1904.

NEW ZEALAND.

EDUCATION:

THE UNIVERSITY OF OTAGO.

("THE UNIVERSITY OF OTAGO ORDINANCE, 1869.")

[In continuation of E.–7; 1903.]

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

Visitor.—His Excellency the Governor.

Council.

Appointed by His Excellency the Governor in Council—His Honour Mr. Justice Williams, M.A., LL.M. (Chancellor); J. Allen, B.A., M.H.R. (Vice-Chancellor); R. Burns, F.R.C.S., Edin.; T. M. Hocken, M.R.C.S.; G. G. Russell; D. Stewart.

Elected by graduates—D. White, M.A.; Rev. A. Cameron, B.A.; T. K. Sidey, B.A., LL.B., M.H.R.; Rev. W. Hewitson, B.A.

Elected by the professors—Professor G. S. Sale, M.A.; Professor J. Shand, M.A., LL.D.

Professors.

Classics, G. S. Sale, M.A.; Natural Philosophy, J. Shand, M.A., LL.D.; Chemistry, J. G. Black, M.A., D.Sc.; Anatomy and Physiology, J. H. Scott, M.D., M.R.C.S.; Mining and Mining Geology and Director of the School of Mines, James Park, F.G.S.; Biology (also Curator of the University Museum), W. B. Benham, D.Sc., Lond.; Mental and Moral Philosophy, Rev. W. Salmond, M.A., D.D.; Mathematics (also Lecturer on Political Economy), F. B. de M. Gibbons, M.A.; English Language and Literature, T. Gilray, M.A.

Lecturers.

French, Geo. E. Thompson, M.A.; German, F. H. Campbell, M.A.; Hebrew, Rev. M. Watt, M.A., D.D.; Practice of Medicine, D. Colquhoun M.D., M.R.C.P., M.R.C.S.; Medical Jurisprudence and Public Health, F. Ogston, M.D., C.M.; Midwifery and Diseases of Women, F. C. Batchelor, M.D., M.R.C.S., L.R.C.P.; Materia Medica, E. E. Blomfield, M.D.; Pathology, W. S. Roberts, M.R.C.S.; Ophthalmology, H. L. Ferguson, M.A., M.D., &c.; Surgery, L. E. Barnett, M.B., C.M., F.R.C.S.; Mental Diseases, F. T. King, M.B., C.M., B.Sc.; Clinical Medicine and Clinical Surgery, the Honorary Medical and Surgical Staff of the Dunedin Hospital; Metallurgy and Assaying, D. B. Waters, A.O.S.M.; Geology and Mineralogy, P. Marshall, D.Sc.

Registrar—J. M. E. Garrow, B.A.

The CHANCELLOR OF THE UNIVERSITY OF OTAGO to HIS EXCELLENCY THE GOVERNOR.

YOUR EXCELLENCY,— University of Otago, Dunedin, 1904.

In compliance with the provisions of "The University of Otago Ordinance, 1869," I have the honour to forward to Your Excellency the following report of the proceedings of the University of Otago for the year ending the 31st March, 1904.

Attendance.—The attendance at the classes for the past twelve months was as follows:—

	Matriculated.	Not Matriculated.	Total.
Males	170	18	188
Females	57	1	58
Total	227	19	248

Degrees.—The degrees obtained by the students at the examinations held by the New Zealand University are as follows: Master of Arts, 8; Bachelor of Arts, 9; Bachelor of Science, 4; Bachelor of Laws, 1; M.B. and Ch.B., 9: also, honours in arts, 6; honours in science, 2 (1 double honours); honours in law, 1; senior scholarships, 2. The Exhibition, 1851, Science Scholarship was won by Mr. Arthur A. Andrew.

Staff.—Towards the end of the year the Registrar, Mr. A. Hamilton, resigned the registrarship, having been appointed Director of the Colonial Museum; Mr. James M. E. Garrow, B.A., was appointed to fill the vacancy. Dr. L. E. Barnett, Lecturer on Surgery, was granted leave of absence for twelve months to enable him to visit the hospitals of the Home-country and the Continent. Dr. Closs was appointed to lecture on surgery during Dr. Barnett's absence.

Council.—During the year the Council has lost one of its original members, the Vice-Chancellor, Mr. E. B. Cargill, who died after a short illness. Mr. Cargill was a member of the Council from the foundation of the University, having been appointed in 1869 by the Provincial Council. He was Vice-Chancellor from 1894 till his death. By his removal the University has lost a firm friend and an enthusiastic supporter. The vacancy caused by Mr. Cargill's death was filled, in accordance with "The University of Otago Council Election Act, 1891," by the graduates electing the Rev. William Hewitson, B.A., for five years. Mr. James Allen, B.A., M.H.R., was appointed Vice-Chancellor.

Scholarships and Prizes.—The following scholarships and prizes have been awarded: Grey-Russell Scholarship, William J. Dunbar; Sir George Grey Scholarship, C. N. Boult; Macgregor Prize, E. K. Lomas; Stuart Prize, B. E. Murphy; Ulrich Medal, George Dey; Parker Prize, William J. Dunbar.

Castle Street Block.—Fourteen of the twenty-eight sections on this block have now been let, and eight houses are erected or in the course of erection. The base of the retaining-wall has been protected by strong buttresses bound by strong wire netting, and this arrangement has so far worked admirably, as not the slightest damage has been done by the Leith during the last two floods.

Wolf Harris Endowment.—Mr. Wolf Harris has generously promised a contribution of £2,000 contingent on a Chair of Physiology being established within three years from date of the gift, the income from this endowment to be exclusively available for the maintenance of a Chair of Physiology in connection with the Medical School of the Otago University. The money in the meantime has been placed to a special account called the "Wolf Harris Endowment Account," and has been invested in Dunedin City Tramway Debentures at 4½ per cent. If the chair is filled within the next three years the income is to be added to the £2,000.

Dental School.—A committee from the Council appointed to inquire into the question of the establishment of a Dental School reported that the carrying-out of such a scheme would be impossible unless the Hospital Trustees granted the use of a room and opened an out-patient department for the practical teaching of dental surgery. There are, however, no funds available for building a Dental Institute. The Senate of the New Zealand University has in the meantime been asked by the Council to prescribe a course, and to make such other provision as is necessary for conferring degrees and diplomas in dentistry, and has appointed the Rev. Mr. Cameron, Professor Shand, and Professor Scott a committee to make further inquiries and to formulate a scheme to give effect to the wishes of the Council, and to report to next meeting of the Senate.

JOSHUA STRANGE WILLIAMS, Chancellor.

OTAGO SCHOOL OF MINES: REPORT OF THE DIRECTOR (PROFESSOR JAMES PARK, F.G.S.).

PROFESSOR JAMES PARK, F.G.S., the Director, reported as follows:—

Diplomas and Certificates.

The Mining School for the session ending the 7th November, 1903, showed the satisfactory attendance of thirty-two registered students, and two casual students for one subject only—namely, one in geology and one in surveying. Of the registered students, twelve entered for their first year, leaving twenty in their second, third, or fourth year, according to their academic standing. Three students in their final year completed their course in the divisions for which they entered; and one of these, having presented satisfactory certificates of time spent in mining operations as required by Regulation 9, was awarded the diploma of Associate in Mining to which he was entitled. The successful candidate was Otto Albert Friedlander.

Diplomas and certificates were issued during the year to seven students who had passed the necessary class examinations prior to 1903, on the production of the necessary certificates relating to practical work, as follows: Frank Hadfield Statham—(1) diploma of Associate in Mining, (2) certificate of metallurgical chemist and assayer; William Ernest Barron, certificate of land and mine surveyor; Stanislaus Charles Napier-Bell, diploma of Associate in Geology; James McGregor Wilkie, diploma of Associate in Metallurgy; Harold F. de Renzy Harman, diploma of Associate in Metallurgy; Claude G. L. Gregg, diploma of Associate in Mining; Kenneth Montrose Graham, diploma of Associate in Mining.

Annual Examinations.

The attendance in the different classes and the results of the annual examinations in the subjects of instruction in the Mining School, as prescribed by the regulations for the different courses, are shown in the following tabulated statement:—

Table I.

Subject.	Attendance.	Results of Examinations.			
		First Class.	Second Class.	Third Class.	Failed.
General geology (senior)	2	1	..	1	..
General geology (junior)	10	1	3	4	2
Mineralogy (senior)	1	..	1	..	..
Mineralogy (junior)	8	3	4	1	..
Petrography (senior)	2	2	..	..	..
Petrography (junior)	4	1	3	..	..
Applied mechanics (senior)	7	4	2	1	..
Applied mechanics (junior)	11	3	7	1	..
Surveying (senior)	9	1	7	..	1
Surveying (junior)	4	2	2	..	..
Mining (senior)	6	4	2	..	..
Metallurgy (senior)	2	2	..	..	..
Metallurgy (junior)	5	2	3	..	..
Blowpipe analysis	6	2	3	1	..
Assaying (senior)	6	2	4	..	..
Assaying (junior)	6	3	2	..	1
Mechanical drawing (senior)	7	6	1	..	..
Mechanical drawing (junior)	5	1	1	..	3

The teachers of the subjects enumerated above were as follow: The Director—mining geology, mining, surveying, applied mechanics; Mr. Waters—metallurgy, assaying, blowpipe analysis; Dr. Marshall—general geology, mineralogy, petrography; Mr. G. Armstrong—mechanical drawing.

Eighteen students in their first or second year, according to their standing, attended the University classes in mathematics, theoretical mechanics, theoretical physics, practical physics, theoretical and practical chemistry; and three, qualifying for the requirements of the B.Sc. degree and for honours in geology, attended the class in palæontology. The results of the examinations in these subjects were as follow:—

Table II.

Subject.	Attendance.	Results of Examinations.			
		First Class.	Second Class.	Third Class.	Failed.
Mathematics	15	1	3	8	3
Theoretical mechanics	9	..	3	5	1
Theoretical physics	8	1	2	4	1
Practical physics	12	5	3	4	..
Theoretical chemistry	11	4	3	4	..
Practical chemistry	11	3	2	6	..
Quantitative chemical analysis	9	2	7	..	..
Palæontology	3	1	2	..	..

The teachers in the different subjects were as follow: Professor Gibbons, mathematics; Professor Benham, palæontology; Professor Shand, theoretical physics, practical physics, theoretical mechanics; Professor Black—theoretical chemistry, practical chemistry, quantitative chemical analysis.

Students in the different divisions, according to their standing, had to attend the drawing classes at the School of Art. Mr. Hutton, the director, reported that the results were satisfactory in every case, as shown in the following tabulated statements:—

Table III.

Subject.	Attendance.	Results of Examinations.			
		First Class.	Second Class.	Third Class.	Failed.
Practical, plane, and solid geometry ..	10	5	3	2	..
Freehand and model drawing	2	1	1	..	..

Ulrich Medal.—This medal was awarded to George Dey, who secured a second class in mineralogy and a second class in petrography.

New Zealand University Examinations.

The results of the November examinations of the New Zealand University, so far as the mining students are concerned, were as follow :—

Honours in Science : A. R. Andrew, first class in physical science (electricity) and second class in natural science (geology) ; J. A. Thomson, first class in natural science (geology).

1851 Exhibition Research Scholarship (tenable for two years, £150 a year) : A. R. Andrew.

Mechanical Engineering : A. C. Owen (part).

Mining Engineering—first examination : D. F. Borrie (part), A. G. Macdonald (part), L. J. H. Webb (part), W. Gibson (completed).

Metallurgical Engineering—final examination : D. M. Tomlinson and J. Henderson.

Metallurgical Engineering—first examination : W. A. Given and A. R. Andrew.

First Section, B.Sc. : R. A. Farquharson.

Final B.Sc. : C. N. Boult.

Grey Scholarship : C. N. Boult.

Mr. Andrew in his University and Mining School career has proved himself an excellent and capable student. The award of the Exhibition Research Scholarship is a fitting reward for his perseverance, and with it he establishes a record not often equalled. He deserves our most hearty congratulations.

Government Mining Scholarship.—Two students—namely, W. A. Given and Arthur R. Andrew—sat for this examination in December. The examination embraced eight written papers on senior mining subjects and one paper on mechanical drawing. These students secured first place in six subjects—namely, mathematics, with 89 per cent. of possible marks ; theoretical chemistry, with 82 per cent. ; practical chemistry, with 75 per cent. ; metallurgy of gold and silver, with 80 per cent. ; mining, with 85 per cent. ; land and mine surveying, 81 per cent. In mine-ventilation, with 81 per cent., A. R. Andrew tied with a Coromandel student for first place ; and in geology, with 75 per cent., he was only one point behind a Thames student, who secured 76 per cent. of marks. The examination-papers were set by the Government Board of Examiners on the curriculum of the Government Mining Schools, which is entirely different from that of the Otago University mining course. Our students having had no special preparation, had thus to depend on their general knowledge of the subjects of examination. In the eight subjects enumerated above Mr. Andrew secured the high average of 80 per cent., but did not gain the scholarship, as he failed in mechanical drawing with 60 per cent.—that is, 15 per cent. below the scholarship requirements. Mr. Given secured the satisfactory average of 64 per cent. in the nine subjects of examination. Altogether, the results were eminently satisfactory.

Laboratory.—During the year fifty samples of ore were assayed for the public at schedule rates, and in the same period the directors furnished reports on twenty-eight samples of rocks and minerals for which no charge was made.

Donations.—The geological collections in the Mining School were supplemented by a large number of fossils, rock, and mineral specimens presented by members of the staff and students. The school is also indebted to Messrs. T. and W. Smith, of Sheffield, for a gift of "steel fractures," which will form a valuable addition to the technological exhibits for the class in applied mechanics.

Geodesic Station.—Towards the end of the session the much needed transit railway theodolite and level arrived from the London makers, and in the few remaining weeks of the session a large block of concrete, with an iron tube imbedded in it, was fixed on the top of Tana Hill, near the University, to serve as a geodesic observatory for our advanced students in surveying. Rounds of angles were observed at Flagstaff and Tana Hill late in October, but the cloudy weather prevailing in November prevented the reading of the angle at Signal Hill. When the angles are completed, the latitude and longitude of the new station will be computed in terms of the meridional station of the General Survey Department ; and, with a permanent referring-light fixed in a convenient place in the harbour, students will be able to check the meridional error of their traverses, and make observations for the determination of latitude and time. This work will be completed early in the session of 1904.

Mining Students' Association.—Considerable interest was shown in the proceedings of this association, and during the session a number of interesting papers were contributed by past and present students on the scope and kind of mining and metallurgical operations that had come under the notice of the authors in their practical work during the preceding summer vacation. Most of the papers were short and simple, with the proper thesis flavour, and a few showed much close and shrewd observation. The titles of the papers and the names of the authors are given below : "The Shotover Mining District," Mr. D. M. Tomlinson ; "Mining Prospects of Western Australia," Mr. W. F. Tomlinson, A.O.S.M. ; "Kaitangata Coal-mine," Mr. W. A. Given, M.A. ; "Treatment of Zinc Slimes," Mr. G. W. E. Turner ; "The Gem-rocks of Kakanui," Mr. J. A. Thomson, B.Sc. ; "A New 'Tippler' used at Fortification Coal-mines," Mr. A. R. Andrew, B.Sc. ; "Taratu Coal-mines," Mr. W. Gibson ; "Metallography," Mr. J. C. Neill ; "Mine Creek Coal-mine," Mr. U. B. Inglis ; "Milburn Phosphate Deposits," Mr. A. R. Andrew, B.Sc. In addition to these, a paper was read by Mr. D. B. Waters on "Acetylene Gas," and one by the Director on "Some Base-level Planes of Erosion in New Zealand."

Domicile of Students.—The permanent homes of the students who attended the Mining School during the session of 1903 were distributed throughout the colony as shown centesimally in the following table : Dunedin and suburbs, 34 per cent. ; Otago (country districts), 9 ; Southland, 7 ; Canterbury, 18 ; Westland, 9 ; Wellington, 3 ; Hawke's Bay, 3 ; Auckland, 17 ; —100.

Associates of Mining School.—The School of Mines was established in 1878, but the graduate course was not inaugurated until nine years later, when three additional lecturers were appointed. The first diplomas were issued in 1887, and since that year 59 diplomas as Associate in Mining, 36 as Associate

in Metallurgy, and 12 as Associate in Geology have been granted to 66 individual students who had completed the prescribed course and complied with the regulations relating to practical work. Of the 66 graduates, 35 took the diploma in mining only; 20 took diplomas in both mining and metallurgy; 4 took metallurgy only; 2 graduated in both metallurgy and geology; and 2 in geology alone. On the other hand, 9 graduated in both mining and geology, and 2 in mining, metallurgy, and geology.

Besides these diplomas, since 1887, 60 certificates as metallurgical chemist and assayer and 18 certificates as mine and land surveyor have been issued to 63 individual students. From these figures it will be seen that 35 students took the mining diploma only, while four took the metallurgical only. On the other hand, the majority of the students who graduated in mining also graduated in metallurgy. And there can be no doubt that these figures correctly represent the relative importance of mining and metallurgy. All our experience has shown that a mining engineer without a knowledge of metallurgy is poorly equipped and greatly handicapped in the practice of his profession. But metallurgy is only a branch of mining. It has not yet reached the dignity of a separate profession here, as it has in Europe and the United States of America. The metallurgist is not a mining engineer, but a highly trained and specialised chemist.

The success of New Zealand mining graduates in Australia, Sumatra, Java, China, India, South Africa, Gold Coast, British Columbia, and United States has been very remarkable; and this success has followed, almost without exception, the possessors of mining diplomas.

The B.Sc. in Mining and Metallurgy.—The University of New Zealand grants a degree of B.Sc. in mining and a B.Sc. in metallurgy. The Universities of Melbourne, Sydney, and Adelaide grant only a B.Sc. in mining, which includes metallurgy; as also do the mining academies of Germany and France, of England with one exception, and America with two exceptions. The question arises, should New Zealand, which possesses no facilities for candidates acquiring a knowledge of metallurgical operations, excepting in the department of gold-recovery, continue to grant separate degrees in mining and metallurgy while older countries, where the facilities are almost perfect, refuse to grant more than one—that is, the B.Sc. in mining, which in all cases covers and includes metallurgy?

The New Zealand B.Sc. in mining, including metallurgy should be made not a purely academic distinction, but the hall-mark of a professional occupation, acquired by a successful apprenticeship in the lecture-room, laboratory, mine, and reduction-works. Its status would then be on all fours with the New Zealand M.B. degree, which now takes a high place in the medical profession. The plums in mining are, perhaps, bigger and more plentiful than in any other profession. A four years' course of study and preparation is a splendid investment to any level-headed youth of grit and perseverance.

Practical Work during Summer Vacation.—According to the regulations of the Mining School, candidates for diplomas are required to spend a certain time in obtaining practical experience, as under: (1.) In the mining division, at least twelve months, partly in metal and partly in coal-mines; and of this period at least nine months must be spent in underground mining-work, and not less than four or more than six months in a coal-mine. (2.) In the metallurgical division, at least twelve months in ore-dressing and metallurgical works. (3.) In the surveying division, at least six months in the practice of mine and land surveying. (4.) In the geological division, at least six months in the practice of geological surveying in the field.

For some years students have found an increasing difficulty in obtaining work in mines or mills, and in the divisions of surveying and geology it has been almost impossible to obtain the practical experience required by the regulations. Toward the end of the session the Director wrote to the Hon. James McGowan, Minister of Mines, pointing out the disability of Otago mining students in respect to practical work, and requested him to provide employment in the Government Departments for seven students in the summer vacation—namely, for two in the General Survey Department, two in the Public Works Department, two in the State coal-mines, and one in the Geological Survey. The Minister approved of the suggestion, and courteously caused instructions to be issued to the several Departments to give the needed employment. Although the arrangement was made late in October, work was found for six students during the summer; and it is anticipated that when the Geological Survey is reorganized employment will be obtained for a greater number in future.

The Hon. Mr. McGowan for sixteen years or more has shown the keenest personal interest in all that relates to technical mining education, and among his many acts to promote the interests of mining schools none has been more warmly appreciated than the present.

Occupations of Old Students.—Among the appointments secured by old students during the year 1903 are the following: Mr. G. Geoffrey Sale, A.O.S.M., as first assistant to prospecting syndicate, Macequece, Portuguese Territory, South Africa, and afterwards manager of slimes-treatment works, Johannesburg; Mr. P. Fitzgerald, A.O.S.M., manager, Golden Pah Mine, Western Australia; Mr. John Henderson, B.Sc., Director of the Reefton School of Mines; Mr. Otto Bishop, A.O.S.M., battery-superintendent, New Inkerman Mines (Limited), Reefton; Mr. E. Paterson, A.O.S.M., general manager, diamond-mines, Brazil; Mr. T. Buteman, A.O.S.M., lecturer to the Kalgoorlie School of Mines, Western Australia; Mr. E. Edwards, A.O.S.M., assistant engineer of the Exploration Company (Limited), Blue Nile, Egypt; Mr. S. E. Napier-Bell, A.O.S.M., manager of the Brothers Home No. 1 Tin-mine, Derby, Tasmania. Besides these, several have obtained appointments as assayers, amalgamators, and cyanide foremen.

Mining Education in Europe and America.—The character and results of mining education at the principal mining schools and academies in continental Europe, England, and America have been much discussed during the past year or two. Broadly speaking, it has generally agreed that the graduates of the American mining schools excelled as mine-managers and mining engineers, the German as metallurgists, and the English as teachers and professors.

The curriculum of the Otago Mining School for a number of years was mainly modelled on the English system, and it is noteworthy that during this period the results, as shown by the occupations of the graduates, reflected the experience of the English prototype. The instruction was, perhaps, more academic than technical; and the students, with their limited experience, doubtless found that teaching was the only occupation that offered a prospect of lucrative employment. But mining schools exist primarily for the training of mining engineers, and this objective is ever present in the mind of the governing bodies of the American and German mining schools. The defects of the Otago course have been removed, this having been effected by the system of practical work inaugurated by the late Director, and the revision of the curriculum adopted in 1901, which have brought the graduate course abreast of that of the leading American mining schools. The results have amply justified the more stringent and practical course now prescribed and enforced.

The Mining School is not able to turn out trained mining engineers, but it prepares the graduates by a system of careful specialisation to be competent to occupy positions as assistant geologists, assistant mine-managers, mine-surveyors, mill assayers, and foremen of cyanide-works. It is in these occupations that the shrewd student accumulates the practical experience and knowledge of detail which afterwards form the foundation of his successful professional career.

A union of theory and practice has often, and rightly, been emphasized by many writers on technical mining education. A judicious union of the two is admitted to be necessary for a proper and intelligent understanding of any professional subject, but it should be borne in mind that theory and practice, although co-ordinate, are not necessarily equal. In some subjects the theory dominates the practice; in others the practice dominates the theory. For example, in the extraction and recovery of gold from its matrix by solutions of potassic cyanide, a proper understanding of the theory is more important than the practice, which is largely mechanical and easily acquired. Conversely, in assaying the theory is simple; but the practice—that is, the skill and precision necessary for the performance of assays that could form the basis of commercial valuations—can only be acquired by long and diligent practice in the laboratory. Again, in the case of geology, the theory and practice are alike simple and easy to acquire; but not every geological student, not even the brilliant student, is a potential geologist. To theory and practice must be added the geological faculty—a mental attitude or function not easily defined—which experience has shown to be rare, but to some extent capable of cultivation. The relative value of theory and practice must be considered in each case, and the instruction so regulated that the one shall be the complement of the other.

It is believed that the success of the American mining education is principally due (*a*) to specialisation and (*b*) to the employment of experienced professional men as teachers in the different departments of mining and metallurgy. It has long been recognised in the United States that the brilliant student without experience is of no value as a teacher in such professional subjects as mining engineering and geology. The pre-eminence of German graduates in all departments of metallurgy is held to be due to three principal causes, namely: (*a*) Judicious specialisation, (*b*) thoroughness of instruction in chemistry, and (*c*) the opportunities which students possess of obtaining practical experience in almost every class of metallurgical operation. So far as New Zealand is concerned, mining students have no opportunity to engage in or even see the metallurgical operations connected with the production of iron, steel, copper, zinc, lead, silver, antimony, &c. And since information concerning these imparted by lectures and text-books, must necessarily be unsatisfactory and to some extent superficial, special attention is devoted to the production of gold, which is the dominant mining industry of New Zealand, the Commonwealth of Australia, and South Africa, and the occupation in which the majority of the Otago graduates find employment.

German Mining-school Examinations.—For a number of years it has been agreed that a written examination-paper of some six or eight questions, in a technological subject covering a course of study extending over six months, is an unsatisfactory and inadequate means of ascertaining the knowledge and proficiency of a student in that subject. The Germans, with a view of increasing the efficiency of mining education, have lately introduced in their leading mining schools some radical changes in the conduct of the examinations for mining engineers. Written examinations have now been relegated to a subordinate place. In view of the great extension of mining technology, it has been deemed advisable to divide the examination into two parts—namely, preliminary and final, the former being held at the end of the student's second year, and the final at the end of the fourth year. Preparatory to the preliminary examination the student, among other requirements, must submit two drawings and two freehand sketches of mining machinery or other appliances not too simple in character; and two simple essays or theses on appliances or methods with which the candidate has become acquainted in the course of his prescribed year of practical work. If these requirements are satisfactorily performed the candidate is put through a *vivâ voce* examination in the following subjects: Higher mathematics, physics, inorganic chemistry, mechanics relating to mining, and mineralogy. Failure in any one subject in the *vivâ voce* examination debars the candidate from passing, but he may present himself for re-examination in that subject at the end of three months. If a candidate fails in more than one subject, all the subjects of examination must be taken again. Candidates for the final examination must accompany their applications with satisfactory certificates of class-attendance and practical work, and the following theses, attested by a declaration that they are the work of the candidate himself, namely: A geognostic description of some mining district or mineral deposit; a description of mining machinery or of an electro-technical installation; a geodetic or surveying paper recording work actually performed by the candidate, with calculations, profiles, and full explanations; and a drawing of some complicated mining machinery or appliances, or a short description, sketch, and calculations of similar machinery of the candidate's own design. When the examiners are satisfied with these preliminaries they will set the candidate a thesis on some mining subject, which must be completed in three months. This done, the candidate is put through a *vivâ voce* examination in geology, including palæontology, mining geology,

mining surveying and geodesy, machinery and electro-technology, chemical technology and blowpipe analysis, general principles of mining law, mine-management, political economy and finance, mining statistics, and the translation into German of a French or English paper on mining.

The preparation of the drawings and theses required in the German mining course itself possesses a high educational value, as thereby many minute but essential details are brought under the notice of the student by personal observation, which is not always possible in mere lecture demonstration. Besides, in the preparation of a thesis a student discovers the limitations of his knowledge—itself no mean advantage—and is thus able to repair his deficiencies before commencing the practice of his profession.

Preparation of Theses for Diplomas of Otago Mining School.—In the regulations relating to the issue of diplomas by the Otago Mining School a certain period of practical work is required in all the divisions; and in the surveying division the requirements of plans, profiles, and geodesy, in conformity with the regulations of 1902, form a thesis perhaps more stringent than the German.

Candidates for diplomas in mining, metallurgy, and geology are not required to produce a thesis, and the experience gained in the prescribed period of practical work is often of doubtful value. On the other hand, the advantages attending the preparation of a thesis on a technical subject are manifestly great, and in order to keep pace with the progressive policy of the Germans it will be necessary to require a thesis from candidates for diplomas in mining, metallurgy, and geology.

Conclusion.—I wish, in conclusion, to express my appreciation of the zeal and ability with which Dr. Marshall, Mr. Waters, and Mr. Armstrong (lecturers), and Mr. A. R. Andrew (demonstrator in surveying) carried out their several duties throughout the session of 1903.

Otago University Museum: Report of the Curator (Dr. W. B. Benham, D.Sc.).

The most important work that has been carried out has been the rearrangement of the entire collection of birds, both native and foreign. Hitherto our native birds had been exhibited in the two end galleries, so that they were separated into two groups by the foreign birds in the side galleries. I have now brought all the New Zealand birds together in the western gallery. This allows them to be arranged without that overcrowding that had previously been gradually brought about by the constant additions to the collection. At the same time this necessitated the withdrawal from exhibition of a considerable number of (chiefly of the smaller) foreign birds, since the side gallery is longer than the two end galleries together. Even now there are too many foreign birds on exhibition; but the improvement on the old conditions is very great. These withdrawals have been stored in one of the basement rooms, which has been fitted with shelves for their reception. This arrangement necessitated the shifting of every single bird, and the shelves had repeatedly to be altered in order to display them satisfactorily. This work occupied myself and the taxidermist for a month. New labels have been written for nearly all our native birds, and labels with the family names have been introduced throughout.

Another work that for many years has been a desideratum was the removing and rearrangement of our native molluscan shells, which still bore the labels written by Captain Hutton more than twenty-five years ago. These names have in a great many instances been altered since that time, so that our labels no longer corresponded with the names to be found in recent works on the subject. These shells have been remounted on tablets covered with black paper, on which the shells are better displayed than on the grey-green paper formerly used. To give some idea of the work involved, I may state that about six hundred tablets had to be covered with black paper, the shells removed from the old tablets and attached to new ones, and six hundred new labels (in printing script) were written. Of these tablets about four hundred and eighty were old ones, and one hundred and twenty additional specimens have been added. This second piece of work occupied myself and the taxidermist about six weeks.

The addition of new specimens and the rearrangement of the cases has again necessitated the withdrawal from exhibition of many of the Tertiary (fossil) mollusca, which, however, I hope to accommodate elsewhere after a rearrangement of our foreign shells.

Amongst the more interesting work upon which the taxidermist has been employed, the following may be mentioned: (1.) The colouring of the feet and beaks of many of our native birds, so as to give them a more lifelike appearance. (2.) Making a new mould and taking a cast in plaster of a new species of ribbon fish (*Regalecus parkeri*), which cast was then covered with silver leaf and painted, so as to be a lifelike representation of the living fish. Casts have also been made of a set of the shells of a gigantic (fossil) barnacle (*Pollicipes*), which I have recently described in the *Geological Magazine*. The shells were loaned to me by Mr. Cheeseman, curator of the Auckland Museum, and I have already sent sets in exchange to the British Museum and the Owens College Museum. (3.) The restoration of a moa, undertaken at the suggestion and under the supervision of Mr. Hamilton. This restoration of the moa attracts considerable interest from the general public. (4.) A large block of Caversham stone has lain for years under the staircase in the main hall. It showed some whales' teeth imbedded in it, which Mr. Hamilton commenced to clear. The taxidermist continued the work, and succeeded in excavating a particularly fine and nearly complete skull of an extinct squalodon-like whale, together with other parts of the skeleton.

Last summer I obtained permission from the Minister of Marine for the taxidermist to visit, in the s.s. "Hinemoa," the southern islands for the purpose of collecting birds, and especially nestling albatrosses, of which he obtained a sufficient supply for exchanging with other museums.

Additions to the Collections on Exhibition.

The following additions have been placed in the exhibition cases:—

A. Zoological: (1) Local Fauna.—In addition to the one hundred and twenty new specimens of mollusca, which, however, are mostly specimens from new localities, I have placed about forty new ob-

jects on exhibition. This number includes a native bat (*Mystacops tuberculatus*), our only endemic land-mammal; a pair of large strap-shaped teeth of Mesoplodon, which have been mounted so as to show their peculiar disposition in the jaws. Fourteen new fishes, including the cast of Regalecus; a new species of Torpedo (Astrape), recently described by Mr. Hamilton; a pouched lamprey (Geotria) from Pelorus Valley; and a native lancelet. Six mollusca, in alcohol, including several nudibranchs, new to science, named for me by the expert Dr. R. Bergh, of Copenhagen, to whom I sent a collection of these animals. Six members of the group Arthropoda, including a pair of long-legged spider-crabs (Paramithrax), new to science, and recently described by Mr. George M. Thomson. Of Vermes the most important is a true leech (*Hirudo antipodum*), the first of its kind to be obtained in this colony, and described by me in the "Transactions of the New Zealand Institute."

A2. A collection of thirteen specimens belonging to various groups of animals collected in the Antarctic seas during the expedition of the "Southern Cross," and presented to the Museum by Sir George Newnes.

A3. Foreign Zoology.—About twenty new specimens have been added, including some interesting deep-sea sponges from the Japanese seas, received in exchange from Dr. Bashford Dean. A stuffed specimen of one of the smaller anthropoid apes (Hylobates). A handsome prize Langshan cock, presented by Mrs. H. Buckland, has been added to our series of domestic varieties of fowl. A series of tadpoles of the golden tree-frog (Hyla), which were collected by one of my pupils, shows the whole course of metamorphosis. Figures, coloured and plain, of various invertebrates, which lose their colour in alcohol, have been placed in the case.

B. Palæontology.—At present this subject is scarcely represented in the Museum; but more important fossils are placed amongst the zoological specimens, and a dozen New Zealand fossils have been added, including a series of graptolites from Nelson, presented by Mr. Hamilton; and a fine nautiloid, by the same; and in the foreign series, six fossil crinoids.

C. Ethnology.—The accommodation in the Museum is, of course, inadequate to allow more than a small number of objects to be exhibited, and this is unfortunate, for to the ordinary visitor this department is of considerable interest. And it is a remarkable fact that, although a good number of our citizens have visited our new possessions and other islands in the Pacific, we have no ethnological specimens from these islands. In 1902 Mrs. Gillies generously deposited in the Museum a considerable collection of objects from New Guinea and elsewhere. Of these I have selected twenty-five for exhibition in the case containing the donations of the late Rev. Chalmers, and a few others from the New Hebrides have also been placed on view. I have added a very good specimen of canoe and its fittings, from Niue (Savage Islands), which I purchased. A small case showing a number of palæolithic implements from various parts of the world has been placed near the case of Maori stone weapons. This new case includes Tasmanian implements presented by the Hobart Museum, and a number of Indian stone implements presented by Mr. Seton-Karr.

Remounts, &c.—A considerable number of zoological specimens have been replaced by better examples, or have been remounted so as to display them in a better manner. In addition to the four hundred and fifty molluscan shells, some thirty-five species of our native fish have been remounted, and a number of invertebrates, both local and foreign. A very fine skeleton of the smooth dogfish and the skull of the porbeagle shark, prepared by the gelatine method, have been added. In order to properly protect the valuable bird (Notornis) deposited by the Government in my care, I have had a very strong plate-glass case made. This is provided with curtains of American cloth, so that the bird is protected from the light. In this case two very rare, if not extinct, birds have also been placed.

General.

The above refers only to work connected with the exhibition of specimens, but a considerable number of natural-history objects has been presented to the Museum by various people in different parts of Otago and Southland. In many instances the donor asks me to supply the name and some information about it, and in each case I acknowledge the gift. Each object as it is received is entered in a register, and a number affixed to it; for in the case of insects and other invertebrates it is not possible to give a name at once without a considerable amount of trouble in searching the literature. The number, however, which the object carries corresponds with that in the register, where are recorded the donor, the locality, any special feature about it, and the room in which it is stored. I keep four registers: A, for New Zealand zoology; B, for foreign zoology; C, for palæontology, petrology, and mineralogy; D, for ethnology and miscellaneous. Each object, then, has an initial letter, with the year-number; and in each year the series of numbers commences afresh, so that, for example, a specimen labelled C.02.52 indicates that it was obtained in 1902, and by turning up the register C all details about it can be seen in a minute. Thus a good deal of clerical work falls to my lot apart from the tedious task of writing a label in printing script for every specimen exhibited. In days to come we may hope that a small printing-press will be obtained for the latter purpose.

Summary of Acquisitions during the Year 1902-3.

A. Local Fauna.—Two hundred and seventy-eight specimens have been received, registered, and stored. Some of these have been placed on exhibition, others are stored for future research, for exchange, and for students' work. Most of the groups of the lower animals of New Zealand still require investigation. Only a tithe or even less are named, and one function of a museum is to accumulate representatives of the different groups, and to send them to experts in New Zealand or elsewhere for investigation. This storage of specimens necessitates the use of bottles, jars, tubes, and preservatives. Of the 278 specimens, some have been collected by myself and by the taxidermist; others have been presented by a variety of people scattered over the Island.

B. Foreign Zoology.—About thirty-three specimens have been obtained, either by exchange or purchase, partly for museum and partly for class purposes.

C. Palæontology.—Including a considerable number of extinct birds collected at Ngapara by Mr. Hamilton, 127 acquisitions are recorded, chiefly fossils from New Zealand rocks.

D. Ethnology, &c.—Some thirty-two objects (including Australian objects, Tasmanian stone implements, and Maori axes) have been received, most of which have been placed on exhibition.

List of Donors of New Zealand Articles.

(Donations of specimens of native animals and of ethnological objects will be most thankfully accepted and duly acknowledged): A. R. Andrew, fossils from Milburn; Captain Bollons, shells, &c., from Kermadec Islands and elsewhere; Miss B. Brown, of Evans Flat, stick insect; N. L. Buchanan, Maori rat, Nelson; C. W. Chamberlain, live penguin, Macquarie Island; H. Chapman, several invertebrates, Karitane; Dr. L. Cockayne, leech and earthworms, southern islands, &c.; Ch. Cooper, several shells, Auckland, &c.; Mrs. Christie, stick insect, North-east Valley; Mr. Dunlop, various invertebrates, Orepuki; R. Ewart, ribbonfish, Purakanui; Dr. Fulton, bird's nest, &c., Taieri; A. Hamilton, various fossils and invertebrates; R. Henry, invertebrates, Dusky Sound; A. Headland, fish, Oamaru; Dr. Agnes Kelly, collection of annelids, Auckland Harbour; A. M. Loasby, long-tailed cuckoo, Caversham; Dr. P. Marshall, fossils; Mrs. Matthews, skeleton of kea; C. B. Morris, land planarian, Oamaru; Professor Park, triassic fossils; T. Paterson, fish, Otago Heads; W. Rayner, various shells, Cape Maria Van Diemen; Donald Ross, a moth, McKinnon's Pass; Josiah Rutland, pouched lamprey, Pelorus Sound; W. Stewart, various fishes; F. Sullivan, living shell-fish; H. Suter, annelids, Auckland; — Tapley, oyster-catcher, Stewart Island; Allan Thomson, fossils, Kakanui; W. Traill, native bat; — Wilkie, lizard, Portobello.

The taxidermist is constantly engaged in various small or large repairs to skeletons, in remounting skeletons, preparing new skeletons, and mounting specimens of all kinds for exhibition, in looking after the collections generally, keeping the cases free from dust and insects, and in the innumerable small jobs that are necessary for keeping the collections in good order.

The work of the janitor consists in keeping the Museum itself and the outside of the cases clean and tidy, and keeping order when necessary amongst the visitors.

The Museum appears to afford much interest to our fellow-citizens and strangers to the town, of whom a large number visits the collections on Sundays and holidays.

BALANCE-SHEET of the UNIVERSITY of OTAGO for the Year ending 31st March, 1904.

Receipts.	£ s. d.	£ s. d.
Balance, 31st March, 1903	.. ..	3,464 6 4
Rents—		
Burwood and Mararoa	1,300 0 0	
Barewood	900 0 0	
Benmore	3,000 0 0	
Forest Hill (Miller) ..	33 6 8	
Forest Hill (Hay) ..	60 0 6	
79c, Barewood ..	16 19 6	
Professors' houses ..	240 0 0	
Leith Street houses ..	40 10 0	
Castle Street house ..	72 0 0	
Castle Street leases ..	122 3 4	
		5,785 0 0
Church Board of Property	.. ..	1,800 0 0
Fees	3,036 18 0	
Less transferred to School of Mines	240 19 6	
		2,795 18 6
Interest on debentures ..	439 13 1	
Less transferred to Scholarships Accounts ..	107 2 2	
		332 10 11
Sale of Castle Street house	.. ..	200 0 0
Incidental receipts ..	.. ..	37 7 10
Timber account (Burwood)	.. ..	10 6 0
Goldfields revenue ..	.. ..	36 11 6
Interest on hot-water supply	.. ..	9 0 0
Analyst's fee	.. ..	25 0 0
		£14,496 1 1

Expenditure.	£ s. d.	£ s. d.
Salaries	7,247 7 6	
Less salaries professors and lecturers School of Mines £1,600		
Less salary of Curator of Museum .. £250		
	1,850 0 0	
		5,397 7 6
Apparatus—		
Biological laboratory ..	63 10 1	
Chemical laboratory ..	94 15 2	
Physics laboratory ..	29 1 0	
Medical School	146 9 6	
		333 15 9
Fees—Professors and lecturers	2,352 5 3	
Less fees School of Mines' scholar ..	16 16 0	
		2,335 9 3
Repairs and alterations	.. ..	132 5 10
Expenses—		
Leith Street houses ..	16 0 2	
Castle Street house ..	13 9 11	
Professors' houses ..	59 12 4	
Retaining-wall	18 14 0	
Letting run	37 13 6	
Selling leases (sections) ..	21 14 0	
		167 3 11
Library	.. ..	89 12 10
Insurance	52 10 5	
Less proportion charged to School of Mines ..	10 0 0	
		42 10 5
Water, fuel, and light ..	.. ..	197 2 7
Printing, advertising, and stationery	98 12 11	
Less proportion charged to School of Mines	10 0 0	
		88 12 11
Law-costs	.. ..	65 9 9
Incidentals	.. ..	75 14 9
Examination expenses ..	.. ..	12 1 7
Donation to Medical School	.. ..	5 5 0
Bank charge and commission	.. ..	6 6 3
Interest on loan transferred to Interest Account	.. ..	722 5 0
Transferred to—		
School of Mines Account	.. ..	1,517 19 4
Museum Account ..	.. ..	221 17 6
Ulrich Prize Fund Account	.. ..	1 8 0
Balance 31st March, 1904	.. ..	3,083 12 11
		£14,496 1 1

School of Mines Account.

Receipts—	£ s. d.	£ s. d.	Expenditure—	£ s. d.	£ s. d.
Government subsidy ..	250 0 0		Salaries—		
Mining classes	240 19 6		Director and lecturers ..	1,200 0 0	
Battery returns	9 10 0		Proportion of salaries of professors	400 0 0	
Sale of material and refund	3 7 0		Assistant	61 15 0	
		503 16 6			1,661 15 0
From General Account		1,517 19 4	Scholar		16 16 0
			Proportion of general expenses	10 0 0	
			Proportion of insurance premium	10 0 0	
			Chemicals, water, fuel, light, and repairs	323 4 10	
					343 4 10
		£2,021 15 10			£2,021 15 10

Museum Account.

Receipts—	£ s. d.	Expenditure—	£ s. d.
Rent of Museum Reserve	400 0 0	Salary of Curator	250 0 0
From General Account	221 17 6	Attendant and maintenance	347 17 6
		Valuator's fee (reserve)	24 0 0
	£621 17 6		£621 17 6

Macandrew Scholarship Account.

	£ s. d.		£ s. d.	£ s. d.
Balance, 31st March, 1903	803 7 0	Bank charge		0 10 0
Interest on debentures	28 0 2	Balance—		
		Debentures	£700 5 9	
		Current Account, Bank of New Zealand	130 11 5	
				830 17 2
	£831 7 2			£831 7 2

Macgregor Prize Fund Account.

	£ s. d.		£ s. d.	£ s. d.
Balance, 31st March, 1903	125 18 4	Bank charge		0 10 0
Interest on debentures	4 0 0	Balance—		
		Debentures	£100 4 1	
		Current Account, Bank of New Zealand	29 4 3	
				129 8 4
	£129 18 4			£129 18 4

Parker Prize Fund Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	49 12 0	Prize-winner	2 0 0
Interest	2 8 0	Balance, debentures	50 0 0
	£52 0 0		£52 0 0

Richardson Scholarship Account.

	£ s. d.		£ s. d.	£ s. d.
Balance, 31st March, 1903	843 1 3	Holder		25 0 0
Interest on debentures	30 16 0	Bank charge		0 10 0
		Balance—		
		Debentures	769 14 5	
		Current Account, Bank of New Zealand	78 12 10	
				848 7 3
	£873 17 3			£873 17 3

Sir George Grey Scholarship Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	50 0 0	Holder	50 0 0

Sir Walter Scott Scholarship Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	292 16 11	Bank charge	0 10 0
Interest on debentures	11 8 0	Balance—	
		Debentures £285 0 0	
		Current Account, Bank of New Zealand 18 14 11	
			303 14 11
	£304 4 11		£304 4 11

Stuart Prize Fund Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	106 3 4	Prize-winners	6 0 0
Interest	3 10 0	Premium on debenture	1 2 6
		Balance—	
		Debenture 100 0 0	
		Current Account .. 2 10 10	
			102 10 10
	£109 13 4		£109 13 4

Taieri Scholarship Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	306 8 8	Bank charge	0 10 0
Interest on debentures	10 14 0	Balance—	
		Debentures £267 12 2	
		Current Account, Bank of New Zealand 49 0 6	
			316 12 8
	£317 2 8		£317 2 8

Ulrich Prize Fund Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	69 7 0	Duty on medals	1 0 0
Transferred from General Account ..	1 8 0	Striking medals	4 15 0
		Balance, debentures	65 0 0
	£70 15 0		£70 15 0

Women's Scholarship Account.

	£ s. d.		£ s. d.
Balance, 31st March, 1903	610 10 5	Holder	15 0 0
Interest on debentures	22 4 0	Bank charge	0 10 0
		Balance—	
		Debentures £554 15 2	
		Current Account, Bank of New Zealand 62 9 3	
			617 4 5
	£632 14 5		£632 14 5

Interest Account.—No. 3 Loan: Building Purposes, £15,000; Reclamation Purposes, £1,000.

	£ s. d.		£ s. d.
From General Account	722 5 0	Interest paid on £16,000 to 1st January 1904	722 5 0

Debenture Account under "Dunedin Savings Bank Profits Act, 1878," and amending Act, 1902.

	£ s. d.		£ s. d.
Balance, 31st March, 1903, Government Debentures	6,500 0 0	Balance, 31st March, 1904, Government debentures	6,500 0 0

Wolf Harris Endowment Account.

	£ s. d.		£ s. d.
From Wolf Harris, Esq., to endow Chair of Physiology	2,000 0 0	Balance 31st March, 1904— Debentures	2,000 0 0

BALANCES.

Cr.	£	s.	d.
General account	3,083	12	11
Scholarships and prizes—			
Macandrew Scholarship Account ..	830	17	2
Macgregor Prize Fund Account ..	129	8	4
Parker Prize Fund Account	50	0	0
Richardson Scholarship Account ..	848	7	3
Sir Walter Scott Scholarship Account ..	303	14	11
Stuart Prize Fund Account	102	10	10
Taieri Scholarship Account	316	12	8
Ulrich Memorial Prize Fund Account ..	65	0	0
Women's Scholarship Account ..	617	4	5
Dunedin Savings-Bank Debenture Account	6,500	0	0
Wolf Harris Endowment Fund Account ..	2,000	0	0
	£14,847	8	6

Dr.	£	s.	d.
General Account, Bank of New Zealand ..	1,257	10	1
Scholarships and prizes—			
Macandrew Scholarship Account ..	130	11	5
Macgregor Prize Fund Account ..	29	4	3
Richardson Scholarship Account ..	78	12	10
Sir Walter Scott Scholarship Account ..	18	14	11
Taieri Scholarship Account	49	0	6
Women's Scholarship Account ..	62	9	3
Debentures—			
General	674	18	0
	384	5	11
	297	1	3
	100	0	0
	366	3	3
	385	0	0
From Savings-bank	6,500	0	0
Wolf Harris endowment	2,000	0	0
Scholarships and prizes—			
Macandrew Scholarship Account ..	700	5	9
Macgregor Prize Fund Account ..	100	4	1
Parker Prize Fund Account.. ..	50	0	0
Richardson Scholarship Account ..	769	14	5
Sir Walter Scott Scholarship Account	285	0	0
Stuart Prize Fund Account	100	0	0
Taieri Scholarship Account	267	12	2
Ulrich Memorial Prize Fund Account	65	0	0
Women's Scholarship Account ..	554	15	2
	15,226	3	3
Less outstanding cheques	378	14	9
	£14,847	8	6

JAS. M. E. GARROW, Registrar, University of Otago, Dunedin.

Examined and found correct,
J. K. WARBURTON,
Controller and Auditor-General.

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