Introduction

The first four million years of human evolution

In one of the last paragraphs of *The origin of species* (1859), Darwin famously suggested that ‘Much light will be thrown on the origin of man and his history’. When he published *The descent of man* 12 years later, there was still no fossil evidence of our earliest evolutionary history, and nothing at all from the African continent. Yet our close biological relationship to the great apes, and especially the African apes, the gorilla (*Gorilla gorilla*) and chimpanzees, had long been recognized, even by scientists who were ignorant of, or unsympathetic to, evolutionary thinking. Nevertheless, when we remember his cautious nature and the continuing powerful opposition to his ideas, it still required fortitude for Darwin to venture ‘It is therefore probable that Africa was formerly inhabited by extinct apes closely allied to the gorilla and chimpanzee; and as these two species are now man’s nearest allies, it is somewhat more probable that our early progenitors lived on the African continent than elsewhere’. In explaining why the fossil evidence of our origins was slow to appear, he prophetically stated ‘Nor should it be forgotten that those regions which are the most likely to afford remains connecting man with some extinct ape-like creature, have not as yet been searched by geologists’. In fact it was to take another 50 years before such fossil evidence began to emerge in Africa itself, and Darwin would have been amazed by the remarkable evidence which has accumulated since then concerning the earliest stages of human evolution.

Spectacular discoveries of early members of the human lineage, including nearly complete skeletons and dozens of other 6 to 2 Ma fossils have been made in the last 10–20 years. Single complete skeletons are much more useful analytically than separate parts of many individuals, yet until recently, few had been found from the period before 2 Ma. Even *Australopithecus*, discovered in South Africa in 1924, and published and named in 1925, is still relatively incompletely known. For instance, the famous ‘Lucy’ skeleton from Ethiopia is only about 20 per cent intact. But new and more complete early hominin skeletons from different parts of the African continent now promise to give us a much more complete picture of the early phases in the history of the human lineage.

As discussed in one of the first contributions to this volume, molecular estimates of the divergence time between humans and chimpanzees presently converge on approximately 5–7 Ma, although we two are old enough to remember the pre-molecular days, when the supposed uniqueness of humans seemed to require a time-span 2–3 times those figures to account for the evolution of special features like bipedalism and high encephalization. But now, fossils of putative human lineage members have been reported from approximately 6 Ma deposits in Chad and Kenya, and fossils of the genus *Ardipithecus* from approximately 4.4 Ma sediments in Ethiopia include about 40 per cent of a complete skeleton. Views differ on the relationship of these forms to each other, and to the succeeding and better-known genus *Australopithecus*. Several skeletons of the latter have been found in the last few years. These include an adult from Sterkfontein cave, South Africa, not yet certainly dated, another adult from 3.8 Ma deposits in Woranso-Mille, Ethiopia, a 3.3 Ma child’s skeleton from Dikika, Ethiopia and four partial skeletons from Malapa Cave, South Africa, dated to about 1.9 Ma. Dozens of other less complete hominin fossils from approximately 6 to 2 Ma have been found, as well as these skeletons.

Our meeting was timed to coincide with the double celebration of Darwin’s 200th birthday and the 150th anniversary of the publication of *The Origin of Species*, and to take the first opportunity to bring together as much as possible of the rich, newly published data concerning the earliest-known members of the human lineage. Through the generosity of the participants, our hope that detailed images and casts of the new material would be brought together for the first time during the meeting was amply met, although in the event only one of us could be there to see the outcome.

The meeting was also planned to showcase the interdisciplinary nature of palaeoanthropology, by highlighting the new methods that have been developed to extract behavioural and life history information from fossils. These included computer modelling of locomotor capabilities, finite element modelling of stresses in bone, laser scanning comparisons of joint surfaces, quantification of semicircular canal morphology and its relationship to head motion, isotope analysis of teeth for dietary and climate reconstruction, confocal microscopy and texture analysis of tooth wear to indicate diet, and reconstruction of life history parameters from
incremental lines in tooth enamel and dentine. The analytical sessions highlighted what could be accomplished by the careful reconstruction, study and analysis of the new fossils.

By concentrating on the early part of the record of human evolution, the meeting was also able to document the essential ecological, behavioural, and morphological stages that underpinned the subsequent emergence of the genus *Homo*. Field workers reported on studies of the behaviour of wild chimpanzees as possible models for early hominin behaviour, and on the geological and environmental setting of the fossils, as well as their anatomy and preservation. Context for the discoveries was provided by colleagues who, for example, used tephrostratigraphy, argon–argon radiometric dating, faunal and floral analysis, GIS satellite imagery and taphonomy.

Our hope was to bring about a new understanding of early hominin evolution by bringing together the newest fossils and the latest analytical methods, and we think the meeting at least helped progress towards that ambitious goal. But the meeting also provided the first opportunity to present many of the newest discoveries to scientific and public audiences alike. A memorable conference dinner was accompanied by a display of replicas of spectacular new material such as the just-published *Ardipithecus* skeleton, and the reconstructed *Sahelanthropus* cranium.

In the event, we have not been able to publish all of the contributions made at the meeting, and this unfortunately included a description of the very complete australopithecine skeleton from Sterkfontein mentioned earlier. Nevertheless we feel that *The first four million years of human evolution* was an appropriate measure of how much progress the field of palaeoanthropology (a term unknown 150 years ago) has made in meeting Charles Darwin’s expectations. We would like to thank all the staff of the Royal Society who worked on the planning and running of the meeting, and the editorial team who has worked so hard to bring this volume to fruition.

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