

1883.
NEW ZEALAND.

NEW ZEALAND INSTITUTE, 1882-83

(FIFTEENTH ANNUAL REPORT OF).

Presented to both Houses of the General Assembly by Command of His Excellency.

THE Board held meetings on the following dates: 8th August, 25th October, 1882, 15th January, and 20th March, 1883.

The members elected under clause 7 of the Act are: The Hon. Mr. Rolleston, Mr. J. McKerrow, and Mr. Martin Chapman. The following gentlemen were elected honorary members of the New Zealand Institute: Sir William Thomson, F.R.S., Dr. W. B. Carpenter, F.R.S., C.B., and Mr. R. L. Ellery, F.R.S.; there now being twenty-seven honorary members and three vacancies.

The members now on the roll of the Institute are: Honorary members, 27; ordinary members—Auckland Institute, 320; Hawke's Bay Philosophical Society, 108; Wellington Philosophical Society, 289; Westland Institute, 87; Philosophical Institute of Canterbury, 163; Otago Institute, 178; Southland Institute, 62: total, 1,234.

The printing of Volume XV. was commenced on the 10th January and finished early in April, the first issue of the volumes being made about the 17th May. The volume contains sixty-two articles, also Presidents' addresses and abstracts of papers, which appear with the Proceedings and Appendix. There are 586 pages of letter-press and forty plates. The following is a division of the contents of the volume for comparison with that of last year:—

	1883.	1882.
	Pages.	Pages.
Miscellaneous	90	200
Zoology	236	144
Botany	124	104
Chemistry	—	16
Geology	60	52
Proceedings	26	54
Appendix	50	40
	<u>586</u>	<u>610</u>

The volumes now in stock are: Vol. I. (second edition), 400; Vol. II., none; Vol. III., none; Vol. IV., none; Vol. V., 48; Vol. VI., 47; Vol. VII., 146; Vol. VIII., 18; Vol. IX., 150; Vol. X., 8; Vol. XI., 60; Vol. XII., 65; Vol. XIII., 68; Vol. XIV., 90; Vol. XV., not yet fully distributed.

From the Honorary Treasurer's statement of accounts it will be seen that there is a balance in hand of £77 14s. 7d.

The annual reports of the various departments connected with the Institute are appended.

Approved by the Board.

WM. F. DRUMMOND JERVOIS, Chairman.
3rd August, 1883.

JAMES HECTOR,
Manager.

NEW ZEALAND INSTITUTE ACCOUNTS, 1882-83.

<i>Receipts.</i>		£	s.	d.	<i>Expenditure.</i>		£	s.	d.	
To Balance in hand, 8th August, 1882	..	5	11	10	By Balance due for printing Vol. XIV.	..	19	18	2	
Vote for 1882-83	..	500	0	0	Printing Vol. XV.	..	508	0	0	
Contribution from Wellington Philosophical Society, one-sixth of annual revenue	..	23	17	6	Binding	1	17	6
Sale of volumes	..	5	5	0	Purchase of second-hand volumes of Transactions, New Zealand Institute, 4 volumes	2	2	0
Draft from London agents, sale of volumes	..	80	0	0	Miscellaneous items, contingencies, &c.	..	10	2	1	
					Balance	..	77	14	7	
		<u>£619</u>	<u>14</u>	<u>4</u>			<u>£619</u>	<u>14</u>	<u>4</u>	

3rd August, 1883.

ARTHUR STOCK, Honorary Treasurer.

MUSEUM.

The estimated number of visitors to the Museum during the year is 36,180, of whom a large proportion visited the institution on Sunday afternoons.

NATURAL-HISTORY COLLECTIONS.

The whole of the collections of stuffed skins have been examined and thoroughly cleaned by the Taxidermist. No extensive additions have been made to this section, chiefly because it has now become impossible to display, or even to store, such collections properly, owing to the crowded state of the Museum.

Pisces.—Under this head it may be mentioned (1) that specimens of *Retropinna richardsoni* and *Agonostoma forsteri*, caught with a rod four miles up the Hutt River, were presented by the Hon. P. A. Buckley, M.L.C.; (2) a specimen of *Agriopus leucocephalus*, presented by Mr. H. Hawke, of Picton; (3) a jar of fish, received from Mr. T. S. Sandeyer, of Tiritiri, Auckland; (4) a young specimen of the torpedo (*Torpedo fairchildi*) and the Skipper (*Schombressox forsteri*), presented by Mr. C. H. Robson, of Napier.

Aves.—A fine specimen of the egg of the huia (*Heteralocha acutirostris*), presented by Mr. G. M. Hewson, and a specimen of the South Island thrush (*Turnagra crassirostris*), presented by Mr. Geddall, of the Government steamer "Stella," are the most noteworthy under this head. Collections of New Zealand birds have been forwarded to Mr. H. Wharton, England, and to the Australian Museum, Sydney, as exchanges.

Reptilia.—Several species, new to New Zealand, have been determined by the Museum Assistant, and a description of them will appear in Vol. XVI. of the Transactions of the New Zealand Institute. Collections of New Zealand lizards have been sent to Professor Pohlton, of Oxford, and Mr. H. Wharton, England.

Invertebrata.—Twenty-two species of echinodermata and nine of crustacea, presented by Professor von Haast, of Christchurch, have been added to the type collections. A cuttlefish, *Tremoctopus robsoni*, which adds a new genus and species to the New Zealand list, has been presented by Mr. C. H. Robson. The Hectocotylus was found in the pouch of the female, which adds to the value of the specimen. A collection of mollusca, New Zealand and foreign, has been presented to Mrs. Whitaker, of Auckland, in exchange for some northern species. The New Zealand land shells belonging to the Museum have been rearranged and named by Professor Hutton, who, at the same time, has rendered the collection more complete by the addition of some of his new species.

ETHNOLOGICAL.

The most important addition to this section is a Malocolo skull, presented by Mr. F. J. Barnett. The skull is remarkable, showing as it does that there is a tribe in Fiji which, like the Caw-we-litcks Indians, flatten the top of the head in childhood.

MISCELLANEOUS.

Extensive additions have been received under this head, among which may be mentioned forty-four samples of artistic earthenware, made and presented by Messrs. Austin and Kirk, of Christchurch; a black vase, glazed with New Zealand manganese, presented by Mr. Hart, of the Press, Christchurch; Japanese ware, presented by Captain Ito, of H.M.S. "Riujo;" iron, made from Onehunga ironsand, presented by Messrs. Chambers and Co.; olive oil, made from olives grown at Kawau, presented by Sir George Grey, K.C.B.; portrait of Sir David Monro, deposited by Mr. C. Monro; and Chinese ware, deposited by Mr. T. W. Kirk.

The collection illustrating industrial art in the colony has received further additions by a valuable donation of terra-cotta ware, made by Messrs. Boyd, of Auckland, the detailed list of which will appear in next year's report.

Amongst the articles sent from the Museum, either as presentations or exchanges, may be mentioned a collection of New Zealand auriferous quartz to the Perth Museum; a large collection of rocks, fossils, and casts to the Oamaru Museum; New Zealand tanning barks to Messrs. Lightband, Allen, and Co., Christchurch, and to Messrs. Krull and Co., Wellington.

GEOLOGICAL SURVEY.

During the past year the survey has been extended in various districts, and the result embodied in reports, illustrated with maps and sections, which are published, as is usual, in a separate form. A stay of some weeks in the interior of Otago, in connection with the observation of the transit of Venus, afforded me an opportunity of re-examining the auriferous gravels and the associated strata of the Manuherikia and Upper Clutha Plains. The result confirmed my first expressed opinion that the excavation of these wide valleys dates from a very early period, and prior to many important dislocations of the basement rocks. Further, that the deposits by which they have been filled up belong to various ages, and that the source of the alluvial gold is to be found in the earliest formed of these deposits—in which the gold is irregularly distributed, so that it can only be extracted by the process of hydraulic mining. That enormous quantities of alluvial gold still remain untouched in this form in the above district is beyond doubt, but experience shows that it is only under circumstances favourable for obtaining a sufficient supply of water and a good fall for the enormous volume of *débris*, or tailings, that the gold can be profitably extracted. At Tinker's Gully, Drybread, St. Bathans, and other places along the west side of the Manuherikia Plain, the older auriferous gravels have been tilted at high angles, and thus brought into a favourable position for being worked. In other places where they are below the general drainage level of the basin, although equally rich, they could not be profitably worked.

For hydraulic mining abundant water-supply is required, and could without much difficulty or expense be obtained from the Clutha River, which has a sufficiently rapid fall to afford power to raise part of its own water to an altitude that would command the terraces. Any expenditure for such a purpose would be of great ulterior advantage to the district, as there are very considerable tracts of land suitable for agricultural occupation if they were irrigated. The proof of this is to be seen in many parts of the district where water-races abandoned by the miners have been utilized for gardens and fields with the most gratifying results, even when the soil presents no marked superiority. The dry climate, and marked difference of the temperature of winter and summer, and day and night, which is so characteristic of this district, is all in favour of successful cultivation if irrigation were afforded; and the destructive effects of the high winds might easily be mitigated by the growth of plantations, as trees flourish vigorously wherever there is even a small trickle of moisture. The claim of the district for expenditure on water-supply therefore appears to me to be better founded than in many other districts, where it would have no ultimate advantage beyond the extraction of gold.

Other parts of the Otago District were visited during January and February with special objects, and the remainder of the season was spent in the Taupo and Rotorua Districts on business relating to the general examination of the district and particularly to the utilization of the thermal springs.

Mr. Cox was engaged during the months of October, November, and December on an examination of the district lying between Collingwood and Big River, along the coast-line, and bounded to the eastward by the Aorere River. He reports that the well-known black slates of the Perseverance Mine appear to be represented near the Golden Ridge Mine at Slaty River, Anatori, and at this latter locality he obtained specimens of *graptolites* which would place these beds as Silurian in age. The Golden Ridge Mine is worked in similar beds, and, notwithstanding the fact that very little systematic work has been carried on there, the reef has yielded much richly auriferous stone, and would, he thinks, prove of great value if worked on a wider basis. In the vicinity of Big River and the Turimawivi he mapped the boundary of the granite, which extends from Rocks Point northwards, and, occurring nearly at the mouth of Big River, forms a narrow strip inland, which is not seen on the surface further than the Turimawivi, where it ends, as a conical hill, at the head of Independent Creek. He further examined the coal measures, eliciting little further information than was previously known; but, from the limestones which overlie the calcareous sandstones of Kaipuhe cliffs, obtained bones of the giant fossil penguin, and he traced the boundaries of the different members of this Cretaceo-tertiary formation. The rocks in which the Golden Ridge Mine is worked appear to extend southwards through Friday and Independent Creeks, and form the greater part of the Wakamarama Mountains, being again met with on the Gouland Downs; it being from this district that Mr. Cox considers the auriferous cements were derived which have been worked on the quartz ranges near Collingwood, and which are probably contemporaneous in age with the Pliocene marls, which occupy a considerable area along the present course of the Aorere River and form the low hills along the coast-line between Takaka and Pakawau. During January, February, and March he was engaged on an examination of the Upper Buller District, between Rotoiti and the Maruia River, in order to determine the extent of the coal measures in this direction and the thickness and value of the coal. He reports that they occur flanking the crystalline rocks which occur in Mount Murchison, and extend from there along the western flanks of the Spencer Mountains as far as the Matakītaki River, from which point foliated and talcose schists are found, also flanked to the westward by coal-measures. The coal-measures occupy the greater part of the area between the line indicated and the mouth of the Matakītaki River, at Hampden, being thrown into several sharp anticlinal and synclinal folds, lapping, at places, round bosses of granite; the coal seams hitherto discovered vary from 2 feet 6 inches to 4 feet in thickness, and are of very superior quality. The upper beds of the coal-measures consist of heavy beds of conglomerate, on which rest marly beds, and it is probably from this conglomerate that a large proportion of the gold in the Mangles has been derived and not from reefs in the vicinity. At the base of the foliated and talcose schists in the Alfred River, Maruia, Mr. Cox found white and blue crystalline limestones interstratified with blue calcareous slates and carbon-schists, which resemble the Lower Devonian beds at Ræfton. During May Mr. Cox further examined the beds at the Whau, Auckland, in order to see if any prospects existed of coal being found there, but reported that nothing fresh had been discovered and there was no probability of coal being found.

Mr. McKay was engaged on Museum work until November, when he went to Oamaru, and was engaged until the latter end of December in making a collection of rocks and fossils, which were to form the nucleus of a museum at Oamaru, and examining the strata between there and the eastern slopes of the Kakanui Mountains. He endeavoured to prove the identity of the Shag Point and South Canterbury coal fields by means of their fossils, but failed to trace them farther south than the Kakanui River. He examined the chalk deposits at Cave Valley, and traced them south to Kakanui, opposite Mahemo, where they alternate with beds of Ototara stone and associated floes of basalt. Further south he examined the coal beds in the neighbourhood of Otepopo and the eastern slopes of the Kakanui Ranges to the Kurow River, and determined the rocks there as belonging to the Kakanui formation. Further west he examined the Otepopo slate quarries on the boundary of the Te Anau series, and thence proceeded to Moeraki and the district which has lately been bored, unsuccessfully, for coal, and on the western section where these beds crop out no trace of coal could be found. At Lyttelton he examined the deposits exposed in the cuttings for the new dock, and determined them as true loess, the proof being found in the occurrence of rootlets from the base of the beds upwards, while at Hillsborough the evidence was yet more conclusive. At Timaru and Oamaru he examined beds of similar origin, and found that in these localities the materials of which they are composed are not of local origin, as is evidenced by the presence of mica. At the mouth of the Kakanui River he traced the so-called gem-stones, which consist chiefly of pyrope, olivine, and augite, to their parent rock in the Waireka tufas, which it appears the Hon. Mr. Mantell had

previously discovered as far back as 1850, when he called the cliffs on the south side of the Kakanui River the Ruby Cliffs. In the neighbourhood of Palmerston he examined the section across the Horse Range, finding the Port Chalmers breccia at the base of the Shag Point series, and occurring along the line of fault previously described by Mr. Cox. He collected specimens at Waihemo, Green Valley, and Pigroot, those from Green Valley being identical with the fossils of the coal beds in the Waitaki Valley. At Naseby he examined the shaft and surrounding country in Hogburn Creek, where the Deep Sinking Prospecting Company is situated; this shaft has proved nothing more than could be equally well seen from the surface. There is yet another hundred feet to sink before reaching the main bottom, where there is a good prospect of gold occurring. He examined the country from Clarke's to the Kyeburn Diggings, and found the rocks there to belong to the Te Anau series. In the neighbourhood of St. Bathans he found small patches of volcanic rocks in the Manuherikia Valley, breaking through the old lacustrine deposits of the district. He then made a further collection of fossils from Nugget Point, obtaining some important additions to the fossils of that district, including an ammonite about 18 inches in diameter across the chambered portion, which would give a diameter of about 3 feet for the perfect shell. In the neighbourhood of Catlin's River he examined the Mataura beds, in which boreholes had been put down for coal with unsatisfactory results. He found nothing which leads him to suppose that workable seams of coal will be found here, the conditions being similar to those at the Toitois and Hokonui Ranges. During May he visited the Wairarapa, and made an examination of the Cretaceous rocks along the coast, the most important discovery made being a series of volcanic rocks occurring as dykes, and sheets in them. In June he visited the Terawhiti Gold Field, and made a general examination of the district, paying special attention to the Golden Crown claim, in which the reefs appear to be very broken, but unquestionably containing a percentage of gold which will be remunerative if the reefs hold.

COLLECTIONS.

During the intervals of field work Mr. Cox has been engaged on an examination of the New Zealand minerals, and has embodied the results of his work in two papers, read before the Wellington Philosophical Society, in which he has scheduled all the minerals which are yet known in New Zealand. The total number of varieties mentioned is 74 metallic and 134 non-metallic minerals, making 208 in all. He has since been engaged on an examination of the rocks, and is grouping and classifying them prior to description. He has also completed the classification of a fine collection of foreign minerals, including a valuable series presented some years ago by the Director of the Geological Survey of Canada, which has hitherto been inaccessible for reference. The examination of very large collections of New Zealand rocks has also been commenced, about fifty selected specimens of volcanic rocks having been sliced and prepared for microscopic analysis, and about a thousand specimens critically examined. During the past year collections of fossils have been made at twenty different localities, chiefly from Tertiary and Cretaceous-tertiary strata. The collections are not yet fully worked out, but the number of specimens added to the Geological Survey collections in the Museum cannot be short of 10,000 fossils. Nearly 9,000 of these came from a single locality. The remaining collections, not numbering more than 1,300 specimens, are, though small, very valuable additions to our knowledge of the fauna of the beds from whence they came.

PUBLICATIONS.

The Seventeenth Museum and Laboratory Report (68 pages 8vo.), and the Fifteenth Progress Report of the Geological Survey, have been distributed. The following are in the press: (1) New Zealand Handbook, 3 Ed., Dr. Hector. A new geological map has been prepared to accompany this work, and printed in colours, in the General Survey Lithographic Department; and a copy of the map, together with explanatory letterpress, has been forwarded to the Agent-General for incorporation with a smaller work which he is publishing in London. (2) The Sixteenth Progress Report of the Geological Survey, 1882, by Dr. Hector, with maps and sections, and including special reports on the Norsewood Lignites (Cox), on the Gold Fields of Cape Colville Peninsula (Cox), on Deep Alluvial Gold Mines in Westland (Cox), on the Geology of Shag Valley (Cox), on the Malvern Hills Coal Mines (Cox), on the Collingwood District (Cox), on Motunau District (McKay), on the Antimony Lode, Carrick Ranges (McKay), on Langdon's Reef (McKay), on the Terawhiti Reefs (McKay), on the Antimony Lode, Reefton (McKay), on the Geology of the Reefton District (McKay). (3) The Meteorological Reports for 1880-82 are being included in one volume, which is now in an advanced state of preparation, and will be illustrated by diagrams showing the changes for each month.

LIBRARIES.

The libraries remain on the same footing as hitherto, and appear to be greatly appreciated. But, as in all other parts of the Museum, the want of sufficient space creates great inconvenience to the public.

New Zealand Institute Library.—There have been 275 volumes received this year, chiefly in exchange for the Transactions of the New Zealand Institute and the publications of the Museum and Geological Survey.

Public Library.—The number of persons using this library is steadily increasing. Twelve more, out of the large number of volumes missing when the library was removed to the Museum, have been recovered by the Librarian.

Patent Library.—It would seem that the vast amount of information contained in this library is becoming more generally known, as the number of persons referring to the volumes is much larger than last year. Twenty-one volumes have been added since last report.

METEOROLOGY.

The meteorological observations now taken for statistical purposes are limited to stations at Auckland, Wellington, Lincoln, and Dunedin, but observation of rainfall, temperature, and wind-direction are received from the following third-class stations, twenty in number, viz., at Petone, Makara, Upper Hutt, Summit Station, Wellington, Masterton, Feilding, New Plymouth, Wanganui, Palmerston North, Christchurch, Puysegur Point, Cape Campbell, Oamaru, Timaru, the Brothers, Farewell Spit, Leefield, Marlborough, Brighton, Otago, Taupo, and Invercargill. The results are published in most cases every month either in the *Gazette* or in the local newspapers, and are collected into the annual volume of the statistics of the colony published by the Registrar-General.

The system of intercolonial weather exchange has now been in operation for two years, and the expense has proved to be much under the estimate formed at the Conference. The diagram of the weather for each day over the south part of Australia, Tasmania, and New Zealand is published the same afternoon in Sydney, Melbourne, Adelaide, and Hobart, and by a system of numbered blocks, which have been supplied by this department, a diagram of the weather of each day is published in the morning newspapers in Auckland, Wellington, Christchurch, and Dunedin, and the information without diagrams is published by most of the other papers in the colony, being distributed by the Press Agency. The local weather warnings for the benefit of the shipping round the coast continue to be supplied as heretofore by Captain Edwin, R.N., and are very generally appreciated.

OBSERVATORY.

The time-ball is still dismantled, but hourly signals are given by galvanometer to the Telegraph Department and at the Museum. No change has been made in the Observatory during the year, except that Mr. T. King kindly undertook the meridian observations at a time when both Archdeacon Stock and myself were absent from Wellington. The principal work of the year was the observation of the transit of Venus on the 7th December, 1882, for which purpose I established a temporary observatory at Clyde, in Otago, at the request of Colonel Tupman, R.E., the officer in charge of the British Expedition. The account of my observations has been already published ("New Zealand Journal of Science," January, 1883, page 326).

LABORATORY.

The total number of analyses made in the Colonial Laboratory during the past year for general purposes is 293. Besides this, a number of analyses have been made under the Adulteration Act of 1880, and a few in aid of criminal procedures. The Laboratory number now arrived at is 3,511. The ordinary analyses are divisible as follows: Coals, 26; rock and minerals, 64; metals and ores, 52; examinations for gold or silver, 50; water, 37; and miscellaneous, 64: making up a total of 293.

The heaviest labour of the year has been expended upon analyzing the Taupo mineral waters—a work which has long been urgently required. Twenty-two of these, representing the principal mineral waters of this district, and well certified as to locality, &c., have been fully analyzed.

Those results which have a general interest are given in full in the annual Laboratory report, herewith appended.

20th July, 1883.

JAMES HECTOR,
Director.

1883 July 20th

My dear Sir,

I have the honor to acknowledge the receipt of your letter of the 17th inst. in relation to the above mentioned matter. I have the pleasure to inform you that the same has been forwarded to the proper authorities for their consideration. I am, Sir, very respectfully,
Your obedient servant,
J. W. [Name]