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Go, my sons, sell your lands, your houses, your garments and your jewelry; burn up your books. On the other hand, buy yourselves stout shoes, get away to the mountains, search the valleys, the deserts, the shores of the sea, and the deepest recesses of the earth: mark well.....the various kinds of minerals, the properties and mode of origin..... Be not ashamed to learn the astronomy and terrestrial philosophy of the peasantry. Lastly, purchase coals, build furnaces, watch and experiment without wearying. In this way, and no other, will you arrive at a knowledge of things and of their properties.

- Petrus Severinus 1571

EDITORIAL

At the end of last year the Historical Studies Group suffered the loss of another of its members. Ernie Searle died on 21 December at the age of 87. His association with New Zealand geology began, as a student, almost 70 years ago and his teaching career in the Geology Department at Auckland began six years later. There is a tribute to Ernie in this Newsletter.

Future of the Newsletter : In our last editorial we put two alternatives to members : Continuation of the Newsletter in its present form with an annual subscription of \$10 or incorporation, as a supplement, in the Society Newsletter. 19 replies were received. 11 preferred a separate newsletter and 2 favoured incorporation. 6 would accept either alternative.

The Newsletter will therefore continue in its present form and a subscription charge of \$NZ10 per year will be made. An invoice is inserted in this issue. In order to publicize the Historical Studies Group in the geological community no charge will be made to libraries in the meantime .

Alan Mason

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Our Introductory Quotation

We found this in Archibald Geikie's The Founders of Geology. (1897). Geikie gives the following reference:

Petrus Severinus. Idea Medecinae Philosophicae. 1571, p.73, cap. vii. De principiis corporum (cited by D'Aubuisson).

It seems from this that Geikie did not have access to the original Severinus work and obtained his information from D'Aubuisson. In several places Geikie makes reference to D'Aubuisson's Traite de Geognosie (1819) so the Severinus reference probably occurs in this work.

Geikie refers to Severinus as "the learned and versatile Dane" and says that

The modern spirit of investigation in natural science could not be more clearly or cogently enforced than it was by this professor of literature and poetry, of meteorology and medicine, in the year 1571.

From the Dictionary of Scientific Biography we learn that Petrus Severinus (or Peder Sorenson) lived from c.1540 to 1602 and his primary interests were chemistry and medicine.

THE NEW ZEALAND INSTITUTE OF GEOLOGICAL & NUCLEAR SCIENCES  
(EX GEOLOGICAL SURVEY) COLLECTION OF  
GIDEON AND WALTER MANTELL

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ABSTRACT

Historically important collections of rocks, minerals and fossils made last century by the famous British geologist and paleontologist, Gideon Algernon Mantell (1790-1852), are today held in several British, one U.S.A. and two New Zealand institutions. One of the New Zealand collections of Mantellian material is today held by the Museum of New Zealand Te Papa Tongarewa (originally the Colonial Museum; Dominion Museum; National Museum) and it's history has recently been documented (Yaldwyn et al., in press). The history and content of the other, held by the Institute of Geological & Nuclear Sciences (originally Geological Survey; DSIR Geology and Geophysics) is outlined herein.

INTRODUCTION

Gideon Algernon Mantell (1790-1852) of Lewes, Sussex, was a physician and eminent British geologist, paleontologist, natural historian, lecturer and prodigious fossil collector of last century (Jones p.v-xvii (obituary notice) in Mantell 1864; Spokes 1927; Curwen 1940; Vallance 1984). He is particularly remembered for his early recognition and naming of one of the first great ornithopod dinosaurs, *Iguanodon* (subsequently named *I. mantelli* from his original specimens), (Yaldwyn et al., in press).

Many of his numerous published works on British geology and paleontology are regarded as classic texts, especially his 1844 "The Medals of Creation .....etc", and today copies of his books are treated as collectors items by those interested in the history of geology. In addition however to his prolific writings on British subjects, Gideon Mantell is also known in New Zealand for his early pioneer accounts of New Zealand geology and paleontology (eg. Mantell 1850a; see Adkin & Collins 1965:157, items 3410-3417) based on collections of fossils, moa bones and letters sent to him from New Zealand by his eldest son Walter.

THE NEW ZEALAND CONNECTION

Walter Baldock Durrant Mantell (1820-1895), elder son of Gideon Mantell, emigrated to New Zealand on the "Oriental" as one of the "New Zealand Company" settlers who founded the City of Wellington. Arriving on 31st January 1840, Walter Mantell was to later become a leading figure in the political, scientific and cultural scene of early Wellington in the 1850-1880 period. He held various positions in the colonial government (refer Bagnall 1966, Scholefield 1940, Sorrenson 1990, Yaldwyn et al., in press, for biographic details of his extensive career positions) and was Acting Director of the Geological Survey (Hector 1877: iii, 9; 1890: ix) and "superintendence" of the Colonial Museum (Hector 1866:4) during Janes Hector's various absences. Walter Mantell was also active in the affairs of the Wellington Philosophical Society, and one of the founders and Secretary of the New Zealand Institute (Fleming 1987).

Walter Mantell had an interest in natural history through his father's influence, and was encouraged by Gideon to explore all scientific aspects of his new home. As a consequence Walter Mantell sent detailed letters and fossil, rock and mineral specimens to his father on which were published accounts of New Zealand geology and paleontology (mentioned above). As well he also sent moa bones to Richard Owen at the British Museum, and also contributed his own papers on the moa and on New Zealand geology (see Adkin & Collins 1965: 157, items 3419-3422) making significant contributions to and being associated with early geological maps of the Colony (McLernon 1975:746).

In the field of ornithology, the Mantell family name is perpetuated. In 1847, Walter collected the first subfossil bones of the extinct North Island rail ("*takahe*") which were sent to his father (Mantell 1848) and based on a skull, Richard Owen described a new genus and species, *Notornis mantelli* ( now *Porphyrio m. mantelli* (Owen) ). Walter obtained the first and second specimens of the South Island living *takahe*, which were also sent to Gideon (Mantell 1850b), later named, and now regarded as a subspecies *Porphyrio m. hochstetteri* (Meyer). The naming of the North Island brown kiwi (*Apteryx australis mantelli* Bartlett) further honours the father-son connection with an association with New Zealand's national bird.

## GIDEON MANTELL COLLECTIONS

Collections amassed by Gideon Mantell during his lifetime were immense and considerable interest has been shown in the documentation of the dispersal of his material around the world, particularly as original type fossil specimens described and illustrated in many of his works have become dispersed (Cleevely 1983:195; Cleevely & Chapman 1992; Vallance 1984:97; Yaldwyn et al., in press). Historic details of dispersed Mantell collections in England are known, but the source and history of collections that found their way to New Zealand have been undocumented. Of the two New Zealand Institutions that hold Mantell material Fleming (1973) first published (and Cleevely 1983:195 repeated) that the Dominion Museum (now Museum of New Zealand Te Papa Tongarewa) held Mantell's original *Iguanodon* tooth and that the Geological Survey (now Institute of Geological & Nuclear Sciences) had held types of Mantell's fossil crabs which had subsequently been donated to the British Museum.

Until Yaldwyn et al., (in press) outlined and referenced the history of the acquisition of the Mantell collections given to the Colonial Museum last century, and now held by the Museum of New Zealand Te Papa Tongarewa, little of their history had been known. Following on from their work the occasion is opportune to provide the background to the specimens held by the Institute of Geological & Nuclear Sciences (ex New Zealand Geological Survey), particularly as the history of this collection is closely related to that of the collections originally deposited in the early Colonial Museum.

## THE MANTELL COLLECTION IN THE GEOLOGICAL SURVEY

### Background:

Fleming (1973) had recorded that a "collection [of Mantell fossils] was given to the Geological Survey by Mrs Mantell, Walter's daughter-in-law". This fact had been informally known to Paleontology staff for many years, but precise details were not recalled, or the time of acquisition, except that it was probably sometime about 1930.

A recent search however through the correspondence archives of the Geological Survey (and Mantell Archives at Alexander Turnbull Library - by A.P. Mason), has produced a copy (and the original) of a short letter acknowledging the donation of the collection from the Director of the Geological Survey (Morgan 1927) dated 22 September 1927, to Mrs W.G. Mantell (widow of Walter Godfrey Mantell). No details as to the history of the collection were provided: all that was known was that the collection had been in the Mantell family in Wellington, and that it has an historic link back to Gideon Mantell. This link was easily confirmed through many of the fossils being recognisable as having originated from the British Isles by their typical flint or chalk matrices, or bearing locality labels in Gideon Mantell's writing, such as Cliffe Hill, Lewes; Artherfield, Isle of Wight; Brighton, Portland Oolite, Oxford Clay, Bradford Clay. Also the collection contained a few original wood cut printing blocks relating to Gideon Mantell's published books (see below).

Fleming (1973) noted that on receipt of the Mantell Collection, Dr J. Marwick, Macropaleontologist with the Geological Survey, had a wooden cabinet made to house the collection, and this stood in the entrance foyer to the Geological Survey's offices at 156 The Terrace, Wellington (from c.1927 to 1955). [As a young staff member in the 1950's I remember this elegant cabinet and it's contents. In fact it still survives. Made of rimu and kauri with double doors it measures 120x110x41cm with 24 trays in two tiers]. Not all specimens retained labels, though some specimens had brief details inked on them. There were also rocks and mineral specimens, some polished, but generally all without labels. When the Paleontology Section moved to new premises in 1955 (93 Boulcott Street), the "Mantell cabinet" moved as well. Previously Dr C.A. Fleming (Senior Paleontologist) had decided that some of the better specimens in the Mantell Collection would be useful for systematic studies if they were moved and integrated into the Section's "World" reference collections. Some molluscan specimens were extracted, and were labelled as being from the "Mantell Collection". With the move of the Geological Survey to new premises at Lower Hutt (in 1957) it was decided to integrate all the remaining Mantell Collection fossils into the "World" Collections with many of the specimens being catalogued in various Registers according to their phyla. To recognise the source of the fossils, specimen labels were printed bearing the words "W.B.D. and Gideon Mantell Collection" along the bottom and were used with the specimens. Some of the specimens bore original paper labels giving locality details, but in most cases these were disintegrating and what details were legible were transcribed on to the new labels and originals discarded. Some fossils had locality details inked on to them, but the majority of specimens were devoid of any data.

Attempts were made to identify many of the fossil species present, and their original localities, with some success, if the fossil genera had been monographed and locality sources within England were well-known. The few rock and mineral specimens present in the collection were passed to the Petrology Section, but because of lack of documentation are likely to have been discarded. Until 1994, the Geological Survey's "Mantell Collection" had been effectively "dispersed" within the World Collections of the Paleontology Section. Fleming (1973) had noticed in 1960 that the Mantell Collection did contain original syntype specimens of Mantell's fossil crabs, and these were presented to the British Museum (Natural History). From 13 specimens presented two were later chosen as lectotypes for two species originally named by Gideon Mantell, and 2 others remain potential future neotypes or lectotypes for another species (Wright & Collins 1972: 73-4; 83; 101). In 1985 a rationalisation of National Museum foreign collection holdings saw many fossil specimens

transferred to the Geological Survey. Included among these were eight specimens of Cretaceous ammonites derived from their "Mantell Collection".

### Reinstatement & Content:

In 1994, because of a renewed interest in the Mantell collections in New Zealand (through the work of Yaldwyn et al., on the Museum of New Zealand's *Iguanodon* tooth, and Mason's interest in trying to possibly match further fossils with Mantell's original illustrations), it was decided to reinstate the Mantell material as a separate historical collection. This entailed a search through 16,000 species lots of World Collection specimens to extract original material. The reassembled Gideon Mantell Collection can now be listed (in general terms) as follows -

A. It contains 378 specimen-lots of animal fossils, mostly marine, nearly all (where known) from England. These can be divided into the following phyla: **PROTISTA** (Foraminiferida 1 specimen); **PORIFERA** (30 specimens); **COELENTERATA** (8); **BRYOZOA** (11); **BRACHIOPODA** (43); **MOLLUSCA**-Bivalvia (90), Gastropoda (67); Cephalopoda-Ammonoidea (9); **COLEOIDEA**-Belemnoidea (10); **ANNELIDA**-Serpula (7); **ARTHROPODA**-Insecta (2), Decapoda (17), Cirripedia (3); **ECHINODERMATA**-Blastoidea (3), Crinoidea (14), Cidaroida-Echinoidea (29); **CHORDATA**-Osteichthyes (7), Chondrichthyes (11), Reptilia (6), Mammalia (2); Miscellaneous (trace fossil, tube fossil and 6 unidentifiable). Five specimens have been recognised as originals of Mantell's illustrations. These were figured in "The fossils from the South Downs etc". (Mantell 1822) -

" <i>Conulus albogalerus</i> var. <i>acuta</i> "	p.190, Pl.xvii, fig.16,19
" <i>Conulus subrotundus</i> "	p.191, Pl.xvii, fig.15,18
"Belemnite from the Chalk at Brighton"	p.201, Pl.xvi, fig.1
" <i>Turbinolia konigii</i> "	p.85, Pl.xix, fig.22 [not fig.24]
" <i>Hamites attenuatus</i> "	p.93, Pl.xix, fig.29,30

[Three of these specimens still carry the faded remains of small green labels bearing the published plate numbers].

B. Also with the collection are 51 wooden printing blocks. 5 are uncut blanks - 28 are unused and depict anatomical illustrations, and few are labelled. (Association with Gideon Mantell is uncertain but likely).

7 are unused blocks of geological/paleontological features, with one labelled "Ganoid Scales; Medals; not used" (a reference to Mantell's 1844 work).

2 used (inked) blocks are the originals of the geological map and cross-section used in "The Fossils from the South Downs....etc: (Mantell 1822:296)

9 used (inked) blocks are paleontological and two of them are originals of:

Mantell (1844) "Medals of Creation", Vol.1 p.237, Lign.52

Mantell (1844) "Medals of Creation". Vol.2, p.468, Lign.103

The remaining 7 probably relate to other papers by Mantell.

### ORIGIN OF GEOLOGICAL SURVEY MANTELL COLLECTION

The date when the collection was donated to the Geological Survey (September 1927), by Walter Mantell's daughter-in-law, coincides with the year when the large and remarkable Mantell Family collection of papers was also donated by Mrs Walter Godfrey Mantell to the Alexander Turnbull Library (Dean, 1979; Vallance 1984; Yaldwyn et al. In press). In July of that year also a large collection of "New Zealand and foreign sea shells, collected by the



father and grandfather of the late Mr W.G. Mantell" had also been presented by Mrs. W.G. Mantell to the Dominion Museum (The Dominion 1927). This was obviously the time when Mrs Mantell, recently widowed, was attempting to tidy up the scientific and documentary legacy of the Mantell family as soon after (in 1930) another large collection containing New Zealand and world ethnological artefacts (amongst other material) was also transferred to the Dominion Museum (Yaldwyn et al., in press) and acknowledged by the Minister of Internal Affairs, 7th June 1930 (archival letter per A.P. Mason).

Yaldwyn et al., (in press) have outlined the complex history of Mantellian collections associated with the Colonial Museum/National Museum, with which the Geological Survey collection was obviously linked. The historic episodes they identified can be summarised as follows:

1. An original donation (Feb.1850) by Gideon Mantell to son Walter of "378 specimens of rocks and minerals" (Bastings 1953: 363, items 13,14; though Spokes 1927: 223 refers to "600 specimens") which was displayed by the New Zealand Society (Fleming 1987:7)
2. The return to England (1856-59) by Walter Mantell after Gideon's death, probably bringing material back with him in 1859 from his father's estate, which had not been purchased by the British Museum or sold at auction (see Cleveley & Chapman 1992:328) but had been left to Reginald, Walter's younger brother, who had died in 1857 (Vallance 1984:99)
3. The transfer (in 1865) of the New Zealand Society's collection to the Colonial Museum along with Walter Mantell's own deposit (of material possibly brought back with him in 1859) giving as many as 2000 specimens (of rocks, minerals and fossils).
4. The apparent withdrawal by Walter (in 1876) of the entire (or almost the entire) Mantell Collection from the Colonial Museum, (presumably during a period when Walter was an Acting Director) where it was retained by the Mantell family until 1927.
5. The donation of collections back to the Dominion Museum (in 1930) by Walter Mantell's daughter-in-law, Mrs W.G. Mantell (which may not have included any fossil specimens as that material or what remained of it had already been separated and passed to the Geological Survey in 1927).

It would seem that from this history of the Mantell Collections and their associations with the Colonial Museum that the collection gifted to the Geological Survey in 1927 had the possible following history. The specimens were brought back from England by Walter Mantell in 1859 and held either as a separate collection by the family until 1927, or were part of the deposit made to the Colonial Museum in 1865. If they had been deposited with the Colonial Museum, they were withdrawn in 1876 and held by the family until 1927, then gifted to the Geological Survey. Any fossil specimens recognisable as relating to Gideon Mantell that were held by the Colonial/Dominion/National Museum after 1876 (eg. the 8 ammonites transferred to the Geological Survey in 1985) would presumably be specimens that were overlooked when the majority of the Mantell Collection was withdrawn in 1876.

Today the Mantell Collection (ex Geological Survey) held by the Institute of Geological & Nuclear Sciences, remains an interesting historical link with both an important figure (Walter

B.D. Mantell) in New Zealand's early scientific and political history, and with a famous figure (Gideon Mantell) in the history of British geological science, on the opposite side of the world.

#### ACKNOWLEDGEMENTS

Appreciation is expressed to Alan Mason for his interest and efforts in trying to establish what specimens within the Institute of Geological & Nuclear Sciences Mantell fossil collection may have served as the originals for Gideon Mantell's many published illustrations. Both Alan Mason and John Yaldwyn kindly shared their detailed background knowledge of Mantell family history and made an early draft of their paper (with G.J. Tee, in press) available. Their helpful discussions and information are herewith acknowledged.

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Thought for the times -

There can be no applied geology unless  
there is geology to apply

THE GEOTHERMAL FEATURES SHOWN ON HOCHSTETTER'S GEOLOGICAL  
MAP OF THE AUCKLAND PROVINCE

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ABSTRACT

Ferdinand von Hochstetter (1829-1884), who visited New Zealand in 1859 with the Novara expedition, made four geological maps of portions of the country; two of these show geothermal fields, in addition to regional geology. Hochstetter's map of the Geology of the Auckland Province is at a scale of 1:700,000 and shows the locations of 22 geothermal fields, 18 in the Taupo Volcanic Zone. Several of these have changed in their activity since 1859 or even been destroyed; others appear to have changed only slightly. Hochstetter's maps thus provide a valuable record of earlier geothermal activity in this important geothermal region and reveal how it has changed since 1859.

INTRODUCTION

Ferdinand von Hochstetter (1829-1884) was the most outstanding member of the Novara expedition which took its name from the Austrian frigate that arrived in Auckland on 22nd December, 1858, as part of a world circumnavigation. Hochstetter obtained leave from the expedition to remain in New Zealand to make surveys of its natural history, geology and geomorphology (Carle, 1988). He was the first to describe and interpret many features of the geology of New Zealand and to recognize that the Taupo Volcanic Zone (TVZ) is a graben.

Hochstetter also made the first regional geological survey of any area in New Zealand and produced the first geological maps of the colony (Hochstetter and Petermann, 1863, 1864a,b). 'The Bibliography of New Zealand Geology to 1950' (Adkins and Collins, 1967) cites 24 books, papers and reports by Hochstetter, some co-authored. The most notable of these are his books entitled 'Geologie von Neu-Seeland' (1864), which formed part of the results of the Novara expedition, and 'Neu-Seeland' (1863); both of these have been translated into English by Fleming (Hochstetter, 1959) and Sauter (Hochstetter, 1867) respectively. The English version of 'Neu-Seeland' is not the same as the German edition, with the former containing more about the geology and geography but less about the Maori and the colonisation history.

Hochstetter was greatly impressed by geothermal activity in New Zealand and devotes about 60 pages to it in both books (33 in the Fleming translation), almost entirely describing thermal features in the Taupo Volcanic Zone ("this marvellous region").

These accounts include sketches and paintings of individual thermal features, and wider views of thermal areas such as those at Orakeikorako and Rotorua.

Especially valuable are the four geological maps made by Hochstetter (Hochstetter and Petermann, 1863, 1864) published in both German (1863) and English (1864) and drafted in Vienna by A. Petermann. The map he made of thermal activity at Rotomahana on a scale of 1:12,000 is superb, and provides a record of a beautiful thermal area largely destroyed by the Tarawera volcanic eruption of 10 June, 1886. This paper, however, describes the distribution and depiction of thermal features on his maps, at a scale of 1:700,000, of the southern part of the Auckland Province (Hochstetter and Petermann 1863, 1864).

#### THERMAL FEATURES ON HOCHSTETTER'S MAPS OF THE AUCKLAND PROVINCE

##### The maps

Three maps produced by Hochstetter on a scale of 1:700,000 show the distribution of thermal features. There are the two geological maps, identical in every respect except that one is in English (Hochstetter and Petermann, 1864) and the other in German (Hochstetter and Petermann, 1863). Thermal features are also shown on the route map that accompanies his book 'Neu-Seeland' (Hochstetter, 1867), but many symbols here are absent or difficult to see.

##### Hochstetter's Route

Hochstetter and his party entered the Taupo Volcanic Zone (Figure 1) on 13 April 1859 in the Waihi-Tokaanu area after travelling overland from the northwest. He spent 5 days near Tokaanu, surveying this area and its thermal activity, before walking along the eastern shore of Lake Taupo. He viewed thermal activity between Mount Tauhara and the Waikato River, which he crossed close to its outflow from the lake. He travelled (April 22) via Karapiti (Craters of the Moon) on the mail route before going northeast to Orakeikorako, where he spent several days. After crossing the Waikato River again here, he continued in a northeast direction along the western side of the Paeroa Fault scarp, passing Te Kopia and Waikite. He left the Waikite Valley (April 26) and went to Rotomahana (April 28). At Rotomahana, he mapped and described the extensive thermal activity there before going to Rotorua for five days (May 3). He and his party (rejoined by their photographer on April 26) travelled northwards along the eastern shore of Lake Rotorua to Tikitere where they made a short detour to the northeast (May 6), viewing the thermal activity as far as Ruahine. They then travelled northward to Maketu and back to Auckland (May 21) via Tauranga (May 9), Matamata and Taupiri, passing en route the Okaura

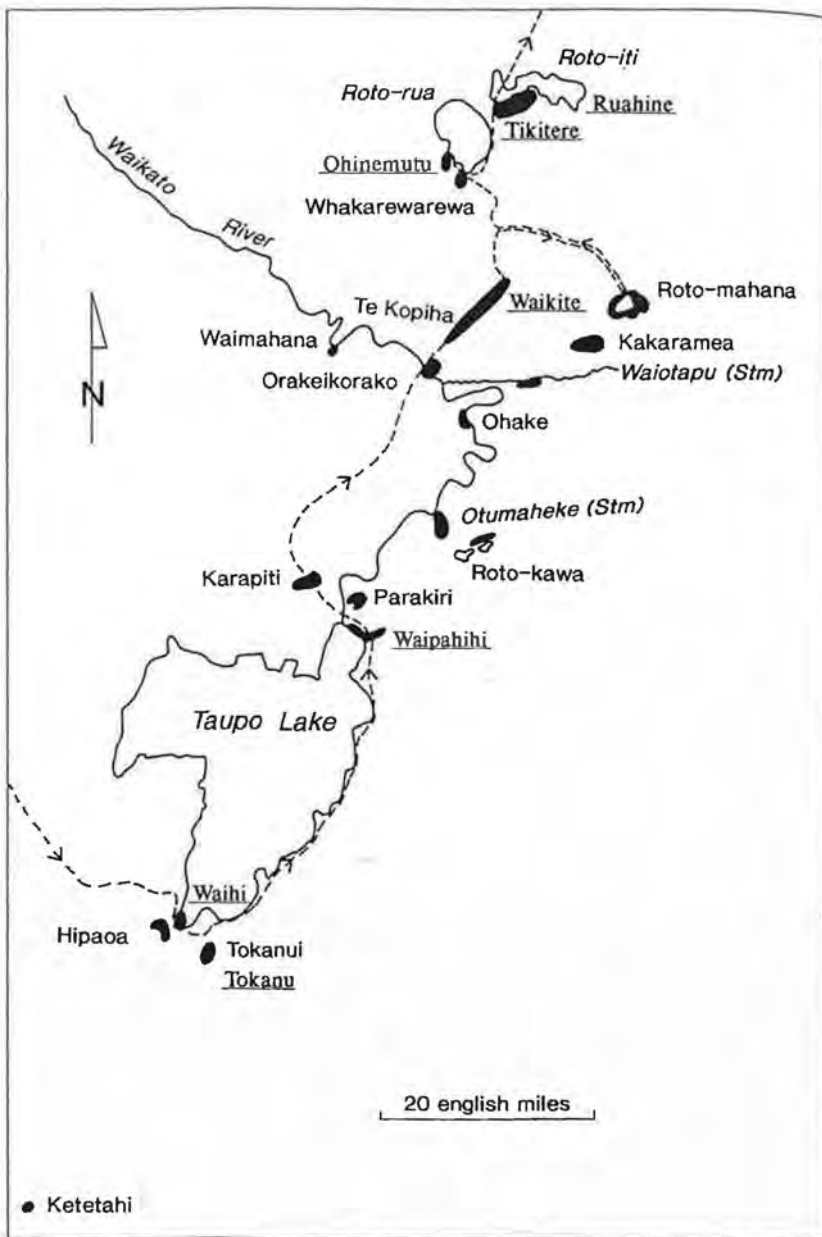


Figure 1: Locations of hot springs, fumaroles and solfatara in the Taupo Volcanic Zone shown on the Hochstetter and Petermann maps (1863, 1864). Their positions and Hochstetter's spelling are shown. Places mentioned in the Hochstetter (1867; 1869) volumes but not shown on the map are underlined.

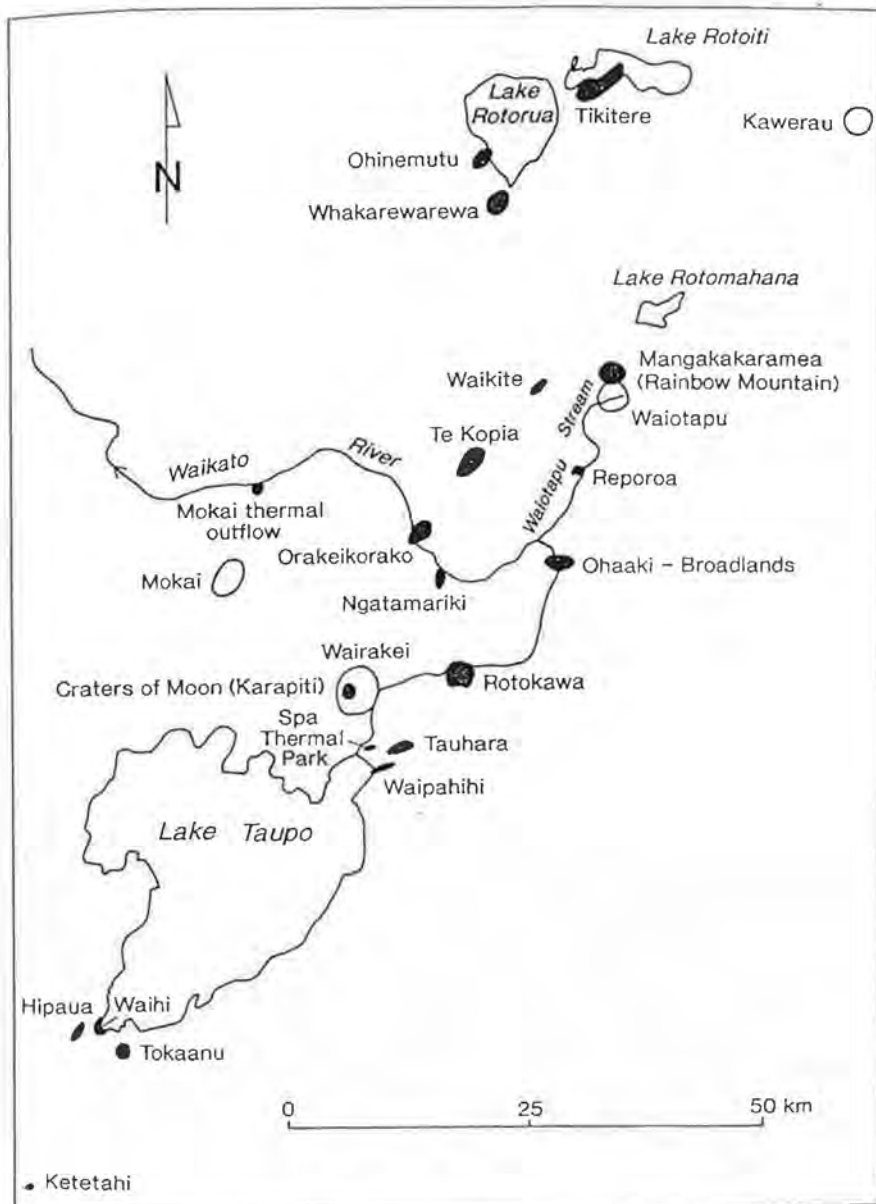


Figure 2: The main geothermal areas in the Taupo Volcanic Zone mentioned by Hochstetter (1867: 1959) and Hochstetter and Petermann (1863; 1864a and b) with modern spellings and positions. Also shown are locations of Wairakei, Waioatapu, Mokai and Kawerau geothermal fields not mentioned by Hochstetter.

Springs on the Waiho River in the Hauraki Rift. Hochstetter and his party were therefore in the TVZ for only a little over three weeks.

#### Hochstetter's depiction of thermal features

The thermal features are shown on Hochstetter's geological maps at 1:700,000 by a series of orange and yellow dots, all less than 1 mm diameter. These are intended to occupy previously printed black semicircles but some in my copy of the map are offset slightly, as are the yellow and orange colours. The number of dots is clearly meant to indicate the distribution of the thermal manifestations and not the intensity of thermal activity. The key describes symbols as representing "Hot springs, fumaroles and solfataras" ("Heisse Quellen, Fumarolen u. Solfataren"). The key thus makes no distinction between the different types of discharge features present in a thermal area, but alongside some there are labels such as 'hot water' or 'mineral spring'. The text of his books makes clear, however, that Hochstetter distinguished between the different types of features. The thermal activity at Ketetahi and nearby is not shown by a symbol but by the label 'Solfatare'. Some thermal areas are named on his maps, e.g. Hipaoa (Hipaua) and Ohake (Ohaaki), others are not. In several instances, the maps show only the names of the most prominent single discharge feature in a thermal area, e.g. fumaroles at Karapiti, Parakiri and Te Kopiha (Te Kopia).

#### Distribution of thermal areas on Hochstetter's map

Hochstetter shows 22 separate thermal areas on his maps (Figure 1), 18 of them in the Taupo Volcanic Zone. The maps treat Tikitere-Ruahine, Rotomahana and Te Kopia-Waikite as areas of contiguous activity. The areas are listed in Table 1, and the distribution of those he mentions are also shown on a recent map (Figure 2). Hochstetter visited 13 of the thermal areas shown on his map, 12 in the Taupo Volcanic Zone. He mentions all of these in his books and/or map texts (Hochstetter, 1863, 1864; Hochstetter and Petermann, 1863, 1864a, 1864b). Many are described in considerable detail with the names of many individual discharge features mentioned. There are 4 thermal areas in the TVZ shown on his map which he did not visit: Rotokawa, "Otumaheke Stream" (?part of Rotokawa), Ohake (Ohaaki), Waimahana (Mokai outflow), and one which he shows on the south bank of Waiotapu Stream (near Reporoa).

#### Comments on individual fields

Thermal activity on the southern shore of Lake Taupo.

Hochstetter's map shows three distinct thermal areas here: Hipaoa (Hipaua), Terapa (Waihi) and Tokanu (Tokaanu), and these



TABLE 1: Thermal areas shown on Hochstetter and Petermann's maps (1863, 1864)  
of the southern part of the Auckland Province.

Manifestation name or nearest place name on map	Name in Hochstetter (1867 or 1959)	Modern Name	Seen by Hochstetter?	Apparent size (No. of dots)	Comments
Te puia	Not mentioned	Te Puia	No	2	On north side of Kawhia Harbour.
Hikurangi	Springs not named	-	Yes	2	Described as "powerful and probably chalybeate" by Hochstetter (1867).
Hipaoa	Hipaoa	Hipaoa	Yes	6	Hochstetter comments on alteration.
No name given	Waihi area	Waihi	Yes	4	" " "
Tokanui	Tokanu	Tokaanu	Yes	11	
No name given	Waipahihi	Waipahihi	Yes	10	Steam for "a whole mile along the lake shore".
Parakiri	Parakiri (fumarole)	Spa Thermal Park	Yes	6	More active in 1859 than nowadays.
Karapiti	Karapiti (fumarole)	Craters of the Moon or Karapiti	Yes	10	Part of Wairakei system.
Roto-kawa	Roto-kawa	Rotokawa	No	4	Visited by Dieffenbach (1843)
Orumaheke	Otumaheke Valley	None	No	11	Confusing (see text) but possibly part of Rotokawa system.
Ohake	Ohake	Ohaaki-Broadlands	No	8	
On Waiotapu Stream	Not mentioned	?Reporoa	No	9	
Orakei Korako	Orakei Korako	Orakeikorako	Yes	7	Detailed descriptions in Hochstetter (1863, 1864, 1867, 1959).
Rotoreka Valley Te Kopihā, Waikite	Pairoa Range Te Kopihā	Te Kopia-Waikite	Yes	18	Manifestations extend in north-east direction for about 10 km. Active now only at Te Kopia, Waikite and Puakohurea.
Kakaramea	(Mt) Kakaramea	Maungakakaramea or Rainbow Mountain	No	8	Northern part of Waiotapu system. Much more active in 1859 than now.
Rotomahana	Rotomahana	Rotomahana	Yes	13	Mapped by Hochstetter on a scale of 1:12,000. Features mostly destroyed by volcanic eruption on 10 June 1886.

are described in both books. Their locations match those of present-day activity although there have obviously been changes in the intensity of activity. Indeed, Hochstetter himself draws attention to the changes which occurred there that followed the debris flow which engulfed the Maori village at Waihi in 1846: this flow derived from the Hipaua thermal area where steam had altered andesite rocks to soft clays.

Thermal activity on the northern shore of Lake Taupo

The thermal features here comprise hot water discharges along the Waipahihi Stream and on the lake shore nearby. Hochstetter shows discharges extending from the mouth of the Waipahihi Stream almost to the Waikato River, and he said (1867) that the lake steams for 'a whole mile along the shore'. He also noted in his books the lakeside siliceous deposits there and mentions that the Waipahihi Stream discharges warm water into Lake Taupo. Part of this area is still thermally active and the Waipahihi Stream water is still warm, but the thermal activity does not now extend as far to the west along the lake shore as he shows on his map. The level of Lake Taupo is now higher than it was in 1859 so some of the thermal discharges he shows are now likely to have been submerged or extinguished. There are silicified deposits a meter or so below the present lake level near the outlet of the Waipahihi Stream and this shows that thermal waters once discharged here.

The nearby thermal area, which Hochstetter labels Parakiri, is now commonly referred to as the Spa Thermal Park. It is much less vigorously active than it was in 1859, with most decline occurring in the past 50 years following the raising of the level of the Waikato River. He describes a vigorously discharging fumarole, Parakiri itself, but this must have died shortly after his visit since no other visitors are known to mention it. Hochstetter does not show the altered and steaming ground which occurs between Parakiri and Mt Tauhara (the Tauhara thermal area), 5 km to the east, although he mentions it in his books, as indeed did Dieffenbach (1843) in his book.

Karapiti

Hochstetter's map shows the Karapiti thermal area, which takes its name from the most prominent fumarole there. Hochstetter describes and illustrates this fumarole in his two books. Nowadays this area is more commonly known as Craters of the Moon, and the Karapiti fumarole itself ceased discharging about 1981. Hochstetter's map, however, does not show the thermal activity in the Wairakei Valley, formerly known as Geyser Valley, and about 4 km north-east of the Karapiti area. This is a little surprising because of the vigorous geyser eruptions that were probably taking place there then, some of which Dieffenbach evidently saw, but Hochstetter's route was a few kilometres west of this valley. He does, however, mention some thermal activity in a small valley 'one mile' northwest of

Karapiti. This is most likely to be an area of steaming and altered ground where activity still occurs today, and not the thermal manifestations in Wairakei Valley which Hochstetter knew Dieffenbach had visited in May 1841. Dieffenbach did not report a name for this area or springs, and he described its location poorly, hence Hochstetter's omission. Even so, it is surprising that he was unaware of a major thermal area so close to his route and yet had heard about the more feeble manifestations further away at Ohaaki and Rotokawa.

#### Rotokawa and Otumaheke Stream

Hochstetter did not visit Rotokawa, as Dieffenbach did; however, the maps show two small lakes at Rotokawa with thermal activity on the northern shore of the eastern one. There is extensive steaming ground in this area today but only a single lake. This lake is drained to the northeast by the Parariki Stream which flows into the Waikato River. This stream is not shown on Hochstetter's maps nor is the thermal activity prominent in its upper reaches. The thermal activity which Hochstetter does show occurs along the Otumaheke Stream, so labelled, on his maps. This is a problem. Fleming pointed out (Hochstetter, 1959) that this name is now given to a stream much closer to Taupo, located in the area where Hochstetter shows the Parakiri thermal area. There is no sizeable stream flowing north from Tauhara towards the Waikato River, and certainly not in the position Hochstetter depicts his Otumaheke Stream to be. However, there is a small creek of very local catchment entering the Waikato River at about the location Hochstetter shows his Otumaheke Stream. Furthermore, there is feeble steam discharge and weakly steam-altered ground nearby, and the conglomerates and tuffs at the river edge are silicified here. A few springs now discharge chloride-bicarbonate waters on both banks of the Waikato River 500m east of the stream mouth. This thermal area forms part of the Rotokawa geothermal field. The confusion is compounded by Hochstetter's mention (1867) of an Otumaheke Valley occupied by a "rivulet of warm water" on the north side of the Waikato River. This valley is very close to Karapiti, and reads as though it is the Waipouwerawera Stream or a short warm water stream draining Totara Gut (L. Klyen, pers. comm.). The possibilities are: (a) that Hochstetter made a mistake in his map and mislocated some of the thermal activity of the Spa area by 10 km, which seems unlikely; (b) that in 1859 the thermal activity near the small creek (whose position is thus shown correctly) may have been very much more extensive and intense than it is today, but Hochstetter coincidentally shows the creek to be more substantial than in fact it is; or (c) that he confused the thermal activity east of Karapiti, which he believed to be near the present Otumaheke Valley, with some feeble discharges he heard about at the place he believed to be Otumaheke Stream near Rotokawa. Option (b) is preferred since the alteration near, and at, the mouth of the small stream testifies to former geothermal activity here.

### Ohake

Hochstetter shows the Ohake (Ohaaki) thermal area on his map as occurring on both banks of the Waikato River. He mentions in his books solfatara here, and the spring Te Kohaki which is clearly the Ohaaki Pool. He most likely obtained this information from the local Maori as he did not visit this thermal area.

### Thermal activity on Waiootapu Stream (? near Reporoa)

Hochstetter's map shows a small, unnamed thermal area on the south bank of the Waiootapu Stream, about 8 km east of its junction with the Waikato River. He makes no mention of this area in either of his books or map descriptions, and he did not travel on the east side of the Paeroa Range. He thus heard about this area from others, presumably some of his Maori guides. Fleming (Hochstetter, 1959) identified this thermal area as Golden Springs. This is an area of fairly minor thermal activity only 2.5 km distant from the mouth of the Waiootapu Stream and on its north bank. More likely, however, the thermal activity Hochstetter depicts is either the more impressive and vigorously active Reporoa thermal area, 8.4 km from the stream mouth, but on the north bank, or the now feeble discharges known today as the Loop Road Springs; these are 10.0 km from the mouth of Waiootapu Stream but on its south bank.

### Orakeikorako

Hochstetter's map shows thermal activity at Orakeikorako and he gives careful and valuable descriptions of the thermal activity in both his books. Thermal activity in this area has changed greatly since 1859 and these changes have been described in detail by Lloyd (1972).

### Thermal activity along the Paeroa Fault

The maps show a northeast-striking band of thermal activity extending uninterrupted for about 10 km on the western foot of the 'Paeroa Range' (Paeroa). There are brief descriptions in his books of thermal activity at Te Kopihia (Te Kopia) and Waikite, about 10.5 km apart, but no mention of the thermal activity between them which his maps show. As pointed out by Fleming (Hochstetter, 1959), however, and by Bignall (1994), the occurrence of hydrothermally altered ground along the scarp suggests that thermal activity may have been more widespread in 1859 than it is now.

### Maungakakaramea

Hochstetter's maps show thermal activity here, and he makes a very brief mention of it in his books. Thermal activity at Maungakakaramea, now more usually known as Rainbow Mountain, has been declining over the past century and it was clearly much more vigorous in 1859. Thermal activity here is now known to

comprise the northern surface expression of the Waiotapu geothermal field. Most manifestations at this field today occur about 3 km south of Maungakakamea but these are neither mentioned in Hochstetter's books nor shown on his maps.

#### Rotomahana

The thermal features here are described in detail in Hochstetter's books and shown on his map of the thermal area made on a scale of 1:12,000. The thermal manifestations were destroyed on 10th June, 1886 during the volcanic eruption from Mount Tarawera (Keam, 1988).

#### Waimahana (Mokai outflow)

Hochstetter's maps show a small thermal area on the south bank of the Waikato River near a place that he labels 'Waimahana', but he makes no mention of it in either of his books. This area seems to match most closely with the very minor thermal features at Hot Water Beach, 8 km downstream from where the Waipapa Stream flows into the Waikato River; it is likely that other features that discharged in 1859 were submerged or extinguished when Lake Whakamaru filled in about 1961. The warm and feeble discharges here are now known to be outflows from the Mokai geothermal field which is expressed by mud pools and fumaroles 12 km south of the river. Hochstetter's maps do not show these features, but the maps suggest thermal activity near the Waikato River was greater in 1859 than it has been in recent years.

#### Rotorua

Hochstetter's maps show two thermal areas present on the south-west shore of Rotorua. The southernmost is Whakarewarewa and so labelled; the northern one is Ohinemutu, which is mentioned in his book but also includes the Kuirau (Park) thermal area west of the present hospital. Thermal activity in the Rotorua area is well described and there have been many changes to it since 1859 (eg. Allis and Lumb, 1992).

#### Rotoiti

Hochstetter's maps show thermal activity extending in a northeast oriented band from Tikitere to Ruahine, as described in the books, but his maps suggest that the activity extends even further east, to include Ngarehu Point on the Tawhitinui Peninsula where Hochstetter and his party had a survey station. This area is still thermally active in a manner which matches Hochstetter's descriptions. He does not mention the small area of thermal activity at Taheke on the northern shore of Rotoiti although his route was within 1 km of it.

#### Hochstetter's depiction of thermal features outside the TVZ

Hochstetter's maps show thermal areas outside the TVZ. only one

of which (Okauia) he visited. These are the Te Puia springs on the north shore of Kawhia Harbour, Okauwia (Okauia) on the west bank of the Waiho River, 6 km east of Matamata, those at Te Aroha and at Makomako (Miranda). He mentions these four only very briefly in his books but regards them as quite insignificant in comparison to the thermal areas of the TVZ. The thermal springs in these areas are still active.

His map also shows thermal features on the south-east flank of a 'Hikurangi Mountain', west of Lake Taupo. He labels these as being two mineral springs, the only features thus designated on his map. He describes them as "powerful" but makes no mention of their temperatures. This perhaps implies that they were cool, and there are no warm or hot springs known here now.

#### DISCUSSION

Hochstetter also knew about thermal activity at Ngawha, Northland, at Moutohora (Whale Island), and at Whakaari (White Island). These areas, however, lie outside that covered by his maps. However, he mentions being told (correctly) about thermal activity at Rotoehu but he did not show this on his maps, perhaps because he was unsure as to its exact location.

The main thermal areas in the TVZ which Hochstetter did not show on his maps or mention are Ngatamariki and Kawerau. Nor does his map show the extent of thermal manifestations at Wairakei, Mokai or Waiotapu. Several thermal areas with minor activity were also apparently unknown to him. His maps are, however, very sound and important documents in the history of New Zealand geology. Hochstetter thoroughly deserves the praise he has received over the past 135 years for his grasp of the geology of the TVZ and his maps. This praise can rightly be extended also to include Hochstetter's mapping and the descriptions he gives its thermal manifestations. Much of the country he covered, particularly west of Taupo, was difficult to traverse, and he avoided using the easier Waikato River route or following Dieffenbach's path. That such a high quality map could be produced after only 7 months field work testifies to Hochstetter's outstanding ability and the help he received from those members of his party who assisted him with the surveying and scientific observations. They spent 23 days in the TVZ, and Hochstetter's depiction of the distribution of its thermal features is essentially correct.

Several of the thermal areas he shows and describes have changed little since 1859 but others have undergone spectacular changes or even been totally destroyed (Rotomahana). The occurrence of thermal features at places no longer superficially active, or else feebly so, is important to help add the time dimension that is needed to assess individual geothermal reservoirs and to appreciate the dynamic but changing nature of active geothermal systems.

## ACKNOWLEDGMENTS

I thank Richard Glover, Lewis Klyen, Les Kermode, Alan Mason and Manfred Hochstein for their helpful comments and advice.

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## ERNEST JOHNSTONE SEARLE

28 August 1909 - 21 December 1996

" I flipped through the pages of the University Calendar and when I came to 'Geology' my eyes caught 'Demonstrator E.J.Searle'. That did it ! That man could teach !"

This explanation by Peter Wong, who was one of Ernie's pupils at Auckland Grammar sixty years ago, as to how he came to study geology on entering university, explains in four words why two generations of Auckland geology students remember Ernie Searle with such affection -

" That man could teach !"

.....

Student. demonstrator. lecturer. professor and professor emeritus. Ernie Searle's connection with Auckland University geology went back almost seventy years. But Ernie's connection with geology itself went back even further for his early childhood years were spent in a setting of intense geological activity, the Hauraki Goldfield, a district which in six years around the time of Ernie's birth produced four Geological Survey Bulletins.

Ernest Johnstone Searle was born on 28 August 1909 at Karangahake and no less than four bulletin areas (10, 15, 16, and 20) converge on that township. Karangahake lies just within the northern boundary of Aroha Subdivision and about the time that Ernie was celebrating his second birthday in August 1911, a few kilometres to the south, J.A.Bartrum, with whom Ernie was later to have a long partnership, was beginning his field work in that subdivision.

When Ernie was seven years old his family moved to Herne Bay Auckland and Ernie became a pupil at Bayfield Primary School. In 1924 he moved on to Auckland Grammar School and it was in that year that a unique institution came into being - the Matai Club. This was a group of Grammar School students, living in Herne Bay, who met regularly to discuss topics ranging from science to religion. Also a member of the Matai Club was J.C.Black, father of Professor Philippa Black now on the staff of the Auckland University Geology Department. That club, started by boys barely into their teens, was to endure for over sixty years until time took its toll on the founders.

Ernie left Auckland Grammar at the end of 1927 to start his university studies and his teaching career. One early teaching appointment was at Okahu, an isolated settlement 24 kilometres south-east of Dargaville. It was here that his natural ability



as a teacher first became apparent. when, in the evenings, he succeeded, where others had failed, in teaching the intellectually handicapped child of his landlady to read and write.

Parallel with his teaching career Ernie was, under difficulties, continuing his university studies and geology was taken because, as an evening course, it fitted in with his teaching commitments. Despite the lack of facilities in the department in those days, Ernie's training in geology would have been thorough and comprehensive for Bartrum, alone among New Zealand university geology teachers of the time, taught the subject on a broad front. Bartrum's graduates were not paleontologists or petrologists or geomorphologists - they were geologists.

Ernie completed his M. Sc. in Geology in 1933 and in 1934, out of consideration for an over-worked professor he offered his teaching services to the department at no charge. The arrangement was formalised in 1936 when he was officially appointed Demonstrator at a salary of 20 pounds per year

That position of part-time Demonstrator was to be held for a long time with a generation of Auckland geology students passing through Ernie's evening laboratories. At the time, the Geology Department occupied a small portion of the upper floor of the Old Choral Hall in Symonds Street. Jack Grant-Mackie, himself a forty five year 'veteran' of the department, recalls his first year laboratory work:

"It was to a background of clattering tramcars and the raucous aftermath of 6 o'clock closing that students of those days received their introduction to practical geology. Ernie's patience seemed endless as he went over explanations, pipe and lens in hand."

In his article, 'The Thirties and Forties', in the centennial history of the Department, Ernie refers to the forties as "the most pleasant I had experienced, although some of the busiest". They certainly started off busy for him. In 1940 Professor Bartrum took his first (and last) sabbatical leave and Ernie, along with his work at Auckland Grammar, ran the Department single-handed. For the first time, his teaching ability, so effective in the laboratory, was applied in the Stage 1 lecture hall.

There were immediate results. In the previous four years an average of five Stage 1 students had, each year, gone on to Stage II Geology but following Ernie's lectures to Stage 1 in 1940, eighteen of his students went on to the advanced course.

This increase in interest followed through to the masters level. In the five years 1943 - 1948 eight students completed M.Sc. in

Geology. In the previous fifteen years there had been only five.

Four of the eight, Hugh Battey, Nick Brothers, Bob Clark, and Larry Harrington went on to greater things in geology. Other members of the group were Peter Wong, the author of our introductory quotation, and Alan Mason. Decades later, these six and their wives, three of whom had, themselves, studied geology under Ernie in the 1940's, began a series of annual reunions. Guest of Honour at the later reunions was always Ernie Searle and it is pleasing to record that he was still able to be present at the last one held, in March 1996.

Previously, Masters students had worked in isolation but now, it was possible for them to discuss their thesis problems with fellow students. Whenever Ernie took time out of his Stage 1 Laboratory for a few puffs of his beloved pipe he would enter into these discussions. So for the first time his knowledge of and enthusiasm for geology were applied above Stage 1 level.



As two generations of geology students at Auckland remember him - Ernie Searle and pipe. That pipe should be mounted and placed for all time in a prominent position in the Department of Geology at the University of Auckland.

For Ernie, the forties ended as they had begun - very busy. Professor Bartrum died in office in June 1949 and Ernie, once more found himself in the lecture hall of the Department. Arnold Lillie took over the chair in 1951 and Ernie continued part-time until the end of the decade.

By that time, Ernie had been a part-time staff member for 25 years. Throughout that period his teaching career had continued, firstly at Auckland Grammar School (1932-1951) and then at Auckland Post-primary Teacher's College (1951-1959).

In 1955, he received a grant from the New Zealand Council for Educational Research to study the teaching of science in New Zealand post-primary schools. His book on that subject (259 pages), published by Oxford University Press in 1958, helped to formulate the curricula at a time when the post-war baby boom coincided with an increased emphasis on science education in schools.

It was also in the 1950's that Ernie's knowledge of Auckland geology became known to the wider community. City building projects, at a standstill in the 1940's, were now commenced and Ernie was consulted in the construction of the Harbour Bridge, Mangere Airport, Motorway and the city sewerage scheme, amongst others.

His detailed knowledge of the Auckland volcanoes led him to become one of the first campaigners for their preservation.

Ernie seems to have enjoyed helping other people, particularly when he was 'spreading the good news about geology'. WEA, trainee teachers, Junior Naturalists, Auckland Institute members, Festival Tours and many others benefited from his willingness to give up leisure time to lecture and conduct field trips.

As if all this was not enough, he devoted time to such organizations as the Territorial Army (for which service he received the Efficiency Decoration), Competitions Society, Air Force pre-entry courses.

The amazing thing is that despite all this activity, family was not neglected and somehow Ernie found time to be involved in everything that his children did. The childhood memories of his elder daughter, Barbara, are of Ernie Searle, family man, not of Ernie Searle geologist, Ernie Searle teacher or Ernie Searle consultant.

The late 1950's saw a 300% increase in the number of students entering the Department. To cope with the increase new staff positions were created. Ernie was the logical first choice to fill one of these positions but there was a 'red tape' problem. Anything less than a senior lectureship would have meant a drop in salary for Ernie but the university authorities were not

prepared to give a senior lectureship to some one whose highest degree was a mere M.Sc.

So Ernie was encouraged to enrol as the Department's first Ph.D. student (part-time, naturally, although this too earned the disapproval of the university authorities). In the event Ernie never got that Ph.D. His external examiner recommended that he transfer his candidature to the higher D.Sc. degree. This was obtained and, now on the staff, Ernie had a truly 'meteoric career' - part-time demonstrator to associate-professor within five years must be something of a record !

Ernie obtained his D.Sc. for his work on the Auckland volcanic field and it is interesting to note that the first University of New Zealand D.Sc. in geology had been awarded to P. Marshall, sixty years previous, for a study of the same field.

Ernie, at the age of 50, was, at last, a full-time geologist and by 1965 he had added a further 20 papers to his publication list. His comprehensive field knowledge of Auckland geology was now put into print and in the case of the volcanoes it was expanded to include laboratory studies. All his publications are on the geology of Auckland but much of the information they contain is of more than local significance.

His popular account of Auckland geology, City of Volcanoes, was published in 1964. It was an immediate best-seller and a second edition was published in 1981.

But it is as a teacher that his former students remember him-

"He was an excellent teacher - most certainly the best I ever had - who really made geomorphology and volcanology exciting."

"His love of geology was plain to all in the enthusiasm he exuded. He made it a live wondrous exciting topic, one of real relevance to human well-being."

and we give the final say to Rilda Gorrie, a colleague at both Teacher's College and university -

"Ernie is to my mind one of the very best teachers at Senior Post-primary, Graduate Training College, and University that I have had the good fortune to work with. He is a scholar who has the ability to communicate."

Despite the high level of his research activities in the 1960's, Ernie still found time to participate in university administration - council, senate, and Dean of Science. Rapid expansion and student agitation made these stressful years for university administrators but Ernie built up a reputation as a

diplomat and smoother of troubled waters. To quote Rilda Gorrie again -

"He was exceedingly pleasant with all and suffered fools gladly. He had plenty of practice."

As if all this was not enough Ernie spent 15 years on the Council of the Auckland Museum.

Ernie Searle retired from the Department in 1972 with the status of Professor Emeritus but he still had many years of service to the community ahead of him. A member of the Auckland Education Board from 1972 to 1986, he served on six subcommittees. Here again, his remarkable equanimity was noted.

"You'd think that he had been asleep but woe betide you if you tried to take advantage of that at question time."

Ernie's sixty years of service to education was recognized by the award of the Queen's Service Medal in the 1986 New Year's Honours and in 1987 the New Zealand Educational Institute gave him its rare Honorary Fellowship. He was one of only 23 Honorary Fellows in a membership of 20,000 and it was this award that Ernie valued most as he always regarded himself as a teacher first and a geologist second.

For geologists, however, there must be regret that geology as a career only became possible for Ernie at the age of fifty. The contribution that he made to New Zealand earth science in that last fifteen years of his working life gives an indication of 'what might have been'.

.....

This obituary is based on a testimonial account presented to Ernie in celebration of his eightieth birthday, a shortened version of which was published in Society Newsletter No. 92, June 1991. We reprint below, the list of publications included in that account.

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Alan Mason

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### The Society Archives

Ian Keyes, who contributed the 'Mantell' article in this issue, is both an ex-officio and an ordinary member of the Historical Studies Group. His 'ex-officio' status arises from his position as Society Archivist which he has held for eight years. Late in 1988 Ian took over seven large cartons and a filing cabinet containing Society records which had been stored at the Hamilton Office of the New Zealand Geological Survey. Prior to his departure from 'the Survey' in 1986, Neil Fowke had catalogued and organized some of the items and Ian has carried on with the work.

The material that Ian has collected from various sources has been largely in date order and he has reorganized this under topic headings such as Committee Minutes, Submissions, Conferences, Publications, Subcommittees, etc. etc.

In our Newsletter No 4, March 1992, Ian reported on progress to that time and in the last five years he has, in his usual methodical way, continued the work. Cartons of old Society records continue to arrive at Ian's office and are sorted, classified (and in some cases destroyed -space available is not limitless).

There are still gaps in the archive files so Ian would welcome any Society records that readers may have. He is particularly anxious to get copies of submissions made by the Society in past years on matters of public interest.

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# A PRE-WAR GEOLOGICAL RECONAISSANCE DOWN

## THE WANGANUI RIVER

Brian Mason

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In Historical Studies Group Newsletter No.9, September 1994 we printed Cyril Firth's account of his involvement in petroleum exploration in New Zealand during the war years.

Early in 1939, another member of the Historical Studies Group, Brian Mason, carried out a reconnaissance geological survey down the Wanganui River to explore the petroleum potential. Brian was about to commence his studies at Canterbury for a Masters in Geology and had been employed by New Zealand Oil Exploration Ltd, a Shell subsidiary, as an assistant to a company geologist, Jack Woolley.

However, shortly before the survey was to start, Jack Woolley suddenly took ill and Brian found himself 'geologist in charge' of the expedition.

In addition to Brian, the survey party consisted of a well known Taumarunui identity, George Waihapa, and an assistant known only as Mita. There was a last minute 'ring in' when, half-an-hour after leaving Taumarunui, George's dog, which had been present at the departure from Taumarunui, was seen to be swimming after the boat and was hauled aboard.

Like most prewar petroleum surveys in New Zealand, the final results of the survey were negative although it did map an anticlinal structure between the Wanganui River and Oio which looked promising but the company was unable to follow up with a drilling programme as the war intervened. The structure was drilled in the sixties but was found to be dry.

Sheet 7 of the 4 mile Geological Map of New Zealand maps most of the area covered by the traverse as Upper Miocene Taranaki Series and Brian remembers that dips were uniformly low, about 5 degrees, making it difficult to draw any structural conclusions.

The survey run was the now standard canoe trip of the 90 miles of the Wanganui River between Taumarunui and Pipiriki. Below, we print extracts from Brian's diary which give us an interesting account of field work in New Zealand sixty years ago.

.....

Friday, 17 February : Left Taumarunui 3 pm. Had to lower boat down the rapids below Herlihy Bluff and also in another rapid a little lower down. Camped some distance above Te Maire 7 pm. Went eeling and caught about eight. To bed 11.30

Monday. 20 February : Axe had been forgotten at lunch place at Paparoa Rapids so Mita walked back for it. Shot some rabbits for fresh food while waiting for Mita to return. Ate our last eel for breakfast so rabbit very welcome.

Tuesday, 21 February : Away about 9.30. Beautiful day. Examined salt spring (called Waitote) opposite the Waipahihi Stream. Pulled up at Rusling's farm midday. Rang Jack Woolley and asked him bring food, camp oven etc. He arrived 4 pm and left again about an hour later after an earnest dissertation. Camped in whare.



Above : Camp below Aukopae. 19 February

Left : At Lower Dhura Fall. 20 February

Wednesday, 22 February : Beautiful day. Mapped from the Retaruke River down to the camp in the morning. In the afternoon worked down river for two or three miles.

Thursday, 23 February : Saw much interesting geology so did not cover any great distance

Friday, 24 February : Shot a pigeon in the evening and made a fine stew of him.

Sunday, 26 February : Up rather late and spent two hours clearing up map of Retaruke SD so did not leave until 11.30. Camped at mouth of Tangarakau River 6.15.

Monday, 27 February : Up 7.15 and spent two hours writing a letter to Dr. Creek, the Chief Geologist of New Zealand Oil Exploration Limited, then got maps ready for Tangarakau trip. Started up the Tangarakau at 2.30.

Tuesday, 28 February : While George and Mita at work on the log jams I did some geology up a side creek.

Wednesday, 1 March : Glorious day. Spent whole day clearing log jams and getting boat up, finally camping 6.30 about three quarters of a mile below the Heao Stream. Caught Brownie the dog trying to pinch our bacon, the only meat we had left. Saved the bacon with only a few tooth marks in it.

Thursday, 2 March : Out of meat, tired of eels, so Maoris went out after a pig with the gun while I started up the Heao. Ran into a mob of wild cattle which gave me a bad scare, so turned round and got back to camp at 4.30

Sunday, 5 March : Mita shot a boar in the afternoon. Fair travelling but many supplejacks. Left coming back till rather late, not in camp until 8.20, half an hour after dark.

Monday, 6 March : Shifted camp upstream. After lunch I went geologising. Tred by two bulls.



George and Mita with a wild boar shot in Heao Stm.



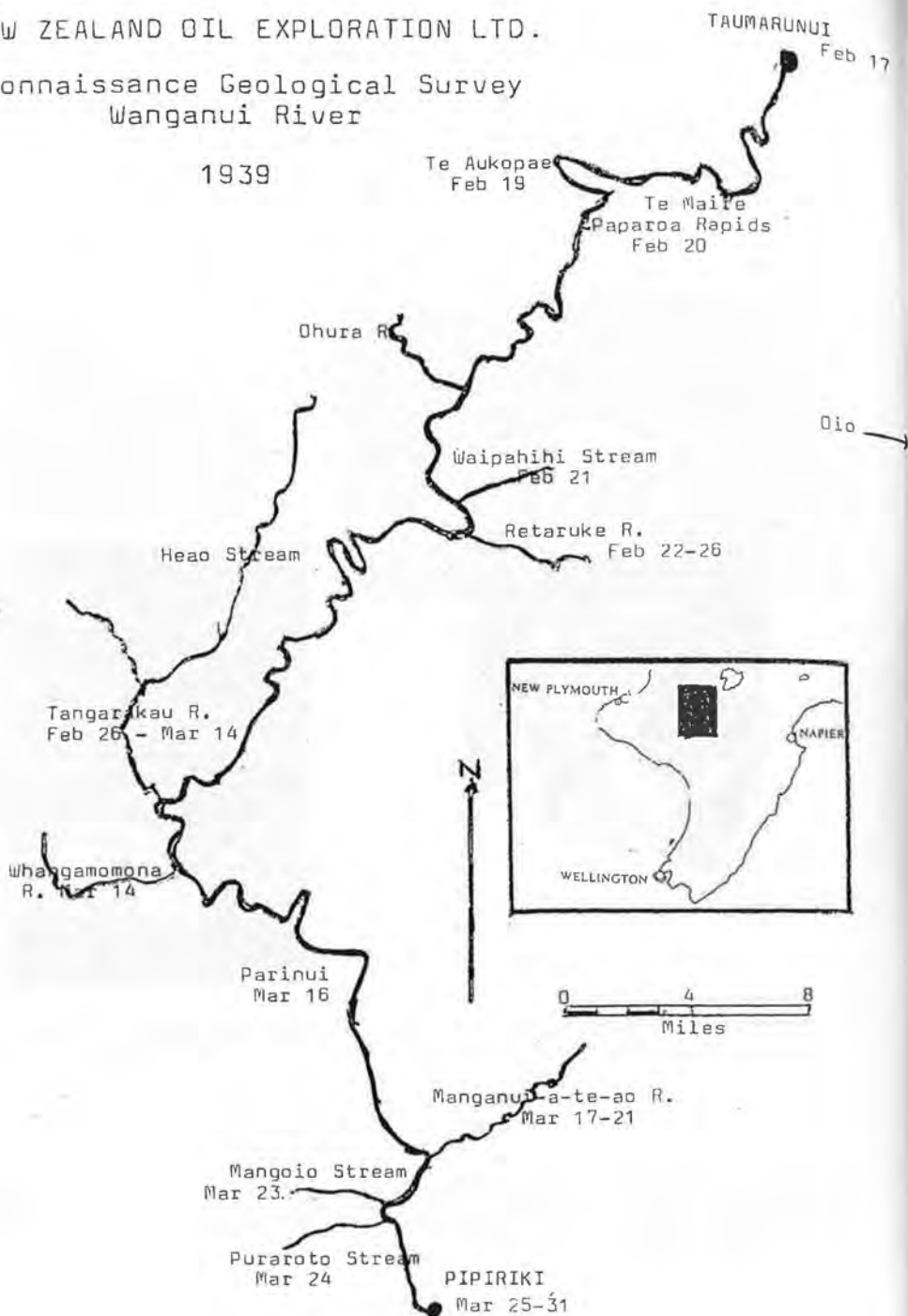
Mita and George with camp oven bread

Tuesday, 7 March : Left camp 8.30. Tred by cattle on the way upstream. Back to camp 7.45 to find gear well and truly fly-blown. Had to cut maggots off the meat in order to get enough for a meal.

## NEW ZEALAND OIL EXPLORATION LTD.

Reconnaissance Geological Survey  
Wanganui River

1939



Thursday, 9 March. Burnt holes in my only pants by putting them to dry before the fire, so had to sit down and mend them. George chopped through a big log blocking river and Mita baked bread. Started working up the Tangarakau. Fell in river on way home. Some wild goats appeared opposite the camp, but not quick enough with the gun to get any of them.

Friday, 10 March : Rain , so did not get up till 8 am. Caught an eel so had eel and fried potatoes for breakfast. Much trouble with log jams but geology very simple. Had our first view of open country since leaving Retaruke.



Brian in canoe at Parauui  
16 March



Log jam in Tangarakau  
River

Saturday, 11 March : Heavy showers, so Maoris went out shooting while I filled in maps. . Maoris brought home two pigeons so had pigeon stew for dinner

Monday, 13 March : Shot a sucking pig and had him for dinner - first class

Tuesday 14 March : Had a good run down the Tangarakau to the Wanganui. Proceeded downstream and met 'Ongarue' on its way to Pipiriki. Got mail informing me of award of post-graduate scholarship. Camp one mile below the Whangamomona River.

Friday 17 March : Spent morning washing clothes and cleaning up generally. George accidentally threw all our cooking fat in the River - much sorrow. Broke camp 2 pm and camped at the mouth of the Manganui-o-te-Ao at 7.45.

Saturday 18 March : Started up Manganui-o-te-Ao at 10. Camped about two miles upstream at an old Maori settlement. Got five pigs with one bullet and a pocket knife in the evening. A wonderful gorge on roast pork.

Sunday 19 March : Visited old settlement in the morning and got some pears. Pulled up numerous rapids and camped three miles further up that night.

Tuesday 21 March : Rain in early morning kept us in bed until 9. Thought we had better get out of the Manganui-o-te-Ao with the boat in case of flood so broke camp at 10. Some heavy rain during the day. Caught a pig and a goose at the old Maori settlement on the way out. Reached the main river at 5 pm.

Thursday 23 March : Beautiful day. Proceeded down river. Lunched just below Mangoio, finished up the remains of the goose.

Friday 24 March : In the morning proceeded on foot up the Puaroto. Plenty of pigs about, shot two yearlings. Spent afternoon sprucing up, cutting hair, shaving etc. in preparation for a triumphal entry into Pipiriki.

Saturday 25 March : Broke camp and proceeded to Pipiriki arriving there in late afternoon. Rang Woolley who said to stop there and not to proceed to Wanganui

Monday 27 March : Talked to Creek over telephone in the morning, arranged about getting money to pay off George and Mita. Went off geologising around Pipiriki.

Tuesday 28 March : Geologising around Pipiriki

Friday 31 March : Woolley arrived about lunch time and we broke camp for the last time. Arrived Taumarunui in time for dinner.

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(There are more reminiscences from Brian on his experiences in the field in pre-war New Zealand in Historical Studies Group Newsletters 3 and 4 - Ed.)

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Also on the subject of reminiscences -

The Dowager Duchess of Old  
Was almost incredibly old.  
'My dear', she would say,  
'I remember the day  
When the last Brontosaurus was foaled.'

'THE GEOLOGY OF NEW ZEALAND' by ALEXANDER MCKAY

? A LOST MANUSCRIPT

In Newsletter No. 10, March 1995, we gave an account of McKay's work as Government Geologist in the early years of the century. We mentioned that, following medical advice in March 1902 that he should not engage in field work, he began to write a 'Geology of New Zealand'. After about twenty weeks he had written "670 folios" which we interpreted as 1340 pages.

1340 pages in twenty weeks is a fast rate of composition and, frankly we are surprised at the statement, quoted in Newsletter 10, that these 1340 pages were ready for printing. Yet the Annual Mines Department Reports indicate that the work went on for a further two years. These Mines Department Reports were included in the Appendices to the Journals of the House of Representatives but they were also published separately as Papers and Reports relating to Minerals and Mining. They usually begin with a 'Mines Statement' by the Minister of Mines and in his Statement for 1903, the then Minister, James McGowan, has this to say under the heading "Geological" :

The work of the Government Geologist has included the collection of data which it is intended to incorporate in a projected work on "The Geology of New Zealand," and also of preparing for the press descriptions and illustrations of rock-specimens from the Hauraki Gold-fields, which have been classified and reported on by Professor Sollas (Oxford), together with an account of the geology of the district from which the specimens referred to were obtained.

and in his Statement for the following year, 1904 :

The Government Geologist has been engaged in writing up notes and memoranda on matters connected with the geology of New Zealand, more especially in classifying, naming and repacking the large and valuable collection of rock specimens which have accumulated in the Colonial Museum for many years past.

McKay, himself, is less specific in his report dated 31 May 1904 (we have been unable to locate his report on the previous year):

I have the honour to state that since the date of my last report, for the year 1902-3, I have been unable to prosecute geological examinations in the field, due to the continuance of the disability under which I labour. I have, however, fully employed my time in preparing original matter, and supervising the printing of this, and the report of Professor Sollas, and in

preparing photographic illustrations from rock-slices for the same

The Bibliography of New Zealand Geology lists only two papers, totalling fifteen pages, by McKay for 1903 and 1904 and in the following years he published nothing of significance apart from his contribution to The Rocks of Cape Colville Peninsula and even here the bulk of the work had been done prior to the period covered by his May 1904 report. The Minister's statement for 1903 (above) refers to McKay's working on that contribution and McKay's Letter of Transmittal of the completed manuscript to the Minister, as published in The Rocks of Cape Colville Peninsula is dated 25 November 1903. Furthermore, the wording of McKay's May 1904 report implies that there is no connection between the "original matter" and Sollas' Colville studies.

So 'preparing original matter and supervising the printing of same' almost certainly applies to his 'Geology of New Zealand' - this being the only other research project mentioned in the Mines Department Reports.

And there the trail comes to a dead end !

In his report for the following year McKay refers to work for The Rocks of Cape Colville Peninsula but makes no mention of his own "original matter",

The Rocks of Cape Colville Peninsula appeared in 1905 and 1906 but what happened to McKay's 'Geology of New Zealand'? There was no time restriction. He continued as Government Geologist for several years in parallel with Bell's Geological Survey and did not finally retire from the Mines Department until the end of 1909. W. Berry's letter of July 28 1902 quoted in Newsletter No. 10, pp.7 and 8, tells us that at that time there were 670 folios "ready for final consultation before printing" and in his report of 31 May 1904 (above) McKay states that he was supervising the printing.

On page 12 of the article in Newsletter 10 we mentioned McKay's inability, and his own admission to this, to complete large projects. Roger Cooper has pointed out (private communication) that in any case McKay's publications indicate that he was not at his best in broad syntheses and "second order" interpretations. His strength lay in field observations and 'first order' interpretations. So if his 'Geology of New Zealand' had seen the light of day it could well have been a disappointment.

McKay's manuscript would have been of great use to Park and Marshall in their books on the geology of New Zealand which were published a few years later. Yet neither mentions it despite the fact, as mentioned in his preface, that Marshall wrote his manuscript in 1907.



In a private communication Bill Watters draws attention to the environment in which McKay would have been working as his project drew near to final printing. He would have been aware that Park and Marshall were preparing books on New Zealand geology. Also, the rapid increase in knowledge arising from the work of Bell's Survey could have led McKay to the realization that much of his own work was being superseded.

There was animosity between McKay and Bell and it is possible that Bell could have applied his greater 'political clout' to stop publication of McKay's book. However such action goes against all we know of Bell's character and principles and Bell must have respected McKay's knowledge of New Zealand geology.

There now arises the question of what happened to the 670 folios (minimum) that were at the printing stage. The Government Printer may have had the answer but he did not make annual reports in the early years of the century.

Enquiries at National Archives, Government Printing Office, and Energy and Resources Division of Ministry and commerce (formerly Mines Department) all drew blanks. Significantly, the McKay papers at the Turnbull Library, although they contain many pages in McKay's handwriting on his contemporary project on Cape Colville Peninsula, do not have a single mention of his 'Geology of New Zealand'.

All this leads to the likely explanation that McKay himself put an end to the project and it also seems that he destroyed his manuscript.

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I am grateful to Roger Cooper and Bill Watters for their helpful suggestions in the preparation of this article.

Alan Mason

#### Forthcoming Conferences

Bicentennial Lyell-Hutton Conference : London 30 July to 3 August and Edinburgh 5 to 9 August. The Bicentennial Conference celebrates the anniversaries of the death of James Hutton and the birth of Charles Lyell, both in 1797.

XXth International Congress of History of Science : Liege, Belgium 20 to 26 July.

Australasian Association for the History, Philosophy and Social Studies of Science : Auckland 9 to 13 July

for further information contact Alan Mason.

The montage that we print inside the back cover of our newsletter incorporates items from La Creation et ses Mysteres Devoiles by Antonio Snider. We have recently noticed an article by Albert V. Carozzi in Geological Society of America Bulletin Vol. 81, 1970 entitled 'New Historical Data on the Origin of the Theory of Continental Drift'. Carozzi's Abstract for his article reads as follows :

Examination of the original texts of Francis Bacon's Novum Organum (1620) and of Francois Placet's La corruption du grand et petit monde (1668) shows, that contrary to common belief, these two authors should not be considered as forerunners of the theory of continental drift; this conclusion also applies to A. von Humboldt (1801). A. Snider, in La Creation et ses Mysteres devoiles (1858) is the first naturalist who has unequivocally postulated and illustrated a juxtaposition and drifting of the continents as Taylor and Wegener did in the twentieth century.

This abstract refers to Humboldt (1801). We quoted from that reference on page 16 of Newsletter No. 7.

Carozzi, along with most other present-day authors, gives the date of publication as 1858. Our copy, it will be noted from the montage, is dated 1859 and makes no mention of a previous edition or printing (although this is not unusual for the time) and has 487 pages, the same number as Carozzi gives for his 1858 edition.

Another mystery is that a number of modern writers refer to the author as "Snider-Pellegrini". Again as our montage indicates, the title page of our copy names him as A. Snider and he signs his Preface as such.

Although Snider's 'La Creation' has gained a place in the history of geology it is far from being a classic of geology. Carozzi summarizes its explanation of the origin of the Americas and of their indigenous populations:

He assumes that before the Deluge, dry land formed a single mass which, through the action of underground fire, became increasingly hardened as a result of irregularly distributed crystallization. In order to maintain equilibrium, dry land was split by incipient cracks lined with volcanoes, the most important of them having a north-south trend. During the Deluge, increased expansion due to the volcanoes led to a further splitting of dry land, mainly along its major fissure and the island of Atlantis, accompanied by its volcanoes, drifted westward during a single violent commotion until planetary equilibrium was again reached, becoming America. A proof of this displacement is the similarity of the opposite coasts of the Atlantic.



510 — la plus grande, la plus longue, la plus importante, crovasse se trouvant du nord au sud, bien visible et d'une largeur à l'aurore de 200 milles, n'empêchait pas la communication des continents. En cet endroit, cette crovasse aura été peut-être de 100 milles de largeur; elle divisait la terre presque à égale distance indiquée. On pouvait pressentir qu'une séparation inévitable, que la masse la plus grande restait en raison de sa pesanteur, et que la crovasse serait repoussée à une distance proportionnelle.



511. — la masse la plus forte, et celle qui est restée.

Nous ne savons pas de quel nom on appelle à l'époque du sixième jour, la portion de cette masse qui est au l'Europe, comme de nos jours, l'Asie, l'Afrique, l'Europe.

La grosse masse partielle, dont la crovasse se trouvait au sud de l'Arde, était à l'ouest, et dans l'orientation actuelle, quelle a subi, sa surface s'est portée plus à l'ouest en sorte que cette masse forma elle-même un grand continent, que nous appelons aujourd'hui l'Amérique.



Arthur Holmes, 1890-1965



Alfred Lothar Wegener, 1880-1930



Sir Harold Jeffreys, 1891-1979

Preuves de la formation de l'Amérique.

Sommaire. — Les faits toujours appuyés de leurs preuves, 522. — Preuves physiques; correspondance des caps et des golfes, 523. — Preuve tirée du système des volcans, 524. — Nomenclature des principaux volcans, note U, id. — Tremblement de terre de Lisbonne, 525. — Tremblement au Pérou, 526. — Cataclysme au Kamtscharka, 527. — Cataclysmes partiels; effets à attendre du prochain cataclysme général, 528. —



James Alexander Lozier DuRoi, 1878-1948



Harry Hammond Hess, 1906-1967