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Darwin's Landscapes (and Seascapes)

Patrick Armstrong (Edith Cowan University)

Charles Darwin (1809-1882) was a great integrator. His success was due to the fact that he was able to bring together evidence from many different sources to build his theory. Thus, in developing his notion of evolution through natural selection, he combined evidence from the study of the breeds of domestic animals (he was particularly interested in pigeons), from geology, from the study of variation, from the study of the behaviour of animals, and from the distributions of animals and plants. The original insight can probably be dated to March 1837, 180 years ago, while he was discussing his specimens and observations with naturalists in Cambridge and London, after his return from the *Beagle* voyage. It does not seem that there was any Eureka moment while he was in the Galapagos Islands, the Pacific archipelago with which his name is so often associated.

He linked different strands of thought and observations from an early stage in his voyage as a supernumerary aboard HMS *Beagle* (1831-1836). In South America and the Falklands, he showed how the appearance of organisms, their habitat, environment, and behaviour were interrelated. Amongst his notes on the Falklands is a description of a kelp bed as a 'whole environment'. While the terminology of *ecosystem*, *food-chain*, *food-web*, or *ecological niche* lay far in the future in 1835, Darwin clearly understood the importance of considering the bed of kelp that lay at his feet as he looked out over Berkeley Sound, East Falkland, as a tightly integrated system (DAR31.1/242-243). Here follows a small extract:

On shaking the great entangled roots [of a strand of kelp, the prolific type of seaweed that grows in cool temperate seas] it is curious to see the heap of fish, shells, crabs, sea-eggs, cuttlefish, star fish, Planaria, Nercilae which fall out. ... One single plant forms an immense and most interesting menagerie. If this Fucus was to cease living: with it would go many of the Seals, the Cormorants & certainly small fish...

The idea of the whole kelp-bed as an ecosystem regime is clearly conveyed.

Another oft-quoted example is the 'entangled bank' with which he concludes the *Origin*:

It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us.

The idea of an English hedgerow as an integrated system, with numerous links between the components, is well conveyed.

Nowhere are his integrative powers more clearly seen than in his development of his 'Theory of Coral Reefs and Atolls'. In South America, he was collecting evidence of the uplift of land relative to the sea - and indeed, he found fragmentary evidence for local uplift in the Galapagos. As his ship was blown across the Pacific before the Trade Winds, he glimpsed, probably from the masthead, several atolls, noting their internal lagoon and surrounding low circular or horse-shoe-shaped land area. At Tahiti, he waded out to inspect growing corals in the adjoining reef, and also, from a high point, viewed the barrier reef and enclosed circular lagoon of the nearby island of Eimeo, now called Moorea:

From this point, there was a good view of the distant island of Eimeo. ... On the lofty & broken pinnacles, white massive clouds were piled, which formed an island in the blue sky, as Eimeo itself in the blue ocean. The island is completely circled by a reef, with the exception of one small gateway. At this distance, a narrow but well defined line of brilliant white, where the waves first encountered the coral, was alone visible. Within this line was included the smooth glassy water of the lagoon, out of which the mountains rose abruptly. The effect was very pleasing & might aptly be compared to a framed engraving, where the frame represents the breakers, the marginal paper the lagoon, & the drawing the Island itself (*Diary*, 17 November 1835).

Darwin conveys the impression of the landscape, and seascape, extremely well, using metaphor and simile to depict, very vividly, exactly what he observed.

Amongst Darwin's geological notes from the *Beagle* period in Cambridge University Library is a hastily written manuscript, running to about two dozen pages. It was probably written between 3 and 21 December 1835 while sailing between Tahiti and the Bay of Islands, New Zealand. In this document, which is titled 'Coral islands', can be seen the first coherent statement of his theory that fringing reefs (where coral growth is attached to the shore), barrier reefs (where there is a moat-like encircling lagoon) and true atolls (Darwin sometimes used the term 'lagoon islands' to describe these circular or horse-shoe-shaped groups of islets around a central lagoon) are members of a single series, one form developing into the next as the result of submergence. This represents Darwin's earliest adoption of the idea of *gradualism* – the notion that one form of something could be transformed into another as the result of long-continued, gradual change. In this, he had been influenced by Charles Lyell's *Principles of Geology* (1830-1833), which he brought with him on the *Beagle*. The central argument in *Principles* is *uniformitarianism*, the idea that, because 'the present is the key to the past', the geological state of the remote past should be interpreted by reference to the long-continued action of gradual processes observable today.

In the 'Coral Islands' manuscript, Darwin very briefly summarises his description of Eimeo:

The mountains rise out of a glassy lake, which is separated by a narrow, defined line of breakers from the open sea. Remove the central group of mountains, & there remains a Lagoon Isd. I ground this opinion from the following facts. There is a general similarity in the two cases in the form & size of their reefs; their structure appears identical, we have scarcely fathomable water in each case, at a very short distance on the outer margin; within is a shallow basin more or less filled by knolls of growing coral or converted into dry land. In the Lagoon Isds there are some which do not deserve this title, for they consist of a circular reef of which scarcely a point projects above water; while others have a more or less complete, but narrow ring of land (DAR40/2, and Stoddart 1962).

Darwin links a careful description of landscape and seascape with observation of smaller scale features, as well as offshore soundings and shrewd deduction: he was able to 'see the big picture' and to analyse it accurately.

The story was not quite complete: after his transect of the Pacific, the visit to Tahiti, and the writing of the 'Coral Islands' manuscript, he needed to have his feet on an atoll. Here he is in the Cocos (Keeling) Islands in the Indian Ocean, where he was able to test his theory against an actual atoll, which he describes perceptively:

[T]here is to my mind much grandeur in the view of the outer shores of these lagoon islands. There is a simplicity in the barrier-like beach, the margin of green bushes and tall Cocoa nuts, the solid flat of Coral rock, strewn with occasional great fragments, & the line of furious breakers, all rounding away towards either hand. (*Diary*, 6th April 1836)

He has the knack of conveying the essential feel of a landscape and seascape, linking the landforms, marine features and vegetation: always the integrator, but with a strong aesthetic sense, and an understanding of the importance of the light on a scene. And in the interior of the lagoon:

The general appearance of the land at a distance is precisely similar to what I have mentioned at the Low Isds of the Pacific. On entering the Lagoon, the scene is very curious and rather pretty; its beauty is, however, solely derived from the brilliancy of the surrounding colors [sic]. The shoal [ie shallow], clear and still water of the lagoon, resting in its greater part on white sand, is, when illuminated by a vertical sun, of a most vivid green. This brilliant expanse, which is several miles wide, is on all sides divided by a line of breakers, or from the blue vault of Heaven by the strips of land, crowned at an equal height by the tops of the Cocoa nut trees. As in the sky here & there a white cloud affords a pleasing contrast, so in the lagoon dark bands of living Coral are seen through the emerald green water ... [I]t is impossible not to admire the elegant manner in which the young & full grown Cocoa-nut trees, without destroying each other's symmetry, mingle together into one wood: the beach of Calcareous sand forms a border to these fairy spots (*Diary*, 10-17 April 1836).

Darwin liked islands, and he particularly liked Cocos. This was no doubt partly because of the intrinsic beauty of the place, but was probably also due to the fact that it was here that he received confirmation that his 'Theory of Coral Reefs and Atolls' – the idea that fringing reefs, barrier reefs and atolls were members of a sequence – was correct. An

account of the Cocos archipelago formed a key case study in his *Structure and Distribution of Coral Reefs* (1842).

Charles Darwin's appreciation of landscapes, and his understanding of the role of the light and the nature of the atmosphere in determining the subtlety of the perceived colours in a view, was in no small measure due to his reading of Alexander von Humboldt's 1822 *Voyage in the Americas*. He had been reading Humboldt in the summer before he left Cambridge, and had a copy with him. Five months into the voyage, at Rio de Janeiro, after dinner on 26 May 1832, Darwin

walked to the Bay & had a good view of the Organ mountains. I was much struck by the justness of one of Humboldt's observations, that hills in a tropical country seen from a distance are of a uniform blue tint, but that, contrary to what is generally the case, the outline is defined with the clearest edge (*Diary*).

Here are Darwin's field notes of observations on the landscape near Waiomio, North Island, New Zealand, which he visited around Christmas, 1835. He indicates what he regarded as an attractive view, emphasising the spectacular and the 'exotic' (this was perhaps typical of travelers of his day), and shows how he appreciates both the gross form of the landscape and its micro-features, such as the petrology (rock-structure) and the tiny fluted surface forms of what is now referred to as the Whangareri crystalline limestone, which is of Tertiary age.

A few miles inland [from the Bay of Islands, where HMS *Beagle* lay at anchor], at a spot called Waiomio, we meet with a formation of a compact, pale flesh-coloured Limestone, ... this contains many crystals of a similar kind, as almost to give the whole rock a crystalline structure. In many places Minute ... rounded pebbles are embedded in the lime, & in such quantity as to render the Limestone impure.- The rock is stratified in nearly horizontal planes. - bare masses stand out [like, *deleted*] in the form of Castles or fortified towns, & amidst the green undulating country have [a rather *del*] singular appearance.- Besides the singularity in form on the large scale, the surface of the compact rock has been acted on by the rains in a rather extraordinary manner.- We may see in miniature an exact model of ... Alpine county; the ... sharpness of the crests of the ridges & the steepness of the lateral ravines are perhaps rather characictured [*sic*] (DAR37.2/802-803).

The comparative approach, the eye for detail and the integrative manner are all typical of Darwin's *Beagle* period writings. Anyone who has walked across the grassy country towards Roku's Cave, near Waiomio, looked upwards to the steep limestone escarpment, and run their hand over the rocks, will feel that Darwin often had the knack of succinctly conveying the essential character of an environment.

Towards the end of his book *The Voyage of the Beagle* (1845), the book that represented a reworking of his *Diary*, Charles Darwin attempts to summarise his views on the appreciation of landscapes - he prefers the word 'scenery':

The pleasure derived from beholding the scenery and general aspect of the various countries we have visited, has decidedly been the most constant and highest source of enjoyment. ... [T]here is a growing pleasure in comparing the character of the scenery in different countries, which to a certain degree is distinct from merely admiring its beauty. It depends chiefly on an acquaintance with the individual parts of each view: I am strongly induced to believe that, as in music, the person who understands every note, will, if he also possesses a proper taste, more thoroughly enjoy the whole; so he who examines each part of a fine view, may also thoroughly comprehend the full and combined effect. Hence a traveler should be a botanist, for in all views, plants form the chief embellishment. Group masses of naked rock, even in the wildest forms, and they may for a time afford a sublime spectacle, but they will soon grow monotonous. Paint them with bright and varied colours, as in Northern Chile, they will become fantastic; clothe them with vegetation, they must form a decent, if not beautiful picture (*Voyage*, chapter 21).

Darwin clearly appreciated an attractive view, and he could describe it well, utilising the power of simile and metaphor to convey impressions. Possibly the picturesque and varied landscapes of his youth, in the Welsh Borderland near his native Shrewsbury and North Wales, developed his taste in landscape. Later he experienced the more austere and jagged views in the hills around Edinburgh and the seascapes along the Firth of Forth. But he was profoundly influenced by his reading, before, during and after the voyage of HMS *Beagle*, by the great work of Alexander von Humboldt (1769 -1859), *Personal Narrative of a Voyage to a New Continent*, 1822. Darwin appreciated, more than many, that a landscape was made up of a variety of components - rocks (geology),

landforms (geomorphology), vegetation (botany), as well as the human components of a landscape. He was particularly attracted by the effects of the dialogue that exists between land and sea – well expressed in his *Theory of Coral Reefs*.

Darwin's descriptions of landscapes and seascapes are the product of his remarkable capacity for integration, for seeing a whole environment, and for relating a number of different themes, or strands of thought. It is almost as though he used the idea of landscape as an organizing or integrating concept. This is the same ability that led to his development of his evolutionary hypothesis, the coral atoll theory, his ideas on the transformation of igneous rocks, and of child development. And throughout the voyage, and indeed much later, Darwin was seeing the world through the lens provided by Humboldt's *Personal Narrative*.

There is perhaps one further point that might be made. Darwin is not often described as having a strong aesthetic sense. But the use of language such as 'The pleasure derived from beholding ... scenery ... has decidedly been the most constant and highest source of enjoyment', and the evocative description of the lagoon at Cocos as a 'fairy spot', show a real aesthetic feeling. In his *Autobiography*, he states that in his early life he had much enjoyed poetry – Shakespeare, Coleridge, Wordsworth, Byron and Scott, for example – as well as pictures and music. A particularly telling sentence in the section on his aesthetic sense is:

In connection with pleasure from poetry, I may add that, in 1822 [ie when he was 13 years old], a vivid delight in scenery was first awakened in my mind during a riding tour on the borders of Wales, and which has lasted longer than any other aesthetic pleasure (*Autobiography*, p 44).

In later life, he asserted in his *Autobiography* that his mind had become a machine for grinding out general laws from observations and facts, and this was the cause for the decline in his aesthetic sense (*Autobiography*, p 139, see also Graham, 2008). During the *Beagle* period, and immediately after, on his own evidence, Darwin's aesthetic feeling for landscape, or 'scenery', was at a high level, and this, plus his perception of the integrative nature of the landscape may explain the fine descriptions that enrich his writings from that stage of his life.

Darwinian evolutionary theory can be credited with ushering in a whole gradualist paradigm, an amalgamation of many theories, including Lyell's. W M Davis

contributed the idea of the *cycle of erosion*, the idea that a land surface after uplift passed through of series of stages as the result of denudation (1899). Frederic Clements advanced the idea of *ecological succession*, suggesting that plant communities passed from an initial stage (a bare land surface, such as a lava flow, or young sand dune) through a number of serial stages to an ecological climax: each stage prepared the way for its successor (1916). And then, in 1929, Derwent Whittlesey, suggested that cultural (ie humanized) landscapes themselves ‘evolved’ over time in his paper entitled ‘Sequent Occupance’:

Human occupance of an area, like other biotic phenomena, carries within itself the seed of its own transformation. ... The American farmer, inaugurating a stage of occupance by plowing and planting virgin soil, sets in motion agents which at once begin subtly or grossly to alter the suitability of his land for crops; in extreme cases the ground deteriorates to a point where it must be converted into pasture or forest or even abandoned: when either of these occurs, human occupance of that area has entered upon a new stage.

Whittlesey went on to stress the ‘dynamic character’ of landscapes, referring to the ‘succession of stages in the human occupance of an area establishes the genetics of each stage in terms of its predecessor’. The allusion to the notion of plant succession, and ultimately to Darwinian evolutionary theory, is very clear.

Darwin has been credited with changing the manner in which humanity viewed the world. A key component of the conceptual framework he erected in order to do this had, as its core, the notion of gradualism. And one of the routes that took him to this lay through his appreciation and careful analysis of environments, landscapes and seascapes as integrated systems. In turn, the study of cultural landscapes owes something to his gradualist, evolutionary view – the notion that humanized landscapes change over time just as do living organisms, plant communities, coral atolls, or river valleys. Perhaps Darwin’s ultimate expression of the gradualist paradigm was in his final book *The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits* (1881), in which he examines the role of denudation in the formation of landscapes and in particular the action of earthworms in breaking down strata through allowing air and water to reach the subsoil, and in comminuting particles, allowing them to be removed by rain and wind. He conceded that the processes must have been

exceedingly slow, but 'Worms have played a more important part in the history of the world than most persons would suppose'. Thinking perhaps of the chalk downland close to his home at Downe in Kent, he links the gradualist notion to his appreciation of attractive landscapes:

When we behold a wide, turf-covered expanse, we should remember that its smoothness, on which so much of its beauty depends, is mainly due to all the inequalities having been slowly levelled by worms (*Vegetable Mould and Earthworms*, 1881, chapter 7).

He also, perhaps unconsciously, in the final paragraph of this, his last book, links the notion of gradualism, as it applies to the work of earthworms on the sculpting of the landscapes of the English downland, to that of the landscapes and seascapes of the coral atolls of the Indo-Pacific that he once described some 45 years previously:

Some other animals, however, still lowly organized, namely corals, have done far more conspicuous work in having constructed innumerable reefs and islands in the great oceans: but these are almost confined to the tropical zones.

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