

## ONE LONG GIGANTIC BLUNDER

We tend to remember Charles Darwin as he is depicted near the end of his life in 1882, captured by the new technique of photography. A solemn old man, with a great white beard, a black cape and a black hat, his haunted eyes suggesting he is brooding over the enormity of the big idea that had led, in 1859, to his great work *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. Less well known is the Darwin who returned from the five-year voyage of HMS *Beagle* in 1836, when still only 27, a handsome, ambitious young man who saw himself as a geologist (Fig. 1).



**FIGURE 1** Charles Darwin in 1840, aged 31. FROM A PAINTING BY GEORGE RICHMOND.

He almost immediately became secretary of the Geological Society of London.

His first two proper scientific publications were both geological, very different but inter-related in an intriguing way. The first, read before the Geological Society in 1838 and published in 1840 in their *Transactions of the Geological Society of London*, was entitled 'On the Connexion of certain Volcanic Phenomena in South America; and on the Formation of Mountain Chains and Volcanos, as the Effect of the same Power by which Continents are elevated'. Its foundations were a global tectonic theory proposed by his mentor, Charles Lyell. It begins with a fine opening paragraph:

'The object of the present memoir is to describe the principal phenomena generally accompanying the earthquakes on the west coast of South America; and more especially those which attended the shock that overthrew the city of Concepcion on the morning of the 20<sup>th</sup> of February, 1835. These phenomena evince, in a remarkable manner, the intimate connexion between the volcanic and elevatory forces; and it will be attempted to deduce from this connexion, certain inferences regarding the slow formation of mountain chains.'

His second paper, published in *Philosophical Transactions of the Royal Society of London* in 1839, was more parochial: 'Observations on the parallel roads of Glen Roy, and other parts of Lochaber in Scotland, with an attempt to prove they are of marine origin'. Shortly after its publication he was made a Fellow of the Royal Society. These mysterious 'Parallel Roads' (Fig. 2) are three perfectly horizontal terraces, a few metres wide, on the sides of a valley about 30 km east of my home in the West Highlands of Scotland. In a world that is all curves, they have a distinctly engineered look, and the local people can be forgiven for calling them 'roads', produced by some ancient civilization.

In 1815–1817, geologist John MacCulloch, a Scot who lived in London, and Thomas Dick Lauder, a Scottish landowner and amateur geologist, working independently, surveyed the 'roads' and came to similar conclusions. They suggested that they were beaches, the shorelines of ancient freshwater lakes. But, this left a serious problem; there is no sign of a barrier that could have held back the water. MacCulloch considered the possibility that they were marine beaches but rejected the idea because the horizontal 'roads' were restricted to a few valleys, and he could not find any sea shells. Lauder's careful surveying showed that the height of the 'roads' was governed by that of cols in the surrounding ridges, which would have provided spillways for the lakes. While most geologists in subsequent years accepted the lake theory, the location and fate of the final barrier remained an enigma.

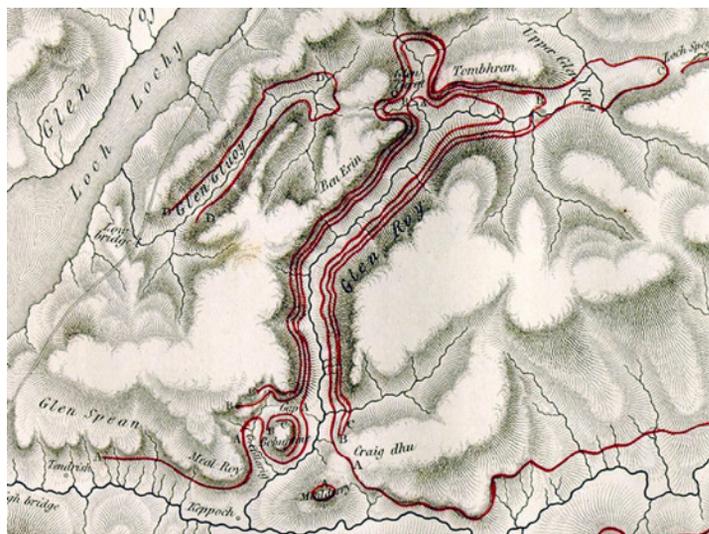
In 1838, Darwin, fired up by his discovery of elevated marine terraces at Coquimbo in Chile, visited Glen Roy, looking specifically for evidence that the 'roads' were of marine origin, thereby proving that global 'elevatory forces' were at work. His field evidence and conclusions



**FIGURE 2** The three mysterious 'Parallel Roads' of Glen Roy. They are at 260 m, 325 m and 350 m, respectively, above present-day sea level.

appear in his long 1839 paper (45 pp). It goes into mind-numbing local detail, but in it, Darwin presented no new large-scale work and simply transposed Lauder's map of the 'roads' onto a new base-map (Fig. 3). He failed to find evidence of marine shells and brushed aside Lauder's discovery that the 'roads' equated with local col heights as a mere coincidence. Their restricted regional extent was put down to lack of preservation elsewhere. Despite these considerable difficulties, Darwin stuck to his model.

His nemesis arrived the following year in the form of the Swiss palaeontologist and glaciologist, Louis Agassiz. The Agassiz family have figured in Parting Shots before (*Elements*, 2010, v6n5, p 351). Louis never accepted Darwin's view of evolution; but that was a disagreement for the future. In 1840, Louis visited Britain to work primarily on fossil fish, but also to promote his 'Ice Age' theory in which he proposed that much of northern Europe had been covered by an ice-sheet. He lectured in Edinburgh and Glasgow and briefly visited Glen Roy, where he declared that the 'roads' were the shorelines of a lake held back by glaciers. He suggested where the snouts of glaciers could have been located, but their position did not adequately explain the distribution of the roads.



**FIGURE 3** Part of Darwin's 1839 map of the 'Parallel Roads' (in red), based on Thomas Dick Lauder's mapping (1820) transposed onto a new base map. In Glen Roy there are three 'roads', but in the lower valleys there is just one. 'Glen' is the Scottish word for a steep-sided valley, and a 'loch' can be either a lake or an arm of the sea.

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The geological community gradually came to accept Agassiz's hypothesis, but Darwin was slow to do so. It was more than twenty years before new evidence finally made him change his mind. He was, of course, pre-occupied by *Origin of Species* (1859). Nevertheless, it was Lyell and Darwin who suggested that Thomas Jamieson, a Scottish agricultural scientist and amateur geologist, should revisit Glen Roy and its surroundings. In 1861–1862, Jamieson came to Glen Roy, applied up-to-date understanding of the behaviour of glaciers, and made use of features such as glacial striae, moraines and erratics. His model of advancing and retreating glacier snouts, published in 1863 in the *Quarterly Journal of the Geological Society*, is the one we accept today. Darwin's reaction to Jamieson's work was one of despair. He wrote to Lyell, 'I am smashed to atoms about Glen Roy, my paper was one long gigantic blunder from beginning to end'.

My unexpected interest in geomorphology came about because I also work for a voluntary organization, Lochaber Geopark ([www.lochaber-geopark.org.uk](http://www.lochaber-geopark.org.uk)). We have recently opened a visitor centre and café at the foot of Glen Roy. My colleagues know much more about Glen Roy (and Quaternary geology!) than I do, but a small contribution I could make was to visit the Centre for Research Collections in Edinburgh University to get some engravings from these early works that have now been digitized. Among the box of volumes the librarians provided was a separate reprint of Darwin's 1839 paper, signed in ink by Darwin himself on the first page, 'C. Lyell Esq<sup>u</sup> – From the Author'. Now, that was a thrill!

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