BOOK REVIEWS

Adrienne Mayor, *The First Fossil Hunters, Paleontology in Greek and Roman Times*, New Jersey: Princeton University Press, 2000. xx + 361 pp. with notes, maps, figures, two appendices and index. ISBN 0 691 05863 6.

Mayor's book is not a severe scientific account. It is rather a *tour de force* of a scarcely existing inter-disciplinary topic with a subjective personal agenda and a strong desire to make a point. It is based largely on some 131 citations from 32 classical authors, a large body of historical data that is slowly woven into a persuasive thesis. The book summarizes the knowledge and views of the classical world about remains of bygone creatures. In addition, Mayor probes several general issues such as the tension between academic science and popular knowledge, the nature of and need for scientific hoaxes, and above all the deplorable breach between widely separated modern fields of knowledge, in this case between classical history and paleontology.

Pelops, the great-grandfather of Heracles, was the founder of the Olympic Games. As a youth he had been sacrificed, chopped up and served to the gods, who ate his shoulder before they realized what it was. The gods restored him to life and replaced his huge original shoulder-blade with one of ivory. Greek mythology then followed the adventures of this bone after Pelops' death. It was kept in a bronze chest in Olympia, it was taken as a talisman to help the Greeks sack Troy, and then it was lost at sea in a storm off Euboea. Years later the fisherman Damarmenos found it in his net and subsequently returned it to Pelops' shrine in Olympia, thus stopping a terrible plague.

This is a typical Greek story with seemingly little historical significance, as related by Pausanias. But Adrienne Mayor finds a lot more in it. Olympia is on the Alpheios River, a region where dense concentrations of the bones of large Pleistocene mammals have been unearthed, including mammoths. A large fossilized mammoth scapula, which might bear a resemblance to a human bone, could have been polished to bring out an ivorine quality, and then displayed in a temple as that of the mighty hero Pelops. The shallow seas around Euboea are sunken Neogene valleys where nets of fishermen may recover bones of large Miocene Pikermi-type mammals such as mastodons, rhinoceroses and others. The ruins of the Pelopion in Olympia were dated to the seventh century B.C., which was a time when bones of Hellenic heroes were much sought-after relics. Some large fossilized bones have indeed been found among ruins of Greek temples from that period.

Exposed geological strata around the Mediterranean basin are rather young. Remains of dinosaurs are rare and fossil bones belong mainly to large early mammals, including elephants, mastodons, mammoths, giant giraffes, rhinoceroses, hippopotami, bears and many others. Mayor shows that the Greeks were aware of these large fossilized bones, which kept emerging from the ground during earthquakes and floods and in crumbling coastal cliffs. They collected and studied the bones and often

travelled to see and marvel at them. They tried to make sense of these findings and interpreted them in many different ways. They identified them as belonging to extinct elephants or to mythological animals like the Neades, which had supposedly inhabited the island of Samos. They assigned them to various monsters, and to a variety of mythological creatures, many of them hybrids of a composite nature, such as Cyclops, Griffins and Tritons. But human nature, which always looks for its own history and ancestors, gave these large imposing bones their preferred interpretation as the remains of mythological heroes and giants. This was because bones of large mammals, especially molar teeth, vertebrae, scapulas and femurs, could be erroneously thought to belong to humans, even by non-experts today.

Mayor recounts stories of Greek cities in the fifth to seventh centuries B.C. that engaged in a 'bone hunt' for relics of 'their' mythological heroes. Thus there were bones of Orestes displayed in Tegea, of Theseus in Skyros, of Hippodamia in Olympia and many others. Then there were battle-grounds of the Gigantomachia, the great fights of Gods and Heroes against Titans, Giants and monsters. Greek mythology told of armies of giants that were killed by Zeus in Arcadia, in Crete and in Cos, all known today to contain rich beds of exposed fossils. In Megalopolis and other sites, Zeus attacked and destroyed legions of giants using lightning, and there the earth, as described by ancient authors, was still smoldering. Fossilized bones in these places have a black color, presumably the effect of combustible low-grade coal (lignite), which may ignite spontaneously and smolder indefinitely. One wonders what came first — did the mythological stories about these fierce battles become popular and were they later placed in areas crowded with large scattered bones? Or did the Greeks, who were familiar with large numbers of rotting bodies of fighters in their own battlefields, inevitably identify the fossil fields with remains of ancient battles, later to bestow upon them mythological significance?

Today we look for bones of hominids, we collect them, we measure them, we interpret and display them. The inquisitive Greeks and Romans did precisely the same — they collected ancient bones, measured them and interpreted them according to their understanding. They displayed the bones in temples and in private collections, and sometimes they even tried to reconstruct the original creatures. Philostratus of Lemnos wrote in about 218 A.D. an imaginary dialogue between a seafaring merchant and an old grape-farmer. The two discussed the tallness of mythological heroes as indicated by the sizes of their bones. The farmer reported various findings, among them a skeleton of a slain giant unearthed in Alonisus, whose 'skull alone held more than two Cretan amphoras' (which add up to 40-48 liters, about the volume of a skull of a 10-year-old elephant). Another impressive example concerns the emperor Tiberius. Phlegon of Tralles wrote the *Book of Marvels* in which he also discussed 'giant bones'. According to his account special ambassadors brought the emperor a foot-long tooth, which had been recovered from cracks following an enormous earthquake in Pontus. Tiberius was anxious to know the size of the mythological hero who once owned that tooth. 'He summoned a certain geometer, Pulcher by name, and bade him fashion a face in proportion to the size of the tooth. The geometer estimated how large the entire body as well as the face would be by means of the weight of the tooth, hastily made a construction, and brought it to the emperor'.

Mayor does a lot more than persuading the reader that what seem to be fairy stories and fantasies are in fact keen observations and significant statements about the natural world. She explores classical myths concerning the history of the world and shows that they follow an evolutionary model. Giants replaced Titans and monsters in an ancient world inhabited by a large number of legendary creatures. These forms of life in turn became extinct during the Gigantomachy. Man came on the scene only later. This evolutionary world-view of the history of life was, according to Mayor, influenced by the realization that the surface of the earth contained bones of large extinct creatures. Evolutionary insights came even closer to modern understanding with Lucretius who advocated a step-by-step development of animals geared by the fight for the survival of the fittest. Another insight about evolution, which must have been influenced by the fossil finds, was the realization by several classical authors that man and beast were becoming progressively smaller with time. But Mayor also explores in detail the limits of Greek scientific insights. There was a gap between popular knowledge and reasoning as discussed above, and the academic natural philosophers. Plato, Aristotle and others wished to free themselves from naïve popular beliefs by looking for rational explanations of natural phenomena. In many fields they were astonishingly successful. But when it came to fossil bones they chose to ignore the evidence. Popular accounts of ancient bones were entwined with mythology and folklore in such an intimate manner that most philosophers would never even refer to them, an astonishing fact that is difficult to explain. It is even more surprising when we know that Greek philosophers interpreted correctly the existence of shells, fish-prints and other marine organisms embedded in rocks on mountains. They deduced that the mountains were covered by sea when rocks were being formed. Mayor suggests that the fossil record was too chaotic and fragmented and therefore difficult to interpret, and that the Greeks lacked a paradigmatic framework to allow them to contemplate geological theories and to realize the extreme depths of time involved. Mayor might get into a circular argument here, because fossils of unknown creatures embedded in geological strata were among the main driving forces in the modern formation of hypotheses about the past history of the earth.

Mayor goes on to discuss the schism, which also exists today, between science and folklore. Academic Greek science was mistaken when it ignored data about fossilized bones which had been gained by popular science. Nevertheless, I would be reluctant to follow Mayor's analogy with the situation at the present time, when again science pays little attention to the claims, for instance, of 'creationists' or of advocates of the 'paranormal'. It is not necessarily a reluctance of scientists to incorporate observed data into their theories which estranges science from folklore and non-science. They are rather separated by the modern formulation of the methods of experimental science, as we understand them today. Advocates of the paranormal put forward a large number of claims based on uncritical observations, which are often not amenable to scientific research. Despite a few examples to the contrary, one wonders whether science could gain much insight from these claims. Mayor rightly adds that the alienation between academic and popular science brings about the development of 'fantastic folklore' with the production of hoaxes. She describes some little known fake creatures displayed in antiquity, which were met either by

trust, or, even then, by scorn. Modern scientific frauds, like the Piltdown skull or the Roswell aliens, serve a similar purpose. They derive from man's curiosity about his nature and about the world, and they fill in blanks in official knowledge, in a similar manner to the healer who enters the scene when medical care fails.

For me, the most important message in this book is the mutual blindness between distant disciplines of human learning. There is so much knowledge available, so many facts, so many theories. But unfortunately, this knowledge is fragmented between super-specialized disciplines. Indeed, who could be further removed from each other than historians of antiquity bent over texts of long-forgotten languages on the one hand, and paleontologists sweating in the sun extracting huge remains of extinct creatures out of rocks, on the other? Should we be surprised that paleontologists are unaware of Greek and Latin texts which beautifully describe their objects of interest? Or that historians regard these same texts as unimportant, exaggerated, non-trustworthy accounts? The best illustration of this blindness stares out at us from the cover of Mayor's book. It is a representation of a sixth century B.C. Greek vase from the Museum of Fine Arts in Boston, depicting Heracles and Hesione fighting the Monster of Troy. We only see the head of the monster, as if attached to a black stand behind it. This head looks ugly and crudely drawn, in contrast to the figures of humans, horses and birds around it. It did not fulfil the expectation of art historians looking for a sea-monster, and they have tended to interpret it as an artistic blunder. And yet, when Mayor gives us the right clue we immediately recognize this monster to be a beautiful realistic portrayal of a large skull, embedded in a vertical cliff. She consulted several paleontologists about it but they could not decide exactly what it was. Was it the skull of a dinosaur, a toothed whale, a Miocene Giraffid? Or was it some sort of terrifying chimera composed of bones of different creatures, put together by the artist?

The First Fossil Hunters is itself a chimera, densely annotated and claiming scientific credibility, yet easy-going and personal at the same time. It relies heavily on classical texts, using modern paleontological knowledge to extract new meanings. These interpretations may sometimes be subjective and open to criticism, yet the sheer number of quotations and allusions lends credibility to the author's message. At the same time the book is cleverly written in a semi-popular style, understandable and fun to read for the interested layman.

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