Climbing the evolutionary tree

The Ape in the Tree: An Intellectual and Natural History of *Proconsul*
by Alan Walker & Pat Shipman
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Peter Andrews

The ape in the tree is *Proconsul*, a fossil ape known exclusively from East Africa. It has many things to recommend it as a subject for a book: it is the earliest known ape in the fossil record (dating from 18–20 million years ago); it is represented by the most complete remains of any fossil ape (several partial skeletons); and, since the first remains were found some 75 years ago, it has been studied by many people of different levels of eminence. It is therefore a good subject on which to build any number of scientific edifices, whether historic, taxonomic, ecologic, phylogenetic or to do with functional morphology.

What's more, it has been at the centre of feuds, deaths, disputes over ownership, and rivalries between some of the biggest personalities in anthropology. In many of these, Alan Walker has been involved at first hand, and he brings a strongly personalized view of these events to this book. It is first and foremost an account of his own involvement with the discovery and description of some of the best specimens of *Proconsul* yet found. The account is actually written by Alan's wife, Pat Shipman, but it is curiously written in the first person singular as if by Walker, and we learn as much about him in this book as we do about the place of *Proconsul* in the evolution of the apes.

One of Walker's many gifts is his ability to illuminate subjects he is interested in and to bring new ideas to bear. His stated aim in this book is to provoke curiosity about apes and the part they have played in our evolutionary past. He recognizes that we should not view fossil apes in some sense as 'failed apes'. There is a tendency among some workers, both past and present, to try and identify fossil apes with their living survivors — chimpanzees, gorillas and orangutans — so the common ancestor of humans and chimpanzees, for example, is seen by some as having been chimpanzee-like.

Walker does not address this particular issue directly, for he is dealing with a fossil ape that lived close to the time when monkeys and apes diverged (about 20 million years ago), but he states unequivocally that the common ancestor of monkeys and apes was neither monkey nor ape but a being in itself that had its own suite of characters and its own way of life. This enlightened approach, free of the straitjacket of descendent species, is the most successful aspect of this book in documenting the way of life of *Proconsul* in all its aspects.

Having said this, Walker makes it clear right from the start that this is no scientific treatise, but a semi-popular account of early ape evolution. His mentor was John Napier, a larger-than-life character who had enormous influence on primate studies in the middle of the twentieth century. One of Napier's major works was a monograph — *The Fore-limb Skeleton and Associated Remains of* Proconsul africanus *(*British Museum (Natural History), 1959) — on the partial skeleton of *Proconsul* from Rusinga Island, which provides a detailed morphological description with the emphasis on the function of the animal as a whole. Napier's approach to functional morphology was hugely influential and made a great impression on Walker, who has carried on and extended this approach with the help of a succession of bright, enthusiastic students.

The study of functional morphology is based on interdisciplinary collaboration: morphology is interpreted in terms of function, function in terms of behaviour, and behaviour in terms of interaction with the environment. This requires a high level of collaboration that is entirely in line with Walker's stated intention to "give as many opportunities to up and coming young people as I could". He is an inspired and inspiring teacher, but it is my regret, and the subject's loss, that he has not himself produced a monographic treatment of *Proconsul* and its place in ape evolution to match Napier's. The present book is not an adequate replacement, however entertaining it may be.

There is also a failure to extend the approach of functional morphology to its third aspect: interaction with the environment. There is little more than anecdotal discussion about the environment that *Proconsul* lived in, other than saying that there was forest and trees for it to move around in. The apparent link to forest environments is important for Walker's reconstruction of *Proconsul*'s way of life, for it implies a reliance on tree-living. Primates that live in woodland rather than forests, by contrast, are more terrestrial, as the tree canopies are too open and too poor in resources to support fruit-eating mammals all year round.

Walker does not mention a wealth of published environmental evidence, much of it done in the 1970s, a period of study excised from his account of *Proconsul* studies, and some that he does mention is now thought to be wrong. For example, much of the evidence for the environment at Rusinga, based on both plants and mammal faunas, shows that the area was dominated by seasonal deciduous woodlands with patches of forest that were almost certainly ephemeral both

in time and space. The strong evidence for forest environments comes from other sites: Songhor and Koru, based on abundant mammalian faunas, and Mfangano, based on the fruits of tropical forest trees. The evidence for forest at Rusinga is based on localized outcrops of forest faunas, abundant woody climbers, which typically would have been growing locally along water courses, and leaves with apparent (not yet analysed) forest affinities. The so-called fruit-and-nut bed, which Walker mentions several times as providing evidence of forest, is actually dominated by plant species with deciduous woodland affinities. The idea of *Proconsul* as a slow climber subsisting mainly on a diet of soft fruits, as indicated by its functional morphology, is less viable if it lived in a deciduous woodland environment, rather than a forest.

Walker's semi-popular account of this important fossil ape will be an accessible and entertaining read for the educated layman. It will also be a useful guide to students learning about how research is conducted, although they need to be aware of the idiosyncracies in this highly personalized account. We can live in hope that Walker will do justice to his great abilities and will yet produce a definitive account of this ape in the tree. ■

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The evolution of scientific thinking

Reef Madness: Charles Darwin, Alexander Agassiz, and the Meaning of Coral
by David Dobbs
Pantheon Books: 2005. 306 pp. $25

Rachel Wood

Reefs have long fascinated natural historians and geologists for their unearthly beauty, as well as their ability to produce prodigious amounts of carbonate sediment. Yet reefs offer more than their share of paradoxes. How do coral-reef islands seemingly grow from great depths in the middle of the oceans? What controls the production of all this limestone? And why do so many reefs form necklaces strung across the Pacific? These questions troubled the minds of nineteenth-century scientists and philosophers. The long, tortured and often sad history of how the 'coral reef problem' was finally solved is laid bare in this eloquent and thoughtful book.

We are first introduced to the key figures: Louis Agassiz, his son Alexander and Charles Darwin. The book explores in detail the meteoric rise and fall of the arrogant, narcissistic and charismatic Louis, and his relationship with his shy and diligent son. Louis, a palaeontologist, was the first to propose that an ice age could explain many features of the Earth's surface. In the mid-nineteenth-century United States, which was hungry for pioneering personalities that embodied the spirit of a young nation, Louis' enormous energy and persuasive vision enabled him to found many scientific institutions that still thrive today. Darwin, by contrast, is presented as a distant figure, more a man with a following than a personality.

It was Louis' failure to embrace the implications of Darwin's *Origin of the Species*, instead tenaciously holding on to his idealistic logic that God had created all species whole and immutable, that toppled him from his pedestal in American scientific and Boston blue-blood society. In just five years Louis was transformed from being seen as the prince of US science to an archaic reactionary.

As a young man, Alexander was caught between paternal loyalty and a great personal need for objective and careful analysis. He rejected his father's florid unscientific style but was equally unhappy with Darwin's theorizing, which was based, as Alexander saw it, on equally unacceptable flights of imagination, rather than on the tireless compilation of meticulously observed facts.

Darwin had been greatly influenced by the geologist Charles Lyell, whose major tenet was that geological structures, rather than being the result of past catastrophes, were instead formed by the constant action of slow and gradual processes observable today. It is easy to see how such thinking led to Darwin's formulation of another time-based phenomenon: the origin of multiple species through common descent by means of natural selection. Darwin's observation of Pacific reefs, together with his harrowing experiences of the Earth-moving forces of earthquakes during the voyage of the *Beagle*, led him to propose that oceanic reefs and atolls were formed on subsiding foundations, such as volcanoes. His imaginative intellect saw here another result of small changes that could account for otherwise complex patterns: that there was a dynamic relationship between the reefs and their foundations that seemed to shape them. But proof for this theory was there none.

So the stage was set for a century-long battle for the roles of empiricism, theorizing and imagination in scientific endeavour. In 1876, the Scottish oceanographer John Murray had put forward an alterative coral-reef hypothesis. He proposed that reefs grew not on their own debris, but on the accumulation of sediment derived from plankton and other non-coral skeletons. Alexander Agassiz was immediately drawn to this idea: it was born of neither his father's idealism nor Darwin's over-simple theorizing, but seemed instead to be based firmly on observable fact. Alexander, grief-stricken by the early loss of his wife and other relatives, had finally found his *raison d'être*: to disprove Darwin's theory.

Made hugely wealthy from the ownership of copper mines, Alexander was able to embark on a massive programme of travel. For decades he made detailed observations of all the known coral reefs. He was convinced that each reef was a unique outcome of forces that combined in different ways: no single grand theory was required. By 1902, he believed he had proved Murray's theory. Yet astonishingly, after his death in 1910, no manuscript that summarized his massive accumulation of observations was ever found. It seems that for Alexander, the chase was everything.

The truth is that there were never enough facts to go on. All the protagonists had died long before the origin of reefs was resolved by deep drilling in the 1950s. The penetration of Eniwetok atoll down to its volcanic foundations revealed some 1,500 metres of coral reef limestone, proving Darwin right.

Reef Madness is more than a narrative about the victory of empiricism, the power of observation as the evidence of truth, over the philosophy of belief. It is also a beautiful illustration of how theories can, or must, be built slowly and painfully,brick by brick, by a dynamic combination of both imaginative leaps and factual observation. It would be foolish to think that this debate has ended: as