Ami Boué and the First Geological Map of New Zealand

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Newsletter No. 10 (March, 1995) and *Newsletter* No. 12 (March, 1996) provide some information about the possible first geological maps of New Zealand. *Bulletin* No. 66 of the Geological Survey of New Zealand (*The Geological Map of New Zealand*, 1959) contained a mention (p. 2) by the then Survey Director, R.W. Willett, of a geological map of the South Pacific, dated 1843, which included New Zealand. It was supposedly produced by the French geologist Alcide d'Orbigny (1802–1857) and was said to have been published in his *Voyage dans l'Amérique Méridionale* (7 vols + atlas of 2 vols, Paris, 1835–47). But Willett stated that he had not actually seen the map and my own efforts to locate it some years ago proved unsuccessful (see *Newsletters* 10 and 12, mentioned above).

In my London University MSc thesis, 'Geology in New Zealand Prior to 1900' (1967), I suggested that there would have been insufficient information for anyone to have produced a geological map of the whole of New Zealand in 1843, and I maintained that the first such map must have been that of W.B.D. Mantell, the two rolls of which were kept at the Geological Survey, Lower Hutt, in the 1960s and are, I suppose/hope, still there. I hazarded that the two rolls of hand-coloured map must have been prepared in the latter part of the 1850s. It was difficult to know how Mantell had enough information, even then, to produce the maps as he did, and the dates are, so far as I am aware, still unfixed. But that is a problem that does not concern us here.

The note in *Newsletter* No. 10 mentions a reference to a geological map of the world by the geologist Ami Boué (1794–1881), given on p. 593 of the English translation of Eduard Suess's *The Face of the Earth* (1904). Boué published his *Essai d'une carte géologique du globe terrestre* in Paris in 1845. I have not myself seen this work, but it would indeed appear to be related to a version of the item that Willett had in mind when he referred to a very early geological map of New Zealand, from the 1840s; for the *first* appearance of Boué's map was indeed prepared in 1843, as explained below.

Recently new light has been thrown on the problem by a publication of the French geologist, academician, and historian of geology, Michel Durand-Delga: 'Des premières cartes géologiques du globe par Ami Boué (1843) et Jules Marcou (1861) à l'atlas géologique du monde de 1984', in: Gabriel Gohau (ed.), *De la géologie à son histoire: Ouvrage en hommage à François Ellenberger* (Paris: Comité des Travaux Historiques et Scientifiques, 1997, pp. 193–205) (issued 1998). This paper discusses Boué's work and refers to his publication: 'Mémoire à l'appui d'un essai de Carte géologique du globe terrestre, présenté le 22 septembre 1843, à la réunion des naturalistes d'Allemagne à Gratz [= Graz, Austria]', *Bulletin de la Société géologique de France*, 2nd Series, 1844, *1*, 296–371. Moreover, Professor Durand-Delga has kindly supplied me with laser colour copies of parts of the two maps (1843 and 1845), for the areas of New Zealand, Australia, Papua New Guinea, and Indonesia:

1. The map that Boué displayed at Graz in his lecture of 1843, geologically hand-coloured onto a printed map 'Die Erde in Mercator's Projection' by C.F. Weiland, Weimar, 1841, Scale 1:58,000,000 [Document B 256, in the library of the Geological Society of France];
2. The revised map, as published in Boué's monograph of 1845 [Document C 256 bis, Geological Society of France].

These are reproduced (Figures 1 and 2) below, bearing Durand-Delga's annotations.*

The question then remains as to how Boué had sufficient geological information to enable him to provide any sort of geological map of New Zealand in 1843. The only possible significant sources of information would appear to have been Dr Ernst Dieffenbach's *Travels in New Zealand* (London, 1843), this German naturalist having visited New Zealand in 1839 on behalf of The New Zealand Company; and information that may have been gleaned from James Dwight Dana, who visited New Zealand briefly from Sydney in 1840, during the United States

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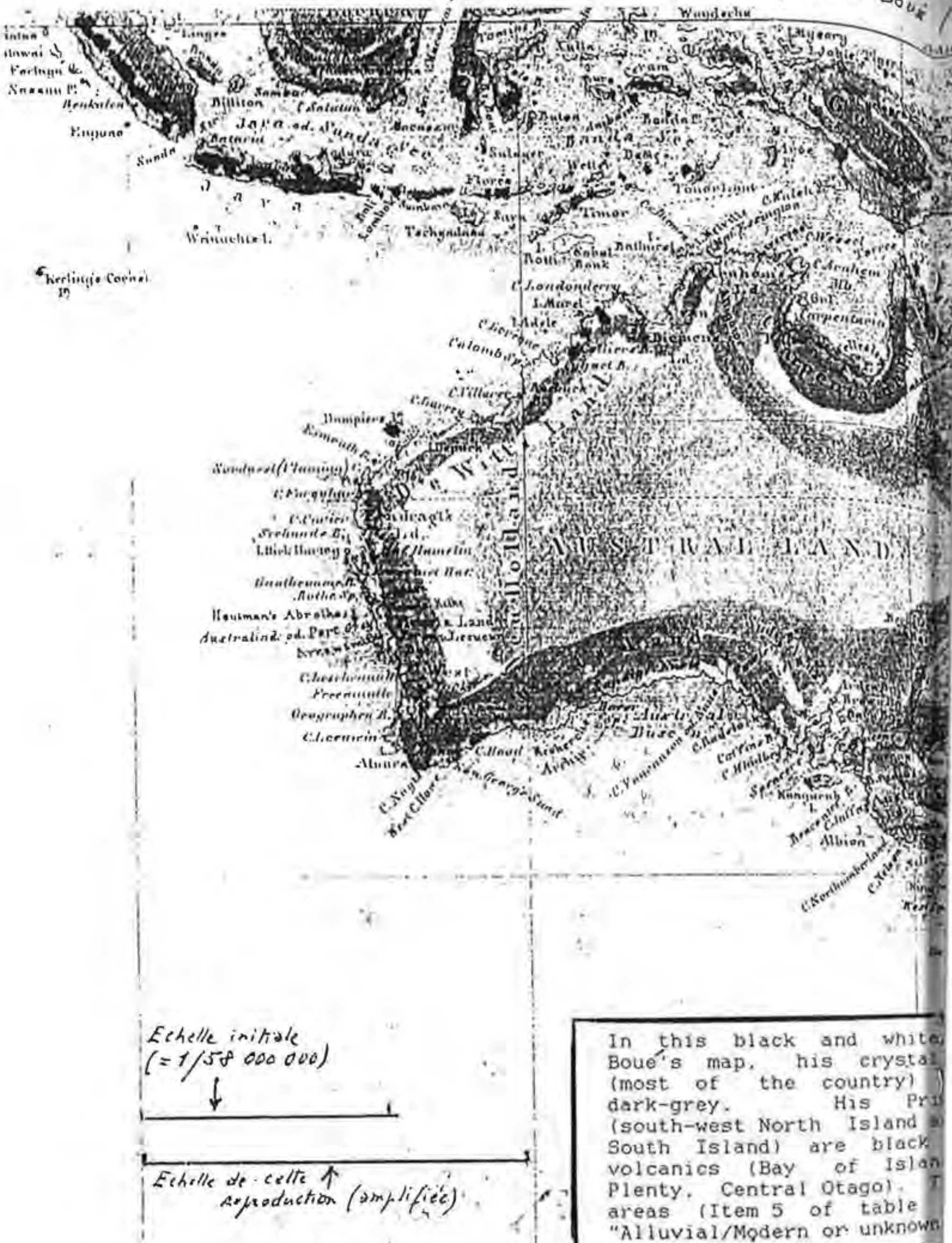
* If readers wish to receive colour copies of the Australasian parts of the maps, they may do so at cost by application to the editor of this *Newsletter*, Alan Mason.

($4-00 per map plus postage 80 cents - APM)

Original présenté à Grätz en 1843 par Ami Boué



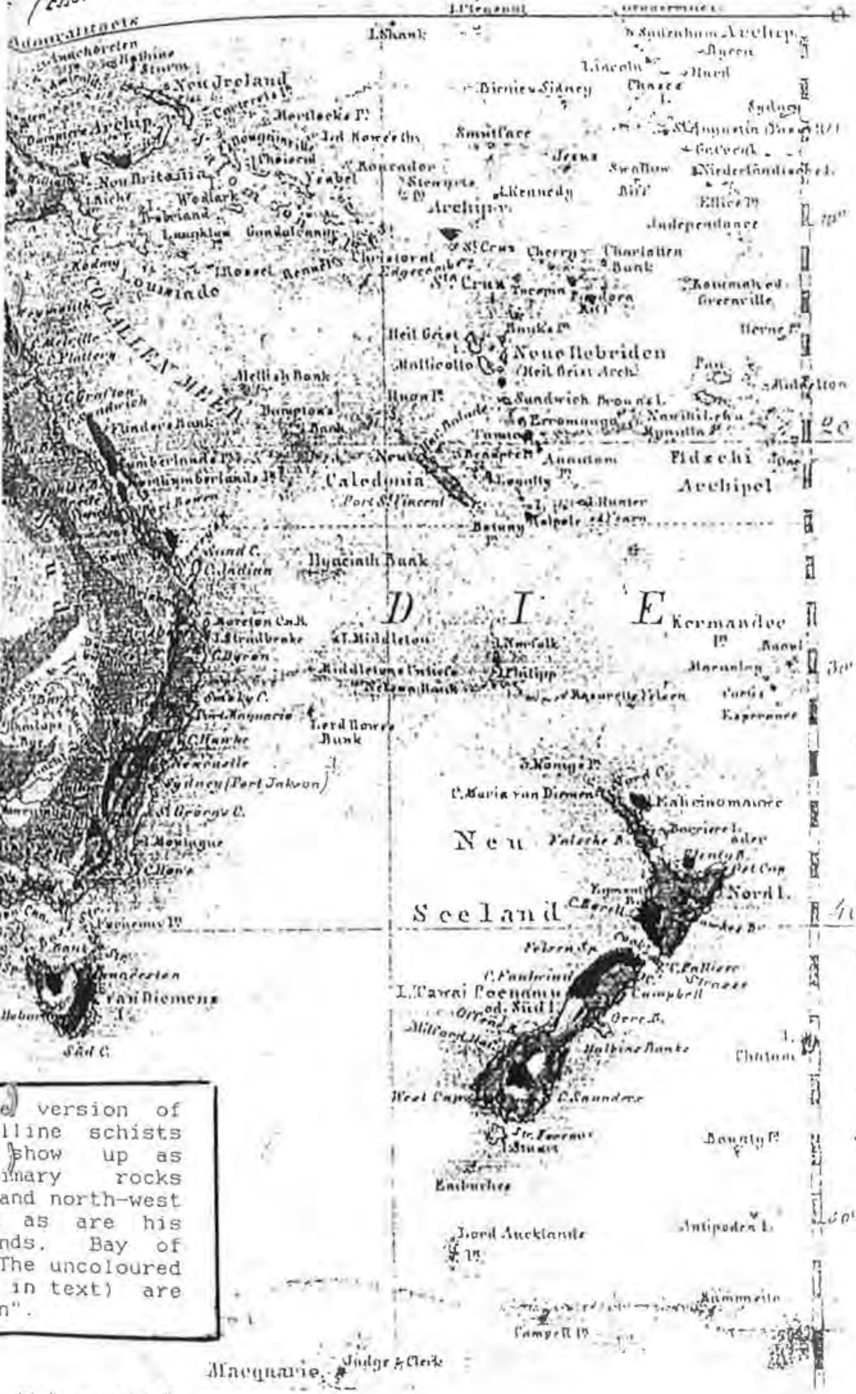
In this black and white
Boue's map, his crystal
(most of the country)
dark-grey. His Pri
(south-west North Island
South Island) are black
volcanics (Bay of Islan
Plenty, Central Otago).
areas (Item 5 of table
"Alluvial/Modern or unknown

[Fond topographique: "Die Erde in Mercator's Projection", von C.F. Weiland

Figure 1 -

(Essai d'une Carte géologique du Globe terrestre)

Document 3 #56



version of
lline schists
show up as
inary rocks
and north-west
as are his
nds. Bay of
The uncoloured
in text) are
n".

← green-gray Flötz-Gebirge [= Secondary]

← yellow: Tertiäre Gebirge

← violet: Kristallinische Schiefer Gebirge

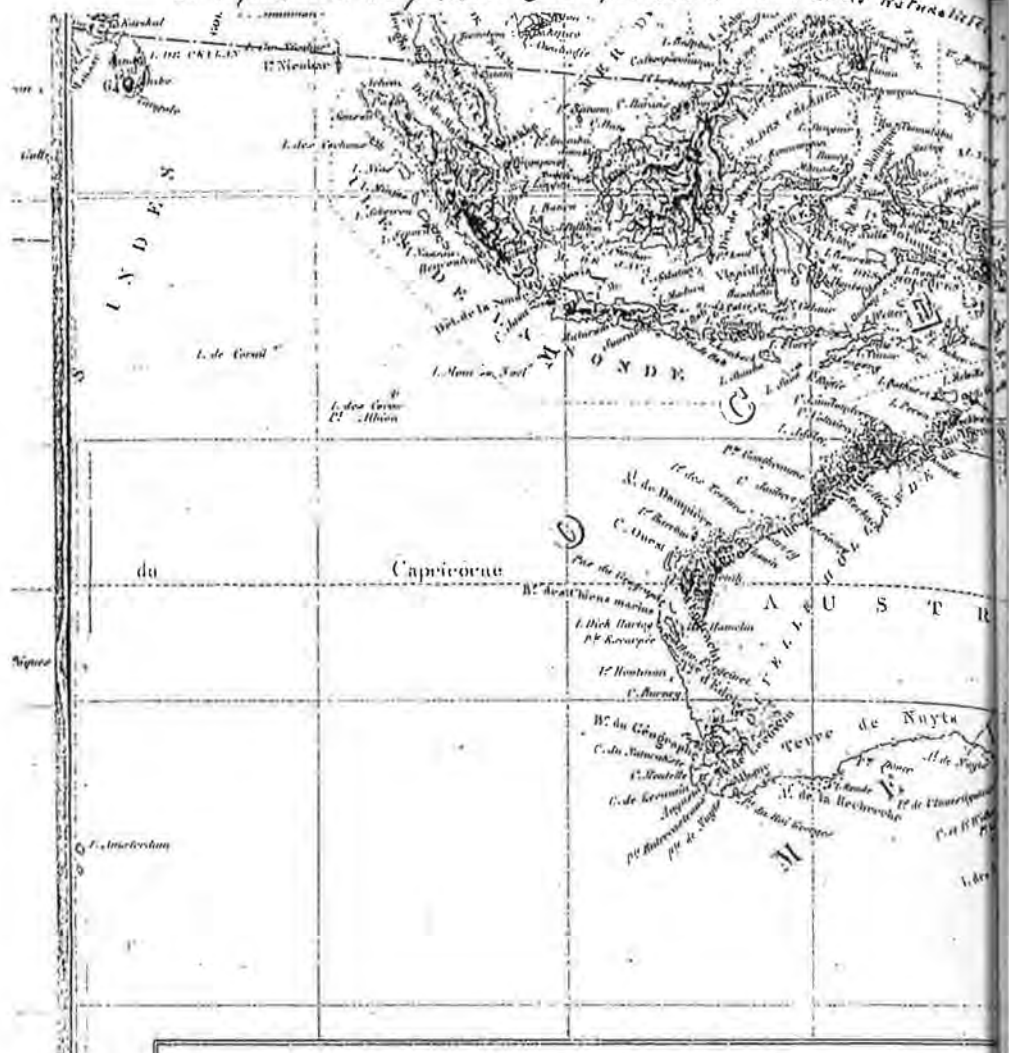
← blue Urgebirge (= Primary!)

← red (points!) "Vulkane, plutonische Gebilde"

Weimar, 1841]

1843 Map

La Maquette avait été présentée le 22 sept. 1843 à la Réunion des Naturalistes



EXPLICATION DES COULEURS.

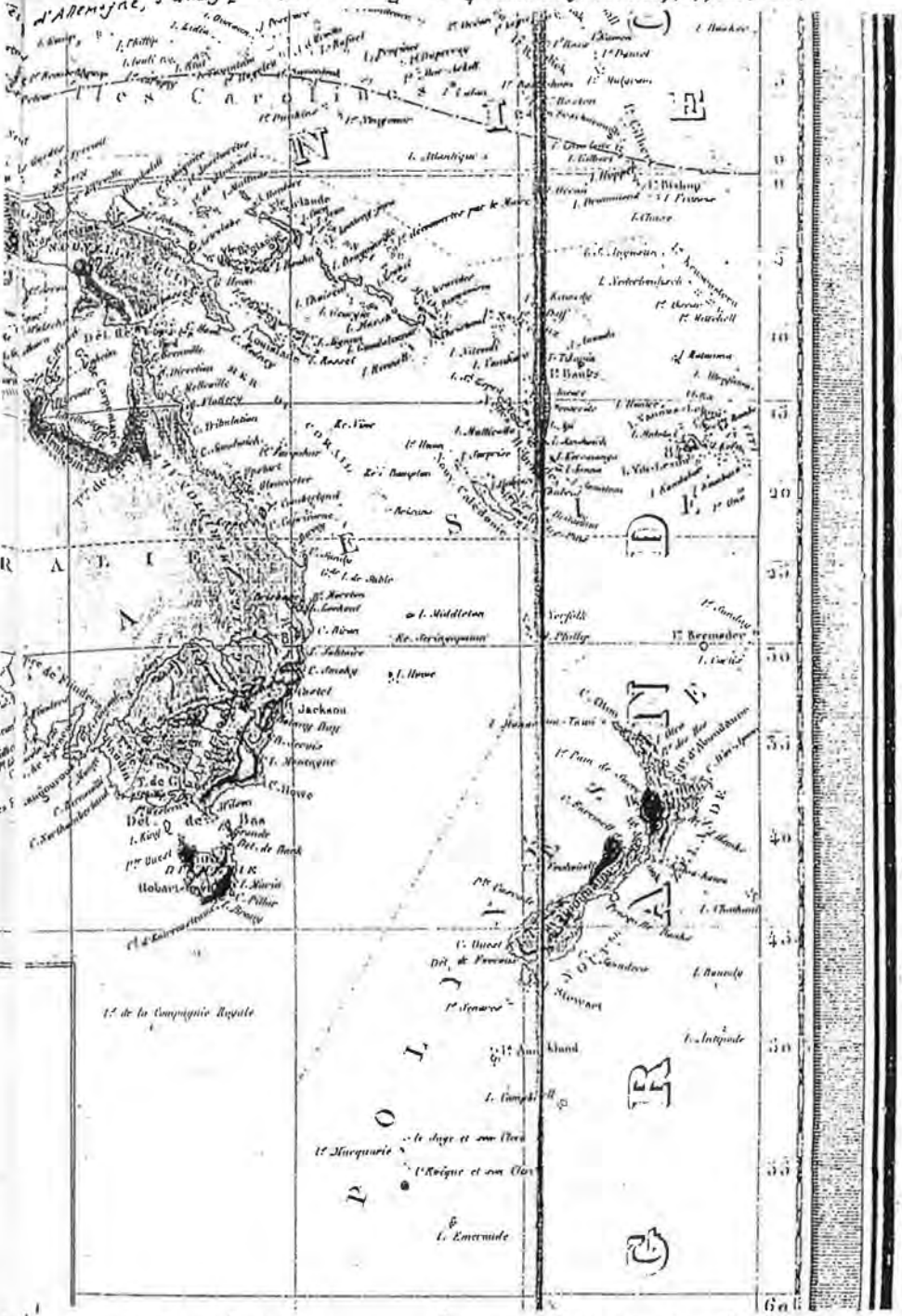
- Schistes cristallins et Granites.
- Terrain primaire, (intermédiaire ou de transition comprenant le système Carbonifère.)
- Terrain secondaire.
- Terrain tertiaire.
- Terrain alluvial moderne ou terrains inconnus

Echelle conservée

"Essai d'une Carte géologique du Globe Terrestre"

Figure 2 -

d'Allemagne, à Gratz [=Graz, Osterreich] - Cf. Bull. Soc géol. France, (2), t. I, 1844



, par A. BOUÉ, 1845 [document C 256 bis, Soc. géol. de France, Paris]

1845 Map

Exploring Expedition under the command of Charles Wilkes. But Dana's published account of New Zealand geology did not appear until 1849 and when it did he relied on Dieffenbach for information outside the Auckland region and the Bay of Islands. Darwin's geological observations on New Zealand also came too late (1844), at least for the first version of Boué's map; and in any case there is but little on New Zealand beyond a list of a few rocks collected at the Bay of Islands. Boué's name does not appear in the relevant volumes of the Darwin *Correspondence*.

Regarding Dieffenbach, his biographer Gerda Bell (*Ernest Dieffenbach Rebel and Humanist* (Palmerston North: The Dunmore Press, 1976, p. 147) demonstrates that his *Travels* appeared early in 1843, so it *would* have been possible for news of his book to have reached Boué by September, 1843; and quite possibly it did. (I thank Alan Mason for this reference.)

However, according to Durand-Delga's examination of Boué's work, most of what he depicted in geological colours for the parts of the world that he did not visit was based on what he thought might reasonably be there, according to his geological experience elsewhere and his theorising. His experience was in fact considerable. Boué came from a French-speaking Huguenot family in Hamburg, was educated in Switzerland and Paris, studied medicine in Edinburgh and travelled widely in Scotland, producing the first geological map of that country (1808). He resided in Paris for twenty years and was active in establishing the Société géologique de France. Finally, he settled in Vienna, travelling extensively in the Balkans and Turkey. Apparently he collected information for many years (1815 to 1843) from every possible source, from the writings of geologists and other travellers, with a view to compiling a world map.

Boué's maps had six colours:

1. Pink: Crystalline schists or granites
2. Dark Blue: Primary, including the Carboniferous System [sic]
3. Blue/green: Secondary
4. Yellowish: Tertiary
5. White: Alluvial/Modern or unknown
6. Orange/red: Volcanoes; plutonic/igneous rocks.

As Durand-Delga points out, it was the very simplicity of Boué's classificatory system and his *lack* of knowledge that made his compilation possible, since he could cheerfully colour in his map according to the flimsiest of evidence or information. (Needless to say, however, his map was more satisfactory for Europe than for Australasia.)

It would appear that for Boué most of New Zealand consisted of crystalline schists, with some 'Primary' rock in the northwest of the South Island (approximately Nelson Province) and the southwest of the North Island (approximately Taranaki Province), with volcanics in the Bay of Islands, the Bay of Plenty, and (for some obscure reason) Central Otago. It is difficult to know what he meant by 'Primary', but, as can be seen from the key to Figure 2, it apparently had equivalents in 'Intermediate' or 'Transition' rocks. Thus we might tentatively and approximately equate Boué's 'Primaries' with Palaeozoics—a term introduced by John Phillips in 1841, but not used by Boué.

As Durand-Delga explains, much of Boué's reasoning was based on analogies. Rocks might be expected to be similar in situations that were supposedly analogous (such as Sicily and Calabria and Tierra del Fuego and South America?); and mountain ranges that had similar alignments might be expected to be geologically similar. It is possible, then, that there was some intended analogy between the rocks of the South Island of New Zealand and Tasmania in the 1843 map, and possibly more generally for the east coast of Australia and New Zealand as a whole. This supposed similarity seems to have increased rather than decreased in the 1845 version, and eastern Australia seems to have become rather more like a 'standard' Wernerian map, with 'Transition' rocks butting against both sides of a central crystalline core for a mountain chain (the Great Dividing Range of eastern Australia). The supposed close resemblance between Tasmania and mainland Australia had a parallel, for example, in Spain and Morocco, across the Straits of Gibraltar. It may be noted that the volcanic or igneous rocks somehow 'disappeared' from both Tasmania and Otago between 1843 and 1845, which was a backward step at least so far as Tasmania was concerned where there are large outcrops of dolerite.

I speculate somewhat, of course—probably as much as Boué himself! It may be remarked, however, that analogies somewhat similar to those proposed by Boué were used by

other geologists of the period. The influential French theorist, Léonce Élie de Beaumont was at that time actively promoting the idea that there were certain preferred directions for mountain ranges, and that those with similar alignments were of similar age, all supposedly being produced by the contraction of a cooling earth. The no less influential British geologist, Roderick Murchison, predicted the presence of gold in eastern Australia on the basis of the similarity of rock samples he had himself collected in the Urals and specimens sent to him from Australia by Paul Strzelecki and the similar meridional alignment of the Great Dividing Range and the Urals. (See R.I. Murchison, *Siluria*, London, 1854, pp. 450 and 452–53.) Indeed, Murchison thought that this was one of his most profound geological prognostications, and he patted himself on the back for assisting in the Australian gold rush, and thus aiding and abetting British imperialism and the gain of British wealth through colonization.

It would be fair to say, I think, that modern geology is still keen to establish tectonic and other generalizations—fortunately with more evidence than that which Boué had available to him. If Boué's extrapolations were excessive, or even wild, his notion of a global geology—rather than many 'parochial' stratigraphies—was a valuable one, at a time when the gradual assemblage of geological knowledge from piecemeal observations was the norm. Amongst the stratigraphic synthesizers, Boué's attempted generalizations, depicted graphically, were perhaps on a scale grander than those of anyone else in the 1840s.

Thus the geological mapping of New Zealand began!

Acknowledgements

I am most grateful to Professor Michel Durand-Delga for providing me with annotated colour copies of parts of Boué's world maps of 1843 and 1845; and to Alan Mason for information about Dieffenbach.

From the days when geology was even more exciting than it is now _

> "Admitted in his infancy to the Order of the Knights of Malta, he killed a brother knight in a duel, was condemned to death but, in consideration of his youth, was pardoned after nine months in prison, which he spent studying the natural sciences. He made an exhaustive study of the Alps, and in 1791 described the mineral dolomite, to which he gave his name. Captured on his way home from Napoleon's Egyptian campaign, he was imprisoned in Messina, in a pestilential dungeon. Forbidden writing material, he made a pen from a piece of wood and, with the smoke of a lamp for ink, he wrote his treatise, Sur la philosophie mineralogique et sur l'especе mineral (1801) on the margins of a Bible, the only book he possessed."

The subject of this quotation is Dieudonne Dolomieu (1750-1801) and the quotation comes from The Pick and the Pen by A.J.Wilson