

# THE ISTHMUS OF AUCKLAND

with its extinct Volcanoes,  
by  
D. Ferdinand von Hochstetter  
1859.

The Drawing & geographical Foundation compiled  
principally from the Surveys of Stokes & Drury  
by A. Petermann.

Scale 1:120.000.

$\frac{1}{2}$  German geogr. Mile (15.1°)

1 Engl. Mile (6916 = 1°)

Heights in Engl. Feet.

Soundings in fathoms.

Lava streams.

# Hochstetter's Auckland Diary

Sascha Nolden  
Bruce W. Hayward

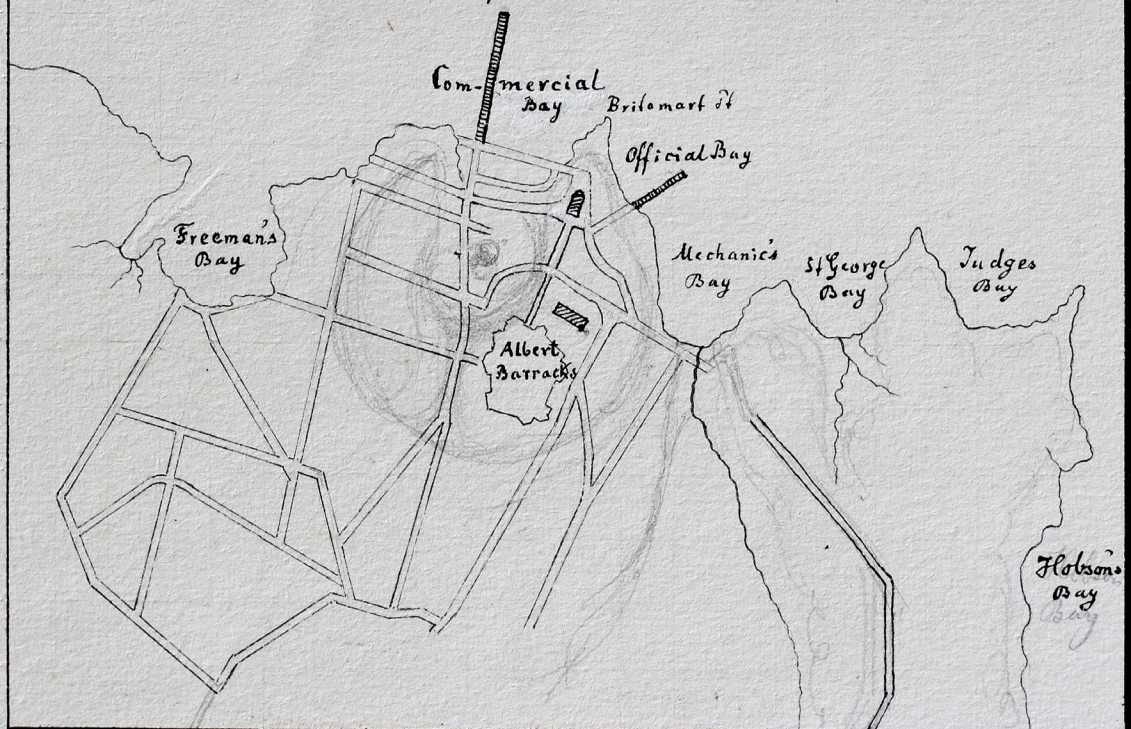


Hochstetter's  
Auckland Diary



Plan der Stadt Auckland

Waitemata - Hafen





# Hochstetter's Auckland Diary

22 December 1858 – 5 March 1859

Sascha Nolden & Bruce W. Hayward





To  
Prof. Dr. med. Arthur R. von Hochstetter  
in Zürich

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FRONT COVER: Ferdinand von Hochstetter, *The Isthmus of Auckland with its extinct Volcanoes*, Gotha: Justus Perthes, 1865. First English version of the map with geological colouring, printed in Gotha and published in Auckland. (Hochstetter and Petermann, *Geological and Topographical Atlas of New Zealand*, Delattre, Auckland, 1864).

FRONTISPIECE: Ferdinand von Hochstetter (1829-1884), *Plan der Stadt Auckland* [Plan of the city of Auckland]. The pencil circles near the middle of the map indicate the location of the centre of Albert Park volcano and the extent of surrounding ash erupted from it. Pencil and ink on paper, 177 x 207 mm (Hochstetter Collection Basel HCB 3.2.16).

BACK COVER: Ferdinand von Hochstetter, *Der Isthmus von Auckland mit seinen erloschenen Vulkankegeln*, Gotha: Justus Perthes, 1862. Published map with Hochstetter's manuscript annotated numbering of the 63 points of volcanic eruption he recognized, 249 x 192 mm. This is the earliest German version of the map without geological colouring, published as plate 6 to accompany the article: Ferdinand von Hochstetter, 'Der Isthmus von Auckland in Neuseeland', in August Petermann's *Mittheilungen aus Justus Perthes' Geographischer Anstalt über wichtige neue Erforschungen auf dem Gesamtgebiete der Geographie*, vol. 8, no. 3, 1862, pp. 81-83. (Hochstetter Collection Basel HCB 3.2.17).

PROVENANCE NOTE: Hochstetter's diary forms part of the Hochstetter Collection Basel donated by Inge von Hochstetter and her family to the Natural History Museum in Vienna on 30 April 2016.



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Neu-Seeland  
1859.

Nro 1.

Dr. Ferdinand Hochstetter

Figure 1: Title page of Ferdinand Hochstetter's Auckland diary, the first of five he wrote in New Zealand. Holograph in ink on tinted endpapers, 226 x 145 mm (Hochstetter Collection Basel).



# Hochstetter's Auckland Diary:

## background and context

### Introduction

Ferdinand Hochstetter's Auckland diary (Fig. 1) is an important historical primary source document and unique archival documentary heritage item, which was written between December 1858 and March 1859, and spent the next 150 years in the private possession of the creator and his descendants. Research and arrangements for international loans of material culminating in the first exhibition on Hochstetter in New Zealand, hosted by Auckland Libraries in 2008, guest curated by Sascha Nolden to mark the sesquicentennial of Hochstetter and the Novara Expedition's visit to Auckland (Nolden 2008), provided the catalyst that led to this material eventually being made available for research and publication. Existing as part of a private collection comprising a major part of the creator's estate, the Auckland diary had never been accessible to researchers prior to the time when Sascha Nolden first made contact with the owners and was subsequently invited to appraise, document and digitise the collection in July 2010 (Nolden 2014). Presented here is the first English translation of the first of Hochstetter's five New Zealand manuscript diary volumes, of which the final two, documenting the visit to the Province of Nelson were previously published by the Geoscience Society of New Zealand (Johnston et al. 2012; Johnston and Nolden 2014).

### Ferdinand Hochstetter

Ferdinand Hochstetter<sup>1</sup> was born on 30 April 1829 in Esslingen, Württemberg<sup>2</sup>. In his childhood he was influenced by his father who was a theologian and naturalist with a special interest in botany, and the author of numerous books on natural history. Hochstetter initially studied theology, but found his main interest in the sciences and finally graduated with a doctorate in mineralogy from the University of Tübingen in 1852. He then took up a state travel grant to visit a number of German universities and locations of geological interest before finally arriving in Vienna.

In that city he published his doctoral thesis with the Imperial Academy of Sciences (Hochstetter 1854), and after initially working as a volunteer was appointed geologist to the Imperial Austrian Geological Survey, where he contributed to the mapping of the Bohemian Forest region over the next few years (Nolden 2017). By 1856 he was also teaching geology at the University of Vienna, but later that year the Academy of Sciences selected him to take part in the first Austrian naval expedition to circumnavigate the globe. Thus Hochstetter (Fig. 3) was appointed as geologist and physicist of the Imperial Austrian Novara Expedition, which departed from Trieste on 30 April 1857, his 28th birthday, and made stops and official visits at Gibraltar, Madeira, Rio de Janeiro, Cape Town, St Paul Island and Amsterdam Island, Ceylon (now Sri Lanka), Madras (now Chennai), Nicobar Islands, Singapore, Batavia (now Jakarta),

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<sup>1</sup> Christian Ferdinand Gottlieb/Gottlob Hochstetter (1829-1884), was later known as Hofrat Professor Dr Ferdinand Ritter von Hochstetter, after being ennobled and knighted by the King of Württemberg and Emperor of Austria. There is some uncertainty around the name Gottlieb or Gottlob, as there is a manuscript source in Hochstetter's own hand which uses the name Gottlieb, while the birth registry entry appears to state Gottlob.

<sup>2</sup> Kingdom of Württemberg 1806-1918, now part of Baden-Württemberg, in the Federal Republic of Germany.

Manila, Hong Kong, Shanghai, Pohnpei (Caroline Islands), Sikaiana (Solomon Islands), and Sydney, before reaching New Zealand.



Figure 2: Joseph Selleny (1824-1875), depiction of Ferdinand Hochstetter (1829-1884) in his well-equipped cabin on the Austrian frigate *Novara* in 1857 (Hochstetter Collection Basel).

## Novara Expedition in Auckland

The frigate *Novara* with Hochstetter on board (Fig. 2), arrived in Auckland on 22 December 1858. The *Novara* being the largest naval vessel, in fact the biggest ship, to have visited the port up to this time, and Austria still being described as one of Great Britain's oldest allies, was well received with all formalities and great public interest. In fact, the visit was much anticipated, due to a public awareness of the Novara Expedition, initially through a letter from Karl Scherzer (Fig. 31) dated 29 December 1856 outlining the plans of the expedition, including a scheduled visit to New Zealand, published in full in the *New Zealander* newspaper on 22 July 1857 (*New Zealander* 22 July 1857: 2).

Hochstetter's visit was also highly anticipated as the geologist's reputation had preceded him and high hopes were pinned on his abilities to provide expert consultation and practical advice in relation to the newly discovered mineral resources in the form of coal deposits found in the vicinity of Auckland. Hochstetter's name had first been referenced in connection with the expedition in an Auckland newspaper on 7 October 1857, when he was described as "Dr. Hochstetter, from the Geological Institution of the Austrian Empire" (*New Zealander* 7 October 1857: 2).





Figure 3: Bruno Lancel Hamel (b. 1837), studio portrait of Ferdinand Hochstetter in Auckland, 1859. Albumen silver print, 180 x 144 mm (Auckland War Memorial Museum PH-ALB-84-p5-1).

On 11 December 1858, some ten days before the arrival of the *Novara* in Auckland, the editorial of an Auckland newspaper outlined arrangements made in Sydney and expressed the hopes and expectations:

While Sir William Denison was endeavouring to arrange with a Geological Surveyor – (and we may here state that the Rev. W. B. Clarke, who is the best Geologist in this part of the world, would have been glad to visit New Zealand if his other avocations had permitted him to do so) – the Austrian frigate “*Novara*” came in most opportunely with a large scientific exploring party on board. Sir William placed the matter before Commodore Wüllerstorff, the Commander of the “*Novara*,” and that gentleman at once gave his consent that the Scientific Officers of the Expedition should prospect and report upon the Auckland Coal Fields. For this purpose, therefore, Commodore Wüllerstorff determined to come on to Auckland; and we learn that the “*Novara*” may daily be expected in our harbour. The

importance of this visit, and of the information we may reasonably hope to obtain from the Scientific Staff, can hardly be too highly estimated; and the ready courtesy with which Commodore Wüllerstorf has acceded to the request of Sir William Denison to aid the Province of Auckland in the development of those mineral riches which we ourselves have hitherto been so apathetic about, merits, and should receive the warmest thanks of our fellow-citizens as well as of the constituted authorities. (*New Zealander* 11 December 1858: 3)

Hochstetter and the Novara Expedition were therefore arriving to very favourable conditions, and it was an arrangement of simple diplomacy between the Governor-General of Australia and the Governor of New Zealand with the Imperial expedition that led to Hochstetter being given leave to undertake field investigations of coal deposits during the initial period of the visit, before the expedition departed for Tahiti on 8 January 1859.

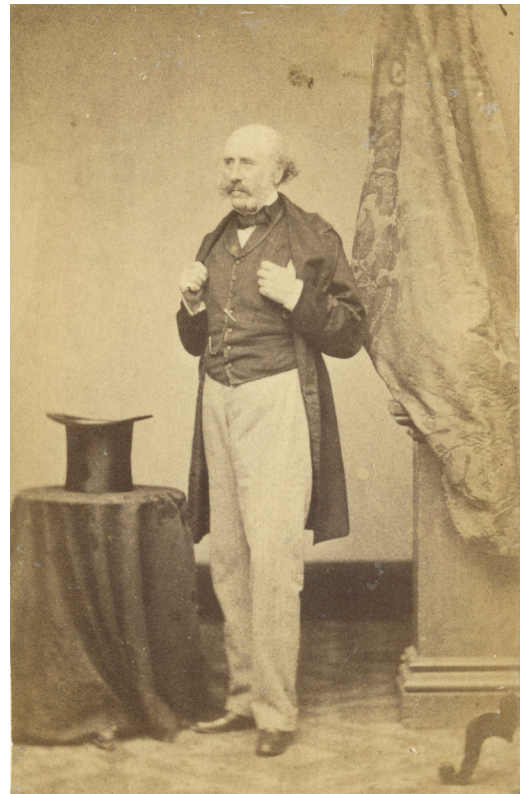


Figure 4 (left): Thomas Wingate (1807-1869) (attrib.), cabinet portrait of William Thomas Denison (1804-1871), Governor of New South Wales from 1855 to 1861. Albumen print, 220 x 163 mm (Caroline Simpson Collection, Museums of History New South Wales, Rec. No. 52361).

Figure 5 (right): Freeman Brothers (Sydney), carte de visite portrait of Thomas Robert Gore Browne (1807-1887), Governor of New Zealand from 1855 to 1861 (Alexander Turnbull Library PA2-0740).

Hochstetter duly visited the coal deposits and on his return from Drury he wrote up his report in German, which was then translated into English by Karl Scherzer. The final report dated 4 January 1859 was presented to the Auckland provincial government, and published as 'Report of a Geological Exploration of the Coalfield in the Drury and Hunua District, in the Province of Auckland (N.Z.)', in *The New Zealand Gazette*, number 2, on 13 January 1859 (Hochstetter 1859, 13 January: 9-12; see page 169-174). The Governor of New Zealand, Thomas Gore Browne (Fig. 5) then wrote a letter of thanks on the same day:



Government House, Auckland, New Zealand,  
January 4th 1859.

Sir,

I do myself the hono[u]r to express to You the gratification which the visit of His Imperial Majesty's Frigate "Novara" has afforded to the Inhabitants of Auckland and to myself.

I beg also to convey to You and to the Officers of the scientific department of Your Expedition my best thanks for the valuable information supplied by the investigations of these gentlemen.

It will be my agreeable duty to report to Her Majesty's Government on the subject and I am satisfied, that Her Majesty will receive the communication with pleasure and will recognise the importance of the services rendered to one of Her Dependencies.

Wishing You a prosperous voyage and success in the interesting objects of Your pursuit, I beg to subscribe myself

Your faithful servant

Thomas Gore Browne

Col. H. M. S.

Governor of New Zealand (Scherzer 1862, Beilage III: 1).

So clearly the governor was pleased with the contribution made by the scientific contingent of the visiting expedition. However, by the following day the government had decided that they wanted more of the same, and asked for Hochstetter to be able to extend his stay:

Government House, Auckland, New Zealand,  
January 5th 1859.

Sir,

Having already endeavoured to express my thanks to Yourself and the Officers of the scientific department of Your Expedition for the valuable aid afforded to this Colony, I now venture to ask You to confer a still greater favo[u]r, by giving permission to Dr. Hochstetter to extend his researches for a few months longer.

In the event of Your granting this permission, the means necessary to enable him to explore effectually, will be provided at the expense of the Colony of New Zealand.

I feel less diffidence in making this request to You, as Representative of the Imperial Government, because Dr. Hochstetter's labo[u]rs in this Colony may be made the means of furthering the objects, which His Imperial Majesty the Emperor of Austria had in view, when He despatched the Expedition under Your command.

I beg to add, that, should You feel it compatible with Your duty to accede to the application I have now the hono[u]r to make, every assistance shall be afforded to Dr. Hochstetter, whilst engaged in this Colony, to enable him to make his scientific researches as valuable as possible to the Expedition of which he will remain a member, and care shall be taken to facilitate his return to Europe at the expense of this Colony by such route as he shall prefer.

I have the hono[u]r to be Sir

Your most faithful servant

Thomas Gore Browne

Col. H. M. S.

Governor of New Zealand (Scherzer 1862, Beilage III: 1-2).

Wüllerstorff-Urbair (Fig. 6) gave permission for Hochstetter to remain in New Zealand under these conditions, as he wrote in a reply to Browne on 5 January 1859, closing his letter: "With the hope that the friendly arrangement thus entered into on this subject may create a lasting [bond] of union and communication between the scientific men of both countries" (Scherzer 1862, Beilage IV: 3-4).



Figure 6 (left): Ludwig Angerer (1827-1879), carte de visite portrait of Bernhard von Wüllerstorff-Urbair (1827-1879), commodore of the *Novara* Expedition (Hochstetter Collection Basel HCB 5.2.W13).

Figure 7 (right): Adèle (Vienna), cabinet portrait of Friedrich von Pöck (1825-1884), commander of the *Novara* under Wüllerstorff-Urbair (Hochstetter Collection Basel HCB 5.2.P13).

## Travels and excursions in Auckland

The initial period of Hochstetter's visit to Auckland, while the *Novara* was still in Auckland, is not described in any detail in the diary, and although Hochstetter had formerly sent extended detailed accounts of the expedition for serialised publication in the newspaper *Wiener Zeitung*, he found he was having to devote his time to the investigation and reporting on the coal deposits, and therefore passed on the task of continuing the travel accounts for Vienna to Julius Haast (Fig. 35), whom he had only met since his arrival in Auckland.

The sources for the time when the *Novara* was in Auckland are therefore largely secondary. Haast wrote travel accounts that were then published in serialised form as a continuation of Hochstetter's accounts, which had appeared in 40 parts (Haardt 1885), thus Haast's became the final instalment as number 41. But they were published under the pseudonym of Julius Hanf, and appeared not only in the *Wiener Zeitung*, but also the *Grazer Zeitung* and *Laibacher Zeitung*. Other original accounts of the sojourn in Auckland by Haast under the pseudonym Hanf appeared in the supplement to the Augsburg *Allgemeine Zeitung* (Hanf 1859, 2-3 December).





Figure 8: Bruno Lancel Hamel (b. 1837), Commercial Bay in Auckland, 1859. Albumen silver print, 111 x 257 mm (Hochstetter Collection Basel HCB 2.7.2). The *Novara* anchored offshore and passengers and crew would have come ashore here.

According to these accounts, it was on the day following the arrival in Auckland, that the scientists first landed in Auckland and were soon welcomed by the hospitable Carl Frank Fischer (Fig. 36) and other local German-speaking residents of Auckland. While on a more formal diplomatic level they had dinner with Governor Browne, at Government House (Fig. 9), and enjoyed the best of Auckland social circles. The *Novara* also hosted visitors, for example on 24 December Bishop Pompallier was a guest of honour on the *Novara* holding mass on board, and high mass was also held by Pompallier on 2 January. But it was Fischer who was the central social organiser and most generous host, with many of the scientists and officers spending their evenings at his home, including the final evening prior to the departure of the *Novara* on 8 January (Hanf 1859, 21 April).



Figure 9: Bruno Lancel Hamel (b. 1837), Government House in Auckland, 1859. Albumen silver print, 116 x 158 mm (Hochstetter Collection Basel HCB 2.7.4).

Haast mentions that the scientists Hochstetter, Frauenfeld, Zelebor, and Jelinek would go on regular excursions and return loaded with their collections of specimens. Scherzer collected statistics on New Zealand, Eduard Schwarz focused on ethnology, and Selleny sketched Auckland and surroundings.

The travel accounts then describe the Christmas feast hosted by Eruera Patuone on the North Shore, including the exchange of speeches, featuring one given in English by Wüllerstorff-Urbair, with William Baker as interpreter (Hanf 1859, 13 April, 14 April). Haast then recounts the expedition from Auckland to Drury and south to the Waikato River organised by the government and jointly led by Drummond Hay (Fig. 74) and Charles Heaphy (Fig. 10). Most of the scientists on the *Novara*, except Scherzer and Zelebor took part, along with the officers Friedrich von Pöck (Fig. 7) and Eugen Kronowetter. Haast, at the time fulfilling a commission from the shipping company Willis Gann & Co in London, was also invited to join, along with the editor of the *New Zealander* newspaper, George Smallfield.

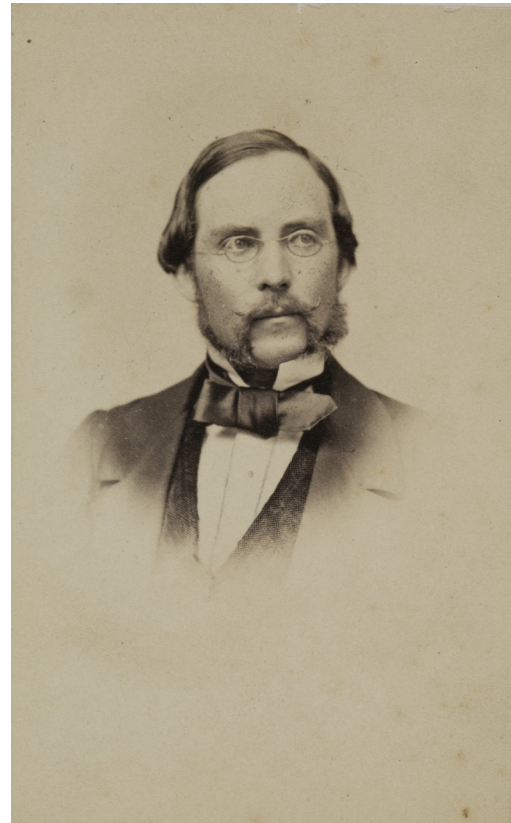


Figure 10 (left): Charles Heaphy (1820-1881), portrayed here wearing his Victoria Cross, by unknown photographer, 1864. Cabinet card, 145 x 105 mm (Auckland War Memorial Museum PH-2007-12-1).

Figure 11 (right): Carte de visite portrait of August Heinrich Petermann (1822-1878), circa 1864. (Alexander Turnbull Library PA2-2150).

The expedition left Auckland in five horse-drawn carts on 28 December. The journey passed the various volcanic cones – a prominent feature of the Auckland landscape, with special reference made to earlier fortifications, terracing, and lava flows. After some ninety minutes the foot of Mount Richmond, also known as Ōtāhuhu, was reached, and the mountain was climbed by Hochstetter and others, providing rich pickings for the geological, zoological and botanical collections, before heading for Ōtāhuhu for breakfast. The tour then continued across the plains



of Tāmaki to Papakura, which was reached after an hour (Hanf 1859, 14 April). They arrived at Drury at one o'clock in the afternoon, where they found the hotel (Fig. 12) decorated and flying both the British and Austrian flags. After the break in Drury they headed for the forest and hills where the kauri trees and rich botany were much admired by the visitors. Finally, Hochstetter and party then reached the 12 foot thick coal deposit exposed in a gorge.



Figure 12: Bruno Lancel Hamel (b. 1837), Drury Hotel on the Great South Road south of Auckland, 1859. Albumen silver print, 149 x 191 mm (Hochstetter Collection Basel HCB 2.7.5).

At this point the group split into two parties: while Hochstetter with the guidance of Heaphy and Arthur Guyon Purchas (Fig. 39), who was credited with having discovered some of the coal deposits, focused on the geology, Haast and others dedicated themselves to assisting Frauenfeld and Zelebor with their zoological and botanical collecting. Hochstetter looked at various coal deposits and limestone formations in the area and eventually reached a waterfall. Both parties returned to Drury in the evening and spent a very comfortable night in the hotel (Hanf 1859, 15 April).

The next morning the geological party led by Heaphy explored the area, while the other party comprising seven individuals including Haast and Pöck, led by Drummond Hay, were taken in a 25 feet long waka, a canoe carved from a single kahikatea tree trunk, on a creek named as Te Taheke, which flows into the Manukau Harbour, to visit a Māori village, but this plan was abandoned. Instead they made their way to a beach on the harbour and cooked fish and oysters over a fire for lunch. They spent the afternoon collecting before returning to Drury in the evening.

The next day Pöck returned to Auckland, and the others equipped with horses, both for the transportation of luggage and riding, set off southwards, as the horse-drawn wagons used up to this point could go no further on the intended route through the forest to the Waikato River (Hanf 1859, 16 April). The journey took them to Ramarama, where a 600 acre block had been purchased and was being farmed by John Martyn, who showed the visitors the land he was developing, before the expedition continued (Hanf 1859, 18 April). The party eventually

emerged on a fern-covered plain with the valley of the Mangatāwhiri River, a tributary of the Waikato River, and rode on to the village of Mangatāwhiri. The guests were welcomed and accommodated in the newest of the whare and invited to partake in a feast of food prepared in a traditional Māori earth oven known as a hangi (Hanf 1859, 19 April).

The following day the journey was continued around midday in waka travelling down the Mangatāwhiri River and on to the Waikato River as far as Tuakau. Here they were again accommodated in the best whare and New Year's Eve was celebrated, combining English and German traditions in a New Zealand setting. This included toasts to Queen Victoria and the Austrian Emperor and the singing of both German and English national anthems, and other songs and waiata (Hanf 1859, 20 April). At noon on 1 January the return journey to Auckland was commenced, and Drury was reached at nine o'clock in the evening, and after a dinner with many speeches of thanks and acknowledgement they stayed at the Drury Hotel before returning to Auckland the following day. Hochstetter then wrote his report, had it translated into English by Scherzer and presented it to the Government in Auckland on 4 January (Hanf 1859, 21 April).

Karl Scherzer, as the official historiographer of the Novara Expedition, published a best-selling account in three volumes. This includes a narrative description of the excursions around Auckland, notably visits to Judges Bay and Orakei Bay, Titirangi and the Waitakere Ranges, Smith's sawmill, and St John's College, and provides a summary of the results (Scherzer 1862). Other details of the local interactions and activities that did not make their way into the official published accounts, are recorded in Scherzer's manuscript diary, comprising three volumes held in the collections of the Mitchell Library, State Library of New South Wales (Scherzer 1857-1859, for the visit to Auckland see volume 3: 78-98).

Once the initial investigation of the coal deposits around Drury was completed and a report presented and duly published, Hochstetter's reputation was firmly established, and he was asked to stay on in New Zealand rather than continue on the voyage. It is worth noting that Hochstetter appears to have already contemplated this possibility on his voyage from Sydney to Auckland, when he wrote in his diary on 21 December 1858:

the matter of the coalfield examination for the government of New Zealand, requested by the Governor General of Australia which the commodore officially put to me yesterday, awoke in me the idea of remaining behind in New Zealand, to split from the expedition and from the *Novara*, in order to carry out a geological exploration of this geologically so classical yet scientifically never before explored area, on a more all-encompassing scale. Assuming that the English government of New Zealand would provide me with the means for this; the latter does not seem so impossible, as the letter from the governor of New Zealand to the Governor General of Australia, wherein the request for a geologist for the investigation of the coal measures near Auckland is made, it was mentioned that in the first instance there are £500 available for this purpose. The government saves itself these £500 if I carry out the investigation. But precisely these £500 would be sufficient, if the government were to place them at my disposal for the purposes of a more comprehensive geological investigation. The matter has by no means matured in me to a point of a decision being made, as it will be hard to leave the *Novara*, however I presented the whole affair to the commodore, to hear what he had to say to such a plan. The commodore had some reservations, as he was not sure if his authority extended so far, that he could leave me behind here without first enquiring with the Naval Command Office or the Academy,



however he thought the matter was certainly worth thinking about and one could discuss this further in Auckland. An initial decision needs to be made on whether I wish to remain in the Antipodes or not. I will wait for the mail from home, which awaits us in Auckland; perhaps the letters from home and from friends will have a determining influence on me. (Nolden and Darragh 2023: 50-51).

However there was still a degree of hesitation before Hochstetter was persuaded to stay, and then given leave of the expedition. Hochstetter ended up spending more than nine months in New Zealand, exploring major parts of both the provinces of Auckland and Nelson.

## **The Auckland Diary**

The Auckland Diary presented here as an annotated English translation was the first of a series of five Hochstetter wrote during his stay in New Zealand. He was a very experienced diarist, having already kept diaries from the time of his youth while travelling with his father. On the Novara Expedition he had also already written nine diaries and filled other notebooks with technical notes and collected data. Coupled with his writing of regular travel accounts for publication in serialised form back in Vienna, and the extensive correspondence he maintained, meant Hochstetter was a very prolific writer and active science communicator.

The diary is written in black ink and pencil in a leather-bound notebook on both sides of unruled pages of laid paper, and features a number of sketched illustrations and mounted newspaper clippings. The initial period in Auckland was a very busy time of field work, exploration, and social engagements, so Hochstetter did not in fact write up his diary entries in full for this time. Once the *Novara* had departed, Hochstetter got back into his routine, immediately beginning to provide a full record of his observations and activities. But later there are again times when he is not out exploring and consequently completing more mundane tasks such as packing his collections for dispatch back to Vienna or writing his reports and drafting maps, when he once more neglects to write diary entries. But the initial period in Auckland, while exploring the volcanic field, and before heading south through the Waikato towards Lake Taupō and returning north via the Lakes District, he was obviously getting a great deal of satisfaction from his work and recording these experiences in his diary in full.

This diary provides an insight into the physical and social state of Auckland at the time. Capturing the journeys among the fascinating and diverse range of eruption points and explorations of the natural history of the area. While at the same time witnessing Hochstetter's meetings and interactions with people at all levels of society. In fact, about 100 people are mentioned or otherwise made reference to in these pages. Apart from people, an important feature this primary document records are the place names or toponyms, which Hochstetter actively records and collects on his journeys of exploration, with the aim of capturing and preserving these on his maps.

## **Translation and editorial conventions**

The annotated translation presented here aims to convey the spirit and meaning of the text found in the original archival source document, preserving something of the author's voice and idiomatic form of expression, while not endeavouring to record with the utmost fidelity the orthographic and semantic idiosyncrasies, that are common to any first draft handwritten accounts of this nature. However, examples are noted in the footnotes and preserved, while the

main text aims to allow the reader to enjoy a largely unimpeded journey following the original author on his visit of exploration.

More specifically, and to mention some examples, abbreviations and contractions have largely been rendered in full; where names and toponyms have been recorded phonetically and inconsistently at times, these have mostly been corrected and noted in the annotations. Scientific and technical names and terms, along with many references and records of te reo Māori terms and phrases have also been preserved with only some very minor adjustments. The lack of macronisation of the te reo Māori reflects the conventions of the period, but macrons have been selectively used in the translation for Māori words which have become part of modern New Zealand English.

This edition aims to present the full text of what Hochstetter recorded in his first New Zealand diary, with the exception of the appended table of barometric readings. Also included are full transcriptions of the newspaper clippings and finally the annotated and corrected copy of his published report on the explorations of the Drury Coalfield.

Sketches in the original diary have all been included and are captioned as Sketch 1 to 17. All other illustrations captioned as Figures are editorial additions, comprising mostly historical maps, sketches, landscape and portrait photographs, which in some instances have been cropped to help bring pertinent details into focus. Unless named, the photographer is unknown.

## **Publications relating to Auckland**

Hochstetter's published legacy includes a number of publications featuring Auckland and his explorations recorded in this diary. One of the earliest reports sent back to Vienna was dispatched at the end of February and published as part of the proceedings of the meeting of 14 July 1859 by the Viennese Academy of Sciences under the title 'Bericht über geologische Untersuchungen in der Provinz Auckland (Neu-Seeland)' [Report on the geological investigations in the Province of Auckland, New Zealand]. Here Hochstetter described the work undertaken in Auckland and his plans for the remainder of his stay in New Zealand (Hochstetter 1859).

Most prominent among the publications are his illustrated works on New Zealand, published by J G Cotta in Stuttgart, initially as a German edition in 1863 titled *Neu-Seeland* (Hochstetter 1863) and later, with the aid of a subscription from the New Zealand government, as an English edition titled *New Zealand: Its physical geography, geology and natural history with special references to the results of government expeditions in the Provinces of Auckland and Nelson* in 1867 (Hochstetter 1867). The more technical geological account was produced as part of the official reports of the Novara Expedition, published by the Viennese Academy of Sciences and produced as a lavish series of finely illustrated volumes by the Austrian Imperial State Printery. Hochstetter's contribution on the geology and palaeontology of the expedition comprises three volumes, of which the first, published in 1864 is devoted to the provinces of Auckland and Nelson (Hochstetter 1864). This volume was translated into English by Charles Fleming in 1959 (Fleming 1959).

Beyond the published legacy, is Hochstetter's estate of archival heritage material representing significant documentary resources for research on the Viennese connections with New Zealand, of which the present diary is just one example. In this regard it is worth noting that Hochstetter



maintained regular contact with people in New Zealand long after his departure, and continued to collect and seek material and information pertaining to New Zealand.

Hochstetter took every opportunity to present and publish on subjects relating to New Zealand ranging from broader accounts to highly specialised lectures and papers. It becomes clear from his letters that he formed a strong bond with New Zealand and this initial period of becoming acquainted and forging a special relationship, which was to last for the remainder of his life, is all found recorded in this diary. And even though he never had another opportunity to visit New Zealand, he would sometimes turn to his New Zealand diaries in later life to revisit the fond memories they preserved.

### **Auckland survey, cartography and maps published in Gotha**

Hochstetter mentions that he devoted the first two months, January and February to the survey of Auckland District volcanoes, basing his study on the preliminary work completed by Heaphy up to this time, and the one inch to the mile topographical sketch maps provided by the Surveyor General's office. But these maps consisted of coastal outlines and waterways, and lacked terrain. Hochstetter was therefore obliged to complete both a topographical and geological survey at the same time (Scherzer 1862: 162).

The maps form an important part of Hochstetter's legacy, and went on to become not only the first geological maps of parts of New Zealand to be printed in colour, but also formed the basis for the first New Zealand atlas (Hochstetter and Petermann 1863), and the first atlas to be published in New Zealand (Hochstetter and Petermann 1864). The map of the Auckland volcanic field is not only iconic as a cartographic masterpiece, but also represents an important geological and topographic record of the area, an area that has seen some of the most intensive urban development of anywhere in New Zealand since the time of Hochstetter's visit, and therefore captures and preserves an important record of the past.

Hochstetter's diary is both a record of his professional and social activities, but also doubles as his field notebook in which he captures and records his first-hand observations. It is clear from the annotations and other markings, that he used his diary extensively as a source manuscript and record, when working on his publications. There are a number of publications that resulted from his visit to Auckland which would have been partly based on his notes. These included a piece on Auckland published in August Petermann's *Geographische Mittheilungen*, which was accompanied by the very first version of the Auckland isthmus map (see back cover). This first version lacked the geological colouring and might be described as the topographical iteration of the cartographic work produced by Petermann (Fig. 11) and his team at the Justus Perthes cartographic publishing house in Gotha.

Hochstetter reserved sole authorship of his Auckland map, but clearly there were other contributors, including the work of Charles Heaphy, and that of contracted surveyors John Lambert Tole and William Boulton. Meanwhile Heaphy in particular benefitted from Hochstetter's observations, survey and interpretations of the geology.

It has been noted that Heaphy had already prepared a sketch map of the volcanic field in 1857, which is no longer extant, and a copy was placed at Hochstetter's disposal during his stay in Auckland. Heaphy also took the opportunity to update his map (Fig. 13) after Hochstetter had finished his survey of the Auckland volcanoes in February 1859 before sending it to the

Geological Society of London along with his text and a series of seven watercolours. The paper was accepted for publication and the central section of the manuscript map (Fig. 14 right) along with a map of the North Island (Fig. 15 right) were published.



Figure 13: Charles Heaphy (1820-1881), *Sketch of the Geological Formation of the Auckland District*. 1857 (corrected up to February 1859). Pencil, ink and watercolour on paper, 1000 x 830 mm (Geological Society of London LDGSL/209). This was sent to London along with his manuscript, which was published as Heaphy (1860) along with a lithographed black and white map derived from the central portion of the above (see Fig. 14).





Figure 14 (left): Map I from Charles Heaphy's paper 'On the volcanic country of Auckland, New Zealand', published in the *Quarterly Journal of the Geological Society of London* (Heaphy 1860); (right): corresponding central detail from manuscript map shown in Figure 13 (Geological Society of London LDGSL/209).

Hochstetter was apparently not informed of Heaphy's plans to present and publish these results in London, which ultimately contributed to considerable tension and the final rift in the relationship (Schoeman 2012). But during the period of the visit to New Zealand the relationship was most cordial and friendly, as Heaphy led Hochstetter not only to the coal deposits to be investigated in southern Auckland, but also on a camping visit to the North Shore of Auckland, and a later excursion to Coromandel to see the goldfields. On this occasion they spent seven days on an excursion along with Haast to see the goldfields of Coromandel, where they travelled by cutter, via Waiheke Island (Nolden & Grenfell in press).

After completing his survey of the Auckland District, Hochstetter undertook a major 79-day expedition in the southern parts of Auckland Province. This allowed him to complete a topographical and geological survey of parts of the interior of the upper central North Island. The expedition enabled Hochstetter to collect specimens to send back for the benefit of both the museum in Auckland and the Imperial museum collections in Vienna. He also took survey bearings and made barometric altitude measurements that formed the basis for the cartographic productions eventually executed in Gotha, Germany. On this expedition he was aided by a group of porters, and benefitted from the capable support of Julius Haast, the photographer Bruno Hamel, the artist and draftsman Augustus Koch, and the guiding and interpreting skills of Drummond Hay acting on behalf of the government.

The expedition departed from Auckland on 7 March, initially heading south toward Mount Taupiri and from there along the Waipa River and eventually across to the southern end of Lake Taupō. From there they travelled north along the eastern shore of the lake and eventually

arrived at Lake Rotomahana, in time for Hochstetter to admire the Pink and White Terraces on his 30th birthday. After exploring the lakes the expedition continued up to the Bay of Plenty passing Maketu and Tauranga, before returning via the Great South Road to Auckland where they arrived on 24 May (Hochstetter 1867: 282-458).

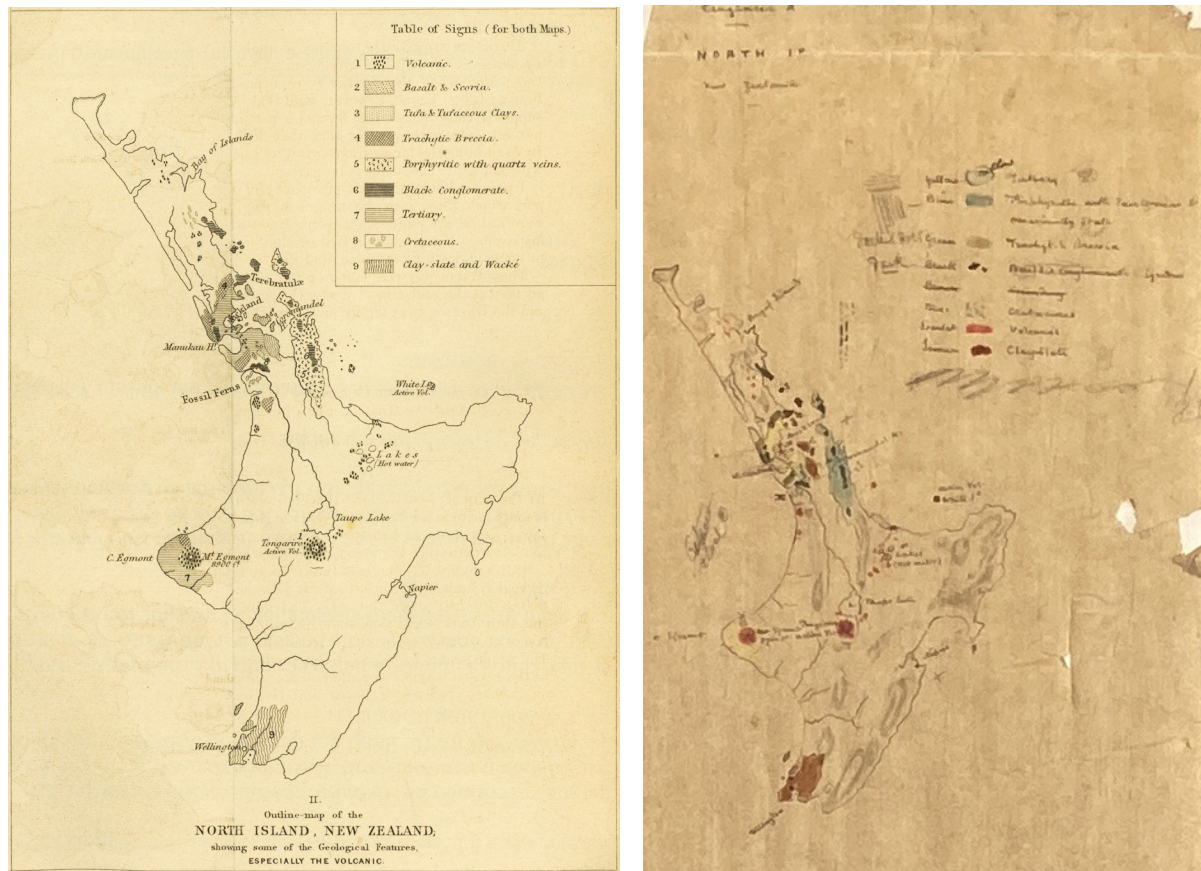


Figure 15 (left): Map II from Charles Heaphy's paper 'On the volcanic country of Auckland, New Zealand', published in the *Quarterly Journal of the Geological Society of London* (Heaphy 1860); (right): corresponding manuscript version of map (Geological Society of London LDGSL 209).

Hochstetter notes that his planned visits to the copper mines on Great Barrier Island and Kawau Island did not take place due to inclement weather. But it is apparent from Hochstetter's geological annotations on a printed base map (Fig. 16), in the area north of Whangaparāoa, including Kawau Island, that Heaphy and others must have filled him in on some of the main features, including fossil locations.

Towards the end of his stay in Auckland, Hochstetter presented a lecture to a capacity audience on 24 June. The lecture was illustrated with a display of maps, plans, sketches, and photographs. The final event in Auckland was a dinner in his honour on 24 July, when he was presented with a testimonial and address prior to his departure for Nelson.





Figure 16: Detail from *Map of the Auckland District*. 1852. Published by Smith, Elder & Co. London, and J. Williamson, Auckland, 1853, with annotations by Hochstetter. Watercolour, ink and pencil on fragment of printed map, 327 x 407 mm (Hochstetter Collection Basel HCB 3.2.14). As Hochstetter did not visit the area north of Whangaparāoa Peninsula, the geological observations he recorded here were based on information provided by Charles Heaphy and others, often together with specimens.

This address rendered on parchment (Fig. 17) in fine calligraphy by Leon de Laville (a French-born clerk at the Auckland survey office, who was naturalised in 1855), and published in Scherzer (1862, Beilage V: 5-6) provides a summary acknowledgement and expresses the sentiment of appreciation and gratitude of the people of Auckland:

Dr. Hochstetter,

On the conclusion of Your Geological Examination of a large and most interesting portion of this Province of New Zealand, we, the assembled inhabitants of Auckland representing every section of the community, and for the most part intimately connected with the Agriculture and Commerce of the Province – desire to express our admiration of the eminently scientific manner, and unwearied activity, with which You have conducted your researches into the Geological Formations and Mineral Resources of Auckland. We have also to thank you for the valuable information upon these objects, which You have already placed in our possession in the public lecture delivered by You in this hall on the 24th June, and in the reports, You have forwarded to the General and Provincial Governments.

The report of a member of the “Novara” Expedition on the physical characteristics of this portion of New Zealand – of which so little has hitherto been known – will be acknowledged in Europe as both impartial and authentic.

To us, as a community, the information contained in that Report and the maps, You have constructed, together with those additional details we hope to receive from You after Your return to Europe, will be of essential service in a material point of view. We also desire to convey to You our sense of the impartiality of Your reports – which, whilst they lay open to our view those resources of the country that will eventually aid to its wealth and its general prosperity, in no way exaggerate their value or tend to lead to extravagant ideas or speculations that might only result in disappointment.

Arriving in Auckland a stranger, upon whose sympathies we had no claim, You have exerted all Your energies to condense the results of Your scientific exploration into practical forms, for the benefit of the people of the foreign country, You visited for purely scientific purposes, or for the special advantage of Your own country.

On all these accounts we feel, that our warmest thanks are due to You for Your disinterested exertions for the promotion of our welfare. As an enduring testimony thereof, we request the acceptance of this Purse, – the contents of which we beg, You will devote to the purchase of some piece of plate that we trust may be regarded by Your family and Your countrymen not only as a tribute of respect to Your varied talents, but as a well-merited memento of the grateful acknowledgement by the people of the Province of Auckland of the eminent scientific and practical services rendered to them by You.

We are desirous that the plate should bear the following inscription:

Presented to Dr. Hochstetter, Geologist attached to the Imperial Royal Austrian Scientific Expedition in the Frigate “Novara”, by the inhabitants of the Province of Auckland, New Zealand, in testimony of the eminent services rendered to them by his researches into the Mineral and Agricultural resources of the Province.

Signed on behalf of the subscribers:

R. Mould,

Colonel, commanding Royal Engineers, Chairman of Committee.

John Williamson,

Superintendent,

Province of Auckland.





Figure 17: Leon de Laville, testimonial address presented to Hochstetter in Auckland on 24 July 1859. Ink and wax seals on parchment, 577 x 650 mm (Dr Sascha Nolden Collection).

On 28 July Hochstetter, along with Haast, finally left Auckland on the steamer *Lord Ashley* and travelled to Nelson via New Plymouth and Wellington. In Nelson Hochstetter received a warm welcome from the local people and support from the provincial government, which ultimately enabled him to explore extensive parts of the province of Nelson. There was a rich array of things to see and explore, including geological features and fossil locations, mining operations and the goldfields. Mineral resources, including coal, gold, copper, and chromite were a major focus for both political representatives and investors. Hochstetter's surveys and inspections were well supported and his opinion and prognosis eagerly sought and anticipated (Johnston & Nolden 2011; Johnston 2023: 277-285).

Before taking his leave, Hochstetter presented a very well attended public lecture in Nelson, which was published in the provincial government gazette and newspapers (Hochstetter 1859). In the end both the people of Auckland and of Nelson provinces had demonstrated a keen interest in the work of the Novara Expedition geologist, who in turn gained positive impressions of the land and the people in both provinces, and when he finally left on board the steamer *Prince Alfred* on 2 October he felt amply rewarded for his efforts (see Johnston and Nolden 2014; Johnston et al. 2012).



Figure 18: Ferdinand Hochstetter's travels in Auckland during his survey of the volcanic field (Map prepared by Bruce W. Hayward).



## Hochstetter's study of the Auckland volcanoes

Hochstetter's finely engraved colour map of the volcanoes of Auckland (Fig. 21) is the best-known cartographic representation of the field and is often cited as the first map of the city's volcanoes. Hochstetter was infatuated with the volcanoes during the first part of his stay in Auckland in late December 1858 to February 1859, but he would not have been the first to have perceived their origins. The volcanoes would have been recognised as having been formed by volcanic activity by pre-European Māori. Archaeological evidence on Motutapu Island shows that Māori witnessed the eruption of the youngest volcano, Rangitoto, adjacent to Motutapu, when it erupted 650-600 years ago (Nichol 1982, 1992; Needham et al. 2011).

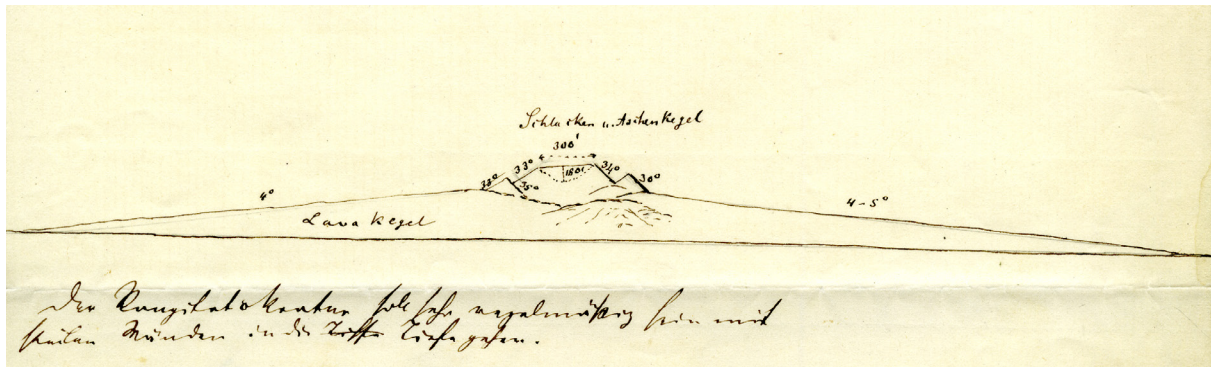


Figure 19: Ferdinand Hochstetter's technical survey sketch of Rangitoto Island, surveyed from a distance. Labels central cone as ash and scoria, and outer area as lava cone (Dr Albert Schedl Collection, Vienna).

Less well-known is that Charles Heaphy had made a map showing the location of some of Auckland's volcanoes after becoming Auckland's provincial surveyor in 1856. He presented this map at a meeting of the Auckland Mechanics' Institute in 1857, but it is now lost (Mason 2002). Heaphy was keen to have a trained geologist come to Auckland and assess its potential mineral wealth and was excited when Hochstetter arrived. In addition to undertaking an assessment of the coal resource at Drury, which he was initially tasked to do, Hochstetter showed considerable interest in the small volcanoes that were scattered throughout the Auckland District. We know that Heaphy provided Hochstetter with his map on which the volcanoes were numbered to assist in his planning of visits, as Hochstetter refers to Heaphy's map and the volcano numbers in many places in his diary. It would appear that this map had 40 volcanoes identified and numbered, some with several parts numbered (a, b, c).

Soon after Hochstetter left Auckland in July 1859, Heaphy sent a manuscript on the geology and volcanoes of Auckland to the Geological Society of London for publishing. The manuscript included a map of the volcanoes of Auckland (Fig. 13) with the following note: "constructed by Mr. C. Heaphy from actual survey in 1857, corrected to February 1859. The corrections here alluded to have arisen from observations made during the progress of Dr. F. Hochstetter's geological survey of the Auckland District." (Heaphy 1860: 251). We may never be sure what modifications Heaphy made to his map as a result of his informal discussions with Hochstetter and from accompanying him on his visits to several of the volcanoes. There is a change in the numbering order after volcano numbered 40, which could possibly indicate the volcanoes with higher numbers were added subsequent to Hochstetter's arrival. Heaphy's manuscript was read at a Geological Society meeting in London on 30 November 1859 and published on 1 February 1860 (Heaphy 1860).

For reasons only known to Heaphy, he never told Hochstetter of his intentions to do this, nor did Heaphy inform Hochstetter he was sending a geological map of the Auckland Province (which was based on much of Hochstetter's work, with input from Heaphy and others) to the International Exhibition in London in 1861. These actions by Heaphy resulted in Hochstetter including a tersely worded footnote in the atlas asserting authorship and defending his intellectual property in response to what he perceived to be plagiarism (Hochstetter and Petermann 1864). Heaphy defended his actions and after a brief but very public controversy in New Zealand newspapers, the two remained irreconcilable for the remainder of their lives (Mason 2002, 2003; Schoeman 2012).

## **How Auckland's volcanoes erupted**

Hochstetter's observations of Auckland's volcanoes led to his acceptance of the theory of accumulation for volcano formation and rejection of the theory of elevation. He recognised that many of Auckland's volcanoes started eruption by the formation of a tuff cone surrounding a tuff crater and postulated that the crater was largely formed by subsidence around the vent. He also inferred that the tuff beds were laid down horizontally and "were probably submarine and took place at the bottom of a shallow muddy bay" (Hochstetter 1864, in Fleming 1959: 179). He theorised that after all the tuff-cones or tuff-craters had been formed, "a slow and gradual upheaval of the whole isthmus seems to have taken place" (Fleming 1959: 181) and the subsequent scoria and lava eruptions were subaerial. In his lecture to the Mechanics' Institute of Auckland, Hochstetter (1859) observed that "in general the scoria cones rise from the centre of the tuff-craters. Occasionally, as in the instance of Mount Wellington, they break through the margin of the tuff-crater". He initially believed (1859) that the outwards dip of the tuff in the tuff-cones was due to their elevation during the eruption of the scoria cone(s) in the centre, and this explains his inference in his diary that there was a buried scoria cone beneath the mud bank in the centre of Pukaki Crater. Hochstetter (1864, in Fleming 1959: 182) hypothesised that the floors of the tuff-craters, containing one or more small scoria cones, had subsided after the cones had erupted, whereas they did not subside if lava flows had erupted from them.

Hochstetter noted (Fleming 1959: 181) that the scoria eruptions of "the second period did not break through at every point of first period eruption" and in many places simple tuff craters are all that was produced. He recognised that his subaerial scoria and ash eruptions built the steep cones of Auckland with slopes of 30-35° and that these eruptions also threw out "red-hot drops of fluid lava" that acquired "pear- and lemon-shapes" as they flew through the air and were deposited as volcanic bombs over the slopes of the scoria cones. In his June 1859 lecture, Hochstetter (1859) noted that "these mountains have not been burning simultaneously. It can easily be observed that some lava streams are of an older date than others." As an example, Hochstetter cited that the Great South Road, near Penrose, passed from the red soils of the decomposed older One Tree Hill lava flows onto the much newer, black and undecomposed lava streams from Mount Wellington.

When Hochstetter visited in 1859, he was clearly able to trace back many of the lava flows to their source volcanoes – something not possible now because they are largely hidden beneath Auckland city. Hochstetter recognised that a large area of lava flows that he called the Waitemata lava field was formed by amalgamation of flows from Mount Eden, Three Kings and Mount Albert, and that his similar-sized Manukau lava field was formed by amalgamated flows from One Tree Hill, Mount Smart and Mount Wellington.



Although Heaphy was present at Hochstetter's lecture in June 1859, and had prepared several illustrations for it, in his 1860 publication he presented quite different hypotheses about the eruptions of Auckland's volcanoes. Both Hochstetter and Heaphy said the volcanoes were extinct but noted that some had erupted fairly recently – for example, Mount Wellington (Hochstetter 1864), and Rangitoto (Heaphy 1860). Heaphy also included seven watercolours (e.g. Figs. 20, 49, 65, 84, 85) with the manuscript he sent to the Geological Society of London.

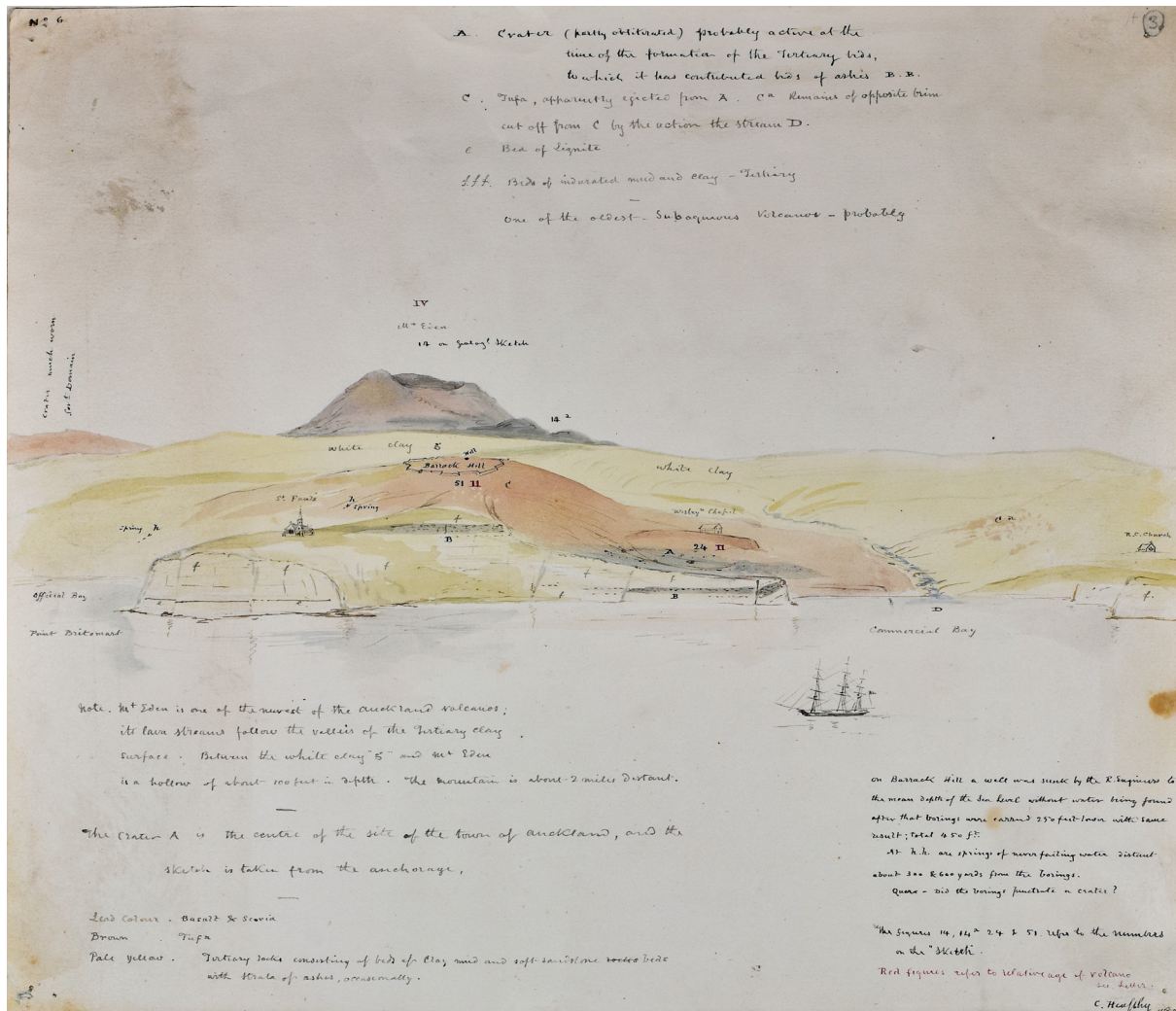


Figure 20: Charles Heaphy, No. 6 Mt Eden. 1859. Watercolour, ink and pencil on paper, 270 x 310 mm. Number six of seven watercolours prepared to accompany Heaphy's paper sent to the Geological Society of London in 1859 (Geological Society of London LDGSL 209/06).

This painting is a view from offshore of downtown Auckland. Note the orange-coloured area represents volcanic ash surrounding two inferred volcanoes (numbered 24 and 51). Number 51 is the crest of Albert Park hill and is not recognised as a volcanic centre today.

Today, geologists accept that the Auckland Volcanic Field is dormant and likely to erupt again but note that each recognised volcano (eruption centre) is essentially extinct and the next eruption will be somewhere new (Hayward et al. 2011; Hayward 2019; Hopkins et al. 2021). It is currently accepted that all of the volcanoes have erupted in the last 200,000 years and for most of this time the sea level has been considerably lower than today. The only volcano that erupted through sea water was Rangitoto, just 600 years ago (Needham et al. 2011), although North Head's vent may have been infiltrated by some sea water during its early eruptions (Agustin-Flores et al. 2015).

As noted by both Hochstetter (1859, 1864) and Heaphy (1860) most of Auckland's volcanoes began with eruptions that built a tuff ring (tuff-cone of Hochstetter) surrounding a maar (explosion) crater (tuff-crater of Hochstetter). We now understand that these early eruptions were phreatomagmatic (explosive as a result of magma reacting with cold water) and erupted devastating base surges (small pyroclastic flows), ballistic blocks and small ash clouds (Hopkins et al. 2021).

After most of the water was expended during the early phreatomagmatic phases of eruption, the style switched to dry fire-fountaining of frothy lava which built the steep-sided scoria cones. At the same time gas-poor lava upwelled inside the vent and pushed its way through the base of the loose scoria in the growing cone and flowed down stream valleys or spread out as lava flow fields over the flatter land of the Manukau Lowlands. Occasionally vast outpourings of lava flows built up large, gently sloping shield volcanoes, such as those of Rangitoto and Maungakiekie/One Tree Hill. As recognised by both Hochstetter and Heaphy, sometimes the lava flow breached one side of the scoria cone crater and rafted some of the cone away.

The actual combination of volcanic landforms – tuff ring, scoria cone, lava flows – present in each of Auckland's volcanoes depended in large part on the amount of magma that rose to the surface during each eruption. In a number of instances, the supply of magma stopped before the wet phreatomagmatic phase was complete and all that was produced was the wide explosion crater surrounded by a tuff ring (e.g. Onepoto, Orakei and Panmure basins). If they were not filled by subsequent erupted material, these explosion craters eventually filled with rainwater to become freshwater lakes. The only crater lakes still intact are Lake Pupuke and the tiny Pond Crater at Puhinui, although an ephemeral lake exists during wet periods in Crater Hill's crater. Two of the early tuff rings (Pukewairiki, Boggust craters) appear to have been breached by the Last Interglacial high stand of sea level, around 120,000 years ago and quickly the lakes filled with marine mud brought in suspension by every high tide. The same thing happened at the beginning of the present high stand of sea level (about 9000-8000 years ago) with seven more tuff ring crater lakes being invaded by the sea and rapidly filling with marine mud.

Eruptions within at least 13 tuff rings switched to fountaining for a short while before the supply of magma ran out. These built small scoria cones or clusters of small cones in the centres of the craters surrounded by a circular depression, that later filled with water creating a moat between the cones and the tuff ring, for example, Ōtāhuhu/Mount Richmond, Mount Robertson/Sturges Park, and Otara Hill. In a few instances, lava flowed out into the circular depressions forming lava lakes which solidified into basalt around the base of the scoria cones, as in Te Tatua-a-Riukiuta/Three Kings, Pukekawa/Auckland Domain, Grafton, Waitomokia and Crater Hill.

Continued magma supply built the scoria cones even larger, completely, or almost completely, burying the tuff ring and crater beneath, as in the case of most of Auckland's larger, better-known volcanic cones, such as Takarunga/Mount Victoria, Maungawhau/Mount Eden, Ohinerangi/Mount Hobson, Te Komoki/Mount St John, Maungakiekie/One Tree Hill, Puketapapa/Mount Roskill, Owairaka/Mount Albert, Rarotonga/Mount Smart, Rangitoto and Mangere Mountain.



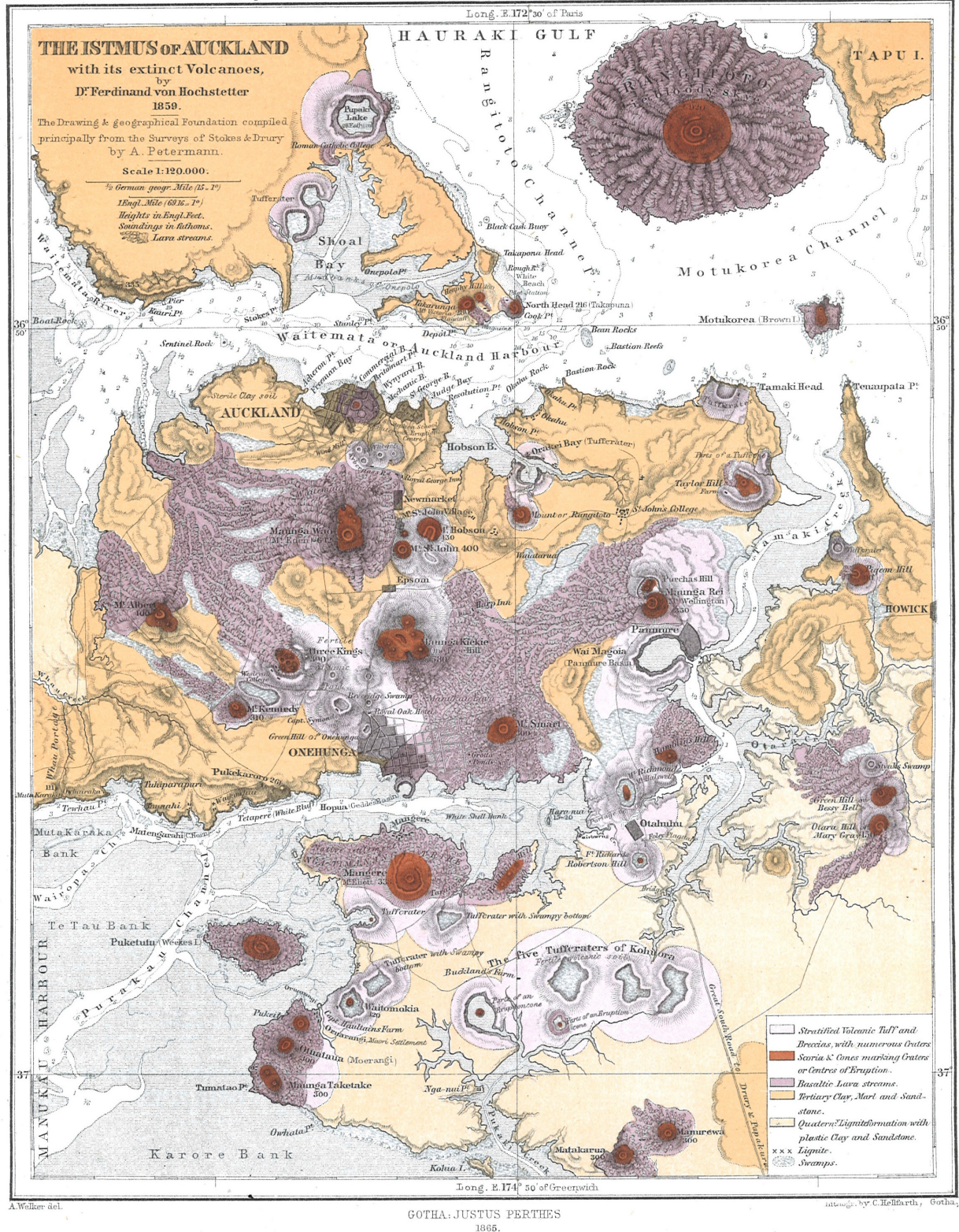


Figure 21: Ferdinand von Hochstetter, *The Isthmus of Auckland with its extinct Volcanoes*, Justus Perthes, Gotha, 1865 (Hochstetter and Petermann, *Geological and topographical Atlas of New Zealand*, Delattre, Auckland, 1864).



Lava was expelled as flows from at least half of Auckland's cones. Short flows, that are now often not visible came out from the base of Maungauika/North Head, Albert Park volcano, Maungarahiri/Little Rangitoto, Taurere/Taylors Hill, Ohuiarangi/Pigeon Mountain, Otara Hill, and Ōtāhuhu/Mount Richmond. The longest flow in the field came down a stream valley from Te Komoki/Mount St John about 75,000 years ago, with its toe almost reaching Birkenhead on the north side of the Waitemata Valley (now Harbour). Two volcanoes with remnant portions of tuff ring, central scoria cones and extensive lava flows were surrounded by the rising sea about 8000 years ago to become volcano islands today – Te Motu-a-Hiaroa/Puketutu and Motukorea/Brown Island.

## Number of volcanoes in the Auckland Volcanic Field

Hochstetter (1864) numbers 63 separate volcanoes on his map of the Auckland volcanoes (Fig. 21) and provides descriptions of most. Heaphy (1860) mentions 62 volcanoes, although the highest number on his published map is 54. While the two share all the obvious volcanoes on their maps, Heaphy has included Hochstetter Pond in Onehunga (recognised by Hochstetter and today as a collapsed lava cave). At the present time, 53 is the accepted number of Auckland volcanoes that are recognised.

After 160 years of excavations and boreholes related to urban spread over the volcanic field, a number of Hochstetter's inferred volcanic craters have been shown to be swamps filling shallow depressions in the land surface and are now discounted as volcanic centres (e.g. Kermode 1992). These are predominantly on the Manukau Lowlands (Hayward 2013) and in the Royal Oak area (Hayward and Kenny 2013). Excavations, boreholes and the advent of precision Lidar contouring have allowed geologists to recognise seven volcanoes within the field that Hochstetter and Heaphy would have struggled to recognise – Pukewairiki, Hampton Park, Ash Hill, Cemetery Crater, Grafton Crater, Puhinui Craters and Boggust Crater (Hopkins et al. 2021).

Table 1: Volcanoes of Auckland (according to Hochstetter's annotated numbering on the 1862 map).

No.	Modern toponym (Hayward 2019)	Historic toponym label on Hochstetter maps German/English edition	1860 Heaphy No.	2019 BWH No.	Hochstetter visit/ diary entry (and named others)
1	Pupuke Moana/Pupuke Volcano	Pupaki Lake [Lake Pupuke] {Papuke L. (Heaphy 1860)}	2, 2a	3	6 February 1859, (Heaphy and Haast)
2	Te Kopua-o- Matakamokamo/ Tank Farm/Tuff Crater	Tuffkrater/Tuffcrater	50	4	-
3	Te Kopua-o-Matakerepo/ Onepoto Basin	Tuffkrater/Tuffcrater	49	5	-
4	Takarunga/Mt Victoria	Takarunga   Mt Victoria   Flagstaff	3	7	5 February 1859, (Heaphy and Haast)
5	[Duders Hill]	-	45, [3a]		5 February 1859 (Heaphy and Haast)
6	Takararo/Mt Cambria	Heaphy Hill [named by Hochstetter]	4	8	5 February 1859, (Heaphy and Haast)
7	Maungauika/North Head	North Head (Takapuna)	[5]	6	5 February 1859, (Heaphy and Haast)



<b>No.</b>	<b>Modern toponym</b> (Hayward 2019)	<b>Historic toponym label</b> <b>on Hochstetter maps</b> German/English edition	<b>1860</b> <b>Heaphy</b> <b>No.</b>	<b>2019</b> <b>BWH</b> <b>No.</b>	<b>Hochstetter visit/</b> <b>diary entry</b> (and named others)
8	Rangitoto	Rangitoto	1, 1a, 1b	1	Sketch 22 December 1858, observed in passing
9	Motukorea/Browns Island	Motukorea (Brown I.)	6a, 6b, 6c	2	Observed in passing
10	Albert Park		24	9	?
11	[Symonds Street]	Tuffkrater	-	NA	?
12	[Symonds Street]	Tuffkrater	-	NA	?
13?	Grafton	Tuffkrater	-	10	?
14	Pukekawa/Auckland Domain	Tuffkrater	15, [15a]	11	4 February 1859
15	Maungawhau/Mt Eden	Maunga Wao (Mt Eden)	14	13	? December, 1858
16	Te Tātua-a-Riukiuta/Three Kings	Three Kings	17, 17a	17	17 February 1859 (Purchas)
17	Puketāpapa/Pukewīwī/Mt Roskill	Mt Kennedy	18	18	17 February 1859 (Purchas)
18	Te Ahi-kā-roa-a-Rakataura/Ōwairaka/Mt Albert	Mt Albert	16	19	9 February 1859 (Haast and Ninnis)
19	Maungakiekie/One Tree Hill	Maunga Kiekie (One Tree Hill)	[19]	16	17 February 1859 (Purchas)
20	Rarotonga/Mt Smart	Mt Smart	22, 22a	21	December 1859
21	Te Tauoma/Purchas Hill	Purchas Hill [named by Hochstetter]	9b	26	18 February 1859 (Purchas)
22	Maungarei/Mt Wellington	Maunga Rei (Mt Wellington)	9	27	18 February 1859 (Purchas)
23	Te Kōpuke/Tītīkōpuke/Mt St John	Mt St John	10	15	?
24	[Cornwall Park Ave swamp]	[east of Mt St John]	-	NA	?
25	Ōhinerangi/Mt Hobson/Ōhinerau	Mt Hobson	13	14	24 February 1859 (Ninnis)
26	Maungarahiri/Little Rangitoto	Mount od Rangitoto	[12]	22	24 February 1859 (Ninnis?)
27	Ōrākei Basin	Orakei Bay (Tuffkrater)	11	23	24 February 1859 (Ninnis)
28	Whakamuhu/Glover Park	Tuffkrater [Tamaki Head]	-	24	18 February 1859 (Purchas)
29	[Glendowie Park]	Rest eines Tuffkegels	-	NA	18 February 1859 (Purchas)
30	Taurere/Taylors Hill	Taylor Hill	47	25	18 February 1859 (Purchas)
31	Te Kopua Kai-a-Hiku/Panmure Basin	Wai Magoia (Panmure Basin)	54, [23]	28	24 February 1859 (Ninnis)
32	Te Apunga-o-Tainui/McLennan Hills	Hamblins Hill	55, [25a]	35	Observed in passing
33	Ōtāhuhu/Mt Richmond	Mt Richmond Mt Halswell	25	36	28 December 1858 (Purchas, Haast, Heaphy, Ninnis)

<b>No.</b>	<b>Modern toponym</b> (Hayward 2019)	<b>Historic toponym label</b> <b>on Hochstetter maps</b> German/English edition	<b>1860</b> <b>Heaphy</b> <b>No.</b>	<b>2019</b> <b>BWH</b> <b>No.</b>	<b>Hochstetter visit/</b> <b>diary entry</b> (and named others)
34	Te Hopua-a-Rangi/ Gloucester Park	Hopua (Gedde's Basin)	<b>21</b>	20	16 January 1859
35	[Tramway Workshops]		-	NA	17 February 1859 (Purchas)
36	[Liverpool St]		-	NA	17 February 1859 (Purchas)
37	[2 Turama Rd]		-	NA	17 February 1859 (Purchas)
38	[Jellicoe Park]	Green Hill	-	NA	17 February 1859 (Purchas)
39	[Beveridge Swamp]	Beveridge Swamp	-	NA	17 February 1859 (Purchas)
40	[Hillsborough Bowling Club]		-	NA	17 February 1859 (Purchas)
41	[behind 35 Pigeon Mt Rd]	Tuffkrater	<b>7</b>	NA	24 February 1859 (Ninnis)
42	Ōhūiarangi/Pigeon Mountain	Pigeon Hill	<b>[8]</b>	42	24 February 1859 (Ninnis)
43	Styaks Swamp	Styak's Swamp	<b>28</b>	30	21 February 1859 (Buckland)
44	Matanginui/Green Mount	Green Hill oder Bessy Bell	<b>29</b>	31	21 February 1859 (Buckland)
45	Te Puke-o-Taramainuku/ Ōtara Hill	Otara Hill oder Mary Gray	30	32	21 February 1859 (Buckland)
46	Mt Robertson/Sturges Park	Robertson Hill	<b>27, 27a</b>	37	?
47	[Papatoetoe]	{Die fünf Tuffkrater von Kohuora}	-	NA	?
48	Kohuora	{Die fünf Tuffkrater von Kohuora}	53	48	?
49	[Aorere Park swamp]	{Die fünf Tuffkrater von Kohuora}	-	NA	?
50	Te Pūkaki Tapu-o- Poutukeka/Pūkaki Lagoon	Rest eines Eruptionskegels	<b>32, 32a</b>	46	29 January 1859 (Buckland)
51	Crater Hill	Rest eines Eruptionskegels	<b>31, 31a, 31b</b>	47	29 January 1859 (Buckland)
52	Māngere Lagoon	Tuffkrater	48 <b>[33c]</b>	40	17 January 1859
53	[Ventura St swamp]	Tuffkrater mit Sumpf auf dem Kraterboden		NA	17 January 1859
54	Waitomokia/Moerangi/Mt Gabriel	Waitomokia	<b>35,</b> 35a, 35b	42	17 January 1859
55	[Ascot Ave swamp]	Tuffkrater mit Sumpf auf dem Kraterboden		<b>[42]</b>	17 January 1859
56	Te Pane-o-Mataaho/ Māngere Mountain	Mangere (Mt Elliott)	<b>33</b>	39	17 January 1859
57	[Boultons Hill]	Boulton's Hill [named by Hochstetter]	-	NA	?
58	Te Motu a Hiaroa/Puketūtū	Puketutu (Weekes I.)	<b>34</b>	41	Observed in passing 17 January 1859



No.	Modern toponym (Hayward 2019)	Historic toponym label on Hochstetter maps German/English edition	1860 Heaphy No.	2019 BWH No.	Hochstetter visit/ diary entry (and named others)
59	Puketapapakanga-a-Hape/ Pukeiti	Pukeiti	<b>36</b>	43	17 January 1859
60	Otuataua	Otuataua	<b>37</b>	44	17 January 1859
61	Maungataketake/Elletts Mountain	Maunga Taketake	[38]	45	Observed from Otuataua, 17 January 1859
62	Te Manurewa o Tamapahore/Matukutūruru/ Wiri Mt	Manurewa	<b>39</b>	51	Travelled past on 23 January 1859
63	Matukutūreia/ McLaughlins Mountain	Matakarua	<b>40</b>	52	Travelled past on 23 January 1859

Note locations numbered **20**, **24**, and **43** on Heaphy (1860) are not numbered by Hochstetter nor recognised as volcanoes today. The following with Hayward (2019) numbers (BWH), were not recognised by Hochstetter: 12 Te Pou Hawaiki, 33 Hampton Park, 34 Pukewairiki/Highbrook Park, 38 Boggust Park, 49 Cemetery Crater, 50 Ash Hill Crater, and 53 Puhinui Craters. Fifteen features numbered as volcanoes by Hochstetter are labelled NA in column five as subsequent evidence shows that they are not volcanic centres. Heaphy numbers in square brackets [ ] were not shown on his published map (1860) but were on the version used by Hochstetter in 1859. Heaphy numbers in bold are those referred to by Hochstetter in his diary.



Figure 22: Charles Heaphy, *Geological view from over the Anchorage Auckland Harbour. Looking from N:10°W to N:80°E*. 1859. Pencil, ink and watercolour on canvas-backed paper, 520 x 840 mm (Hochstetter Collection Basel HCB 1.4.1). The 27 numbered features are listed as: 1. M<sup>t</sup> Manypeaks (Little Barrier); 2. Cape Colville; 3. Coromandel Ranges; 4. M<sup>t</sup> Hamilton. Cape Rodney Range; 5. Kawau Island; 6. Rakino I<sup>s</sup>; 7. Waiheke I<sup>d</sup>; 8. Motutapu I<sup>d</sup>; 9. Motuihi; 10. Tiritiri I<sup>d</sup>; 11. Wangaparua Prom<sup>y</sup>; 12. Toroa Pt<sup>t</sup>; 13. Shoal Bay; 14. North Shore of Waitemata Harbour; 15. Reefs Tidal; 16. Bastion Rock; 17. Okahu Pt<sup>t</sup>; 18. Orakei Pt<sup>t</sup>; 19. Brown's I<sup>d</sup>; 20. Rangitoto; 21. North Head; 22. Crater Hill; 23. M<sup>t</sup> Victoria; 24. Quarry Cliff; 25. Lava streams; 26. Sandy Flat; 27. Pupuke Lake.

## **Loss of volcanoes in Auckland**

Today 53 volcanoes are counted as eruptive centres in the Auckland Volcanic Field but six of the maar craters and 15 of the scoria cone volcanoes have been completely, or almost completely, destroyed by infill or quarrying over the past 160 years. Even when Hochstetter visited Auckland in 1859, he noted that “the scoria cones, although not suitable for cultivation, are none the less of practical importance since they furnish a road-making material that is excellent in quality and easy to exploit. To this road metal, the Auckland isthmus owes its fine highways (metalled roads). The metal quarries are opened up everywhere at points close by the roads, in the scoria cones of Mt Eden, One Tree Hill, Mt Wellington etc.” (Fleming 1959: 183).

Today, of all the scoria cones in Auckland, just one (Motukorea) has had no quarrying.

Although so many of Auckland’s volcanic landforms have been lost or damaged, it is only by good fortune that now, all, but one (Crater Hill), that remain in reasonably good shape are, at least in part, preserved in public reserves. If it had not been for the need to have reservoirs providing gravity-fed water to the growing suburbs of Auckland, many more of Auckland’s iconic cones may have been quarried away in the early-mid twentieth century. These scoria cones often provided the only available high point for the placement of reservoirs. Their installation caused some damage to the cone peaks but without their presence entire cones may have been removed. Even the installation of reservoirs did not prevent continued quarrying on the sides of many of the cones. In the most severe example, quarrying around a scoria cone created the pyramid-shaped remnant of Matukutureia/McLaughlins Mountain with just enough room for the reservoir tank on the peak (now removed as no longer required).

Hochstetter named two of Auckland’s volcanoes after Aucklanders who accompanied him on some of his volcano mapping expeditions – Heaphy Hill (Takaroro/Mt Cambria) and Purchas Hill (Te Tauoma). He also named a prominent ridge of lava flow at Mangere after his draftsman assistant – Boulton’s Hill. What would Hochstetter now think of the road-making activities he so praised, which have long ago completely quarried away all three features named by him?

## **Hochstetter’s observations on the South Auckland Volcanic Field**

During his time in Auckland Hochstetter concentrated his studies on the Auckland Volcanic Field and later produced a map entirely devoted to it (Fig. 21). In between times he made excursions to places further afield to document the geology and features in the region surrounding the Auckland isthmus. One such area was just to the south between the southern shores of the Manukau Harbour and the Waikato River. In this area Hochstetter made the first written observations of the South Auckland Volcanic Field – a similar, but older field of basalt volcanoes to the Auckland field (e.g. Nemeth et al. 2012; Hayward 2020). This field has more than 80 identified volcanoes (eruptive centres), which all erupted between 1.5 and 0.5 million years ago (Briggs et al. 1994). Hochstetter journeyed south through the east and central parts of the field between Drury and the Waikato River after his coal field studies in December 1858, and through the western and northern part of the field on his way to and from Port Waikato in late January 1859.

Compared with his observations and mapping of the Auckland Volcanic Field, Hochstetter’s observations and mapping of the South Auckland Field were very preliminary and lacked detail. There were probably several reasons for this. The most obvious was that Hochstetter





In his diary entry for 22 January 1859, Hochstetter describes in considerable detail what he called a basaltic “conglomerate” (boulder formation) that he saw exposed around the Waiuku Arm of the Manukau Harbour. He noted that it was often extremely weathered but occasionally the well-rounded boulders or cobbles were fresh enough for him to note that they were made of olivine basalt. Subsequently he noted this “conglomerate” in many places where he travelled through the South Auckland Volcanic Field between Waiuku, Awaroa, Drury and the Waikato River. In a few places, instead of conglomerate he records solid or jointed basalt that he saw where the creeks had eroded more deeply forming waterfalls (e.g. Waitangi and Mauku) over fresh basalt rocks. He concluded that the conglomerate was derived from the basalt flows erupted from small basalt volcanoes. Unfortunately, he did not recognise that the conglomerate was in fact weathered basalt lava flows with core stone weathering inwards from the cooling joints leaving the fresher, rounded boulders from the cores with the more decomposed rock along the joints either still in place as clay or washed away. The washed out core stones were seen in stream beds or as a relict lag on the land surface.

Among Hochstetter’s unpublished material there is a partially completed watercolour map that includes the South Auckland Volcanic Field (Fig. 23). His light-grey mapped extent of the basaltic “conglomerate” is a relatively accurate approximation for the known extent today of the weathered lava flow field of the South Auckland Volcanic Field north of the Waikato River. Here and there he maps the location of the fresh basalt he saw and also seems to show the location of five basalt cones – Bald Hill, near Waiuku which he saw on 27 January and four he does not mention in his diary – three on the south side of the river plus what may be Pokeno Volcano, north of Mangatāwhiri. He also shows two basalt centres in the Hunua Ranges – one that forms the Hunua Falls and the other probably Pukekiwiriki/Red Hill near Papakura, both of which he was told about by others and records in his diary on 23 February. On 26 January Hochstetter mentions seeing at a distance a low cone at Kohanga on the south bank of the Waikato River but he does not show it on his sketch map. However, this and several other larger cones are depicted on the published geological topographical map (Fig. 24) of the Southern Part of the Province of Auckland (Hochstetter and Petermann 1864).



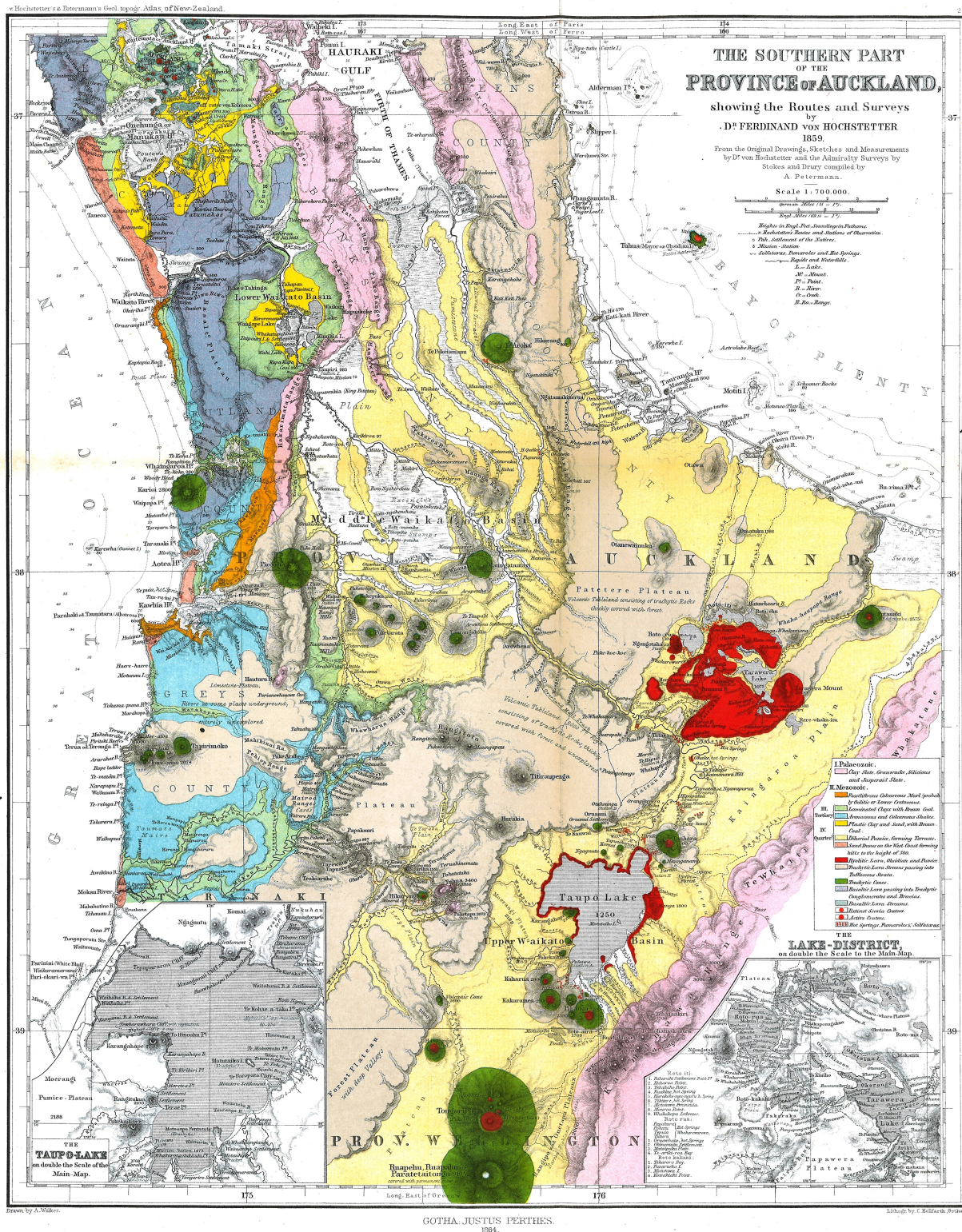


Figure 24: Ferdinand von Hochstetter, *The Southern Part of the Province of Auckland, showing the Routes and Surveys*, Justus Perthes, Gotha, 1864 (Ferdinand von Hochstetter and August Petermann, *Geological and Topographical Atlas of New Zealand: Six maps of the Provinces of Auckland and Nelson*, Delattre, Auckland, 1864).



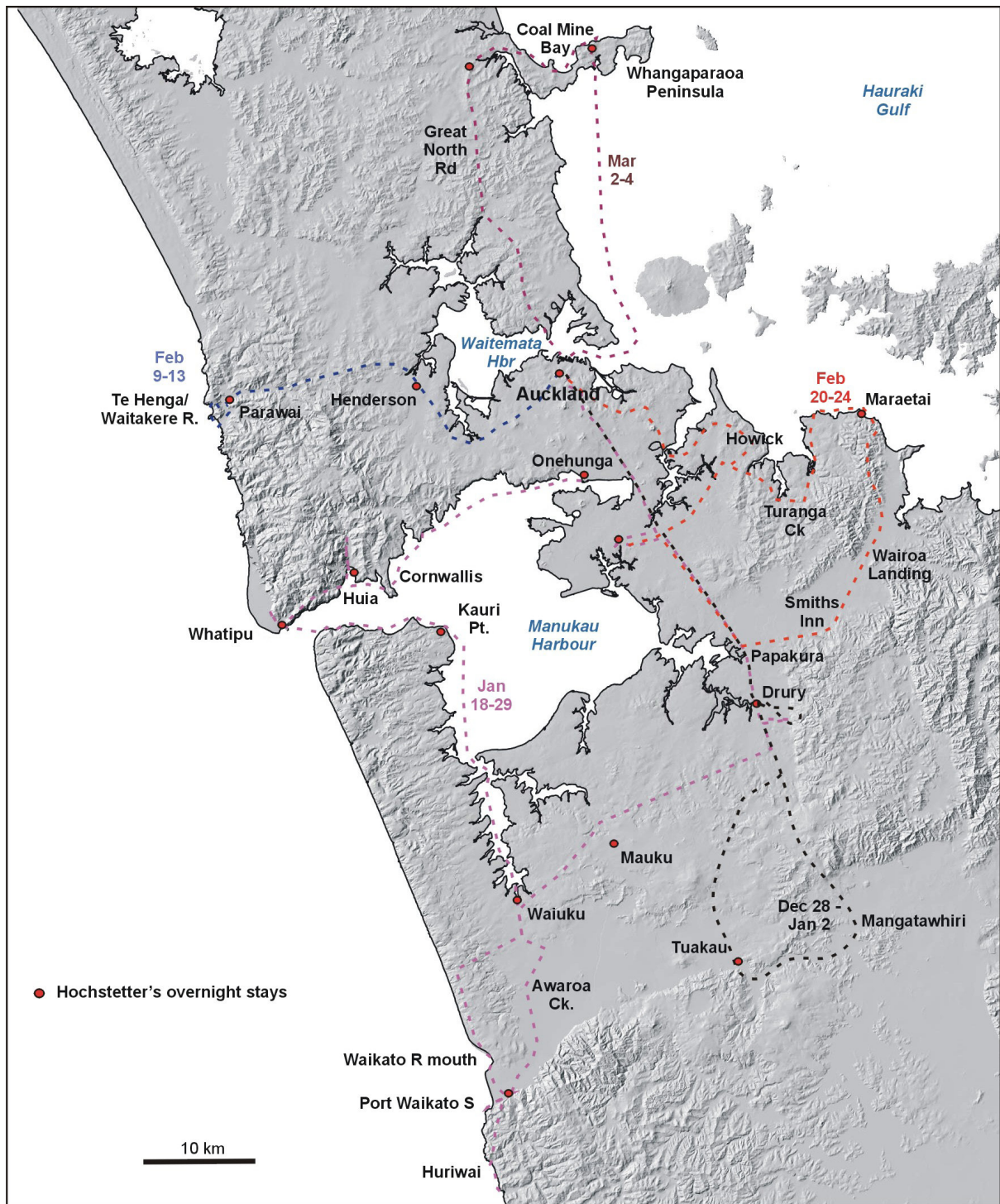


Figure 25: Hochstetter's travels in the Auckland region as described in his diary, showing approximate routes and dates of excursions, and locations of overnight stays (map prepared by Bruce W. Hayward).



# Hochstetter's Auckland Diary: an annotated English translation

[cover title label]

New Zealand | 1 | F Hochstetter

[title on first free endpaper]

New Zealand | 1859 | No. 1 | Dr Ferdinand Hochstetter

[page I]

X.<sup>3</sup>

My stay in New Zealand

a) during the visit of the frigate *Novara*

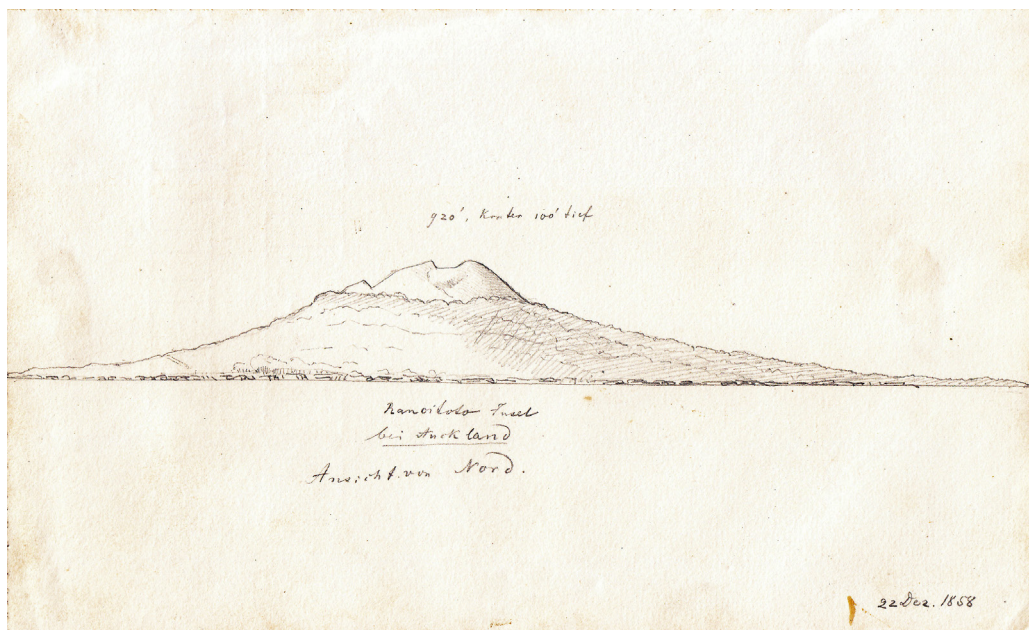


Figure 26: Ferdinand Hochstetter, *Rangitoto Insel bei Auckland. Ansicht von Nord* [Rangitoto Island near Auckland. View from the north], 22 December 1858. Sketched by Hochstetter on the day the *Novara* arrived in Auckland. Pencil on paper, 140 x 230 mm (Hochstetter Collection Basel HCB 3.2.24).

[page II]

**22-23 December**

Around town in Auckland.

**24-25 December**

Visit to the volcanic cones at Onehunga.

**26 December**

Magnetic observations in Auckland.

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<sup>3</sup> Roman numeral 10 denotes that this is the tenth in the series of *Novara* Expedition diaries. Hochstetter appears to have decided to start a new series of diaries for his visit to New Zealand and therefore describes this as diary number one in all other instances. Number nine, the prequel diary to this one describes the visit to Sydney and voyage to New Zealand (Nolden and Darragh 2023).

## **27 December**

In Auckland

## **28 [December]<sup>4</sup>**

Departure for Drury to examine the coal.

## **29-30 [December]**

Carried out this examination.

## **31 December**

To the Waikato. New Year's Eve in Tuakau.<sup>5</sup>

## **1-2 January**

Return journey [to Auckland].

## **3-4 January**

Wrote report in Auckland.

## **5-6-7 [January]**

Sorted out my affairs regarding my remaining here.<sup>6</sup>

[page IIIa]

## **On the surroundings of Auckland**

Tautari's *Saint Kilda* schooner of 60 tons, owners and crew are Māori, doing a regular run between Auckland and the Bay of Islands.<sup>7</sup>

Until about one lifetime ago the Auckland area was still inhabited by a very numerous Ngāti Whātua tribe, possibly numbering some 20,000-30,000 souls.<sup>8</sup> Now there are hardly 50 people of this tribe living in the Auckland district. The lava caves at Three Kings, Mount Smart, and Mount Wellington<sup>9</sup> are filled with the skeletons of this unfortunate tribe that was exterminated in the wars by murderous Hongi.<sup>10</sup>

Notes for a description of the area.

Highly peculiar character of the landscape: on the west coast a higher mountain range covered in native forest<sup>11</sup>, divided by the entrance to the Manukau Harbour with steep

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<sup>4</sup> The words in square brackets here replace ditto marks in the source manuscript.

<sup>5</sup> In the source manuscript Hochstetter writes Tuakao, but corrects the spelling in later entries.

<sup>6</sup> In his diary written during the crossing from Sydney to Auckland (Nolden and Darragh 2023: 31), Hochstetter notes on 21 December that he had considered the possibility of remaining in New Zealand to complete a more thorough geological survey, rather than continue on the voyage of the *Novara*.

<sup>7</sup> Hemi Tautari (c. 1814-1883), of the Ngāpuhi tribe, was born at Paihia in the Bay of Islands. He was known as a reliable trader between the Bay of Islands and Auckland, and was the owner of half the shares in the *Saint Kilda* from 1857 to 1865. The *Saint Kilda* was a schooner of 63.9 tons, captained by Tautari.

<sup>8</sup> Ngāti Whātua is a confederation of four tribes: Te Roroa, Te Uri-o-Hau, Te Taou and Ngati Whatua-o-Orakei, all affiliated with the Mahuhu-ki-te-rangi canoe which landed on the west coast between Kaipara Harbour and the Hokianga.

<sup>9</sup> Some of the lava caves from Te Tatua-a-Riukiuta/Three Kings and Maungarei/Mount Wellington are still accessible, but no human remains are now present, having been removed or sealed up. No lava caves are accessible at Rarotonga/Mount Smart.

<sup>10</sup> This is a reference to Nga Puhi chief Hongi Hika (c. 1772-1828), who visited England in 1820 where he assisted with the compilation of a Māori dictionary and met George IV.

<sup>11</sup> Waitakere Ranges (north of the harbour entrance) and Awhitu Peninsula (south of the entrance).



heads, at the north head three jagged points, one above the other, then the shallow bay of the Manukau Harbour. Volcanic cones on an island<sup>12</sup>, with protruding peninsulas and adjacent flat land, white shelly shores but black lava shore on the Onehunga side, lava reefs<sup>13</sup>. The entire configuration of the land such, as if there were no distinct boundary between land and water, as if there were an ongoing conflict, with the numerous volcanic cones as witnesses to the various epochs. It looks like a flat land, only flooded<sup>14</sup>, from which the sea is gradually withdrawing more and more. Small islands in the bay, banks of shells, meadows of seaweed. Most likely the land is being pushed up between the two oceans<sup>15</sup>. On which the numerous ‘tattooed’ mountains<sup>16</sup> rise, originally land wars were fought in, at, and on them, and later during the romantic middle ages of New Zealand they were castles, fortified pā, surrounded by kumara plantations. In this period bloody tribal wars were fought at and on them, and thus they stand as ruins, the crater [page IIIb] as the scar of the land battle, the terraces with the deep dug out holes, the scars, which remind one of the bloody tribal wars. The tattooed mountains, like the tattooed face of the old New Zealand warrior are reminiscent in form of the jagged shape of the ferns.

On the entire Auckland isthmus there are really no trees, formerly lush kauri forests, and dense bush, only at the craters there are still the occasional hidden remains of the former forests in deep cut gorges, only sparse scrub marks the landscape. From the elevations one sees the ground plan of the various settlements, towns with broad widespread streets, but without houses, only on the corners there are occasional houses, a few farms, churches, and public inns. Black basalt walls<sup>17</sup> or green gorse hedges<sup>18</sup> divide up the land, meadows, and paddocks, one sees grazing stock, and haystacks in the haymaking season around Christmas. No rivers, only coastal inlets, and freshwater ponds/lakes in old tuff craters<sup>19</sup>, circular like framed mirrors set in the ground, metalled<sup>20</sup> roads cross the hilly land, one sees driving omnibuses, farming families, with wife and child in a dogcart<sup>21</sup> or the lady riding on horseback beside her lover or husband.

Smoke rises from the forests in the distance and from the fern scrublands, yelling calls “hui” resound, the call of the New Zealand settlers, and the Māori narrate romantic tales of the old chivalrous times.

High and low tide on both coasts three hours different, smoke rises in the distance.

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<sup>12</sup> Te Motu-a-Hiaroa/Puketutu Island.

<sup>13</sup> Basalt lava flows from Maungakiekie/One Tree Hill and Rarotonga/Mount Smart.

<sup>14</sup> The Manukau area was a flat forested land drained by several incised river channels during the Last Ice Age (up until ~10,000 years ago) when rising sea level, as the world warmed, partly flooded the Manukau valley creating the harbour.

<sup>15</sup> All of the Auckland region has been pushed up and extensively eroded in the last 15 million years but there is little evidence of significant uplift of the Tamaki Isthmus in relatively recent times.

<sup>16</sup> A reference to the volcanic cones of Auckland that had been reshaped (tattooed) by earthworks to create living terraces and defended forts (pā) by pre-European Māori.

<sup>17</sup> Made of loose locally-available basalt rocks on the surface of former lava flows. Built by both pre-European Māori in their cultivated stonefield gardens and by early European farmers between their paddocks.

<sup>18</sup> Common gorse *Ulex europaeus*, hedges planted by early European settlers.

<sup>19</sup> The term used by Hochstetter for what are now known as maars or explosion craters surrounded by tuff rings.

<sup>20</sup> Broken rock or scoria used in road construction.

<sup>21</sup> Dogcarts are vehicles with two wheels drawn by a single horse. They usually have seating for two people at the front facing forwards and two people at the rear facing backwards.

On the west coast 3–3½ hours later than on the east coast, which is significant for future canals.

I found a single resident on all these mountains, on Mount Hobson near Auckland, living partly underground, partly in a tent was a lonely old crazy Māori woman, banished by her tribe to live here and die, where so many had died and been eaten.

[page IV]

Romance of Mount Eden<sup>22</sup>

[page Va]

Various notes

Hongi, the Napoleon of New Zealand, 1819 visited George IV in England.<sup>23</sup>

Totara wood very durable and does not rot, but instead for bridges and such like, the government always uses kauri which rots more quickly.

The three most beautiful women in Auckland are: Misses<sup>24</sup> Atkins<sup>25</sup>, Buchanan<sup>26</sup>, and Outhwaite<sup>27</sup>.

The three best Auckland boats are: *Glance*, *Comet*, *Grace Darling*.<sup>28</sup>

Tupakihi is a plant, shrub, the ‘Tutu’ fruit it bears in bunches.<sup>29</sup> The berries have seeds which have toxic characteristics, from the juicy flesh a sweet violet juice is pressed, which makes the native wine without being fermented.<sup>30</sup>

Rauweruhe, *Pteris esculenta*, the fern root when dried, ‘Roio aruhe’.<sup>31</sup>

Waka is the name for a river canoe.<sup>32</sup>

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<sup>22</sup> This is in the style of a heading, but the remainder of the page is blank.

<sup>23</sup> See also note above. Hongi Hika (c. 1772-1828), who visited England in 1820.

<sup>24</sup> In the source manuscript Hochstetter uses idiosyncratic phonetic spellings of the names, rendering them as: Etkins, Buckanan, and Outhwaith.

<sup>25</sup> Possibly related to the family at Hastings Atkins’ Station in Wairoa, Kaipara District. A Miss Atkins is already noted in a Flower Girl costume at a ‘Fancy Ball’ hosted by Colonel Wynyard and his wife in 1855.

<sup>26</sup> This is most likely a reference to Fanny Chaytor Buchanan (1841-1917), or one of the other daughters of Dr Andrew Buchanan (1807-1877) and his wife Emma, née Harkness (1813-1890): Emma Buchanan (b. 1835) and Edith Mary Buchanan (1838-1904) had both married in December 1857, and Agnes Buchanan (1837-1858) had died on 31 May 1858 at the age of 21, Janet Curling Buchanan (1843-1920?), and Emily Baston (born 1850). Fanny later married William Anderson Low in 1865.

<sup>27</sup> Most likely a reference to one of the two daughters of Thomas Outhwaite (1805-1879), who arrived in New Zealand in 1841 and was appointed the Registrar of the Supreme Court in Auckland, on 1 January 1842, and his wife Marie Henrietta Lousie Outhwaite, née Roget (1811-1905). The daughters were Parisian-born Victorine Francoise Clotilde Outhwaite (1837-1925), and Auckland-born Anne Jane Louisa ‘Isa’ Outhwaite (1842-1925).

<sup>28</sup> The ships were: *Glance*, 20 tons, Captain Rattray; *Comet*, cutter 17.3 tons, Captain Daniel Sellars (1830-1880); *Grace Darling*, 25 tons, Captain Williams.

<sup>29</sup> Tupakihi and Tutu are the Māori names for *Coriaria arborea* and seven other species in the family Coriariaceae.

<sup>30</sup> John Malcolm opened his paper “On the Toxicity of Tutu Fruit and Seed” with the statement: “Attention has frequently been drawn to the remarkable fact, discovered by the Maoris, that the juice of the ripe tutu-berry is harmless, while the seed is intensely toxic.” (Malcolm 1919).

<sup>31</sup> Bracken fern, *Pteris esculenta* first described by Georg Forster in 1786, is a junior synonym of *Pteridium esculentum* (G. Forster) Cockayne 1908. Māori term is now spelled rarahū. The rhizomes/roots (Māori: aruhe) formed a staple food for Māori.

<sup>32</sup> Waka is the Māori general term for a canoe.



Regarding the Māori: The women keep pet piglets, the way in our country one might keep canaries or lap dogs. In Mangatawhiri<sup>33</sup> I observed how women were breastfeeding such piglets.<sup>34</sup>

Tattooed lips of the women look blackish blue.

Remarks, which I made in Tuakau at the Waikato:

Greeting of male and female friends by rubbing of noses, or in fact pressing of noses, sobbing, sighing and crying. Thus, if the nose is not already broad by nature, then it must hereby become that way. How long the scene lasts depends on the level of friendship; I saw actual tears, [page Vb] and after the scene the nose thoroughly cleared.

Manner in which the Māori cook meat and potatoes.

The classic period of the Māori is past, one no longer sees the beautiful carvings, mats, raincoats; all is already half civilised. In the ear they wear a shark's tooth on a black band, or a figure cut from nephrite. They do not allow anything to be bought off them, except for the highest prices, but want to buy everything that they like. There seems to be a lot of money in circulation.

Instead of kumara fields and Phormium<sup>35</sup>, now potatoes, wheat and corn.

Great variety in the faces which indicates an extraordinary mixing of races. The general view is that the New Zealand race consists of a mixture of Asian Jews, Malayan Austral-negroes, and Polynesians, and among a dozen Māori one can find types for each element. Flat noses, nice straight noses right through to sharply bent hawk's beak noses, fine straight hair, thick horse hair and curly woollen heads.

Cannibalism was apparently originally based on superstition that by eating certain parts of the slain enemy, one would acquire their qualities, would make one stronger, and so especially the brain was eaten, but then it became more and more of a habit, and finally a tradition, and often hunger would lead parents to agree to swap their children to eat them. The last case of cannibalism [page VIa] was apparently performed on a Māori in the Province of Auckland 15 years ago.

Ngahiri | paepaearuhe | patumuka – for the preparation of fern roots

Toki | kapo | tikahu – various forms of stone axes.

Eels<sup>36</sup>

New Zealand eels, apparently in Piako<sup>37</sup> eels as fat as a thigh and 5 feet long are no rarity, eels of 11-inch diameter and 6 feet in length have been vouched for. These eels are apparently often in swamps where the water is between half and one foot deep, and push tracks through the swamp grass, like dogs. The eels make a noise that is somewhere between the croaking of a frog and the barking of a dog.

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<sup>33</sup> Mangatawhiri is an area 14 km east of Tuakau.

<sup>34</sup> Goldie makes reference to this when he writes: "Maori women used frequently to be seen suckling a suckling-pig, either from affection for the animal or because they could not find children who required foster-mothers" (Goldie 1904: 108).

<sup>35</sup> New Zealand Flax, *Phormium tenax*, widely used by Māori for making clothes, mats, baskets, ropes, fishing lines and nets.

<sup>36</sup> New Zealand longfin eel, *Anguilla dieffenbachii*, and the Shortfin eel, *Anguilla australis*,; only the former is endemic to New Zealand.

<sup>37</sup> Piako River reaches the sea at the southern end of the Firth of Thames, about 45 km east of Tuakau.

Tuangi<sup>38</sup> is the common bivalve which the Māori eat, and of which the shells may be found strewn on all the volcanic hills.



Sketch 1: Bivalve.

Teraro<sup>39</sup>, a larger bivalve that is eaten.

Kokota<sup>40</sup> another flat long bivalve which is very common on the shores of Auckland. This is often found amongst the shells from beach deposits that are used to burn lime, remarkable, due to the similarity of the two names, that the Māori use the term Kotakotu for lime in general.

Kutai<sup>41</sup>, the large mytilus which the Māori eat.

Kuku, the same shell, used to describe it in its dried form.

Tio<sup>42</sup>, the common oyster.

Kina<sup>43</sup>, the echinoid.

[page VIb]

#### Spirits – Superstition of the Māori

By knocking with the fist with regular intervals while accompanying with a long drawn-out whistle, one can cause an entire Māori pā to get into a state of excitement, for in this way their spirits announce their presence. In the surf they hear the voices of their ancestors who have passed on and have all sorts of magic potions/methods to calm these spirits. The owl, especially, is a holy bird to them, when an owl perches on one of their huts at night, then it is certainly considered to be the ghost of a family relative, while they also believe that those who have died will soon return to them in the form of pigs, cats, and birds. Sharks that circle a canoe that is in danger in stormy conditions at sea, are evil spirits. They believe that after their Christian baptism they lose all power over the spirits of their departed.

The Māori have been in New Zealand for about 500 years, and they have a tradition about savages living in the forests, which they met and exterminated. It would seem that gradually the Māori are dying out. One must look for the cause of this in the change in lifestyle due to the influence of the Europeans. They no longer have their old traditional clothing – so well suited to the climate, and instead wear European rags; no longer lead the quiet life in the pā, only interrupted by war expeditions, instead are nomadic, and therefore numerous cases of the cold, and often many weeks of being deprived of suitable nourishment, then there is illness/disease, and as soon as one Māori falls ill, they are placed in a tent by their tribe, the wives and relatives come and sing songs of lament, which someone in good health could not bear, let alone someone ill, children's illnesses have been brought in by Europeans, etc.

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<sup>38</sup> The common cockle, *Austrovenus stutchburyi*.

<sup>39</sup> Probably referring to the large bivalve toheroa, *Paphies ventricosa*. It is clear from the manuscript that Hochstetter was struggling to render this word.

<sup>40</sup> Pipi, *Paphies australis*.

<sup>41</sup> Refers to mussels, in this instance likely the green-lipped mussel, *Perna canaliculus*.

<sup>42</sup> Rock oyster, *Saccostrea cucullata*.

<sup>43</sup> Sea urchin, *Evechinus chloroticus*.





## **Alone in the Antipodes!**

Reverend Mr Arthur Guyon Purchas<sup>44</sup> takes the credit or blame.<sup>45</sup>

### **Saturday, 8 January**

At 6 am, Strong<sup>46</sup>, the boatman, brought me on board to say farewell. It was a beautiful morning, the frigate ready to set sail, was only waiting for a breeze to spring up and the turning of the tide. I never thought that I would find it so hard to take leave, as it in fact was.

When approaching 8 am, the command was given to pull up the anchors, I again felt the way I had when taking leave in Vienna; I had to cry, for the fourth time since I had become a grown man. I then felt that I was at home on the frigate after all, and that I now regret staying in a strange land amongst strangers, and it was hard for me to leave the ship all of a sudden, whose destiny had been intertwined with my own for so long, and hitherto companion to my joys and sorrows. My voice failed me, when I shook hands with my comrades to say goodbye, and I noted that among some of them eyes filled with tears. And when I said adieu to the commodore and commandant on the [deck], I was unable to say more than “I thank you, Mr Commodore and Commandant”.<sup>47</sup> Both seemed no less moved than I was myself; I hurried down the ladder to the boat, the band played, the anchor was raised, and I allowed my tears to flow freely, and even before I had reached land, the *Novara* had set sail, and floated off slowly propelled by the lightest breeze. I was still able to look back for a long while, and even when the ship had already disappeared, I could still make out the masts behind the North Shore. Towards 11 am the wind freshened, and the *Novara* quickly disappeared out of sight, she [page VIIb] will have reached the high seas by evening and is now heading towards Tahiti.

It gave me great satisfaction to see on my departure, that the officers had obviously all come to like me, and I think they will sometimes miss me and remember me.

The *Novara* was gone, and only I remained here, so it was time to begin arranging everything necessary for my time here.

First of all, a more spacious accommodation; I left the Royal Hotel<sup>48</sup>, and moved into a spacious abode with four rooms in Mr Winch’s Boarding House, the so-called Claremont House.<sup>49</sup>

Reverend Mr Purchas had arranged a servant for me named Archibald Clarke<sup>50</sup>, who came to me, a handsome good young lad, and showed himself to be very willing, but awfully forgetful, and at night, and only at night, is apparently prone to epileptic fits. I now planned to furnish myself in a homely fashion, and to tidy up the enormous amount of ballast I had shifted here from my cabin on board. As I would furthermore be fully occupied for the remainder of the day with writing letters and the packing of my existing collections, I went

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<sup>44</sup> Reverend Arthur Guyon Purchas (1821-1906) was the vicar of St Peters Church, Onehunga, Auckland (Fig. 39).

<sup>45</sup> This is in reference to the influence Purchas had on Hochstetter’s decision to stay in New Zealand.

<sup>46</sup> George Strong was contracted by the Provincial Government to provide boat transport for the Geological Survey, for example, invoice for the conveyance of Arthur Guyon Purchas, “Hire of Boat and three men to and from the North Shore” on 12 January 1859 (Auckland Museum 1860); Strong was later appointed Chief Boatman Naval Coast Guard, Auckland, in 1860.

<sup>47</sup> The commodore was Bernhard von Wüllerstorff-Urbair (1816-1883) (Fig. 6), and the captain of the *Novara* referred to as the ‘Kommandant’ by Hochstetter was Baron Friedrich von Pöck (1825-1884) (Fig. 7).

<sup>48</sup> Charles Joslin’s Royal Hotel in Eden Crescent, Auckland (Fig. 28).

<sup>49</sup> Claremont House (Fig. 29) was run by Charles and Sarah Winch in Princes Street, Auckland.

<sup>50</sup> Archibald Clarke (c. 1841-1879), acted as personal valet to Hochstetter during the first part of his visit.



straight to Mr Whitaker<sup>51</sup>, the Attorney General, in order to let him know, that I would not be able to begin my work before the end of next week. I spent the evening at home. Haast<sup>52</sup> was with me, and the evening passed in conversation about the past few days.



Figure 28: Royal Hotel (centre), on the corner of Eden Crescent and Short Street, Auckland, c. 1864. Hochstetter stayed here from 23 December 1858 to the departure of the *Novara* on 8 January 1859 when he moved to Claremont House (Auckland Libraries Heritage Collections 3-Album-45-19).



Figure 29: James Douglas Richardson (1878-1942), copy photograph of Claremont House (left), on Princes Street, Auckland, where Hochstetter lodged from 8 January and which he used as his base for most of the time he spent in Auckland (Auckland Libraries Heritage Collections 4-863).

<sup>51</sup> Frederick Whitaker (1821-1891), New Zealand Attorney General (Fig. 102).

<sup>52</sup> Johann Franz Julius Haast, later Sir Julius von Haast (1822-1887), had arrived in Auckland on the *Evening Star* on 21 December 1858, one day before the *Novara* (Fig. 35).

AUCKLAND, Dec<sup>r</sup> 27 1859.

*Dr* *Hochstetter*

*Dr* to CHARLES JOSLIN,  
ROYAL HOTEL,  
EDEN CRESCENT, OFFICIAL BAY.

		£	s.	d.
Dec <sup>r</sup> 23	3 Dinners - - -	"	8	3
	2 Coffee	"	1	$\frac{1}{2}$
	Bot Perry	"	4	2
	Demanda b Bot Ale 2.	"	2	$\frac{1}{13}$
24	Bed & Breakfast	"	5	$\frac{63}{4}$
	Bot Perry	"	5	"
	Lunch 2. before Mar 2.	"	4	"
	Ale 2. Bot Ale 2.	"	4	"
25	Bed - - -	"	3	"
26	Bed & Breakfast	"	5	"
	Lunch 2. coffee b	"	2	6
	Dinner - - -	"	3	"
	coffee - - -	"	"	6
	Bot Ale b Bot Ale 2.	"	2	6
27	Bed & Breakfast	"	5	"
	Lunch & coffee	"	2	6
	coffee b Lunch 2.	"	1	"
	Bot Ale	"	2	"
			2	18 6

Figure 30: Hochstetter's hotel bill from Charles Joslin's Royal Hotel, dated 27 December 1859 (Dr Albert Schedl Collection, Vienna).

### Sunday, 9 January

An equally fine summer's day, like yesterday, in fact the evening was outstandingly fine. Dr Fischer<sup>53</sup> had given me a standing invitation for Sundays, and so today for the first time I turned up for lunch at 2 pm.

Of course, all the talk was about the *Novara*, for which especially Mrs Fischer<sup>54</sup>, who had whiled away many pleasant hours in the company of the commodore and commandant, held a great interest.

<sup>53</sup> Dr Carl Frank Fischer (d. 1893) was a German homoeopathic medical practitioner in Auckland (Fig. 36), and founder of the *Homoeopathic Echo*, the first medical journal published in New Zealand.

<sup>54</sup> Prudence Florentine Fischer, née Delattre, known as Flora (d. 1879), the wife of Dr Fischer, died in London (Fig. 37).



But what does one have to hear after the event? I was no little surprised, to hear such accurate opinions. Everyone I have spoken to here was delighted by the fine gentlemanly manner of the commodore, respected the upright straight sense of the commandant, and is suspicious of the sweet overly complimentary Dr Scherzer<sup>55</sup>, they find in Dr Schwarz<sup>56</sup> a mean/common Jew, take pity on the weak and dependent nature of Selleny<sup>57</sup>, who has completely walked into Scherzer's trap, and praises the naturalists of the *Novara*, for maintaining their independence.

The following edifying history is told of Schwarz: a Mr Graham<sup>58</sup> handed him a very valuable collection of ethnographic objects and a kiwi egg, obviously intended for the collections of the expedition. Dr Schwarz knew this all too well, as he wrote before the very eyes of the donor on a slip of paper with the kiwi egg "For the zoological collections of the expedition presented by Mr Graham" and passed the egg on to Zelebor<sup>59</sup>, but packed up the ethnographic objects and took them on board to his own cabin. As it happened, two Germans, Haast and Koch<sup>60</sup>, were present during the hand-over, and casually mentioned to the commandant in the evening, that they were pleased that the expedition had received such fine presents. Obviously, the commandant had no knowledge of this, but as Selleny had heard the conversation, he hurried off to Schwarz and told him, and that they were in danger of losing their precious loot, which they had probably planned to share. That was the ugly secretive scene, which I myself witnessed when I happened to be seated for dinner together with Scherzer, Purchas and Zelebor at the Royal Hotel, where Zelebor fittingly said: "Selleny is a righteous man!!!???"

Schwarz then had nothing more [page VIIIb] urgent to do, than to run to Mr Graham, and say that he had believed that the ethnographic objects were intended as a personal present to him, and that he would help him out of a situation of great need, if he would be so kind as to write him a letter, wherein he would express that he, Mr Graham, had given the ethnographic objects to him Dr Schwarz, as otherwise he might find himself in an awkward situation. On being asked in this way, Mr Graham naturally obliged, so when Dr Schwarz is questioned, he will be able to justify his action using the letter. But this is also the genesis of the letter.

Dr Fischer is furthermore angry that Schwarz decried him as a charlatan/quack. Anyway, that is a complete lie, and downright nastiness. In short, Dr Schwarz has left here with the reputation of a mean/common fellow, and his horrendous botanical ignorance coupled with great arrogance, and a feverish desire to avoid having to collect anything himself, but receive as many collections as possible as gifts from others, has contributed just as thoroughly as in Java, to the shame of the expedition, as brought to light here.

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<sup>55</sup> Dr Karl Ritter von Scherzer (1821-1903), ethnologist and historiographer of the *Novara* Expedition (Fig. 31).

<sup>56</sup> Dr Eduard Schwarz (1831-1862), assistant surgeon on the *Novara*, seconded to assist with botanical and anthropological research on the expedition.

<sup>57</sup> Joseph Selleny (1824-1875), the official artist on the *Novara* Expedition.

<sup>58</sup> This is probably a reference to Robert Graham (1820-1885), prominent Auckland merchant, land owner and Member of Parliament; or his brother David who was also a merchant in Auckland at the time.

<sup>59</sup> Johann Zelebor (1819-1869), a zoologist on the *Novara* Expedition (Fig. 34).

<sup>60</sup> Augustus Carl Ferdinand Koch (1834-1901), German artist and lithographer in Auckland at this time (Fig. 89).



Figure 31 (left): Hermann Heid (1834-1891), carte de visite portrait of Karl von Scherzer (1821-1903), historiographer of the Novara Expedition (Alexander Turnbull Library PA2-0854).

Figure 32 (right): Franz Schultz (1813-1865), carte de visite portrait of Georg von Frauenfeld (1807-1873), zoologist on the Novara Expedition (Alexander Turnbull Library PA2-1638).



Figure 33 (left): Emil Rabending (1823-1886), carte de visite portrait of Anton Jelinek (1820-1897), botanist and gardener on the Novara Expedition (Alexander Turnbull Library PA2-1426).

Figure 34 (right): J Ruwner & Co (Vienna), carte de visite portrait of Johannes Zeebor (1819-1869), zoologist on the Novara Expedition (Hochstetter Collection Basel 5.2.Z1).



Haast is similarly angry about Scherzer, as he tried to make him out as suspect here. Madame Fischer declared Scherzer for a skinflint/miser, and servant to the commodore, and feels sorry for Selleny. That is what this fine “clover leaf” has achieved, and I have to say that I am almost pleased to be away from the frigate and that I have nothing more to do with this, as I have completely convinced myself, deceitful mean “clover leaf”, that our ways have parted. But I do feel sorry for my colleagues Frauenfeld<sup>61</sup>, Zelebor, Jelinek<sup>62</sup>, if they are not man enough to stand up to him and maintain their independence.

Strangely enough, just when I was unpacking the [page IXa] specimens from Reverend Mr Clarke<sup>63</sup> of Sydney today, I found among the papers a letter from Mr Angas<sup>64</sup> at the Museum in Sydney, wherein he writes to Clarke that Mr Wall<sup>65</sup> has to be deposed as he is bringing shame on the museum, “Dr Scherzer having expressed his surprise at the fact that in Sydney one employs a drunk as a curator of the museum”. Thus, this remark stems from him, which made us all feel embarrassed for Wall. I am curious about how this Novara Expedition will end. I am hoping that the commodore’s eyes will yet be opened to this “precious clover leaf”.

I feel sorry for Selleny, as he will not have another pleasant hour on board, as all the officers are deeply bitter and insulted that frigate lieutenant Monfroni<sup>66</sup> received 14 days of “house arrest” because of him, as a result of an argument.

It is fascinating, two Germans in Auckland, Dr Fischer honoured and respected by everyone, the house in which the commodore and commandant, as well as the naturalists visited daily, hated by the officers, as Selleny made the mistake in his house, and Scherzer wrote him an invitation list, from which Lieutenant von Rath<sup>67</sup> was intentionally omitted.

Merchant Petschler<sup>68</sup>, Fischer’s antagonist, hardly respected, but very charming towards us all, his house was mainly visited by the officers. German disharmony on a German warship. But a great satisfaction for me that there are people who quickly see through to the true nature, and recognised Scherzer’s superficial humbug character.

### **Monday, 10 January**

Deposited £220 Sterling at the Auckland Bank in the morning. Dr Fischer was so kind as to accompany me there. Then visits from Mr Heaphy<sup>69</sup>, Mr Ninnis<sup>70</sup>, Mr Purchas.

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<sup>61</sup> Georg Frauenfeld, later Georg Ritter von Frauenfeld (1807-1873), zoologist on the Novara Expedition (Fig. 32).

<sup>62</sup> Anton Franz Jelinek (1820-1897), botanist and gardener on the Novara Expedition (Fig. 33).

<sup>63</sup> Reverend William Branwhite Clarke (1798-1878), Australian geologist and Anglican clergyman (Fig. 93).

<sup>64</sup> George French Angas (1822-1886) was appointed secretary and accountant of the Australian Museum on 10 October 1853 (Fig. 91).

<sup>65</sup> William Sheridan Wall (1815-1876), trained as taxidermist in Dublin and studied anatomy at Trinity College, he was first appointed collector and preserver at Sydney in 1840 before gaining the title of curator in 1845. He held his post until 1859.

<sup>66</sup> Moriz Monfroni de Montfort (1832-1889), was ‘Fregatten-Lieutnant’ on the Novara Expedition; after 1874 he was known as Manfroni von Manfort.

<sup>67</sup> Baron Joseph von Rath (b. 1831), born in Pavia near Milan, served in the Austrian navy until 30 April 1863.

<sup>68</sup> Carl/Charles Petschler (1820-1882), a German merchant in Auckland, and later in Sydney (Fig. 70).

<sup>69</sup> Charles Heaphy (1820-1881), artist and surveyor, arrived in New Zealand as an employee of the New Zealand Company on board their vessel *Tory* in 1839. Held the position of Provincial Surveyor in Auckland at the time of Hochstetter’s visit (Fig. 10).

<sup>70</sup> James Ninnis (1809-1879), English mining engineer who originally came to New Zealand in 1846 to manage the copper mine on Kawau Island (Fig. 55).

Heaphy will prepare the map for my survey for me. Visited the Superintendent<sup>71</sup> together with Ninnis and Purchas, and requested a notice be placed in the papers, calling for settlers to send in specimens.<sup>72</sup> Then on to visit Colonel Mould<sup>73</sup>, Royal Engineers, regarding the corresponding observations, which were kindly promised to me, sent maps to Colonel Sillery<sup>74</sup>, and Colonel Gold.<sup>75</sup> Then a visit to my countryman Archdeacon Kissling<sup>76</sup>, born in Murr near Marbach, 15 years as missionary in Africa, and now 17 years in New Zealand, a dear old man, who was excited to see a countryman, and then accompanied me to Surgeon Stratford<sup>77</sup>, a paradox geologist.<sup>78</sup> Spent the evening at home.

### **Tuesday, 11 January**

At home in the morning, packing, visitor after visitor. At 5 pm with Haast to the immigrant ship *Evening Star*<sup>79</sup>, on which Haast had arrived, a ship of 800-900 tons, very neatly furnished, which completed the journey from England to Auckland in 93 days. We did not find the captain on board, as he was at a dinner on the *Kingston*<sup>80</sup>, a second immigrant ship berthed in the harbour. At the invitation of the captain of the *Kingston* we then visited this ship, and met a gathering there, men and women merry with champagne. Discussion about cyclones with the captain of the *Evening Star*.

### **Wednesday, 12 January**

Again, busy with packing. Finally finished packing the cases for the Academy of Sciences<sup>81</sup> – collections partly still stemming from Australia, [page Xa] some already from New Zealand. In response to the newspaper notice regarding the submission of specimens, two settlers already came to me today with mineral specimens asking for advice. Spent the evening at Heaphy's residence for his so-called evening party, which began at 7 pm, and from whence I returned

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<sup>71</sup> John Williamson (1815-1875), politician, printer and newspaper editor, Superintendent of Auckland Province (Fig. 103).

<sup>72</sup> Hochstetter addressed an open letter to the Colonial Secretary, dated Auckland, 13 January 1859, appealing to the New Zealand public for contributions of natural history specimens. This was first published in *The New Zealand Gazette*, 14 January 1859, and then reprinted in numerous New Zealand newspapers.

<sup>73</sup> Colonel Thomas Rawlings Mould (1805-1886), an English military engineer with the Corps of Royal Engineers, who arrived in New Zealand in 1855 and served as Colonel of the Auckland Regiment of the New Zealand Militia (Fig. 100).

<sup>74</sup> Colonel Charles Malcolm Sillery (c. 1835-1898), born in Limerick, arrived in New Zealand on the *Maori* and left again on the same vessel in 1865 after nine years serving in New Zealand.

<sup>75</sup> Colonel Charles Emilius Gold (1809-1871), English-born New Zealand soldier and artist (Fig. 96).

<sup>76</sup> Archdeacon George Adam Kissling (1805-1865), was born in Murr, Wurttemberg, worked for the Church Missionary Society in Sierra Leone and New Zealand and served as Archdeacon of Waitemata (Fig. 97).

<sup>77</sup> Dr Samuel John Stratford (1802-1871), surgeon in Auckland.

<sup>78</sup> It is not clear what Hochstetter means by "paradox geologist", but it is presumed that Stratford was a keen amateur geologist, who saw himself as a bit of an authority on the subject, contrary to others' estimation.

<sup>79</sup> The *Evening Star*, under the command of Captain Frederick Stanley Ewen (1825-1873), had departed from Gravesend on 11 September and arrived in Auckland 21 December 1858. The passenger list includes Johann Haast. See *The Southern Cross*, 24 December 1858.

<sup>80</sup> *Kingston*, under Captain Richard Lytton Weeks, had left Plymouth on 15 September and arrived in Auckland on 29 December 1858.

<sup>81</sup> In reference to the Kaiserliche Akademie der Wissenschaften in Wien / Austrian Imperial Academy of Sciences in Vienna, who had selected Hochstetter to join the Novara Expedition.



at 1 am. Three sisters of his wife<sup>82</sup> and a few insignificant gentlemen were there, and I was terribly bored. Playing cards and ring games.

#### **Thursday, 13 January**

Still occupied with packing. In the evening at 7 pm dinner with the Superintendent of Auckland Province.<sup>83</sup> Purchas, Haast, Smallfield<sup>84</sup>, Capt. Wing<sup>85</sup>, Ninnis etc. present. I am received with the greatest cordiality all round. Today my report was published in the *Government Gazette*<sup>86</sup> and copied from the same in a supplement/extra issue of *The New Zealander* newspaper.<sup>87</sup> The Superintendent, not a highly educated man, was originally a printer, due to his many contributions to the colony was elected Superintendent, but apparently has many opponents, the opposition party is the *Southern Cross*.<sup>88</sup> I caught a bad cold yesterday and suffered from a severe headache, and consequently left the gathering at 10 pm.

#### **Friday, 14 January**

Stormy from the southwest all day and for me an almost too cool a temperature. Today I handed over the four cases numbered XXIII to XXVI at Brown<sup>89</sup> and Campbell<sup>90</sup> to be sent to the Academy of Sciences and wrote letters for the mail which will depart from here at the end of January. Went to Mr Whitaker<sup>91</sup> about the arrangements for next week's journey, and Captain Steward. In the evening Dr Fischer came to see me and gave me homoeopathic powder for my cold. Haast was kind enough to describe the visit of the *Novara* in Auckland, as I do not have time to do this myself and gave me his article for the *Wiener Zeitung* newspaper.<sup>92</sup>

[page Xb]

#### **Saturday, 15 January**

Today still stormy from the southwest, but calmer towards evening, and fine weather all day long. Spent the entire day at home and wrote letters. At Fischer's in the evening, but as the Doctor was not at home, conversed with Mrs Fischer about the *Novara*.

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<sup>82</sup> Charles Heaphy's wife was Catherine Letitia Heaphy (1829-1910) née Churton, the eldest daughter of Reverend John Frederick Churton (1798-1853) and his wife Mary Churton, née Falwasser (1801-1879). Churton had five daughters, so Mrs Heaphy's three sisters mentioned here would have been three of the following four, of whom the older two were already married at this time: Alice Sarah Woodhouse, née Churton (1831-1909), Jane Frederica Buchanan, née Churton (1833-1886), Marion Dudley, née Churton (1835?-1909), Mary Dorothy Eyre, née Churton (1837?-1923).

<sup>83</sup> Superintendent of Auckland Province was John Williamson (1815-1875).

<sup>84</sup> George Smallfield (1817-1863), was the editor of *The New Zealander* newspaper.

<sup>85</sup> Captain Thomas Wing (1810-1888), pilot of the Manukau Harbour (Fig. 53).

<sup>86</sup> Ferdinand Hochstetter, "Report of a Geological Exploration of the Coalfield in the Drury and Hunua District, in the Province of Auckland (N. Z.)", *The New Zealand Gazette*, no. 2, 13 January 1859, pp. 9-12.

<sup>87</sup> Ferdinand Hochstetter, "Report of a Geological Exploration of the Coalfield in the Drury and Hunua District, in the Province of Auckland (N. Z.)", *The New Zealander*, extra, 14 January 1859, p. 1.

<sup>88</sup> *The Southern Cross* newspaper.

<sup>89</sup> William Brown (c. 1809-1898), partner in the Auckland merchant and shipping firm of Brown and Campbell.

<sup>90</sup> John Logan Campbell (1817-1912), partner in Brown and Campbell (Fig. 92).

<sup>91</sup> Captain F G Steward, private secretary to Thomas Gore Browne, and Captain of the Royal Company of Auckland Rifle Volunteers.

<sup>92</sup> Articles published under the pseudonym Julius Hanf in the *Wiener Zeitung*.



Figure 35: Julius Haast (1822-1887), who accompanied Hochstetter on almost all of his exploratory excursions and survey expeditions in New Zealand. Photographer unknown, 1859, 135 x 185 mm (mount 280 x 360 mm) (John Webster Collection, Auckland Libraries Heritage Collections 881-01). The inscribed dedication by Haast to Arthur Guyon Purchas is dated 26 July 1859.





Figure 36 (left): Carl Frank Fischer (d. 1893), a homoeopathic practitioner in Auckland. Carte de visite, 90 x 52 mm (Hochstetter Collection Basel HCB 5.2.F7).

Figure 37 (right): Prudence Florentine (Flora) Fischer (d. 1879) and her daughter Marie Thérèse Fischer (1857-1918). Wife and daughter of Carl Fischer. Carte de visite, 100 x 64 mm (Hochstetter Collection Basel HCB 5.2.F14).



Figure 38: John Kinder (1819-1903), Carl Frank Fisher's house, Sans Souci, in Auckland, c. 1861. Photograph, 64 x 68 mm (Hochstetter Collection Basel HCB 2.9.7). Hochstetter lunched and dined here on many occasions while in Auckland, as a guest of the Fischer family.

## Sunday, 16 January

Fine weather but windy from the southwest, otherwise a wonderful beautiful day. In the morning I wrote a detailed letter to the Minister of Internal Affairs, A von Bach<sup>93</sup>, with regard to my remaining here. Lunch with friend Haast at Fischer's. Again, the conversation was almost entirely about the *Novara*, especially the meanness of Dr Schwarz who through his behaviour has brought the entire Novara Expedition into disrepute with some people.

Today Fischer said that he believes that Schwarz instigated Monfrony to cause the scandal against Selleny, and when Drummond Hay<sup>94</sup> had raised a toast at Fischer's to the members of the Novara Expedition, and said to "Mr Dr Jelinek", Schwarz had laughed loudly and poked Monfrony in the side and behaved himself in such a way that it was noticeable to all present. In relation to a poor hypochondriac German named Kressmann<sup>95</sup>, who is now eking out an existence from dealing in curiosities, the following incident was described. This poor devil consulted every doctor, including Dr Schwarz and bought a bottle of wine for 5 shillings, in order to be able to give the doctor a glass of wine. Dr Schwarz declared the wine to be awfully bad, but nonetheless allowed himself to be gifted curiosities, and pressured him into selling him others at the lowest possible prices. I note for the record that Dr Sinclair<sup>96</sup> had already left a very large parcel of plant specimens for the Novara Expedition with Dr Knight<sup>97</sup>, before he departed, and this was handed to Dr Schwarz, [page XI] along with mosses and lichens from Dr Knight. Also, ethnographic objects were handed over by Mr Graham from a Wesleyan missionary, and Mr Kressmann. Already on the second day, Schwarz was so mean as to express that Dr Fischer was an opportunist who knew nothing about medicine.

As a consequence of such meanness the Austrian gentlemen have fallen into severe disrepute amongst some of the people of Auckland.

Mrs Fischer says that she will write to the commodore and give him a hint and mention the matter, and Dr Fischer promised to write a satire about it for Frauenfeld to read out at the table.

[page 1]

16 January

First excursion to the Manukau Harbour and surroundings

(Named after the tree "Manuka" *Leptospermum scoparium*)

At 4 pm the four-seater dogcart was standing at Winch's Boarding House, ready to take me to my friend Reverend Mr Purchas in Onehunga, who had invited me to already come on Sunday evening in order that we might get away in a timely manner the following day.

My friend Haast accompanied me to Onehunga, in order to then take a walk on the return journey which he felt in need of. My servant Archibald Clarke was also with me. A fine Sunday afternoon, and what the English liked most about it was the nice breeze, while I must say that for me it was the opposite, an unpleasant strong wind, still from the southwest. The south-westerly died down at night. It is rather peculiar that this wind, which out at sea

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<sup>93</sup> Alexander Freiherr von Bach (1813-1893), Austrian Minister of the Interior, 1849-1859.

<sup>94</sup> George William Drummond Hay (1827-1881), surveyor in the Province of Auckland (Fig. 74), who went on to act as guide and interpreter to Hochstetter and party on a major survey expedition in the interior of the North Island.

<sup>95</sup> J G Kressman was likely a German residing in Auckland at the time.

<sup>96</sup> Andrew Sinclair (1794-1861), Scottish-born New Zealand colonial secretary, surgeon and botanical collector.

<sup>97</sup> Charles Knight (1808-1891), English-born New Zealand botanist, doctor and public servant.



must blow as a stiff breeze after sunset, dies down more and more on land, and dies down completely at night, but then returns with renewed intensity in the morning. Obviously, this is influenced by the relationship of the warming and cooling of the land and sea.



Figure 39: Arthur Guyon Purchas (1821-1906). Self-portrait cased ambrotype, 1859 (Hochstetter Collection Basel HCB 5.2.P17). Hochstetter credits Purchas with persuading him to stay on in Auckland when the *Novara* left. Purchas hosted Hochstetter overnight at his residence in Onehunga on 16 January and together they undertook a number of excursions around Auckland.

The distance from Auckland to Onehunga is approximately 7 miles, which one may easily walk in 1½ hours, or drive in one hour.

Onehunga is laid out on a large scale for a population of about 100,000 people, with an actual population of about 1000, mostly retired soldiers, who after seven years of service have received a small house and a piece of land from the government. On the future roads of the town, stock is still grazing at present. But only a few years ago this was still only a fern-covered wilderness. There are a Catholic church, a Wesleyan church, and an English (Anglican) church with a school house. The latter has been built solidly by Reverend Purchas using blocks of lava, and the former features a fine harmonium on which he played for us.

We used the evening to still visit a few geologically interesting spots in the vicinity:

No. 21.

1) Geddes Basin<sup>98</sup>, number 21 on Heaphy's map<sup>99</sup>, a tuff crater of almost regular circular shape, only on the southern side towards Manukau Harbour the wall rim is broken through. To turn this into a dock would take no more than to remove the mud which fills the crater basin, in order that at high tide it has no more than 8 feet of water, and to close the natural opening to the harbour with an artificial lock. And as I hear this is being planned. The circular wall is only about 15-20 feet high, steep on the inside but shallow on the outside running down towards the flat plain of Onehunga, and coming from here one does not realise that there is a crater there, meanwhile there is no doubt this was once a point of eruption. In the so called Westhorn of the basin, a quarry reveals regular alternating thin layers of mud and finer and coarser volcanic ash and scoria. In these layers are the occasional large blocks of lava, porous with olivine and fragments of Tertiary clay marl layers<sup>100</sup>, sure evidence of the fact that eruption is more recent than the Tertiary strata. The strata are angled at 5-10° regularly towards the outside, and one can follow them from the Westhorn to the sea and can see in the quarry here how the layers have broken down into loose grit, where they are exposed to the sea water are cemented together very firmly. The alternating layers of ash and mud almost appear to reflect the changes from low to high tide. In any case, the layers are separated by water, the ash eruption was submarine<sup>101</sup>, although there are large blocks of lava all around, no lava flow seems to have flowed from this point of eruption, instead the lava flows appear to come from Mount Smart and One Tree Hill.

No. 20.

2) Pond and Grotto, two crater-like deep depressions, similar to the Eifel maars, but are not eruption craters, more likely nothing other than collapsed lava caves<sup>102</sup>. The two holes lie in a north-south orientation, a section is something like the following:

[page 3]



Sketch 2: Profile of Grotto and Pond, Onehunga, now named Puke St Grotto and Hochstetter's Pond.

the southern hole, called Pond is perhaps 30 feet<sup>103</sup> deep, 100 feet in diameter, the steep sides formed of lava, the bottom is covered with water most of the year, namely in winter, and

<sup>98</sup> Now referred to as Te Hopua-a-Rangi/Gloucester Park.

<sup>99</sup> Charles Heaphy had prepared a rudimentary map of the volcanoes of Auckland in 1857, which he updated in February 1859, before submitting it to the Geological Society of London, where it was published (Heaphy 1860).

<sup>100</sup> Probably referring to the Waitemata Formation of early Miocene age that underlies Auckland (Edbrooke 2001).

<sup>101</sup> The volcanic ash layers that form the tuff rings of Auckland erupted on land although the eruption style was phreatomagmatic as a result of interaction between the rising magma and fresh groundwater or surface water (e.g. Hayward 2017).

<sup>102</sup> These are now known as Puka Street Grotto and Hochstetter Pond (a reserve) and still interpreted as collapsed lava cave roofs.

<sup>103</sup> The symbol for the imperial unit of measurement in the source has been represented by the word 'feet' in the translation.



is dry only during a few summer months. Two feet below the muddy surface of the bottom lies a thick diatomite deposit, from which white layers of infusoria<sup>104</sup>, siliceous infusoria, are deposited. The northern hole, called Grotto, is deeper, about 50 feet, also with steep lava walls, and about 80 feet wide, Grotto is always dry. On the western side, layers of tuff<sup>105</sup> appear at the upper edge above the lava beds, as at No. 21.

A shallow depression in the ground extends from the Grotto in a north-eastern direction for a few hundred yards, clearly suggesting the formation of the holes to have occurred by subsidence, the collapse of lava caves.

The entire lava field all around is covered with three to four feet of fertile soil, with the exception of individual large bare angular lava blocks. In the lava field at various points there are underground caves, which explain the origin of the phenomenon described under no. 20, and explain the lava banks - at times displaying more or less regular columnar form. From their crevasses springs of fresh water break out everywhere on the shore between Onehunga to the east on the road to Otahuhu and extending to Manukau Bay.

3) The spring close to the north-eastern edge of no. 21 is called Waihihi<sup>106</sup> meaning erupting water. The water gushes out in a strong stream at four different points, but without any gas developing. The water has no mineral aftertaste. I found the temperature of these and several nearby springs to be consistently 15.1° C. These springs provide Onehunga with the best drinking water, and if a large port city does not develop here, it is easy to use the water from these springs with the help of steam engines to pump it to parts of the city.

These springs all arise on the boundary of the lava flows and the underlying clayey strata of the Tertiary hills<sup>107</sup>.

[page 4]

At 9 o'clock in the evening Haast went back to Auckland and I was once again with Purchas in a simple pastor's family with a large number of children.

Rev. P[urchas] has a chair of exceptionally comfortable design that I will give a description of here, as far as possible, so that I can have a chair made according to this pattern one day.

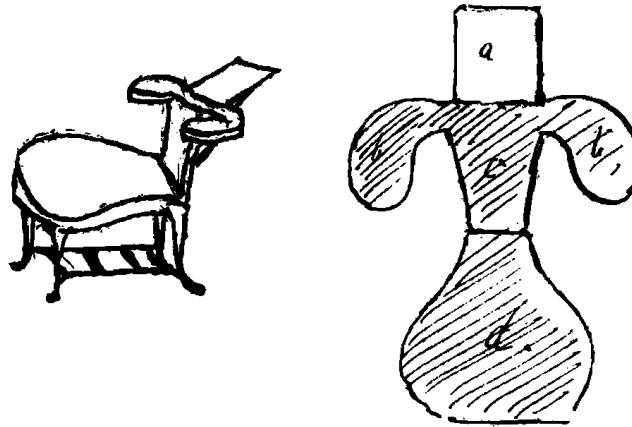
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<sup>104</sup> A basket term for freshwater microscopic life. The Hochstetter Pond diatomite deposit consists almost entirely of the siliceous skeletons of freshwater algae called diatoms.

<sup>105</sup> Nowadays considered to have been erupted from nearby Rarotonga/Mount Smart (Hayward 2017: 144).

<sup>106</sup> Waihihi punawai, later given the European name Bycroft's Spring because it was used to power Bycroft's flour mill on the site. The spring is still used to supply water to Onehunga.

<sup>107</sup> The spring water is sourced from rainfall on the lava flow field on the south side of One Tree Hill. It flows downhill through cooling cracks in the lava flows on top of the impervious weathered surface of the Waitemata Formation. On reaching near sea level the freshwater flows along on top of the denser sea water and gushes out as springs just above high tide level (e.g. Hayward 2017: 39).



Sketch 3: sketch and plan of chair belonging to Arthur Guyon Purchas.

Chair for sitting in two directions.

- a. small writing or reading table to flip back
- b. Armrest pads
- c. Back
- d. Seat

In the evening at 7 o'clock the coastal steamer for Taranaki, Wellington, Nelson, Canterbury, Otago had left the Manukau port; this steamer makes its return trip monthly. The steamer is small, 300 horsepower and has to endure the rough seas on the west coast.

### Monday, 17 January

A magnificent, glorious morning, a completely cloudless sky, the wind has also stopped, instead a light breeze from the south, which is extraordinarily refreshing. Captain Ninnis had provided provisions for tents and everything necessary; however, Captain Wing with the pilot boat could not meet us at the agreed time because he only piloted the steamer across the bar this morning. So, I decided to do another trip, to Mangere, to make use of the day. At 10 am we passed over a black lava bank that borders on the snow-white shell beach. A Māori settlement at the entrance here. Mangere village was not so long ago the seat of a Māori king. A carved stick I could not purchase at any price, since it belongs to the king<sup>108</sup> and anyone who sells it would lose his head. We entered some of the huts, the Māori people [page 5] were eating potatoes and dried Waikato eels. They name the eels Tuna, and the cooked and dried eel is called Tuna maroke. When travelling, large quantities of such eels are always hung up on flax in bundles of 20-30 pieces as provisions and taken with them. However, this is a far too fatty dish for European palates. The Māori teacher named Pamate, a fine tattooed man, gave me a detailed description of the tattooing process, of which I understand little. The operation is said to be most painful on the corners of the eyes, chin and ears, and the operation is never performed all at once, but after a small area is finished – how much depends on what the person concerned can endure – it is allowed to heal the spot completely. That's why you see a lot of half-tattooed people. The operation is only performed on adult individuals, but the custom is disappearing altogether.

Kupenga the fishing net of the Māori

<sup>108</sup> Reference to the Māori king Potatau Te Wherowhero (d. 1860).



Waha-a-ika the stick of accompanying form<sup>109</sup>



Sketch 4: Māori wooden weapon, known as a tewhatewha.

Patu-kohatu the chief's weapon made of black basaltic rock, like the one I own.

Patu-pounamu the valuable one made of the green shimmering stone<sup>110</sup> of the southern island.

Mangere No. 33 on the map, the mountain is a scoria cone about 500 feet high with 28-30° inclination, the crater of which is said to be almost completely preserved – I didn't take time to climb the summit. Lava flows are mainly in a northerly and westerly direction. An interesting tuff crater on the south side<sup>111</sup>.

No. 33c, which is open to the southwest, so that the tide covers the crater floor with water, and only a very small island, only 6-8 feet high, the crater rim about 30 feet high, lies above the water level in the middle of the circular bay. But even on this small crater island, the crater-shaped depression can still be seen quite clearly. From there along the beach, where on the [page 6] hightide mark outcrops of the lignite deposits<sup>112</sup> of the Drury and Papakura area appear, towards Captain Haultain's Farm. Captain Haultain<sup>113</sup> is a very nice man, with whom I not only drank the best coffee I've ever had in an English house, but who also promises me before my departure from his excellent fern collection to give duplicates of everything I don't already have. Captain Haultain then accompanied us to some very interesting points in the area.

<sup>109</sup> Hochstetter appears to have confused the term wahaika, a shorter club-like wooden weapon, and tewhatewha as depicted in his sketch.

<sup>110</sup> Pounamu or nephrite jade, known also as greenstone.

<sup>111</sup> Mangere Lagoon.

<sup>112</sup> Belonging to Pleistocene Tauranga Group.

<sup>113</sup> Captain Theodore Minet Haultain (1817-1902), soldier, politician and farmer (Fig. 40).

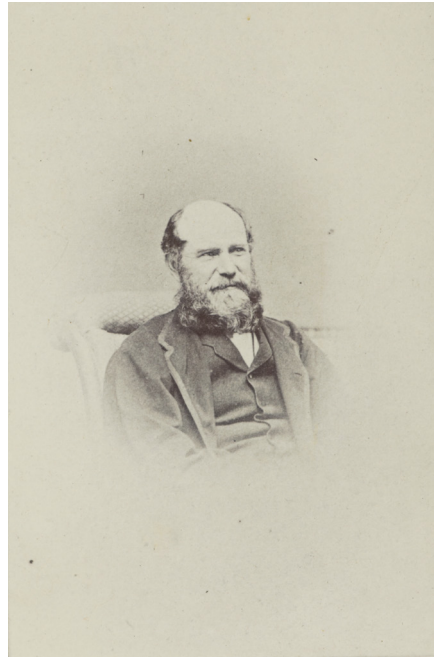


Figure 40: Theodore Haultain (1817-1902). Copy photographic print (Puke Ariki PHO2011-2289). Hochstetter visited Haultain at his farm on the crest of the Waitomokia tuff ring on 17 January. Haultain showed him around and gave him “the best coffee he had ever drunk in an English house”.



Figure 41: William Boulton, *Plan and Section of the Mangari Mountain*, 1859. Ink, pencil and watercolour on paper, 770 x 1070 mm. Scale 20 chains to 1 English mile (Universitätsbibliothek der Humboldt-Universität zu Berlin, Historische Geographische Sammlung: A 72-08). After Hochstetter visited Mangere Mountain on 17 January, Boulton was commissioned to prepare this detailed plan.





Figure 42: Ferdinand Hochstetter, *Manukau Harb[our]*. Sheet No. 3: *Shewing the Big Muddy Creek, Onehunga Village, Mangarei, Ihumatau and Pukaki C[ree]k*. Scale one inch to one mile. January 1859. Watercolour, ink and pencil on mounted tracing paper, 280 x 280 mm (Hochstetter Collection Basel HCB 3.2.1)

The most interesting of all is No. 35 Waitomokia. Had Leopold von Buch<sup>114</sup> seen this true model of an elevation crater with an eruption cone in the middle, he would have laughed triumphantly at all opponents of his theory. It is decidedly the most instructive of all the remarkable tuff craters. In the middle of a swamp whose black peat bog soil is surrounded by a lush green ring of reeds, there rises an 80-100 feet high eruption cone, a real scoria cone, with two crater-shaped depressions. The southern one is closed round, but the northern one is open towards the North, the cone therefore appearing more as a group of small mounds<sup>115</sup>, which could not have been better chosen by the Māori for a fortified pā. For the whole system

<sup>114</sup> German geologist Leopold Freiherr von Buch (1774-1853).

<sup>115</sup> These were in fact three small scoria cones, now all quarried away (Hayward 2017: 264).



is indeed a natural fortress. The tuff rim is the outer rampart, the swamp is the moat, and the eruptive cone, terraced in the same manner as all similar hills at Auckland, the inner fortress. Captain Haultain is busy drying out the swamp and for this purpose has dug ditches 8 feet deep, but without reaching the bottom of the peat formation at this depth. Mighty tree trunks lie buried and well preserved in the peat, [page 7] evidence that the swamp surrounding the cone was once covered with forest. The walls of the tuff crater rise steeply from the swamp to 50-60 feet high, on the southern edge of which Captain Haultain's home is standing. The tuff layers, flattening outwards at 4-5°, form a perfectly regular, flat cone, over the stepped surface of which the inner eruption cone just projects. Individual blocks of basalt and individual genuine volcanic bombs lie scattered on the surface of the elevation crater. The system of well-layered scoria that make up the tuff crater is well exposed on the steep wall of Oruarangi Creek, which cuts south into the circle of the tuff crater. The volcanic layers lie above light clay marl and consist of coarser volcanic detritus at the bottom, which gradually turns into finer, completely sandy ash layers at the top. Higher up in the creek there are tuff layers on both sides of the creek, but then at a bend in the creek, on the left there are compact masses of lava flows<sup>116</sup> on the southern shore, the stratified tuffs on the right.

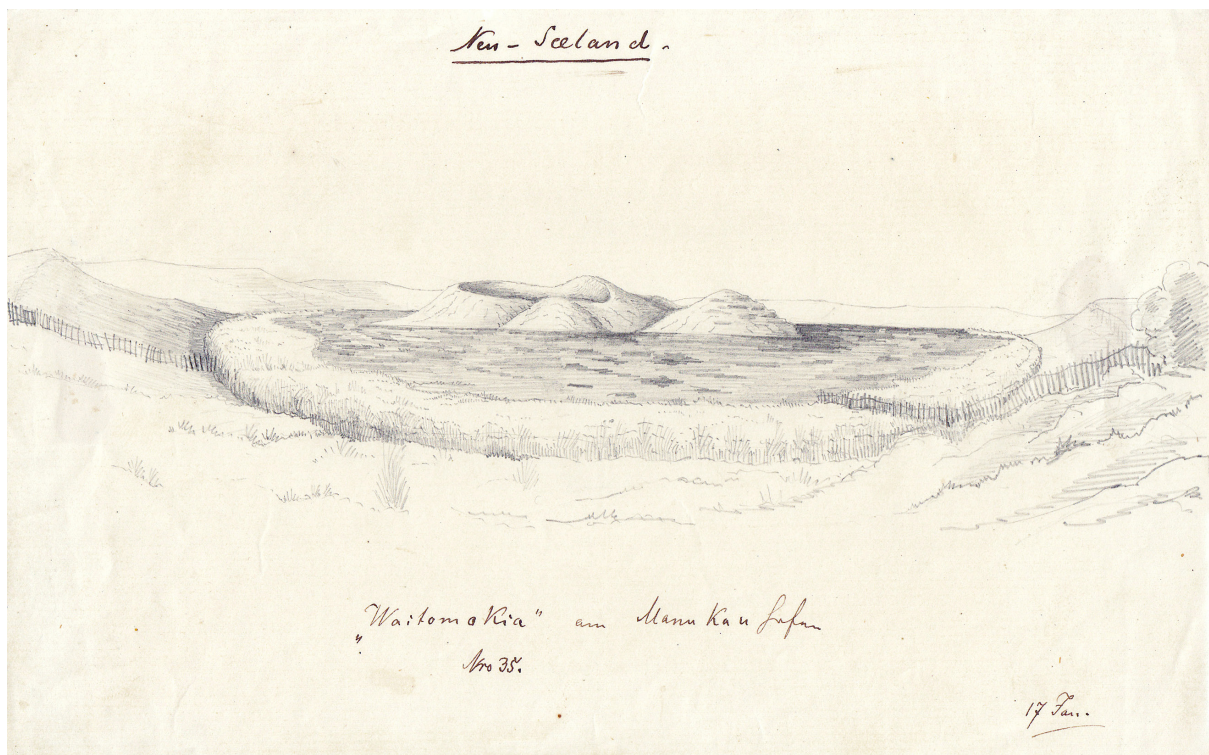


Figure 43: Ferdinand Hochstetter, *Neu-Seeland*. "Waitomokia" am Manukauhafen. Nro. 35 [New Zealand. Waitomokia on the Manukau Harbour. No. 35] 17 January 1859. Pencil on paper, 140 x 224 mm (Hochstetter Collection Basel HCB 3.2.25). View from the northeast.

South of Waitomokia there are three other not uninteresting eruption points:

No. 36. Pukeiti a very low, small but regularly shaped cone with an extremely regular crater depression. This crater, the most regular of all that I have seen, is 130 paces in circumference, and 10 feet deep. As small as the cone is, powerful lava flows seem to have flowed north from it.

<sup>116</sup> Lava flows from Pukeiti Volcano.





Figure 44: William Boulton, *Plan and Section of the Oruarangi Craters*, 1859. Ink, pencil, and watercolour on paper, 600 x 1060 mm. Scale 5 chains to 1 inch (Universitätsbibliothek der Humboldt-Universität zu Berlin, Historische Geographische Sammlung: A 72-10). Hochstetter was enthusiastic about the features of this volcano (Waitomokia) in his diary when he visited on 17 January. William Boulton was later commissioned to prepare this more accurate plan.

South of this is No. 37. Otutaua, a very steeply rising scoria cone, an ancient Māori knight's castle. Half a crater, the western half [page 8] missing, mighty streams of lava flowed towards the sea in this direction<sup>117</sup>. Considerably higher than No. 36, perhaps 350 feet above sea level. Further south:

No. 38. Mount Maungataketake, the tallest and most extensive of this series, surrounding lava flows. The summit maybe 500 feet above the sea. However, I have not climbed this peak.

Also, I couldn't find time to visit the nearby completely volcanic Island Puketutu No. 34 or Weekes Island. To visit this one may wade through the mud at low tide<sup>118</sup>.

Transferred from Mangere in a canoe by the Māori people, late in the evening we reached Onehunga again, I was very pleased with the results of the day, I was indebted to Captain Haultain's volcano, for shedding light on the formation of these tuff craters with sunken scoria cones, peculiar to the Auckland region.

### Tuesday, 18 January

Early in the morning I received a letter from Captain Wing to say that he was waiting for me at Onehunga Pier with his whale boat to start our tour around the Manukau. The weather was extraordinarily favourable, I couldn't have wished for a nicer day, there was no wind at all, the morning fog lying far and wide over the flat area had disappeared around 9 o'clock, and the sun was shining brightly in a cloudless sky on the perfectly calm water of the Manukau Gulf, it was so calm as I have never seen it, obviously ideal for me and my purposes. Our baggage and our provisions were quickly accommodated in the excellent boat, five Māori took the oars [page 9] and swiftly we travelled along the north side of the harbour.

<sup>117</sup> West flowing lava flows had rafted away the western side of the breached crater.

<sup>118</sup> Today road access is provided by a causeway.

What I was able to observe from the boat, I wrote on the map. The first change in strata seemed to me to be at the promontory between Little and Big Muddy Creek, hence the first landing. The profile that the coastal erosion shows is the following: at the bottom, the strata of the Auckland Tertiary formation<sup>119</sup> in regularly horizontal beds, light yellowish-white sandstone and marl<sup>120</sup> beds above, here 20 feet thick, a bed of volcanic breccia<sup>121</sup>, with small fragments of the most diverse trachytic<sup>122</sup> rocks, among which the iron-oxide red ones in particular stand out brightly. This fine-grained breccia, or tuff, if you will call it that, is overlaid with red clay<sup>123</sup>. Big Muddy Creek appears to be an interesting point worthy of further investigation. But we hurried to reach the Puponga Peninsula, which protruded far into the Manukau harbour, all the more so when, at about 1 o'clock, a very fresh sea breeze rose from the west-south-west at the same time as the incoming tide, which with the tide countered our onward journey from Puponga Point in the channel exposed to the ocean and into Manukau Harbour in the direction of Captain Wing's house<sup>124</sup> threatened to make it very difficult.

On the north<sup>125</sup> side of Puponga in a small completely sheltered bay<sup>126</sup> we landed for the second time to rest and eat. By the time the potatoes were roasted, I had time enough to examine the hulking masses of rock of a very coarse trachyte breccia that make up the eastern<sup>127</sup> half of the peninsula. Pieces of trachyte sharp-edged, angular, not a single one rounded, of all sizes up to 4 and 6 feet [page 10] of all colours, red, green, brown, black, some with very neat little augite crystals are extraordinarily firmly cemented in these rock masses. This is the beginning of the massive volcanic rocks<sup>128</sup>. Trachyte breccia, at least 1000 feet thick at the north head.

Compare section. Huge deposits in which no layering can be seen. Passing along the beach from the projecting corner of rock at Karangahape Bay, where at an ill-chosen point the plan for a town named Cornwallis was laid down<sup>129</sup>, one comes successively to the following deeper strata.

1) Clay layers sometimes red, sometimes white, but predominantly ferrous, which have the character of decomposed tuffs.<sup>130</sup>

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<sup>119</sup> Waitemata Sandstones (Formation), later named this by Hochstetter.

<sup>120</sup> Hochstetter uses the German term for marl when describing what we now call mudstone; the term marl is restricted to muddy limestone, which are seldom present in the Waitemata Sandstones.

<sup>121</sup> Now referred to as Parnell Grit, a unit seen by Hochstetter in several places around Auckland.

<sup>122</sup> A widely used term in the nineteenth century for igneous rocks with visible elongate crystals of feldspar, but seldom used today. These rocks are andesite.

<sup>123</sup> From deep subtropical weathering of the breccia.

<sup>124</sup> At Whatipu, on the north side of the entrance to the Manukau Harbour.

<sup>125</sup> Strictly east side.

<sup>126</sup> Now site of Cornwallis Wharf.

<sup>127</sup> Strictly southern part.

<sup>128</sup> Early Miocene Piha Conglomerate (Hayward 1976) that forms the uplifted, eroded remnants of the eastern submarine slopes of the giant Waitakere Volcano (e.g. Hayward 2017: 109-117).

<sup>129</sup> In 1841, the New Zealand Manukau and Waitemata Company landed immigrants from the United Kingdom here to establish a settlement. It lasted but a few years before being largely abandoned.

<sup>130</sup> Layers 1 and 2 are partly weathered iron sand deposits of the Pleistocene Kaihu Group (Edbrooke 2001). Some of the titanomagnetite grains have been altered to rusty iron-oxide and others are unaltered.



2) Rust-coloured quartz sandstone very friable, very peculiar black sprinkled with ferrous magnetite, a very characteristic layer, from which the heavy black ferromagnetic sand in the bay originates, about 10 feet thick.

3) The Auckland tertiary formation of soft light sandstone and clay marl, but at the bottom there are beds of a very peculiar kind. Conglomerates of pudding-like colourful appearance, consisting mainly of round unworn boulders of a light clay marl, only the size of a hazelnut, but also the iron oxide red pieces in it<sup>131</sup>.

A Christmas tree<sup>132</sup> here measuring 24 feet in circumference.



Figure 46: Ferdinand Hochstetter, *Manukau Harb[our]*. Sheet 5. *Shewing the Heads, Te Huia, Kakamatua, and Nihotupu Creeks*. Scale one inch to one mile. January 1859. Watercolour, ink and pencil on mounted tracing paper, 280 x 280 mm (Hochstetter Collection Basel HCB 3.2.2). These sections of coast were explored by Hochstetter on 18-21 January.

<sup>131</sup> Early Miocene Cornwallis Formation containing a mix of rounded pebbles of white mudstone and red-weathered volcanic rock types (e.g. Hayward 1976).

<sup>132</sup> Pōhutukawa, *Metrosideros excelsa*, possibly the same tree still growing near Cornwallis Wharf.



The shoreline up to the bay on the Huia where we pitched our tents<sup>133</sup> for the night gave me the same profiles. Everywhere the lodestone-bearing<sup>134</sup> sandstones over the Auckland tertiary formation, and over these sandstones the reddish clays looking like decomposed tuffs, and over them<sup>135</sup> the trachyte breccia, forming high rocky peaks.

First night in the tent.

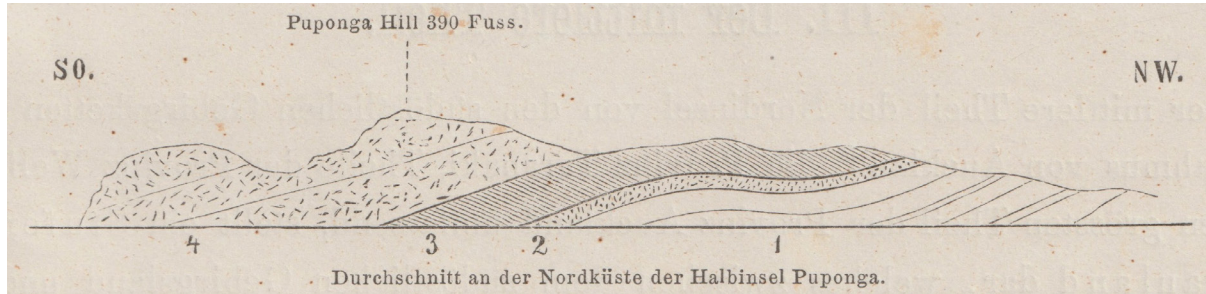


Figure 45. Ferdinand Hochstetter, published cross-section on the north coast of Puponga Peninsula derived from Hochstetter's notes during his visit on 18 January (Hochstetter 1864: 17). Hochstetter appears to have switched the stratigraphic order from his diary where unit 1 in the diary = unit 3 (above) and unit 1 = unit 3 (above). Unit 4 (above) = trachyte breccia.

[page 11]

### Wednesday, 19 January

A glorious morning, completely calm. Although I had been deprived of all sleep by one of our bed mates, who snored terribly, and by countless mosquitoes, which gradually found their way into our tent, I still felt excellent after pouring fresh spring water over myself. Prepared a cup of coffee and ate a few eggs, completely refreshed, and strengthened for the day's work.

At 9 o'clock we went to Huia Bay, definitely the most beautiful and romantic part of the entire Manukau Harbour. Deep wooded gorges with vertical cliffs. High sharp peaks, beautiful streams, and rivers full of the purest spring water; a wild, torn mountain landscape covered with primeval kauri forests and at the mouths of two streams that flow out of the mountains were sawmills<sup>136</sup>, fire and sword at work conquering the primeval forests.<sup>137</sup> In addition, the beautiful, glorious morning, calm air and sea. We visited the sawmill at the north end of the bay. The forests are attacked here according to Canada's system; a wooden track is laid along a watercourse from the sawmill five miles into the heart of the forest, on which the huge kauri trunks are taken to the sawmill. We walked along the tramway, beautiful views of the forest on both sides, as lush and beautiful as in the Papakura district.

<sup>133</sup> Possibly Foster Bay.

<sup>134</sup> Lodestone refers to magnetic titanomagnetite grains that give the unweathered sand its black colour.

<sup>135</sup> With limited exposures of rock, Hochstetter mistakenly inferred that the Pleistocene black sandstone deposits underlay the Early Miocene Piha Conglomerate, which formed the high peaks.

<sup>136</sup> In 1859 there were two operating sawmills in Huia Bay at the mouths of Huia and Karamatura Streams (Diamond and Hayward 1980: 8-12).

<sup>137</sup> Here Hochstetter is using distinctly poetic romantic language to describe the harvest and destruction of the indigenous forest in an area he has described as being most beautiful and romantic.





Figure 47. Joseph Michael Foy (1847-1923), Cornwallis Saw Mill Bush, 1867 (Alexander Turnbull Library 1/2-046670-F). Horses hauling log on tramway similar to that in the nearby Huia Valley, visited by Hochstetter on 19 January.

The creek banks bared the deeper strata of the mountains here rising to 1000 feet high, nothing but soft tuffaceous sandstones<sup>138</sup> of grey or greenish colour without fossils. The creek itself carries huge unworn blocks of trachyte, which no doubt come from the trachyte breccia which forms the rugged rocky peaks of the mountains. On the banks of the main river<sup>139</sup>, which are partially dammed<sup>140</sup>, the mill is powered by a water wheel. Behind the sawmill on the right bank of the river next to the mill canal are fine-grained, yellowish-white, crumbly tuff sandstones, on the left side the water falls into a natural riverbed over about 10 feet high sandstone steps<sup>141</sup>. The sandstone here is thinly layered, plate-shaped and coloured red by iron ore at the top, covered by clay that is intensely red due to iron oxide, in which many [page 12] trachyte blocks lay. In places, this conglomerate is extremely firmly cemented. This conglomerate is nothing other than a modern scree formation limited to the bottom of the river. We were back at our camp site around 11 am and then made our way to North Head<sup>142</sup> on foot over the hills. The path is a 'native path', a path of the Māori, which only a few Europeans will have traversed, and which without a Māori as a leader who knows it well, no one should dare to travel without the danger of getting completely lost in the forest-covered mountains and gorges, and a real risk to life. The path cannot be recognized at all in places and leads over the steepest highest peaks exactly where one should least expect a path, arduous, since one literally has to slip through the forest, climb over the rocks, but extremely romantic, and rewarding because of the magnificent views that one has from time to time of the jungle-covered mountains and the sea. The lower slopes of the mountains still consist of soft sandstone, then red decomposed argillaceous strata, until one arrives at the hard rocky

<sup>138</sup> Nihotupu Formation weathered volcanic sedimentary rocks (Hayward 1976).

<sup>139</sup> Huia Stream.

<sup>140</sup> Referring to the mill holding dam which provided the head of water to power the 4 m-diameter, 3-m-wide waterwheel (Diamond and Hayward 1980: 10).

<sup>141</sup> Just downstream from the swing bridge that crosses the Huia Stream below the Lower Huia Dam.

<sup>142</sup> Whatipu.

masses of trachyte breccia, which form the rounded highest peaks. At some points the rock was more phonolitic slate<sup>143</sup> than trachytic. The primeval forest is kauri forest, the kauri trees do not form closed stands like our conifers but alternate with other tree species. The long lines of fern trees looked particularly beautiful, stretching through the forest like corridors or veins with their light-green fronds magnificently projecting against the dark masses of kauri crowns. The kauri is somewhere in the middle between hardwood and softwood, its crown is somewhat reminiscent of the crowns of our noble firs. At 1 o'clock we camped at a small stream in the middle of the jungle in the so-called Destruction Gully, so called by the butchery between two groups of Māori, which is said to have taken place here<sup>144</sup>. A half-rotted hut marks the place as a Māori encampment, various pretty ferns all around. We were amazed not to find any mosquitoes here. From there we continued our travels along the path and reached Captain Wing's albatross nest at 5 o'clock. We were all so hungry and tired that our thoughts went no further than eating and then sleeping. That is how it was. The wind in the evening from northwest.



Figure 48: Joseph Michael Foy (1847-1923), Huia Mill, 1867 (Auckland Libraries Heritage Collections JTD-07L-03817-1). Hochstetter visited here on 19 January and described the waterwheel and nearby rocks.

<sup>143</sup> Probably a misidentification of platy-jointed finely crystalline andesite flows.

<sup>144</sup> Ngati Whatua chief Kawharu led a campaign of retribution against the Kawerau pā down the Waitakere coast in circa 1700, culminating in the bloody event here (Diamond and Hayward 1979: 5).



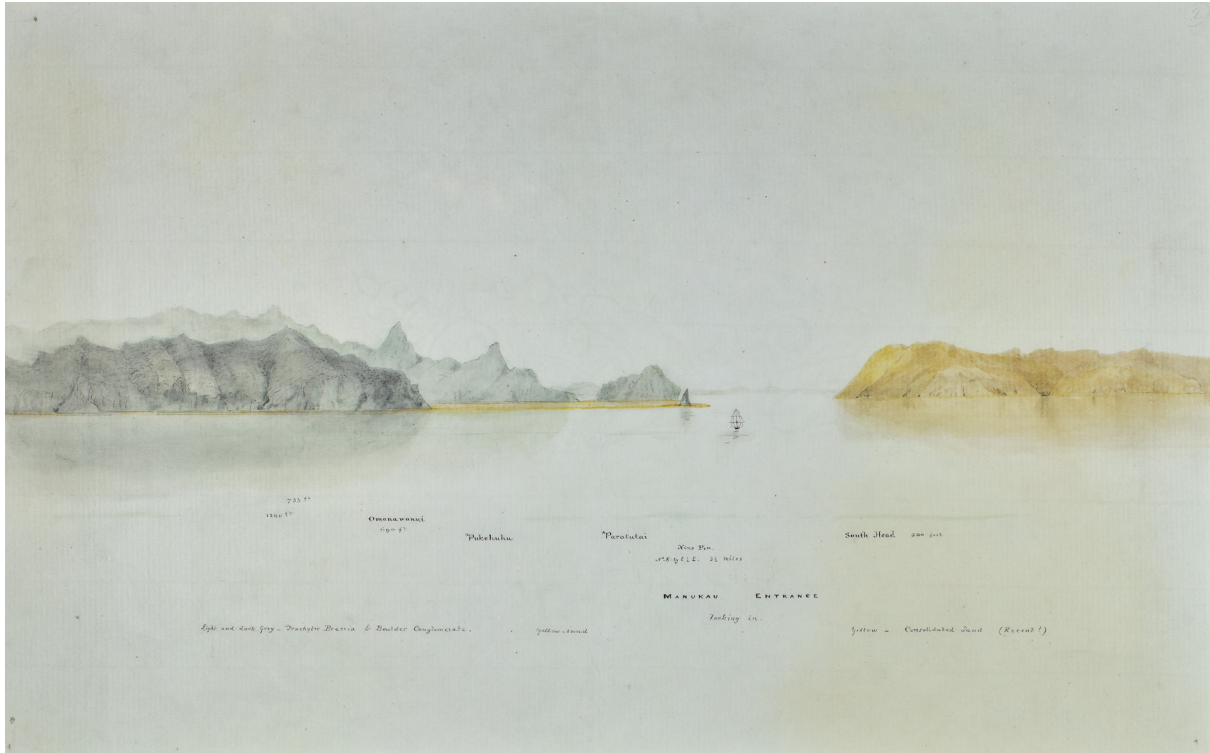


Figure 49: Charles Heaphy, *No. 4. Manukau Entrance*. Watercolour, ink and pencil on paper, 250 x 390 mm. Number four of seven watercolours prepared to accompany his paper sent to the Geological Society of London in 1859 (Geological Society of London LDGSL 209/04). This section of coast was explored by Hochstetter on 20-22 January. View from offshore to west.

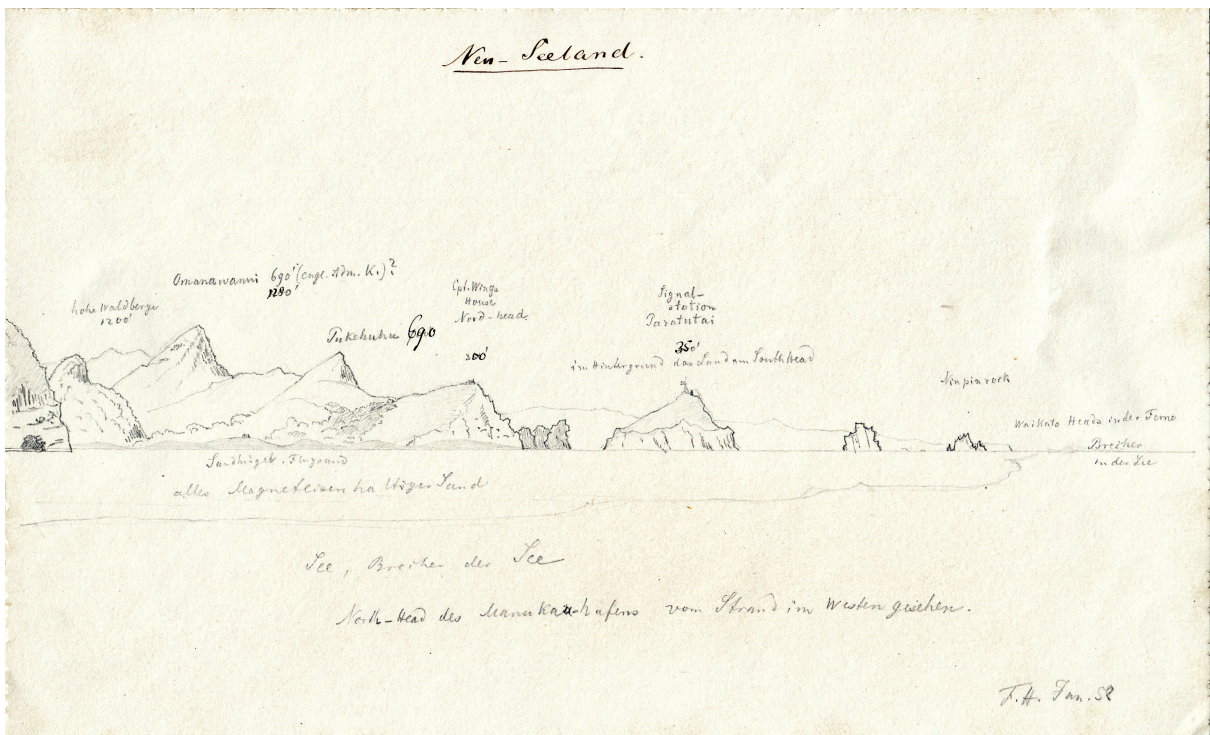


Figure 50: Ferdinand Hochstetter, *North-Head des Manukau-hafens vom Strand im Westen gesehen* [North head of Manukau Harbour viewed from beach in the west], January 1859. Pencil and ink on paper, 140 x 230 mm (Hochstetter Collection Basel HCB 3.2.28).

### Thursday, 20 January

Mostly cloudy sky, with a weak breeze from the northwest, a little rainy in the morning, but then clearing up again, and quite clear for a few hours at noon. The day was utilised to explore the surroundings of Captain Wing's lofty castle on the rocks<sup>145</sup>. So, after a hearty breakfast, we climbed down the steep cliffs on the side towards the signal station<sup>146</sup>, almost a breakneck path over the rugged and sharp rock masses of trachyte breccia, but down on the seashore everything was fine brown sand mixed with a lot of ironsand, to a sizeable heap blown together by the wind, in places even deposited in quite regular thin layers, 8-10 feet thick. It is peculiar how the drifting sand, I might almost say crater-like, surrounds individual outstanding rocky cliffs<sup>147</sup>.

Just the first cliff below Captain Wing's home interested me. The first vein mass through the breccia that I saw. A dike approximately 1½ feet wide, a black dense basaltic rather than trachytic looking aphanitic rock<sup>148</sup>, with imperfect columnar outcrop striking south-north, dip 40° East. The dike divides upwards into two thinner veins through the breccia. We followed the west shore from Wing's residence about three miles up to a lagoon between the sand dunes of the beach where Wing found a moa bone which he gave to me. The whole coast beyond the small Parera<sup>149</sup> island – so far I could see nothing but 4-500 feet high bare vertical rock faces. Absolutely everything is trachyte breccia in thick, generally horizontal beds, in places the beds inclined 10° to the north-west. Calcareous spar veins through the breccia.



Figure 51 (upper): Ferdinand Hochstetter, rock described in diary on 20 January, at the foot of cliffs below Captain Wing's home, Whatipu (Dr Albert Schedl Collection, Vienna); (lower): woodcut illustration (Hochstetter 1864: 16).

<sup>145</sup> The signalman's house was located atop Wings Head, the high hill on the mainland opposite Paratutae Island.

<sup>146</sup> On top of Paratutae Island.

<sup>147</sup> There is often a gap between wind-blown sand dunes and the base of cliffs created by wind eddies.

<sup>148</sup> Referring to a fine-grained rock texture where individual crystals can only be seen with magnification.

<sup>149</sup> Paratahi Island, south side of Karekare.





Figure 52 (upper): Ferdinand Hochstetter, sketch of cliff section at Whatipu described in diary on 20 January (Dr Albert Schedl Collection, Vienna); (lower) woodcut illustration (Hochstetter 1864: 16).

Thick dikes intersect well-bedded breccia beds, trending south-southeast to north-northwest and dipping  $45^{\circ}$  to the east. This is the prevailing strike direction of the dikes that can be seen in the rocks with [page 14] deep caves<sup>150</sup> washed out by waves; protected by sand dunes, and on the ground at the back of the caves it is not uncommon to find piles of boulders. All this points to a time when the surf washed over the rocks themselves and deposited boulders in the back of the caves. Now these caves are a safe night camp for Captain Wing's cattle<sup>151</sup>. At noon a walk to the deep creek gorge<sup>152</sup> that cuts the ridge on its southernmost promontory where Captain Wing's house is located, separates from the west coast. At the mouth of the valley on the sea side mighty sand dunes are piled up two and three in a row, overgrown with interesting sand grasses, all ironsand. Behind the sand dunes are narrow fertile alluvial terraces, used by Wing for vegetable cultivation. Found some interesting ferns in the gorge. Captain Wing not only has the loveliest black tomcat with a golden-yellow brass collar that I have ever seen, who lives in the woods when Wing is gone and as soon as the master comes home, plays the lapdog, but also pigs who like dogs run after the master to obey the call and instead of wagging their tails grunt happily and move their ears. Captain Wing owns the most beautiful bull I have seen in the colony so far, beautiful cattle and sheep, which are everywhere scattered on the rocky cliffs. A detailed description of Captain Wing's house and farm would make a beautiful romantic genre picture of New Zealand. Captain Wing said he was not very happy with the latest assessment of the Manukau Harbour entrance. He considers the southern channel to be perfectly secure<sup>153</sup>. The breakers do not always give

<sup>150</sup> Whatipu stranded sea caves are a popular tourist attraction, in the abandoned sea cliffs just north of Whatipu Valley mouth.

<sup>151</sup> Later a dance floor was built inside the largest of these sea caves by workers from Whatipu Sawmill.

<sup>152</sup> Whatipu Stream gorge.

<sup>153</sup> Four years later the Manukau Harbour bar was the site of New Zealand's worst shipwreck on 7 February 1863 with 189 lives lost. On a calm day, the ship used an old chart and took the wrong channel through the bar, despite warnings from the signalman.

signs of dangerous sandbanks, because when the water was high and the sea calm, like this morning, there were no breakers to be seen anywhere far and wide.



Figure 53. Captain Thomas Wing (1810-1888). Wing was pilot at Manukau Harbour mouth when Hochstetter's group stayed in his house on the top of the hill overlooking Whatipu, on 19 and 20 January (Hocken Library).

[page 15]

### **Friday, 21 January**

All [night] I heard the wind whistling over the house that sheltered us so hospitably, and when at daybreak I saw from our high vantage point over the mountains and the sea, it was not at all as if we would be able to do anything today. A strong north-west wind drove heavy rain clouds from the sea over the mountains, the sand bars in front of the Manukau Harbour broke violently, it looked "rough" in the full sense of the word, and when we sat down for breakfast at 8.50 am, we made the decision to give up on continuing our tour today. But at about 9 o'clock the wind turned to the west, the sky cleared up completely in half an hour, the sun shone so splendidly, the wind had also died down. The boat was quickly ready, we climbed down the steep cliff, and sailed over to the South Head at 10 o'clock. It's strange the big difference between North and South Head. On the north side rugged densely forested mountains, bold sharply pointed cones, all from top to bottom dark trachyte breccia, hard rock masses, made to resist the onslaught of the waves for thousands of years. The South Head is all sand<sup>154</sup>, drifting sand blown up to 500 feet by the wind on the precipitous slope, 580 feet high, called Mahanihoni<sup>155</sup> by the Māori, and the mountains themselves of soft layers of sand and clay in regular horizontal layers, a sterile tableland above, without forest.

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<sup>154</sup> An uplifted huge sand dune barrier that built across the mouth of Manukau Bar during the Pleistocene Ice Ages.

<sup>155</sup> Highest point of Manukau South Head.



The whole west coast, south from the entrance to Manukau Harbour to the Waikato Heads, consists, as far as one could see, of the same horizontal strata of alternating sandstone and argillaceous strata. Captain Wing landed me on the steep slope where I was able to observe the following strata as I laboriously climbed.

[page 16]

Layer sequence at the south head of Manukau Harbour at the Mahanihahi precipice, height 580 feet.

From the top:

- 1) Sand and argillaceous layers, alternately light yellow in colour, the sandstone, genuine quartz sandstone, nothing tuffaceous
- 2) 2 feet the sandstone white, more honey and yellow, greasy clay marl, when dry, similar to sepiolite/meerschaum<sup>156</sup>, a layer that reminds me of the Nicobar Island clay marl<sup>157</sup>.
- 3) Green fine ferromagnetic sandstone in thick beds 10-12 feet
- 4) 2-3 inches<sup>158</sup> bituminous sandy shale<sup>159</sup>, very thinly schistose
- 5) Yellow-brown or red-brown ferrous sandstone, sprinkled with iron sand, a very characteristic layer that stretches all around the south side of Manukau Harbour, easily friable, the sandstone is more quartz than clayey, this sand extends down to the level of the sea.

The wind has piled up sand drifting all the way up the slope, the ferromagnetic brown sand that forms the wide sandy beach along the west coast on either side of the harbour entrance. The drifting sand reaches up to 500 feet high, almost to the top of the mountain range.

We struggled because Captain Wing sailed ahead with the boat to get along the shore at high tide to a small bay where the boat awaited us. Not far from here we passed the Māori village of Ahuitu (Awhitu)<sup>160</sup>, where hundreds of sharks were hung up to dry on the beach, a favourite dish of the Māori. The land gets lower from the west coast, the steep edge of the shore here only about 100 feet high, the red-brown iron sandstones are overlaid by lighter argillaceous sandstones in regular horizontal layers [page 17] form the uniform geological structure of the whole embankment. We reached Mr. Graham's and Logan's place near Kauri Point<sup>161</sup> at around 2 o'clock. Up to here, Captain Wing was able to take us by pilot boat. The steamer from Sydney, which is due to depart tomorrow, obliged him to return to his station today to be in position, and so we disembarked on the beach here with all our belongings. Mr Graham was unfortunately away with his schooner, having sailed to Papakura this morning and we didn't take advantage of this opportunity that was supposed to bring us to Waiuku, so had to stay here. Mrs Graham kindly gave us good quarters and I used the afternoon after the captain sailed back with low tide in order to observe some sections along the beach.

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<sup>156</sup> Clay mineral of sedimentary origin, often used in the nineteenth century for making meerschaum smoking pipes.

<sup>157</sup> This is a layer of white rhyolitic ash that erupted from the caldera volcanoes in the centre of the North Island.

<sup>158</sup> The symbol for the imperial unit of measurement in the source has been replaced by the word 'inches' in the translation.

<sup>159</sup> A black lignite layer (not schistose) formed as a thin soil horizon between successive sand dunes.

<sup>160</sup> "Awhitu Native Village (deserted)" is shown on Admiralty chart No. 1117, *Entrances to Manukau Harbour*, 1853, in what is now Wattle Bay.

<sup>161</sup> Between Big Bay and Grahams Beach.

The salient point on the coast, called Papaotuwaka<sup>162</sup> by the Māori, shows the following strata from top to bottom at about 60 feet high vertical drop:

- 1) White argillaceous sandstones sometimes tinged reddish or yellow, 10-12 feet.
- 2) Banded, variegated clays in thin layers, alternating red, yellow, and white, 2 feet.
- 3) Ferruginous sandstone yellow, more quartz than clayey, 12 feet.
- 4) Bituminous layers, apparently very young, very young lignite<sup>163</sup>, nothing similar to the brown coals of the Drury District.
- 5) Mighty beds of 18-20 feet stippled iron sandstone.
- 6) Clay and sandy marl in thin layers, 6 feet.

Then the water level.

All sandstones and clay very soft and crumbly, a little further south a creek with recent peat formation.

The beach in parts is completely pure quartz sand, with completely clear transparency. White quartz sand with patches of black ironsand on top.

[page 18]

Motifs for a picture of the Manukau Harbour.

Māori sailing in their canoes with two sails, the steamer at anchor at White Cliff<sup>164</sup>, schooners sailing, but not a single larger sailing ship or merchant vessel. At Huia Bay, a small coaster that wants to go to Taranaki, a trip that can be done in 12 hours with good winds, has been waiting for favourable winds for 5 days and does not go out despite the best weather and despite the signals from Wing's signal station. Kawau birds<sup>165</sup>, white-breasted, black-backed, with long necks, stand like penguins on the rocky cliffs at projecting corners, which are named after them, they look curiously at the boat, turning their long necks to and fro, and then flutter up. Rows of long-legged, long-billed grey snipe-like birds on the sandy beach. Altogether a dead deserted appearance, three channels leading to three different creeks<sup>166</sup>. At low tide between the deep channels brown sand and mud beds, in the channels always moving water, low tide out, high tide in, sharp winds from west and south-west throw up foaming waves, and the Manukau Harbour is notorious as rough water. This is probably the reason why there are no real boats in the whole harbour. Forest on one side on steep rock masses, sawmills, Canada system in the Huia poor clay marl country on the other side overgrown with ferns. Columns of smoke rise from fire on both grounds, fire in the jungle, fire in the bracken. Coal is the potential lifeblood of Manukau Harbour, there hasn't been a merchant vessel in the harbour for years. [page 19] Individual scattered settlements of Europeans and Māori all round. Māori people's fires by night.

The humble family, who received us so hospitably, did everything to make our evening pleasant. The woman told me her fate, how she suffered shipwreck on the voyage from Victoria to New Zealand in the Bass Strait and lost all her belongings and hardly saved her life, which she does not like at all here, and that she would like to go back to Victoria. An

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<sup>162</sup> "Papaotutawaka Pt" is shown on Admiralty chart No. 1117, *Entrances to Manukau Harbour*, 1853.

Prominent point south of Grahams Beach, labelled as Papaotutuwaka on New Zealand Lands and Survey NZMS 13 map of 1931.

<sup>163</sup> Pleistocene soil and swamp layers within sand dune sequence.

<sup>164</sup> Two km west of Onehunga.

<sup>165</sup> New Zealand shag species, most likely New Zealand Pied Shag (*Phalacrocorax varius varius*).

<sup>166</sup> Wairopa, Papakura and Waiuku Channels.



excellent bed was given to me for the night, and when I went to bed the woman played a music box so that I could fall asleep to the music.

### **Saturday, 22 January**

The big question is how to get from Kauri Point to Waiuku, a distance of about 18 miles by water, but maybe three times as far by land, if it is at all possible, was solved in the best possible way by an extremely fortunate coincidence.

After an extremely heavy rain shower at 5 am in the morning combined with such strong gusts of wind that I thought the wooden house would be swept away with it, the schooner *Sea Belle* came into sight on the way from Onehunga to Waiuku. Since the channel passes close to Kauri Point, we were able to call out for it to stop and take us along. Since the tide had just started to rise and the fresh west wind promised a quick trip to Waiuku, we were able to have breakfast in peace. At 8.30 we were on board with our baggage. The passengers had to help lift the anchor, adjust the sails, then we shot towards our destination at a rate of 7 miles. The *Sea Belle* is a 20-ton schooner which sails regularly between Onehunga and Waiuku, and from here brings to Onehunga the products of the Māori which they bring from the Waikato districts to Waiuku, mainly flour, New Zealand flax. The whole crew consisted of two people, the captain, and the helmsman, so it is easy to understand that the passengers have to be commandeered to assist for all manoeuvres. After the sails were set, the captain to the pump and pumped water almost all the way. Nobody could persuade me [page 20] to travel even from Onehunga to Waiuku in such a vessel, on board of which such hideous disorder reigns; but today's journey took us so close to land that I could rely on swimming. By the way, with the fresh westerly wind, it was blowing so fast that we anchored at 11 am in Waiuku Creek off Waiuku and had reached our destination.

The coast from Kauri Point on the north to the narrow entrance to Waiuku Creek shows, on the 20-30 feet high vertical cliffs, the same sections which I formerly described from Papaotuwaka. The country rises very gradually towards the west coast in flat hills, up to a range of mountains 6-700 feet high at the highest peaks, which runs along the west coast. The higher parts of this country are partly forest-covered, but the lower hill country is all clear land without forest, a not very fertile sand or clay soil. In earlier times, however, all the land between the Manukau and Waikato Heads seems to have been densely covered with kauri forests, with kauri resin everywhere gathered in large quantities by the Māori. Some of the higher peaks on the west coast, occasionally show more rugged forms reminiscent of the forms of trachyte breccia on the north head of Manukau, but I have been repeatedly assured that no trace of such trachyte breccia occurs here, that rather the very highest peaks consist of nothing more than drifting sands, the same sand containing magnetic iron that forms the beach on the west coast, and that this sand is sometimes blown up to form pointed cones on the peaks, so that this coastal range is nothing more than a range of dunes.





Figure 54: Ferdinand Hochstetter, *Manukau Harb[our]*. Sheet 4. Shewing a portion of the West Coast, Waiuku Estuary, Mouk Creek and the Waiau. Scale one inch to one mile. January 1859. Watercolour, ink and pencil on mounted tracing paper, 310 x 280 mm (Hochstetter Collection Basel HCB 3.2.3). Hochstetter made these observations as he traversed this part of the Manukau Harbour on the schooner *Sea Belle* on 22 January.

If one wants to draw a boundary in the layers of clay and sandstone which form the land between the Manukau and Waikato Heads, the red-brown blasted lodestone sandstone gives the best [page 21] horizon, what is below this as far as I have been able to assess, is the marine Tertiary formation and above this would belong to the lignite formation, and characteristic of these higher layers would then be mainly white, very fine sandstones, and white and yellow clay marl.



At the narrow entrance to Waiuku Creek<sup>167</sup>, a new formation appears for the first time: Basaltic conglomerate<sup>168</sup> entirely different from trachyte breccia: all blocks are round, decidedly unworn, the rock is porous basaltic lava, usually so extraordinarily decomposed that the petrographic nature of the rock can hardly be discerned. But where these are still clear in fresher pieces, one recognizes decided basalt with olivine, no trace of feldspar. Such basalt conglomerate occurs on either side of the narrow entrance to Waiuku Creek. From then on, the land becomes very low on both sides and has exactly the same character as in Drury and Papakura. The scarcely 6-10 feet high steep shore walls of the creek show completely horizontal white clay<sup>169</sup> and sand layers, over the reddish iron sandstone, and soon after passing the points Toro and Kiwi, there occurs exactly at the water line, visible at low tide, and just in the water at high tide, the same peat-like lignite seam as in the creeks at Drury and Papakura, and I am of the opinion that the bituminous slates at the South Head of Manukau are the same horizon<sup>170</sup>. This lignite seam retains the same horizon to the end of Waiuku Creek. The 10-12 feet high banks of the creek show here on top white, very fine, somewhat argillaceous sand, resembling kieselguhr<sup>171</sup> layers in the Papakura Flats are only the one variety, including two lignite seams, the first 1-2 feet thick, then 1 foot brown bituminous shale, then again peat-like lignite whose thickness cannot be seen. It is extremely characteristic over extensive areas: this lignite seam [page 22] maintains its horizon at the waterline.

The only exception to this general condition of the banks of Waiuku Creek is a point called Kokowhai<sup>172</sup> by the Māori, on the east side of the creek. The Māori, however, use this word to designate earth coloured intensely red by iron oxide, which they can use as a paint. The shore cliff here is coloured intensely red, a characteristically protruding about 60-80 feet high ridge of hills rising somewhat above the level of the flats here. The lower layers are red sand and clay with iron oxides, and basalt conglomerate like that described earlier at the entrance to Waiuku Creek, which from here onwards is entirely in the lignite formation superimposed further north at the level of almost all slightly protruding parts of the flats. The small streams on either side of the creek are then filled with the large round blocks of basalt washed out of the decomposed masses of the conglomerate<sup>173</sup>.

I here fully convinced myself that the so-called boulder formation overlies the peat-like lignite strata, like a diluvial<sup>174</sup> or quaternary formation, that not only are the higher protruding hills of the flats formed by this basalt conglomerate, but that it can even be found in places scarcely 10 -20 feet above sea level.

<sup>167</sup> The context indicates that this is between Clarks Beach and Tokaroa Point where conglomerate is present in the low cliff and foreshore rocks.

<sup>168</sup> The Clarks Beach conglomerate is considered today to be part of Piha Conglomerate of andesite composition (Edbrooke 2001).

<sup>169</sup> Note in right margin here: "Waiuku means: Wai = water, uku = pipe clay = white earth".

<sup>170</sup> There are numerous lignite layers that can be seen today in the Awhitu Peninsula sand dune sequence.

<sup>171</sup> Kieselguhr is diatomite, whereas we now know this unit is an ignimbrite deposit that was deposited from a dense cloud of volcanic ash that swept across the land as a pyroclastic flow from the centre of the North Island, close to 1 million years ago (Alloway et al. 2004).

<sup>172</sup> Now Kahawai Point at Glenbrook Beach.

<sup>173</sup> More likely eroded from the basalt lavas of the South Auckland Volcanic Field that forms the eastern shoreline of the upper Waiuku Inlet.

<sup>174</sup> Deposited during the biblical flood.

Waiuku a future town, but which now has about 12 houses, including some shops and two inns. Mr Williams' Hotel was our hospitable quarters, interestingly situated just off the great Māori track from south to north. The land between the end of Waiuku Creek and the Waikato is flat. [page 23] A creek running from the Waikato River to the flat country<sup>175</sup> comes within a mile and a half of the end of the Waiuku Creek, and between the two creeks the highest point is scarcely 40 feet above the sea, a low land rise formed of much decomposed basalt conglomerate<sup>176</sup>.

The Māori of the Waikato bring their products to the end of the Waikato creek, Awaroa Creek, and from there to Waiuku, and in order to open a formal trade route here there has been a great deal of talk of the construction of a canal connecting the Waikato with the port of Manukau.

A midday walk took me to the Waikato Creek, where we met a whole caravan of Māori who had just come from the Waikato districts on their way to Manukau. The whole families with wives and children come along on such occasions, as well as dogs and pigs. The men sat there on the grass smoking, among them magnificently tattooed individuals. The women were busy peeling potatoes with the shells of bivalves<sup>177</sup>, so numerous in the Waikato, for supper. The Māori had with them many hundreds of dried Waikato eels, whole baskets of peaches and apples, the items they were carrying for sale were New Zealand flax and kauri gum. Like all indigenous peoples, they were curious. Mr Purchas had to tell them my name, they made it Hokitata, meaning "return soon". How apt this interpretation of my name!

At 6 o'clock we ate. A Mr Captain Johnstone<sup>178</sup> based in Te Haroto<sup>179</sup>, Raglan, Whaingaroa District, had himself introduced to me and let me know that he believed that he had discovered copper ores on his property and promised to catch and send in kiwi – kiwi and some other birds for my collections. Very tired, I went to bed at 8 pm and once again slept well.

[page 24]

### **Sunday, 23 January**

Rest day in Waiuku. Alternating more or less heavy rain showers, and clear skies, wind from the west, fresher towards noon. Purchas held service at 11 am and then rode 10 minutes further to Mauku to hold service there as well.

I was busy writing in the morning, and in the afternoon I went for a walk with Mr Griffiths<sup>180</sup> over the low ridges of basalt conglomerate which form the watershed between the Manukau and Waikato at Waiuku. These hills are fern land, very little of it yet cultivated. Better soil is said to be farther east, where the forest spreads far and wide. Several settlements at the edge of the forest.

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<sup>175</sup> Awaroa River.

<sup>176</sup> There is a partially legible note in margin here: "in part not [...] layers of red clay". Hochstetter wrongly believed the rocks of this area were mostly basalt conglomerate, but we now know they are basalt lava flows from the South Auckland Volcanic Field that have suffered corestone weathering, which weathers the rock along a boxwork of cooling cracks leaving fresh rounded corestones from the inside, often exposed on the surface. These resemble conglomerate.

<sup>177</sup> Kākahi or freshwater mussel *Echyridella menziesii*.

<sup>178</sup> Captain John Campbell Johnstone (1817-1882), resident at Te Haroto near Raglan.

<sup>179</sup> Bay near head of Raglan Harbour.

<sup>180</sup> Alfred Benson Griffiths (d. 1881).



In the middle of the forest between Waiuku and Auhanga [Kohanga<sup>181</sup>] on the Waikato rises a single forestless mountain<sup>182</sup>, perhaps 600 feet high, and far above the rest of the flat country. As it is bare and in the middle of forest, it is named Bald Hill that is like bald head. This is the highest peak in this district, probably made of basalt.

The settlers near Waiuku each have their own well, at a depth of 30-40 feet they usually reach good drinking water, the best is the water that comes from the basalt rock. Under the basalt conglomerate there then lies either sand or white clay. The water in Waiuku itself is cloudy, milky, with parts of dissolved clay.

From the top of the basalt conglomerate hills I had a view of the many miles of swamp that lies on the right bank of the Waikato, while on the other side rises a higher wooded range. The swamp is mostly overgrown with forest, its bottom lying just in line with the highest water, so that spring tides sometimes submerge the forest a few inches. The Awaroa Creek leads through the swamp to the Waikato. I cannot share the opinion of some colonists that the Waikato once flowed into the Waiuku Creek.<sup>183</sup>

[page 25]

A rain shower, which looked very threatening, as if a heavy thunderstorm was approaching from the south, compelled us to return. It did not rain too heavily but continued for several hours.

In the meantime, Captain Ninnis together with our Māori Captain Cook went to the nearby Māori village to make arrangements for our tour tomorrow.

I spent the evening at Mr Griffiths' home. The warm room with a fire burning in the hearth did me good. The news that I was a heavy smoker had reached here long ago, and I had to light my cigar as soon as I had finished tea.<sup>184</sup> Mrs Griffiths<sup>185</sup> a pretty young woman showed me shells that she collected, and Mr Griffiths some plants and bugs which have been collected by his friend Mr Battersby<sup>186</sup>. The sister of Mrs Griffiths<sup>187</sup> was a lovely young lady. We were together until 9 pm. Mr Purchas had returned from Mauku.

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<sup>181</sup> Small settlement on south bank of Waikato River.

<sup>182</sup> A small, steep-sided scoria cone, Bald Hill (147 m ASL), located 7 km east of Waiuku.

<sup>183</sup> A hypothesis that still has currency but has never been fully proven, possibly because the Waikato did flow into the Manukau before the South Auckland Volcanoes erupted, 1.5-0.5 million years ago (Hayward 2017: 208-211).

<sup>184</sup> This sentence is an addition in the right margin of the manuscript.

<sup>185</sup> Isabella Jane Griffiths, née Brownlow (1828-1884), the daughter of Frederick Brownlow and his wife Jane, née Amiraux, married Alfred Benson Griffiths on 2 December 1856.

<sup>186</sup> Charles H Battersby of Waiuku. Hochstetter met Battersby, who contributed a brief entry in his autograph album dated Waiuku January 1859: "May you meet with every success in your expedition, and your name be ever remembered as that of a benefactor to New Zealand." (Nolden 2023: 71).

<sup>187</sup> Florence Amelia Brownlow (1838-1908), was born in St Helier, Jersey, Channel Islands, the younger sister of Isabella Jane Griffiths. She arrived in Auckland on 31 May 1857 on the ship *Harkaway*, and married Charles French Johns on 9 June 1863 in Parnell. Florence Brownlow wrote the following brief entry in Hochstetter's autograph album in January 1859 "May your efforts be crowned with success and from my heart I say God speed you" (Nolden 2023: 71).

## To the Waikato



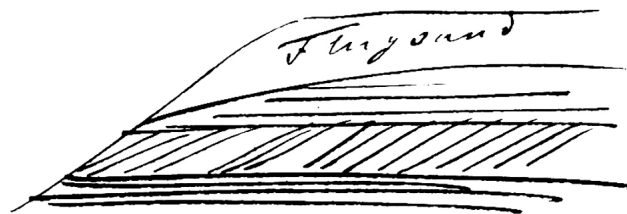
Figure 56: James Ninnis (1809-1879), *No. 2 Boring*, table of data from drilling carried out to investigate the Drury Coal deposits Hochstetter was tasked to assess, with mounted colour scheme of geotechnical strata encountered (Dr Albert Schedl Collection, Vienna; Nolden 2008: exhibit 47).

<sup>188</sup> The latter part of this sentence appears as an insertion in the left margin of the manuscript.



New Zealand flax. I had occasion, meanwhile, also to see Māori of the Waikato, en route to Onehunga, towing a large canoe out of the Awaroa Creek, long waterway<sup>189</sup>, overland to Waiuku Creek. There was a lot of shouting, 30-40 people, men, women and children dragging the canoe on the ground, and one with a blood-red shirt and the mere in his hand led the procession with the most eloquent gestures and terrible cries.

The route to the Heads is from Waiuku across the coastal range to the West Coast beach and then along it to the Waikato. The flat fern-covered undulating land rises very gradually towards the coast. One passes the Māori village of Tauwhare two miles from Waiuku. The path, nothing more than a narrow footpath that can be ridden without any difficulty, initially leads over clayey, then more and more sandy soil, until one reaches the actual shifting sand region at the height of the range of hills. Further up in depressions between the undulating hills, before reaching the highest sand hills, lie two freshwater lagoons<sup>190</sup> said to be full of eels, the whole border range, at the highest points [page 27] 500-600 feet appears from the eastern side to be nothing other than sand dunes, only once one comes down towards the coast does it become apparent that the sand is only blown over a sandstone formation, which extends from the Manukau to the Waikato Heads. Here I convinced myself as to what steep cones the sand has blown up at an angle of 45°, and that the entire highest crest of the coastal range of hills consists of nothing but drifting sand, which is constantly in motion and changing. The sight is an incredibly sterile one. Grasses sprout and are buried again. The sand does not only form loose heaps but is blown together in regular layers in places. One section was particularly interesting to me because it shows how apparently transverse foliation<sup>191</sup>,



Sketch 5: drifting sand | Sand in strata, sketch from Hochstetter's diary.

as in the Sydney sandstones, can arise in wind-piled sand deposits. The sand is the brown lodestone sand I've seen on the Manukau Heads. Such dune deposits, when they harden into formations, must contain plant, terrestrial, and sea animal remains at the same time, for everything is buried in it.

A deeper indentation between the sand hills leads down quite steeply beside a small creek to the west coast beach, called Tauroa by the Māori, the place where the passage leads to the beach is called Rukuwai<sup>192</sup>. Sandstone cliffs, covered in sand drifts, whale bones, and the brown lodestone sand on the shore covered with white [page 28] sea shells, all create a portrait of the beach. Gulls and other waterfowl sit on the beach at low tide looking for food. A lovely picture as we galloped along the beach, fresh breeze, blue ocean, white foaming surf, sandstone cliffs overgrown with bushy grass and *Phormium tenax*<sup>193</sup>, scattered water trickling through the sandstone cliffs, many slips, all torn up. Geologically one might almost ask, does

<sup>189</sup> These two words appear as an insertion in the left margin in the manuscript.

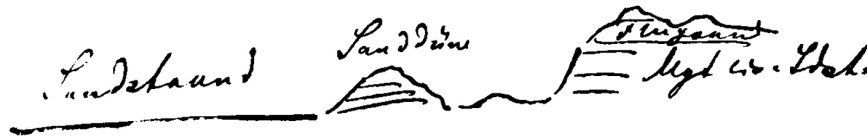
<sup>190</sup> Dune lakes – Lakes Whakatihua and Puketi.

<sup>191</sup> Cross-bedding, typical of sand dune formations.

<sup>192</sup> Now known as Kariotahi.

<sup>193</sup> New Zealand flax.

the magnetic iron sand on the beach come from the ironsand-sandstone which forms the coastal ranges, or the other way around. Decisively it is the former<sup>194</sup>. All along the coast to the Waikato Heads the horizontal strata remain the same, a greyish very fine-grained ironsand bearing sandstone, which I have described as fine chloritic sandstone at the Manukau South Head, has a very marked characteristic stratum No. 3) at the Manukau South Head, only with the difference that the stratum here develops much thicker. The coastal profile remains the same all the way to the Waikato North Head:



Sketch 6: sandy beach | sand dune | drifting sand | ironsand-sandstone.  
Sketch of Waikato North Heads profile.

at the North Head itself the sand dunes double and triple, the map here roughly follows:



Sketch 7: drifting sand | sandstone with | morass | sand dunes | Waikato | countless sea shells  
countless Waikato freshwater mussels. Sketch map of Waikato North Head.

[page 29]

It is impossible for ships to enter the mouth of the Waikato River, heavy surf over flat sandbanks, the river within the sandbank, however, a magnificent river for river steamers, the same contrast as with the Manukau Heads, here with the Waikato Heads only in reverse. Here the North Head is lower, all sterile grey-brown shifting sand, sand dunes, only sparsely overgrown with sand grasses in places, white shell beds characteristically stand out from the brown sand. This side is exposed to the prevailing southwest winds. The South Head is overgrown with green vegetation to a higher level, and the thin yellowish and green-looking layers, up to 30-40° steeper walls suggest this is another formation. So here too there is a border between two formations, similar to the Manukau Heads. At 4 o'clock we arrived at the North Head. A fire was lit by Captain Cook to tell the Māori on the Waikato side that they have travellers to convey, and soon we saw a canoe put off from the opposite bank with a Māori coming to inquire how many we were. He went back and then two small canoes came to pick us up.

<sup>194</sup> The coastal ranges are coastal sand with the sand originally sourced from the beach, and with erosion of the range the sand is also returned to the beach.



We sent our horses back with a man and allowed ourselves to be ferried across. The crossing is about  $\frac{3}{4}$  of a mile wide at a point so far upstream that the waves of the sea no longer have any influence, but the ebb and flow cause constant movement of the water here. On the other left side of the river first 6-7 Māori huts. Only three Māori people are said to live here permanently, but a significant number are always here on their journeys. Half a mile from this Māori settlement at a place called Maraetai, i.e. area near the saltwater, [page 30] lies the house of Rev. Mr Maunsell's<sup>195</sup>, Anglican mission station. It is usually deserted now that the Reverend has moved further upriver to Kohanga<sup>196</sup> but we met his sons there and made ourselves as homely as possible in the poorly equipped house.

While Mr Ninnis was preparing dinner, I took a walk with Mr Purchas up the craggy cliffs of the South Head, which are only accessible at low tide<sup>197</sup>. I was pleasantly surprised to find fossils in layers of a secondary<sup>198</sup> formation, probably Cretaceous. Belemnites [Belemnites bipartitus Blainville<sup>199</sup> Neocomian seas<sup>200</sup> is a closely related form, but canal predominantly on the back]<sup>201</sup>, terebratulid brachiopods, large oysters, large bivalves, echinoderms were discovered in strata striking hour 10-11, dipping at 37° W<sup>202</sup>. Fine, white-yellow, clayey-limestone sandstones<sup>203</sup>, just like our Bohemian Planersandstones, and thin grey clay marl crumbled over them, extraordinarily regularly. Thin layers of calcareous spar veins, just like Gaultmarl. As the sun went down there was no more time to exploit the discovery, as we had to return. We ate very simply, but with appetite, and then we went to bed tired but satisfied. Towards evening in the east, a thunderstorm that only hit us with a few drops of rain, in the evening again completely calm.

## Tuesday, 25 January

Friend Purchas had had a violent attack of diarrhea during the night and felt so weak this morning that he could not accompany me on today's tour. I departed at 7 am with Captain Ninnis and my [page 31] two servants, on the 'great mail route' southbound, on which a walking postman carries the mail from Auckland to Taranaki every 14 days, or on the "mail road" to Whaingaroa<sup>204</sup>, as our Captain Cook named the route. This so-called postal road to Whaingaroa and Taranaki is, however, as yet nothing other than a foot track originating from the Māori people, which appears to be exceedingly well-trodden. The path leads from Rev. Mr Maunsell's old house past a small Māori village over meadows, through bushes, over fern-covered hills up to the height of the coastal plateau of about 700 feet above sea level, furrowed by brooks and rivers, cut through by more or less deep gorges. From the first hill you reach there is a nice view north to the coast between the Waikato and Manukau Heads. The expected mail steamer was just steaming in front of the entrance to Manukau Harbour

<sup>195</sup> Robert Maunsell (1810-1894), Irish-born New Zealand missionary, linguist and translator.

<sup>196</sup> These two words appear as an insertion in the left margin of the manuscript.

<sup>197</sup> Why did Hochstetter make a special trip to this area? We infer that maybe Purchas had seen thin coal in the rocks of the coast south of Port Waikato and suggested the voyage, knowing the need for coal for Auckland.

<sup>198</sup> Mesozoic.

<sup>199</sup> Now *Pseudobelus bipartitus* (H.M.D. de Blainville, 1827).

<sup>200</sup> Early Cretaceous. Today the South Head belemnites are dated at Late Jurassic.

<sup>201</sup> This is written as a marginal note in the left margin of the manuscript and appears to be crossed out.

<sup>202</sup> Hochstetter's diary notes are somewhat confusing as he muddles together fossils from both Jurassic and the unconformably overlying Oligocene rocks. He correctly and more clearly describes and illustrates them in his *Paläontologie von Neu-Seeland* (Hochstetter 1865; Beu et al. 2012).

<sup>203</sup> Oligocene sandy limestone of the Te Kuiti Group (Waterhouse 1978).

<sup>204</sup> Raglan.

and a small sail was in sight further out. Blue ocean, long double and triple lines of white surf, sterile-looking sandy hills of the coastal range, on the other hand, the eye looks in close proximity to the left into the lush green forest valley that stretches up from Maunsell's house. The path continues over the hills, sometimes through meadows of ferns, sometimes through scrub forest, sometimes through individual small high forest areas, which stretch up from the valleys to the heights in individual places. In these stretches of high forest, the path, which is otherwise a comfortable, dry footpath, becomes terribly muddy, and you have to balance over the roots of the trees if you don't want to sink in up to your knees. I stood as if spellbound when at a place Captain Cook called Mahunga<sup>205</sup>, the view to the south opened up. A cloudless sky, with air so transparent and clear that whatever protruded above the horizon had to be seen.



Figure 57: Francis Dillon Bell (1822-1898) (attrib.), *The Revd Mr Maunsell's School & Mission establishment Waikato Heads*, 1854. (Archives New Zealand, IA1 Box 3459/ SEP no.4 [from 1854/10010] R21583266). Hochstetter and party stayed here, at the mouth of Maraetai Stream, on the nights of 24-25 January.

The coastline to the south was visible from afar. Clearly in front of us, rising out of the blue ocean, was the old volcanic cone-mountain Karioi<sup>206</sup>, the mighty 3000 feet high cornerstone that forms the south head of Whaingaroa Harbour.

### ***Maritime Record.***

*The Lord Worsley has arrived, after a remarkably fine passage, but she has not brought the November mail. She sailed from Sydney on the 15th inst., at 8 p.m., with the wind strong at*

<sup>205</sup> Possibly the high hill now known as Nihonui.

<sup>206</sup> Mount Karioi (756 m ASL) is a large extinct Pliocene volcano. Hochstetter uses the spelling Karihoi in the manuscript.



*NNE., continuing so for the two following days, after which she experienced light weather with smooth water, until Cape Farewell was sighted on the 20th at 3 p.m., it then blowing fresh from the Northward, with thick weather; the following morning, at 7 o'clock, fetched Nelson Roads. Sailed from Nelson at midnight on Saturday, and, when half way across Cook Strait encountered a strong gale from the South east; - made Taranaki on Sunday at 3 p.m. after an excellent run of fifteen hours; was unable to hold communication with the shore that day; but took on board her sheep and other stock in the course of the following afternoon, sailing at 6 p.m. of that day with moderate weather, and entering the Manukau yesterday at 9 a.m.*<sup>207</sup>

[page 32]

Farther inland in the blue distance is a very jagged mountain range, for which I was given the name Pirongia, it is said to lie on the Waipa River.

Farther south on the coast Albatross Point, the south head of Kawhia Harbour, was visible, then faint hints of land further west protruding and suddenly I glimpse rising out of the blue ocean perfectly deserted and clearly against the horizon, the white snowy peak of Mount Egmont (Taranaki). I felt an indescribable joy when I beheld the magnificent volcanic cone, and so clear that I could distinguish the regular ridges which descended its slope. I have no doubt that, on a clear day like this, Mount Egmont can even be seen from the Manukau Heads.<sup>208</sup>

At half past eight o'clock we reached a camp of the Māori on the way, some straw huts, which at least give the traveller shelter against rain on this route. A nearby *Phormium tenax* shrub, some of which had been tied together in a tuft as a sign, attracted the full attention of our Captain Cook; I saw him sitting there sorting through the individual leaves of the flax bush and soon laughing with delight, carved into the leaves, he had found the names of friends and acquaintances from Whaingaroa, and was now carving his own name with a seashell:

Na Ku Ki

91 + 75 + 73

The numbers, he said, mean the same as the writing. Later we found several more such *Phormium tenax* bushes along the way with inscriptions by Māori people.

The track continues through the forest, and here it became horribly muddy until we came back to open hills covered with *Pteris esculenta*<sup>209</sup>. In the forest [page 33] many rata trees (*Metrosideros robusta*), the *C. matador* (compare with Brazil's forests) of the New Zealand forests. The view of the coast, of the valleys cutting through the coastal plateau, is always new and changing. In many places, mountain slips uncover the uppermost layers, which consist of a very crumbly, fine-grained, yellowish sandstone, which alternates with white clayey layers in horizontal layers, but offers nothing further of note.<sup>210</sup>

Thus, the route from Waikato goes over the hills for 6 miles, cutting the corner of the Waikato South Head back to the coast, very steeply down from the last projecting hill about 500 feet

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<sup>207</sup> This is a newspaper clipping pasted in the right margin of the manuscript page: 'Maritime Record'. *New Zealander*, volume 15, issue 1333, 26 January 1859, page 3.

<sup>208</sup> Taranaki maunga is visible from the summit of Mount Donald McLean in the southern Waitakere Ranges on a clear day.

<sup>209</sup> Bracken fern.

<sup>210</sup> Unclear where Hochstetter is referring to, but the flat-lying rocks he describes are probably Oligocene Te Kuiti Group.

above sea level<sup>211</sup> to a small creek valley, and from there over a drift sand plain dipping at 45° on the right bank of the creek drift sand area and a drift sand dune further on at the coastal beach<sup>212</sup>. We met the postman from Taranaki, with his mailbag on his back and a burning torch in his hand, on his way to Auckland. This overland postal delivery goes once every 14 days. The postman was a burly Māori with a turupou (a long decorated walking stick, also used for defence) in hand. The seal of the Queen of England is printed on his mailbag. When I asked why he was carrying the heavy stick, he replied, ‘Pakehas’ – to defend against white men.

Already on the way down to the beach there are some geological outcrops. The last low ridge, which one crosses from that sloping sand plain, which looks only like a sand dune from the sea side, shows the following layers<sup>213</sup> exposed on the inner side facing the land at a small slip:

At the top a yellow and in part sandy clay marl

Two thin layers of bituminous slate

Conglomerate sandstone

At the base

However, the steep coastal slopes give far better and more interesting outcrops.

I initially followed the coast for 3-4 miles [page 34] south towards Whaingaroa. The beach consists entirely of the same grey-brown iron sand from which the iron is in places completely washed out on the surface, forming black patches that look like gunpowder has been spilled. Out of the sand of the beach here and there, parallel to the coast in strike lines, at h10<sup>214</sup> the top of the strata protrude flat at 10°-15° against the sea, that is, strata inclined to the west.

Cretaceous location No I. A | clayey sandstone conglomerate with silicified or carbonaceous tree trunks, coal nests bituminous shales and thin coal deposits in extraordinarily regularly stratified beds.<sup>215</sup> A few miles south and from the west coast, circa two miles inland apparently steam and smoke emerge from the ground from a burning coal seam?<sup>216</sup>

The lowest layers that come to light here are hard argillaceous sandstone beds, greenish and yellowish grey in colour, not quartz sandstones, very argillaceous sandstone beds, reminiscent of sandy planer strata, which, however, continue to become more and more conglomerate on the coast, without however, turning into rough conglomerates. The conglomerate is difficult to characterize in detail, the cobbles appear to be from marls, sandstones and various types of argillaceous slates, without any trace of volcanic rock. In these sandstone and conglomerate beds there are extremely numerous silicified tree trunks in places, without order in all directions, mostly only short fragments, but of considerable size, often up to one foot thick. Elsewhere in the same sandstone there are pieces of trunk with charred bark and

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<sup>211</sup> Nihonui (170 m ASL).

<sup>212</sup> Huriwai Beach.

<sup>213</sup> Late Jurassic-Early Cretaceous Huriwai Group strata.

<sup>214</sup> Archaic notation for a bearing, where the direction is given as the hour of 10 o'clock on the face of a clock when the 12 points north. The Onewhero geological map confirms that the strata here strike at about 160° (about 11h) and dip west.

<sup>215</sup> All the above described conglomerate, carbonaceous sandstone and mudstone belong to the Huriwai Group, which is inferred to have accumulated above sea level on a braid plain delta (Ballance 1988).

<sup>216</sup> This text appears as subheaders, notes and additions in the left margin of the manuscript page, with the references to a series a geological formations and locations continuing as a sequence on the following pages.



small nests of a very shiny charcoal with rhomboidal fracture. Between these sandstone beds, which are up to 12 feet thick in some places, sometimes purer argillaceous layers lie in an extraordinarily planar manner, and sometimes a few feet above the high-tide line, at times right in the high-tide line, can largely be found in the layer heads protruding from the sand of the beach, partly on the steep cliffs of the coast, only ½ to 1 foot thick layers of hardened bituminous marl and slate clay follow, which are about 1½ miles south of the point where the path [page 35] from the height leading down to the beach contained deposits of pure coal a few inches thick.

About 2 to 2½ miles south is a high sheer cliff face beneath which colossal boulders fallen in the surf lie untidily one on top of the other<sup>217</sup>. Here one has an opportunity of studying the nature of the higher layers, partly on the cliff itself, partly on the fallen blocks, which form the coastal terrace.

[Cretaceous location] B. Marl beds with fossil ferns | C. Limestone beds Foraminifera limestone a kind of white marble certainly the same layers | D. Quadersandstein<sup>218</sup> sandstone.<sup>219</sup>

The nests of coal and thin carbonaceous layers pass into beds of sometimes more sometimes less conglomerate clayey sandstone, one sees here overlaid by mighty grey-blue clayey yellow beds, which in their lower layers are completely full of plant remains, all fossil ferns. Unfortunately, this marl is so exceedingly fissured and crumbled on the surface that, not having the tools necessary to dig deeper, I only managed with great difficulty to collect some distinct pieces with the neat fossil ferns.

To the next higher strata, as the lowest member of a pure marine formation overlying the strata described, belong, I believe, the large blocks of a white semi-crystalline platy limestone<sup>220</sup>, which appears to consist of nothing but foraminifera, echinoderm spines, and bryozoans, a genuine former beach formation these plate-like limestone<sup>221</sup> so closely resembles the limestones quarried in the Hunua Ranges near Papakura that I consider the two occurrences to be identical<sup>222</sup>.

Lying over these limestone beds. 30-40 feet thick developed very fine-grained yellowish-white calcareous sandstone beds<sup>223</sup>, which bear the character of the Bohemian Quadersandstein so much that I [page 36] adopt this term for them for now. I did not succeed in finding any fossils in it. No doubt these sandstone beds, which break up in colossal blocks, would make excellent building blocks.

If one looks more closely at the sequence of these four layers, which I count as forming part of one and the same formation, it is clear that here a progression from a more or less pure freshwater formation (a. and b.) through a coastal formation (c) to a pure marine formation has taken place, so that the ground on which these strata were deposited was continually sinking during the formation of the strata.

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<sup>217</sup> Geological sequence described implies this is south end of Huriwai Beach.

<sup>218</sup> Appearance of paving stones or ashlar.

<sup>219</sup> This text appears in the right margin marking the sequence of the described geological formations.

<sup>220</sup> Oligocene Elgood Limestone of the Te Kuiti Group.

<sup>221</sup> Flaggy limestone.

<sup>222</sup> Both are limestones but the ones south of Port Waikato are older (Oligocene) than those at Papakura (Early Miocene).

<sup>223</sup> Glen Massey Sandstone of Oligocene Te Kuiti Group.

I consider the whole layered complex to be an equivalent of our European Cretaceous formation<sup>224</sup>.

However, this does not complete the sequence of layers that form the coastal terrace on the west coast south of the Waikato, but over the described Cretaceous layers there are still mighty beds of younger, probably Tertiary layers, crumbly iron-bearing quartz sandstones containing magnetic iron, and white, yellow, or iron-bearing clays, strata exposed by numerous slips<sup>225</sup>.

Cretaceous location No. II<sup>226</sup>

Farther south I have not examined the coast. On the other hand, the corner of the rock immediately to the north of the point where the path from the Waikato Heads to Whaingaroa leads down to the beach for the first time, is to be described in more detail as an excellent fossil location<sup>227</sup> and at the same time as a very instructive locality for the strata. Perhaps never before me, had a European climbed over the boulders that stand in the way here when trying to walk north along the beach, in order to get to the one behind [page 37] and access the vertical rock face and the excellent fossil site, which remained unknown for so long.

In terms of their basic character, the strata are completely identical to those described for locality I in their sequence, one above the other.

At the bottom there are greenish sandstone-like beds, sometimes very fine-grained, sometimes merging into medium-grained conglomerate, regularly layered sandstone beds with nests of coal and many but very indistinct trunks and branches with charred bark. These layers are just in the area of the highest tide.

Above this, on a vertical rock wall about 40 feet high, in an almost horizontal position, only slightly inclined at 10-12° to the North, there are extraordinarily regularly stratified marl beds, with grey-green sandstone beds of various thicknesses between them.<sup>228</sup> Where the marl is pure, it is a light grey-green or blue-green stone marl, coloured iron rusty only on the surface. These marls are full of excellently preserved ferns<sup>229</sup>. One can collect as many magnificent specimens as one wants from the blocks that lie broken off the rock face on the beach in a short time, since the compact stone marl can be easily split according to the stratification surfaces. Captain Cook named the fossil ferns Taraku, Mr Ninnis takes credit for the first find.<sup>230</sup>

The higher layers are not accessible to direct observation, so one can convince oneself from a distance that the mighty blocks of a calcareous coral conglomerate lying down on the beach are the next higher layer. Instead of the plate-shaped foraminiferal limestone at locality I, one now has true calcareous conglomerate here. Corals and sponges of all kinds, different species of echinoderms, foraminifera, stand out very clearly on the weathered surface. Each block is [page 38] a treasure trove for the collector.

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<sup>224</sup> The lower unit is Late Jurassic to Early Cretaceous, but this is followed by a hiatus and unconformity overlain by the Te Kuiti Group of Oligocene age.

<sup>225</sup> Probably the Early Miocene Waitemata Group.

<sup>226</sup> This appears in the left margin of the manuscript as a continuation of the earlier locations, with corresponding "a.", "b.", "c.", and "d." on the following pages.

<sup>227</sup> Famous Huriwai fossil plant locality.

<sup>228</sup> Reference note in right margin of manuscript: Marl Beds with the magnificent ferns.

<sup>229</sup> Jurassic fern, *Cladophlebis*.

<sup>230</sup> Final sentence inserted as note in right margin of manuscript.





Figure 58. Jurassic fossil fern frond, *Polypodium hochstetteri* found by Hochstetter just south of Port Waikato. (Hochstetter 1867: 279; see also Hochstetter et al. 1865: Tafel II).

Above that, probably 100-140 feet thick, again the non-fossil bearing, yellowish-white, fine-grained, calcareous Quadersandstein sandstone, in massive beds without clear stratification with pillar-shaped vertical fissures overlain by younger Tertiary sands and clays. Between C. and D. there appear to be glauconitic conglomerate layers full of fossils.<sup>231</sup>

Richly laden with the fossil treasures found, and satisfied with the results of the day, we made our way back around 4 pm and, very tired, reached our night quarters from the previous night at sunset. Captain Cook was so astonished at our discovery of ferns, that ferns grow not only in the forests but also in the rocks of New Zealand, that he showed the piece he had packed to every Māori we met, and that the greatest sense of shared astonishment then erupted in lively dialogue was apparent.

To my delight I met my friend Purchas in better health, the noble man, although he could hardly stand up, had been to the Waikato South Head twice to collect fossils for me and had brought back some very nice specimens.

The little pig that we had acquired from the Māori people in the morning to roast for our supper, had unfortunately escaped into the forest, and we had to content ourselves with the remains of our ham, which we had taken with us. I felt a great desire to put the witch of an indigenous woman who was cooking for us and from whom the pig had escaped, into the oven instead, but I was soon appeased because I still had a bottle of beer and the cigars.

<sup>231</sup> This appears as part of a series of references in the left margin of the manuscript. Includes note: "I have a spatangoid echinoderm" and "c. are green sandstone layers".

**Wednesday, 26 January**

An equally glorious summer day like yesterday with a breeze from the south-west. The morning was used to study the strange belemnite marls on the Waikato South [page 39] Head, which I discovered on the 24th, to exploit and examine more closely.

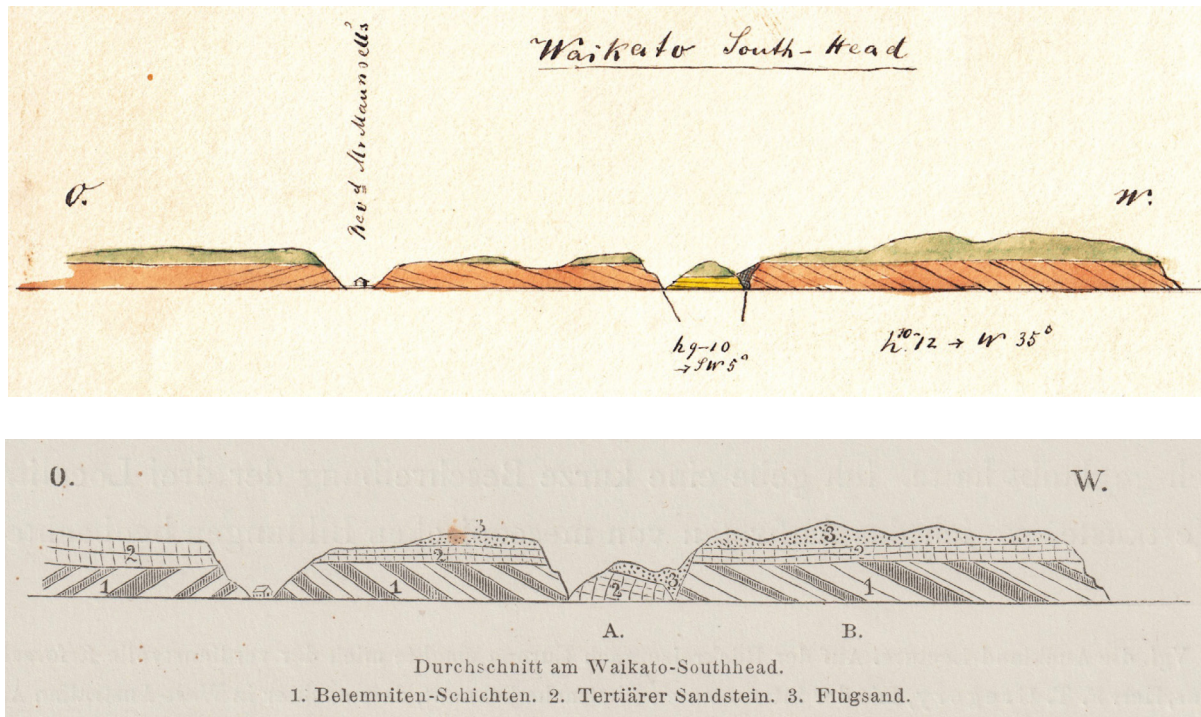


Figure 59 (upper): Ferdinand Hochstetter, *Neu-Seeland. Waikato South-Head*. Watercolour ink and pencil on paper, 62 x 230 mm (Hochstetter Collection Basel HCB 3.3.23 detail); (lower): Cross-section at Waikato South Head with 1. Belemnite beds, 2. Tertiary sandstone, and 3. Drift sand. Shows the strata exposed on the south side of the Waikato River from South Head (right) eastward to beyond Maunsell's house (in gorge). Note the anticline in the Jurassic belemnite beds with the axis at the mission house. (Hochstetter 1864: 28; see also Fleming 1959: 62).

Cretaceous formation location III<sup>232</sup>

In the gorge, at the exit of which Rev. Mr Maunsell's house is situated, on both sides well-layered marl beds alternating with layers of sandstone, the same marl beds form the left bank of the river until one comes across the sand dunes at the coast.

<sup>232</sup> Reference header in margin. The sections that follow are denoted as "a. planer sandstone", "b.", and "c." on this page of the manuscript.



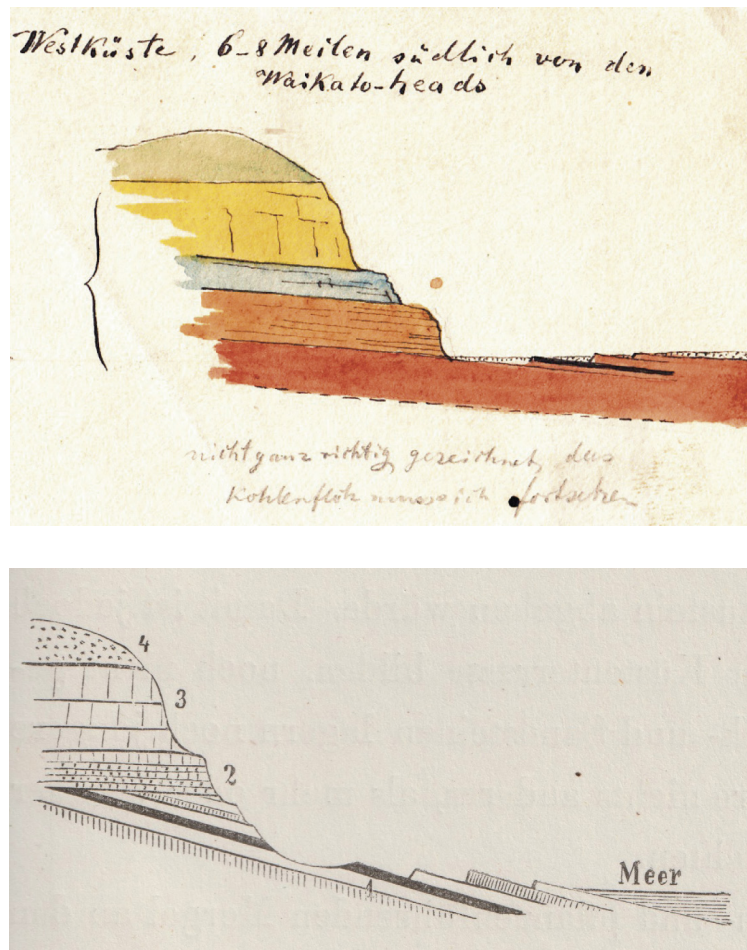


Figure 60 (upper): Ferdinand Hochstetter, *Westküste. 6-8 Meilen südlich von den Waikato-Heads* [West coast 6-8 miles south of the Waikato heads]. Watercolour, ink and pencil on paper, 67 x 230 mm (Hochstetter Collection Basel HCB 3.3.23 detail); (lower): Cross-section looking south of strata exposed on the corner of Port Waikato at the south end of Sunset Beach, visited by Hochstetter on 23 and 25 January. (Hochstetter 1864: 31; see also Fleming 1959: 64).

The first corner of the rock, which is washed by the surf at high tide, shows a white-yellow, very fine-grained, sandy, clayey rock, in layers to h9-10 → SW 5° the rock is something between actual sandstone and sandy argillaceous marl, breaks up in imperfectly plate-shaped pieces, and the rock is completely identical to Bohemian planer sandstone [Plänersandstein]. I was not a little surprised to find similar fossils in it, *Schizaster*<sup>233</sup>, a small finely striped *Terebratula*<sup>234</sup> very similar to the Bohemian *Terebratula gracilis*, and a second smooth *Terebratula*, also a very peculiar *Pecten*<sup>235</sup> and various other fossils. Incidentally, the fossils on the whole are rare in this rock and are found more in the lower layers than in the higher ones, which are more yellow and ferruginous.

<sup>233</sup> An echinoid, sea urchin.

<sup>234</sup> A brachiopod, lamp shell.

<sup>235</sup> Scallop.



Sketch 8: Fossil shell.

These sandstones or sand marls terminate abruptly at a fault fissure where the bedding conditions are, however, quite indistinct under broken strata, of extraordinarily glauconitic sandstone, thick black clays fill the fault fissure, quite full of large oysters and large bivalves (either *Cytherea* or *Cyprina* according to the hinge, similar to *Cyprina angulata* from Upper Greensand, Blackdown)

But the shells are so extraordinarily brittle and fragile that it is not possible to get whole specimens out.

Immediately adjacent to this fault is an extremely thick complex of strata of steeply tilted (h 10-12 → W. 35°) marl and sandstone beds, unconformably overlaid by horizontal beds of younger sandstones and clays. The stratification in this whole complex is extraordinarily regular.

Bed lies over another bed: greenish fine-grained sandstones with indistinct remains of plants and coal [page 40] particles alternate with pure, dark grey-blue or brown calcareous marl beds, which are interspersed with white calcite veins.

Cretaceous location III on light grey.<sup>236</sup>

In some places, this stony marl includes small pyrite cubes, in others peculiar concentric-shelled, perfectly spherical concretions the size of a hazelnut, the mass of which is nothing other than marl. The frequent alternation of the sandy layers with the marls is striking, all the more as these latter are extremely remarkable due to numerous marine fossils, especially belemnites. *Belemnites bipartitus* Blainv[ille], or a closely related form.<sup>237</sup>

Representatives from the canaliculata family, the first *Belemnites* which, if I am correctly informed, were found in the southern hemisphere. Largest are the size of a finger, large and small appear to belong to one species.

In addition to belemnites, the most common fossils are a *Gryphaea* like *Exogyra*<sup>238</sup> and small bivalves.

The belemnites occur not only in one stratum, but throughout the marl beds of the whole strata complex to the westernmost corner of the Waikato South Head. I didn't go around the corner.

It is difficult to decide in which sequence the layers A, B, C originally follow one another at this third location. I consider C to be the lowest rank, then B, and finally A to be the top one, which appears wedged between the marl beds due to faulting.

<sup>236</sup> Final entry in series of reference headers in margin.

<sup>237</sup> This sentence appears as a note in left margin of manuscript.

<sup>238</sup> Extinct bivalve.



During the survey we saw several very beautiful waterfowl on the beach, including a fairly large snipe-like bird with scarlet beak and feet, snow-white belly and black back<sup>239</sup>.

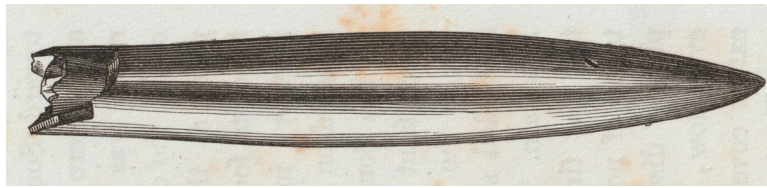


Figure 61. Belemnite *Belemnites aucklandica* discovered by Hochstetter at Port Waikato (Hochstetter 1867: 275; see also Hochstetter et al. 1865: Tafel VIII).

The Waikato, in spite of a respectable width of about half a mile, does not look so grand at its outlet as further up<sup>240</sup>, where it flows between green forest mountains and encloses luxuriantly overgrown islands. A shallow bar of sand, [page 41] over which the sea breaks violently even when the weather is calm, makes it almost completely inaccessible even for small vessels. Its current route is on the north side, which offers, bare of almost all vegetation, the desolate sight of sand dunes rising higher and higher one behind the other like sea waves, whose green colour is only interrupted by individual white shell beds. The westernmost corner of the North Head is a rich treasure trove of marine shells of all kinds washed up by the surf here. The field of white shells opposite Maunsell's house, on the other hand, consists entirely of the shells of the Waikato bivalve<sup>241</sup>, whose animals the Māori eat with great fondness, and whose shell they use as knives. On the right bank of the Waikato, the shifting sand has extended upstream and inland. Generations ago, however, where all is now shifting sands, is said to have been a settlement of the Māori, with luxuriant kumara plantations. The Māori tell of a sudden occurrence, of an unusually high tide, combined with a hurricane, which diverted the river, that formerly flowed at the foot of the sheer South Head, out of its channel. Even today, a wide alluvial plain, on which masses of pumice stones lie spread out and a lagoon in the middle of this plain, rich in wild ducks, marks the old riverbed.<sup>242</sup>

In the afternoon we departed from our quarters where we had spent two days, Ninnis and my servant rode the same way we came, back to Waiuku, Purchas and I let the Māori row us up the river in a canoe to the Awaroa Creek. We proceeded along the sand dunes of the right bank, in water rather heavily agitated by the fresh breeze, until we came into narrower, calmer channels between low marshy islands which lie before the mouth of the creek. The left bank of the river with its luxuriantly overgrown terrain offered a pleasant sight, and over the lower river islands, luxuriantly overgrown with marsh grasses and *Phormium tenax*, the white church [page 42] tower of the Kohanga mission station shimmered over to us. At Kohanga higher forested mountains rise, and a low cone<sup>243</sup> near the riverbank shows across clearly volcanic formations, so I have no doubt that basalt and basalt conglomerate<sup>244</sup> begin here, such as I have seen further upriver at Mangatawhiri and Tuakau.

<sup>239</sup> Note in left margin of manuscript: beach wading bird. This is most likely a description of torea, South Island pied oystercatcher, *Haematopus finschi* Martens, 1897.

<sup>240</sup> Near Mangatawhiri which Hochstetter visited earlier in January.

<sup>241</sup> Freshwater mussels.

<sup>242</sup> Toponym in right margin of manuscript: Totomoaka.

<sup>243</sup> Tikorangi scoria cone (122 m ASL) beside an explosion crater and tuff ring of the South Auckland Volcanic Field.

<sup>244</sup> As previously noted, there is no conglomerate. Hochstetter mistook corestone weathering of basalt lava flows for conglomerate.

I could not leave the majestic river without thinking of steamers, which perhaps after a few decades, when the river banks, which are still entirely in the hands of the Māori, become the property of Europeans. steam up and down from and to the heart of the country. After a journey of 1½ hours, partly on the open river, partly between the river islands, we entered the narrow creek, the old war trails and now the modern trade route of the Māori, on which they brought their products from the Waikato to Waiuku and from there to the Manukau Harbour. We had the tide with us, and the journey in the narrow creek, just wide enough for two canoes to avoid each other, through beautiful primeval forest that covers the immense swamp through which the creek meanders, would be one of the most beautiful, if the millions of mosquitoes did not almost drive the traveller to despair. Kahikatea forest is the swamp forest in those areas.<sup>245</sup> Laurel karaka<sup>246</sup>, Veronica speciosa<sup>247</sup>, Cordylines<sup>248</sup>, Phormium bushes, the mighty kohutuhutu tree<sup>249</sup>, the karamu with red berries<sup>250</sup>, the kokahaka plant with its golden clusters of berries<sup>251</sup>, the toreietī<sup>252</sup>, tree ferns and epiphytic ferns of all kinds on overhanging tree trunks form the main scenery<sup>253</sup>. We had sufficient water to come out of the forest into the grassy swamp, the Māori had to disembark here to lighten the canoe and it was now pulled from the bank on ropes made of Phormium flax leaves tied together until we reached the landing place about 3 miles from Waiuku.

[page 43]

Here we met a whole camp of Māori, and numerous canoes. After a short stay in the nearby hospitable house of Mr Jenkins<sup>254</sup>, we reached Waiuku in the evening. Little Fanny gave me some seaweeds as a souvenir, [and] after eight days I received four beautiful specimens of *Helix Busbyi*<sup>255</sup> forwarded to me from her.<sup>256</sup>

As proof that the indigenous people are well paid for their services, I mention that the journey took about 4 hours, and cost 15 shillings, which are divided among five Māori.

### Thursday, 27 January

Slightly cloudy sky, but otherwise fine weather. Lots of light whirlwinds, raising dust. In the morning I had to deal with improving the arrangement of my collections, in order to get them to Auckland in good order.

Already a visit at 9 o'clock from Mr and Mrs Griffiths along with Mr Battersby to look at my things, generally great astonishment at the beautiful objects. Mrs Griffiths helped me arrange and pack up with her own hands. Mr Battersby brought me some insects.

<sup>245</sup> This sentence appears as a note in left margin of manuscript.

<sup>246</sup> New Zealand laurel karaka, *Corynocarpus laevigatus*.

<sup>247</sup> New Zealand hebe.

<sup>248</sup> Ti, New Zealand cabbage tree, *Cordyline australis*.

<sup>249</sup> Probably kotukutuku, New Zealand fuschia, *Fuschia excorticata*.

<sup>250</sup> *Coprosma robusta*.

<sup>251</sup> Kahikatea, *Dacrycarpus dacrydioides*.

<sup>252</sup> Unidentifiable.

<sup>253</sup> Presumably Purchas pointed out and named these plants for Hochsteter as they travelled along.

<sup>254</sup> George Jenkins was a merchant, and postmaster at Waiuku, operated Waiuku Flour Mill and Waiuku Stores.

<sup>255</sup> Pupurangi, large kauri snail, *Paryphanta busbyi*. Its natural range is restricted to Northland, so these specimens may have been collected there.

<sup>256</sup> The latter part of the sentence is an addition inscribed in the right margin of the manuscript.



At 1 o'clock we left Waiuku for Mauku. We could only get one horse, which Purchas and I took turns riding. The path leads over low hill country covered with ferns, sometimes through a small piece of forest that is still left, and over small streams and creeks.

The first stream we came to after an hour's walk, which flows into the Waitangi Creek, forms a 6 feet high waterfall<sup>257</sup> just below the crossing point over compact basaltic rock masses, not conglomerate, and I also think Bald Hill, the one that protrudes from the forest on the right, is basalt<sup>258</sup>. From the stream the path leads up to an area which owes its excellently fertile soil to decomposed basalt conglomerate.

Nowhere so far have I encountered such extraordinary luxuriant growth of *Pteris esculenta* and *Phormium tenax*.<sup>259</sup> I saw here flower stems of *Phormium tenax* 14 feet high and 2-3 inches thick. On this occasion I learned how to use these flower stalks as torches when they are very dry. A woody ring encloses a light-violet pith that burns like tinder, and as such is used by the Māori when travelling.

[page 44]

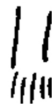
A short rest gave me the opportunity to note the following details from Mr Purchas on the use of *Phormium tenax*:

The Māori call the leaves harakeke

The shaft [is called] korari

Use of the leaf in its natural, unprepared state, simply slit, as a rope, ribbon, string of all kinds to make baskets for the daily use, is plaited to keep the sides of their huts together, simply laid on top of each other the leaf is used as a drinking vessel, when cooking eels and the like it is often used as a base or for wrapping.

The eel net or proper eel basket is made from the hanging fern mangemange<sup>260</sup>. Semi-prepared or processed leaf of *Phormium tenax* is used to make the raincoat of the Māori, weruweru, and every other kind of clothing.



Sketch 9: Flax leaf

The mat whariki, the fine dress kakahu, then ropes, and all kinds of toys for the children are woven from the fully prepared fibre. The fibres are often dyed black from the hinau tree<sup>261</sup>, red from the bark of tawhero<sup>262</sup> and tawaiwai<sup>263</sup>. Other colouring dyes are not known to the Māori, although the wood of the puriri tree<sup>264</sup> is said to give a very beautiful yellow colour

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<sup>257</sup> Waitangi Falls.

<sup>258</sup> Basaltic scoria cone.

<sup>259</sup> Reference heading in right margin of manuscript: *Phormium tenax*.

<sup>260</sup> Creeping fern, *Lygodium articulatum*.

<sup>261</sup> *Elaeocarpus dentatus*.

<sup>262</sup> *Weinmannia silvicola*.

<sup>263</sup> Celery pine, *Phyllocladus trichomanoides*.

<sup>264</sup> *Vitex lucens*.

and the mapou<sup>265</sup> bark a beautiful purple colour.<sup>266</sup> From the seeds of titoki<sup>267</sup> the Māori make their hair oil.

Karaka is the tree on which a tinder fungus<sup>268</sup> grows.<sup>269</sup>

Apparently there is a New Zealand orchilla.<sup>270</sup>



Figure 62: Ferdinand Hochstetter, *Manukau Harbour Sheet No. 2. Shewing the sources of the W[h]angamaire, Mouk [Mauku] and Slippery Creeks*. January 1859. Watercolour, ink and pencil on mounted tracing paper, 250 x 285 mm (Hochstetter Collection Basel HCB 3.2.4).

We arrived at Major Speedy's<sup>271</sup> farm in Mauku at 5 pm and were received in the friendliest way. Mrs Speedy, almost more man than woman, is master of the house, two marriageable daughters, and two lovely little girls.

<sup>265</sup> *Myrsine australis*.

<sup>266</sup> Reference heading in left margin of manuscript: Colours.

<sup>267</sup> *Alectryon excelsus*.

<sup>268</sup> Also known as bracket fungus or hoof fungus.

<sup>269</sup> Note in left margin of manuscript.

<sup>270</sup> Note in left margin of manuscript. Orchilla is a European lichen that is the source of purple-blue dye.

<sup>271</sup> Major James Speedy (1811-1868) and his wife Sarah Speedy had 12 children spread over 20 years. Lived on 750 acre farm at Mauku.



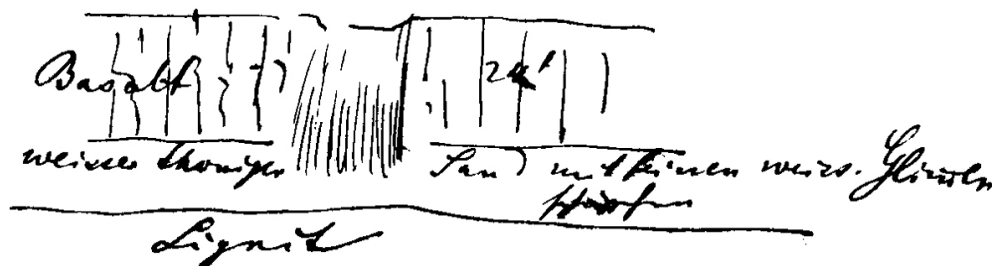
The evening passed quite pleasantly. Mrs Speedy offered me some of her dried ferns, allowed me, as a great exception, to smoke, and after we, Purchas and I, had banished thousands of mosquitoes, which come here from the nearby forest, through smoke from our bedroom, everything was fine until the next morning.

[page 45<sup>272</sup>]

### Friday, 28 January

A nice warm pleasant day, with just enough wind to be pleasantly refreshing. After breakfast led by the manly Mrs Major herself and accompanied by her two adult daughters, two genuine New Zealand bush maidens, on an expedition through mosquito-filled primeval forest over hill and dale to Browns Creek, in order to see the extensive lignite deposit again, which here is overlaid by basalt conglomerates (boulder formation) and is only exposed again in the creek. The romantic walk was bountiful for my fern collection. The well at Major Speedy's Farm goes 20 feet deep through basalt conglomerate, the water is 14.2°C. I did not deliver the popular lecture that the major's wife wanted me to give, but at 11 o'clock in the morning at Mauku in Major Speedy's garden at the special request of the major's wife, in memory of my visit here, and in memory of the expedition through the New Zealand jungle in company of these fine women, I planted a blue gum tree. May it grow tall and thrive luxuriantly. That is, as I was told, the English custom, to honour a memorable guest.

Major Speedy gave me his excellent riding horse and at twelve we set out for Mr Vickers' farm. Again, two lovable marriageable young girls who play the piano and sing while we enjoy a breakfast. Near the house a pretty waterfall<sup>273</sup> which we visited, the creek, which empties into Waiuku Creek, here falls 24 feet high over a vertical basalt cliff. The profile exposed here is as follows.



Sketch 10: Waterfall. Basalt – 24' [feet] | white clayey sand with fine white mica slates | Lignite.  
Sketch of rock layers at Mauku Falls.

[page 46]

A little further down the creek the same bed of lignite is again exposed in a small pit at Mr Vickers' place<sup>274</sup>. This point is interesting in that for the first time I saw without a doubt the basalt overlying the lignite formation of the Manukau plains. The basalt with imperfectly columnar separation, is spread out like a bed, and a large part of the so-called boulder formation does not consist of conglomerate, but of basalt spread out in layers.

Near the latter farm is Mr Crispe's Farm<sup>275</sup>. Here, too, we made a short visit, accompanied by the lovely Vickers' daughters. It almost seemed to me as if we were on a tour of the colony's

<sup>272</sup> This page is a sheet of Hochstetter's "Dr F. H." embossed letterhead paper inserted in the bound diary.

<sup>273</sup> Mauku Falls.

<sup>274</sup> Samuel Crispe Grace Vickers (1834-1915) and his wife Emma Heaton Vickers, née Crispe (1837-1917).

<sup>275</sup> Joseph Crispe (1805-1877) and his wife Mary Jane Crispe, née Heywood (1805-1878) had a farm named "Stanlake" near Mauku Falls.

daughters of marriageable age, because lo and behold, again three young pretty marriageable girls, who all displayed their kindness towards me, and showed me what curiosities and rarities they have. The location of these three last-named farms, near the Māori village of Patumahoe, is one of the prettiest I have encountered on this whole tour. Low undulating hill country high enough to afford an unobstructed view over parts of the Manukau gulf and towards the volcanic hills of Auckland, a pretty change from forests and open spaces, fresh forest streams and pretty young girls. Whoever wants to write short novels about the life of the colonists in New Zealand should set up camp for a while in the farmhouses of the Mauku district, rich in daughters.

*Superintendent's Office  
Auckland 14 Febr. /59*

*Dr Hochstetter*

*Sir*

*I am requested by Joseph Crispe Esqr. (of Stanlake Mauku) to forward to you the packet of soil sent herewith it is from 50 feet below the surface & in sinking a well his men have dug through 20 to 25 feet of it.*

*I believe Mr Crispe has sent it at suggestion of Revd. A G Purchas.*

*I am Sir*

*Your obdt Servt*

*Robt Lusk<sup>276</sup>*

The soil here is almost everywhere the fertile soil of the decomposed basalt conglomerate. A peculiarity here are small globules similar to peanuts, which in large numbers cover individual areas on the surface; they seem to be a product of decomposition [page 47] of the basalt conglomerates, but do not consist of brown limonite, but as it seems to me of a manganese-containing iron ore. Where these balls are found, the soil is said to be less fertile. Five young girls escorted me as we rode from here to Young's Inn in Drury. A long ride, over monotonous fern-covered, flat hill country, with nothing of interest whatsoever other than what is connected with the humbug going on about the future city of New Liverpool<sup>277</sup> here being staked out. Sterile clay soil alternates with some places where the soil becomes richer through basalt and conglomerate. We reached Young's Inn at sunset; the Austrian flag had disappeared from the gable of the hotel.

### **Saturday, 29 January**

Very beautiful almost completely windless day. After breakfast rode to a spot in Slippery Creek, on the right side, near Papakura, where Mr Purchas remembered seeing peculiar rocks. For a long time, we could not find our way through the fern steppe, whose swampy parts we had to avoid, but we finally reached the location.

A very similar fine-grained trachyte breccia<sup>278</sup> occurs here in Slippery Creek as I have seen on the north side of Manukau Harbour between Little and Big Muddy Creek. The difference

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<sup>276</sup> Robert Baillie Lusk (1798-1891). Holograph manuscript letter pasted in margin of manuscript diary.

Annotated by Hochstetter: This sample nothing but red decomposed volcanic porous scoria, probably a layer of the boulder formation.

<sup>277</sup> The township of New Liverpool in the Parish of Waiau, on the banks of the Manukau or south side of Manukau Harbour, was planned, promoted, and eventually offered for sale by auction on 14 February 1859, but never developed. One of the attributes used to promote it was "Indications of Coal have been discovered in the immediate neighbourhood" (*Daily Southern Cross* 1859, 28 January).

<sup>278</sup> Parnell Grit bed.



in fragments is characteristic: white, red, brown, greenish-violet. The fragments become finer and finer, and in the same stratum the rock passes into a fine tuffaceous sandstone perfectly resembling some of the sandstones on the cliffs of the Auckland shore. The base layer invisible. Above, however, the fine breccia merges into the usual yellowish-white clay marl of the Auckland Formation<sup>279</sup>. [page 48] I believe the lignite overlies these strata and these are fine grained. The breccia is nothing other than the continuation of the coarse-grained breccia of the Manukau North Head<sup>280</sup>.

Several points in the flats where the clays appear exceedingly magnesite-like, similar to the Nicobar Island clay marl. Short stay at Coles Inn then on to the tuff craters at Mr Buckland's<sup>281</sup> Farm.

No. 31<sup>282</sup> of the map is the main point called Kohuora that is, living or flooding moving fog, because the swamps of the five tuff craters that are close together here very often have layers of fog. A very practical name.

31a b c grassy swamps are surrounded by more or less perfect circles of tuff craters<sup>283</sup>.

31 itself is again a true model<sup>284</sup>. In the middle of the crater swamp, the remains of the sunken scoria cone rise up as a small island of basalt blocks and scoria, which is only a few 100 yards long and about 12 feet high. Around the swamp low rocks of basalt lava with caves in them<sup>285</sup>, at the tuff crater remained the remains of the lava masses that sunk. Then the steep rim of the crater, the highest point of which is about 70 feet above the swamp. Layers of tuff regularly flattening outwards, scattered blocks of lava above and distinct volcanic bombs. The southern creek cuts through the regularly bedded volcanic layers of ash.

The well shafts go through the layers of ash to a very soft, very fine, to extraordinarily fine white mica sandstones of light blue-grey colour of considerable thickness<sup>286</sup>. In this sandstone, which crumbles into fine dust, the settlers always find water<sup>287</sup>. In the nearby tuff crater No. 32 the inner scoria cone is completely submerged<sup>288</sup>, the crater communicating with the creek is full of water and a shallow mud bank in the middle, which is dry at low tide<sup>289</sup>,

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<sup>279</sup> Later named Waitemata Sandstone by Hochstetter.

<sup>280</sup> Similar rock type but not continuous rock unit from the Waitakere Ranges to here.

<sup>281</sup> Farm of Alfred Buckland (1825-1903) and his first wife Eliza Buckland, née Wallen (1825-1866).

<sup>282</sup> Hochstetter was using Heaphy's numbered map of the volcanoes.

<sup>283</sup> Heaphy identified and numbered only three craters in this vicinity, but Hochstetter identified two more swampy areas as craters. Today only Heaphy's three (Pukaki Lagoon, Crater Hill, Kohuora) are accepted as volcanic craters (Hayward 2013).

<sup>284</sup> Crater Hill.

<sup>285</sup> Remains of a lava lake that came up inside the crater and later withdrew leaving solidified rim around the inside of the crater with several lava caves beneath the skin (Selfs Lava Cave, Underground Press Lava Cave).

<sup>286</sup> Pleistocene rhyolitic sediment of the Tauranga Group.

<sup>287</sup> Probably the water comes from the Pliocene shell beds (Otahuhu Formation) that lie just beneath the Pleistocene rhyolitic sediments and are well-known aquifers beneath the Manukau Lowlands.

<sup>288</sup> There is no evidence of any scoria cone in Pukaki Lagoon, although Hochstetter shows one on his map, but Heaphy does not. Hochstetter says it is completely submerged which suggests he believes they were always present in these kind of volcano, even if he could not see one here and inferred an intertidal mud bank mantled one.

<sup>289</sup> Pukaki Lagoon was intertidal mangroves and mud flat at the time. The crater floor is now grazed pasture, having been dammed in the 1920s to create a speedway (now gone). The crater was originally a freshwater lake until it was breached by rising sea level about 8000 years ago, after the end of the Last Ice Age (Hayward et al. 2009).

marks the top of the submerged scoria cone. The land round these tuff craters exceedingly fertile, and from the Manurewa Hills to Otahuhu a perfect plain which appears to be covered with very young alluvium.

Mr Buckland takes me to Otahuhu, from there by omnibus [horse-bus] to Auckland.

[page 49]

## **In Auckland**

### **Sunday, 30 January**

How good it is for me to be in my own house again. On my return I found my rooms clean and neat, cleaned and swept, my friend Haast had seen to it that this was done. Since my newest collections have not yet arrived, I am exclusively occupied with my botanical and entomological collections. Haast helped me sort my ferns. I've got quite a nice batch of ferns now. In the meantime, little has happened here, my report has, as I hear, been printed again in all New Zealand newspapers and the public has taken possession of my name so much that they made reference to me when New Liverpool was founded in the Karaka district, etc. As a result of my request in the newspapers, some zoological specimens and coal samples have arrived from north Auckland.

Lunch together with Haast at the Fischers' residence. They were both gracious and friendly as always. In the evening I meet Sir Osborne Gibbes<sup>290</sup>, resident in Whangarie, a very interesting lively man who speaks French fluently, and also speaks German quite well. Fischer definitely wants to make me a supporter of homoeopathy, "I have to read Hahnemann<sup>291</sup>" [etc.] I bring him back from his oddities by telling him a few things from Reichenbach's<sup>292</sup> life.

Glorious weather all day, no wind in the morning and evening. Southern breezes all day.

### **Monday, 31 January**

Regatta! a public holiday in Auckland. All shops and all offices are closed, and those who are able, are on the water today. I too have to take part somewhat against my will, so at 10 o'clock I went with the Fischers and Haast on board Captain Young's *Evening Star*, to watch [page 50] the races from its deck. But there was so little wind the whole morning that there was no real life in the party. The only thing that interested me was the race of the Māori with their war canoes. To get a better view, I went with Captain Young<sup>293</sup> on board the flagship *Harwood*<sup>294</sup>. Four canoes were racing together, each manned by about 30 men, in one I even counted 38 men, sitting 2 and 2 behind each other. In the middle of the canoe the leader was standing upright, setting the pace for rowing with the most peculiar, wildest gestures, and cheering with short, repeated words. The head is thrown back and forth, turned left and right, with flying hair and rolling eyes. And since the oarsmen also participate in this wild movement of their heads, it really looked like when the canoes started racing at the given signal by means of a cannon shot – as if they were with wild shouts of war and in impetuous fighting fury as in former times against the enemy. Among the gestures there is one that is particularly notable, a peculiar, almost trembling like spasms, extraordinary quick movement of the hand.

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<sup>290</sup> Sir Samuel Osborne Gibbes (1803-1874), member of the Legislative Council, 1855-1863.

<sup>291</sup> Christian Friedrich Samuel Hahnemann (1755-1843) was a German physician and founder of homoeopathy.

<sup>292</sup> Carl/Karl Ludwig von Reichenbach (1788-1869), German scientist, industrialist and philosopher.

<sup>293</sup> Captain William Young (1795-1867), captain of the *Evening Star*, which had brought Haast to Auckland.

<sup>294</sup> The passenger ship *Harwood*, 462 tons, under Captain William Forsyth.

In the afternoon a westerly breeze sprung up, and now more life came into the party. Cutters, schooners, whaling boats, vessels of all shapes and sizes sailing partly in competition, partly for private pleasure now criss-crossed each other, and Auckland Harbour now offered a very busy, living picture as if it were a city with a population of 100,000 residents. We dined with Captain Young aboard the *Evening Star* and returned ashore at 6 pm. I felt such a bad headache that I went straight to sleep.

[page 51]

### **Tuesday, 1 February**

At home in the morning. Heaphy with me, then McMillan<sup>295</sup>, a settler from the north, who, prompted by my report, looked for and found coal at some of the points mentioned, so he came to me very enthusiastically. At 12 o'clock I visited Whitaker and am pleased to hear that a dedicated building is being made available for me to keep my collections. A small three-room single level cottage near where I am staying, which I shall henceforth call "the Imperial Geological Survey in New Zealand". My collections from the last trip also arrived safely today. Purchas visited me. In the evening at Rev. Mr Kinder's<sup>296</sup>, a little dinner party, Purchas, Haast, MacLean<sup>297</sup>, some vicars, made up the company, but mainly arranged to bring me together with a German compatriot, Mr C S Völkner<sup>298</sup>, from Hamburg, missionary in Tauranga for 10 years. Völkner urges me to visit him in Tauranga, or preferably to travel with him right away. I am indebted to him for some notes about the neighbourhood.

I was very amused by the descriptions that Völkner gave us about a war that has been going on for three years between two Māori tribes in his area. All attempts by the Europeans to reconcile the hostile tribes were in vain. Both factions have securely entrenched pā and are well supplied with rifles and ammunition. As a sign of the beginning of the fight, a red flag is put up in the pā, as a sign of the armistice, a white one. The conflict consists of firing bullets towards each other from the entrenched camps and making a great noise. But the distance is such that the balls cannot hit. The bloody result of the three-year war is that seven people were shot, and these through carelessness by [page 52] members of their own party. The whole thing is a war game, like when children play soldiers, but which has the bad result that the Māori neglect their business, agriculture, animal husbandry [etc.], and become wild. The following way of manoeuvring is characteristic of their way of warfare. One party raises the red flag, the other immediately shows the white one as a sign that they are preparing food and eating, after eating, this party raises the red flag, and prepare to get started. But now the others have gotten hungry and wish to eat, so now they raise the white flag and so the day passes without serious hostilities.

A very serious war took place a few years ago near the Bay of Islands between the Māori and English people, in which, due to a terrible ignorance and incompetence of the officers, many 100 men of English troops were shot in the unsuccessful attempt to storm a fortified pā.

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<sup>295</sup> Finlay John McMillan (1819-1879) was a farmer at Whangaparāoa.

<sup>296</sup> Reverend John Kinder (1819-1903), New Zealand Anglican clergyman, teacher, artist and photographer (Fig. 63). In 1859 he was headmaster of the Church of England Grammar School and lived in Kinder House, Parnell (a heritage basalt building, built in 1856).

<sup>297</sup> Thomas Every MacLean (1819-1901), Auckland landowner and politician (Fig. 98).

<sup>298</sup> Reverend Carl Sylvius Völkner (1819-1865), a German-born missionary was hung from a tree by Māori in Ōpōtiki in 1865 (Fig. 64).





Figure 63 (left): John Kinder (1819-1903). Hochstetter was entertained at Kinder's house for dinner on 1 February. Albumen print, 1853. (Auckland War Memorial Library PH-ALB-89-p2-2).

Figure 64 (right): John Kinder (1819-1903), photographic portrait of Carl Sylvius Völkner (1819-1865), a German protestant missionary Hochstetter met at Kinder's house on 1 February. (Alexander Turnbull Library 1/2-059698).

I was amazed in the highest degree by Mr Kinder's magnificent sketches of New Zealand. Kinder is a consummate artist, I have never seen more beautiful pen drawings. Kinder sends all his sketches to his friends in England:

Miss Kinder  
W. Bovill<sup>299</sup> Esq. M.P.  
Worplesdon Lodge  
Guil[d]ford, Surr[e]y, near London

I asked for this address so that I could see the sketches when I returned and, with Mr Kinder's permission, borrow some for publication. In addition, Mr Kinder has promised me that he will copy the following sketches when he has time, so that I can use them for my own publication purposes:

1. Roto Iti Lake<sup>300</sup>
2. Whaka-pa-koko in the Wahitapu (idol in a sacred place) Tauranga.<sup>301</sup>

<sup>299</sup> Sir William Bovill (1814-1873), English lawyer, judge and politician.

<sup>300</sup> John Kinder, *Roto Iti*, 1857, pencil on paper, 174 x 253 mm (Hochstetter Collection Basel HCB 1.5.2; Nolden and Nolden 2011: 51).

<sup>301</sup> John Kinder, *Whaka-po-ko-ko in the Wahi tapu Tauranga*, ink and watercolour, 160 x 80 mm (Tauranga City Libraries, Reference no. Art 21-004).

3. Mt Maunganui and old pā at Tauranga<sup>302</sup>
4. Terraces in the upper Waikato<sup>303</sup>
5. Oruarangi, Waikato<sup>304</sup>
6. Capt. Haultain's volcanic hill
7. Perforated rock of Cape Brett<sup>305</sup>
8. Kawau, old copper mines and smelting works<sup>306</sup>
9. Mt Camel Ho[u]hora<sup>307</sup>
10. Kororareka<sup>308</sup>, Bay of Islands<sup>309</sup>
11. W[h]angaroa<sup>310</sup>

Mr Kinder also owns excellent beautiful ethnographic objects, a fern collection, of which he gave me a few specimens, and has started an insect collection, all with extraordinary precision and care.

We were together until 10 pm.

The weather is fairly clear, slight breeze from the north west in the morning. Then completely calm, in the evening the sky became cloudy, and breeze from north northeast, to all appearances the beginning of an easterly gale.

### Wednesday, 2 February

The sky is completely cloudy, it is blowing quite strongly, from the north-east. However, it doesn't rain. A little more cheerful and calm towards evening, the breeze more from the east. Made a visit to the superintendent, otherwise at home all day, writing and drawing the map.

### Thursday, 3 February

After a little rain during the night, completely calm, then in the morning a fresh breeze from the south, which lasts all day and sweeps the sky. I am at home all day working. A moment in the evening with Dr Fischer.

### Friday, 4 February

Morning at Heaphy's office, then visited eruption point 15a<sup>311</sup> in Auckland city itself. My collections have been transported to the Imperial Geological Institute, unfortunately there is no progress with the setting up of tables and racks.

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<sup>302</sup> John Kinder, *Te Papa Tauranga - 1857. Maunganui and Old Pa*, 211 x 333 mm (Keith and Fraser 1958: 22)

<sup>303</sup> This is likely John Kinder, *Upper Waikato*, watercolour on paper, 117 x 336 mm (Auckland Art Gallery, Accession No. 1937/15/75); or *Upper Waikato shewing Terraces*, 110 x 333 mm (Keith and Fraser 1958: 22).

<sup>304</sup> John Kinder, *Oruarangi, Waikato near Tuakau, 1857*, 189 x 294 mm (Keith and Fraser 1958: 20).

<sup>305</sup> Hole in the Rock, Motukokako/Piercy Island.

<sup>306</sup> John Kinder, *Kawau Is. 1857. Old Copper Mine*, 221 x 328 mm (Keith and Fraser 1958: 21).

<sup>307</sup> John Kinder, *Houhora, Mt Camel*, watercolour on paper, 210 x 342 mm (Auckland Art Gallery, Accession No. 1937/15/49) [original caption: "Hohora Mt Camel Decr 21. 1858, from the low cliff above the beach"].

<sup>308</sup> Now Russell.

<sup>309</sup> John Kinder, *Kororareka Bay of Isl.*, 1859, watercolour on paper, 236 x 292 mm (Hochstetter Collection Basel HCB 1.5.1; Nolden and Nolden 2011: 50).

<sup>310</sup> John Kinder, *Whangaroa: The cupolas of St Peter and St Paul - the scene of the burning of the 'Boyd'*, 29 December 1858, 207 x 344 mm (Keith and Fraser 1958: 26).

<sup>311</sup> Auckland Domain, according to Heaphy's map (Heaphy 1860).

I regret to say how sleepy the government is.

### To the North Shore

#### Saturday, 5 February

Heaphy, having arranged for some measurements to be taken on the North Shore, had invited me and Haast to accompany him there and to camp with him for two days.<sup>312</sup> I found the opportunity very convenient to examine the volcanic eruption points on the North Shore and so we sailed over at 10 am. Also, in the company of Heaphy's wife and child. There were two tents to pitch on the beach and although only 1½ hours from Auckland we preferred to camp here, that is Heaphy preferred, not I; to Aucklanders it seems a pleasant change to once again lead a tent life rather than enjoy the comforts of a house.



Figure 66. Charles Heaphy (1820-1881), portrait of Catherine Letitia Heaphy, née Churton (1829-1910). Catherine Heaphy and her husband Charles and child joined Hochstetter and Haast on their excursion to the North Shore, 5-6 February. Pencil and watercolour on linen-packed paper, 251 x 199 mm, 1851 (Alexander Turnbull Library A-144-001).

<sup>312</sup> Haast, under the pseudonym Julius Hanf, wrote an account of this camping trip with Charles Heaphy, his wife, and a three-year-old child, to the North Shore of Auckland, under the title "Streifzüge in Neu-Seeland. 1. Eine Villeggiatur in Auckland" for the German *Allgemeine Zeitung*, which was republished in the evening edition of the *Wiener Zeitung* (Haast 1859, 5th, 6th, and 7th December). Haast notes that Mrs Heaphy (Fig. 66) joined them to climb Mount Victoria and North Head. The following morning they walked to Lake Pupuke.



The flagstaff on Victoria Hill, and a few settlers in simple wooden houses, the more comfortable pilot's quarters, that's all, and a small Māori settlement on the north side, that's the whole of the North Shore. Seems to be some sort of amusement park for the future Auckland as it is meant to be. A hut for female sea bathers is just being built here and even the governor<sup>313</sup> does not disdain to live here for a few weeks from time to time in the summer, he with his wife in a tent, the children in one of the settlers' houses. The part of the North Shore closest to Auckland does not have a hotel yet.

And now geology.

The North Shore – I mean the peninsula between O'Neill's Point<sup>314</sup> and North Head was once an island, shifting sands<sup>315</sup> enclosing a small patch of Tertiary land connecting this peninsula to Takapuna Head. Small as the peninsula is, scarcely a mile across at its widest point between Auckland Harbour and the eastern arm [page 55] of Shoal Bay, it still offers some geologically interesting features. The western half is Tertiary land with steep vertical walls to the south, that is, towards Auckland, gently sloping towards the north that is towards Shoal Bay. Here, as at Auckland, the deeper strata of the Tertiary cliffs contain some lignite-transformed pieces of wood, parts of branches and trunks of a shrub-like growth, or of a small tree<sup>316</sup>.



Figure 65: Charles Heaphy, *No. 1. The Northern Shore of Auckland, New Zealand*. Watercolour, ink and pencil on paper, 260 x 670 mm. Number one of seven watercolours prepared to accompany Heaphy's paper sent to the Geological Society of London in 1859 (Geological Society of London LDGSL 209/01). Hochstetter explored these Devonport volcanoes with Heaphy and Haast on 5 February.

The western half consists of volcanic formations.

No 3. Mt Victoria – Takarunga = Flagstaff Hill. 283 feet above the sea, a scoria cone truncated at the top, semi-circular open to the south-east, this formation may be regarded as a crater, which is open to the south-east and from which lava, forming mighty rocky outcrops, has flowed in the same direction to the sea. Like almost all other mountains near Auckland,

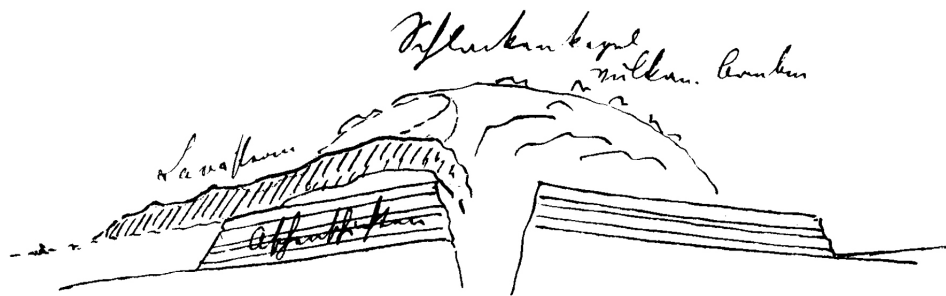
<sup>313</sup> Sir Thomas Robert Gore Browne (1807-1887), fourth Governor of New Zealand, 1855-1861 (Fig. 5).

<sup>314</sup> This is now the end of Bayswater Peninsula, but Hochstetter's description implies he was referring to Stanley Point.

<sup>315</sup> Behind Narrow Neck Beach.

<sup>316</sup> The Waitemata Formation sandstones were deposited in a deep marine basin but contain scattered carbonised wood carried into the sea by rivers in storms (e.g. Hayward 2017: 83-87).

this volcanic hill was formerly a fortified Māori pa, once terraced all over and on the north side near the summit one can still see a hole about 20 feet deep and just as wide square, which served the Māori as protection from the enemy, like our wolf pits served our hunters<sup>317</sup>. 3a to the east of 3 is a small, apparently independent eruption point, a small scoria cone<sup>318</sup>, but the southern half of which has broken off and is probably washed away by the sea. 4. about 100 feet high, a low scoria cone<sup>319</sup> with a fairly completely preserved crater, the rim of the crater but lower and open, as at 3 below a small lava stream flowed out. 5. North Head. Takapuna. This is the most interesting [page 56] of all the hills, about 200 feet high, of almost perfectly regular hemispherical shape. A faint suggestion of a crater depression on the west side. Above the pilot's house, in the westerly direction, a small lava flow also flowed out. On the hill but on the surface beside scoria, nothing but volcanic bombs, and indeed of a regularity and size such as I have not yet seen on any of the Auckland volcanoes, of a perfectly pear shape, with a spirally twisted apex at the end, and about 3-4 feet long and 2 feet thick, weighing more than 4-5 hundred weight. Such bombs must have erupted from this small insignificant point of eruption after it had emerged out of the sea<sup>320</sup>. That the beginning of the eruption was under water is evidenced by 30-40 feet thick layers of volcanic ash and scoria forming an angular extraordinarily solid breccia caked together, and these volcanic tuff layers flow outwards in an extremely regular manner all around, so that when the water is low at the foot of the 30-40 feet high tuff cliffs one sees on the deep layers, as on a roof inclined at an average of 12 feet. I found some very interesting ferns at one point on the east side. The geological profile roughly follows:



Sketch 11: Scoria Cone | volcanic bombs | lava flow | layers of ash. Sketched cross-section through North Head volcano.

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Between 4 and 5 a small swamp<sup>321</sup>. On the south-west side of 3 an elevated gravel terrace 6-8 feet high, formerly shore, now overflowing with water, merging into a white shell beach. This terrace, which consists of boulders of volcanic rocks is the only sign of recent uplift I have observed near Auckland so far<sup>322</sup>.

<sup>317</sup> These large pits were usually the base of large storage buildings.

<sup>318</sup> Duder's Hill, now considered to have been scoria from Mount Victoria rafted to this point by lava flows. Quarried away in early twentieth century (Hayward 2019: 97).

<sup>319</sup> Takaroro/Mount Cambria. Named Heaphy Hill by Hochstetter.

<sup>320</sup> Hochstetter inferred that all of Auckland's tuff rings were erupted under the sea and then the region uplifted and the lava flows and scoria cones erupted (Fleming 1959: 179-181).

<sup>321</sup> Now the low playing fields of Devonport Domain and Vauxhall Reserve between Torpedo Bay and Cheltenham Beach.

<sup>322</sup> This rounded basalt cobble deposit is now interpreted to be a high-tide beach from 6000-2000 years ago when sea level was 1.5-2 m higher than today, rather than evidence of uplift.

We prepared our camp for the night in tents as well as we could and slept as well as we could.

### Sunday, 6 February

A fresh south-west wind had picked up during the night, which blew gustily with rain showers in the morning, and promised and delivered a very unpleasant day.

Despite the wind and rain, we carried out our plan to visit Lake Pupuke. The lake is 5 miles from North Head, despite the bad weather, Mrs Heaphy could not be stopped from accompanying us there, and only then did I see what a tender wife Heaphy has. Heaphy had a bad headache all day.

The road to Lake Pupuke leads over sterile fern heathland on white clayey Tertiary soil and nothing more uninteresting can be imagined than such fern steppes. Where the ground is a little better, there is a small Māori settlement. The tuff crater of Lake Pupuke belongs to a European farm whose owner is said to have hopes for copper here.

No. 2 Pupuke Lake. The Māori have a legend that Rangitoto, the highest of Auckland's volcanic cones, arose out of Lake Pupuke, the deepest volcanic crater lake in Auckland, separated by a channel only 3-4 nautical miles wide, both the most opposite forms of volcanic formation. Lake Pupuke is a tuff crater enclosing a deep freshwater lake of oval elliptical shape 1 nautical mile long,  $\frac{3}{4}$  wide. According to Captain Burgess<sup>323</sup>, 28 fathoms the deepest point in the middle of the lake, with mud and earth gradually ascending towards the edges.<sup>324</sup>



Figure 67: Carl Frank Fischer (d. 1893) (attrib.), *Florasee. Property of Dr C F Fischer on the border of Lake Pupuke North Shore, Auckland*. Watercolour on paper, 143 x 133 mm (Hochstetter Collection Basel HCB 1.2.1). Hochstetter visited Lake Pupuke volcano on 6 February.

<sup>323</sup> Captain Isaac James Burgess (1824-1904), held the position of Chief Pilot and Harbour Master in Auckland (Fig. 87).

<sup>324</sup> This sentence is a note in the right margin of the manuscript, based on information likely received after writing the original diary entry.



Its depth has not yet been determined. The settlers say that no bottom was found at 90 fathoms near the crater rim just beyond the thicket of rushes along the shore. According to my theory<sup>325</sup>, the water should be shallower in the middle of the lake above the sunken scoria cone. The Auckland Pilot Captain Burgess has promised to sound out the lake while I am here. As a tuff crater, Lake Pupuke is one of the most regular in the area. Volcanic tuff layers and scoria, flattening outwards at 6-8°. The crater rim 80-100' above the water level. Steep descent with 30-40° on average towards the lake. Individual basalt rock cliffs, which emerge on the inner edge between the regularly layered tuff layers, above them basaltic veins through the tuff layers. Large masses of basaltic lava, flowing from streams, form rocky cliffs projecting far along the coast, in which caves are said to be located<sup>326</sup>, which, like all caves in the region, hold evidence of the wars of the New Zealanders in the form of the human skeletons found in them. These tuff craters have a peculiar importance to the area in relation to their value as cultivated land. They form the stretches of land of good fertile farmland, in the midst of the sterile clay soils of the Auckland Tertiary Formation. This is far more noticeable around Otahuhu than here. But much depends on the degree of decomposition in which the layers are. The inner part covered with scrub, in which I again found some very pretty ferns.

Wild ducks in large numbers on the lake, peculiar little freshwater mussels, beautiful freshwater algae, and many eels.

The lake is very reminiscent of the Laacher See on the Rhine, and like the cathedral church on the Laacher See, here on the southwest side a Roman Catholic College<sup>327</sup>, which is now abandoned.

The way back was by no means pleasant in the strong southwest wind, we found our tent blown over, the wind was so strong, the sea was so high even in the Waitemata River (= Auckland Harbour), which was only 2 miles wide, that we could not return to Auckland. Heaphy with his wife stayed in the tent that was still standing and returned early the next morning when the wind had died down, Haast went over in a small cutter with two other gentlemen and I took refuge with the pilot Captain Burgess, who received me very kindly and gave me quarters for the night. The wind kept blowing with the same force until 11 o'clock in the night, then it became quite calm until 5 o'clock in the morning.

At daybreak it was again blowing extraordinarily freshly.

### **Monday, 7 February**

But now it was safe, at 9 o'clock I departed for Auckland in the pilot's safe cutter *Falcon*, 9 tons. We had to turn against the wind, and at 10 o'clock I was safely back in Auckland.

The pilot gave me some interesting notes regarding the changes going on in Auckland Harbour. He assured me that all visible or invisible rocky reefs on the coast are slowly rising<sup>328</sup>, that e.g. Rough Rock in the Rangitoto Channel used to have 8 feet of water and that now a small rock needle is only 3 feet under the water, the Okahu Rock at Hobson Bay is also

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<sup>325</sup> Not adhered to by modern geologists.

<sup>326</sup> No lava caves are recorded from Lake Pupuke basalt flows.

<sup>327</sup> St Mary's Industrial School for boys opened in 1849, on the site of present day St Joseph's School.

<sup>328</sup> Annotated note in right margin written in red colour pencil: NB elevation.

supposed to rise and all the sandbanks in the harbour are growing very quickly, namely the mud bank in Commercial Bay is gradually growing.



Figure 68: Ferdinand Hochstetter, *Nordshore* [North Shore], February 1859. Watercolour, ink and pencil on paper, 255 x 354 mm (Hochstetter Collection Basel HCB 3.2.6). Hochstetter studied the Devonport volcanoes on 5 February. He never visited Rangitoto (right) nor the two Northcote craters (centre).

Visit to the governor, he asks me regarding a proposed trip with the English frigate *Iris* to write to him specifically, and to inform him of my wishes in this regard. For my part, however, I am very undecided whether such a trip around the island, with brief visits to various places, is the best use of my time.

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In the evening with Haast and the editor of the *Southern Cross* at Petschler's, at his repeated urgent invitation; his wife is a good pianist.

A beautiful night driving home from Petschler's residence at the foot of Mount Hobson. – Visits throughout the day from Captain Wing, Ninnis, and Purchas. The noble Purchas brought me a whole bag full of things again, beetles, flies, butterflies.

### Tuesday, 8 February

Again, a very fresh wind from the southwest with a clear sky. Finally, the Imperial geological institute of New Zealand is finished and I come to unpack my collections. The government presents me with a letter from the Nelson Provincial Government expressing the wish that I should come to Nelson to study the mineral resources of the area. The governor

communicated the document to me, with the request to say whether I would like to comply with the request. – the question is whether I can – time! time! time!

In the evening, a moment at Fischer's, a sudden fire alarm spreads a great shock through the whole town, but fortunately it's only a chimney fire which is quickly extinguished.



Figure 69 (left): Harriet Petschler, née Taylor (1825?-1897) and her son Charles Talbot Petschler (1855-1928), c. 1865. Carte de visite, 104 x 65 mm (Hochstetter Collection Basel HCB 5.2.P11). Hochstetter notes Harriet Petschler's accomplishments as a pianist.

Figure 70 (right): Charles Petschler (1819-1882), c. 1865. Carte de visite, 103 x 63 mm (Hochstetter Collection Basel HCB 5.2.P10). Petschler was a German merchant in Auckland who hosted members of the Novara Expedition at his home, and later moved to Sydney.

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### **Wednesday, 9 February**

Second excursion around Waitemata Harbour. Ninnis was already there at 8 am, I had just crawled out of my bed when the travel marshal came in and reported that the dogcart was ready. By the time everything was packed, it was 10 am, a cloudy, rainy sky and when we were ready to leave, it was already raining. However, the weather only matters when you travel by water, not when you travel on land so we were in good spirits. On this second trip, Haast is my travel companion for the first time, I hope that we get along well, Haast drove Ninnis and my new servant, a young 16 year old boy "James" on horseback. Our destination is Henderson's Mill on Taikata Creek<sup>329</sup>, a branch of the Waitemata Harbour.

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<sup>329</sup> Better known today as Henderson Creek.





Figure 71: Ferdinand Hochstetter, *VII. Henderson's Mill*. Pencil and ink on mounted tracing paper, 235 x 270 mm (Hochstetter Collection Basel HCB 3.2.7). This shows Mount Albert volcano and lava flows (top right) mapped by Hochstetter on his way to stay the night at Henderson's Mill (centre) on 9 February.

Mount Albert on the left of the trail was our first destination, a scoria cone about 500 feet high, an extremely splendid point for surveying all around. One overlooks the entire isthmus from Manukau to the Waitemata and in particular the course of the lava flows which flowed from the Three Kings and Mount Eden and from Mount Albert itself. Mount Albert itself is

$\frac{3}{4}$  crater open to the north-northwest<sup>330</sup>. The highest point is a smaller scoria cone on the east side to the southeast. “Scoria cones” because the whole cone-shaped mountain consists of loosely piled scoria and volcanic bombs. We found on the slope several excellent specimens of pear-shaped, or better lemon-shaped, bombs, and a large block of lava, exceedingly deceptively resembling a log in structure, elongated form<sup>331</sup>. This scoria cone was also a fortified pā in the past, it is terraced all around and on the individual terraces one can see long, deep ditches dug “wolf holes”<sup>332</sup>. Enormous masses of lava have flowed from Mount Albert, all in a northerly direction, a marked lava mound lying just before the crater mouth very characteristically marks the point of outflow of the lava<sup>333</sup>. The lava divided from this outflow into two flows, one running north-west in a shallow [page 62] valley-like depression between two hills of white clay marls of the Auckland Tertiary formation, running down to the sea. The other flow diverted by the present Tertiary hill found its way in a north-easterly direction and joins here with lava flows which flowed northwards from the Three Kings and those which flowed westwards from Mount Eden into one great common lava flow which emptied into the Waitemata Harbour opposite the Kauri Point, and here forms a rocky reef<sup>334</sup> reaching far into the harbour.

The excellent survey obtained from Mount Albert has afforded me the following general observations:

Mount Eden, Three Kings, Mount Albert are three eruption points extraordinarily rich in lava, their lava flows look so fresh as if they had just flowed, their boundaries are extraordinarily sharply marked, either by small streams running at the foot of the lava walls, exactly on the boundary of the lava and the Tertiary argillaceous marl, or where the water has no outlet through swamps which run along the lava flows. The surface of the lava flows is for the most part so clearly preserved that in many places one can still clearly see the arcuate flow ridges. All this points to a relatively recent period of volcanic eruptions<sup>335</sup>. This agrees very well with the fact that there are no traces of layered ash on these mountains, no fact speaks for submarine processes as with the tuff craters, everything rather – the bombs mainly, for purely supermarine processes at a time when the earlier submarine-erupted tuff craters, the Tertiary land with its entire current relief and current sea borders was raised above the level of the sea<sup>336</sup>. These show the lava flows [page 63] of the three mountains mentioned in the most striking way. For like streams of water, they stretch in the shallow depressions between Tertiary hills and avoid them. Three Kings for example lies just on the watershed between the Manukau and Waitemata. The enormous masses of lava that flowed northwards from this point have spread northwards in the trough-shaped shallow depression that lies between the Tertiary hills on which rises Mount Eden on the one hand and Mount Albert on the other, following the same pre-volcanic valley depression that lava flows flow from Mount Eden and Mount Albert.

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<sup>330</sup> No longer seen because one third of the height of Mount Albert has been quarried away.

<sup>331</sup> Also a volcanic bomb.

<sup>332</sup> Kumara storage pits, the lower parts of ridge-pole buildings used for food storage.

<sup>333</sup> Present Summit Road entrance to Owairaka/Mt Albert Domain.

<sup>334</sup> Te Tokaroa/Meola/Pt Chev Reef, now known to be the northern end of a long lava flow from Mount St John (Hayward 2019).

<sup>335</sup> Owairaka/Mount Albert is currently dated as one of Auckland’s oldest volcanoes at 120,000 years old, whereas both Te Tatua-a-Riukiuta/Three Kings (28,500 years) and Maungawhau/Mount Eden (28,000 years) are much younger and the lava flows of these latter two do indeed have very little ash over them (Hayward 2019).

<sup>336</sup> This uplift hypothesis is not required nor accepted today.



After passing the western lava flow of Mount Albert<sup>337</sup>, the way leads, with bridges over the various creeks, good wooden bridges, all the rest of the road is only dirt road – over a flat hilly terrain the most boring and sterile fern country – *Pteris esculenta* and the tea tree shrub – *Leptospermum lauceolatum*<sup>338</sup>, together with some introduced grasses form the only sparse vegetation where once there were lush kauri forests. The kauri forests are said to have been burned down during the Māori wars. One can still see the places where individual mighty trees stood. One can still find the stumps, or pits, next to a heap of earth, the otherwise white clay has burned yellow and red there, these are places where the wind has knocked over the forest giants, and these sterile fern heaths on mostly clayey ground are the places where the Māori people gather the kauri gum, the only usable thing left of the precious forests. Only the 1000-1500 feet high range<sup>339</sup> of trachyte breccia along the west coast still looks dark green from kauri forests down to the desolate hill country. But in these mountain forests a forest fire has been raging for 14 days, and the sawmills [page 64] at Huia, Whau, and Taikato Creeks, let the ancient forests feel their sharp teeth.

At 4 o'clock we arrived at Henderson's Mill, about 40 people live here. Cargo boats can get to the mill with the tide and take their loads. The tide is here an hour later than at Auckland, and considerably higher. The mill belongs to Mr McLeod<sup>340</sup> our friendly innkeeper, furnished in the most excellent way, and generates immense sums. A worker gets £2 a week and has to feed himself in return. Mr McLeod had been expecting us, an excellent dinner is prepared. After the meal we went for a walk, which, however, showed me nothing but desolate fern steppes, in the background the forested mountains and the rising smoke of the forest fire. In the evening the sky had cleared up completely, there was no wind at all, and everything was still, not a single person or insect could be heard, how different it was in the tropics! Only the cricket that had migrated from Europe made itself heard.

### Thursday, 10 February

Mr McLeod had a very nice little room prepared for me, and then I slept wonderfully. until early morning. The most beautiful almost cloudless day and windless. I went for a walk in the morning to the excellently equipped sawmill, a circular saw and two other saws working here. McLeod also has a small iron foundry. The foundry sand dug on the spot is said to be the best in the world. The creek is named "Taw" Creek. The craftsmen, such as carpenters foundry workers etcetera earn very good wages of £3-3½ Sterling per week.

At nine o'clock we set out, accompanied by Mr McLeod. The great northern road was [page 65] soon so bad that I preferred to mount myself on horseback, and leave my servant the seat in the dogcart. The way leads from the low, gently undulating hill country, intersected by the various creeks of the Waitemata, slowly higher to a range of hills, which, though bare of all forest as the low country, is only sparsely covered with ferns and *Leptospermum*, but feature far more rugged, steeper forms. At the height of this range of hills our paths parted to Dilworth<sup>341</sup> Farm and further to the Waitakerei<sup>342</sup> westbound from North Road. Our way led

<sup>337</sup> Where New North Road crosses Oakley Creek.

<sup>338</sup> Manuka, tea tree, *Leptospermum scoparium*.

<sup>339</sup> Waitakere Ranges.

<sup>340</sup> John McLeod who provided accommodation at Henderson Mill and was employed by Henderson and MacFarlane to manage their sawmill. McLeod had already provided advice on the Drury Coalfields prior to Hochstetter's arrival in Auckland (see 'The Drury Coal Fields', *The New Zealander*, 13 October 1858: 3).

<sup>341</sup> James Dilworth (1815-1894), Irish-born Auckland accountant, investor and farmer.

<sup>342</sup> Now spelt Waitakere.



straight over the highest, extraordinarily sharp (with steep slopes on both sides) ridge of the range, which runs almost exactly from east to west<sup>343</sup>. The back of this range is so sharp in places that our carriage drove with one wheel on the north slope and the other on the south slope. This range forms the watershed ‘backbone’ between the Kaipara and Waitemata. One not only hears the surf on the west coast from Kaipara, but also sees the white-yellow sandy hills of the Kaipara Heads. The western coastal range has broken through completely at the Kaipara, so that the land between the outermost creeks of the Waitemata and the Kaipara River is only about 15 feet above the sea. The border range has here again sunk to the lower hill country, and also the black masses of kauri forest melt more and more together on the Kaipara. The forestless range of watersheds that we came across deserves a special name, I suggested the names “Red Hills”<sup>344</sup> = red hills and for the highest point the name “Mount Rouge” = “[cosmetic for colouring the cheeks] hill” after their geological origin and character. Although here in the higher ranges of hills the sterile fern steppe indicates infertile clay soil, the character of the clay here is also quite different from that [page 66] in the lower lands. I refer to these clays as variegated conglomerate clays, the predominant colours being red, yellow and white, these colours do not change to different layers, but without any rule, some spots red, others yellow, others white. The red is partly pure iron oxide, red, partly more lilac-red, the yellow rusty iron. On closer inspection, these clays consist of small pebbles of clay marl and pebbles of various clayey rocks. These are the same strata that I observed for the first time on the Puponga Peninsula<sup>345</sup>, lying immediately beneath the trachyte breccia. I called them decomposed trachyte tuffs, here too they made the same impression on me and the strata also seems to consist of the Auckland Tertiary formation. Beneath the trachyte breccia are narrow veins of brown iron and argillaceous iron, which can be traced for some distance in a straight line, and the large geodes of argillaceous lodestone are extremely distinctive. Thus, these colourful clays appear in many places at the height of the range. As poor as these clay hills now look, you can still clearly see on them everywhere the traces of former lush forest cover. The Māori people collect a lot of kauri gum on these hills, small forest remnants in individual ravines, individual rewa-rewa trees<sup>346</sup> and kauri trunks half-rotted in the earth. On the way to Dilworth’s farm<sup>347</sup> we were met by Smallfield and Dilworth who were following us from Auckland and further along the way we met three other Auckland gentlemen who had travelled ahead of us.

We arrived at Dilworth’s Farm at 11am. Two small huts on the edge of the forest at the source of the Kaipara River<sup>348</sup>. We had been expected, and although the space was so limited, there was an excellent dinner prepared. Wild pigeons, “Kukupā”, are very delicious. [page 67] Then wild boar pate. For the feral pig, the Māori have no particular name, they call it bush porka. Up to here it was possible to ride and drive, the track ahead had to be walked. Five Māori had turned up to carry our luggage. After an hour’s rest we set out. We had to cross the ridge of Maungatoetoe. At its height the forest begins, and now all of a sudden a completely changed scenery. From the top there is a view of a magnificent mountainous forest landscape, the coastal mountains here 1000-1200 feet high, furrowed by deep brook gorges. The trachyte

<sup>343</sup> Now Crows Road (Evans 2022).

<sup>344</sup> Red Hills Road is a major ridge crest road in Massey today.

<sup>345</sup> Cornwallis Formation consists of pebbly sandstone with white rounded pebbles of mudstone in a volcanic sand matrix. When weathered these produce red clay soils spotted with the less-weathered, white pebbles (Hayward 1976).

<sup>346</sup> Rewarewa, *Knightia excelsa*.

<sup>347</sup> Near Waitakere village today.

<sup>348</sup> Kumeu River branch of the Kaipara River.



[illegible]

We descended to the Waitakerei Stream and then through the forest along the left bank. The boulders in the bed of the brook are nothing but trachyte in the most varied varieties, originating from the breccia which composes the highest mountain peaks. At 4 o'clock we



came to the canoes which were kept ready for us to go to the Māori settlement of Waitakerei five miles away. A general exclamation of delight at the marvellous landscape. On the left bank of the stream a fertile, fairly extensive alluvial area with fruit-laden peach trees, on the right bank steeply rising forest mountains. The place was called “Ferdinand’s Rest”. The creek is navigable for canoes from here, narrow but deep water.

Further down, the banks become swampy<sup>349</sup> in places with magnificent vegetation. *Phormium tenax* grows luxuriantly out of the water as if it were an aquatic plant, then the ti tree - cabbage tree = *Dracaena*<sup>350</sup>, swamp grasses of all kinds. From time to time the wooded slopes jut out to the shore.

At 5 o’clock we reached the entrance of the village “Parawai” about 1½ miles from the west coast in a completely sheltered location on the left bank of the river on a slope that protrudes here and forms a low terrace. Terrible barking of dogs and shouts of welcome. A small village, but the first stockaded pa, also within the main stockade<sup>351</sup>, the individual families are [page 68] closely fenced off. The chief welcomed us wearing a black jacket. Potatoes and fish were ready and soon we were eating together on the square in front of the church hut. I was surprised to see so few young people in the village, they are all said to be gone, living around on the cultivation sites, or being educated at the Wesleyan College<sup>352</sup>. The Māori people here all Wesleyan and very religious. At sunset they held devotions, prayers and songs in their church, and then they clear the church – and as a great distinction – allowed us to use it as our night quarters. Everyone made themselves as comfortable as possible. The sky became cloudy in the evening, the clouds moved with a north-easterly wind, I very much fear a change in the weather.

### Friday, 11 February

In the night I heard it blowing and roaring from the wind and surf. The sky looked gloomy and cloudy, masses of black clouds came with heavy gusts of wind from the northwest between 6 and 7 am, and brought light rain, but as I have noticed so often, the wind soon turned to the west, the sky cleared and with the south west breeze blowing very freshly in the afternoon, the weather was again the most beautiful one could wish for.

At 8 o’clock in the morning we all left together. We went about a mile further down the creek in two canoes to a landing place on the left bank called Waiti, where there are some Māori huts, and small corn and kumara plantations on the fertile alluvial ground. The river thence spreads shallowly over the shifting sands which choke its mouth and has a gentle outlet to the sea just under the rocks which form the north head of the Waitakerei valley. The exit of the valley about one mile wide, enormous masses of drifting sand - all brown iron sands. “Makaka” grows on the drifting sand, a small shrub with edible white berries<sup>353</sup>. Sands like those on the Manukau and Waikato – just in the middle a little purer quartz sand – are piled up here to form 30-40 feet high dunes, and cover in thick [page 69] layers far into the river valley up the slopes of the south head. The masses of sand blocked the drain of the mountain water in a small side valley, and thus gave rise to the formation of a freshwater lake “Wainamu”<sup>354</sup>

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<sup>349</sup> Bethells Swamp, largest swamp on mainland Auckland.

<sup>350</sup> An African plant genus looking very similar to ti, the New Zealand cabbage tree, *Cordyline*.

<sup>351</sup> The earthworks of a stockaded pā exists on the end of this point today (Diamond and Hayward 1978).

<sup>352</sup> Three Kings, Auckland.

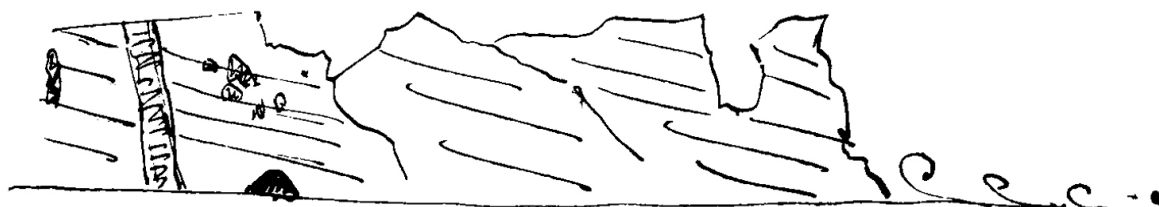
<sup>353</sup> Note in left margin of manuscript. This description perfectly matches the sand coprosma, tarakupenga, *Coprosma acerosa*. No plant called makaka is known today.

<sup>354</sup> One of the best examples of a sand-dune-dammed lake in New Zealand.



about 150 feet above sea level. In some places, however, the bedrock is still visible on the left side of the valley from the shifting sand and lo and behold, colourful conglomerate clays, unequivocally evident here as decomposed trachytic tuffs, overlain by the rock-forming trachyte breccia<sup>355</sup> of the Manukau North Head. These trachyte breccias begin very sharply marked with strata inclining towards the sea (h7 → 10° SW), at one point higher up but inclined at 20-25°, at the top of the high ground, and at the torn and broken corner of the south head, one has again the trachyte breccia rocks from the level of the sea to the top. High vertical falls in a most peculiar way completely eroded and hollowed out by the atmosphere/weather. Below in the area of the high tide deep caves washed out, just at the corner a cave 30 feet high, 30 feet wide and 200-300 feet deep into the rock, only the spring tide reaches the back end of the cave, the floor of which is covered with sand and into which huge masses of giant seaweed have washed up. Just before the cave on the left a mighty mass of trachytic veins 12 feet thick h5 → 85° E. and many smaller veins. The coast with the rugged, torn rocks, with the caves gives an extraordinarily wild-romantic picture.

“Waitakerei South Head”



Sketch 12: Cliffs with cave at sea level. Sketch of south end of Te Henga Beach.

In most places the breccia are extraordinarily layered, but what struck me is that the fragments – of all sizes from 6 feet diameter to the fine grit – appear here for the most part more rounded, their surface not worn [page 70] however, never smooth, but rough, quite meteoric, as if covered with a glassy crust. As rough as the surface is, it looks as if all protruding surfaces were polished to a shine or smeared with oil<sup>356</sup>. Some strata are freer from coarse large fragments and pebbles, these strata then have the appearance of sandy trachyte, like tuff layers at Big Muddy Creek and Slippery Creek. A stratum in the midst of massive breccia is an entirely white conglomerate of clay marl of a most peculiar nature. Appearance (compare the collected pieces) – but all this more in the deeper layers, here the colourful conglomerate also appear. Clays here in part interchanged with the breccias.

The whole of the west coast appears to present a huge fault line, hence the inclination of the strata all outward to the sea<sup>357</sup>.

From the south head we went to the north head. Here lies buried in the sand for the time being the wreck of an English ship<sup>358</sup> that foundered on the brecciated island of Ihumoana, an old Māori pā, in [18]53, a second island on the north head which also formerly carried a fortified Māori pā, the Māori people call Kauwahaia, a rocky outcrop of rock by Waitakerei,

<sup>355</sup> Piha Conglomerate.

<sup>356</sup> Polished by sand grains thrown against the rocks by the surf.

<sup>357</sup> The strata do not dip seaward in many other places along the west coast (Hayward 1983). There is no strong evidence for a coast-parallel fault.

<sup>358</sup> Barque, *Helena*, wrecked in Waitakere Bay, 16 September, 1853.

meaning where the water disappears. Also, the north head greatly fractured, violent falls and slips forming the said islands.

Pohutukawa a tree excellently suited for ship lumber that grows on these small broken rocks<sup>359</sup> connected to the land by shifting sand dunes.

The north head offered me a new fact, which I could nowhere so clearly observe. The steep breccia conglomerate rocks here are all overlain by 100-200 feet thick lodestone layers<sup>360</sup>. The sandstone is soft, fine-grained, the ironsand is not scattered in it, but in layers, and here too [page 71] again, the question, does the ironsand on the shore come from these sandstones, or are the sandstones hardened ironsand<sup>361</sup>. Difficult to decide, at any rate this is the most recent formation and at the same time synonymous with the layers which form the uppermost from the Manukau South Head to the Waikato South Head. Here the sandstone layers are iron-rusty red-brown, and you can see them from afar by this colour.

We camped<sup>362</sup> on the bluff above the surf and then climbed the highest point over the coast “Ohinetu” from which on a clear day you can see Mount Egmont and on the other hand you can see the Kaipara Heads. Up here all ironsand sandstone. After the country in the woody hills. All colourful conglomerate clays, northward the land slopes gradually towards the Kaipara South Head. The last point at which the trachyte breccias emerge is 3-4 miles north of Waitakerei north head, a marked hill called by the Māori Tirikohua. Further up one sees nothing but sand dunes and drifting sand.

The way back from this point on the slope to the Waitakere River gave the following glimpses of one of the most beautiful New Zealand landscape sceneries that I have seen until now.

In the foreground magnificent toe-toe grass, *Phormium tenax*, *ti* = *Dracaena*, *Solanum*<sup>363</sup>, plantations of kumara, pigs, horses, and old hut. Then the creek meandering through a wide swamp<sup>364</sup> area<sup>365</sup>, enclosing a small island on the right, next to it a landing place, canoes, more huts, grazing horses, bush forest, then the shifting sand areas to the lake<sup>366</sup>, above them higher dark green forest areas to the lake, kauri forests, in the middle a forestless hill overgrown with ferns, crossed by the border of trachyte breccia and coloured clays. On the colourful clay ends with palisades [page 72] bordered pā “Parawai” further swamp again, and high kauri forest mountains, tattooed New Zealanders in the foreground with kahikatea trees bearing dark green foliage and yellow edible berries.

At 2 o'clock we were back from our excursion, all quite tired, so we soon fell asleep. At 4 o'clock the company left for the lake, I stayed behind and wrote.

Incidentally, the gentlemen soon returned without having achieved anything. And in the evening we sat together with the Māori in front of the church, we conversed as well as we could.

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<sup>359</sup> Referring to Erangi and Kotau points, between Te Henga/Bethells Beach and O'Neill Bay.

<sup>360</sup> Pleistocene Kaihu Group sandstone.

<sup>361</sup> Clearly the latter.

<sup>362</sup> Camped, here refers to taking a break.

<sup>363</sup> Poroporo, *Solanum aviculare* has pretty purple flowers.

<sup>364</sup> Additional description note in right margin: swamp grass with kauri stumps just like in our swamps.

<sup>365</sup> Bethells Swamp.

<sup>366</sup> Dune-dammed Lake Wainamu.

The Māori here belong to the Kawerau tribe of only 30 people living in two villages.<sup>367</sup> The chief “Waterhouse” = Wata rauhi in Māori, “Tawhia” is his indigenous name<sup>368</sup>, is a gentleman who asked his fellow tribesmen to sing us songs. And so, there was singing and playing the whole evening until the moon shone down on us. We sang the Austrian national anthem and the Prussian national anthem to the Māori, and the Māori sang us their old war songs, but the chief wrote me a few lines in my album so well and nicely in form and sense that I was amazed.

Our evening dinner consisted of potatoes and delicious fresh eels, which the Māori had caught in the river for us during the day. The river is said to be overflowing with eels, which are sometimes said to reach an astounding size. I took a few specimens in alcohol with me of another freshwater fish.

### **Saturday, 12 February**

We started at 8 o’clock, a glorious day, the chief escorting us back to Mr Dilworth’s farm himself. [page 73] We parted from the village to loud hoorays which the Māori called out to us. On the way back I did some botanical collecting, some beautiful new ferns, then I became acquainted with “Kohurangi”<sup>369</sup>, a small epiphytic tree on the “Nikau”, a palm of the Arecas family of which the young leaves were eaten<sup>370</sup>. Another taller palm, said to occur in New Zealand, the Māori named “Kaihuia”<sup>371</sup>

Great farewell scene from the Māori people from the Waitakere at Dilworth’s Farm with various rounds of mutual farewells. Mr Graham acted as interpreter, I expressed my thanks for the hospitable reception at the pā, the chief replied: Friend! You have nothing to thank, for I could offer you nothing but a place to sleep and flax for a bed, but I must thank you, for you have come far to see us, to examine our valley, and our neighbours who own the land, have never been here. But you were there, you recognized everything, saw everything. A people that has such men and sends them far across the seas to see us and write about our country, just out of curiosity, must be a great people, if I could come to Austria by land I would like to visit you, but the ocean lies between us, and so I can only say, “Remember your friend, and farewell.”

Then he turned to Mr Smallfield, the editor of the *New Zealander*, and said: You now know our valley, our people, you will write what you have seen<sup>372</sup>, then also write that a road is being built to us, we all want to help and work on it.

That was the gist of the speeches. What is the difference between these Māori people? In the interior of the island they resist having engineers travel and survey, resist that paths be made, and here they know [page 74] no greater wish.

The hurrahs echoed through the forest for a long time as we rode home. We reached Henderson’s Mill in good time and passed the evening in merry conversation. Captain Ninnis

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<sup>367</sup> Waiti Village and Parawai Pa, Te Henga (Tatton 2019).

<sup>368</sup> Te Kawarau rangatira Tawhia Kiterangi, took the name Hone Watarauhi/Wataruihi, or John Waterhouse, after the Wesleyan minister in Sydney, when he was baptized and converted to Christianity in 1845 (Tatton 2019). Also known as Te Watarauhi Tawhia or Tawhiakiterangi (Thomson 2017: 27).

<sup>369</sup> Kirk’s tree daisy, *Brachyglottis kirkii* var. *angustior* is an epiphyte growing on trees.

<sup>370</sup> Nikau palm, *Rhopalostylus sapida*, in the family Arecaceae is New Zealand’s only native palm species. Its young shoots are edible.

<sup>371</sup> This is the name given to the full grown nikau palm.

<sup>372</sup> Smallfield wrote up an account of the trip, published anonymously in the *New Zealander* in two parts on 16 and 19 February 1859 (Smallfield 1859).



returned to Onehunga, but the rest of the gentlemen agreed to stay and see Henderson's Forest with us the next day.

### **Sunday, 13 February**

A clear, cloudless day with a refreshing southerly breeze.

After breakfast we ride to the forest, a good road leads to the forest settlement, where the people who are busy cutting down the trees live in small wooden houses scattered in the forest.

The creek upstream from Henderson's Mill has a few cross-sections that I must mention.

At Henderson's Mill itself there is a white argillaceous sandstone in the creek, which alternates with soft grey sandstone, or almost loose argillaceous sand, which is excellently suited as moulding sand, also alternating with pure white argillaceous marl and a white-grey, fine marl conglomerate.

Further up the creek soft grey argillaceous sandstones, very fine-grained with isolated carbonaceous traces. The sandstone is characterized by small white clayey particles and small black clayey slate-like particles that give the sandstone a tuff-like appearance, although there is no trace of volcanic particles in it. Overlying the sandstone are more white argillaceous strata. The whole Tertiary formation<sup>373</sup> here is an alternation of soft sandstones and sandy argillaceous marls, white, yellow and grey colours predominate, [page 75] and above lies alluvial rubble on both sides of the brook, which was nothing but rubble. Trachytic and phenolitic rocks, including a trachytic piece, found rich in feldspar with fine hornblende crystals with the character of a real primitive syenite<sup>374</sup>, then very nice, silicified wood<sup>375</sup> found as boulders in the stream, which, like the boulders, come from the trachyte breccia of the coastal mountains.

Higher up in the mountains, a section along the tramway reveals a peculiar clay marl conglomerate with a calcareous binder, extraordinarily solid when fresh and of a grey-blue colour, but without any trace of volcanic rock in it, these marl conglomerate layers contain traces of lignite, in the same way as in Auckland.

The marl conglomerate beds<sup>376</sup> lie above the sandy and clayey layers of the Auckland tertiary formation but are still from trachyte and pre basalt.

I summarize what I observed in the kauri forest. At 2 o'clock we were back from the forest, then dinner. Entries from the whole company in my album and back to Auckland where I arrived at 6 pm.

[page 76]

### **Henderson's 'Bush' and 'Mill'**

Regarding the kauri forests: Kauri are the king, the prince of the New Zealand forest, the only wealth of the province of Auckland – what happens when this wealth has been spent?<sup>377</sup>

The Kauri forests between the Manukau and Kaipara on trachyte breccia and trachyte tuffs are not among the most luxuriant to be seen in northern New Zealand and, if clearing continues, will soon be gone without a trace, as will the forests which formerly covered the

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<sup>373</sup> All belong to the Early Miocene Waitemata Sandstone Formation.

<sup>374</sup> Probably andesite.

<sup>375</sup> Silicified wood is now extremely rarely found in the Waitakere Ranges. Most must have been collected out of the stream beds long ago.

<sup>376</sup> Cornwallis Formation.

<sup>377</sup> This question is an addition in the left margin of the manuscript.

great tracts of land which now cover the Waitemata as sterile fern heaths, where the white clay soil shines through everywhere.

Kauri gum, which the Māori digging the ground are here collecting from rotten trunks, traces of which lie buried beneath the surface. The stumps of toppled forest giants are the remnants of the former forest. What used to happen in the wars of cannibal tribes to burn out the enemy is now happening in the interests of civilization and culture, to make money and make the land arable!? The forest is devastated and destroyed with fire and sword<sup>378</sup>. There was a fire in Henderson's Bush for 14 days!! All the news heard in the papers was just: "No damage has been done to timber." It won't be long before a cry of distress will go through the country – for wood and for forest.

Even if they are not the most beautiful, the kauri forests in the Titirangi range are beautiful and worth seeing.

Here the kauri always grow together in clumps, rarely individually, never in places exposed to the wind, always in the middle of the forest so that they give each other protection. The colour of the crown of dark green, which stands out above all other forest trees, can be seen from a considerable distance, the kauri are like dark shadows on the forest sides, and as if from corridor masses, these dark kauri shadows are interspersed with light green tree fern veins. If one cuts down the forest and leaves individual trees standing, they gradually die off. Isolated attempts to plant kauri have so far failed. It is peculiar that mosquito plague in December, in January and February. In March the mosquitoes had largely already disappeared.

[page 77]

In one and the same grove the trees are of the same age, groves with trees of 100, others of 200, 400, and 500 years. The oldest and largest trunks are said to reach a diameter of 15 feet and a height of 150-180 feet with 100 feet to the crown. The average measurement of such trunks as felled for the sawmills is 4 feet in diameter by 80 feet in height of the trunk to below the crown, or 130 feet in height including the crown. Such trees may be 300 years old. After counting several trunks I found 10-12 annual rings per one English inch as an average result. Sometimes, however, individual annual rings attain a much greater thickness, up to one inch.

Perfectly cylindrical trunk, almost circular in section, at the roots up to where it divides into branches, almost equally thick is characteristic, the crown may occupy 2/3 of the total size. The crown has more the habit of our noble fir, like the spruce, does not have a central trunk reaching up to the summit, rather the trunk divides at once into diverging mighty branches, usually two, and these two divisions often already at the root in twin trees, often each main branch divides into several again and so the crown is not conical, but rather umbrella-shaped. Flowering time December. Fruit ripening as cones at the end of February. At this time the kauri forests are visited by many birds, the cones all fall apart very easily. Bark 1-1½ inches thick on 4 feet thick trunks, flakes off like our firs. The resin, mainly in the bark, flows between the bark and the wood, and especially down on the trunk near the roots in thick nodules.

The resin has a very aromatic smell, in the burning parts in the forest it smells just like in a Catholic church.

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<sup>378</sup> Hochstetter is using romanticised poetic language here portraying man conquering nature by fire and sword, while in less poetic terms this would be described as by fire and axe or fire and saw.



Sketch 13: Kauri tree.

Forest devastation also means that only the best trunk wood is used, but the resin-rich bark, and the crown of the tree from which the resin is obtained are simply burned together. The trunks are sawn into so-called [page 78] mill logs of 10-30 feet length, usually trunks of 4 feet diameter, and taken to the sawmill. First, from the heart of the forest, a wide road<sup>379</sup> leads steeply down from the slopes, on which the logs are rolled towards the “tramway” of a wooden railway. The logs come on the wooden track to the alluvial area. Henderson<sup>380</sup> has created dammed ponds to allow flooding throughout the year as needed.



Sketch 14: Juvenile kauri tree.

The kauri wood shrinks lengthwise. Kaipara, Hokianga the main places for kauri.<sup>381</sup>

<sup>379</sup> Rolling road in which a whole line of logs are moved downslope using timber jacks to control the roll.

<sup>380</sup> Thomas Maxwell Henderson (1810-1886), was a New Zealand politician and one of the earliest settlers in Auckland, who established a sawmill at the junction of Opanuku Stream and Oratia Stream in 1848.

<sup>381</sup> Sentence appears as note in left margin of manuscript.



The kauri groves are of very variable extent, often occupying many square miles, or as few as 30-40 trees standing together. Between the clumps no other large trees, like rimu and kahikatia, only low undergrowth consisting of tree ferns, nikau palms, totara, tanekaha, te hangehange, Tenau reke tekohe, te kiekie<sup>382</sup>, te whatangi, te kaitia, te paawa, te tawa<sup>383</sup>.

The kauri trunks are often completely free of parasites<sup>384</sup>, but covered up in the crowns with epiphytic ferns and bromeliads.

In the Drury Ranges I measured a kauri trunk 21 Viennese feet in circumference, 35 feet high to below the crown and quite cylindrical to that point.



Figure 73. Joseph Michael Foy (1847-1923), *Cornwallis Saw Mill Bush*. Bush men or sawmill workers on rolling road. Hochstetter witnessed a rolling road like this in Henderson Valley kauri forest on 13 February (Alexander Turnbull Library 1/2-046671-F).

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<sup>382</sup> Kiekie, *Freycinetia banksia*, a thick native vine common in Waitakere forest.

<sup>383</sup> Tawa, *Beilschmiedia tawa* tree.

<sup>384</sup> Because they shed their bark.

In 1858 the Māori of the province of Auckland are said to have earned 16,000 pound sterling from gum, one ton of gum is worth 8 pound sterling.

The young kauri trees, trees from 60-100 years old, have a completely different habit than the old; young trees have the pointed conical habit of our spruces. The dead-straight trunk runs to the top, the branches, not yet independently strong, form a regular, pointed cone-shaped crown around the axis trunk, which is how I saw young kauri stands on the North Shore.

[page 79]

### **Monday, 14 February**

Glorious weather, light sea breeze. My first task was to reassure the superintendent about the invitation that had been extended to me to visit Nelson. I informed him that in any event I intended to visit Nelson, but only after I had completed my task in the province of Auckland. The superintendent was extremely satisfied with my decision, I presented him with the plan of my trip to the interior to the hot lakes and the superintendent promised to give me a photographer to take with me. I then thanked the governor for the kind invitation to accompany him south on the frigate *Iris*, and declined on the basis that I preferred to do connected work in the province of Auckland. Again a lot of visits during the day, in the evening at Fischer's.

### **Tuesday, 15 February**

Nice, clear day, almost cloudless, the wind today, after the south and south-west wind had prevailed for almost a whole month, from the south-east, and in the evening a little more from the east. In the morning the secretary of the Mechanics' Institute brought me the diploma as an honorary member of the institute. McMillan brought large lumps of coal from Whangaparaoa. Dr Stafford<sup>385</sup> visited me. I wrote to the governor to formally request to have Drummond Hay as companion and interpreter on the journey to the interior and ask Drummond Hay (Fig. 74) to arrange what needs to be arranged. In the evening, at 9 o'clock, a big evening party hosted by Mrs Gore Browne<sup>386</sup>. I go there in uniform, meet the whole beautiful Auckland world, dance and even sing.

### **Wednesday, 16 February**

Same nice weather as yesterday. Dr Stafford takes me to see the Jung family, who are very courteous and have collected insects from Coromandel for me, also offer a collection of ferns and mosses, and further organized a whole collection of nature prints of leaves from New Zealand wild plants for me. Purchas brought me beetles and butterflies again and always the noble man – writes my English [page 80] letters for me. I respond to the Nelson government's invitation and say that I will come there in June and stay there for the month of July. Then I answer the letters from the Mechanics' Institute. In the evening I go to Koch to win him over for the tour to Lake Taupo.<sup>387</sup>

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<sup>385</sup> Sir Edward William Stafford (1819-1901), Premier of New Zealand and Colonial Secretary in Auckland.

<sup>386</sup> Renowned salon hostess Harriet Louisa Browne (1829-1906), wife of Colonel Sir Thomas Gore Browne, Governor of New Zealand, 1855-1861.

<sup>387</sup> Sketch in left margin here showing relative position of Captain Cook Hotel and Royal George Inn.



Figure 74. George Drummond Hay (1827-1881), surveyor who acted as interpreter for Hochstetter and guided members of the Novara Expedition to Drury and the coalfields (28 December - 2 January), accompanied Hochstetter to Whangaparāoa (2-4 March), and on his survey journey to the central North Island. Albumen print, 96 x 72 mm (Alexander Turnbull Library PA1-q-250-24-1).

#### **Thursday, 17 February**

Cloudy, cloudy sky with a north and north-easterly wind, but no serious rain. In the morning at 8 am I set off towards Onehunga, as Purchas and I had arranged to meet up at the foot of One Tree Hill to explore several volcanoes and investigate points in the area more closely.

We first climbed the mountain Maungakiekie One Tree Hill left on the road to Onehunga. On the west side, the first elevations to which one comes form scoria and ash craters open to the west, on the south side of this ash crater there is a gravel quarry<sup>388</sup> that exposes the layers 60 feet high; the profile is interesting in many respects:<sup>389</sup>

Soil 1-3 feet, gradually merging into argillaceous strata, as from a stream of mud which flowed from the volcano at the end of all eruptions, between the thinly stratified mud a layer only a few inches thick, giving the appearance of a wholly decomposed volcanic tuff<sup>390</sup>.

Sharply delineated is a second layer of arable soil about 3 feet thick<sup>391</sup>, which gradually passes downwards through more or less decomposed layers into the regularly stratified layers of ash of black colour<sup>392</sup>, sometimes coarser, sometimes finer, which form the main mass

<sup>388</sup> This old scoria quarry is still present on the south side of the western breached crater.

<sup>389</sup> The text in the following paragraph is represented as a basic diagram showing the one to three feet of top soil over three feet of other strata as described.

<sup>390</sup> This upper unit is inferred to be tuff erupted from nearby Three Kings Volcano, 28,500 years ago.

<sup>391</sup> This soil is inferred to have developed beneath forest cover between the original eruption of Maungakiekie, ~60,000 years ago and Three Kings volcano, 31,000 years later.

<sup>392</sup> Primarily scoria.



of the lateral ash crater. In these finer layers of ash there are sometimes large blocks of lava that look like huge volcanic bombs. The ash crater is terraced inward, ancient fortifications built by Māori who built a fortified pā on One Tree Hill. [page 81] Behind the ash crater to the northeast, almost in the middle of the whole mountain, lies the actual crater, above whose floor the highest point rises about 150 feet high on the southeast edge. An old tree trunk ‘Christmas tree’<sup>393</sup> here, now almost rotten down to the ground, gave the mountain its name in its younger years.

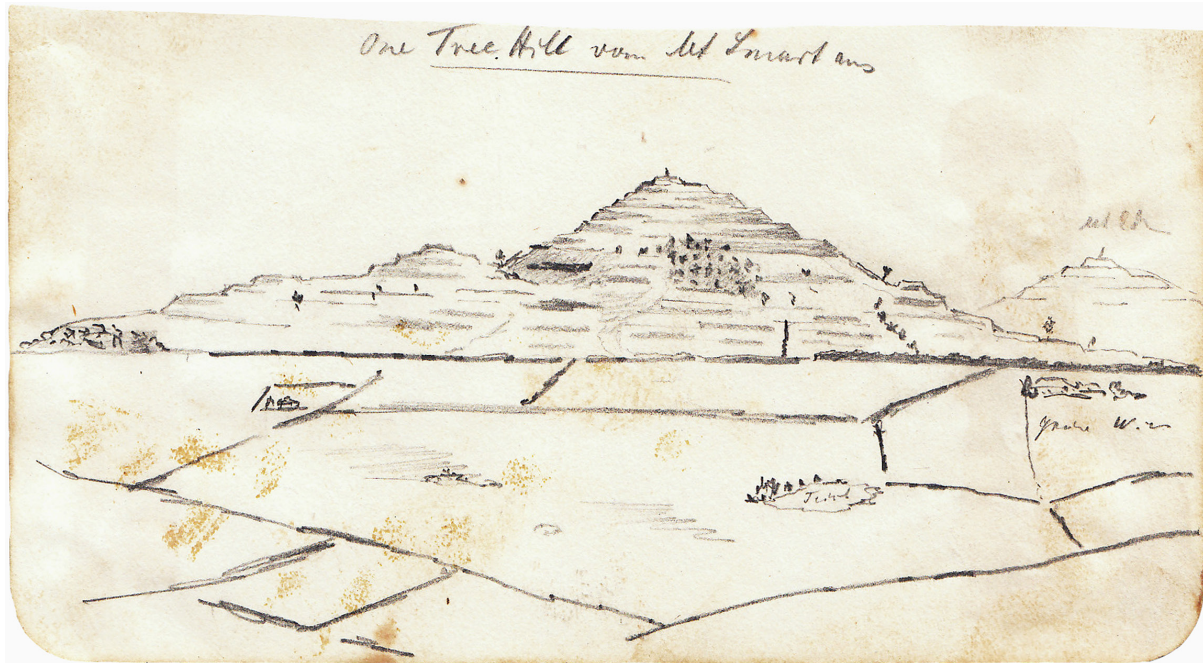


Figure 75: Ferdinand Hochstetter, *One Tree Hill von Mt Smart aus* [One Tree Hill viewed from Mount Smart]. Pencil on paper, 78 x 142 mm (Hochstetter Collection Basel HCB 3.2.26).

South of the main scoria crater, which is oval in shape, lies a second scoria crater just southeast open to Mount Smart. From which the bulk of the mountain's lava flows flowed; to the northeast of the central cone lies a small lateral scoria cone without a clear crater depression. The in this manner multi-peaked mountain, characterised as a former mighty Māori pa, in being marked or tattooed all over, displays a completely different appearance when seen from different sides, and one is unable to get a correct idea of its structure without having climbed to the highest point. From here one also has an excellent view of the entire surrounding terrain.

The scoria cone of One Tree Hill rises with steep slopes from an extraordinarily flat sloping tuff cone<sup>394</sup> that regularly encloses the northern side of the mountains. But towards the southeast no trace of tuff cones, in this direction opposite to the tuff deposits the lava flows have flowed in the direction towards Mount Smart and in the direction towards Gedde's Basin in Onehunga. The boundary of the lava flows forms a line almost convex towards east in a southerly direction. Older lava flows occur here and there under the tuffs in a north-easterly

<sup>393</sup> Pōhutukawa, *Metrosideros excelsa*. This tree was cut down by an unknown colonist in 1852 and replaced by a group of Monterey pines planted in the 1870s. The last of these was cut down by a Māori activist in 2000. A small grove of young tōtara and pōhutukawa are currently growing on the peak.

<sup>394</sup> The tuff referred to here was erupted from Three Kings and actually thickly buries the basalt lava shield volcano of Maungakiekie on its western and northern sides.

direction, in other places the tuff emerges here and there under the newer lava flows.<sup>395</sup> The One Tree Hill lava flows flow together with the Mount Wellington and Mount Smart lava flows and together form the great fractured rocky lava field in the centre of which rises Mount Smart. This is intersected by the road<sup>396</sup> to Otahuhu and from which individual [page 82] streams run out far into the shallow mud masses of the Manukau, where they form clearly visible, far-reaching rocky reefs at low tide, under which fresh spring water gushes out everywhere. The western lava flow is the same which exits west of Geddes Basin at Onehunga embarkation place.

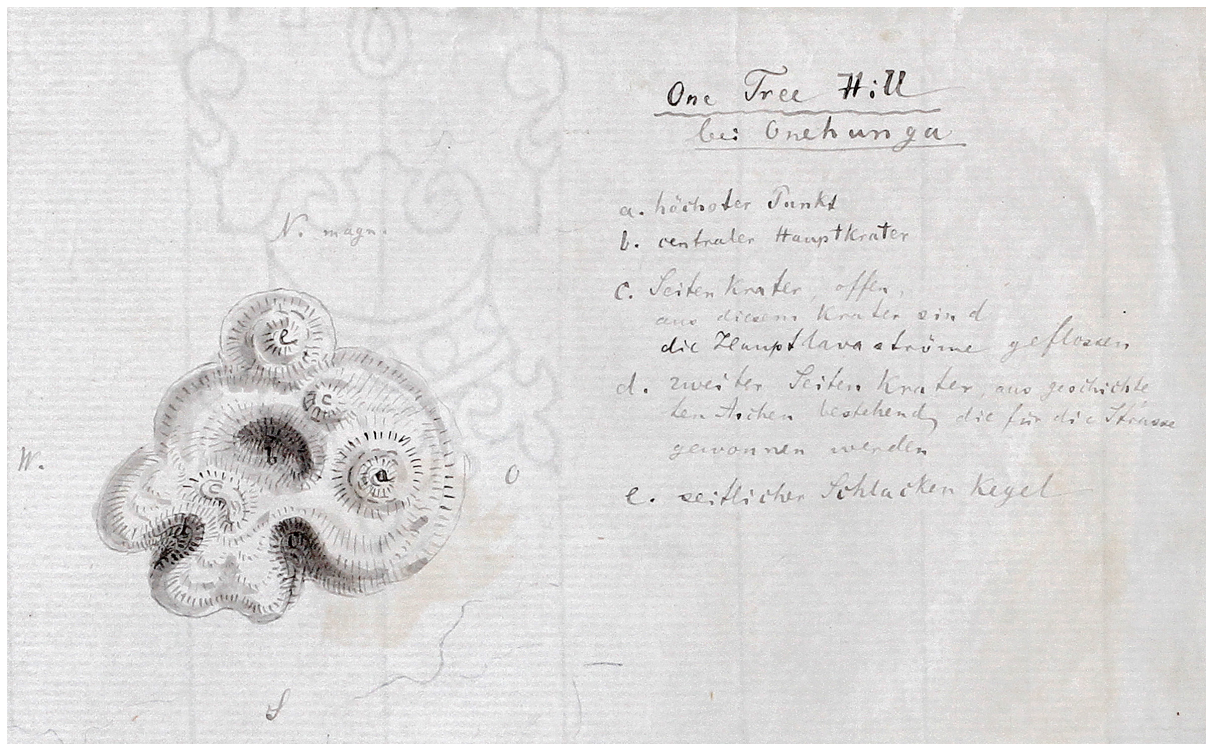


Figure 76: Ferdinand Hochstetter, *One Tree Hill bei Onehunga* [One Tree Hill near Onehunga], 19 February 1859. Ink and wash on watermarked laid paper, 190 x 245 mm (Hochstetter Collection Basel HCB 3.2.22). Hochstetter and Purchas visited Maungakiekie/One Tree Hill on 17 February when this map would have been first sketched.

The whole terrain between One Tree Hill, Three Kings and Mount Kennedy<sup>397</sup> is a very strange tuff crater terrain. Here are the best Onehunga farms, which owe their excellent soil precisely to the decomposed tuff craters. A novice in geology, or a less practiced geological eye, will see nothing in all the terrain referred to but an irregularly flat, hilly, very fertile country, with occasional marshes and small pools of water in depressions between the flat-topped hills. The yellow iron colour of the soil stands out characteristically against the white sterile argillaceous soils of the Auckland Tertiary Formation, and in these sterile fern heaths, one sees on the tuff soil the most beautiful, lush meadows on which hay is made in abundance around Christmas. Magnificent fields, meadows, pastures, horses and cattle.<sup>398</sup> Here one does not have to deal with hard blocks of lava rock, which have to be laboriously removed in

<sup>395</sup> This sentence appears as an addition in the right margin of the manuscript.

<sup>396</sup> Note in right margin: "Harp of Erin" the hotel where the roads meet.

<sup>397</sup> Puketapapa now known as Mount Roskill, named by the earliest English owner Alexander Kennedy.

<sup>398</sup> This sentence appears as an addition in the left margin of the manuscript.



order to create meadows. Only here and there does an isolated lava mass protrude, otherwise everything on the surface is decomposed tuff, further on one reaches regularly layered volcanic ashes and scoria of black and brown colour, and underneath there is rocky lava in some places.



Figure 77: Ferdinand Hochstetter, IX. [sketch map of central Auckland volcanoes] 17-18 February. Pencil and ink on blue laid paper, 205 x 326 mm (Hochstetter Collection Basel HCB 3.2.9). Waitemata Harbour coast at top and Manukau Harbour coast at bottom. Straight lines are roads.

With my map in hand though, anyone may easily recognise the regular [page 83] circular arrangement of the terrain in individual tuff craters. Tuff crater is next to tuff crater, one just has to be careful not to take the depression in front of one, sometimes three or four tuff crater circles, for a crater depression<sup>399</sup>.

For better orientation I want to describe the clearest of these tuff craters in more detail:

If one has just passed the western crater opening of the western side scoria cone of One Tree Hill on the road from Auckland to Onehunga, then the road leads successively over two very flat ridges, these two ridges are the two crater rims of the first tuff crater on the road, the straight one is cut in the middle by the road. Immediately afterwards, before one gets to the hotel 'Red Brick House' in Royal Oak, there is a small circular water puddle on the left very close to the road, barely 30 feet across.

At Red Brick House, to the right of the road and to the left of the path that leads here to Three Kings Wesleyan College, is Beveridge's Swamp drained by a canal cut to Ormsby's Gully,

<sup>399</sup> In this area around Royal Oak, Hochstetter recognised five tuff craters but all appear to have been ash-mantled depressions in the top of the Maungakiekie western lava flows and not volcanic centres (Hayward and Kenny 2013). The ash is from Three Kings Volcano and the lava emerging through from beneath is from Maungakiekie.



which is surrounded by a tuff crater that is particularly well preserved to the south. At the highest point of this tuff crater on the southeast side of the swamp lies Captain Symonds'<sup>400</sup> House with the flagstaff. Then comes the "Green Hill" of Onehunga<sup>401</sup>, just in the centre of the shallow crater depression of this tuff crater lies the road from Auckland towards the southwest to the Commercial Hotel of Onehunga and is deeply incised where it crosses the southwest rim of the crater. [page 84] In the road cutting, the layers of tuff are very clearly exposed. At the southern foot of Green Hill on the beach, the Auckland Tertiary formation occurs with the tuffs exposed, grey-green ferruginous clay marl alternating with sandy trachyte tuff layers, and the lava flows from One Tree Hill flow past the eastern foot.

Further east of Mount Kennedy and south of Three Kings is a large swamp surrounded by a very clear tuff crater boundary and only open to the northwest between Three Kings and Mount Kennedy itself. Here the swamp settles in a shallow depression between the two named hills, three or four other smaller tuff craters that lie between One Tree Hill and Three Kings and south of the Three Kings, I can't name them more precisely, they can be seen on the map.

The higher range of hills west of Onehunga Creek in Ormsby's Gully consists of clayey Tertiary hills.

An experienced geological eye can tell by the colour of the soil, what grows on the soil, the type of cultivations, and the type of fencing, whether basalt and lava blocks or introduced "Furze"<sup>402</sup> or "Whiu" *Ulex Europaeus*, from the whole relief of the surface easily distinguish the Tertiary land, the tuff land, the lava land, the scoria land and the scoria cones.

Three Kings one of the strangest volcanic structures in the area. The central scoria mass of the group consists of three almost equally high hills separated by more or less deep valleys, of which the name of the highest and southernmost of these scoria hills is twin peaks and also the one [page 85] lowest and eastermost of the three, so one can count five scoria cones, all terraced by Māori labour. These mound groups enclose two deeper crater depressions, the south-east crater being deeper and more pronounced, the western one being more open to the west.

This central 3 or 5 peak mass of scoria is surrounded almost in a circle by a wall of lava<sup>403</sup>, the lava being piled up basalt in mounds lying next to one another without any clear order.

This lava wall is most incompletely developed on the south-east side, on the other hand towards the north-west the lava has piled up in a series of marked, untidy hills, from which two very marked lava streams now flow in a north-westerly direction. In the west of these two lava flows are the Three Kings Caves, famous for their many Māori skeletons<sup>404</sup>. Farther to the north west these lava flows spread out more and more bounded by swamps and then by flat Tertiary ridges, and finally flow together with the lava flows of Eden and Albert to form the great Waitemata lava field, sloping down towards the Waitemata<sup>405</sup>; the Manukau corresponds to the lava field of Mount Wellington.

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<sup>400</sup> Captain John Jermyn Symonds (1816-1883), New Zealand Member of Parliament and judge of the New Zealand Land Court.

<sup>401</sup> Now Jellicoe Park.

<sup>402</sup> Another term for gorse, which was introduced to New Zealand by early European colonists for hedge rows.

<sup>403</sup> Remains of a lava lake inside the crater which has several different levels as a result of lava withdrawal and partial collapse of the lake surface (Hayward and Kenny 2009).

<sup>404</sup> All now removed.

<sup>405</sup> In the vicinity of Western Springs.

Some of the buildings belonging to Wesleyan College lie on the western part of the lava wall. W. Hanson Turton<sup>406</sup> Governor and Chaplain, Three Kings College, Auckland.<sup>407</sup>

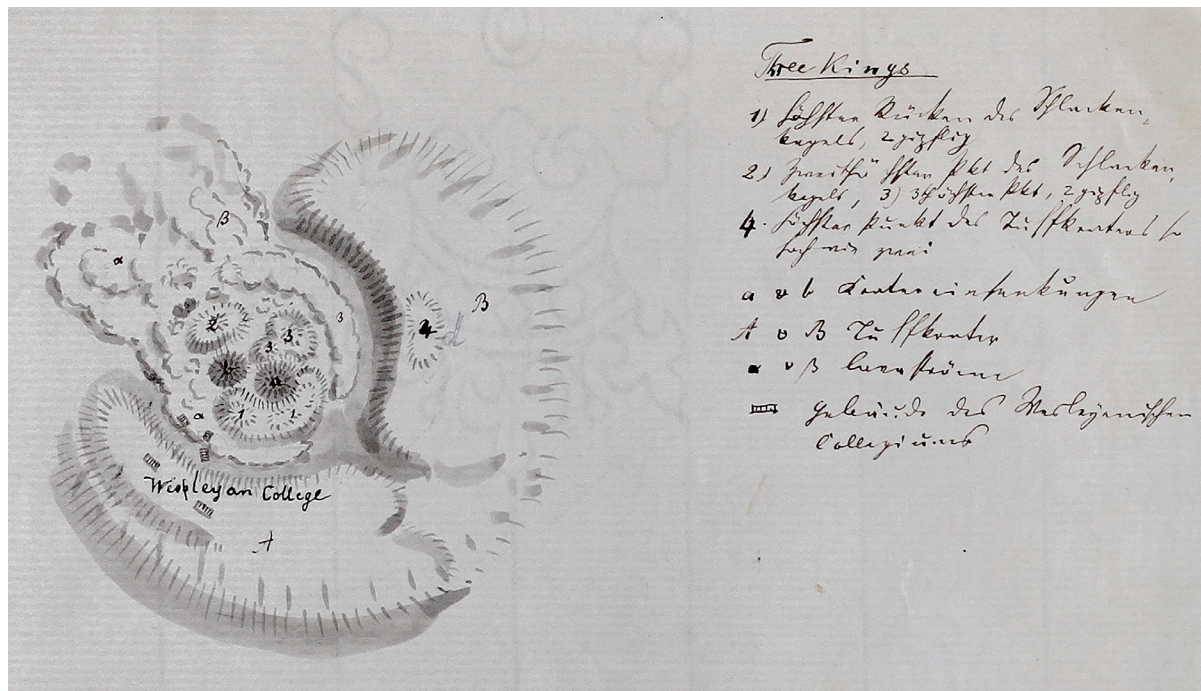


Figure 78: Ferdinand Hochstetter, *Three Kings*. Ink and wash on paper, 185 x 245 mm (Hochstetter Collection Basel HCB 3.2.23). Hochstetter and Purchas visited this volcano on 17 February.

The third member of this group is a most excellent tuff crater, which amphitheatrically encloses the scoria cones and the lava wall. On the western side, between the lava wall and the steeply rising rim of the tuff crater, there is a narrow, flat surface on which the church stands<sup>408</sup>. On the western part of the tuff crater itself lies Rev. Mr Turton's [page 86] house and the building for the female pupils.

The tuff crater is open to the northwest, in the direction in which the lava flows flow, and divided into two halves by a shallow valley in the opposite direction to the southeast. The south-west side is the lower one. The north-eastern side, on the other hand, rises steeply and high to a summit<sup>409</sup> nearly as high as the tallest of the scoria peaks, and therefore entirely covers it as seen from the east.

Mount Kennedy<sup>410</sup> is nothing other than a simple scoria cone with shallow fully intact crater depression. Weakly developed at the foot of the hill is a lava rock barrier [*Felsriegel*], then a gently flattening tuff cone, which is missing in the north-westerly direction, here between swamps and swamps themselves again enclosing the flat low-mass lava flows emanating from the small eruption point.

<sup>406</sup> Henry Hanson Turton (1818-1887), Wesleyan minister (Fig. 101).

<sup>407</sup> This sentence appears as a note in the right margin of the manuscript.

<sup>408</sup> Now McCulloch Avenue, Three Kings.

<sup>409</sup> Top of St Andrews Road today.

<sup>410</sup> Puketapapa/Mount Roskill.



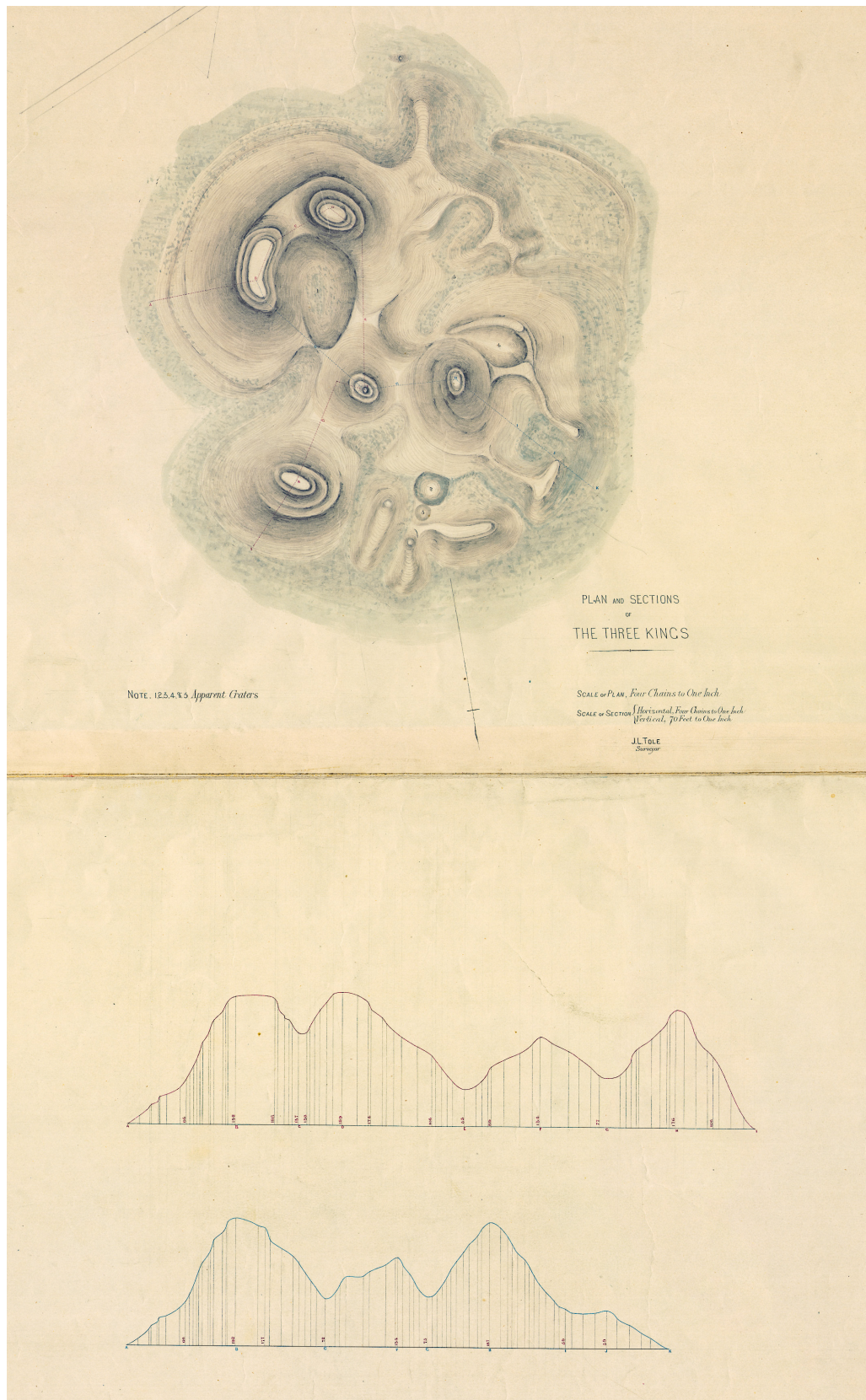


Figure 79: John Lambert Tole (1832-1905), *Plan and Sections of The Three Kings*, [1859]. Ink and watercolour on paper, 960 x 530 mm. Scale 4 chains to 1 inch (Universitätsbibliothek der Humboldt-Universität zu Berlin, Historische Geographische Sammlung: A 72-09). After Hochstetter visited Three Kings volcano on 17 February, Tole was commissioned to produce this more accurate plan.



At 6 o'clock we arrived in Onehunga at Mr Purchas's house. The ride home gave me a good opportunity to see the Manukau at low tide<sup>411</sup>, a strange sight. The channels were now crossed like rivers in their beds, everything was dry up to the markers that had been put out. The mud flats overgrown with seaweed, here and there heaps of yellow shells and the black masses of lava from the streams that flowed from Mangere and Weekes<sup>412</sup> Island.

Rain in the evening.

Characteristic of the tuff craters and very decomposed scoria cones are two trees, which also occur elsewhere mixed in the forest.

Warangi<sup>413</sup>, like pukapuka leaves but with white underside<sup>414</sup>, and Mapau<sup>415</sup> trees, here they form whole stands and remnants of forests, in which they almost exclusively prevail.

[page 87]

### Friday, 18 February

It rained pretty hard all night; everything looks refreshed and recovered. In the morning it blows from the west again, it looks cloudy and rainy again. We don't leave until 10 am and drive to Mount Wellington in Purchas's dogcart.

Mount Wellington = Maungarei, one of the most significant and remarkable of the Auckland volcanoes.

The scoria cone mountain rises up almost on a geometrically exactly circular basis with a steep slope angle of 30-32°, flatly truncated at the top and enclosing a very interesting crater field here, of which I have drawn a more detailed sketch map. The scoria cone has been broken up on the south side by a large gravel quarry<sup>416</sup>. Here one sees coal-black scoria, so fresh in appearance<sup>417</sup> as if they had only just been heaped up, piled one on top of the other in regular strata, in strata running parallel to the mountainside dipping at 32° dipping, and water did not contribute to the accumulation of these layers of scoria, but the layers lie on top of each other here, with steep surfaces, like the layers of an artificial heap. The volcanic ejecta lie extremely loosely on top of each other, are soaked with moisture like a sponge, some larger volcanic bombs inside, but they break up into small pieces as soon as they dry in the air.

The summit of the mountain bears a deep, well-preserved double crater. On the west side, the crater rim is about 80-100 feet lower than on the east side, where the highest points of the mountain are. The mountain appears open on the western side, and the mighty lava masses of the relatively young volcano have also flowed out in this direction. High lava mounds are piled up here at the foot of the mountain, from which the main streams can be followed from afar. From the circular north crater [page 88] the streams have flowed principally in a north-westerly direction, to the foot of a Tertiary range of hills terminating from the Tertiary rises on which St Johns College lies. Deflected by this range of hills, the lava flows bend north and northeast, ending in a shallow valley<sup>418</sup> in the direction towards the Tamaki River.

But the greater part of the lava flows seems to have flowed out of the oval southern crater.

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<sup>411</sup> Manukau at low tide is also repeated as a reference in the left margin of the manuscript.

<sup>412</sup> Puketutu/Te Motu a Hiaroa.

<sup>413</sup> Rangiora, *Brachyglottis repanda*.

<sup>414</sup> This comparative note appears in the left margin of the manuscript.

<sup>415</sup> Mapau, *Myrsine australis*.

<sup>416</sup> The huge scar of this quarry persists. It was used on and off between the 1850s and 1967.

<sup>417</sup> Auckland's second youngest volcano, erupted 10,000 years ago.

<sup>418</sup> Eastview Reserve, Glen Innes, Auckland.

Massive flows 30-40 feet high can be traced west and south-west<sup>419</sup>. The lava masses have then all forced their way through a comparatively narrow passage between Tertiary ridges; to the north the Tertiary ridges running out at Ellerslie's Hill, to the south the Tertiary ridges<sup>420</sup> are on the left of the road to Otahuhu before coming to Mount Richmond. After this passage, the flows spread out again and now united with the lava flows of Mount Smart and One Tree Hill form the large lava field at Onehunga. There is no doubt that lava flows from Mount Wellington flowed in a south-westerly direction as far as Onehunga<sup>421</sup>, only there pouring into the sea, and that they also reach the sea on the east side of Mount Smart.

NB. On the large Manukau lava field one can observe exactly the boundary where the lava flows of Mount Wellington and One Tree Hill come together. One Tree Hill's lava flow is the older, and the lava decomposes in a reddish colour and Mount Wellington lava flow is newer and the lava black, still in a very fresh condition. One can see the boundary on the road between Harp of Erin and Otahuhu<sup>422</sup> very clearly since the road changes suddenly from red to black. The lava flows of One Tree Hill all converted to cultivations, those of Mount Wellington all still in their original state.<sup>423</sup>

At the western foot of the mountain in these streams there are large caves full of human skeletons from the Māori wars.<sup>424</sup>

Also, at the northern foot of the road to St John's College, one sees in isolated places the old ground over which the lava flows have flowed, burned red like bricks. Rev. Mr Purchas has found leaves in these red-burnt argillaceous strata which appear to belong to a very young Recent formation.

The shallow freshwater pond surrounded by swamps on the north-eastern foot of Mount Wellington [page 89] is not a tuff crater, the low hills surrounding it are Tertiary, it owes its formation to a damming of water on the one hand by Tertiary hills and on the other hand by lava flows.

Climbing the mountain is also very interesting for the layman, on the one hand because of the magnificent crater field of the mountain, on the other hand because of the beautiful view that can be enjoyed from the summit.

The geologically most interesting phenomenon at Mount Wellington however is an old tuff crater, enclosing an old eruptive cone<sup>425</sup>, at the north-northeast foot of the mountain.

It is the only point I know of where, near Auckland, an ancient volcanic system combines with a younger one in such a way as to produce phenomena which give direct evidence of the different ages<sup>426</sup>. The sketch will make these relationships clear.

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<sup>419</sup> Mostly quarried away with the resulting hole now occupied by the suburb of Stonefields.

<sup>420</sup> Motukaroa/Hamlins Hill.

<sup>421</sup> Modern Lidar topography suggest this is not possible, but Maungarei flows did reach the Manukau Harbour shoreline, east of Mount Smart at Southdown.

<sup>422</sup> Great South Road near Penrose.

<sup>423</sup> This paragraph is written as a note in the left margin of the manuscript.

<sup>424</sup> Te Rua-a-Potaka lava surge chamber is sealed off.

<sup>425</sup> Te Tauoma/Purchas Hill (named by Hochstetter).

<sup>426</sup> Both volcanoes are dated at 10,000 years although it is clear that Te Tauoma erupted slightly before Maungarei and they were possibly different vents of the one volcanic event.

The road from Panmure to St John's College is on the east side of Mount Wellington straight over the tuff crater, then over the middle of the crater floor, which is a flat surface from which some lava plates, coming from an ancient stream, emerge in the middle. The tuff crater is almost completely preserved. Just superimposed on its southwestern edge rises the new scoria cone of Mount Wellington. The old eruption cone belonging to this tuff crater rises on the north-western side of the crater floor. The road cuts through the eastern tip of the eruptive cone and exposes the red (from decomposition) masses of scoria of which the cone is composed.<sup>427</sup> After this intersection, the road passes over the lower lava flow of Mount Wellington drained sideways into the crater floor of the older tuff crater. Then a second road cutting through the northern tuff crater [page 90] edge. Volcanic ash layers, true submerged tuff layers formed tilting outwards at 8-10°, but to the left of the road is a powerful new lava flow from Mount Wellington which, having sent a small stream of lava aside to the bottom of the old tuff crater, has flowed with its main mass directly over the tuff crater itself.

These are the conditions which clearly show how a young supermarine<sup>428</sup> eruptive cone of Mount Wellington, which is extraordinarily rich in lava, rises in the area of an older submarine<sup>429</sup> tuff crater system and partially covers the older system with its scoria and lavas. Extraordinarily instructive conditions for the relative age of the Auckland volcanoes.

The main lava flows, as stated, flowed west of the eruptive cone of Mount Wellington, but flat tabular lava flows can also be seen on the south and south-eastern side of the mountain. However, these lava flows do not form protruding rock blocks and bulges like those, but rather form flat rock slabs of porous lava, only 1-1½ feet thick, which are columnar, fissured and almost naturally formed building blocks, these lava slabs lie over very decomposed volcanic tuffs and I am almost of the opinion that these are the old lavas of the old tuff crater system.

Mount Wellington is not only geologically but also historically interesting. It must once have been the castle of a very numerous Māori tribe. On the previously mentioned slabbed lava flows one can see the traces of the former kumara plantations. Seen from above, the figures of the earlier fields look most interesting. The whole mountain is terraced over and over, a huge effort if one [page 91] considers that the Māori people had no iron tools. Shells also scattered all over the mountain. The whole mountain with its lava fields all around is the ruin of a former Māori fortress.

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<sup>427</sup> Note in right margin of manuscript records that there was a road gravel quarry in this area.

<sup>428</sup> Above the sea or subaerial.

<sup>429</sup> See earlier note that there is no evidence to support submarine deposition of most tuff rings/cones.



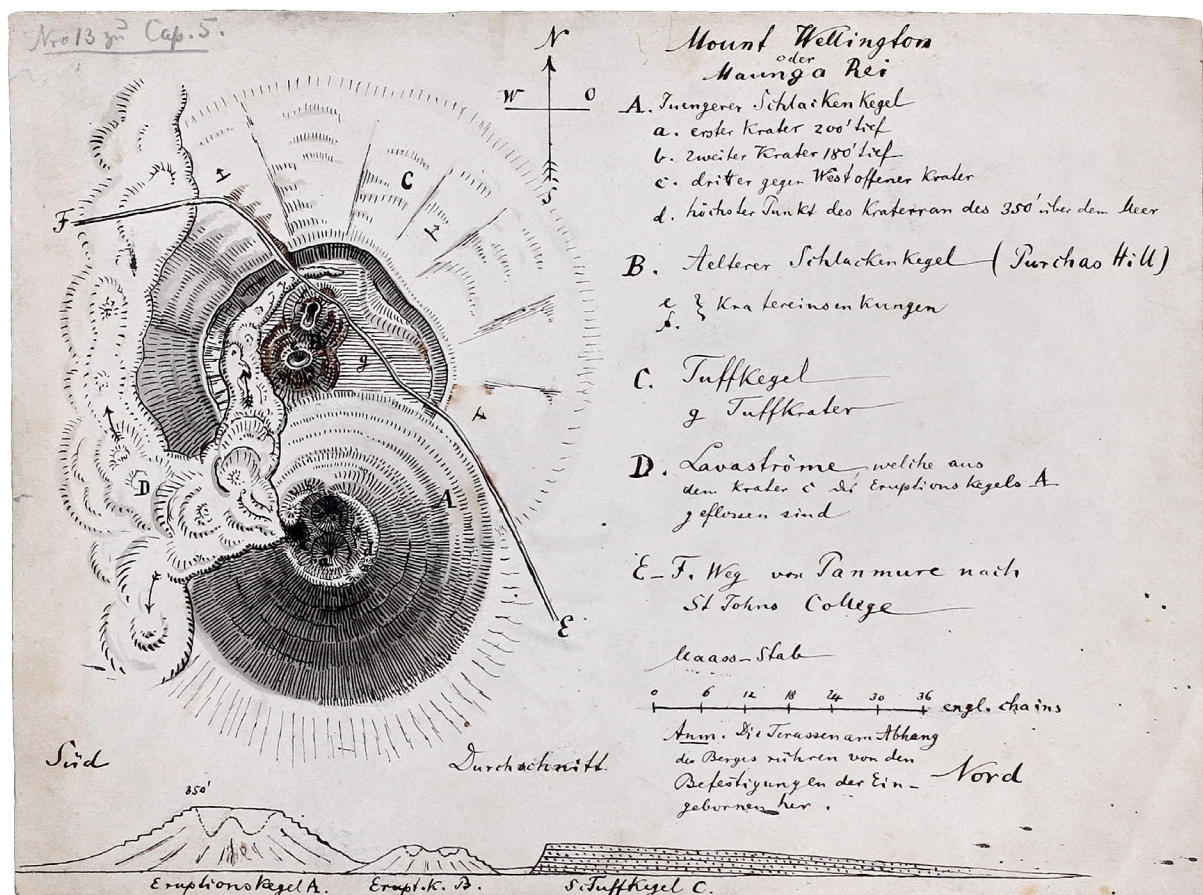


Figure 80: Ferdinand Hochstetter, *Mount Wellington oder Maunga Rei* [Mount Wellington or Maungarei]. Ink and pencil on paper, 164 x 220 mm (Hochstetter Collection Basel HCB 3.2.21). This plan is based on Hochstetter's visit with Purchas to Maungarei/Mount Wellington on 18 February.

I am including here some observations I made about Mount Smart<sup>430</sup> around Christmas. Mount Smart, one of the mountains richest in lava, rises as a regular but truncated cone from the mighty lava field formed all around by the lavas of Mount Wellington and One Tree Hill. The scoria cone has three crests at the top, between which an irregular crater is sunk. Mount Smart also rises as a Māori ruin from the land now cultivated by Europeans, on the crests and below in the crater one notices four-cornered walls. The peaks are all terraced, shells scattered all over the mountain, only *Pteris esculenta*<sup>431</sup>, introduced grasses and clover species grow on the cone, which consists of red scoria piled up in layers, ejected and piled up at an incline of 30°. In the direction of h 10 to the northwest, at the foot of the scoria cone, there is a deep funnel-shaped hole, just like the karst sinkholes, a collapse of a lava cave, because the hole only contains compact lava rocks. The whole hole is filled with a lush vegetation of trees and shrubs, many beautiful ferns in it. Cone-shaped scoria and caves full of skeletons reaching far into the sides prove that this was just a cave-in.

<sup>430</sup> Rarotonga/Mount Smart scoria cone has been quarried away and the excavation is now a sports stadium.

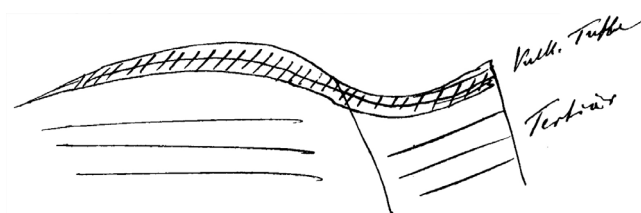
<sup>431</sup> Bracken fern.



Figure 81: Ferdinand Hochstetter, *Mt Wellington von Mt Smart aus* [Mount Wellington viewed from Mount Smart]. Pencil on paper, 78 x 142 mm (Hochstetter Collection Basel HCB 3.2.27).

On the west and north-west side of the mountain, immensely extensive ruins of earlier Māori cultivations and a large Māori village. Blocks of lava laid irregularly on top of each other to form walls, enclosing more or less regular squares, with high bracken scrub in the background [page 92] the tattooed mountains, and next to the old farm walls of the Māori the new lava walls, which surround the meadows of European settlers. This sight did not fail to make a great impression on me.

After a brief visit to St John's College, we continued our investigations to the west corner of the Tamaki Creek. On this west corner lies Mr Richard Taylor's farm<sup>432</sup> at the foot of a flat slope composed of layers of volcanic tuff, this tuff mound shows on the corner itself a quite crater-like depression, but in my opinion one is not dealing here with a tuff crater itself, but only with the remains of one<sup>433</sup>. The profile is the following:



Sketch 15: Volcanic tuff | Tertiary. Sketch of Glendowie Valley.

<sup>432</sup> Richard James Taylor (1828-1883), Auckland farmer at Glendowie, West Tamaki.

<sup>433</sup> This valley is not inferred to be a volcanic centre, but just tuff, erupted from Taurere/Taylors Hill, thickly mantling the Waitemata Sandstone valley sides.



The crater-like depression is caused by a fault, through a kind of gorge, because the profile of a tuff crater must always be like this:



Sketch 16: Profile of a tuff crater.

On the steep slope towards the sea, one sees the volcanic tuff layers 20-30 feet thick, the Auckland Tertiary formation overlay. The tuffs here are extraordinarily coarse conglomerate, with large fragments of Tertiary marl and all sorts of older types of rock in them, namely fragments of the finer sandy trachyte ashes<sup>434</sup> can also be found in these tuffs.

[page 93]

A similar tuff crater remnant lies further southeast above the bluff.

A complete very fine volcanic system is William Taylor's<sup>435</sup> Hill east of St John's College an elongated low scoria cone with a shallow crater at the east end, three smaller lateral scoria cones to the southeast<sup>436</sup>. Lava flows which flowed in a north-westerly direction, insignificant, a very fully developed tuff crater all around, open only in the direction in which the lava flows flowed<sup>437</sup>.

Rain and the onset of dusk put an end to our day's work, I returned to Auckland at 9 o'clock in the evening, I can say I examined around 30 craters<sup>438</sup> in these 2 days, and the map sketch from this trip may remain a souvenir for me.

### **Saturday, 19 February**

After yesterday's rain another beautiful day, with a fairly strong south-westerly wind. I stay in Auckland, busy drawing maps all day.

### **Sunday, 20 February**

A bright beautiful day. Updated my diary in the morning. At Fischer's for lunch. After dinner accompanied by Fischer and Haast to Mr Buckland at Otahuhu. Fischer and Haast return at 10 o'clock in the evening on the most beautiful moonlit night. I stayed with Mr Buckland to tour with him for a few days.

### **Monday, 21 February**

Off to the Wairoa.

The morning not very inviting, wind from the southeast later from the east, always fighting between rain and sun, blowing from the east in the evening and every prospect of a rainy morning. But whatever the weather, the weather didn't deter us from the travel plans for the day, [page 94] and Mr Buckland had the kindness to provide his horses for the journey. I had an old steeplechase horse, but now 15 years after its youthful heroic deeds it was only inclined to go at a walk, so my geologist hammer had to serve as riding crop and spur at the same time, one with the point, the other with the hammer. So we, Buckland, my servant James and I,

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<sup>434</sup> Parnell Grit.

<sup>435</sup> William Innes Taylor (1821-1890), Richard Taylor's brother, had estate called Glen Innes, now a suburb.

<sup>436</sup> Taurere/Taylors Hill.

<sup>437</sup> Beneath present day Glendowie College.

<sup>438</sup> As previously noted, this number includes many of the wetland depressions around Royal Oak that are no longer recognised as craters, as a result of man-made exposures made during suburban development.



started at 8 in the morning. Across the flat, not infertile country towards the Otara hills. These are the three old volcanic eruption points which are southeast of Panmure, south-southwest of Howick on the eastern side of Tamaki Creek and lie in a due north-south line in a row rising from the flats. I climbed the scoria cone of the southernmost of the three points.

No. 30<sup>439</sup> on the Heaphy map, a scoria cone scarcely 150 feet above sea level with a crater depression open to the south east which has become very unrecognizable due to the length of time and the old Māori fortifications. In the same direction and then spreading to the south-west in the area, lava flows of insignificant extent flowed out. On the east side of the scoria cone, one half of a scoria cone and the rudiments of the lower tuff crater can hardly be seen. On the west side between the swamp, the fully preserved and a sharply defined inner escarpment on the east side, is the tuff crater of the second location.

No. 29 on Heaphy's map. Very clearly preserved tuff crater, on the south and south-east side a scoria cone with a clear crater, this is open to the north, and from there to the northwest lava flows of considerable extent flowed in the direction of the Otara<sup>440</sup> Creek. A fairly extensive swamp between the lava flows. But a very neat model of a tuff crater in this location. No. 29 Green Mount and beautiful tree vegetation fills one of the few craters that are filled with forest, hence the name. These are also called Bessy Bell<sup>441</sup> and Mary Gray<sup>442 443</sup>.

No. 28. A complete tuff crater<sup>444</sup>, the crater steep inward, the floor a swamp [page 95] without trace of a scoria cone, on the southern highest part of the rim of the crater stands Mr Styak's<sup>445</sup> house. Towards the north, the swamp of the crater communicates with the large swamp between the lava flows. West the Tamaki River with its side creeks from Panmure to south only with very low Tertiary<sup>446</sup> cliffs hardly 20 feet high.

A higher Tertiary range of hills stretches south and south-southeast from Howick running flat into the Papakura plains on the stretch of land called Clendon's Grant. We crossed these hills, some of which were still wooded, heading east, and about 12 o'clock arrived at the farm at the southern end of Turanga Creek, which belonged to Mr Kennedy<sup>447</sup> in Auckland. The whole range of hills is nothing but the steep white or whitish-yellow clay soil of the Auckland Tertiary Formation. In small creek gorges and also in the upper end of the Turanga Creek itself nothing else comes to light than a soft grey, often iron-laced yellow weathered or almost white bleached fine-grained argillaceous sandstone. The small streams often fall into terraces in the gorges, the water then digs out deep round cavities as if chiselled. At Kennedy's Farm I found some pieces of this sandstone with little bits of shell debris, all of a similar characteristic to the fossil-bearing sandstone at the Orakei Bay<sup>448</sup> near Auckland.<sup>449</sup>

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<sup>439</sup> Te Puke-o-Taramainuku/Otara Hill, now completely quarried away and covered in an industrial subdivision.

<sup>440</sup> Should read Pakuranga Creek, as Otara Creek is further south.

<sup>441</sup> Green Mount.

<sup>442</sup> Otara Hill.

<sup>443</sup> Appears as note in left margin of manuscript.

<sup>444</sup> Now known as Styaks Swamp crater. Completely filled in and lies beneath industrial buildings and road.

<sup>445</sup> John Styak (1820-1877), Auckland landowner at Green Mount, and Justice of the Peace.

<sup>446</sup> Pleistocene Tauranga Formation cliffs (Kermode 1992).

<sup>447</sup> Alexander McKenzie Kennedy (1817-1897), Scottish banker who arrived in New Zealand in 1839, purchased land in Auckland at Mount Roskill, which was also known as Mount Kennedy at one time.

<sup>448</sup> Named respectively Turanga Greensand and Orakei Greensand, but the same lithology and undoubtedly the same provenance.

<sup>449</sup> Addition in right margin here, noting "the water of the 12' deep well = 15.3 C[elsius]".



Figure 82: Ferdinand Hochstetter, X. [sketch map of volcanoes in eastern Auckland], February 1859. Watercolour, ink and pencil on paper, 530 x 180 mm (Hochstetter Collection Basel HCB 3.2.10). Hochstetter explored the East Tamaki volcanoes (centre) on 21 February and Pigeon Mountain (top) and Panmure Basin volcanoes on 24 February.

At Kennedy's Farm we found hospitable reception for a few hours, both for ourselves and our horses, and were properly fed all around. At 1 o'clock we started again, the land between the Turanga and Waikopua creeks is low Tertiary hill country, which adjoins somewhat higher ranges of hills in a south-easterly direction. To the right of the trail in the direction of the continuation of Waikopua Creek is the ruggedly rising wooded ridge of Mount Pleasant perhaps 700 feet above sea level<sup>450</sup>. In front of this is a cone-shaped [page 96] lower but conical hill<sup>451</sup> separated all round from the ranges with deeper indentations. A hill that can be recognized by its terracing as an old Māori pā. On top of this cone lies Chandler's Farm<sup>452</sup>. We rode up there, as the relief of these mountains was so peculiar that we suspected other formations. The cone has more fertile soil than the surrounding Tertiary clay marl land, the soil looks ferrous yellow, but I could not convince myself that there is a volcano here; tuff, or something other than a broken down part of the tertiary Formation, of weathered clay-slate hills, these were more ferruginous. On the other hand, we found in a creek bed at the foot of the hill behind the cone a high forest ridge, all boulders of a black-blue extraordinarily, fissured fracturing hard old argillaceous schistose rock consisting of no structure at all, except for individual small pieces, and more basalt or aphanitic-like as rocks from the argillaceous shale family. Fine white quartz veins, which run through the rock, reveal its true character<sup>453</sup>. Here for the first time we came to the boundary of the Tertiary formation and a range of hills probably consisting of primary clayey slates. This formation limit is extraordinarily clear once you have crossed the high ground above Waikopua Creek on the way to Maraetai. Low fern overgrown clay marl hills, rich in kauri gum, border here to the east on a rugged and sharply rising higher mountain range, from which small valleys everywhere run at right angles to a stream that runs along this mountain [page 97] range, meanders and flows into the small Maraetai Creek. This whole range of mountains now consists of the dark blue-grey argillaceous rock and is only overlaid by a weak Tertiary cover at its northernmost end at Maraetai itself.

The most informative location is on the sea shore between the Te Puru Creek, Maraetai Creek and the small bay called Papawhitu<sup>454</sup> on the map. On the coastal terrace of the designated place is one of the eastern mission stations, now a farmer named Eckford<sup>455</sup>, a victim of New Zealand loneliness and poverty, lives here in a small house alone as a bachelor.

The cross-section along the coast here:



Sketch 17: East | Tertiary clay slate cliffs sandstone clay marl | West

<sup>450</sup> On Kimptons Road (257 m ASL).

<sup>451</sup> Seemingly unnamed peak above present Whitford Quarry (206 m ASL).

<sup>452</sup> Farm of William Chandler.

<sup>453</sup> Waipapa Terrane greywacke of Triassic-Jurassic age (Kermode 1992).

<sup>454</sup> Small bay east of Maraetai, once known as Home Bay.

<sup>455</sup> Thomas Eckford's four-room farm homestead built in 1851 at Maraetai on his 368 acre farm. The building was shifted to Howick Historical Village, renovated and opened to the public in 2017. Hochstetter renders the name phonetically as Eckfört in the diary.



At the western corner there are sandstone beds trending flatly towards h 6-7 at 5°-10° to the southwest, overlaid by lighter clay marls. At the eastern corner, black rocky cliffs emerge in the sand of the beach showing some kind of direction, whether fissuring or stratification is unclear towards h8-9, the quartzous argillaceous schist<sup>456</sup>. The point where these rocks appear, corresponds exactly to the continuation of the strongly marked boundary line of that range of hills, there are only 2-3 feet high cliffs of rock crossed by fine veins of quartz. But and that is the most important thing: no trace of coal on the border of both formations, the soft greenish-grey sandstones of the Tertiary lie directly on the hard ancient cliffs of clay slate<sup>457</sup>. Probable that sharp edge of the mountain range is the old seashore and the coals must be sought on the other incline towards the Wairoa.

The bachelor at the old mission station provided us in his sad desolate little [page 98] house basic quarters for the night – meagre, but all he had to offer, and given with Scottish hospitality. The miserable run-down man is a Scot forlorn from lost love?



Figure 83. Richard Taylor (1805-1873), *Maraetai Mission House & Church, May 5 1847*. Pencil, ink and wash on paper, 80 x 170 mm (Alexander Turnbull Library E-296-q-077-3). Hochstetter spent the night of 21 February in the house on the left.

### Tuesday, 22 February

All night it had blown violently from the east, in the morning it calmed down, the sky was overcast and looked rainy, but during the day everything cleared up and in the evening we had a cloudless sky with no wind at all.

I had slept very well in my blankets in the miserable house, perhaps the most miserable and saddest I shall have seen in New Zealand and was up at 6 am to walk east along the beach. I got to the Māori settlement of Pohaturoa, one mile from our quarters, situated on the waterfront but in a very pretty area. A beautiful sandy beach where canoes can easily land, a stream of fresh water running through a forest valley, the sea for fishing, gently sloping

<sup>456</sup> All is weakly metamorphosed greywacke, no schist has developed.

<sup>457</sup> The Eocene coal at Drury, that Hochstetter surveyed when he first arrived, occurs between the Tertiary Waitemata Formation and the underlying greywacke. At this locality it has either been eroded away before deposition of the Waitemata beds or never accumulated in this locality in the first place, as Hochstetter infers.

hillsides with cultivations and higher wooded ridges in the background. A large war canoe lay on the beach, and we found an old but very intelligent-looking Māori woman as the only keeper of the settlement, who offered us peaches, all the rest of the people had gone to the forest early in the morning to cut kauri trees. Apart from the Māori tradition of hanging up large numbers of Port Jackson sharks<sup>458</sup> as food for the next winter, the settlement looked very European and civilized.

Today, even more than yesterday, I was convinced of the primary clay-slate-like character of the rock that forms the wooded mountainous country to the west of Wairoa Creek<sup>459</sup>, by looking at numerous rocky cliffs emerging from the beach. The slate structure is perfectly evident on individual cliffs. h10-11 →W 70°- 80° this is the dominant direction.

[page 99]

In some places the rock is perfectly hard and fresh, in others completely decomposed into ferrous yellow clay. Soil mostly better than Auckland Tertiary soil, but always only of medium quality.

After we had another cup of tea at Mr Eckford's, we set off for Wairoa. The path along the coast is only a footpath, in order to be able to use our horses we had to ride back a little of the way we came yesterday and then take a path suitable for horses over the mountain range itself<sup>460</sup>. But one of the creeks was so deep at high tide today that the water came up to the horses' saddles.<sup>461</sup>

So today I passed the clay slate mountains, which yesterday I saw rising with steep edges marked in this way. Only parts of the western slope are forest-free, barren land, sterile ferrous yellow clay soil, but at the top and on the opposite slope everything is forest. The mountain country is extremely broken up, the path led up and down steep slopes, all mountain forms are steeper and worse than in the gently undulating Tertiary country, but nowhere on the whole path does a single rock emerge, everything on the surface seems to be completely decomposed being in yellow ferruginous clay, only a few less decomposed pieces lying around and the stone rubble in the streams, which consists exclusively of the black-blue hard clay slate rock, mixed with individual white and yellow quartz pieces, originating from thin vein masses, lead to the conviction that the whole mountain country consists only of such clayey slate. So no coal here either. The last rise before descending into the alluvial plain of the Wairoa River gives a fine view of the whole landscape. A broad, 2-3 mile expanse of valley lies spread out there, enclosed on either side by dark forested mountains which on the east side of the valley<sup>462</sup> are a considerable height, perhaps reaching 1800 feet, [page 100] much higher than on the west side where we came across mountains reaching at most 800-900 feet. The tidal creek meanders like a stream through the middle of the valley, the entrance to the creek is said to be blocked by a sand bar, the creek is therefore accessible only to small craft of 16-20 tons, but for such craft navigable upstream 3-4 miles as far as the tide rises, then the creek narrows to a narrow creek-bed, which farther up soon turns eastward into the ranges. On the western side of the creek lie successive farms of European settlers, situated against mountain slopes on one side and across the alluvial fields on the other extending to the creek. The land beyond belongs to the Māori, whose huts and plantations are visible here and there,

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<sup>458</sup> The Port Jackson shark is endemic to the coastal waters of South Australia. These New Zealand sharks were probably kapeta/rig/spotted dogfish, *Mustelus lenticulatus*.

<sup>459</sup> Now formally Wairoa River.

<sup>460</sup> Whitford Hills.

<sup>461</sup> This sentence appears as an addition in the right margin of the manuscript.

<sup>462</sup> Hunua Ranges.

and who in the red-painted war canoe just sail towards the sea. The alternation of forest, meadow and field, of mountains and plains gives the landscape a charming appearance, and if there wasn't that much sterile clay soil between individual fertile grounds, one could imagine a large number of inhabitants living here in the future in a glorious valley with the most luxuriant cultivations.

But maybe that will also come true because the soil only needs work and drying out through drainage.

The first farm we reached was Captain Robert's Farm<sup>463</sup>, we found Mr Roberts there with his wife, hospitably treating us to tea. The track from here along the creek two miles to where the road to Drury begins at Wairoa Landing is so bad, that we were forced to send my servant James back with our horses to Otahuhu on the same road we had come, [page 101] and continue on foot. From a second very poor-looking farm on the hillside, a little boy with a very good voice served as our guide. His mother, who is Irish, feels very happy here, as she told me, because it is possible to support a family here in this country. However, I didn't find the farm at all splendid, and on the potato and corn field you could hardly tell that anything had ever been planted, the soil was so sterile there.

Far better the next farm where we met Mr Allies<sup>464</sup> and Mr Brown. Our guide had pointed out to us that Mr A[llies] was a tough man who didn't give anything away. But we found here an extraordinarily friendly welcome, we took tea and I was even offered a cigar. Mr Br[own] is doing experiments with a machine he invented himself, to prepare New Zealand flax for export to Europe and promised me samples. The creek that runs by this farm carries nothing but argillaceous boulders with bits of quartz, Mr A[llies] showed me magnetic iron washed out of the creek's sand, much like it is found on the west coast beach, but I preserved the people's belief that they live in a gold area<sup>465</sup>. When digging wells at the foot of the hills one came upon the clay, snow-white kaolin layers (compare the sample).

But the finest farm in Wairoa Valley is Mr Thorp's Farm<sup>466</sup>. Mr Th[orp] an educated settler, theoretical and practical farmer, 6 sons, immense capital for a farmer, tree nurseries here, and vineyards, as well as the former are thriving, things are going badly for the latter. On the other hand, Mr T[horp] told me that he had vineyards on his farm by the Thames, and I actually tasted New Zealand wine here for the first time, but in order to preserve it, it was heavily mixed with sugar. Mr Th[orp] made me the compliment that he noted in my report that I was a man fond of the truth and called out "Glück auf" to me when saying goodbye.

[page 102]

Apparently I introduced this word to New Zealand. Close to the farm is the newly built wooden church for the Wairoa District. The forest all around was burning, that seemed to me a somewhat strange and dangerous way to clear land around a wooden house. From here on we now had a good track, that is in such a dry season as now, while in rainy weather one will find the way through the kahikatea swamp forest bottomless. The entire area at the top of Wairoa Creek is still in need of drainage. In this forest I saw a rata tree<sup>467</sup> of 5 feet diameter,

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<sup>463</sup> Captain Ascot Roberts (1835-1881) and his wife Elizabeth Roberts, née Watson (1843-1914).

<sup>464</sup> Harvey Allies (1820?-1881), from Bristol, arrived in Auckland in the mid-1850s, was a partner with Stannus Jones, in the auction firm of Jones and Allies, and freehold owner of a farm in Wairoa, County Eden. Died on 3 January 1881 in Auckland.

<sup>465</sup> No gold of any significance has ever been found in the Hunua Ranges region.

<sup>466</sup> Joshua Thorp (1796-1862), trained surveyor and civil engineer, had farms at Puke, Paeroa and The Wairoa, now Clevedon (Thorp Quarry Road).

<sup>467</sup> Northern rātā, *Metrosideros robusta*.



the epiphytic nature is evident even with such a thick trunk by its spiral-shaped twist, and the shedding bark is reminiscent of natural vines, the ancient rata tree, the murderer, was once again embraced by a younger offspring of the same species. Then the Pokatiwa tree<sup>468</sup>, with broad spreading buttress roots, which the Māori use for the sterns of their canoes.

Everywhere here in the forest fire and fire and fire right next to the road, so that the burning trees can collapse overhead.

Where the forest ends, the terrain rises in low hills, between higher ridges on both sides.

We reached Mr Smith's Inn called Travellers Rest<sup>469</sup> at 7 o'clock on the way to Papakura and found our night's accommodation there.

### **Wednesday, 23 February**

Beautiful almost cloudless sky, very warm day, little wind, towards evening a little overcast, rainbow, the whole sky had a copper-coloured quality. Looks as if the fiercest storm was to be expected.

[page 103]

#### **Hunua Ranges**

We departed at 8 am for Smith's limestone<sup>470</sup> quarry on the north-western slopes of the Hunua Ranges. I had previously visited this point on the occasion of my coal investigation at Drury and Papakura and now consolidated my observations. I was happy that Mr Smith<sup>471</sup> of Cooper and Smith limestone quarries 5-6 miles from Coles Inn in Papakura,<sup>472</sup> whom I asked to be aware of fossils when breaking stones, enriched my collection, which I had made on my first visit, with numerous specimens of a large *Terebratula*<sup>473</sup>.

Beneath a 3-4 foot thick layer of ferruginous clay which forms the surface, the following strata have been exposed by excavation:

- 1) 3-4 feet thick bed of fine-grained soft grey-blue, also grey-green sandstone with a few but mostly well-preserved marine shells.
- 2) Soft clayey-calcareous beds, a blue-grey clayey-calcareous marl, becoming conglomerate in places by more or less small boulders which it encloses, viz. small black pieces of the clay-slate bedrock therein. This marl is full of foraminifera, isolated corals, large terebratelids, and other sea shells.
- 3) Underneath, a limestone bed about 4-5 feet thick. The same layer as 2) only more lime less clay and gradually merging into a platy lime of crystalline structure, beautiful blue crystal in the interior of the mountain, white on the surface, full of echinoderm spines with reflecting fracture surfaces, in fact nothing but a shell breccia, a real beach formation.
- 4) Under the limestone fine soft argillaceous sandstones of brown colour. A large bivalve is very characteristic of this sandstone, but in addition to the sea shells, there are a few dicotyledonous leaves.

The whole sequence is very clearly layered. Observed strike and dip directions are h2-h3 NW 8-10.° This direction coincides with the surface and strike along the slope.

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<sup>468</sup> Pōhutukawa/New Zealand Christmas tree, *Metrosideros excelsa*.

<sup>469</sup> Wairoa South, located on Wairoa Road, near Ardmore.

<sup>470</sup> Early Miocene Papakura Limestone of the Waitemata Group.

<sup>471</sup> Benjamin Smith (1814-1867) and his wife Martha Smith, née Neavy (1815-1891).

<sup>472</sup> In right margin of manuscript.

<sup>473</sup> Lampshell, brachiopod.

Mr Smith opened the limestone quarry<sup>474</sup>, installed a lime kiln at the quarry and I owe to him the interesting fossils, [page 104] which are listed in my catalogue on page 155. The limestone seam quarried immediately behind Smith's house re-emerges further down in a small ravine to the west of the house. A cave runs through from top to bottom. This limestone cave is a small washout by the creek.<sup>475</sup> I could not convince myself of Smith's view that it is two seams with 10 feet of sandstone between them. The limestone is also 4-5 feet thick at the bottom, a little purer, crystalline, can be polished very nicely, it lies as 3-4 inch thick layers, so horizontally that no strike or dip can be discerned.

Northeast close to the limestone quarry there is a fine crystalline black aphanitic rock of a dioritic character, which I consider to be an igneous rock, of the argillaceous bedrock<sup>476</sup>. The Māori used this rock to make their stone axes "toki".

Are these limestones Secondary<sup>477</sup> or Tertiary?

In the vicinity of the limestone is said to be a small area covered with volcanic scoria<sup>478</sup>

I have also been able to convince myself that the same plate-like limestones, composed entirely of conchoidal breccia, extend along the whole north-western slope of the Hunua Ranges, from the turn which the hill country makes at Drury in a direction north-east after three hours to the Wairoa. The limestone lies over a soft greenish sandstone<sup>479</sup>.

Limestone was taken by Captain Ninnis found in a creek gorge at Drury, the limestone described at Mr Reid's<sup>480</sup> farm, the limestone quarry described at Mr Smith's farm, at three different points, then at Mr John Allen Rae's<sup>481</sup> farm on the northern slope of the Hunua Ranges towards the Wairoa. Several settlers have mentioned to me that limestone is also found in the mountains beyond the Wairoa in a continuation of this direction. I am of the opinion that this lime and the platy limestone [page 105] on the west coast south of the Waikato are secondary<sup>482</sup>, so that a Cretaceous formation occurs here, which continues at the Waikato Heads, and that this Cretaceous formation immediately underlies the Drury coal formation<sup>483</sup>.

The Hunua Ranges are separated by a 3-4 mile wide flat valley<sup>484</sup> from the hill country<sup>485</sup> lying between the Wairoa and Tamaki Creeks, and foothills extending in a southerly direction to the road from Otahuhu to Papakura. Only low rolling hilly country barely 60-80 feet above sea level lies between the Papakura flats and the plains. At Wairoa Creek<sup>486</sup> a valley striking from southwest to northeast appears to be of very recent date (lignite, Kieselguhr and sandy clay marls in these flats; near Travellers Inn the same strata continue with kieselguhr, and peat-like lignite covered in white fine-grained sandy mica sandstone and clay marls like in

<sup>474</sup> Located today between Ardmore Quarry Road and Watercare's Ardmore treatment station (Waterhouse 1974).

<sup>475</sup> This sentence appears as an addition in the right margin of the manuscript.

<sup>476</sup> No diorite is known in the Waipapa Terrane, but this could be basalt from an ancient undersea lava flow.

<sup>477</sup> Mesozoic age.

<sup>478</sup> The nearest volcanic rock is tuff (not scoria) of Pukekiwiriki/Red Hill, Papakura.

<sup>479</sup> Tipakuri Sandstone, Kawau Subgroup, Waitemata Group (Hayward and Brook 1984).

<sup>480</sup> Reid was a farmer south of Auckland.

<sup>481</sup> This has not been identified.

<sup>482</sup> Now known to be Tertiary, Oligocene of Te Kuiti Group.

<sup>483</sup> No limestone underlies the Late Eocene Drury coal, just an eroded greywacke surface.

<sup>484</sup> Ardmore flats.

<sup>485</sup> Whitford Hills.

<sup>486</sup> There is a reference to strike using the archaic representation of h3, 5' here and a note in the margin indicating southwest to northeast.

the Drury flats) and a fault line that runs in this direction from the Waikato Heads appears to correspond to this<sup>487</sup>, therefore I am of the opinion that the limestone will not be found in the western hill country.

This hill country has the following names:

Paparoa Range at Howick<sup>488</sup>

Mangemangeroa Range ending at Turangi Creek<sup>489</sup>.

Ratahi Range<sup>490</sup> to the side of the Papakura Flats

Puhanui [Pahinui] range between Papakura and Otahuhu. Puhinui range tapers off towards the flats.

This whole mountain country consists only of common clayey slate in the north, and gives way to Tertiary sandstones in the south, as far as I could observe.

Of the limestone locations mentioned, I have visited the one on Mr Rae's farm myself. Romantic location of the farm on the northern slope of the Hunua Ranges towards the Wairoa. Beautiful views of the Wairoa Ranges, flats and creek. The farm has only been in cultivation for one year; [page 106] located in the middle of the jungle, and everything is still in a primitive condition. The cut down forest stays there for a year to let the wood dry out and then it is burned off. If such a fire does not succeed completely, removing the wood involves great expense and trouble, hence a good fire is an essential for the beginning settler. Experienced settlers prefer woodland to fernland for the beginning of a farm, because in woodland you can sow as soon as the forest has burned down and you have yield in the first year, fernland has to be tilled.

Despite a very arduous tour from the farmer's house into an extraordinarily steep deep gorge near the house, I got few geological results. Nothing was to be seen in the depths of the gorge but fragments of the black-blue shale rock, and higher up there is platy limestone and sandstone.

The Hunua Ranges are still extremely difficult to access, and one laboriously works one's way on the wild bush roads, on the hewn lines over roots and through dirt holes, one sees nothing, the activity of walking takes all one's strength. New Zealand forest dead and barren with no animal life, and the surface so deeply crusted with a loamy crust of weathering and decomposition that nothing can be seen. Geological investigations are almost impossible without the greatest expenditure of time and resources, without excavations and artificial openings in the ground. [page 107] We therefore gave up the plan to work our way through the mountains to Papakura and climbed back down to the sunny plain of the Wairoa track.

Mr Buckland also informed me that he had hiked all the way up Wairoa River and had seen nothing but black argillaceous rock, until a 90-foot waterfall<sup>491</sup> over a basalt dyke, here on the right bank of the river an old volcanic cone, and further up all yellow and red basalt tuffs, the fertility of which led Mr B[uckland] to buy land here many years ago, but not yet in cultivation because of the inaccessibility of the area.

In the sand of the road to Papakura you can see here and there black magnetic iron mixed with white quartz particles washed together. How widespread lodestone is in this area, considering the lodestone sands on the west coast.

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<sup>487</sup> The Port Waikato Fault trends east-northeast and passes south of the Hunua Ranges, not this far north.

<sup>488</sup> Paparoa Road today.

<sup>489</sup> Presumably the hills between Mangemangeroa and Turanga creeks.

<sup>490</sup> Presumably the hills south of Whitford and around Brookby.

<sup>491</sup> Hunua Falls over a basalt plug.



Excellent tasting dinner at Coles Inn<sup>492</sup> in Papakura. On the way back to Mr B[uckland's] farm, a quick visit to the north of the Manurewa ranges, almost at dusk.



Figure 84: Charles Heaphy, *No. 2 Manukau Harbour From Papakura looking West*. February 1859. Watercolour, ink and pencil on paper, 280 x 440 mm. Number two of seven watercolours prepared to accompany Heaphy's paper sent to the Geological Society of London in 1859 (Geological Society of London LDGSL 209/02). Sketch shows Matukutūreia / McLaughlins Mountain (left) and Matukutūruru / Wiri Mountain (right) volcanic cones.

No. 39 and 40 | Manurewa<sup>493</sup> and Matakara<sup>494</sup> 180 feet high.

Two points of eruption in north-south rising from the flats, therefore visible from afar, the easternmost of the Auckland lava volcanoes. Without tuff crater eruption cone, the northern one with well-preserved shallow crater, scoria cone with significant lava flows that flowed south and west, less east.

Now I do have to mention that we met a lady riding in the afternoon, [page 108] Mrs Job Hamlin<sup>495</sup> from Tamaki Creek, who promised to send seaweed collected by her young daughter to Auckland.

Very tired, we arrived safe and sound at Mr B[uckland's] Farm as the night was falling. "All right"!

<sup>492</sup> Run by George Loveson Cole (1813-1903), who arrived in Auckland in 1842 and was one of the first European settlers in Papakura, referred to as the "father of Papakura".

<sup>493</sup> Matukutūruru/Te Manurewa-o-Tamapahore/Wiri Mountain. Completely quarried away.

<sup>494</sup> Matukutūreia/McLaughlins Mountain. Only a quarried pyramid remnant remains. Matukutūreia stonefields gardening site is on its southern lava flows.

<sup>495</sup> Rhoda Betty Hamlin (1808?-1906), was the wife of Job Hamlin, who was murdered in October 1863.

## Thursday, 24 February

The adventurous looking sky last night brought the most beautiful and warmest day of the year so far. Mr B[uckland] in whose comfortable, hospitable house I was quartered for the night, had business in town, he gave me his dogcart, and accompanied by Captain Ninnis I drove from Mr B[uckland's] place to Howick in the morning. The road, passable for a light dogcart, leads west past the foot of the Otara Hills, which I have described on page 94.

About noon we reached Howick, a large-scale town on Tertiary hills which run down from the Paparoa Ranges towards the Tamaki River. The town now consists of several 100 small wooden houses, with 2 churches and a hotel. Looks like a toy box with small children's houses had been emptied here and scattered around on the slopes of an almost circular hollow formation, subsidence of the Tertiary hills. Many streets are here laid out on a criss-cross and circle. To the northeast, a road leads to the beach past the church. Abandoned dwelling houses along this street, an abandoned hotel, the people who once settled here have moved on to regions that have more fertile soil than this miserable, parched Tertiary country. A pier is built down the beach, half completed, in Howick harbour lay a single Māori [page 109] canoe at anchor.

The steep coastal cliffs offer nothing new, only the ever-repeating sections of the Auckland Tertiary formation, at the bottom white fine-grained argillaceous sandstone, in places coarser, then marl conglomerates above argillaceous and sandy layers of yellow-white colour, in regular horizontal layers. In the sand of the beach here and there in the sun brightly sparkling iron sands<sup>496</sup> washed together.

After a brief rest at Howick Inn, I set out for the Pigeon Hill<sup>497</sup> No. 8 on the east side of Tamaki Creek – a low scoria cone only 100-120 feet high, from which the scoria for the roads in the area are extracted, triple peaked, like most of the very degraded scoria cones, the crater very degraded, open to the west, in this direction then south insignificant lava flows have flowed to the head of a small side creek of the Tamaki River<sup>498</sup>, but the tuff crater to the east and north is very clear and complete. In a north-westerly direction, this tuff crater is followed by a second smaller one with a circular swamp on the bottom. No. 7<sup>499</sup>

The road runs from Howick to Panmure over Tertiary ridges until you come to the ferry across the Tamaki River. Just across from the ferry is the narrow entrance into the magnificent Panmure No. 23 tuff crater lake with sheer tuff walls both inside and out on the Tamaki River. This large tuff crater extends with a small circular segment over the Tamaki River and where one embarks on the ferry one stands on top of young volcanic tuff layers, while below [page 110] the same in the high water mark of the creek the lignite formation of the flats is visible.

The exposed lignite is 4 feet here but is undoubtedly of much greater thickness. In the lignite masses, large tree trunks are still so unaltered, completely wood, as if the peat bog had just been covered by volcanic ash<sup>500</sup>. This is the only point where it can be directly observed that the Auckland volcanoes themselves are younger than the lignite formation of the flats.

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<sup>496</sup> Derived from the volcanoes in the centre of the North Island brought down the Waikato River when it flowed down the Hauraki Lowlands and Firth of Thames out to the coast near Great Barrier Island.

<sup>497</sup> Ohuiarangi/Pigeon Mountain. Half has been quarried away.

<sup>498</sup> Wakaaranga Creek.

<sup>499</sup> Nowadays inferred to have been a small steam explosion crater through the tuff ring. Now infilled and retained as a private reserve.

<sup>500</sup> Seen today in the low bank beside Rotary Walk, Riverlea Avenue, Pakuranga.

From Panmure I drove the interesting route around Mt Wellington already described to St John's College, and from there on the way to Auckland visited the one on the right side of the road.

No 12. Mount or Rangitoto<sup>501</sup> so called eruptive cone. Low terraced cone with very imperfectly preserved North West opening crater. In this direction insignificant lava flows have flowed out to Hobsons Bay, under which springs of fresh water emerge on the beach<sup>502</sup>. On the southeast side a still clearly recognizable, well-preserved half tuff crater, which joins the large one to the north tuff Crater No. 11 of the map.

No 11. Orakei Bay Lagoon<sup>503</sup>, a shallow circular lagoon, at low tide the mudflats emerge dry. Thinly layered beds of young volcanic ashes emerge around the steep edge. These volcanic tuff beds include large fragments of clay marl and finer Auckland Tertiary formation rocks. On the beach towards the Māori settlement you can see how the volcanic tuff layers overlie the Auckland Tertiary Formation.

[page 111]

Magnificent pohutukawa trees grow on the cliffs, which are in full bloom around Christmas, shimmering red.

Mount Hobson a scoria cone of older date<sup>504</sup>. Just half of a crater cone, the southwestern side is missing<sup>505</sup>. A richer vegetation, lush phormium bushes and scrub forest are the result of the more decomposed slags. The cone rises on a flat very fertile tuff cone.

Just as the sun was setting I reached Auckland, where I met letters from Taranaki, from Denison<sup>506</sup>, Governor of N.S.W., and again some gifts for my collections; enclosed letter is a sample.

*Dundee Saw Mill Feb 22 1859*

*Mr Hochstetter*

*You may well remember what you said to me when you last visited this region and the snails you wished to have, I have not seen any in this long time, or I should have found them.*

*But these days I have found two worms, which are of a size which I have never seen. The New Zealanders have told me that these animals die in the autumn and spring, when a beautiful tree will grow out of the dead body, that may be true enough, but I will leave it to their better knowledge in the matters of their own - the big worms in a bag with this letter.*

*From a countryman and friend*

*Thomas Heinrich Horn<sup>507</sup>*

In the evening Dr Pollen and Dr Fischer visited me for a few moments.

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<sup>501</sup> Maungarahiri/Little Rangitoto. "Mount or Rangitoto" is the label of this volcano on Hochstetter's 1864 volcanoes map.

<sup>502</sup> Now buried beneath Martyn Wilson Field.

<sup>503</sup> Now known as Orakei Basin.

<sup>504</sup> Ohinerangi/Ohinerau/Mount Hobson dated at 34,000 years old.

<sup>505</sup> The southwest side of the crater has been rafted away by lava flows.

<sup>506</sup> William Thomas Denison (1804-1871), Governor of New South Wales, 1855-1861 (Fig. 4).

<sup>507</sup> Holograph letter written in ink on blue paper pasted in right margin. Thomas Heinrich Horn (c. 1830-1876), sawmill manager, married Catherine Gready (1848-1927) in 1864. Wrote to Hochstetter from Henderson and Macfarlane's Dundee Sawmill, established in 1848 near the junction of the Oratia Stream and Opanuku Stream in West Auckland.



## In Auckland

### Friday, 25 February

I was just lucky with the weather. Rain and wind today. A storm from the northeast is gathering again, as before the departure of the *Novara*, in the evening in company with Dr Fischer.

### Saturday, 26 February

Full storm from the northeast, the frigate *Iris* ready to sail to go around the island with the governor, cannot depart in this weather. At noon I visited Mrs William Young, Albert Street Auckland and C O Davis<sup>508</sup>, Māori Interpreter. Two people who with extraordinary courtesy enriched my collections with contributions from Coromandel. This time I was presented with a collection of sea grasses. At home preoccupied with writing in the evening.<sup>509</sup>



Figure 85: Charles Heaphy, *No. 3 Mt Richmond*. Watercolour, ink and pencil on paper, 280 x 440 mm. Number three of seven watercolours prepared to accompany Heaphy's paper sent to the Geological Society of London in 1859 (Geological Society of London LDGSL 209/03).

[page 112]

Addendum.

Eruption points near Otahuhu:

No. 25a Hamblin's Hill<sup>510</sup>, scoria cone from which lava flows flow into Tamaki Creek.

<sup>508</sup> Charles Oliver Bond Davis (1817-1887), chief Māori interpreter to New Zealand Government (Fig. 95).

<sup>509</sup> Note the final part of this sentence appears on page 113 of the manuscript.

<sup>510</sup> Te Apunga-o-Tainui/McLennan Hills – now completely quarried away. Hamlin Hill is a sandstone ridge 1.5 km to the northwest.

No. 27. Robertsons Hill<sup>511</sup>. Scoria cone with extraordinarily regular, completely preserved crater depression. Many beautiful volcanic bombs at the cone. Swamp all around, then the tuff crater, much more clearly marked here than at No. 25. Large basaltic lava and scoria blocks enclosed in the tuff layers.

Caves in lava flows are something very common, usually the mahoe<sup>512</sup> tree, whose wood the Māori use to rub and ignite fire, grows at the entrance.

No. 25. Mount Richmond<sup>513</sup> the road passes close to the foot of the scoria cone, which is cut by an irregular very mixed crater into several individual crests terraced by Māori people, four main high points. All around the scoria cone is a swamp like an artificial rampart. The tuff crater or tuff cone is without a very clear inner crater rim because the scoria cone has not set deep enough. No lava flows.



Figure 86: Charles Heaphy, *Plan of Mt Richmond Group of Craters*, [1859]. Ink and watercolour on paper, 630 x 530 mm. Scale 5 chains to 1 inch (Universitätsbibliothek der Humboldt-Universität zu Berlin, Historische Geographische Sammlung: A 72-12). This volcano was visited by Hochstetter and others on 28 December on their way to Drury for the coal field survey.

<sup>511</sup> Mount Robertson/Sturges Park. Now a sports fields in the moat and a sports stadium inside the enlarged scoria cone crater.

<sup>512</sup> Māhoe/whiteywood, *Melicytus ramiflorus*.

<sup>513</sup> Ōtāhuhu/Mt Richmond.

### **Sunday, 27 February**

All day the north eastern gale with heavy rain which the settlers have so long wished for in vain. The *Iris* can't sail again. I also like the weather according to Eulenspiegel principles, I hope after rain comes sunshine for me. At the Fischers' to dine without Haast. Small disagreements between Haast and Fischer's wife. I got to know my photographer Hamel<sup>514</sup>, my assistant Koch got in touch, and Alfred R Huntley<sup>515</sup>, employed by the gasworks at Hunter's Hill in Sydney, visited me and invited me to stay with him when I come to Sydney. The ship *Harwood*, Captain William Forsyth<sup>516</sup>, is in port ready for London, and has all the *Novara* collections on board. The frigate *Iris* sailed in the afternoon but must have had a very stormy night; because in Auckland it has been stormy and rained more than ever.

### **Monday, 28 February**

After raining all night, it brightened today with north-westerly winds; Koch helped me to finish the maps and in the afternoon to arrange my mineralogical collection.

Wrote to the academy and commodore in the evening.

### **Tuesday, 1 March**

I was at Whitaker's in the morning with my maps; the minister expressed his wish for me to visit Whangaparaoa before my journey south, to report on the coal McMillan had brought from there. I had to [page 114] agree to this and the trip south was thus postponed for a few days.

At home in the evening and wrote letters for the next mail.

Easterly wind again in the morning with rain, clearing up in the afternoon.

### **Wednesday, 2 March**

#### **Wangaparawa or Whangaparaoa.**

The barometer had fallen sharply, which indicated a fresh wind from the south-southwest, which swept the whole sky, so that we had a cloudless sky after the gloomy rainy weather of the last few days. Captain Burgess the pilot was at the pier at 8 am with his famous cutter, at 9 am I sailed accompanied by Drummond Hay and Captain Daldy<sup>517</sup> with my servant and a Māori. We had sharp winds and, consequently, high seas, the cutter once again proved itself to be an excellent seaworthy vessel, and we covered the 16 nautical miles distance in two hours. A small bay, sheltered by a protruding cliff, on the south side of the peninsula offered us an excellent anchorage. I was back on land and thus on my terrain. We walked across the peninsula, then along the beach, and found very hospitable quarters at noon in Mr Campbell's house<sup>518</sup> – a simple thatched house.

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<sup>514</sup> Bruno Lancel Hamel (b. 1837), photographer, who was appointed to accompany Hochstetter's survey expedition in the central North Island, and went on to produce the first photographic album to be published in New Zealand (Hamel 1859).

<sup>515</sup> Alfred Reynolds Huntley (1816-1868), engineer with the Australian Gas Light Company in Sydney, who died at his residence in Hunter's Hill.

<sup>516</sup> Captain William Forsyth, captain of the *Harwood*. Some published sources use the spelling Forsayth.

<sup>517</sup> Captain William Crush Daldy (1816-1903), politician, master mariner, and merchant in Auckland (Fig. 94).

<sup>518</sup> Duncan Campbell (1818-1875) and wife Sarah Campbell, née Cameron (1824-1863), neighbour of McMillan.



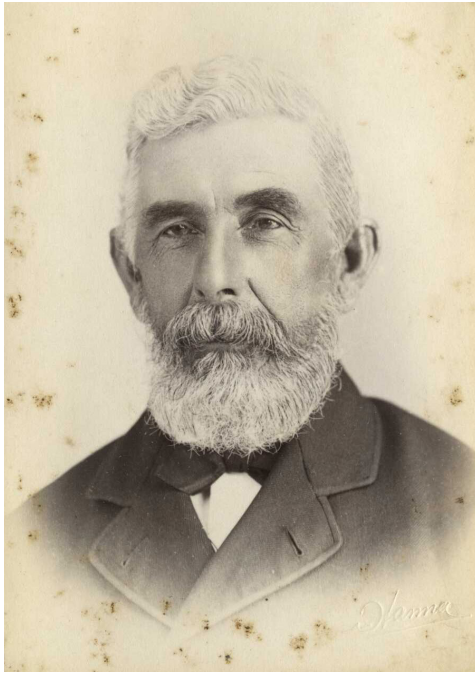


Figure 87 (left): John Robert Hanna (1850-1915), Captain Isaac James Burgess (1824-1904). Carte de visite (Alexander Turnbull Library PA2-0804). Auckland pilot, based in Devonport, sailed Hochstetter and his party to Whangaparāoa on 2 March.

Figure 88 (right): James Dacie Wrigglesworth (1836-1906), Augustus Koch (1834-1901), 1873. Carte de visite, 105 x 64 mm (Hochstetter Collection Basel HCB 5.2.K15).

It is a pleasure to see these settler families, how healthy everything looks, how children are thriving and how happy people are despite the isolation. Captain Burgess returned to Auckland that evening with Captain Daldy, we slept in the small settler house.



Figure 89 (upper): Ferdinand Hochstetter, field sketch of Waitemata Group strata on the north side of Whangaparāoa Peninsula, visited by him on 3 March (Dr Albert Schedl Collection, Vienna); (lower): woodcut illustration (Hochstetter 1864: 13; see also Fleming 1959: 47).

### Thursday, 3 March

A beautiful clear day with south-westerly breeze, in the evening windy and cloudy. Mr Campbell accompanied us to the spot on the north shore of Whangaparaoa<sup>519</sup> from where Mr McMillan [page 115] brought the coal. I convinced myself that there was nothing here but driftwood turned into coal and coal itself on secondary deposits.

From there only eight miles to Mr Kelly's Farm on the Great Northern Road, but I have never found a walk of such insignificant distance so difficult, nothing but beach, and from the beach across the poorest fern steppes.

If all New Zealand were like this, then all New Zealand would not be worth possessing. To the west are still large forests, the so-called Wainui Blocks, which are tackled from all sides. Māori from the Hot Lakes districts are nomadic in this region and digging for gum. We found the most hospitable reception in Mr Kelly's house<sup>520</sup>. The old man<sup>521</sup> can't read or write but is otherwise a splendid fellow who has made a lot of money. I was tired and thirsty like never before and slept and drank all afternoon.

### Friday, 4 March

A nice clear day with a nice south-westerly breeze. Mr Kelly gave us two horses, which are only too calm, with which we set off at 9 o'clock slowly across the most boring fern steppe country that one can ever imagine. Two young fellows, returning from the bush to town with their bundle on their backs, whom we met on the way, soon engaged in conversation with us. "In one day one can see more good arable land in Australia than in New Zealand in one year – one can do absolutely nothing with the soil here, the kauri forests are the only wealth of the province of Auckland, if it were not for them, then the land would not be worth half as much". Furthermore, great hopes were expressed in the conversation in relation to the [page 116] mineral wealth of the area. Old miners from Cornwallis with wishbones play a big role, unbelievable as it sounds. Someone claims to have found a type of wood in the forest, and when they carry a piece of the wood in both hands and walk over metal veins, the wood is pulled so that they can no longer hold it in their hand. Whenever a trace of quartz is found in the area that is poor in quartz and rich in clay, gold must also be there immediately. Across all the broken hill country from Kelly's Inn to the Auckland North Shore there is nothing to be seen but sterile fern country, here and there with a sad remnant of kauri forest. All white or ferrous yellow clay marl soil.

Only a small road cutting close to Auckland lets one look into the interior of these hills. My conclusion: colourful conglomerate clays are entirely indicative of what overlies the more sandy strata of the Auckland Tertiary Formation, and forms the crests of the hills. Chunks of all kinds and of all colours, water worn in clear layers, which, strangely enough, stand almost vertically here, clay marl sandstone, trachyte boulders, but all in a soft, completely decomposed state, everything greasy and clayey and traversed by brown lodestone veins<sup>522</sup>.

At 3 o'clock we reached Stokes Point<sup>523</sup>. We had to wait an hour for the boat to take us over, and safely reached Auckland at 4.30 pm.

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<sup>519</sup> Coal Mine Bay.

<sup>520</sup> Known as Kelly's Corner, on the Great North Road, present-day intersection between Wilks Road and Dairy Flat Highway.

<sup>521</sup> Maurice Kelly (1795-1888) and his wife Mary Kelly (c. 1814-1884).

<sup>522</sup> Early Miocene Albany Conglomerate lens within Waitemata Formation at Cuthill, near junction of Upper Harbour Highway and Albany Highway (Schofield 1989).

<sup>523</sup> Northcote.

Thus this tour happily ended.

### **Saturday, 5 March**

Preparations for departure for the hot lakes. Packed and equipped.<sup>524</sup>

Maberly<sup>525</sup>, in Queen Street wishes Dr Hochstetter to give a lecture on geology – to the Young Men's Christian Association.<sup>526</sup>

[page 129]

C) ad vocem: Coals with regard to my report.

[page 132]

Samoa or the Mariner Islands between 13° and 15° Southern latitude and 168°-173° west of Greenwich.

Three main islands

Savai'i, Upolu and Tutuila on which colonists have free passage, these inhabitants provide the best nursery for British Missions, the most unafraid fields for the spread of faith.

[page 133]

Māori names for New Zealand.

Te Ika a mauī = the fish of Maui. Maui was the god who fished the fish out of the sea, the name for the North Island, the shape of the island has remarkable similarity to the form of a fish, and the name shows that the Māori had a good concept of the shape, even though they had no map. The eyes of the fish lie west and east of Wellington, Port Nicholson the mouth, Mt Egmont peninsula the back fin, the East Cape the abdominal fin, North Cape the tail, Tongariro area the stomach, from which on the east side the excrements issue forth.

Aotearoa, the name of one of the canoes from Hawaiki that populated the island. (According to Baker, Hawaiki is Savai'i in the Samoa group, Tonga in the Māori language = south, tawhiti = distant journey, far, all of this together with the similarity of the language and the natural attributes of the Māori speaks for this, rather than Hawaii. Letter H of the Māori is often pronounced in such a way that it could be heard as an S The great chief Hongi is often Shongi, and Hokianga – Shokianga, by Europeans who are simply going by the phonetic sounds of the Māori. Mr Baker, as someone who knows the Māori language well, is able to understand the Samoans, who are at times brought to the Bay of Islands by whalers, without any difficulty.

The North Island especially, but also the whole of New Zealand is called Aotearoa.

Aotea is canoe and roa is long.

[page 134]

Te wai pounamu, means the greenstone lake, for the greenstones that are found on the South Island.

Rakiura = Stewart Island.

For the Samoa Islands speaks also: Mata atua, the name of the Samoan islands, and also the name of a canoe that brought the Māori.

In Taylor's book Matatua is incorrectly used for Mataatua.

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<sup>524</sup> Pages 117 to 128 blank.

<sup>525</sup> George Frederick Maberly (1823-1913) established a 'Literary Lounge' in Queen Street, Auckland in 1859.

<sup>526</sup> This appears as a note written by Julius Haast pasted in the left margin of the manuscript. Pages 130 and 131 blank.



Māori,

Tangata maori

Wai maori = freshwater

Waitai = salt water

Māori are mostly found on the North Island.

Nui tireni the Māori word for New Zealand.<sup>527</sup>

[page 147]

Kokowhai = red earth, actually the name for pure iron oxide, which the Māori use as make-up, and as paint, but generally also for intensely red rocks, both sandy and clayey, for example a point at Waiuku Creek.

Uku = white earth, in fact silica/sinter. Quartz-rich substance in the Drury, Papakura, Waiuku plains at Manukau.

The Māori apparently sometimes eat the white earth.

Waro = coal, the Māori have the tradition that coals are the remains of the Great Flood.

Oneone = sandy land, ground, dry ground.

One tea = clay, the ground of the kauri gum, for example.

Rangitoto = volcanic scoria, this is what the rock is called that is formed by active volcanoes.

Kohatu = black basalt rocks, like the Māori use for cooking.

Onepu = sand.

Onekura = red volcanic soil.

Kuahu<sup>528</sup> = sandstone, for example, the Tertiary cliffs at Auckland.

Punga-punga = pumice, this is what the Māori called the biscuits of the Europeans when they first saw them.

Tuhua = Obsidian.

Kara = round bluey-black stones<sup>529</sup>, which they are able to use for cooking, the same term is used by the Māori at the hot lakes for limestone, while they called the round trachyte and basalt rocks motiti.

Puia is the general term for volcano, this is what all the Auckland volcanoes are called.<sup>530</sup>

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<sup>527</sup> Pages 135 to 146 blank.

<sup>528</sup> Hoanga.

<sup>529</sup> Basalt.

<sup>530</sup> This is the end of the manuscript. Hochstetter has annotated the end of this page with a note saying “All utilised”, indicating that he has carried this informational content across to his manuscripts for publication.

## Newspaper clippings in the diary

Newspaper clippings mounted on page 148 onwards of the manuscript diary:

### **The Anniversary Regatta.**

The most sanguine anticipations respecting the success of this our grand Provincial Fete were fully realised<sup>531</sup> on Monday last. A better or a more brilliant Regatta, we incline to think, was never celebrated since the Pakeha and the Māori brought their joints exertions to bear in imparting an interest to an Exhibition which, for intensity and energy of character is, we believe, peculiar to Northern New Zealand. The day was a most favourable one; and from an early hour the note of preparation, especially amongst the gentlemen of the Mosquito Fleet, resounded far and wide. At 7.30 a.m. the Harwood (the Flag Ship) gave a gun in intimation that the Sports were to come off, and, at 8, she dressed ship in an appropriate and becoming manner. As the appointed hour drew nigh the City sent forth its pleasure seekers in many a merry group – some launching out on the sparkling waters – some proceeding on board the several ships in port, - others contenting themselves with witnessing the doings from the numerous surrounding promontories – every “coin of vantage” displaying their throng of gazers, gay in holiday attire.

On board the “Harwood”, every arrangement had been made by Captain Forsyth, Mr. Armstrong, and the Officers of the ship to promote the aims of the Committee, as well as to contribute to the enjoyment and comfort of the numerous visitors with which this fine and well-regulated ship was thronged; and it is only due to Mr. Fielding to state that the commissariat under his direction was well organized and abundantly provided. Out old friends of the Rutland Band were likewise at their port and played some of their favourite music in their usual efficient style.

#### **First Race**

Precisely at 10 a.m., bang went the signal gun, and away went the competitors in the Whale Boat Race – First prize £15 – second prize £7 – third prize £3. In this race the following competitors started:

“Kahawahi,” Te Rangi. Green.

“Freeman’s Bay,” Lawrence Miles. White ground, blue cross.

“Katimauhe,” Matini. White, red cross.

“Raiwhara,” Hapimana. Red and blue, horizontal.

“Te Riwi,” Te Riri Tuku. Yellow, white stripe.

“Manukau Pilot,” J. W. Carr. White, blue border.

“Pea,” J. Irvine: Blue.

The course was from the South side of the Flagship passing round to the north of the flag boat moored off Freeman’s Bay, down to the flag boat in Judge’s Bay, passing round to the south, and coming in on the south side of the Flagship. The boats took their positions in capital style, and both in respect of material and personnel presented a highly creditable appearance, several of them (the “Kahawai,” the “Manukau Pilot,” and the “Raiwhara,” by Mr. Carr of Fort-street) having been built for the occasion. An excellent start took place; but unfortunately for the “Kahawai,” a very pretty and likely boat, one of her oars went in two at the first stroke, and, not having a spare one, she dropped out of the race much to the chagrin of her native owners and admirers. The “Pea,” a remarkably beautiful boat built of cedar by Irvine of Waitangi, and pulled by a crew from the Bay, was much admired; she came in a capital first, pulling the distance in five and thirty minutes, followed in about fourteen or fifteen seconds by the “Manukau Pilot,” and shortly afterwards by the “Raiwhara.”

#### **Second Race**

This was the race for the Mosquito fleet, of which not less than eighteen entered. The first prize was £15, the second £5, and the third £3. The course was precisely the same as in the first race, only that it was reversed. It was a remarkably pretty sight to behold this miniature fleet form line and dress, which they did in excellent order. There was not a breath of wind as they took their stations, and it was feared that the first part of the contest would be confined to an exhibition of which could drift the fastest with the

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<sup>531</sup> Orthography in source: realized.

ebb; however, at 10.30 a.m., just as the signal gun was fired, a fine westerly breeze sprang up and away they went in a lump, the following being the individual competitors: -

“Apprentice,” W. M. Ellis. Red, white diamond. 19 feet keel.

“Transcur,” A. Nicholson. White. 17 feet 10 inches.

“Dragon,” J. McDowell. Red ground, white St. Andrew’s cross.

“Ranger,” J. Morrison. White, blue cross. 18 feet 4 inches.

“New Year,” G. S. Graham. Tricolor, No. 1. 17 feet 6 inches.

“Undine,” G. S. Graham. Tricolor, No. 3. 14 feet 6 inches.

“Fanny,” F. Gilbert. Red, with white star. 21 feet.

“Kawana,” Rata. Red ground, yellow cross. 21 feet.

“Sprightly,” C. Berry. Red, white, yellow. 16 feet.

“Mary,” J. Wishart. Red, white cross. 18 feet.

“Rosy Ann,” T. Scott. Union Jack, 19 feet.

“Nightmare,” H. Knowles. Blue, white ball. 19 feet 6 inches.

“Marion,” J. Hammond. White and blue, horizontal. 17 feet 6 inches.

“Nora Creina,” G. S. Graham. Tricolor, No. 2. 15 feet 2 inches.

“Fearnought,” E. LeRoy. White flag, blue border, blue star. 22 feet.

“Zealandia,” G. Smallfield. Blue, white half moon. 18 feet 6 inches.

“Mischieff,” Darrock. White, red cross, white tail. 20 feet 4 ½ inches.

“Rambler,” J. J. Archibald. Red, white stripes. 17 feet 8 inches.

The “Apprentice” went away with a good lead, the main body massed and hanging most lovingly together until they neared the flag boat off Judge’s Bay, which the “Fearnought” was the first to round, the wind then falling light. Shortly afterwards a steady breeze set in, and the several boats commenced drawing into their respective positions, and working up the harbour with the utmost care and skill. The goal was eventually reached in the following order: -

Mischief, Fanny, Nightmare, Fearnought, and Marion; the others were not placed.

### **Third Race**

This was for a Prize of £10, by Watermen’s boats pulling a pair of sculls, the course being from the Flagship, round the Flagboat in Judges’ Bay, and back to the ship. The following were the entries: -

“Robert,” H. Hawkes. Pink.

“Nys,” C. Sullivan. Light blue.

“Nis,” J. Cook. Blue, white, blue.

The “Robert” took the lead at starting, but the “Nis” came in an easy first.

### **Fourth Race**

This Race was open for Tiwai Canoes; but none coming forward, the sixth race for Waka Taua Canoes took the place of the fifth race in order to satisfy the impatient Maoris, as well as to admit of the breeze, rapidly freshening, to acquire its full force.

This Race has always, and most deservedly, been accounted as one of the most peculiar and attractive of any in the Auckland Regatta List. There is something exceedingly striking in the appearance of these great War canoes, decorated as they are for the occasion, and crowded from stern to stern by a stalwart and intelligent race, as keenly alive to the sport as the most enthusiastic yachtsman alive, with nerves braced and hearts resolved to go in and win.

The course was the same as that in the second race, and the distance to be gone over a long one. There were therefore three prizes of £20, £10, and £5 – a very moderate inducement considering that the winnings would have to be divided among so many, each canoe carrying probably from 35 to 50 men.

Four took their stations. These were: -

“Te Rere,” ..... Retimona

“Tuputeuki,” ..... Te Waka



“Hurai,” ..... Raweti

“Hurimarangai,” ... Hapimana

This was a most exciting race. At starting, “Te Rere” took the lead, the other three, for some time, being so close on board each other that their paddles clashed and clattered like to many overgrown castanets. “Te Rere” maintained the lead throughout and come in an easy winner. Objections were raised on the ground that she is a Tiwai, not a Waka Taua canoe, but she is a Tiwai of very large dimensions, and Paul, who is on the Regatta Committee, considered that no objection ought to be raised, as she was the only Tiwai that came forward to run.

#### **Fifth Race**

This was a race for Trading Vessels of from 10 to 25 tons, to sail with fore and aft canvas only.

Course, the same as the first, - twice round. First Prize, £20; Second, £10. The following took their stations:-

“Alma,” J. Bennett. Blue. 10 tons.

“Snowflake,” J. J. Dalliston. Red, white stripes, Union corner. 10 tons.

“Triad,” J. Bennett. White flag, circular saw, 15 tons.

The Triad got away cleverly, took and maintained the lead throughout, and came in an easy winner. Snowflake second; followed closely by the Alma.

#### **Sixth Race**

The sixth race in reality, but seventh on the list, was for Cargo Boats, of which the following seven were at their post: -

“Teazer,” John Wood. Red, 11 tons.

“Mary Ann,” C. Robinson. White, red cross, 9 tons.

“Tickler,” J. Copland. (Burgee name), 10 tons

“Tam O’Shanter,” G. Short. Blue, white cross, 10 tons.

“Lizzie,” J. Clark. Red, (double swallow), 9 tons

“Active,” D. McFarlane. Red, white name, 9 tons

A new and interesting feature was imparted to this Race by the presentation, from an Auckland Mercantile House, of a handsome silver cup, to which 15 sovereigns were added; - the second prize being £10, and the third £5. Course the same as that in the preceding race. The boats were started at 1.30 p.m. “Teazer” being the first to fill his mainsail and get away. As a splendid working breeze was now blowing, the race proved a most interesting one, and was watched with much anxiety by all parties. “Teazer,” however, stuck to the lead and won manfully, “Tam-O’Shanter” coming in second, and “Tickler” third.

#### **Seventh Race**

Was for sailing vessels of from three to ten tons.

First Prize £10; second £5. Course, the first reversed.

“Foam,” H. Fenton. Blue, white cross, 4 ½ tons

“Echo,” Capt. King. White, blue E, 3 tons

“New Year,” G. S. Graham. Tricolor No 1, 3 tons

The start of this race was an unfortunate one, the Foam and Echo getting entangled, and the former carrying away her topmast by coming in contact with the Flagship’s flying jed-boom; in this crippled condition, the Foam had no alternative, but to lower her peek and reef her mainsail, and with her topmast still hanging off at an angle of about 45 degrees, she worked her course, as if she was resolved to make a trigonometrical survey of the harbour. The “Echo” came in first – “The New Year” second – and “Foam” third. A protest, it is said, has been entered against the “Echo.”

#### **Eighth Race**

This was a very spirited affair, being for dingies not exceeding ten feet keel, to be pulled by boys under sixteen years of age. First prize £3; second £1. Course, round the Boat off Judge’s Bay, and back to the flagship.

“Chips,” F. Conway. Blue

“Young Teazer,” R. Marchall. Red

“Jolly Miller,” H. McBrighty. Green

“Young Favourite,” J. Allen. White

There was a considerable jump of a sea when this race was started, and as a stiff breeze was blowing the skill and bottom of the lads were thoroughly tested. Young Teazer soon began to draw a head and to show that she was in the hands of one who had a thorough knowledge of the harbour and his craft. Young Teazer came in a clever first, followed in succession by Chips – Jolly Miller – and Young Favourite.

### **Ninth Race**

The last race of the day was a Duck Hunt. H. Hawkes being the duck, in which capacity he was not caught, notwithstanding that he struck out manfully from the ship and afforded his pursuers in the gig every fair chance of laying hold of him.

The whole of the matches were concluded by 4 o’clock, and we cannot but repeat that a better or more effective Regatta was never seen in Auckland.

There is one circumstantial fact of which, in future, we should be glad to see advantage taken. It is this, that both for the enjoyment of the spectators, and for the benefit of those engaged in the sailing matches, the Regatta commences at much too early an hour. Before 12 (noon) there is seldom any wind; so that that fact points to the natural conclusion that before 12 o’clock no race should be started. Midday would be a much more convenient hour for all, and a day of holiday would be much better brought to a close at 6 or 7 than at 4 or 5 o’clock. We trust the Committee will take these things into their consideration, and that they will not dissolve without endeavouring to organize a permanent Regatta Club. With a Mosquito Fleet numbering 18 to 20 yachts, and these annually increasing in number, size, and beauty, we cannot but think that the time has fully arrived when such an Institution may be successfully and beneficially established.

### **The Regatta Ball**

In the evening, by the liberal permission and co-operation of Captain Forsyth, a Ball was given by some of the active promoters of the Regatta, on board the “Harwood”, the poop of which had been converted in a very short time into a commodious and elegant ball room well secured against the night air. A numerous party of ladies and gentlemen were present, and a remarkably pleasant evening was spent. The arrangements of the Stewards were very complete, and the quadrille party of “The Rutland Band”, under the leadership of Mr. T. Gallagher, gave great satisfaction. And thus gaily was terminated the Anniversary Auckland Regatta of 1859.<sup>532</sup>

### **Mechanics Institute**

A deeply interesting lecture, on the Familiar Geology of the Auckland district, illustrated by drawings, was delivered in the Hall on the evening of Tuesday, the 11th ult., by C. Heaphy, Esq. The audience was comparatively small, but judging from appearances, highly intelligent. The lecturer, before entering on the specialities of his subject in relation to the geological formation of the Auckland district, gave a lucid description of some of the most important principles of Geology applicable to the earth generally. Geology may be defined as a History of the Crust of the Earth. It makes enquiries respecting the successive changes that appear to have taken place on the covering of the earth, – and of those agencies by the operation of which these changes have been produced: and it discloses, for the benefit of men, those wonderful discoveries resulting from its investigation. In the elucidation of all these points, Mr. Heaphy seemed quite at home. The lecturer gave a clear description of the rocks<sup>533</sup> – Primary, Secondary, and Tertiary – and of the particular qualification of each; and referred to the unknown but very lengthened periods of time – from the necessarily slow and gradual deposition of matter – that must have been occupied in their formation. He described the stratified rocks to be, one layer of rock placed on the top of another, like books placed on each other horizontally; and that in the process of formation, and order, they were placed horizontally; but afterwards were, it now appears, for beneficial purposes to the human

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<sup>532</sup> Anonymous. ‘The Anniversary Regatta’ and ‘The Regatta Ball’, *The New Zealander*, Volume XV, Issue 1335, 2 February 1859, page 2.

<sup>533</sup> Word capitalised in source.

race, tilted up by some force, from the slightest degree of an inclined plane, to nearly, and in some instances wholly to a perpendicular position. The unstratified rocks have no regular order, but are found scattered over the surface of the earth, and are supposed to have been thrown off from mineral masses by the action of heat, or of some other powerful force. After referring to the plants and animals<sup>534</sup> existing at the respective periods, and also to the Coal formation, consisting of carbonised<sup>535</sup> vegetables – ancient forests, to an amazing extent, having been rendered tributary to the production of this essential to the prosperity and happiness of the human family, - the lecturer directed the attention of his audience to the Auckland district of New Zealand, which is wholly of volcanic origin, and at the commencement pointed out the striking analogy that subsisted between some parts of the Auckland Tertiary<sup>536</sup> country and the North of France, and South-east Coast of England – the Geological district named the London and Paris Basins. The analogy was particularly striking in the cliffs of the Waitemata, Kaipara, and the Manukau. The Auckland Basin was of very considerable extent. Another resemblance was pointed out between the primitive rock of Cornwall and limestone of Huahini. One curious dissimilarity was, that in the Tertiary<sup>537</sup> formation of Auckland there did not appear, as in most other countries, any fossiliferous remains. The lecturer pointed out on the map a considerable number of extinct volcanoes which were at one time in active and fearful operation – Mount Eden, Mount Hobson, One-Tree<sup>538</sup> Hill, Mount Albert, Three Kings, Mount Kennedy, the North Shore, &c., and gave a clear description of the peculiarities of each: several of them having had more than one crater in operation at the same time. Rangitoto, although the last upheavement from the sea, had no less than three in operation at once. Mount Eden and Mount Wellington seem to have been going on at the same time as the streams of lava are mixed, which would not otherwise have been so. No less than sixty-five craters can be counted, which were all at one time or other the scene of volcanic eruption. The lecture was highly instructive, and to those of the audience especially who are conversant with these localities, this part of the lecture must have afforded a high degree of pleasure. –

Any who are particularly interested in the geological formation of these, and of the places alluded to in the lecture now noticed, from a map by C. Heaphy, Esq., now in the reading-room of the Auckland Mechanics' Institute. A number of very interesting facts were mentioned by Mr. Heaphy, in relation to the various volcanic craters that had, but a reaction, subsided into themselves – the “pond” and “grotto” at Onehunga, were instances of these, and the swamp at the back of the Government garden, in the Domain, was a subsided crater, with a spring, still running, that represents the old volcanic or boiling spring. Masses of scoria on the road near Mr. Outhwaite's house, represented a part of the brim of this crater, and the whole was quite independent of Mount Eden, a deep valley intervening.

The lecture, which was extemporaneously delivered, was an abridgement of two papers by Mr. Heaphy, read by Sir Roderick Murchison to the Royal Geological Society of London, and printed by that body.<sup>539</sup>

### **Auckland Regatta**

No finer weather could have been wished for, than yesterday's – the day of our annual holiday, – and we may safely say of the most popular holiday of the year. There was not much wind in the forenoon, and we were afraid that the races for sailing craft might turn out uninteresting, from want of the propelling power; but, greatly to the delight of all, a proper sporting breeze sprung up from the West and Nor-west about midday and continued to the conclusion of the day's sport. The list of winners will be seen below, but till the final adjudgment of prizes, depending in several races on calculations of time and tonnage, we shall abstain from giving more than the results, which, however, with the exception of those in “time for tonnage” races are, we believe, final and conclusive. Everybody seemed thoroughly to enjoy

<sup>534</sup> Incorrectly typographically rendered as “annuals” in source.

<sup>535</sup> Word rendered as “carbonized” in source.

<sup>536</sup> Word not capitalised in source.

<sup>537</sup> Word not capitalised in source.

<sup>538</sup> Second part of toponym not capitalised in source.

<sup>539</sup> Anonymous. “Mechanics Institute”. *The New Zealander*, volume XVI, issue 1509, 3 October 1860, page 6. Newspaper clipping annotated in red pencil “NZ Okt 3, 60”.



themselves. The flagship, the Harwood, was quite gay, the harbour was covered with pleasure-cruisers, and the different points of land commanding the course were full of spectators.

### **First Race**

(10 a.m.), five oar Whale boat. 1st prize, £15; 2nd prize, £7; 3rd prize, £3. Entrance, 15s.

Pea, J. Irvine 1

Manukau Pilot, J. W. Carr 2

Raiwhara, Hapimana 3

Four others started.

### **Second Race**

(10.30 a.m.), Sailing Boats under three tons. 1st prize, £14; 2nd prize, £5; 3rd prize, £3. Entrance, 15s.

Mischief, Darrock 1

Fanny, F. Gilbert 2

Nightmare, H. Knowles 3

Fearnought, E. LeRoy 4

Marion, J. Hammond 5

Several others started.

### **Third Race**

(11 a.m.), Watermen's Boats, pulling a pair of sculls

Prize, £10. Entrance, 10s.

Nis, J. Cook 1

Nys, C. Sullivan 2

Robert, H. Hawke 3

For the fourth race (Tiwai Canoes) there were no entries.

### **Fifth Race**

(12 noon), Trading Vessels, from ten to twenty-five tons, to sail with fore-and-aft canvas only. 1st prize, £20; 2nd prize, £10. Entrance £1.

Triad, J. Bennet 1

Snowflake, J. J. Dalliston 2

Alma, J. Bennett 3

### **Sixth Race**

(12.30), Waka Taua Canoes. 1st prize, £20; 2nd prize, £10; 3rd prize, £5. Entrance £1.

Silver Cup.

### **Seventh Race**

(1.30), Open Cargo Boats, to sail with usual working canvas only. 1st prize, Silver Cup and £15; 2nd prize, £10; 3rd prize, £5. Entrance £1.

Teazer, J. Bennett 1

Tam O'Shanter, G. Short 2

Tickler, J. Copland

Four others started.

### **Eighth Race**

(2 p.m.), Sailing Vessels from three to ten tons. 1st prize, £10; 2nd prize £5. Entrance 10s.

Echo, Captain King 1

New Year, G. S. Graham 2

Foam, H. Fenton 3

The Foam and Echo fouled in the commencement of the race and carried away their topmasts against the jib-book of the Flagship. A protest has been entered by the Foam's representatives against the Echo's

taking the race, but the committee have not yet decided. The opinion on board the Flagship was that the Echo fouled the Foam.

#### **Ninth Race**

(2.30 p.m.) Dingies not exceeding ten feet keel, to be pulled by Boys under 16 years of age. 1st prize, £3; 2nd prize, £1. Entrance, 3s.

Young Teazer, R. Marshall 1

Chips, F. Conway 2

Jolly Miller, H. McBrighty 3

Young Favourite, J. Allen 4

We have to congratulate the Bay of Islands on winning the whale-boat race. It was an easy beat, the victor crew taking the lead from the start, slackening their pace from time to time, and walking away apparently just when it pleased them. The crew consisted of Mr. Irving, Mr. Howe, two Messrs. Edmonds, and one of the Messrs. Williams' boys. The boat, cedar built, from Mr. Irving's yard, is one of the prettiest models we ever saw. She was bought for £50 by the Maoris, before the race, it being stipulated that the engagement was to remain with Mr. Irving and crew, who had rowed her down to Auckland from the Bay.<sup>540</sup>

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<sup>540</sup> Anonymous. "Auckland Regatta", *The Daily Southern Cross*, volume XVI, issue 1210, 1 February 1859, page 3.



Figure 90: Detail from a French manuscript map of Auckland, showing the villages of Papakura with Cole's Inn, and Drury with Young's Inn in the west, and extensive manuscript annotations by Hochstetter recording the geology, especially relating to coal deposits, natural features such as the waterfalls along Symonds Creek, and the names and houses of resident landowners. Watercolour, ink and pencil on vellum cloth, 928 x 877 mm (Hochstetter Collection Basel HCB 3.2.15).



***Report of a Geological Exploration of the Coalfield  
in the Drury and Hunua District, in the Province of Auckland (N.Z.)***<sup>541</sup>

**By Dr. Ferdinand Hochstetter**

*Member of the I. R. Geological Institution of the Austrian Empire, – and Geologist on board the Austrian frigate, “Novara.”*

Having been requested by the Government of New Zealand to examine and report upon the Coal-field recently discovered in the neighbourhood of Auckland, and having received the sanction of Commodore Baron de Wüllerstorff-Urbair, of the Austrian Frigate “Novara,” for this purpose; I have the honor to report as follows:–

After having spent the 24th and 25th of December last in making an investigation of the Geological structure of the country in the immediate neighbourhood of Auckland, between the isthmus of Whau on the west, and the isthmus of Otahuhu on the east, – I started on the 28th of December in company with the Rev. A. G. Purchas, Mr. C. Heaphy, Provincial Surveyor, Mr. Drummond Hay, and several other gentlemen, together with some of my colleagues, for the Drury and Hunua District,<sup>542</sup> to examine, as closely as my time permitted, the Coal, which had recently been discovered there by the Rev. A. G. Purchas, and has since been opened in several places by various settlers.

Our head quarters were at Mr. Young’s Hotel, at Drury, from the top of which the Austrian Flag floated as a pleasant token of welcome. Our reception was most gratifying; nearly all the settlers in the neighbourhood were assembled, showing the great interest that was felt in our mission. I would here state that it was mainly owing to the excellent arrangements made by the Government, to the energy and perseverance of the accompanying gentlemen, and to the useful information afforded by some of the settlers, that I have been enabled, in the very short time at my disposal, to visit and examine the most important points of the portion of the Coal-field brought under my notice, – and likewise to pay a hasty visit to the Waikato River between Mangatawhiri and Tuakau. I have thus obtained a general view of the geological formation of that part of the country; and have arrived at results, which I trust will in some measure answer the expectations of the Government, and prove of value to the people of Auckland by leading to the development of so important a source of national wealth. I shall confine myself at present to matters having a *practical* bearing, reserving my report on the strictly scientific portion of the subject until my return to Vienna, in order to afford time and opportunity for a careful examination of the fossils, and an analysis of the various minerals and rocks, of which I have collected specimens.

The Plains of Papakura and Drury on the eastern shore of the Manukau Harbour<sup>543</sup> are of an undulating character, and but slightly elevated above the sea. They are bounded on the south-east and south by a thickly wooded range of hills of moderate elevation, perhaps from 1000 to 1500 feet in height.

The general direction of this range is from south-west to north-east, from the Waikato to the Wairoa; except a portion near Drury, which runs nearly<sup>544</sup> north and south, and rises almost immediately from the plain. On the slope, of that portion, in more or less deep gullies, seams of Coal are exposed, in some places by the natural action of the water, and in others by the exertions of the settlers.

1. The first, and the southernmost, place<sup>545</sup> we visited was on Mr. Farmer’s land near Drury, on the

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<sup>541</sup> *The New Zealand Gazette*. | Thursday, January 13, 1859. | Colonial Secretary’s Office, Auckland, 12th January 1859. | His Excellency the Governor directs that publication of the following Geological Report by Dr. F. Hochstetter, for general information. | E. W. Stafford.

The title page of this issue is on page 7. *The New Zealand Gazette* bears the imprint: Printed and Published by W. C. Wilson, for the New Zealand Government, at the Printing Office, Shortland Crescent, Auckland.

<sup>542</sup> Hochstetter has crossed out the comma here.

<sup>543</sup> Typographically rendered as “Harbor” in source.

<sup>544</sup> Hochstetter has added an annotated marginal insertion of “h11” here.

<sup>545</sup> Hochstetter has added the marginal note here: “Dieser Platz von einem Eingeborenen entdeckt circa 150’ über der Druryfläche” [This location was discovered by a Māori circa 150 feet above the Drury plain].

right bank of a small stream in a gully just inside the forest, where a shaft about 20 feet deep has been opened by Mr. Turnbull, exposing three seams of coal, separated by thin layers of shale, and amounting altogether to about 15 feet in thickness. A considerable quantity has been raised from this shaft; but, on account of the water it contained at the time of my visit, I could not examine as accurately as I should have wished the section and character of the seam. The dip here is [page 10] 10° towards south-west. The roof<sup>546</sup> is a soft argillaceous sandstone which passes above into bituminous shale, containing vegetable impressions. The bottom was not exposed,<sup>547</sup> but<sup>548</sup> large basaltic boulders, filling up the bed of the creek and lying on the brow of the hill at the edge of the forest, seem to<sup>549</sup> belong to a basaltic conglomerate below<sup>550</sup> the coal.

## 2. Some openings at Mr. Hall's and Mr. Pollock's farms.

(a.) A small<sup>551</sup> hole near Mr. Hall's house just at the foot of the range exhibits a decomposed basaltic conglomerate,<sup>552</sup> large boulders<sup>553</sup> of which are lying for some distance along the face of the hill, extending as far as Mr. Pollock's house; where an abrupt hill<sup>554</sup> seems to consist of a compact mass of eruptive basalt.<sup>555</sup>

(b.) At a somewhat lower elevation and a little farther on to the north, a shaft has been sunk to the depth of thirty-eight feet, with the following section: –

	feet
Yellowish clay	10
Fire clay, of a bluish grey colour <sup>556</sup>	8
Shales, alternating with a hard argillaceous sandstone, both containing fossil plants, and very thin layers of coal	20 <sup>557</sup>

(c.) Still farther to the north, and at a level of about 200 feet below the last-mentioned stratum, a tunnel<sup>558</sup> has been excavated by Mr. Pollock through basaltic conglomerate interspersed with large boulders. It was reported to me that a few marine fossil shells were found in this conglomerate, – but I did not see any specimen of them. If a coal seam exists in this portion, I think it will not<sup>559</sup> be found below the last-mentioned basaltic conglomerate; but in the strata not yet exposed, lying between the conglomerate and the shales found in the lower part of the shaft (b).<sup>560</sup>

## 3. Symond's Creek: –

(a.) On Mr. Symond's farm, just at the point where the creek which bears his name emerges from the gorge on the right bank of the stream, I saw some rocks of a soft tufaceous sandstone, containing

<sup>546</sup> Hochstetter has annotated this with the German descriptive term “das Hangende”.

<sup>547</sup> Here Hochstetter adds a marginal annotation: “Das Flötz streicht wenige 100 Schritte oberhalb der Grube im Bach bei einem kleinen Wasserfall zu Tage aus, u. hier bilden Schieferthone mit Pflanzen abdrücken das Liegende”.

<sup>548</sup> Hochstetter has crossed out the word “but” as part of his annotations.

<sup>549</sup> Hochstetter has crossed out the words “seem to” as part of his annotations.

<sup>550</sup> Hochstetter has crossed out the word “below” here and replaced it with “above” in the left margin.

<sup>551</sup> Hochstetter has annotated this with “8' tiefe” [8 feet deep] in left margin.

<sup>552</sup> Hochstetter has annotated the following note in left margin: “eigentlich nur einzelne Gerölle in thonig sandigen Schichten vielleicht auf sekundärer Lagerstelle».

<sup>553</sup> Hochstetter has annotated this in the left margin: “poröser Basaltlava” [porous basalt lava].

<sup>554</sup> Hochstetter annotation in left margin: “über der Bergterasse sich erhaltend, Spring Hill”.

<sup>555</sup> Hochstetter annotation in left margin: “Das Gestein schwankt zw. bas. u. diorit. Char. Schwefelkies darin. ”

<sup>556</sup> Typographically rendered as “color” in the source.

<sup>557</sup> Hochstetter annotation in left margin: “mächtigere Kohlen vielleicht tiefer cfr 4.b. ”

<sup>558</sup> Hochstetter annotation in left margin: “400' lang” [400 feet long].

<sup>559</sup> Hochstetter has crossed out the word “not” here.

<sup>560</sup> Hochstetter annotation in left margin: “Eine Verwerfung muss dann das verschiedene Niveau erklärlich machen, in dem die Cglte zu den pflanzenführenden Schichten liegen. Unter dem Bslt Cglt soll Fire Clay liegen.”

numerous small marine shells, and gravelly particles of various basaltic<sup>561</sup> and aphanitic rocks. This is the lowest exposed stratum in this valley. Higher up in the forest we find on the surface of a stiff clay soil the same large boulders as at Mr. Pollock's.

(b.) Farther up the stream, near Mr. Campbell's house, seams are exposed at three different points almost close together, just at the level of the stream on its right bank. At the first point in going up, the coal is about two feet thick, a few feet above the water; at the second point the coal is in the bed of the stream, and therefore its thickness could not be ascertained; at the third point, at a bend of the stream, the coal is seen again of a thickness of seven feet, part of which is below the level of the water. As on this place the layers are nearly in a horizontal position, I am of opinion that the coal on these three points belongs either to one and the same seam, varying in thickness, or to a set of seams similar to that described in Section 1.

The roof of the Coal was on all places soft yellowish-white sandstone.

(c.) Another point visited by us, also on Mr. Campbell's farm, is a short distance before one comes to Mr. Clare's house, and at a considerable height above the last-mentioned places, where, in a small gully, the Coal was first discovered a few months ago by the Rev. A. G. Purchas, and opened, at his direction, by Mr. Campbell. The Coal has here a somewhat different appearance from that of the other places, its structure being more<sup>562</sup> laminated. The first specimens brought to Auckland were obtained from this seam.

4. Mr. Fallwell's farm: –

(a.) A shaft, 25 feet deep, southward from the house, in the forest, on the other side of a small gully, contains in the upper part fire-clay and in the lower dark-gray bituminous shale, with fossil plants and thin layers of Coal. In the valley between this and the house occurs, in the bed of the stream, a dark aphanite in rocky masses of a considerable size.<sup>563</sup>

(b.) On the northern slope of the hill on which Mr. Fallwell's house stands, this gentleman has made a cutting, affording the best view of the strata that can be obtained in any of the places we visited. The section is from the surface downwards as follows: –

	feet
On the surface, stiff clay soil, with nodules of argillaceous iron ore, about	3
Soft shales, with vegetable impressions, more or less sandy, about	30
Coal, about	6

This seam consists of three portions; the upper part a laminated coal of inferior quality, one foot; then a band of shale, two inches; the middle part coal of a good quality, one and a half feet; then a band of bituminous shale, six inches; the lowest part, coal of the best quality I have seen, two and a half feet. Thus the whole thickness of the Coal itself may be considered to amount to about five feet. The floor of the Coal consists of bituminous shale, with fossil plants, passing into yellowish clay. (*Thonmergel*<sup>564</sup>).

The strike of the strata is from W. 20° N., to W. 20° S.; – the dip 20–30° to S. 20° W.

(c.) A shaft North from Mr. Fallwell's house at a lower level on the left bank of Symonds' Creek, twenty-six feet deep, shows in its upper part nearly horizontal strata, consisting of three bands of bituminous shale, alternating with sandy layers; – in the lower part greenish earthy tufas of a dioritic<sup>565</sup> character, which I take to be the bottom of the coal formation.

(d.) The same dioritic<sup>566</sup> tufas, unstratified, occur in another pit, which is sunk at a lower level on the

<sup>561</sup> Hochstetter has annotated this with a question mark, and: "(?) wohl Thonschieferbruchstücke".

<sup>562</sup> Typographical error "mere" in source here.

<sup>563</sup> Hochstetter annotated with addition of: "überlagert von weichem Sandstein".

<sup>564</sup> Typographical error "Thoumergel" in source.

<sup>565</sup> Hochstetter annotated with question mark and marginal note: "ist nicht i Tuff, sondern i Plänerart. Sdstein"

<sup>566</sup> Hochstetter annotated with question mark and previous marginal note designated as applicable here also: "ist nicht ein Tuff, sondern ein Plänerartiger Sandstein".



left bank of Symonds' Creek, near Mr. Clare's house. I do not believe that Coal will be found<sup>567</sup> even if this pit should be [page 11] sunk to a lower depth; – but am inclined to think that the carboniferous strata will be found to run out in the higher parts of the hills behind Mr. Clare's house,<sup>568</sup> where, I was told, indications of their out-cropping have been found.

In the upper part of Symonds' Creek, higher up than Mr. Clare's house, occur rocky masses of aphanite,<sup>569</sup> over which the stream falls in a cascade of considerable height.

Farther observations on other points were rendered impracticable on account of the thickness of the forest, and the consequent inaccessibility of the country. Moreover, the shortness of time did not permit us to extend our examinations over other districts; as, for instance – Wairoa, Karaka, &c., where Coal probably likewise occurs. The following general conclusions may therefore not be considered as established facts; – but as *probabilities*, resulting from a very limited number of observations.

#### I. Quality of the Coal.

The Coal is a tertiary Coal. With respect to its quality, it belongs to the best sort of brown Coal, – to the so-called “Glanz-kohle,” with conchoidal fracture. It has quite the appearance of a Cannel Coal, but does in fact not belong to the old carboniferous formation, but to that of a tertiary, probably Miocene age. A future palaeontological examination of the fossil plants which are found in the bituminous shale connected with the seam, as well as that of fossil marine shells found in different strata above and below the coal, will lead to a more exact determination of the geological age of the Coal, – and furnish an opportunity for making a comparison with similar tertiary Coal-formations in Europe.

The practical quality of the Coal, for steam purposes and for producing gas, can only be proved by experiments. A chemical analysis of the Coal will be made at the laboratory of the Imperial Geological Institution in Vienna, from the specimens collected at the different localities; – and its result duly reported to the Government of New Zealand.

The Iron pyrite does not occur in the Coal in such a quantity as to lessen materially its value.

The fossil gum found in the Coal is a kind of “Retinite,” derived from a coniferous tree, probably closely related to the Kauri, but by no means the same species.

There is no great difference in the quality of the Coal found at the places 1, 3b. and 4b.

#### II. Thickness of the Seam.

I was not able to convince myself of the existence of different series of seams, one above the other, in different levels. I am much rather of opinion that the same series occurs at the localities 1, 3, and 4, a difference of thickness in the same series of seams at different spots is quite common occurrence. The fact that the same seam is found at varying heights above the level of the sea, and with different dips, is accounted for by the occurrence of disturbances and dislocations having taken place after the formation of the Coal-measures – such as must have accompanied the eruption of the later volcanic hills in the vicinity of Auckland.

The average thickness of the seam, which at the locality No. 1 is greater than at 3 and 4, may be estimated to amount to above<sup>570</sup> six feet. The sections through the Coal seam show, both at 3 and 4, distinctly, that the seam consists of three parts; – an upper, middle, and lower part. The section which has been described as 4b, can be taken as a fair average.

#### III. Extent of the Coal-Field.

The existing openings seem to justify the conclusion that the Coal-field extends from the southernmost

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<sup>567</sup> Hochstetter annotation in lower margin here: “obgleich die Kohlenflötze 3.b vielleicht 80' tiefer liegen. Da zwischen beiden Punkten ein Wasserfall”.

<sup>568</sup> Hochstetter annotated note in right margin: “Mr. Clare hat hier fossiles Holz, marine Muscheln u. i Haifischzahn in grünlich conglomeratischen Schichten gefunden”.

<sup>569</sup> Hochstetter annotated in left margin: “viell. primärer Urthonschiefergestein”.

<sup>570</sup> Hochstetter has changed the word “above” to “about”.

opening, No. 1, in the N.N.E. direction, as far as the out-cropping in Mr. Campbell's farm, for a breadth, from the base of the hill inwards of about two miles. In a southern direction it probably extends still farther; while in a more northern direction the Coal-field seems to be interrupted in the higher ridges near Mr. Clare's house, (see 4d), and near Hay's Creek, where, in the vicinity of a Native Settlement,<sup>571</sup> eruptive basaltic and dioritic masses, and conglomerates occur.

IV. The Drury and Hunua Coal-field is in reality but a part of a large Basin of Tertiary Formation, extending over a considerable portion of the Province of Auckland.

From information, (for which I am indebted to the Hon. Mr. Whitaker, Mr. Heaphy, Rev. Mr. Purchas, and others), on the general geological features of the neighbourhood of Auckland, the probable boundaries of this basin may be described as follows: –

On the south and east its boundaries are formed by the range of hills running from Waikato Heads, along the course of the river to Mangatawhiri, thence through the Hunua to the Wairoa, and along the course of that river to the sea. This range consists of eruptive basalt, breaking through older formations, and interspersed with a thick stratum of conglomerate (Boulder formation). These basaltic eruptions belong to a geological period of an older date than the volcanic hills near Auckland.<sup>572</sup>

On the eastward the line runs across the island of Motutapu, to the east of Tiritiri Matangi, between Motuketiki<sup>573</sup> and Kawau, across Takatau Peninsula towards Cape Rodney. Thence it turns to the westward, along a range of hills of older geological formation, – running to the West Coast, and following that Coast to Waikato Heads.

The middle of this tertiary basin is occupied by a marine formation, consisting of beds of a soft sandstone, alternating with bands of a yellow clay (Thonmergel<sup>574</sup>). Some of these strata contain numerous marine shells, – (as for instance, at Hobson's Bay), and small [page 12] pieces of drift wood changed into lignite. To this formation, I believe, belong likewise the interesting and valuable beds of limestone,<sup>575</sup> discovered by Messrs. Smith and Cooper in the Wairoa district, abounding in marine shells. I do not think that workable Coal will be found either in or below this formation; – which is exposed in steep cliffs at the entrance, and along a considerable portion of the Coasts of the Waitemata Harbour.

Coeval with, and subsequent to the deposit of this marine formation, there existed on the flat margins of the sea-basin marshy forests of a considerable extent, from which, in the course of time, the brown Coal now found on the margin and along the above-described inner edge of the basin, was formed. Coal deposits similar to those of Hunua and Drury may therefore exist at different places within these boundaries; – as for instance in the creeks running into the western portion of the Manukau Harbour; also in the high land of the Karaka and Wairoa Districts.<sup>576</sup>

The volcanic eruptions in the middle of the basin, in the neighbourhood of Auckland, must have taken place at a comparatively recent period, subsequent to the formation of the Coal. To the same period belong the strata found on the Eastern and Southern boundaries of the Manukau Harbour, extending over the flat portions of Papakura and Drury.

In the tidal Creeks, and other places where wells have been sunk, a soft lignitic deposit, nearly allied to peat, is found at different depths, and in beds varying in thickness from a few inches to twenty feet. This deposit is covered in many places by a greater or less thickness of a remarkable white siliceous matter in

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<sup>571</sup> Hochstetter has added a marginal note in right margin here: "das vulkanische Gestein ziemlich ausgedehnt, poröse schwarzblaue basaltische Gesteine übergehend in ganz dichte Gesteine von diorit. Ansehen die porösen Basaltlaven sind bedeckt von sehr mächtigen Schlackenschichten aus denen Straßenschotter gewonnen wird. Das ganze scheint i halber sehr vermischter Krater zu sein. "

<sup>572</sup> Hochstetter added annotated insertion here: "Aber doch neuer selbst als die Lignitformation".

<sup>573</sup> Known as Motuketekete Island today.

<sup>574</sup> Typographically rendered in error as "Thoumergel" in the source.

<sup>575</sup> Annotated in left margin: "vielleicht Kreideformation" [possibly Cretaceous formation].

<sup>576</sup> Hochstetter has annotated three question marks against the left margin of the final three lines of this paragraph in the source.

a state of very fine division. The latter seems to be derived from a hot lake of large extent, in connection with the recent volcanic eruptions in the neighbourhood of Auckland; – but its *true* nature can only be determined by future microscopic and chemical examination.

I have thus given a slight sketch of the geological history of Auckland and its neighbourhood; and expect to be able, on my return to Vienna, to furnish a more minute and ample description, illustrated by a map of the geological features of the country, compiled from the materials which I have now collected, and from those, which I hope hereafter, to receive from my friends in New Zealand.

#### V. The Working of the Coal.

There exists no doubt that the Province of Auckland is, as we have seen, rich in the possession of abundance of good workable Coal, – which will prove of the greatest importance, both for steam navigation and manufacturing purposes.<sup>577</sup>

With regard to the questions, *where* and *in what manner* the working of the Drury and Hunua Coal-field should be carried on, I venture to offer the following suggestions: –

1. I consider the locality of Mr. Farmer's place as one of the most suitable for commencing a systematic mining. For this purpose it would be desirable to construct a tunnel, commencing from the most convenient point at the foot of the range of the hills, – to be carried in an Eastern direction, inclining upwards, just enough to allow the water to drain off. This tunnel will run below the Coal, or, perhaps, strike it. A shaft should then be sunk from above to meet the tunnel, avoiding the present working (No. 1.) This shaft will pass through the Coal-seams, and the working will then be carried on in the usual manner, – the produce of the mine being removed through the tunnel, and the shaft supplying air to the workings. A railway from the mouth of the tunnel to Slippery Creek can be constructed without any difficulty.

2. In a similar way working could be carried on at Mr. Campbell's and Mr. Fallwell's; and a railway through the valley of Symond's Creek may convey the produce of both mines to the Manukau Harbour. If it would be desirable to work the lower seams in the stream itself, the water can be used as a motive power to drive the pumping machinery, which would be required in this locality.

3. It is of great importance to ascertain whether the coal is confined to the ranges, or extends underneath the plains stretching from Papakura to Karaka and Mauku, at a lower level than the above mentioned recent lignitic deposit. As I was unable to see any natural section of the lower strata in these plains, I would recommend that *borings* be made in the following places:

One on the low land between Young's Inn at Drury and the range;

Another at Chisholm's bush;

A third on one of the higher undulations of<sup>578</sup> the Karaka District;

And perhaps a fourth on the flat between Papakura and Wairoa.

I would also recommend that a similar exploration *by boring* should be made on the widest part of the Mauku flats.

Should these suggestions be carried out, I should be highly gratified to have the results communicated to me at Vienna without delay; in order that my promised report may be made as complete as possible.

And now I conclude with the German Miner's hearty

*"Glück auf!"*

Ferdinand Hochstetter Dr.P.H.

Auckland, January 4, 1859.<sup>579</sup>

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<sup>577</sup> Hochstetter has crossed out the final eight words in this sentence and annotated "for Colonial use" in the left margin.

<sup>578</sup> This word is inadvertently repeated in the source.

<sup>579</sup> Ferdinand Hochstetter, *The New Zealand Gazette*, number 2, 13 January 1859, pages 9-12. Hochstetter's copy with his personal annotations and corrections in margins.



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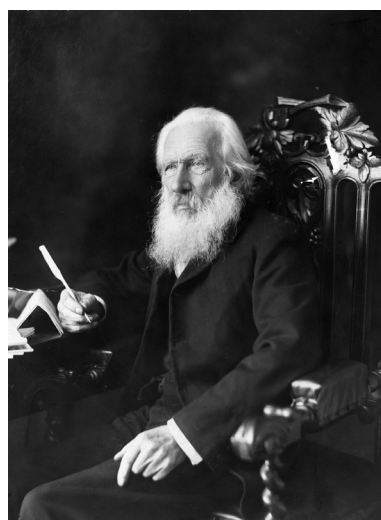


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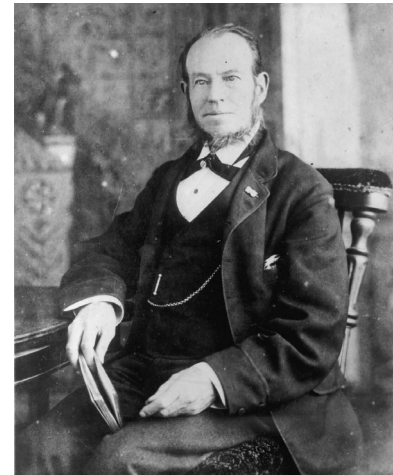


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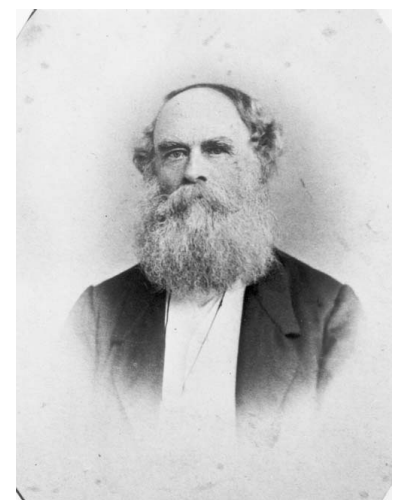


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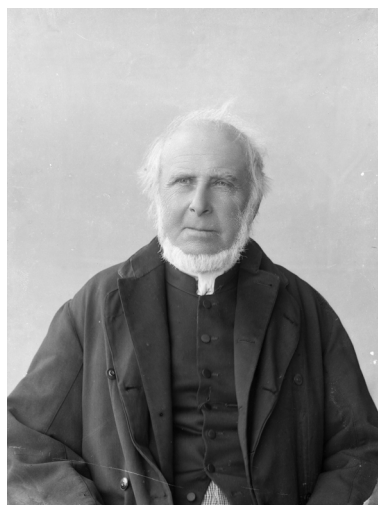


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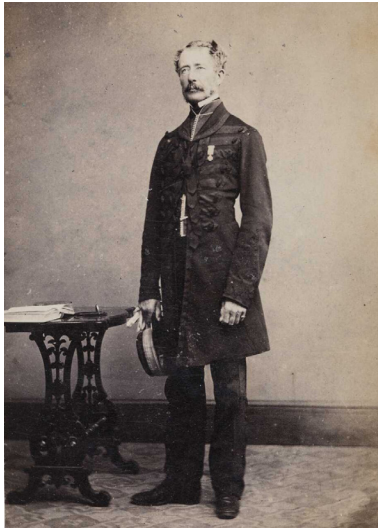


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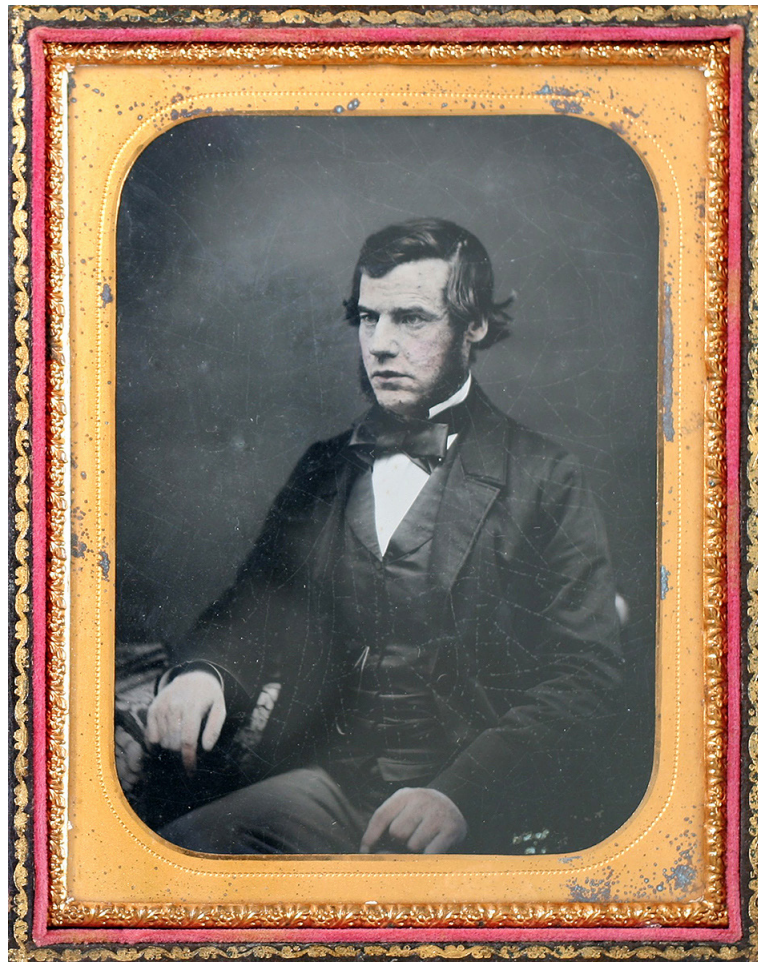


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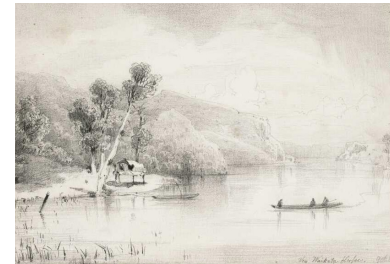


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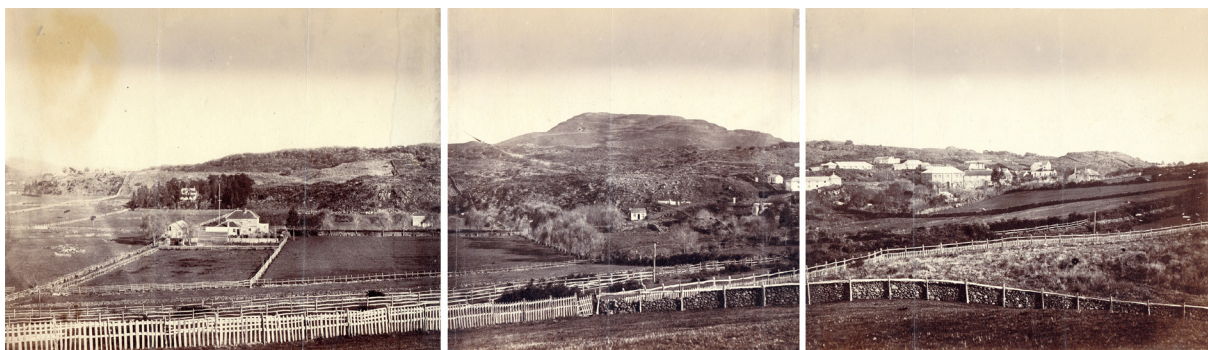


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## About the authors

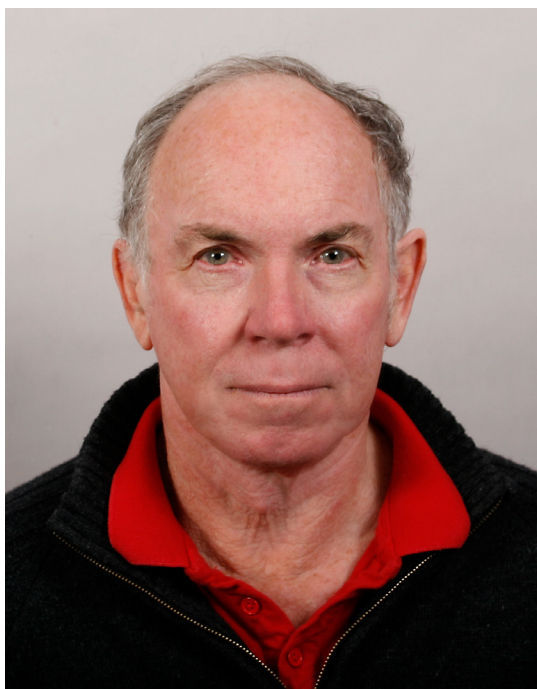
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Sascha Nolden is a graduate of the University of Auckland and Victoria University of Wellington, based on Lower Hutt. A former Research Librarian of the Alexander Turnbull Library, 2015-2023, he is now contributing to research projects as an independent scholar, editor and translator. His special interests include the transcription and translation of historical manuscript material and research based on primary sources in the form of archival documentary heritage material, especially diaries and letters. Previous contributions to publications as a co-author and co-editor relating to Hochstetter include: *Travels of Hochstetter and Haast in New Zealand* (2011), *Hochstetter's Nelson Diary* (2012), *The Letters of Ferdinand von Hochstetter to Julius von Haast* (2013), *Hochstetter's First Nelson Diary*

(2014), *Ferdinand von Hochstetter: Briefe aus dem Böhmerwald* (2017), and *Georgiana von Hochstetter: Reisetagebücher einer Wiener Gelehrtenfrau* (2021). The prequel diary to the one presented here, from Hochstetter's visit to Australia and journey to Auckland, was published as an annotated scholarly translation together with Tom Darragh of Melbourne, in the *Geoscience Society of New Zealand Journal of the Historical Studies Group* in 2023.

### Bruce W. Hayward



Bruce Hayward is a semi-retired geologist and marine ecologist based in Auckland. He is a former editor and president of the Geological Society of New Zealand. He mapped the geology of the Waitakere Ranges for his PhD and later worked extensively on the geology of various parts of northern New Zealand while employed by the former New Zealand Geological Survey and Auckland Museum. In the latter part of his career, he was self-employed principal of the Auckland-based research group Geomarine Research. His wide interests in natural and human history have resulted in twenty-four previous books on topics such as the history of the kauri timber industry in the Waitakere Ranges (with Jack Diamond, 1980), New Zealand fossils (1990), the geology and landforms of northern New Zealand – *Out of the Ocean into the Fire* (2017) and two books on Auckland Volcanic Field – *Volcanoes of Auckland: The Essential Guide* (2011) and

*Volcanoes of Auckland: A Field Guide* (2019) and the origins of New Zealand's natural wonders – *Mountains, Volcanoes, Coasts and Caves* (2022).

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Andrea von Pein, Inge von Hochstetter, Sascha Nolden and Arthur von Hochstetter, Basel, July 2010.



Östliche L. 172° 30' von Paris

# DER ISTHMUS VON AUCKLAND

mit seinen erloschenen Vulkankegeln

von  
D<sup>r</sup> Ferdinand von Hochstetter  
1859.

Die Zeichnung u. geographische Grundlage (hauptsäch-  
lich nach den Aufnahmen von Stokes u. Deury)  
von A. Petermann.

Maassstab 1:120.000.

½ Deutsche Meile (15-16)

1 Engl. Meile (6916-19)

Höhen in Engl. Fuss.

Tiefen in Engl. Faden.

Lavaströme.

HAURAKI GULF

TAPUI.

RANGIOTO  
Hinterer Hügel

Motukorea Channel

Waitemata od Auckland Harbour

AUCKLAND

ONEHUNGA

HOWICK

MANUKAU HARBOUR

Karore Bank

Östliche L. 174° 50' v. Greenwich

Lith. Anst. v. C. Hoffarth in Gotha.

