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On Time and the Origin of the Theory of Evolution

ABSTRACT

This paper presents a perspective upon how the confluence of three differing faces of time may have served as fundamental stimulus for Charles Darwin's formulation of the theory of evolution. The first temporal perspective is represented in Lyell's exposition of 'deep' geological time. This provided Darwin the temporal canvas upon which to conceive the possibility of the prolonged process of change upon which the conceptual basis of the theory of evolution is founded. The second face of time is epitomized in the linguistic treatment of temporality by the Polynesian culture, in whose environs Darwin found himself studying these respective processes of change. The linguistic and conceptual emphasis of this culture on the immediacy of a continual 'specious' present in perception and action provides evident examples of naming transformations of objects and entities well within the observational lifetime of a single individual. The juxtaposition of these conflicting, enormously 'deep' and exceptionally 'shallow' perspectives on time permits the step of insight on the process of change and consistency that became the bedrock of evolution itself. The final element of time, crucial to this whole process of understanding, was the necessary interval of duration for this synthesis to emerge. As a gentleman-scholar aboard the *Beagle*, Darwin possessed this boon of contemplative time in which to recognize and reconcile these vastly different yet eventually, deeply compatible views of time. Darwin's studious and painstaking development of evolution theory stands in stark contrast to the equivalent, but much more sudden brisance of

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understanding on behalf of Alfred Wallace whose own insight I shall argue is an exemplar of another form of time's influence.

KEY WORDS: Time, Genesis of Evolution Theory, Confluence of Temporal Perspectives

The Most Important Scientific Discovery of all Time?

It is arguably a supportable proposition that Charles Darwin's theory of evolution is the most important scientific discovery ever made. While there are certainly rival claimants of great value for such an exalted appellation, the modern world would simply not be what it is without Darwin's pivotal insight. Strangely, it might never have been Darwin's name associated with this theory if not for one of the greatest acts of deference in all of science. Evolution and natural selection were discovered independently by Alfred Wallace. It was only by chance and a sequence of coincidences that their joint discovery was eventually announced in the same issue of the publication of the Linnean Society with Darwin being given precedence in both the scientific and the public mind. The fact that Wallace made essentially the same discovery did help establish that the pattern of evolution was there in nature itself, for all to see. However, it was the receptive minds of Darwin and Wallace, each individually, who first comprehended this all-embracing vision of life. For Darwin, we know that the origins of his insight occurred as a young man founded on his observations made during the voyage of the *'Beagle'* (Darwin, 1839). There are many lessons that can be derived from Darwin's extensive account of this voyage but perhaps the most compelling is the influence of one of the few texts that accompanied him as a young man exploring new worlds. This was Lyell's *Principles of Geology* (Lyell, 1830-1833). It is fair to say that Lyell's text is one of the first consistent expositions of the idea of "deep time," (see McPhee, 1980). Although Gould (1987) has argued that the original perception of deep time was attributable to James Hutton in his *'Theory of the Earth,'* Gould himself eventually concludes that: *"the world was not ready for Hutton (and he was too lousy a writer to persuade anyone anyway). Thus, the codification of deep time awaited the great textbook by Charles Lyell, 'Principles of Geology' (1830-1833)."* Consequently, I argue here that the first necessary element of the conceptual foundation of the idea of evolution was a thorough grasp of deep time and this Darwin must have derived from his reading of Lyell on-board, during the 'Beagle's' outward journey.

The vastness of 'deep time.'

His Majesty's Ship (HMS) 'Beagle' outward journey began when it sailed from England on the 27th of December, 1831. On-board was the 23 year-old Charles Darwin who had been recommended for the voyage by Professor Henslow, the individual who had first inspired the young Darwin's enthusiasm for geology. It was also Henslow who recommended that Darwin take Charles Lyell's recently published text, but he was admonished that *'on no account to accept the views therein advocated.'* Darwin received the second volume of Lyell's work by post when his ship called at Montevideo (Darwin, 2000) and it is evident that this tract exerted an enormous influence on him. Indeed, in his classic work *'On the Origin of Species'* Darwin (1859) himself later remarked:

> *"Independently of our not finding fossil remains of such infinitely numerous connecting links, it may be objected that time cannot have sufficed for so great an amount of organic change, all changes having been effected slowly. It is hardly possible for me to recall to the reader who is not a practical geologist, the facts leading the mind feebly to comprehend the lapse of time. He who can read Sir Charles Lyell's grand work on the Principles of Geology, which the future historian will recognize as having produced a revolution in natural science, and yet does not admit how vast have been the past periods of time, may at once close this volume." (Darwin, 1859, p. 274).*

Here then in his own words is the first perspective on time which is crucial to the stimulation of Darwin's later formulations. It is the explicit, and for that time relatively novel recognition of the vast history of time. We can, of course, contrast this insight with Archbishop James Ussher's earlier assertion that the Earth was created on October 23rd in the year 4004BC (parenthetically, at 9:00 am in the morning [assumedly GMT] which must argue for some degree of intelligence on behalf of any such proposed creator, although being a Monday implies far too business-like a manner). However, what is very evident is that any mind adhering to Ussher's strictures, even if it were able to conceive and to recognize the power of evolution, would tend to dismiss the notion simply because given a total timescale of approximately 6000 years, one ought to see evolution literally happening in front of one's eyes or conversely, consider the process itself as simply impossible, as indeed Darwin implies in the above cited quotation. The fact that phenomenologically one

does not see evolution in evident action (at least outside the opportunities provided by modern instrumentation and laboratory conditions), would be *prime facie* grounds for believing that any such theory of evolution had to be flawed. However, it was Lyell's exposition of the vast longevity of time which helped remove this barrier to such thinking.

Although the idea expressed by Lyell of a very ancient earth was not then a seminal one, it did provide Darwin with the canvass of time over which to stretch the necessary processes that he saw would result in the origin of new species. More formally, the age of time was a necessary but not sufficient condition for the initial formulation of the theory of evolution. This fact is attested to again by Darwin himself who earlier in the *Origin of Species* had noted:

> *"The mere lapse of time by itself does nothing, either for or against natural selection. I state this because it has been erroneously asserted that the element of time has been assumed by me to play an all-important part in modifying species, as if all the forms of life were necessarily undergoing change through some innate law. Lapse of time is only so far important, and its importance in this respect is great, that it gives a better chance of beneficial variations arising and of their being selected, accumulated, and fixed. It likewise tends to increase the direct action of the physical conditions of life, in relation to the constitution of each organism." (Darwin, 1859, p. 80).*

Strictly speaking, Darwin is correct in noting that time, by itself, is insufficient a condition for change (except in the puerile sense that all events must occur in time). Rather, he is commenting on the probabilities of processes being so magnified by the vast extent of time, a proposition that he derived primarily from Lyell's crucial exposition. It is in this sense that an appreciation of the longevity of time is absolutely central to the initial insight of evolution. It is of course speculation, but it might not be too much to say that had Darwin not been steeped in the Lyellian perspective on time, he may not have taken the first necessary step toward evolution theory in the first place. A further elaboration on this particular issue can be found in the informative text by Toulmin and Goodfield (1965, pp. 141-196) and see Eiseley (1960).

Time and its Expression in Polynesian Culture

Thus deep time was the necessary canvas upon which Darwin could depict his ideas. Yet, necessary as the canvas is, it is simply the medium of expression, not the idea, not the picture itself. It is to another perspective on time which we have to turn in order to begin to understand what next stimulated Darwin in the creation of his intellectual masterpiece. To do this we need to explore the Polynesian conception of time. It is as well to admit one's shortcomings prior to criticism emerging, rather than attempt to justify them after it comes out. Thus, I am very ready to admit that I have no expertise whatsoever in early Polynesian cultural studies. What I do know I have ascertained from colleagues from that culture and a perusal of various published materials (e.g., Heyerdahl, 1974). As a consequence, some of my observations may upset specialists in this area of study. I seek their forbearance since I wish to use the following observations to make a connective point, not to explore the nuances of temporality in such early languages. If I am mistaken in particulars I hope to be indulged. If I am mistaken in the general tenor of my remarks then surely criticism should follow.

Let us begin with some remarks by some of the earliest European observers to devote their study to this issue.

> *"The language of the Hawaiians is a dialect of what the Missionaries in the South Seas have called the Polynesian language, spoken in all the islands which lie to the east of the Friendly Islands, including New Zealand and Chatham Island. The extent to which it prevails, the degree of perfection it has attained, the slight analogy between it and any one known language, the insulated situation . . . prove that, notwithstanding the rude state of their society, they have bestowed no small attention to its cultivation, and lead to the inference, that it has been for many ages a distinct language; while the obscurity that veils its origin, as well as that of the people by whom it is used, prevents our forming any satisfactory conclusion as to the source whence it was derived." (Ellis, 1859).*

Ellis argues then for a considerable degree of separation in the development of the languages of the greater Pacific and more recent, detailed studies have

compared and contrasted the distinctions to be made both within and between differing Island groups. My concern here is not with these respective differences and nuances. Rather, it is the relatively novel way in which the conception of time is expressed in these languages on issues such as being and becoming which is of focal interest. In particular, the way in which naming conventions recast items, entities, and beings that emphasize change over permanence. An example may be helpful here. In western culture we would see a piece of fruit and say that is either unripe, ripe, or rotted. Here, the emphasis is the continuity of the object itself, neglecting its changing functionality as edible material. Further, following expressions such as Shakespeare's *'Seven Ages of Man'* we may say someone is a child, a youth, a mature individual, or an old person, but we see this as a consistent temporal progression of the same entity (e.g., Hall, 1983; Hancock, 2002) not a series of different, discrete entities. However, with the emphasis and focus on the present, some Polynesian naming conventions give distinct and different names for example to the fruit at its various stages of ripeness. This may indeed be pragmatically very useful in circumstances where the utility of the item or entity supersedes the necessity for a formal temporal classification system. We still perhaps have remnants of such conventions in cultures more familiar in the western world who call children by diminutives which evolve to formal given names during coming of age ceremonies and the like.

Darwin had relatively little contact with indigenous Polynesian peoples during his Galapagos sojourn (Darwin, 1839). However, the account of the *Beagle*'s voyage goes on to tell us of Darwin's subsequent visit to Tahiti and other such South Sea Islands. It is indeed a speculation, but perhaps one that is justified, to ask whether Darwin, now exposed to such a utilitarian approach to temporal framing, which can be regarded as an acute form of "shallow" time, now took the step of seeing the evident, almost daily change in object/entity naming convention as a license to extrapolate this same mutational function across the whole canvas that Lyell had spread before him? That is, if the native language emphasized the process of change even in objects and beings that we normally refer to by stable names since our temporal conception emphasizes continuity over discontinuity, could Darwin extrapolate this tendency beyond the short perspective of a single lifespan to the eons that Lyell had illuminated? It is my hypothesis that he did.

Darwin and Wallace: Time and Insight

I began this work with a direct reference to the great gesture on behalf of Alfred Wallace in conceding priority to Darwin in the discovery of the theory of evolution. To end I would like to contrast the respective processes of enlightenment between these two individuals, since it illustrates a further crucial facet of time. I have argued that one of the three elements of time, necessary for Darwin's achievement was the interval he required, and indeed took, to contemplate and resolve the dissonances and disparities in his observations. It is best to let Darwin speak in his own words:

> *"When I was on board the Beagle I believed in the permanence of species, but as far as I can remember, vague doubts occasionally flitted across my mind. On my return (in preparing) my Journal for publication, and then saw how many facts indicated the common descent of species, so that in July, 1837, I opened a notebook to record any facts which might bear on the questions. But I did not become convinced that species were mutable until, I think, two or three years had elapsed."*

It is clear from Darwin's own words that his ideas with respect to evolution took time to mature. Indeed, the situation with Wallace only arose because Darwin continued to ponder his ideas for over two decades. This process, begun in the late 1830's and largely completed in the next decade did not see the light of publication until almost 1860. From various accounts, we can understand how Darwin's opinion developed and matured through these years. What is most evident is that Darwin was very careful and took time to complete and embroider his ideas on evolution.

If Darwin's insight developed slowly and incrementally, Wallace's insight came, almost literally in a flash. Again, it is worth hearing from Wallace in his own words, he remembers:

> *"I was then (in February, 1858) living at Ternate in the Muluccas, and was suffering from a rather severe attack of intermittent fever, which prostrated me every day during the cold and succeeding hot fits. During one of these fits, while again considering the problem of the origin of species, something lead me to think of Malthus' Essay on population." (Wallace, 1898).*

He continues:

> *"Then it suddenly flashed upon me that this self-acting process would necessarily improve the race, because in every generation the inferior would inevitably be killed off and the superior would remain - that is, the fittest would survive. Then at once I seemed to see the whole effect of this." (Wallace, 1905.)*

He concludes:

> *"the whole method of species modification became clear to me, and in that two hours of my fit I had thought out the main points of the theory. That same evening I sketched out the draft of a paper; and in the two succeeding evenings I wrote it out and sent it by the next post to Mr. Darwin." (Wallace, 1898).*

Morris (1989), from whom these quotations were extracted, sees this brisance of understanding as evidence of divine intervention. Morris observed that:

> *"herein was a marvelous thing! A theory that Darwin had been developing for twenty years, in the midst of a world center of science and with the help and encouragement of many scientific friends, was suddenly revealed in full to a self-educated spiritist, halfway around the world, alone on a tropical island in the throes of a two hour malarial fit. This is not the usual route to scientific Discovery."*

It is this latter supposition that I wish to dispute. First, Wallace was no amateur dilettante. He had been contemplating these issues for some extended period. His 'flash' of understanding came during a 'fit' of fever and there is evidence to show that such hyperthermic states actually facilitate performance (e.g., Hancock, 1983), whilst also inducing a distortion in the normal passage of time (e.g., Hancock, 1993). There is a natural comparison of this fevered condition and the practice of native Americans in using 'sweat lodges' to generate visions as well as Descartes' observation about the development of his own ideas whilst lodged in an 'oven.' My protestation here is that the hyperthermic state, with its concomitant accelerated speed of cognitive processing provides the necessary fuse for the receptive mind to burst through the barrier to understanding. These different routes to discovery provide a curious parallel with the ideas of 'gradualism' and 'punctuate equilibration' that have been proposed in relation to understanding evolution itself. In the process of discovery, Darwin proved to be the gradualist in understanding while Wallace experienced the sudden quantum leap in understanding lying on his sick bed at Ternate.

Summary and Conclusions

Charles Darwin was transfixed in a world that presented him with three quite radically different perspectives on time. As a 'modern' scientist of the Victorian age, he was naturally familiar with the Newtonian conception of time that dominated then and continues to currently dominate our general perception of the fourth dimension. However, he had been most recently, intellectually imbued with Lyell's crucial insight as to the age of the earth and the possibility of a 'deep' time that extended many millions and even billions of years into the past. It is probable that Darwin had spent a considerable portion of the out-going portion of the voyage of the '*Beagle*' in reconciling himself to this 'new' vista of time. Now, into this mix comes a perspective that emphasizes not the depth of time, but the maximum possible degree of its shallowness. Essentially, time as only the present moment. This inevitable clash of conceptions must force one to ask about the nature of permanence and the nature of change. However, Darwin was no professional philosopher. The problem he posed to himself concerned the emergence of new species and the death of others and what forces drove these developments. He was a naturalist imbued with a geological way of thinking. Thus the resolutions of these temporal issues expressed themselves in his content matter and produced the theory of evolution. Today, we understand how the individual is just a temporary expression of a conjunction in the gene pool made materially manifest. Dawkins (1976) has given us a genetic perspective in which the individual is relegated even from the privileged perch that Darwin left us (and see Hancock, 2005). That Wallace too saw this wonderful vista is, I believe, another function of time and creativity. What I have offered is a perspective only. One cannot enter the mind of Darwin or Wallace in order to confirm their source of creativity, which perhaps they themselves were not directly privy to. However, since time is the measure of all things, it is of interest to seek the ways in which it influenced one of, if not the most profound of scientific discoveries of all time.

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