

Celebrating the book and the author: Charles Darwin and his times

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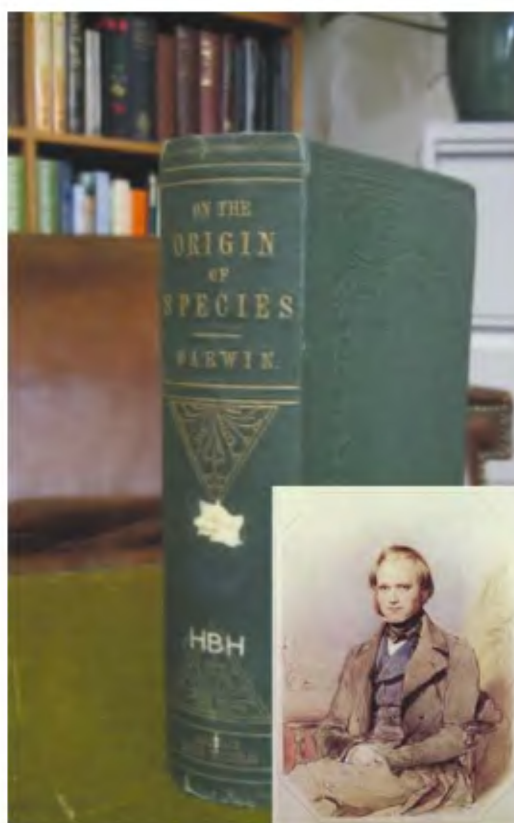
The idea that the life began billions of years ago and the process of its evolution is continuing around us even today and it is likely to extend to an infinite future may be considered as the greatest insight in the human history. At one masterful stroke, it defined our past, present and future in the universe and it removed the role of creator from the scheme of things. That the book *On the Origin of Species* by Charles Darwin, in which he espoused the theory of 'common descent by natural selection' was published just one hundred and fifty years ago itself is mystifying, considering the long time interval between the days, which saw quick succession of revolutionary scientific discoveries of Copernicus, Galileo, Kepler and Newton that preceded the advent of Charles Darwin. Although the European renaissance began about five hundred years ago which opened the floodgates of new science, it looks incredulous at first glance that this robust scientific enterprise took another long 350 years to reach this elegant but a simple truth that sustains this grand scheme called life which manifests itself in its myriad forms around us.

The point is unlike other branches of science, Darwin's science required a huge amount of spatially distributed observational data in palaeontology, geology, zoology and botany, and a major hindrance, I think, was logistics. And, luckily for Darwin he was born and lived at the time of enlargement and consolidation of colonial powers that also facilitated the collection of scientific data from far-flung parts of the world. The drive for mineral resources led also to new discoveries in fossil distribution and geology. Darwin, a product of the long tradition of renaissance, with required felicity both in geology and biology entered the scene at the right time. Darwin and his book, more than anything, owe to *Beagle*, the ship which took him around the globe, and its captain Fitz Roy, who allowed Darwin to share his cabin and carry out observations in spite of him being a bible-thumper and an ardent believer of special creation. Those who go out for scientific cruises would know how important it is to have an amiable working relationship with the captain of

the ship to do what we intend to do during the voyages. Darwin's tolerant personality probably helped him put up with the explosive temperament of his captain. May be Fitz Roy was late to realize the true implication of Darwin's researches, and when its meaning finally dawned on him he was truly crestfallen. Fitz Roy was one of the attendees of the crowded meeting in Oxford at the British Association of the Advancement of Science, when Darwin's theme of the second book *Descent of Man* was discussed for the first time, and at the end of the meeting he reportedly ran out with a bible in his hand shouting 'the book, the book'. It was also the meeting where Samuel Wilberforce, Bishop of Oxford famously asked Thomas Huxley whether he 'claimed attachment to apes by way of his grandfather or grandmother'.

When Huxley, an ardent supporter of Darwin and his book in those days, exclaimed, 'how stupid of me not to have thought of it', the surprise probably was directed more at the incredulity of not

being able to avail the most accessible self-evident truth, rather than the simplicity of the idea itself. There were palaeontologists and geologists like Cuvier, Lyell, Hooker, Sedgwick and many others, contemporaries of Darwin, more qualified in natural science than Huxley, who could have made that statement. Alfred Russell Wallace almost scaled the exalted heights to reach there, which surprised even Darwin. The speculation of evolution itself was not new because it was talked about even before Darwin. It is a truism that no major discovery emerges from an intellectual vacuum and it is applicable to Darwinism too. But it required someone who had the uncanny ability to marshal the seemingly disparate facts to discover the underlying parallels and the greatness of vision to bring together the 'sum of parts' and to build the whole, thus transforming the simple observations to a natural law; somebody with courage of conviction who had the boldness to make that leap of imagination. In order to reach the stage where



Darwin reached (to spill the beans, as it were), it needed the ability to move freely across various disciplines of knowledge, and equally importantly, to be able to occupy a vantage point to acquire a global perspective – the reason why destiny tipped in favour of Darwin.

It was also the time when major discoveries were made in stratigraphy and palaeontology. Discoveries were coming in even from distant Russia and India (Darwin mentions in *Origin* about primate fossils from the Himalayan Shivaliks). The intellectual power of Darwin was shaped to a great extent by his ardent appreciation for the 'noble science of geology'. Both his books, *On the Origin...* and the autobiography are testimonials of his love for geology. More than any of his peers, Darwin was most influenced by Charles Lyell, and his book *The Principles of Geology* (in his autobiography, Darwin admits that Lyell's principles of geology... 'was of highest service to me in many ways'). Darwin chose the first volume of Lyell's book that puts in perspective the earth's past in terms of the processes that are occurring presently following the dictum, 'the present is the key to the past'. When the *Beagle* anchored at Montevideo for the second time, Darwin managed to get the second edition in which Lyell discusses whether the succession of fossilized organisms preserved in the rocks of the geological columns represent a process of 'transmutation', or if they point to independent events of successive creation and extinction – a 'mystery of mysteries' as he called it. The devout Lyell, who was a revolutionary scientist in many ways, however, refused to believe in the relatedness of living things, but the rationalist in him wondered aloud on 'transmutation'. For Darwin it may have been the starting point of his new trail of thoughts. Lyell wanted to reach a compromise to arrive at a theologically comfortable stand. Later when his thoughts matured, Darwin confided his theory of transmutation to his friend Dalton Hooker, almost sorrowfully I think, as if 'confessing a murder'. But what confounded him among other things was the absence of transitional species in the geological columns, which he rationalized as due to 'imperfection of the geological record' (the later discovery of *Archaeopteryx* – a transitional creature sharing the characteristics of the dinosaur and a bird vindicated Darwin, post-

humously). The *Origin* can be read as a long argument addressing the supposition put forward by Lyell that the organisms are created at specific intervals, or whether they descend from earlier ones with modification.

Another issue that confounded Darwin was the prevailing belief of a young earth which agreed with the interpretation of biblical pronouncements. Even people like Lord Kelvin, based on his physical calculations, seemed to support a young earth – this was before the earth's radioactivity was discovered. Darwin's transmutations require enormous amount of time, and geological revelations about fossil-rich Cambrian strata (deposited 500 million years ago) came to his rescue. The incremental change propounded by Lyell is another idea which probably influenced Darwin in shaping his theory of natural selection. He writes in *Origin*: '... He who can read Sir Charles Lyell's grand work on the Principles of Geology, which future historians will recognize as having produced a revolution in natural sciences, yet does not admit how incomprehensively vast have been the past period of time, at once close this volume.' In other words, appreciating the idea of 'deep geological time' is most fundamental for a reader to approach Darwin's logicity of the descent of organisms from a common source. Darwin during his *Beagle* days had witnessed a major earthquake off Valparaiso harbour in Chile, and appreciated the incremental land-level changes brought about by the earthquakes. His observations on coral-reef islands excited Darwin so much that he mentions in his autobiography that 'no other work of mine was begun so deductive a spirit as this...'. For some time Darwin was mulling over writing a book on the geology of the various countries visited. His child-like excitement over geology comes through his autobiography at many occasions: 'I clambered over the mountains of Ascension with a bounding step and made the volcanic rocks resound under my geological hammer'.

Those were the days when even influential geologists like Sedgwick, also a mentor of Darwin, believed in the catastrophic diluvian flood that carved out the coastlines and mountains in one stroke. Reverend Adam Sedgwick, who valiantly fought the implications of Darwin's *Origin*, finally had to give up his fight most ceremoniously in his address to the Geological Society: 'Having been

myself a believer, and, to the best of my power, a propagator of what I now regard as a philosophic heresy... I think it right, as one of my last acts before I quit this Chair, thus publicly to read my recantation. We ought, indeed, to have paused before we first adopted the diluvian theory, and referred all our superficial gravel to Mosaic Flood. For of man, and the works of his hands, we have not yet found a single trace among the remnants of a former world entombed in these ancient deposits...'.

Philip Kitcher who wrote *Living with Darwin*, calls this address a 'funeral oration for the kind of geology practiced by Sedgwick... a geology dedicated to harmony between nature and scripture'. This is how the debate on catastrophism, which derived its strength from the diluvian story in the scripture and the uniformitarianism (the doctrine of gradualism) ended with the latter theory gaining the ground.

The chapter in *Origin* on 'Geological succession of organic beings' is a masterful treatment of ordering of fossil remains of various organisms at different stages in earth's history. I think Darwin clinches the issue of evolution with this essay. Darwin's systematic exploration of truth reaches its crescendo here: the sequences in the earth's history showing different organisms at different stages, distributed uniformly throughout the globe; the extinct species never to appear again. A chaotic mix produced by a one-time massive flood could not have produced this ordering of species at different stratigraphic successions. Since the time of Darwin, we have collected massive amount of data on the ages of rocks correlative with the emergence of various species, and all these later findings vindicate Darwin's predictions. Darwin died in 1882, thirty-three years short of the discovery of the continental drift (displacement) developed by Alfred Wegener. Darwin would have been the happiest person to hear that theory because he was finding it difficult to explain the dispersal of the same species to the most distant parts. His view was that the islands that were above sea now under water served as halting places for plants and animals during the migration. When Darwin 'geologized' about coral islands from *Beagle* off Cocos Island in the Indian Ocean not far from Australia, the part of his excitement could have been that he was able to see the islands (seen

as stopovers of different species in their march towards distant continents) being sunken or lifted up due to geological forces. He was not far-off the truth, and I quote from *Origin*: '... I do not believe that it will ever be proved that within the recent period continents which are now quite separate, have been continuously or almost continuously, united with each other and with many existing oceanic islands'. A view according to him would have cut 'the Gordian knot of the dispersal of the same species to the most distant points, and removes many a difficulty'. Wegener propounded his theory of continental drift in 1915, thirty years after Darwin's death. Darwin was never offered a knighthood, nor did his most vociferous supporter Thomas Huxley obtain one, although England was governed at that time by a liberal Prime Minister Gladstone. Two years after the death of Darwin, Robert Owen, his *bête noire* and a rabid anti-evolutionist became 'Sir' Robert Owen. Then, as of now, conducting epochal science was not enough, one should have powerful friends at higher circles.

When Darwin died, he was to be buried in the churchyard of the village of Downe in Kent, where he spent most of his post-*Beagle* productive years. But there was a chorus of objection to it, mainly by the thinking public of England and a demand was placed to intern him in Westminster Abbey, where other luminaries of British science were buried. Strangely, this chorus was also joined by the church. Darwin was laid close to the monument to Newton, as a result. How did the church make peace with Darwin? To give the flavour of the times, one of the tributes paid from the pulpit, as given in Philip Kitcher's *Living with Darwin* reads like this: 'This man, on whom years of bigotry and ignorance poured out their scorn, has been called a materialist. I do not see in all his writings one trace of materialism. I read in every line that the healthy, noble, well-balanced wonder of a spirit profoundly reverent, kindled into deepest admiration for the works of God'. Darwin was given a most honorable send-off deserving to a great scientist-visionary. But as Kitcher has written, exactly a century later, his critics

in the United States had moved the court in the State of Tennessee to save the school children from the 'corrosive influence of his theory'. The resistance to Darwin continues to emanate from the religious right (now their theory centres around 'intelligent design', and appears to be a rehash of the views of Sedgwick *et al.*), to this day, more virulently, despite the massive evidence that favours evolutionary processes. Obviously more than any scientist or social thinker, they see Darwin's theory as the most subversive to their beliefs and aspirations. Richard Dawkins counters this by holding up Darwin: 'there is more than just grandeur in this view of life and cold though it may seem from under the security blanket of ignorance. There is deep refreshment to be had from standing up full face into the keen wind of understanding: Yeats's: "Winds that blow through the starry ways" '.

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