communication with the Premier of Tasmania on the subject of the Observatory at Hobart, and it was thought that, in reply, to furnish mere facts would be somewhat misleading. Neither the staff nor the equipment of the Observatory was satisfactory. There was in existence a report upon the subject from Mr. C. Wragge, of Queensland, who visited Tasmania some years ago, which stated what was wanting. Mr. Wragge stated that £600 would be sufficient to provide the necessary staff and properly equip the Observatory for its work. At a meeting of the Royal Society, held on the 10th, the following resolution was adopted:—"That the Council be requested to arrange for a deputation of its members to wait upon the Hon. the Premier for the purpose of urging that the reply to be sent to the Acting Premier of the Commonwealth to the queries as to the present staff, cost, and equipment of the meteorological establishment of Tasmania should be accompanied with a statement that the present arrangements for astronomical and meteorological observations are altogether inadequate, and that in the general interests of the Commonwealth, it will be necessary in the future to provide for a fuller equipment, and a better paid staff, as suggested by Mr. Clement Wragge in his report to the Tasmanian Government, dated August, 1895, and by Commander Purey-Cust, in his report, dated April 5, 1894, and laid upon the table of the House of Assembly on July 10,1894." He handed copies of these two reports to the Premier, and urged, on behalf of the Royal Society, that the Acting Premier of the Federal Government may be fully informed as to what would be required to be done both as to astronomical and meteorological equipment before the Tasmanian Observatory can do its work effectively as part of a general national organisation.

Mr. A. Morton read the following letters, which had been received on the subject of the deputation:—

"Bushy Park, June 14, 1902. Mr. A. Morton. Dear Sir,—As I am afraid I cannot be at the deputation on Tuesday, I am sending a record of Mr. Wragge's disturbances. I have had to rule the paper, and the readings of barometer are marked

twice a day, and connected by pencil mark, showing curves of depressions. The names of disturbances are written down as soon as advertised, and, as I estimate their speed at 300 to 400 miles a day, they are often entered five to seven days in advance, and form a very reliable forecast of the weather. They always come as foretold, but sometimes go north or south of Tasmania. It depends on what part of the depression passes over here whether we get more wind or rain, and this can be known by the steepness of the waves. You will notice by the records that a wave is mostly followed by a smaller or half-wave, and it is during this small wave that most of the rain falls. By carefully watching the progress of the waves, in conjunction with the forecasts, a fairly reliable estimate of coming weather can be made for three or four and sometimes six or seven days, in advance. I need not say how important this is for all farming operations, and in scores of instances we have planned our work in reliance on these records, and have very seldom been disappointed. The most disturbing element is easterly or south-easterly weather. The rain from that quarter mostly coming with a high barometer. The black marks at bottom lines indicate the rainfall, each line being the tenth of an inch. If these sheets could be provided, anyone with a barometer and rain gauge could record the readings and rainfall, and, in conjunction with Mr. Wragge's forecasts, could form a fairly reliable estimate of coming weather. Much more might be done by giving more detailed information as to the course and velocity of the disturbances. I can only hope that, instead of lessening the information given, it will be increased, to the great benefit of agriculturists.—Yours, etc., W. E. Shoobridge.

"Launceston Hotel, June 16, 1902. Dear Morton,—I am sorry that I shall not be at the deputation to-morrow re the meteorological service. I am heartily in accord with the objects in view; not only as absolute necessity from a national point of view, but as a matter of great interest and use to the general public. A great nation should not exist without a great meteorological service.—Yours, etc., W. V. Legge."

Professor McAulay, M.A. (Tasmania University) spoke strongly of the necessity of keeping accurate time in Hobart, so that mariners would be able to regulate their chronometers. Hobart was at the present day an important shipping port, and promises soon to be still more important; also it is a port of call for large ships two days out from a port (Sydney) where they have accurate time indicated. These ships subsequently have a voyage of many days before again reaching a port where time is accurately kept. Chronometer rates are different when at sea from what they are on board. Navigators require in Hobart to have Greenwich time to be given to them just as accurately as it can be obtained. Thus a tenth of second error in Hobart may mean several seconds error at a time when a large ship is reaching a dangerous coast, and this may mean all the difference between safety and danger. The matter is, therefore, clearly one of Federal interest. The equipment in Tasmania for keeping time is altogether inadequate to fulfil the requirements above indicated. There is not even (1) a modern transit instrument, nor (2) a reliable clock. Two citizens are practically supplying (the one by electric connection with the Observatory, and the other by the loan of a ship's chronometer) the deficiency in the matter of clocks. Also for utilising the proper equipment for obtaining time accurately it is essential that, at least, one observer should be paid, whose first duty should be to thus make time observations. The State Government ought to provide for two matters recommended by Commander Purey-Cust, R.N., in the paper referred to by the Hon. N. J. Brown. The one is to make permanent, by a suitable inscription, the standard of longitude, left us by the American astronomers, who observed the transit of Venus. The second is to provide for the Observatory a permanent meridian mark.

Mr. H. C. Kingsmill, M.A., Meteorological Observer, said that the Royal Society of Tasmania had brought into notice two forgotten reports, one of which dealt with the meteorological work of the Observatory by Mr. Wragge, the other by Captain Purey-Cust on the astronomical work. The authors of these reports were admittedly experts of the highest class, they were specially invited by the Tasmanian Government to supply the information which they gave, and they spared no pains in making themselves acquainted with local conditions. Mr. Wragge spent two months in Tasmania, visiting every observing station, and suggesting and making improvements at each. Captain Cust spent a month at the Hobart Observatory, testing all the astronomical instruments, taking observations, and checking the calculations of the Government Meteorologist. It would be interesting, said Mr. Kingsmill, to know what has been recommended by these experts, and how far their recommendations have been carried out. Such information is especially necessary at the present time, when the question of a

transfer of observatory work to the Commonwealth Government is under consideration. It appears from what transpired at the meeting of the Royal Society on the 10th inst. that the conditions which Captain Cust and Mr. Wragge reported as necessary for the efficient conduct of the astronomical and meteorological work of the Observatory have never been provided by the Government, either as to staff or equipment. Consequently, as the Hon. N. J. Brown has pointed out, it must be made clear to the Commonwealth Government that if a transfer is made, additions to both will be required. The difficulty of the situation is enhanced by the pressing necessity for retrenchment at the present time. All are agreed as to the desirability of placing the Meteorological Department on a better footing. It seems to have been considered in the past that the department, having to deal with atmospheric phenomena, should live on air. This idea led to its being nearly starved out of existence. Yet if the work is required, it should be paid for, and the payment should bear some proportion to the skill and experience necessary to the attainment of scientific accuracy. Few who have not been trained in science, Mr. Kingsmill pointed out, can realise the quantity of labour necessary to ensure accurate results, or the worse than useless character of work in a scientific department that is nearly right, but not quite. For example, a small mistake in the time-service is more puzzling, and more likely to be misleading, than a large error, which would be obvious. What then is to be done? The most practical appears to be, that arrangements should be made for a conference of the Directors of Observatory work in the different States, and that they should be assigned the task of preparing a scheme which will satisfy both general and local requirements. There is no insuperable difficulty in the preparation of such a scheme; the problem is identical with one which has been already solved in the Dominion of Canada. There was a time, said Mr. Kingsmill, when each Province in the Dominion had its own seperate time service, and meteorological service, such as it was. Now, there is one central office in Toronto, which receives weather telegrams from over three hundred observing stations throughout the Dominion. Forecasts are issued daily from the central office to all the Provinces. A similar system prevailed in the United States, only on a greater scale. No meteorological service in the world was better organised than that of the United States, and on none was there so large an expenditure. Yet it is a productive expenditure, and it has often happened that a saving has been effected by the timely warning of a single storm, which would more than cover the cost of maintaining the service for a year. What has been done both in Canada and the United States, with signal success, can be done, and ought to be done, in this State. He would, in conclusion, most strongly submit for the Hon. the Premier's consideration the advisability of urging that a conference of meteorologists be appointed at an early date.

Mr. A. Risby, Warden of the Hobart Marine Board, supported the object of the deputation.

Mr. John Macfarlane (President of the Hobart Chamber of Commerce) urged that the work of the Observatory, if properly carried out, was of great importance to the shipping. The forecasts of weather, as given to the fishermen in the old country, were largely the means of saving life.

The Rev. J. B. Woollnough, M.A., M.H.A., asked had the Premier received any communication from the Federal Government as to giving Mr. Wragge facilities for his work, as we had been doing?

The Premier said he had received a telegram from Mr. Philp, Premier of Queensland, saying that if free telegrams and postage were conceded, Mr. Wragge's work could be carried on for £2,000 a year, and asking would the various States contribute that amount. He had replied, asking for information, and saying that if Tasmania's contribution was to be on a population basis, he would submit to Parliament a favourable proposal. South Australia had refused, and New South Wales had agreed to contribute. He understood that the Federal Government were willing to concede free postage and telegrams. He also understood that the Federal Government would consider in the recess—if there was one—(laughter)—the question of taking over the meteorological service. In writing to Mr. Deakin, he would bear in mind all that had been said by the deputation. He was afraid the time was not opportune for asking this Government to provide new instruments for our Observatory. He would suggest to Mr. Deakin the conference spoken of by Mr. Kingsmill.