

## HEAPHY AND HOCHSTETTER – THE FIRST RECORD OF BASALT IN THE COROMANDEL VOLCANIC ZONE

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### Introduction

In 1967, while doing field mapping for the Northern Coromandel 1:63,360 (1 inch to the mile) Sheet N40, I was working along the north side of the Kuaotunu Peninsula in andesites (Mahinapua Andesite) east of Otama Beach (Fig. 1). I scrambled around the rocks into Whaorei Bay and was amazed to see on the next headland (Tamaihu), a 110 m high pile of 1-3 m basalt lava flows interlayered with scoriaeous breccia (Mercury Basalts – Skinner 1976). On the east side of Tamaihu, the small peninsula of Tokarahu exposed a basalt dike swarm in a residual eruption centre of basalt scoria and broken lava bombs within a spatter-filled rift (Fig. 1).

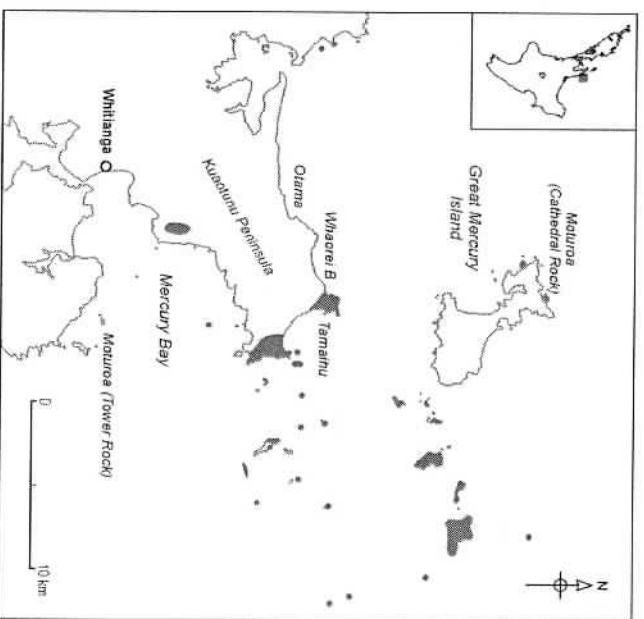


Figure 1: Sketch map of the Kuaotunu Peninsula, Mercury Bay, & Great Mercury Island showing locality of Moturoa – Cathedral Rock on Great Mercury Island; basalt outcrops in red. (after Skinner 1976).

I say 'amazed' because up to that time there had been no recognition of basalt during earlier geological surveys of the Coromandel region. Instead, the areas of basaltic rocks known today were variously mapped as andesite, greywacke, rhyolite and ignimbrite (e.g. Sollas & McKay 1905; Fraser & Adams 1907; Schofield 1967)! Although Sollas & McKay (Vol 1: p. 10) noted that in Coromandel rock collections made between 1854 and 1885, prior to thin section petrographic identifications, the rock names "Dolerite basalt", "Trap basalt" and "Basalt" had been used, neither identification of the source(s) of these names, nor the localities from where the rock specimens were collected were given. No basalt was included in McKay's collection of 406 rock samples sent to Professor Sollas for petrographic description.

### Charles Heaphy in Coromandel

Charles Heaphy was employed as a draughtsman in the Auckland office of the Colonial Survey Department. In 1852, he was appointed to supervise the fledgling Coromandel gold diggings and Gazetted as Superintendent (Heaphy 1852a & b), regularly reporting on the state of the gold diggings (Heaphy 1854 - misspelt "Heaphy"). By 1855, he had been appointed Commissioner of Goldfields (Heaphy 1855) although he administered them from Auckland where he produced a water-coloured, hand-drawn map of the geology of Coromandel Harbour and east from Kennedy Bay through Whangapoua and along the north side of the Kuaotunu Peninsula to Opito Bay, and north to northern Great Mercury Island (Heaphy 1857). Heaphy's geological map of the volcanoes of Auckland has a sketch of the North Island of New Zealand that includes the general volcanic geology of Coromandel (Heaphy 1860). By this time Heaphy had met Hochstetter and had accompanied him on a visit to Coromandel Harbour and town from the 8<sup>th</sup> to the 12<sup>th</sup> of June 1859 (Johnston & Nolden 2011).

Heaphy is renowned as a more than competent artist. During his goldfields days at Coromandel, he produced a number of watercolour sketches of the region that included Maori, a marine view north of the topography from Whangarei east to Coromandel, and details of Coromandel Harbour geology and miners' activities (Nolden & Nolden 2011; Johnston & Nolden 2011). Heaphy notes (1860, p.250-251) that he "has also supplied several original water-colour sketches, indicating the geological and volcanic features of the district" to Hochstetter. Among these was a rather faint pencil drawing of columnar islands annotated in Hochstetter's hand "Motu

roa an der Mercury Bay Nordinsel", and preserved in Hochstetter's estate collection of papers in Basel, Switzerland as drawing 1-4--11 (Nolden & Nolden 2011: p. 38).

### Hochstetter and Coromandel

In *Hochstetter's Geologie von Neu Seeland* (Hochstetter 1864; translated by Fleming 1959), a similar illustration is included before page 89. However it is far more detailed, and is strongly drawn with fern foliage, extra rocks and additionally, has four Maori canoes, two with sails in the bay and two drawn up on the beach. The illustration is labelled as for the Basel drawing, "Motu roa, an der Mercury Bay, Nordinsel" but has (in brackets) "säulenförmiger Trachyt" = columnar trachyte. In addition there is also printed "Ch. Heaphy del. Grefe Lithogr." (lithograph by Grefe) and "Aus d. k. k. Hof. U. Staatsdruckeri" (Aus der Kaiserlich-Königlichen Hof und Staatsdruckeri = from the (Austrian) Imperial & Royal Court and Government Printing Office). In the list of Chromolithographs (p.XIV), the title is given as "Moturoa, Trachyteisen an der Mercury Bay, Ostküste der Nordinsel".

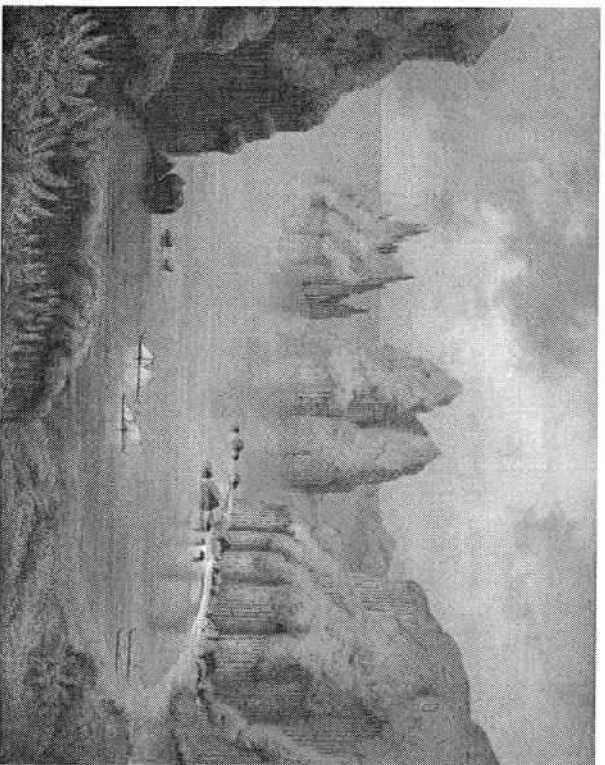


Figure 2: The chromolithograph by Grefe from Heaphy's drawing, in Hochstetter (1864, before page 89).

In Hochstetter's text (p.89; see Fleming 1959 p.119), he states " Von den Mercury-Islands brachte mir Mr Smallfield Handstücke von gelbem Trachyttuff mit eingebackenen Trachyt-, Bimstein-, Obsidian- und Thonmangelbrocken mit; und eine kleine Insel unter der Gruppe soll aus den regelmässigen Säulen eines trachydoleritischen oder basaltischen Gesteines bestehen. Ich verdanke Herrn Ch. Heaphy eine schöne Skizze dieser Säulenbildungen, Welche von Herrn Grefe in Farbendruck ausgeführt wurde." (Fig. 2).

"From the Mercury Islands, Mr Smallfield brought me hand specimens of yellow trachytic tuff with baked scraps of trachyte, pumice, obsidian and clay marl, and a small island of the group is said to consist of regular columns of a trachydolerite or basaltic rock. I am grateful to Mr Ch. Heaphy for a fine sketch of this columnar formation, which has been reproduced in colour by Mr Grefe." (Fig. 2).

So here Hochstetter refers to the columnar rock as 'trachydolerite or basalt'. Then why is the lithograph labelled 'Trachyt' = trachyte? On pages 82-84 in the german text (Fleming p. 113-115), Hochstetter discusses and provides a table of the various names used for volcanic rocks by European geologists at that time. He concludes that the german term 'Trachyt' is actually a carpenter's term for six different volcanic rock types – true trachyte, amphibole andesite, pyroxene andesite, dolerite and leucite-porphry. These last two he considers are varieties of the dolerite or basalt family. He then goes on to divide volcanic rocks into four types – rhyolite, trachyte, andesite and basalt. Hochstetter's writing is thus the first to establish rhyolite and andesite as independent rock types. In Heaphy's time in Coromandel, and with the probability that he learnt his geology from Ernst Diefenbach with whom he sailed to New Zealand in 1839 (Nolden & Nolden 2011), the term 'trachyte' was universally used in New Zealand for almost all volcanic rocks older than Pleistocene-Quaternary. Hence, although Heaphy and initially Hochstetter labelled the sketch as trachyte, Hochstetter later amended the rock name to dolerite or basalt.

### Into the 20<sup>th</sup> Century

After this there was a time gap of some 68 years when little or no interest was shown by New Zealand geologists in an obscure, in their eyes, occurrence of basalt. Marshall (1932) suggests that this was, at least partially, because of the confusion in the naming of the locality. Great Mercury Island is not actually in, but is north of

Mercury Bay, it is not on what is generally known as 'the east coast' of the North Island, and on the outside of southern Mercury Bay proper there is a tiny island also named Moturoa, or as James Cook named it, "Tower Rock". It was not until Marshall visited Mercury Bay and many of its islands that the locality of Motu-roa (meaning high or long island) was confirmed as the north end of what Marshall called "Mercury Island" = Great Mercury Island (Moturoa), or as it is also known today "Cathedral Rock". He also confirmed the rock type as hypersthene basalt, and included a photograph captioned as "Fig. 4. – View of basaltic rocks, north end of Great Mercury Island". Not being critical, but in reality, a comparison of Marshall's photo, the more recent one I have included in this article (Fig. 3) and the chromolithograph in Hochstetter (1864), shows that both Heaphy and Grete used a beautiful degree of 'artistic licence' in their depiction of the rock structures at Moturoa.

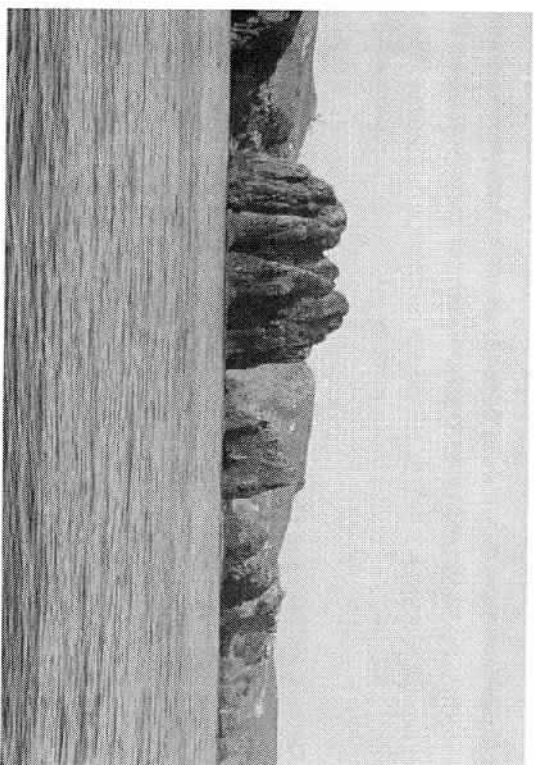


Figure 3. Colour photo from 35 mm slide of Moturoa-Cathedral Rock; view from the north. (Photo: Skinner).

Another 30 odd years were to pass before any further sampling of Moturoa-Cathedral Rock was undertaken. During a geological reconnaissance of Great Mercury Island in the early 1960s, R. N. Brothers (Nick) collected *inter alia* a sample recorded as Field number 32; Auckland University Geology Department Rock Collection number 14377 (amended later to 14363 &/or 14364); Dolerite intrusion at GSNZ *Journal of the Historical Studies Group, Issue 44, April 2013*

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locality NZMS1-N40/272934 Cathedral Rock. I have examined a thin section of this rock and, as Marshall, noted, it is a slightly porphyritic, hypersthene-rich, two pyroxene ± olivine basalt with a dolerite-microgabbro, subophitic texture. Olivine is relatively rare and almost entirely replaced by iddingsite/chlorite pseudomorphs with later partial alteration to siderite/calcite.

Another, perhaps final, twist in the tale is reported by Murray-Oliver (1966: pp. 133 & 136). In an article on New Zealand geologists who were also artists, he sets Heaphy as of "greatest value" in this respect. In particular he notes that the locality "Mercury Bay" as shown on Heaphy's 'chromolithograph' by Grete as reproduced in Hochstetter (1864) is "faulty" as proved "by another Heaphy sepia wash drawing in private hands in Wellington. This is a closer study of Tower Rock, as Cook named it, bearing Heaphy's own title, *Moturoa. Basaltic Rock, Great Mercury Island.*" Unfortunately Murray-Oliver does not reveal the ownership of the 'private hands', and as noted above, Cook's 'Tower Rock' is the other, small Moturoa in Mercury Bay itself. So who is or was confused? I can say without any doubt, having been there, that the Heaphy Basel pencil drawing and the Hochstetter chromolithograph attributed to Heaphy really do depict, allowing for artistic licence, Moturoa-Cathedral Rock on the north end of Great Mercury Island, and the first recorded basalt locality in the Coromandel Volcanic Zone.

#### Acknowledgements

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*PDF copies of this article with illustrations in colour can be obtained by emailing David Skinner (see address above)*

## Collections of letters written by or about James Hector

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Simon Nathan

James Hector (1834-1907) was the dominating personality in the late 19<sup>th</sup> century scientific community in New Zealand. As the first professional scientist to be employed by the government, he founded the Geological Survey (now GNS Science), the Colonial Museum (now Te Papa) and the New Zealand Institute (now Royal Society of New Zealand) as well as supervising weather forecasting, the time service, and the Colonial Botanic Garden.

As part of a forthcoming biographical study of James Hector, several collections of letters have been recently been transcribed – more than 800 letters, mainly from the Alexander Turnbull Library, Te Papa archives, Hocken Library, and the archives of the Royal Botanic Gardens at Kew – by a small team including Rowan Burns, Esmé Mildenhall, Judith Nathan, Simon Nathan and Sascha Nolden. These transcriptions are a valuable research tool for researchers in a variety of fields, so they have been published by the Geoscience Society of New Zealand as parts of *GSNZ Miscellaneous Publication* 133, and are available as free downloadable PDF files from the GSNZ website: [www.gsnz.org.nz](http://www.gsnz.org.nz) – click on Publications, then Misc. Pub. Series.

So far the following six volumes have been published:

- "My Dearest Georgie": transcriptions of 22 letters from James Hector to his wife Georgiana written in 1890 by Judith Nathan & Simon Nathan. *Geoscience Society of New Zealand miscellaneous publication* 133A, 35 pages
- "My Dear Hooker": transcriptions of letters from James Hector to Joseph Dalton Hooker between 1860 & 1898 by Rowan Burns & Simon Nathan. *Geoscience Society of New Zealand miscellaneous publication* 133B, 208 pages
- "My Dear Dr Haast": transcriptions of selected letters from Robert Landley Holmes to Julius Haast between 1864-65 and 1868-70 by Rowan Burns & Simon Nathan. *Geoscience Society of New Zealand miscellaneous publication* 133C, 53 pages.