DER SÜDLICHE THEIL DER PROVINZ AUCKLAND IN NEU-SEELAND

Zur Übersicht der Routen und Aufnahmen, von Dr FERDINAND von HOCHSTETTER 1859

HISTORICAL STUDIES

GROUP

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GEOLOGICAL SOCIETY OF NEW ZEALAND

[illegible] Prof. Dr. F. v. Hochstetter James Hector

F.W. Hutton Alex McKay Julius Haast

S. Herbert Cox James Park

Algernon P. Thomas James Mackintosh Bell R. Speight E. de C. Clarke

Henry Suter Colin Fraser P. Marshall

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Robin S. Allan F. J. Turner M. Ongley

H. J. Finlay C. O. Hutton

R. W. Willett Charles Fleming

Geology in its comprehensive sense is consequently a sublime and difficult science: but fortunately for its progress it is susceptible of division into many different departments, several of which are capable of being extended by mere observation. The knowledge of the general and grand arrangements of nature must be collected from a number of particular and minute instances, and on this ground the slightest information relating to the structure of the earth is to be regarded as of some importance

- Geological Society of London, 1808

THE INTRODUCTION OF THE ALPINE FAULT

The fact that Harold Wellman introduced the Alpine Fault, and the concept of its 300 mile horizontal shift, at the 1948 annual Geological Survey conference in Rotorua is not in doubt, as Dick Willett's summary below shows. Harold Wellman clearly exhibited a map, but any supporting abstract remains hidden as yet and may never have been written. What was important was the concept's introduction. Many in the 1948 audience saw that this could fit with their own data/ideas. Many minds therefore ensured that the concept developed quickly. It is now an essential element of most descriptions of South Island geology, and is an accepted milestone in world geological thinking. Dick Willett's summary of the address is brief, but the fuller record of the discussion presents a number of interesting points.

Extract from pp 91-3 of MS "Geol Staff Conference Rotorua 1948 Minutes" (Compiler R W Willett)

Mr Wellman Alpine Fault

[Mr Wellman] postulated a 300 miles movement along the Alpine Fault. [He] described the Alpine Fault itself...which to the north becomes co-linear with a line between the schist and greywackes of Marlborough. It is then joined, on hypothetical grounds, with the volcanic line of the North Island and thence out to White Island.

In the pre-Notocene rocks, on the west side of the Fault, there are no fossils younger than Devonian. The plutonic and igneous material to the south, is repeated in the north - similarly with the marine Triassic. The geosyncline is extended through Southland, swinging northwards to the line of the fault, and appearing again in the north of the South Island, and extending across to South West Auckland. Maitai rocks lie to the east of it in both cases. The Red Hills intrusive is cut off by the fault and [the] same applies to the Red Hills U.B. of Nelson. Schist of Central Otago has a corresponding schist in the Marlborough area. Along the main divide the schists have thinned.

With [the] aid of a prepared map of New Zealand, Mr Wellman demonstrated his 300 mile shift. The shift must have been post Jurassic. At no place is there Tertiary (except late Pliocene) movement on the Alpine Fault.

Mr Suggate: If Mr Wellman's construction is correct, then Mr Macpherson's arc must be abandoned.
Mr Wellman: Actually Mr Macpherson argued in the Post Notocene rocks. Some beds in the east do not correspond, and [it is] difficult to explain [them] as overthrust without lateral movement.

Mr Suggate: Did not see how it could not affect the Tertiary beds. Tertiaries west of [the] Alpine Fault should show some movement along it.
Mr Wellman: [The] only "tie in" was the Hawk Crag sediments. It is too far for a Hawk Crag arc - there is no movement. The movement must have been completed before Hawk Crag times.

Mr Harrington: [The idea] seems to be based on lithological types. One group of rocks - Riverton-Greenhills - can they be matched?
Mr Wellman: Cannot expect matching of fine divisions.

Mr Fleming: Pliocene rocks do abut against the line. Suggest as a further test - the Bay of Plenty and Kaimanawa greywackes and the Marlborough greywacke.
Mr Healy: Pointed out a ridge of greywacke in the Bay of Plenty area, striking a few degrees north of east.

Mr Suggate: What of the gap in the diagram?
Mr Wellman: The gap is required as the Alpine Fault is not straight.

Mr Te Punga: Could Mr Wellman tell us when this took place and what time the process occupied.
Mr Wellman: Post Jurassic, and pre Hawk Crag Breccia. It could not be contemporaneous with the Hokonui Orogeny, as there would be no such match as illustrated. It would take approximately 30 million years.
Mr Suggate: Pre Hawk Crag? Is that so in order to get the Hawk Crag arc?
Mr Wellman: Hawk Crag would not have been an arc before the shift.

Mr Ongley: Wondered where we were getting to with the argument. [I] want a bit more matched . Really only two features are matched. There should be others.
Mr Wellman: There is a strong development of beds at Waiau, and [I] cannot suggest that the Marlborough schists are Cretaceous. There is no agreement in facies across the fault.

Mr Fyfe: What is the age of those beds at Springs Junction, indurated sufficiently to be included in the the Maitai? There was *Monotis* found at Lake Rotoiti. Dr Henderson was there at the time, and Mr S Sylvester found the fossil. Dr Henderson identified it and then tossed [it] into the lake. [*Monotis* has never been re- collected from there!]
Mr Wellman: Schists extend from Taranaki Bight to North Auckland.

Prof Bartrum: Andesite dykes with the schists. The schists are high grade metamorphism.

Mr Suggate: Asked about the granites of north west Nelson and Fiordland.
Mr Wellman: The gneissic rocks match, and the few granites in Fiordland do.

Mr Reed: Mentioned that in Norway high grade metamorphic rocks of younger age overlie low grade metamorphic rocks of older age.

Prof Cotton: When such a large movement takes place & migration of a crust slab [occurs] in a purely horizontal direction, there must be buckling on one side or other.

David Kear

* *

Our Introductory Quotation

This comes from the earliest days of geology's existence as a separate discipline. It occurs in a small booklet entitled 'Geological Enquiries' published by the Geological Society of London in the first full year of its existence (1808). It must therefore be one of the first philosophic statements on the nature of geology.

A CLOSE VOLCANIC ENCOUNTER

The late Robin Oliver, whose obituary is given in HSG Newsletter 22, wrote an account of volcanic activity on Mt Ruapehu between May and July 1945. This is a valuable illustrated summary of volcanic activity when there was a growing tholoid in the crater which gradually replaced the crater lake. Written as an objective scientific description, it fails to mention that Oliver and a companion where injured by an eruption on July 1st. Oliver was knocked unconscious and burnt by flying debris debris. Both he and his companion were very fortunate not to have been killed. The following account of their injuries and rescue is taken from *The Dominion* of July 3 1945. Many thanks to David Johnston (GNS, Wairakei) for tracing this article.

Robin Oliver suffered a bad burn on his leg, and spent the next 6 weeks in hospital. He carried the scar for the rest of his life.

Simon Nathan

TWO TRAMPERS INJURED

Camped In Crater Of Ruapehu

ROCKS AND ASH HURLED IN SUDDEN ERUPTION

Fears that two members of a Wellington tramping party had suffered serious injuries in a violent explosion in the crater of Mount Ruapehu, where they had decided to spend Sunday night, were allayed yesterday when both men were met by rescue parties and assisted off the mountain. The trampers were Robin L. Oliver, son of Dr. W. R. B. Oliver, director of Dominion Museum, and J. Witten Hannah.

Both suffered shock and received minor burns when masses of red hot rock and ash showered over their tent, which had been pitched on the ice close to the rim of the crater lake. Oliver, who was struck by a flying rock and knocked unconscious, was carried by his companion to a ledge some distance away and left in his sleeping bag, while Hannah, though almost exhausted, descended for assistance. A relief party from the Chateau found Oliver about 2 o'clock yesterday afternoon and he was escorted to a lorry at Salt Hut and taken to the Raetihi Hospital.

The tramping party of four men and four women left Ohakune early on Saturday morning to spend a weekend on the mountain. They were, in addition to Oliver and Hannah, Mr and Mrs Boyd, Mr and Mrs Laing, and Misses Beryl Adams and Vera Schwimmer. The party stayed at Ohakune hut on the bush line, nine miles from Ohakune Junction. Oliver and Hannah went up to the crater on Sunday and decided to spend the night there.

Camped In Crater

Arriving on the high peak about 4.30 p.m., they climbed down and camped on the ice below the main Ruapehu peak and close to the edge of the lake itself. When they pitched their tent there was little activity, but at about 6 o'clock the crater began to erupt.

While the two were brewing tea some time between 8.30 and 9 there was a terrific explosion and showers of red hot volcanic rocks and ash blew out over the crater edge. Most of their equipment was destroyed, their clothes were burnt in numerous places and both of them received minor burns and abrasions from the red hot showers. Oliver was knocked unconscious and was bleeding from a head wound. Hannah, who escaped more lightly, hauled his companion through the falling debris to a ledge further away from the edge of the crater where he made him as comfortable as possible, and then picked his way down to the Ohakune hut in the dark.

When he recovered sufficiently to tell of his experience, Messrs. Laing and Boyd set out for the crater and their wives made the long bush tramp back to Ohakune for help. A rescue party of six under Constable R. Gardner was formed immediately and taking a stretcher left for the summit at 6.30 a.m. yesterday. Another party left from the Chateau. On the way the Ohakune party met Boyd and Laing, who had failed to locate Oliver. The party arrived at the crater at 3.15 p.m., where they found a message from the Chateau party to say that Oliver had been found and was being taken to Salt Hut. All the relief party and members of the Wellington tramping party were returning to Ohakune last night.

Oliver Found Exhausted

The rescue party of 10 from the Chateau, under Constable Adlam, of National Park, with Dr. D. G. McLachlan, of the hospital staff, and Mr. Angus Manson, mountain guide, found Oliver on the southern slopes beyond High Peak at about 2 p.m., in an exhausted condition but able to walk down to the road at Salt Hut, three miles above the Chateau. There were numbers of holes burnt in his pack and clothing, and he had suffered an abrasion of the shoulder. His fingers and legs were slightly burnt. Oliver said a Mr. Hussey, of Ohakune, had guided them to the crater on Sunday, then left them when they elected to remain the night. Oliver, who is attached to the Geological Survey Division, was interested in studying the eruption. The rescuers arrived back at the Chateau at 5 p.m. yesterday.

Mr. Manson said last night that the explosions on Sunday night had completely emptied the lake out of the crater. It was now filled with steaming volcanic rock and lava and all water had disappeared. The whole southern slopes of the mountain were covered with a heavy layer of black ash. The explosion which injured the trampers had hurled rocks estimated to weigh seven and eight tons half a mile down the Whakapapa Glacier. Even a mile down the glacier there were half-ton rocks.

It is considered that Oliver and Hannah were extremely fortunate in not being struck by any of the heavier material.

WILLIAM LAUDER LINDSAY

The Hochstetter of the South

"It is impossible to speak of the geological work of this pioneer geologist without referring to the accuracy of his field observations and the soundness of his generalisations. He may justly claim to have laid the foundation of the stratigraphy of New Zealand Geology"

— Park 1908, p.4

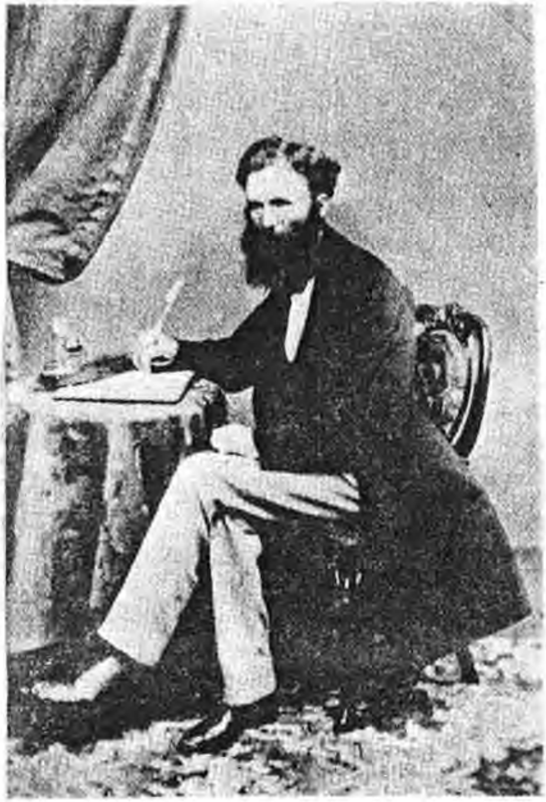
"In the years 1860 and 1861 - (actually 1861 and 1862 - APM) - Dr. W. Lauder Lindsay made a prolonged study of the geology of Otago and Southland. He grasped all the salient features of the geological structure, and his generalisations, which were based on careful field observations, still remain a monument of clear geological deduction. Thus while the genius of Hochstetter laid the foundation of the geological story of the North Island, the shrewd observations of Lindsay formed the basis of the geology of the South Island."

— Park 1910, pp. 1,2

. . . .

William Lauder Lindsay (1829-1880) was born at Edinburgh on 19 December 1829 eldest son of James Lindsay of the Register House in Edinburgh and his wife Helen Lauder. He was educated at Edinburgh High School where he was dux in 1844 and 1845.He had a strong interest in both botany and geology before entering university in 1847 as a student in medicine. At the time medicine provided the only avenue for university studies in natural science. As was the case with James Hector at the same university five years later (Hector 1885), Lindsay's interest in natural science was encouraged by John Balfour, Professor of Botany. Although his university studies were part-time (he worked as a clerk in the Register Office) he obtained several university prizes. He graduated M.D. in 1852 with a thesis on 'Anatomy, Morphology and Physiology of the Lichens'. Lindsay was to make a special study of lichens and his work did much to put the study of this group on a scientific basis. His important <u>Memoirs on the Spermogones and Pycnides of Lichens</u> (1872) lists 33 papers that he had published in the field.

Lindsay's early efforts to obtain employment were in the area of natural science and in 1854 he was an unsuccessful applicant for the Foundation Chair of Natural Science in the University of Melbourne (Anon. 1962). The position went to Frederick McCoy who a few years later was to make a controversial identification of New Zealand fossils (Fleming 1987, 265-270).



– Fleming 1986

Unsuccessful in his efforts to obtain an appointment in natural science, Lindsay, in 1854, became Resident Physician to Murray's Royal Asylum, Perth, Scotland where he was to remain until failing health compelled him to resign in 1879. He published frequently on mental disease and took a special interest in the subject of intelligence in lower animals

In his younger days, Lindsay travelled widely. He explored the mineralogical and geological features of the Harz mountains and made large collections. In subsequent years, in addition to New Zealand and Australia, he visted other places on the Continent, Iceland and the Faeroe Islands, America and Egypt (McIntosh 1882, Seccombe 1893).

Because of failing health, in 1861 he obtained a year's leave of absence which he spent in New Zealand and Australia (McIntosh 1882, p. 738). As a scientist, Lindsay was primarily a botanist and he chose Otago for his first destination because he "had every reason to anticipate meeting with unusual facilities for both geographical exploration and botanical research" (Lindsay, 1868, p.5).

He left Clyde for Dunedin in July 1861 and on the voyage out he was fortunate in having as a fellow-passenger Lieutenant-Colonel Cargill, son of William Cargill, the Father of Otago. This connection enabled him to plan his visit before arrival and also provided introductions to the provincial authorities.

Unfortunately, all this advance work was of no avail. Shortly prior to Lindsay's arrival in Dunedin, Gabriel Read had made his famous gold discovery (23 May 1861). According to Lindsay (1868, p.5) Gabriel's Gully was on a run owned by Cargill but neither he nor Lindsay were aware of the discovery until their arrival in New Zealand.

On landing at Dunedin, Lindsay was met with a general condition of excitement and social unrest. The attention of all was preoccupied with 'The Diggings'. The costs of labour and travel were high and bushrangers made the latter dangerous (Lindsay 1868, pp.5, 61).

These factors made it impossible for Lindsay to follow his original plan and his research was limited to a small area of settled land on the East Coast between Mt. Cargill and the Nuggets. His furthest west was the Tuapekas (Lindsay 1868, pp.10, 11). The coastal part of this area had been mapped in 1848 by Walter Mantell (Mantell 1850, pp. 319-27).

Lindsay spent a little over 3 months in Otago, 7 October 1861 to 20 January 1862. His headquarters were at Fairfield which is now on the southern outskirts of Dunedin city. From here he made frequent journeys on foot.

On 15 January 1862 (almost three months to the day before James Hector arrived to take up the position of Otago Provincial Geologist), Lindsay gave an address in Knox Church to the Young Men's Christian Association. His subject was "The Effect of Natural History on Colonization" (Otago Daily Times 15 January 1862) but it seems that the lecture had problems (see note at end).

Early the following month (Otago Witness 8 February 1862) the Young Men's Christian Association published Lindsay's lecture under the title "The Place and Power of Natural History in Colonization with Special Reference to Otago" (Lindsay, 1862a). This reappeared in a revised form in the Edinburgh New Philosophical Journal for April and July 1863 (Bagnall 1980, p.588). This, in turn, was published separately the same year (Lindsay, 1863).

Although, by his own admission (1862a, p.9), Lindsay's account was "based on mere superficial examination of the rocks", as a pioneer observer he was the first to identify many features of

Otago geology (Hutton and Ulrich, 1875 p.13 ; Ongley, 1939, p.5). Also, most of his predictions and hopes for scientific institutions in Otago were eventually realised.

Following his departure from Otago on 20 January 1862 Lindsay passed through the provinces of Nelson and Auckland (Lindsay 1867, p.170)

His visit to Nelson seems to have been very short (Lindsay 1867, p.170) but a longer period was spent in Auckland Province. He visited the Coromandel goldfield in February 1862 (Lindsay 1862c,p.80) and reported on a stalactite cave at Raglan (Lindsay 1872). In Auckland he may also have visited Mt. Eden as in 1876 he presented to the British Museum (Natural History) a specimen of vesicular basalt from the locality. In the same year he also presented 24 specimens of volcanic rocks, including phonolites, trachydolerites and basalts from the neighbourhood of Dunedin (Smith and Game 1954, pp. 226 and 232).

One interesting record of his New Zealand visit is found in the Proceedings of the Royal Society of Edinburgh, Session 1864-65. On Tuesday , 3 January 1865, A. Keith Johnston, a, well known Edinburgh cartographer, read a communication by Lindsay on a map of Taranaki executed by a Maori. The Map was exhibited at the meeting (Lindsay, 1866a)

On his way back to Scotland, Lindsay stopped over in Australia where he "had the opportunity of examining a better suite of illustrations of New Zealand geology and mineralogy (in the magnificent collection of the Rev.W.B.Clarke, the Government Geologist of New South Wales) than in New Zealand itself" (Lindsay 1863,'p.20).

Lindsay did not forget New Zealand when he returned to Scotland. Nor, for that matter, did New Zealand forget him; at least not in the first ten years after his visit.

In 1871 the New Zealand Institute recognized Lindsay's contribution to the natural history of New Zealand by electing him an Honorary Member. In several of his publications, e.g 1866b, 1867, ,1868, Lindsay describes himself as "Honorary Fellow (or Member) of the Philosophical Institute of Canterbury" but we can find no evidence of this in the New Zealand literature. In any case, the Otago Institute would have been the logical body to make such an award. Significantly he makes no claim to this honour in later publications sighted by the author of this article.

For his part, Lindsay, maintained an interest in New Zealand for fifteen years after his departure.

At a conversazione of the Royal Society of Edinburgh held on 25 February 1863 Lindsay exhibited "Illustrations of the Geology and Mineralogy of New Zealand (Royal Society of Edinburgh.

1863). In addition to specimens, the illustrations included maps, photographs, panoramic views and sketches, all of which could still be available in the archives of the society.

Attached to the programme for the conversazione is a four page note headed "Illustrations of the Geology and Mineralogy of Otago", obviously the work of Lindsay. This detailed listing of Otago rocks bears out Park's opinions quoted at the start of this article. In view of its scarcity in New Zealand and its importance as a summary of Lindsay's work in Otago it is reproduced in full at the end of this article. Unfortunately my copy has suffered some mutilation.

Two years later, Lindsay exhibited at the New Zealand Exhibition held in Dunedin in 1865 with a display of paper-making materials and also "Specimens illustrative of the Geology of Northern Europe, as bearing on that of Otago" which he had donated to the Otago Museum (Anon 1866).

Lindsay was also represented in the New Zealand Court at the Vienna Exhibition of 1873. In addition to botanical specimens, photographs, and sketches he exhibited "17 geological and other maps" (Robinson 1873, pp.212, 215).

On his return to Scotland from New Zealand Lindsay wrote several papers on the coal and goldfields of New Zealand (Lindsay, 1862b, 1862c, 1866b, 1867). He also remembered New Zealand in his other geology papers which concentrated on gold in Scotland (e.g.Lindsay 1870 and 1880). In these he makes frequent comparisons with his findings in New Zealand and he attributes his interest in the subject of gold to his visit to New Zealand "at the time of the outbreak of the gold fever in that fine colony" (1880. p.153).

In 1868 Lindsay indicated that he was preparing papers on the physical geography and the geology of Otago (1868, p.91) but these never eventuated. No doubt his productivity was affected by his continuing ill-health (McIntosh 1882, p. 739).

Lauder Lindsay's publications in medicine (in which he made his career) and botany do not concern us here but we should mention that in the New Zealand context he also published on diatoms, forest trees and tutu poison.

He was one of the first to propose the introduction of salmon into New Zealand and his paper on the subject was referred by the Otago Institute to the Provincial. Government, the Colonial Government, and Acclimatization Societies (Lindsay 1874)

He did not impress all his British contacts e.g. in a letter to Hector dated 13 January 1866 Joseph Dalton Hooker writes-

> I am disgusted with Lauder Lindsay's way of going on, he has in the same way been writing [boshy?] Botany: sorts

of rechauffer* of my work with additions for all which he seems indebted to Currie, Nylander & others. He is a most unsatisfactory man. I quite agree with you that such things do not deserve the honor of Reclamation on our part - really the poor beggar is washed out himself and wants coloring matter from any source.

* French word meaning "to reheat, revise or serve up anew"

(Yaldwyn and Hobbs, 1998, p.66)

Yet, the following year Hooker, in his Handbook of New Zealand Flora, has mellowed in his attitude -

From the Otago province I have an excellent herbarium of Dunedin plants, made by Dr. Lauder Lindsay, F.L.S

and

A considerable number of species are introduced from a manuscript, kindly lent me by Dr. Lindsay, which contains the botanical results of his visit to the islands

(Hooker, 1867, pp. 12, 13, 552)

....

A Note on Lindsay's Lecture of 15 January 1862

In his preface to the first published account of the lecture (Lindsay, 1862a) Robert Gillies, Secretary of the Young Men's Christian Association, writes

......Dr. Lindsay found that the state of his health would not permit him to complete his notes, or even deliver what he had completed. This will account for the fragmentary snd imperfect character of the paper; and it ought to be mentioned that the lecture is printed just as it was roughly sketched off at first, without receiving any revision whatsoever from the author.

This statement suggests that the lecture was not given and this view is supported by the fact that not one of the newspapers of the time, Otago Colonist, Otago Daily Times, and Otago Witnes reported on the talk in their issues over the next day or so. There is no mention of either the lecture taking place or of it being cancelled. (Personal communication from Jean Strachan of Dunedin Public Library). This despite the fact that in its issue of 15 January the Daily Times had exhorted its readers to attend the lecture scheduled for that night.

On the other hand, the correspondence columns of the Otago Daily Times for 29, 30, and 31 January 1862 contain letters referring to "the lecture". But why were these letters not written until two weeks after the lecture? Also, the Supplement to the same newspaper of 31 January 1862 devotes three columns to reporting the geological portion of "the lecture" under the heading "Geology of Otago".

My interpretation of all this is that the lecture did take place but did not go according to plan. Not only had Lindsay not completed his script but illness prevented him from delivering all he had prepared. Hence the tactful silence of the press during the ensuing fortnight.

Early the following month (Otago Witness 8 February 1862) the Young Men's Christian Association published Lindsay's lecture under the title "The Place and Power of Natural History in Colonization with Special Reference to Otago" (Lindsay, 1862a). The title page is endorsed "Being portions of a lecture prepared for, and at the request of, the 'Young Men's Christian Association' of Dunedin". (Note the phrase "prepared for", not "delivered to".) Earth scientists will be pleased to learn that the sections omitted are those dealing with the botany and zoology of the province (Lindsay 1862a, pp 28,29). Geology is given 8 pages and another 6 are devoted to proposing a Museum of Local Natural History. There are smaller sections recommending a botanic garden and university * for the province and on the teaching of science in schools.

Gillies statement quoted above provides the reason for the reappearance of the article in revised form in the Edinburgh New Philosophical Journal for April and July 1863 (Bagnall 1980, p. 588). This, in turn, was published separately that same year (Lindsay, 1863). This publication again carries an endorsement - "Extracts from a Lecture prepared for , and at the request of, the 'Young Men's Christian Association' of Dunedin" (footnote p.3)

Jean Strachan, McNab New Zealand Librarian at Dunedin Public Library, in a personal communication suggests that the 1862 publication represents Lindsay's imcomplete notes which he intended to use for his lecture but was not able to do so. He later completed the notes and published the later version. This has a word count of approximately 16,000 compared with approximately 20,000 of the 1862 version.

Acknowledgments :

Jean Strachan, McNab New Zealand Librarian at Dunedin Public

* Thirteen years later, Lindsay was to return to the subject of the University of Otago which was eventually founded in 1869 (Lindsay 1875)

Library, kindly perused newspaper files on my behalf and made helpful suggestions on the circumstances of Lindsay's lecture of 15 lanuary 1862. John Yaldwyn, Museum of New Zealand, gave permission to quote from My Dear Hector and provided additional information.

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Alan Mason

CONVERSAZIONE

OF THE

ROYAL SOCIETY OF EDINBURGH,

25th FEBRUARY, 1863.

ILLUSTRATIONS OF THE

GEOLOGY* AND MINERALOGY OF OTAGO,

NEW ZEALAND.

I.—AURIFEROUS ROCKS AND DEPOSITS.**

1. General resemblance to those of all other auriferous countries yet known.
2. "Bed-Rock:" Metamorphic Slates :—probably of Silurian age, [mostly Gneiss, Mica, Chlorite, Talc, Clay, and other Slates, with associated Quartzites.]
   - *a*. Frequency of ferruginous impregnation.
   - *b*. Occasional disturbance by eruptive volcanic rocks.
3. These Slates probably form geological basis of greater part of Otago, especially of great central mountain ranges [height 5000 to 9000 feet].
4. *General resemblance of these auriferous slates to the metamorphic slates [of lower Silurian age] of the* SCOTTISH GRAMPIANS.

   Probable diffusion of Gold in Silurian slates, and their derived "Drifts", or alluvium, IN SCOTLAND. "Nuggets" already found in Leadhills, Tweeddale, Breadalbane, Sutherlandshire, &c.

* *Vide* Chapter on "Geology of Otago," in a Lecture on "The Place and Power of Natural History in Colonization, with special reference to Otago." Pamphlet, pp. 30, Dunedin, January, 1862.

** *Vide* Papers on "Geology of the Otago Gold Fields," and on "Geology of the Auckland Gold Fields," read before Geological Section of British Association at Cambridge, October 5, 1862.

5. "*Drift*:" Cainozoic age.

a. *Upper*: consisting of clays, boulder clays, and "chopped-slate" gravels.

b. *Lower*: characterised by *Lignite* beds and associated strata.

Abundance and thickness: extent of distribution.

Gold mining in Otago mostly *alluvial digging*: Comparison with Auckland [Coromandel] gold field, where mainly *Quartz reefing*.**

6. Chief auriferous district is the basin drained by the great central Lakes [Hawea, Wanaka, and Wakatip,] and the Clutha River, with their feeders or tributaries.

Tuapeka and *Dunstan* Gold Fields: *Lindis* and *Arrow* diggings, &c.

7. Auriferous drifts occur also on tributaries [mostly head-waters] of the Mataura [*Nokomai* Gold Field]: Tokomairiro [*Woolshed*]: Waipori [*Waipori*]: Shag and Taeri [*Mount-Highlay* diggings]: Waikouaiti, and other rivers and streams in different parts of province, as well as on the coast [*Moeraki-Beach*] and in and around the capital,—Dunedin [Saddlehill.]

8. Speaking generally, greater part of Otago is auriferous [an area nearly equal to that of Scotland].

9. Minerals associated with Gold, or occurring in the auriferous Drift.

Iserine, prevalence and abundance: *Cinnabar*: *Cassiterite*: *Aquamarine* [*Beryl*]: *Avanturine*, &c.

10. Prediction as to auriferous character of certain New Zealand rocks, by Rev. W. B. Clarke, of Sydney, (Government Geologist of New South Wales,) in 1851.

a. Discovery of *Tuapeka*, by Thomas Gabriel Read, 4th June; proclaimed a Gold Field, July; and First Gold Escort, 12th July, 1861.

b. *Dunstan* and *Nokomai* proclaimed Gold Fields, 23d September, 1862.

c. New Zealand Gold-Fields Act, 1858-60-62.

d. Otago Gold-Fields Regulations, 7th October, 1861: amended 27th June, and 21st July, 1862.

11. *Auriferous productiveness of Otago.*

a. During eighteen months—from discovery of Tuapeka to close of 1862—total yield of Gold [in round numbers] 550,000 oz., of value upwards of *two millions* sterling: probably in following proportions, from

Tuapeka gold field.	360,000 oz.
Waitahuna,	90,000 ,,
Dunstan gold field,	80,000 ,,
Waipori,	7,000 ,,
Woolshed,	6,000 ,,
Nokomai gold field; Highlay, Lindis, Moeraki, etc.,	7,000 ,,
Total,	550,000 oz.

b. Towards close of 1862, mining population of Otago 7,500: fortnightly escort brought to Dunedin upwards of 30,000 oz., giving to each digger an average of at least 1 oz. per week.

c. Up to 31st March, 1862, total export of Gold from New Zealand—

Produce of Gold-Fields in Province of	Quantity† In oz.	Value.
I. Otago,1	359,639	L.1,898,600
II. Nelson,2	46,591	180,541
III. Auckland,3	364	1,372
Total,	406,584	L.1,575,513

† All the quantities given are *exclusive* of what has passed through *private* channels, and could not be duly estimated.

12. *Gold Mining destined to become one of the regular, permanent Industrial resources of Otago.*

a. Supply of Gold at present *unlimited.*

b. No mechanico-chemical contrivances at present adequate to due exhaustion of its auriferous deposits.

II.—LIGNITES, OR BROWN COALS.

1. Cainozoic age: contained in the lower or older auriferous drift, and probably co-extensive therewith. Abundance: general distribution over province.

2. Transition stages from wood to coal.

General resemblance, on one hand, to "Surturbrand" of Iceland, and Brown Coal of Germany [Bonn, etc.]—Cainozoic Lignites; and on the other, to "Coals" of Mesozoic and Palæozoic age.

Comparison with Cainozoic [older and newer] Lignites, of province of Auckland [Drury, Hunua, St. George's Bay, Auckland, &c.]; and with Palæozoic [Carboniferous] and Mesozoic [Cretaceous and Jurassic] Coals of province of Nelson.

3. So-called "Coals" of Fairfield, Saddlehill, Tokomairiro, Clutha, etc.

a. Market price in Dunedin L.2 per ton.

b. Results of chemical analysis.

1 Tuapeka Gold Field and neighbouring diggings alone; mining operations begun in 1861.
2 Aorere, Collingwood, Wangapeka, Buller River, and other diggings; operations begun 1854-7.
3 Coromandel diggings; operations begun 1852.

4. Associated Strata.

a. Quartz-conglomerate ["Cement"] and Sandstones: Building Stones.

b. Clays: Fire and Potter's Clays: Kaolins: Ochres: Laterite.

c. Shales and Limestones, partly fossiliferous [Dicotyledonous leaves, etc.]

5. Included Minerals—Iron Pyrites, Alum, etc.

III.—FOSSILIFEROUS LIMESTONES AND ASSOCIATED STRATA.

1. Probable age: partly Cainozoic, partly Mesozoic [Cretaceous, etc.], and perhaps also partly Palæozoic [Permian, etc.]

a. Comparison with similar strata in other parts of New Zealand, at present supposed to be—

1. Cainozoic,—representatives of Eocene [Bognor beds, etc.]: beds containing Cetaceans, etc.

2. Mesozoic—Cretaceous and Greensand—representatives of Maestricht and Faxö Beds, etc.: Jurassic, containing *Plesiosaurus australis*, etc.: Triassic [equivalents of the *Muschelkalk.*]

3. Palæozoic.—Permian and Carboniferous.

2. *Metamorphism:* Marble of Horse Shoe Bush, Tokomairiro, &c.

3. *Uses:* Building Stones: manure, &c.

4. *Types or examples.*

a. *Greenisland* series, [Dunedin,]—*Infusorial* [mass of microscopic *Foraminifera*, *Entomostraca*, &c.] *Terebratula*: *Echinoderms*: *Ichthyolites*, [Fish teeth—*Shark* family: *defences* or *spines*, &c.]

Glauconitic character: Arenaceous beds.

b. *Woodburn series*, [Saddlehill.]

Ostrea: spines of *Echinoderms*, &c.

c. *Shaw's Bay* series,—Mouth of the Clutha.

Spirifers: *Ammonites*; *Mytilus* Shells, &c

d. *Oamaru* [*Otolara*] series. New species of *Terebratula*. *Cercopora*: *Textularia*; *Bairdia*; *Cythereis*, &c.

e. *Mataura* and *Shag Valley* series, &c.

IV.—FOSSILIFEROUS CLAYS AND ASSOCIATED STRATA.

1. Cainozoic age.

a. *Moeraki* series, [*Onekakara*] Pleistocene.

New species of *Pustulopora—Struthiolaria—Ancillaria—Fusus*, &c.

Septaria beds: Cement.

b. Silicified Wood: Araucarian and monocotyledonous, etc.

c. Drift Wood and Lignites.

V.—MOA-BONE DEPOSITS.

Mostly *Dinornis*: partly *Palapteryx*, etc: age partly recent, partly Cainozoic.
Waikouaiti Bed, &c.

VI.--KAURI-GUM DEPOSITS.

Indicative of former prevalence of Kauri forests over great part of Otago: mostly in Cainozoic strata [Auriferous Drift, etc.] Waitahuna: Tokomairiro: Basin of the Clutha, etc.

VII.--VOLCANIC [TRAPPEAN] ROCKS.

Mostly Cainozoic.

1. *General resemblance of those of Dunedin to those of Edinburgh.*

2. *Basalts*: Columnar: spheroidal: granular: schistose: [Clinkstone and Lydian stone.]

a. *Use*: Road metal: building stones.

b. Contained Minerals: Zeolites: Olivine: Augite, etc.

3. *Tuffes*: amygdaloidal: slaggy or scoriaceous: comparison of latter form with the *Scoria* of the extinct Craters of Auckland.

Contents a. *Sulphur* and Sulphur Muds.

b. *Steatites*.

c. *Lithomarges, ochres, and umbers*: use as pigments.

d. Siliceous and other *Pseudomorphs*.

e. *Schorl*, *Nephaline*, and other minerals.

4. *Porphyries* and *amygdaloids* [Basalt and Claystone base etc.]: *Trachytes*, etc.

VIII.--PARALLELISM BETWEEN THE KJÖKKENMÖDDINGS OF DENMARK AND THE REFUSE HEAPS OF FORMER MAORI PAHS AND VILLAGES, &c.

Collocation of—

a. Shell-mounds: edible and existing species of *Cardium*: *Ostrea*: *Mytilus*: *Patella*: *Venus*: *Haliotis*: etc.

b. Maori *Ovens* and Baking stones: ashes and charred wood.

c. Maori *Stone Hatchets* or "Celts": [of Clinkstone, Lydian stone, or Nephrite.]

d. Eggs and bones of *Moa*, [mostly long bones]

e. Bones of *Man*: Native *Dog*: *Seal*: *Fish*: and various *Birds*—all mostly existing species [*Penguin*—*Albatross*—*Rail*—*Apteryx*, etc.]: all Bones partly charred—calcined—gnawed—broken—or marked by stone-hatchets.

IX.--INSUFFICIENT DATA FOR ACCURATE CHRONOLOGICAL GROUPING OF ROCKS OF OTAGO: arising from

1. Great portion of Province remaining to be explored.

a. Very limited portion of settled districts yet geologically examined, and that only superficially.

7. *Difficulty of determining European equivalents, and thereby too, from present unsatisfactory state of Geological classification and nomenclature.*

Necessity for Reform, with a view to arranging of—

a. More comprehensive and natural Groups.

b. Less arbitrary and artificial lines of separation or boundary.

c. Less local and objectionable nomenclature.

X.—PROVISIONAL CHRONOLOGY OF CHIEF ROCKS OF OTAGO, as known to close of 1861.

I. *Recent.*

Superficial Alluvium: Brick Clays.

Certain *Moa*-Bone deposits.

II. *Cainozoic.*

Auriferous Drift: Upper.

" Lower: Lignite Beds and associated Strata.

Certain Volcanic (Trappean) Rocks.

" Fossiliferous Limestones.

" " Clays.

" " *Septaria* beds of Moeraki.

" " Moa-Bone Deposits.

" " Kauri-Gum "

III. *Mesozoic.*

Certain Fossiliferous Limestones.

IV. *Palæozoic.*

Metamorphic Slates: quartziferous and auriferous.

Possibly certain Fossiliferous Limestones, etc.

Preponderance of Strata of PALÆOZOIC *and* CAINOZOIC *age: especially of the* AURIFEROUS SLATES AND THEIR "DRIFTS."

* *

A Reminiscence of Sir James Hector

Arnold Wall was a member of the University of New Zealand Senate at the same time as Hector and in his autobiography Long and Happy, he recalls Hector's outburst when the senate was discussing a proposal for reform in the university

> " He -(Hector) - was strongly opposed to any change which would require Parliamentary sanction, for if the charter of the university were submitted to the attentions of Parliament nobody knew what might happen. 'If the members of Parliament get hold of it they will mangle it; monkeys do it, monkeys do it, anything they can't understand they pull to pieces !' "

Mineral Names, Endings and Mineralogy History

What can mineral names tell us about the history of mineralogy? Quite a lot, and I am not the first to have considered it (e.g see *Mineral Names: What Do They Mean?* - R.S. Mitchell). The following are a few thoughts inspired by them. For some reason, it is the endings that capture my attention most.

Most mineral names end in *-ite*, as everyone knows. Assuming that it is the anomalies that are usually more informative, consider the following list of some generally well-known names that do not end in *-ite*, together with dates of origin (*Dana's New Mineralogy* 8th ed, 1997 - "D"), and/or first usage in English (according to the *Oxford Dictionary*, 2nd ed, 1989 - "X"):

adularia (1798X)
analcime (1801D)
anatase (1801D)
amphibole (1801D)
andesine (1841D)
barytes (1640D)
beryl (SA[1] 1305,1398X)
celsian (1895D)
chloritoid (1837D)
chrysocolla (315BC D)
collophane (1870X)
corundum(SA 1728X)
davyne (1825D)
diallage (1801D)
diaspore (1801D)
diopside (1800D)
dioptase (1797D)
disthene (1801D)
epidote (1801D)
feldspar (1742D)
galena (SA 1601X)
garnet (1310X)
glaucophane (1845D)
grossular (1811D)
gypsum (SA 1387X)
harmotome (1801D)
haüyne (1807D)
hornblende (1770X)
hyalophane (1855D)
idocrase (1804X)
jasper (SA 1330X)
kaolin (1727X)
leucoxene (1889X)
levyne (1825D)
lime (1935D)
mica (1706X)
microcline (1830D)
nosean (1815D)
oligoclase (1826D)
olivine (1790X)
opal (SA 1398,1567X)
orthoclase (1823D)
periclase (1840D)
plagioclase (1847X)
psilomelane (1827D)
pyrope (1803D)
pyroxene (1796X)
quartz (SA 1756X)
rutile (1803D)
schorl (1524D or 1747D)
spessartine (1832D)
sphene (1801X)
spinel (1528D)
spodumene (1800D)
stilpnomelane (1827D)
talc (SA 1601X)
topaz (SA 1272,1567X)
tourmaline (1707X)
ulvöspinel (1943D)
viridine (1879X as "-ite")
xenotime (1832D)
zircon (SA 1783D)

Endings and their derivations

Though names with *-ite* endings have been excluded, there are still some endings that are prominent. Consider *-ine*. In some an alternative has been developed, simply replacing *-ine* with *-ite* - e.g. *spessartite*. But *tourmalite* and *microclite* would definitely not be tolerated. *Andesite* is a rock - something quite different (though it is likely to contain andesine rather than another plagioclase). Some can be "modernised" by the addition of *-ite*: - *hauynite*, *levynite*, *noselite*. The derivation of *-ine* is from Latin -inus, and is similar to *-ite*, meaning "derived from" or "pertaining to".

To suggest something is like something else, add *-oid*; *spheroid*, *granitoid*. So we have *feldspathoid* and *chloritoid*. Feldspathoids are like feldspars, but they contain less silica. Chloritoid is not really all that much like chlorite, though the resemblance is probably the origin

[1] SA - Dana notes that this name has been used since antiquity

of the name. The ending is from -o- (as a connective from the preceding syllable) and ειδης (resembling), or οιδα - or ειδω (to seem like).

Most others, though endings in effect, are not etymologically endings, but are simply the ends of words from which the minerals get their names. Consider *-ene, -ase, -ane, -ime, -ote,* and *-ome.*

-ene: - σφην (a wedge), σθηνος (strength), ξενος (stranger) - so pyroxene is a stranger to igneous rocks (or so it was apparently thought, once upon a time!), and leucoxene is a white stranger. Disthene has two different strengths in different directions. Anyway, *-ene* is largely on the way out; *sphene* is titanite, *disthene* is kyanite, and *hypersthene* is enstatite or simply clinopyroxene. But *pyroxene* is probably here to stay. *Leucoxene* (like *psilomelane*) is too vague to warrant stringent redefinition, and will probably stay a useful carpet-bag term.

-ase: probably also here to stay, as it is such an integral part of feldspar names - though *idocrase* has become vesuvianite. Derived from κρασις (mixture), or κλασις (cleavage).

-ane: from μελαν (black) or φανης (appear, or shining). *Stilpnomelane* is glittering black, *psilomelane* is bare black, *hyalophane* appears glassy (or glassy and shining), and *collophane* appears like glue (κολλα).

-ime: Analcime is αν– αλκιμ–ος (not strong), and *xenotime* is a valuable stranger (τιμη is value or esteem).

-ote: Epidote is from επι+δοσις (gift).
-ome: Harmotome is joint cutting (τομος - cutting).

Though names ending *-ite* were excluded from the above list, they need some comment. How old is *-ite* as an ending, and why did it come to be the standard? Several names such as *haematite*, *malachite*, and *pyrite* (or *pyrites*) have been in use since antiquity and are likely forerunners. It is derived from both Latin (*-ita* or *-ites*) and Greek (-ιτης), meaning "connected with" or "belonging to". So *haematite* is of blood-red colour, *malachite* is the colour of the mallow, and *pyrite* is a stone that strikes fire. Convention (and etymology) suggests that adding *-ite* to a mineral name also makes it a rock name: consider *quartzite*, *pyroxenite*, *albitite*, *oligoclasite*, *andesinite*, *amphibolite*, *hornblendite*, *olivinite*, *serpentinite*, *nephelinite*, *diallagite*, *bronzitite*, *chromitite*; even *biotitite* and *melilitite*. Some rock names change a *t* to an *s* - consider *anorthosite*, *epidosite*, and *perthosite*. *Peridotite* is an interesting one; does it (or did it) consist of peridot - gem-quality olivine? But how about *kaolin*? That is really perverse - kaolinite is not a kaolin-rich rock, it is a specific mineral within the kaolin group.

Gypsum and chrysocolla are direct from Greek γυψος (gypsum), and χρυσος (gold) + κολλα (glue or solder).

Lime is an oddity - also because it is of Latin rather than Greek origin (*limus* = mud). Although known since antiquity, it was not known as a mineral until recognised as films in limestone enveloped in lava on Vesuvius; hence its 1935 date.

Relation of names to mineralogy history

There was clearly a spate of naming in the first decade of the 19th century. One of the significant events was the publication by R.-J. Haüy of his *Treatise on Mineralogy* (1801). Another was Thomas Allan's *Alphabetical List of Minerals in English French and German* (1808). (Allanite was named after him). Dana's *A Sytem of Mineralogy* (1st ed. 1837) must have produced many names, though only *chloritoid* appears on the above list. Some earlier dates crop up more than once. One is 1567, for John Maplet's *A Greene Forest.* Another is 1398, which is when John of Trevista translated from Latin to English what has been referred to as "the encyclopaedia of the Middle Ages" - *De Proprietatibus Rerum*, by Bartholomew de Glanville (13th century).

Let's look at that list again, this time removing all the names ending with *-vowel/consonant/e:*

adularia (1798)	*chrysocolla* (315BC)	*hornblende* (1770)	*quartz* (1756)
barytes (1640)	*feldspar* (1757)	*jasper* (SA 1330)	*schorl* (1524)
beryl (SA 1305)	*galena* (1601)	*kaolin* (1720)	*spinel* (1528)
celsian (1895)	*garnet* (1310)	*mica* (1706)	*topaz* (SA 1272)
chloritoid (1837)	*grossular* (1811)	*nosean* (1815)	*ulvöspinel* (1943)
corundum (SA 1728)	*gypsum* (SA 1387)	*opal* (1398)	*zircon* (1783)

This list reflects the fact that it was in the late 18th and early 19th centuries (largely following Linnaeus in 1823) that there began to be something of a system for naming minerals. All the names in the last paragraph (except *chloritoid, ulvöspinel* - those being clearly a bit out of place anyway, and *celsian*) are real veterans - pre-1815, probably reflecting their function in denoting materials that were relevant to life at that time, and not necessarily simply related to mining. *Amphibole* (1606) and *pyroxene* (1800) were excluded from the list only because of our very arbitrary criterion. Only in the 19th and 20th centuries, not surprisingly, when the science of mineralogy became systematically developed, did the system of nomenclature evolve where nearly everything ended *-ite*. In the 20th century, when the largest number of minerals received their names, no names without the ending *-ite* appear to have been coined. (I was going to offer a chocolate fish to anyone who could supply such a name, and then I discovered *lime*. There's always some surprise awaiting. But then it isn't really a newly coined name.)

Contemplating the above is much more fun in the middle of the night than counting sheep. How about starting on rock names?

David Smale

....

Editorial Note :

In sending the above article to us David said that it started out as mental doodlings in the middle of the night when he couldn't sleep. Hence his closing sentence which also raises the subject of a sequel on rock names. Any one willing to take up the challenge ?

One of our Historical Studies Group members, Brian Mason, is the subject of an interesting mineral name although the connection is not obvious. The mineral is stenhuggarite from the Swedish word for stonemason, stenhuggar. It was named in honour of Brian who contributed much to the study of the minerals of Sweden. The name masonite could not be used because it was a trademark.

However Brian has been given justice with the mineral brianite.

All this means that Brian is one of the few people to have one mineral named using his first name and another using his last name.

(The above information comes from Mitchell's Mineral Names : What Do They Mean ? mentioned in David's article)

For the specialist - Brianite, $Na_2CaMg(PO_4)_2$, is a colourless monoclinic meteorite -(naturally)- mineral. Stenhuggarite, $CaFe^{3+}SbO(AsO_3)_2$, is a bright orange tetragonal mineral.

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Bartrum Stratigraphy Notes -

In our last newsletter (No.22, March 2001, p.26) we announced the availablility of New Zealand stratigraphy notes issued by Professor Bartrum to his students at Auckland sixty years ago. We have since received from Malcolm Simpson a handwritten precis of the comparable Bartrum notes from the early 1920's. Malcolm made his precis in 1947 from a set belonging to Mrs. Reg Webber (refer page 21 of Newsletter 17). As Sophie Haddow, Mrs Webber studied geology under Bartrum in 1923. In the same class was her future husband, Reg. Webber.

Malcolm has also given us a set of Bartrum's cyclostyled mineralogy notes from the same period.

If you would like to purchase a copy of either of these sets, please contact Alan Mason

Professor Benson and the University of Sydney :

Professor Alan Voisey in a note on Professor Benson in Geological Society of New Zealand Newsletter No.11, 1961 states that Benson accepted the chair at Otago "thinking at the time it might be a stepping stone to the Sydney Chair when it was relinquished by Sir Edgeworth David, whose teaching and example greatly influenced Benson's whole life."

Some years ago Larry Harrington told me that David, on his retirement in 1924, blocked three of his former students, all very strong and capable, from succeeding him in the Sydney Chair of Geology. The three were Mawson, Griffith Taylor and Benson.

More light has been thrown on the subject in a recently published biography of Mawson.*

Mawson had had his eye on the Sydney Chair since the end of World War 1 and when David's retirement was announced he expressed his interest in the position to the Registrar of the University. Another one to express interest was Benson.

A committee of eminent British geologists recommended Mawson for the position with Benson as second choice and Cotton third. Just before this became known, Mawson withdrew his name. (He was later to change his mind again).

David's own choice for his successor was his Acting Professor, Leo Cotton, but this choice was made through a sense of obligation to Cotton who had run the Sydney Department whilst David was absent on war service. Such was David's influence in the University that Cotton was given the appointment despite the fact that he was last in the British Committee's ranking.

These are the 'bare bones' of the story given by Ayres in Chapter 10, The Sydney Chair, of his book.

So - If! -

If Mawson han not reversed his decision to withdraw and if the University Senate had taken the advice of the British Committee William Noel Benson would have left New Zealand in 1924.

We in this country can be thankful that David's standing with the Senate of the University of Sydney was so strong.

Alan Mason

* Mawson: A Life by Philip Ayres. The Miegunyah Press. 1999.

IN THE BEGINNING - The Egmont Volcano

Egmont was sighted on both of Cook's first two voyages but was not recognised as a volcano, not even by the naturalists on the voyages, Banks and the two Forsters. This despite the fact that Johann Reinhold Forster had a life-long interest in volcanism and devoted nine pages to the subject in his book on the second voyage (Forster, 1778, 137-145). Banks, on the first voyage, was, nevertheless, most enthusiastic in his description of the mountain. His Endeavour Journal note for 13 January 1770 reads

This morn soon after day break we had a momentary
view of our great hill the top of which was thick
covered with snow tho this month answers to
July in England how high it may be I do not
take upon me to judge but it is certainly the
noblest hill I have ever seen & it appears to
the utmost advantage rising from the sea
without another hill in its neighbourhood one
4th part of its height at sun set the top appeard
again for a few minutes but the who' day it
was covered with clouds.

- Banks 1980, vol.2.p.118

Sidney Parkinson, artist on the first voyage, made two pencil sketches of Egmont, one of which is reproduced below

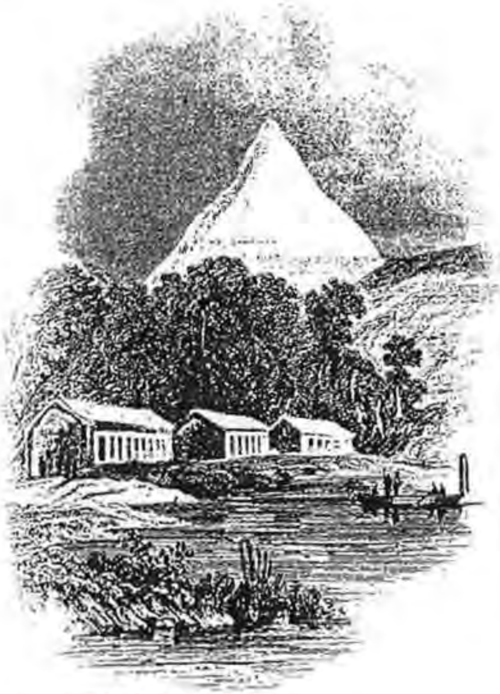
-David, 1988, p.237

(Parkinson's annotation reads "whitish clouds")

Although not as spectacular, Parkinson's view is certainly more accurate than those of Rapkin and Milner (opposite page)

The first recognition of Egmont as a volcano is found in Marshall 1836, pp174, 175 and 183,184 -

> In the far distance, but, from its stupendous altitude, which has been estimated at 14,000 feet, brought apparently within an hour's reach of us, Mount Egmont reared itself in all its stateliness and pride........A more striking or magnificent object in creation than this mountain, I have never beheld, and find it difficult to conceive, unless, indeed, it be its former self, lighted up by the fire that is now slumbering or extinct within its bosom, belching forth lakes of lava on the vast plain from whence it towers in lonely grandeur, made more grand by the very solitariness of its condition, a pyramid of God's own handy work, in sight of which the pyramids of man's erection grow dwarfish, and shrinking from the comparison into insignificance, are felt to be "poor indeed ". The outlines of two craters on its summit are distinctly visible: and deep fissures, proceeding at equal distances, like undulating radii from a common centre, along the plain, show how the too solid earth has been rent and torn during the agonistic throes of the once convulsed and burning mountain ; and with the beds of lava, visible in all directions,serve to prove that once the fierce volcano blazed upon its summit into a beacon ....
>
> In speaking of Mt. Egmont, as a slumbering or spent volcano, I had occasion to make mention of those remarkable rents in the ground, which have widened very generally into ravines,and being well watered are covered with vegetation ; and I then referred the phenomenon to volcanic agency. It may be right, however, to mention in this place, that water probably had a share in producing them as well as fire ; I suppose them to have been produced somewhat in this way. The expansion of steam within the womb of the earth, met with equal resistance at every part, except where the mountain torrents had worn away its surface into beds for the rivers which they fed with perpetual supplies, drawn from the sides and summits of the mountain. Here the resistance from without necessarily diminished as the bed of a river either widened or deepened, while the pressure from within, at such parts, as necessarily, caused the earth, elsewhere solid, to yield; and when at length the fires that had struggled for a vent, evolved at the craters, the pressure, and with it the support from within, being removed, and the weight of water,perhaps at those times mingled with streams of lava, impending without, the ground would give way under the superincumbent load; fall in, and thus occasion those, in some places fearful chasms, in others, wild



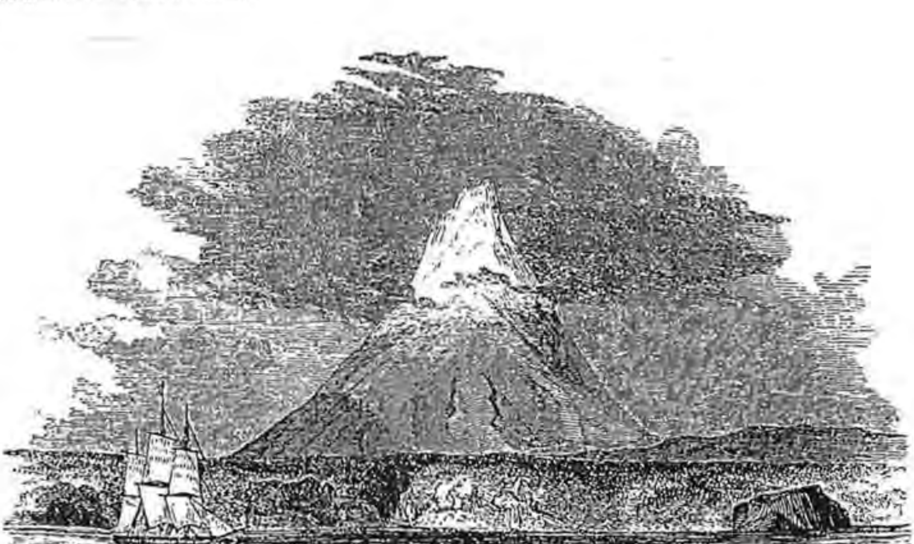
MOUNT EGMONT FROM NEW PLYMOUTH

Two Early Impressions of Egmont

Left : A vignette from a map of New Zealand drawn by J. Rapkin and published in Tallis's Illustrated Atlas in 1851.

-Maling 1996, p.143

Below : From Milner 1860 (page 201)



Mount Egmont in New Zealand.

but beautiful glens.

(Take it slowly and you should be able to understand it. Try removing some of the commas - APM.)

....

Marshall also visited the Bay of Islands where, on 15 March 1834, he "had a distant view of a volcanic mountain, rising in the centre of a vast plain, like a cone, the inverted edge of the crater being distinctly visible, although the fire that once burned within, is either slumbering there still, or has exhausted itself". This was probably Te Ahuahu.

He then goes on -

> " Traces of a volcanic origin are said to be discernible over the whole island, and the alleged fact that soundings may be had from its northern extremity all the way to Norfolk Island, would lead to the supposition that many of the isles by which these seas are studded, are the productions of submarine volcanos. "
>
> (pp.69,70)

....

Acknowledgment;

I am grateful to Heather Nicholson for drawing to my attention the note in Milner, 1860.

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Alan Mason

Ferdinand von Hochstetter :

In perusing early Auckland newspapers for items dealing with the Hochstetter expedition we came across the following note of a Hochstetter discovery not hitherto recorded in the scientific literature -

NEWS OF THE EXPLORING EXPEDITION

It cannot be considered unfair to anticipate a report, which is expected to be published on the completion of the Scientific Exploration now going on in the interior, by making known a few singu'ar discoveries, which cannot fail to interest, if they do not even startle the reader. To begin with a little incident at starting. Before embarking for a voyage up the Waikato from the new village of Havelock, at Maungatawhiri, one of the party, on striking his tent, turned up what appeared to be a piece of obsidian or volcanic glass, flat and circular. On cleaning the surface, however, it proved to be an artificial, and not a natural production. For certain characters naturally developed themselves which were, on close examination, neither Runic nor Cuneiform—but Roman. The following letters were, after some pains, clearly deciphered : —

HO ES LO DO G N

Now, what could this mean ? No stretch of the imagination could lead one to suppose that the Romans ever visited these remote islands. And yet the Latin word *Hospes* was clearly enough implied by the first letters. H was probably a memento of those early Spanish navigators who have left the traces of their visit here by the names *perro* and *puerca*, for dog and pig, engrafted on the Native language. There was no date. Before leaving this tantalizing subject, it may be as well to state that one of the party expressed his firmbelief that it was nothing more than the bottom of a bottle stamped " Hodge's London Gin."

(Southern Cross 5 April 1859)

Alan Mason

GEOLOGY AT THE AUCKLAND MUSEUM

Part 3 : 1946 to 1999

This article completes the history of Auckland Museum geology. Earlier articles covered 1852-67 and 1867-1946 (Mason 1996a and 1999). Since the first part was published Stuart Park (1998) has provided a detailed account of the Museum's first years.

....

At a meeting on 20 February 1946 the Auckland Museum Council decided to appoint a full time geologist to the staff and an Appointments Committee was set up. On 31 May Dr. Arnold Lillie was selected for the position at a salary of 450 pounds per annum. Lillie was at the time working for the New Zealand Geological Survey in the mapping of the Kaitangata Coalfield. He had joined the Geological Survey in 1939 from England following post-graduate study in Switzerland (Black 1999, Mason 1990).

Among the unsuccessful applicants were Hugh Battey and Leslie Adkin. Dreaver (1997) in his biography of Adkin tells us that the appointment was made possible through a grant from the Auckland City Council and that there were eight applicants.

Lillie, who dropped a third of his salary when he took the position, started at the Museum on 1 November 1946 and was introduced to the Museum work and the local geology by his predecessor, Cyril Firth. But at the end of that month he handed in his resignation as he had been offered a senior lectureship at Victoria University College. He left the Museum late in February so he was in office for only four months.

Arnold used to talk of the "bright airy atmosphere" of his 'office'- a trestle table in a corridor at the back of the building surrounded by packing cases. Actually, an office for the Geologist was under construction but Arnold's successor, Hugh Battey, was the first occupant. The office was formed by partitioning off one window bay on the west side of what is now known as the Middle (First) Floor and building a mezzanine floor, for specimen storage, inside the high room thus created. The office is now a service room for the Human Impacts and Oceans Halls

An early assignment for Arnold was to investigate the cause of the weathering of the English Portland Limestone used in the Museum Building (salt air).

Arnold soon acquired the diplomacy needed in dealing with donations of 'meteorites', 'fossil bones' etc. from people who were actual or potential supporters of the Museum. (An essential for all museum scientists.)

At odd times, including weekends Arnold would visit the Geology Hall to gauge the degree of public interest and was dismayed to see how little time visitors spent there. He decided that more emphasis should be placed on displays of a teaching nature requiring not an array of specimens but selected specimens with an explanation of their significance and their environment. He envisaged models of landscapes with outcrops and exposures, cross-sections through mines, displays of volcanoes etc.

The Museum Director, Dr. Archey, for whom a museum was a collection of beautiful and rare objects, regarded Arnold's ideas with some distaste

It was unfortunate that Arnold's short time at the Museum did not allow him to implement his idea, in advance of its time, of changing the Geology Hall from a display of specimens to a display of themes.

On receipt of Arnold Lillie's resignation The museum offered the position to Hugh Battey (Mason 1996b) who had been one of the original applicants. His appointment was confirmed at a Council meeting on 19 February 1947.

There was no display staff at the time but Hugh was a neat and meticulous draughtsman so he both designed and built his geology displays. The first display case constructed was a large one (75 square feet), on cosmogony, on the outside of his office. It occupied a key position in the entrance corridor to the Geology Hall (now Oceans) and provided an appropriate introduction to a later series of cases in the Hall tracing the origin and development of life. That first display case built by Hugh was to be there for over forty years. It is now occupied by 'Turtles, Tortoises, and Terrapins'.

In 1947 a lapidary's wheel was designed and built, but it was not until June 1949 that a polarizing microscope, which had long been on order, finally arrived. Up until then Hugh had pursued his interest in petrology by using a microscope in the Geology Department at the University.

Hugh had two part-time volunteer assistants, Helen Pirie (now Mrs. Robin Oliver) and Alan Mason, both of whom had been students with him in the early forties. A major assignment for Helen was the building of a relief model geological map of Auckland Province on a scale of four miles to the inch. Alan concentrated on the collection, identification, and cataloguing of pre-Tertiary fossils.

Field work was regarded as an important part of Museum geology. Trips of one or two days duration were made at weekends and there were several longer excursions each year. Significant among the latter were visits to North Cape, Three Kings Islands, Rangiawhia Peninsula and Cobb River (with Professor Benson). In the Auckland metropolitan area Hugh, with the

Transport for Auckland Museum geology field work in the late 1940's and early 1950's was provided by Alan Mason's 1934 Chevrolet sedan. It may not have compared favorably with today's four wheel drive vehicles but as shown by these photographs it was capable of off-road travel. (They built them high and solid in 1934) It was converted for sleeping. the back of the front seat being hinged so that it could be lowered to meet the rear seat. In addition to spade, wheel chains, cans of petrol, and "Benghazi Burner' for making tea, the luggage box at the rear contained an additional battery which by a lead through the rear side window provided a light for bed-time reading - real luxury in those days. It did have its faults. There was an open area below the engine so water courses had to be taken slowly otherwise the water would splash up on to the spark plugs and bring the car to a stop surrounded by water. Another problem came to light during work in the Southern Alps when keas attacked the fabric roof.

co-operation of the civil engineering fraternity, recorded new outcrops exposed by earthworks and also old ones being destroyed by those same earthworks.

One interesting excursion was a dash to Ngauruhoe in February 1949 to view a fresh eruption and the first observed lava flow from the crater. An interesting aside to the eruption was that it coincided with a field trip to the area by delegates to the Sixth Pacific Science Congress. Visiting geologists were most impressed with the efficiency of the trip organizers in arranging a volcanic eruption for their benefit!

When Hugh Battey started at the Museum the geology collections were almost entirely igneous rocks and minerals with particular emphasis on the Thames, Waihi, and Coromandel goldfields. There were few fossils and hardly any sedimentology. Alan was interested in paleontology, particularly that of the Mesozoic, and this provided the opportunity to correct the imbalance in the collections. Regular collecting trips were made to Kawhia, Port Waikato, Kaipara and Hokianga and a number of new localities were discovered. Post- Mesozoic fossils remained under the care of A.W.B Powell who continued to publish in the field. He wrote the section on Turridae for the International Treatise on Invertebrate Paleontology but the volume on Gastropods was never published

Hugh's interest was petrology and the rock collections were expanded by collecting trips in Northland and the Nelson Paleozoic.

The New Zealand Fossil Record File was established at the New Zealand Science Congress in 1951 and the Master File for the area between Port Waikato and Dargaville was placed under the care of the Museum. The registration of previously known fossil localities took up a great deal of time. The File was tansferred to the University on Hugh's resignation from the Museum in 1955

Professor Bartrum, Head of Geology at Auckland University College took ill early in 1949 and Hugh Battey became a part-time relieving teacher in the Department. This appointment continued until the arrival of Nick Brothers in 1951.

In August 1951 Hugh Battey took extended leave for post-graduate study at Cambridge University and the Museum work was done part-time by Alan Mason as Associate Geologist with an honorarium of one hundred pounds per year. Ernest Arlidge, a Masters student at the University, helped with cataloguing and maintenance of the collections. A notable accession during this period was a donation of 800 minerals and rocks by the Waihi School of Mines. Field work at this time was done in association with staff and students from the University Geology Department and was directed at enlarging the Mesozoic fossil collection. With only a few hours available each week, little attention could be given to the displays.

Hugh Battey returned to the Museum in April 1954 bringing with him three hundred rocks and minerals that he had collected from classic localities in Europe. Using information gained from his study of methods of display in English and Scandinavian museums he began an overhaul of the Geology Hall. Based on his overseas experience Hugh worked on the principle that cases should be designed for the exhibits, not exhibits for the cases. He realised that stereotyped forms of cases, regularly, symmetrically and immovably arranged imposed severe limitations on display technique.

He now had the help of a trained display artist, P.J.O'Brien, and together they built a series of dioramas illustrating the development of life through geological time. Other displays were on volcanoes, limestone and Antarctica.

Research was not forgotten and, for the first time, geology was prominent in the publication lists of the Museum; a total of thirteen papers in the Museum Records and other journals.

When Hugh Battey took control of the Geology Department at Auckland Museum in 1947 the total number of catalogued specimens amounted to 4300. When he departed nine years later that total had been doubled to 8,600. In the 45 years since then the total number of catalogued specimens has risen by only 2,200.

This photograph was taken in 1995 when a group of early Geology graduates from Auckland University College gathered for a reunion. Most of them had also been associated with the Auckland Museum. In the front row are Hugh Battey (Geologist 1947-1955), Cyril Firth (Associate Geologist 1929-1939), and Ernie Searle (Museum Council 1960-1974). Second from left at back is Jack Grant-Mackie (Museum Council 1989-1996, Institute Council 1996- and President 1998-) and on the right is Alan Mason (Associate Geologist 1951-1954). At the centre of the photograph is Hope Sanderson who, as Hope Macdonald, assisted in field collecting work in the late forties and early fifties.

Inset (top right) : Arnold Lillie (Geologist 1946-1947)

In October 1955, Hugh Battey resigned from the Museum to take up a lectureship at Durham University. Regarding the resignation, the Director, in his annual report' made this comment -

> "The consequential vacancy on our staff has not been filled, as no suitable applicant has yet come forward. The Geological Department is an important one, and this is a matter which will require careful consideration during the coming year."

Regrettably, there appears to have been a change of mind as to the importance of the Geological Department and the position of Museum Geologist was never filled. In fact the departure of Hugh Battey in October 1955 marked the beginning of a 'Dark Age' for Auckland Museum geology.

That 'Dark Age' was to last for 25 years and is evidenced by these extracts from the Museum Annual Reports -

> Expansion of the Maritime Hall will shortly <u>oust</u> Geology and present us with the problem of finding temporary <u>storage</u> for the exhibited minerals and fossils (1961-62)

> We have been fortunate this year in obtaining <u>much-needed assistance</u> in the curatorship and recording of our important mineralogical and other geological research collections.......Dr. Black, with the assistance of Mrs N. Howett, has already checked the collection and carried out a preliminary sorting in preparation for re-housing; a new set of cupboards to provide permanent and improved access has been installed in the south-east <u>corridor</u>(1973-4)

> (The underlining is the author's)

Dr. Black's assistance was short-lived. The Report for the next year recorded that renovations had been completed in the Geology display.

After Hugh Battey departed other staff members were given the added responsibility of Geology but could give little time to the work. One of them was John Wadham -

> By 1968 the mineral collection was housed in the corridor. The rock collection was in storage condition i.e. each specimen was wrapped in newspaper and stored in boxes stacked on top of one another in a small room off the stair-way leading to the attendants' lunch room. In this condition it was most difficult to access specimens or to use the rock collections
>
> -personal communication J.Wadham

There were talks on geological subjects by University staff and others but it was left to A.W.B.Powell and his successor, W.O.Cernohorsky, to keep the flag of geological research flying:

both published on Tertiary Mollusca. In 1965-67 the pre-Tertiary fossil collection was transferred from Geology to be with Powell's Tertiary collection and was completely overhauled.

In the 1980's Museum Geology made a partial emergence from its 'Dark Age'which had lasted for a quarter-century. It began in the first year of the decade with three significant events -

> Anthony Wright who had a double B. Sc. in Botany and Geology as well as a Masters in Botany was appointed Museum Botanist with added responsibility of looking after Geology.
>
> Struan Ensor (Hayward 1995), newly appointed as Museum Education Officer, began to impart his own enthusiasm for geology to hundreds of thousands of Auckland school children and hundreds of student teachers
>
> A substantial display, 'Auckland - Past and Future Landscapes", covering the geological history of the area was opened in November.

The highlight of the 1980's was the work of Struan Ensor. There had been a school service at the Museum from its opening in 1929 and a full-time Education Officer since 1938 (Powell et al. 1967. p.30). Attention had always been given to geology but Struan gave special emphasis to the subject. He built up an extensive collection of teaching slides and study collections and substantially improved and expanded display material in Earth Sciences.

After approximately three years Struan was able to announce -

> The promotion of the Earth Science programme, which involves much practical work, has increased the attendance of visitors in that area 139% since its inception in 1980 (Education Service Report 1983-84)

That increase became 400% by the time of Struan's retirement in 1992 (Hayward 1995)

At the end of the decade came the 'The Firth Dinosaurs", the largest special exhibition ever held in the museum up until that time. It was also the most successful, attracting 130,000 visitors in the ten weeks it was open.

Despite these positive features Museum Geology was stll in a state of Limbo. Anthony Wright, in his report as Botanist for 1983-84, noted a substantial increase in the number of geological enquiries and went on to say -

> It is a matter of some concern that the Museum has no specialist in this popular field, and that adequate time cannot be found for the curation of the geological

collections.

Two years later Anthony, in noting small additions to the Geology collections, remarked that some donations had to be declined "as storage conditions are unsatisfactory and no staff are available to process the specimens".

Anthony received up to twenty geological enquiries per week - sometimes more than botanical. Despite the difficulty of his position, he made a major contribution to the Geology Department by cataloguing the Russell Collection of Hauraki Goldfields ores (Mason 1999 , p.21), a job that had been outstanding for ninety years.

In 1991 Bruce Hayward was appointed Curator of Marine Invertebrates. This, in effect, made him a successor to Powell. Bruce had trained as a geologist and had previously worked for the New Zealand Geological Survey so in 1992 he took over the care of Geology from Anthony Wright. This meant that for the first time since the Museum building was opened in 1929, Geology, including all Paleontology, was under the control of one person.

With the assistance of PGSF funding and Lottery grants Bruce employed paleontologists Chris Hollis (1991-93), Hugh Grenfell (1993-97), and Mike Eagle (1991-). In addition to working on the mollusc collections Mike organised childrens' workshops on fossils. Bruce and Mike made many collecting trips including the Port Waikato Mesozoic where they discovered a new inland Huriwai Plant Beds locality and also the first dinosaur bone to be found outside of the classic locality in Hawkes Bay. Mike continues to work at the Museum as a Research Associate, specialising in fossil crinoids. Bruce, Chris and Hugh worked on Recent foraminiferal research.

Jill Kenny was employed from 1993 to 1996. Her main assignment was to curate, rehouse, and computer database the rock collections.

Tasha Black joined Bruce's staff as a Geology technician in 1996 and began preparing material for the natural history galleries. She is still employed on contract but her employment can be terminated at short notice.

In 1991 Bruce started a winter Geology Lecture series with associated field trips and such was the success of these that at an inaugural meeting in November 1992 an Auckland Museum Geology Club was formed. Within six months membership jumped from 24 to 62 and by 1996 it was over a hundred.

In the year of Hugh Battey's departure, 1955, the scientific staff at the Museum numbered six including Hugh as Geologist. By the early 1990's the total scientific staff had more than trebled but there was still no Geologist. However in 1994

Geology re-appeared on the Museum staff list for the first time in almost forty years with -

Acting Curator - Bruce Hayward
Technician - Jill Kenny
Research Associate - Les Kermode

Also after a similar time lapse, geology was once more in the Museum publication lists, Bruce himself being the main contributor.

A feature of the 1990's was the Caltex Volcanoes & Giants Exhibition which opened in May 1994 and closed in January 1996. Bruce Hayward and Jill Kenny, assisted by Les Kermode, were employed full-time for six months preparing the geological content. It was highly successful,attracting over 300,000 paying visitors and returning a profit to the Museum of $500,000.

By the beginning of 1997 it did seem that the Geology Department at Auckland Museum had fully emerged fron its 'Dark Age' which had lasted for forty years. But it was not to be! In the middle of that year, it all collapsed. The newly-formed Auckland Museum Trust Board announced a major restructuring programme in which the drastic decision was made to close the Marine Department with the consequent loss of Geology.

Public outrage and world-wide condemnation of the closure forced the Board to adopt a compromise which kept the marine, fossil, and geology collections on-site (they had been offered to Te Papa, which rejected them) under the care of two contract technicians.

During 1998 and 1989, Geology Technician Tasha Black and Research Associates Les Kermode and Michael Eagle prepared the geological and fossil content of the new Origins Gallery and limestone cave designed by television producer Keith Hunter.. Unfortunately, displays on minerals and local geology were not considered important.

Today, visitors will look in vain for the Geology Hall which was a feature of the Museum for so many years.(Nor will they see any sign of the contribution made by A.W.B. Powell to the Museum molluscan collections during a period of forty years.)

Geology has a long history at Auckland Museum. The first 159 accessions, recorded in 1852, were minerals and rocks and in its early years the Museum owed much to the geologists Heaphy, Hochstetter and Hutton (Mason 1996a and 1999). It is to be hoped that the present situation will be of short duration and that geology in the not too distant future will regain its rightful place in the Auckland Museum. That it has a place in the minds of the public is proven by the success of the 'Auckland - Past and Future Landscapes', 'Firth Dinosaurs', and 'Caltex Volcanoes and Giants' Exhibitions.

Acknowledgments :

I am grateful to Bruce Hayward who suggested to me six years ago that I write this history of Geology at Auckland Museum. At the time the work was made easier by the fact that I was able to obtain, first-hand, the recollections of every person who had looked after Museum Geology in the past seventy years.

For this final instalment those recollections have come from the late Arnold Lillie and Hugh Battey, and from Alan Berry. John Wadham, Anthony Wright, and Bruce Hayward. Access to Museum files was provided by Alistair Carlile (correspondence and Council minutes) and by Tasha Black and Bruce Hayward (Geology accession registers). Simon Nathan drew my attention to the Dreaver 1997 reference. Finally, my thanks go to Bruce Hayward and Anthony Wright for helpful comments on the manuscript.

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Alan Mason.

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Portraits from 'The Dark Side of the Moon' by Robert Muir Wood

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