

## Editors' overview for Alan Turner QSR Memorial volume

H.J. O'Regan

S. Elton

D. Schreve

The papers presented here, in this special volume dedicated to the memory of Alan Turner (1947-2012), provide a glimpse of the multi-faceted ways in which the mammalian fossil record can be investigated. The authors of contributions in this Special Issue are by no means an exhaustive list of his international collaborators and colleagues, and indeed, many are not represented here, but the contents cover many of the topics and issues that were of central archaeological and wider Quaternary mammalian interest to Alan. Although the papers are not intended to provide a comprehensive overview of all techniques that can be applied, the set nevertheless reveals a snapshot of the state-of-the-art and of some of the methods that have the potential to bring much more of the past to life. Alan always sought to move beyond the 'stamp-collecting' approach of simply listing which taxa were present at a site, attempting to elucidate what the presence of those animals might mean in terms of palaeoecology. In particular, the span of Alan's career has seen major advances in our understanding of Quaternary mammalian biostratigraphy and palaeobiogeography, the widespread application of novel techniques such as ancient DNA, the development of high-precision geochronology and even the discovery of new hominin species. The papers presented here reflect those developments and highlight interdisciplinary approaches, from examination of sediments to careful measurements of the fossils themselves, from modelling the presence of taxa at particular points in the Quaternary to examination of the similarities and differences in fauna within and between sites.

Although Alan was primarily recognised for his expertise in carnivore evolution, his work encompassed diverse aspects of palaeoclimatology, large mammal (and hominin) palaeoecology, guild relationships, dispersals and faunal comparisons within and between continents. In 1993, Turner and Wood summarised faunal differences across the major mammalian families between East and South Africa. In the current volume, Patterson et al. (2014) update this analysis, for felids, hyaenids and bovids only – illustrating just how much new material has been published in the intervening years. Their work highlights one of Alan's major interests in biogeography and emphasises how the study of all fauna, not just primates, can elucidate aspects of hominin evolution and dispersal. This theme is further developed by Macho (2014) who examines coincidental turnover of carnivorans at 3.5 Ma with the australopith radiation, as well as highlighting parallel evolution of omnivory and sociality in hominins and monkeys. Moving out of Africa, Kahlke (2014) provides a comprehensive overview of the evolution of the *Mammuthus-Coelodonta* faunal complex in Eurasia, linking the development of this distinctive and widespread cold-adapted fauna to patterns of progressive aridification, global climatic cooling and increasing continentality. In similar fashion, Palombo (2014) reviews the origination and turnover of large mammals in south-west Europe (the Iberian peninsula, Italy and France) between 3-0.4 Ma as the backdrop to the earliest dispersals of hominins into this region. Still in Italy, Bellucci et al. (2014) provide a very detailed overview of the Early Pleistocene site of Coste San Giacomo, arguing that the assemblage dates to around 2.1 Ma

and providing evidence for the dispersal of African large mammals into Europe prior to early *Homo* dispersals. Further afield, Louys (2014) examines the biogeography and extinction of Quaternary Carnivora in South East Asia, particularly highlighting the asynchronous extinction of the sabretoothed cats and large hyaenids, while Dennell et al. (2014) examine the faunal biogeography of island south-East Asia, posing the question of 'which route might *Homo floresiensis* (or its ancestors) have used to reach Flores?'

Continuing the theme of biogeography and the importance of considering individual species' trajectories, Stuart and Lister (2014) reconstruct the European range and ultimate extinction of the spotted hyaena, *Crocuta crocuta*, in the last glacial period, concluding that hyaena populations fell victim to a web of interacting factors related to climatic cooling, including physiological cold intolerance but also decreased herbivore density caused by reduced vegetative productivity and a consequent rise in direct competition with other large carnivorans. A second species that also became extinct in the last glacial - the Barbary macaque, *Macaca sylvanus* - is considered in detail by Elton and O'Regan (2014). Using ecological niche modelling, they argue that *Macaca*, which was probably at the edge of its ecological tolerance in Britain during the Middle Pleistocene, could still plausibly inhabit parts of Europe today. Like Stuart and Lister (2014), who argue that human persecution may have contributed to the demise of hyaena in Europe, Elton and O'Regan (2014) suggest that human agency cannot be ruled out as a factor in Europe macaque extinction. Edwards et al. (2014) take a different approach to understanding a species on the margins of European occupation, looking at the colonisation of Britain and Ireland by brown bears, *Ursus arctos*, using evidence from mitochondrial DNA. Their analysis determine the continuity of maternal lineages in northern England during the Last-glacial period, suggesting that although this area was not a refugium for Irish bears in the LGM, the northern England populations may have acted as a source of later re-colonisation of Ireland in the Holocene.

Devès et al. (2014), using a bottom-up approach to understanding faunal movements in the Levant, explore how the geology and inferred soil characteristics may determine the locations of optimal grazing for large mammals, and consequently where the focal points for hominin hunting may have been. A novel approach to the study of hominin diets is taken by Buck and Stringer (2014) who consider the possibility of Neanderthals consuming stomach contents as a way of ingesting plant material in their diets.

Several authors present new evidence from individual sites, regions or species in their contributions. Ghezzo et al. (2014) place the carnivore fauna from Equi Cave (northern Italy) in historical context and demonstrate how a wealth of information can still be gained from antiquarian excavations. The site is particularly notable for its unusually high number of Late Pleistocene leopard remains, and for the presence of Neanderthals in the area. Iurino et al. (2014) similarly focus on a historic specimen from a long-disappeared site in the Alban Hills of Rome (Italy), using CT scans of a remarkable natural cast of a griffon vulture (*Gyps fulvus*) within volcanic sediments to generate new insights into the detail of soft-tissue preservation and highlighting the potential for other sites to yield such exceptional information. Following Alan Turner's longstanding interest in reconstructing carnivoran palaeobiology, Flower and Schreve (2014) present temporal and interspecific dietary variability in Pleistocene and modern canids across western Europe, considering the implications of changes in cranio-dental morphology for canid palaeodiet. García-Aguilar et al. (2014) consider the geological setting for the sediments in the Baza Basin (Spain), providing evidence for the presence of hot

springs, which ensured year-round warm temperatures in the local lake system that in turn may have contributed to high productivity and biodiversity. Although Alan was well-known for his encyclopaedic knowledge of Eurasian faunas, his interests were worldwide, including Africa and the Americas. He was involved in the early stages of the Basin of Mexico project, and in memory of this, Gonzalez et al. (2014) draw together the geological setting of the Tocuila mammoths in Mexico and consider the evidence for a meteorite impact and whether this in combination with a second catastrophic event, eruption of the Nevado de Toluca volcano, may have caused environmental disruption that contributed to megafaunal extinction.

Alan was also renowned for his careful fossil descriptions and scholarship surrounding the palaeontological record. In this vein, Maul et al. (2014) continue the work on European small mammals co-authored with Alan a decade ago (Maul et al. 2004) to examine the genus *Mikrotia* in detail. Finally, Salesa et al. (2014) examine the sabre-tooth cat genus *Homotherium*, taking an intentionally broad approach inspired by Alan's example, describing new specimens and looking at both their anatomy and their palaeoecology to consider the possible presence of *Homotherium* in the later Pleistocene of Europe.

In summary, this collection brings to the fore some of the key approaches that form the current basis of our understanding of the Pleistocene mammalian record. Given the paucity of hominin fossils, it is clear that there is still much to be gained from comparison of hominin and non-hominin taxa, in order to shed light on the behaviour and biogeography of our ancestors. The results presented in the papers here provide an opportunity to think more broadly about the significance for fauna and hominins of regional environments, nutrient availability and bedrock geology (Deves et al., 2014; García-Aguilar et al. (2014)), and of depositional contexts and exceptional taphonomic events (Gonzalez et al., 2014; Iurino et al., 2014). It is also apparent from the current contributions that the climatic shifts of the Quaternary have had major effects on taxa both large and small, in terms of affecting large-scale aggregation and disaggregation of faunal communities (Kahlke, 2014; Palombo, 2014), influencing dietary choice and inter-specific competition (Flower and Schreve, 2014) and in determining the mode and tempo of evolution (Maul et al., 2014). Multiple ways of looking at biogeography have been explored, from modelling the presence of taxa (Elton and O'Regan, 2014), to examining the interplay of ocean currents and faunal dispersal routes (Dennell et al., 2014). Beyond the macroscale, however, it is equally clear that discrete and asynchronous evolutionary trajectories can be detected in individual species, thanks to high-precision radiocarbon (re)dating of specimens to establish patterns of extinctions (Stuart and Lister, 2014) and aDNA analyses to elucidate small scale movements within species (Edwards et al., 2014). These observations offer a previously unattainable level of resolution in our understanding of species origination and dispersal. Many of these methods are still being refined, and new sites and specimens may be found that can change our interpretations radically. The fossil record can constantly surprise us, and the methods that we use to examine it are constantly changing too.

We would like to thank all of our colleagues who have contributed their papers to this volume, and we hope it serves as a fitting tribute to Professor Alan Turner – as Flower and Schreve (2014) state he was both a 'carnivore supremo and friend'.