



Creating the Nation's first BioPark

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Letter From the Desk of David Challinor  
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As far as we know, animals other than humans do not think much about where they came from or where they might be going. People, however, have generated endless legends about the origin of the earth and its human inhabitants. Despite occasional, highly publicized claims of discovering "missing links," only careful and scrupulously conducted searches in fossil-rich areas have yielded enough scientific evidence to produce a hazy picture of human evolution.

Many of the explorations for fossil hominids were conducted by the late Louis Leakey and his wife Mary at Olduvai Gorge during the 1950's in what is now Tanzania. Finding a tooth or bone particle from a million-year-old hominid is literally equivalent to finding a needle in a haystack. There were evidently not many such creatures around at that time, at least compared to other large mammals, and for one of the former to die and have his/her bones buried in an appropriate medium long enough to fossilize, and for the ancient fossil-bearing substrate to erode enough for the artifacts to be found on the surface a million or more years later, is remote indeed.

Louis Leakey, however, was a patient and knowledgeable paleontologist whom I visited in the early 1970's when he was living in a small suite at the Jefferson Hotel in Washington, D.C. My wife and I had tea with him, which he prepared himself on a hot plate, while he was recovering from a hip operation. It was a fascinating meeting which gave us the chance to discuss his opinions on human evolution. Leakey thought that humans were not evolutionarily isolated from the rest of mammals but were joined by a succession of predecessors which eventually evolved those traits which today we consider human. His perception has been supported by the research of his wife Mary, and more recently by that of his son Richard, with whom in 1971 I visited his research site near Lake Turkana in northern Kenya.

The Leakeys and their colleagues found that there appeared to be more than one species of bipedal hominid existing simultaneously at least as long ago as three million years. Of these several species of the genus Astralopithicus some became extinct, but others evolved to walk erect and eat tougher food than was normal



for the apes of that time. Then about 2-1/2 million years ago another burst of evolution evidently occurred and the bipedal, ape-like creatures appeared to evolve into two groups -- one adapted to an even dryer environment than before by developing larger teeth to eat tougher plant products than previously, while the other group became more slender, bigger-brained and, more importantly, adapted to eat meat. These characteristics led to the construction of tools with which to hunt and butcher their prey. This latter group is believed to be the first of the genus Homo, of which there were then several species.

One theory to account for these bursts of hominid evolution was that it was in response to climate change. About 2-1/2 million years ago the world's climate became cooler, which meant that the species that then existed had either to migrate to warmer places or, if that was not possible, they became extinct. However, some species of Homo did adapt to the colder climate by changing their diet and mode of living and eventually became H. sapiens. If this sequence is indeed correct, it means that the evolutionary stimulus may have been triggered by external environmental changes rather than by internal competition as Darwin hypothesized. Whatever the cause, humans appeared.

A debate, however, still rages on whether the process of evolution leads to more complex organisms and thus progresses towards "better" ones. Better in this sense is often linked to the "success" humans enjoy as being the most complex animal (or so we like to think of ourselves) yet to evolve. Somehow we have "progressed" in our ability to think rationally and therefore we have achieved a higher standing than other mammals, including our genetically close relatives the great apes.

Recent cognitive studies of the great apes, particularly chimpanzees, show that they react to events very similarly to humans and that progress, in an evolutionary sense, cannot really be tested. Philosophically this raises some interesting questions because it should make humans think more carefully about their traditional attitudes concerning dominion over the rest of the natural world. Many of us believe that because we have progressed so far evolutionarily, we are justified in exploiting other organisms that we perceive as not having advanced as far. One can easily see how this attitude has been distorted in the past (and perhaps even still) by the "most advanced" group (read economically and politically powerful) to justify dominion over other identifiable human groups that they consider less advanced.

Richard Leakey, in his recent book co-authored with Roger Lewin (The Sixth Extinction -- Patterns of Life and the Future of Humankind), admits the claim that evolutionary progress might be found in the relative growth of brain to body size. He points out that human brains are 100 times larger than that of early amphibians and reptiles. The first mammals to appear about 200 million years ago had brains four or five times larger than that of the average reptile, and the growth in brain size for mammals, compared to reptiles, has been greater ever since. This increase in growth rate paralleled the development of the neocortex, a thin layer of cells covering the top of the forebrain, which is believed to allow more complicated cognitive functions. The neocortex is only found in mammals and therefore may be considered an example of evolutionary progress. The growth in brain size and complexity took a spurt of development with the appearance of modern mammals, particularly about 35 million years ago. It was led by primates, with hoofed grazers and carnivores not far behind. Today, relative to body size, monkey brains are two to three times larger than the average brain size of all other mammals, and humans are about six times larger. The only other mammals in our league with a similar ratio of brain to body size are whales and dolphins.

There is clearly no definitive answer to where evolution is heading. I think we can safely say that so far the human brain seems to be the most complex one yet to evolve, but we have to realize that we have evidently reached this evolutionary pinnacle through a series of fortunate and unpredictable circumstances. For example, the first known specimen of the phylum chordata appeared in the Cambrian era burst of species (600 million years ago). It was named by Smithsonian Secretary Charles Walcott Pikaia gracilens. This small creature had a notochord (a dorsal supporting axis) which is arguably a rudimentary backbone. It is not common in the Burgess Shale formation in which it was found, but it did "miraculously" survive all the great subsequent extinctions and so led to the evolution of some groups of vertebrates. The element of chance was and is a crucial component of what survives and what falls by the evolutionary wayside. For example, if the large meteor or comet we believe hit near Mexico's Yucatan Peninsula at the end of the Cretaceous era (70 million years ago) had missed, then the dark, cold weather it must have produced would not have occurred and perhaps the dinosaurs, which had successfully dominated life on earth for 65 million years, might still do so. Among the small mammals that did survive the cataclysmic meteor strike were the earliest known primates, a group of four distinct families in North America. They were small forest dwellers and their continued existence in turn was one more of the fortunate contingencies that led to Homo sapiens. Evolution, however, as a result of sheer chance can never be fully tested and the concept of an orderly force still can be considered.

There is clearly a great division between those people at one extreme who believe the earth was created in seven days over 6,000 years ago and those scientists, philosophers and even theologians who still seek to discover the origin of humans. It is and will be, I feel, an endless quest that will continue as long as humans survive. We have created for ourselves an image of being at the top of life's pyramid. We appear to have beaten all the competition. We are number one! I only urge caution because the higher you climb, the farther you can fall. There is probably nothing magic in our make-up that would insure our eternal existence as a species. Remember that each of us individually is mortal and, given the fossil record, 99+% of species are mortal, too.

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