

Editorial

Mesozoic Terrestrial Ecosystems and Biota

The papers in this Special Issue are based in contributions presented at the *10th Symposium on Mesozoic Terrestrial Ecosystems and Biota (MTE 2009)* held in Teruel (Spain) in September 2009.

For almost 30 years this *Symposium* has documented the advances made by the scientific community in a number of lines of research that aim to give us a fuller understanding of the non-marine Mesozoic palaeontological record.

Dinosaurs have long been the centre of gravity of these meetings, these creatures having given the Mesozoic its best-known appellation of the "Era of the Dinosaurs". The prominence of dinosaurs is the reason the *Symposium* was named after the terrestrial ecosystems that these animals most commonly inhabited. The systematics, palaeoecology and palaeobiogeography of dinosaurs account for the majority of the contributions submitted to the MTE symposiums in the 1980s and 1990s.

However, the first decade of the 21st century has witnessed a challenging and promising expansion of topics and techniques, and a cross-fertilization of disciplines, which are altering paradigms and approaches to the study of the Mesozoic continental, rather than terrestrial, ecosystems. This has gone hand in hand with a significant rise in the number of known localities, especially those of Asia and Africa.

More than one hundred contributions were presented at the *10th Symposium on Mesozoic Terrestrial Ecosystems and Biota (MTE 2009)* held in Teruel (Spain) in September 2009, offering a representative view of this change in emphasis. Several of these are especially worthy of mention.

There was a dominance of contributions providing taxonomic or phylogenetic revisions and new insights into archosaurian taxa in terms of global palaeobiogeographical distribution and palaeoecology. Several examples of this are included in this Special Issue: K. Carpenter and Y. Ishida provide a review of the Early and Middle Cretaceous Iguanodonts and their global distribution; S.D. Sweetman and C.M. Martill analyze the diversity and palaeobiogeographical significance of the micropalaeontological remains of pterosaurs of the Barremian in the Isle of Wight (England); S.L. Brusatte and collaborators examine the evolution of large-bodied theropod dinosaurs in Asia during the Jurassic and Cretaceous; and Company and co-workers contribute to our knowledge of the stegosaurian record in the Jurassic-Cretaceous transitions in the Iberian Peninsula.

Other reptilian and therian groups were also well represented, in particular those that made up the microfauna. Several groups that have traditionally been somewhat disregarded were examined in the *Symposium*, and have been included in this Special Issue. The Laurasian Mesozoic record of choristoderes, their palaeobiogeography, and their palaeoecology in terms of habitats and relationships with crocodiles are tackled by R. Matsumoto and S.E. Evans. L.K. Säilä's contribution on the systematics of Permian parareptiles from the Permian of Russia is another such example. This contribution is also remarkable because it illustrates the tendency towards more contributions about the Permo-Triassic continental fossil record, a hitherto marginal system within the MTE *Symposiums*.

The integrative analyses of fossil assemblages as a whole and their meanings in palaeobiogeographical and

palaeoecological terms are also gaining in prominence. This is exemplified by the contribution of E. Malfaia and collaborators concerning some Upper Jurassic vertebrate fossil assemblages from Portugal, in which the presence of the dinosaur *Allosaurus* reveals a palaeogeographical link with the North American Morrison Formation.

New image analyses techniques have notably improved anatomical reconstruction, revealing important 3D details about two very significant components of continental ecosystems: arthropods and plants. J. Pouech applies these techniques to address physiological interpretations based on isolated teeth of crocodiles, theropods and mammals.

There were a striking number of palaeobotanical contributions, another noteworthy novelty for the MTE Symposium. It is becoming apparent just how important plants are in the reconstruction of Mesozoic ecosystems. The realization of this is a milestone in the study of these ecosystems, grounded in a general interest in understanding the mechanisms that were involved in the origin and radiation of early angiosperms. D. Dilcher argues for the necessity of a new concept of angiosperms based on the interaction and coevolution of angiosperms and insects. The relevance of plants is also supported by the strong bond between them and wetland ecosystems.

In fact, wetlands and forests are two types of continental ecosystem that have received increasing attention over the past few years, as reflected by the Symposium.

S. Dunagan's plenary lecture on the wetland environments and faunas of the well-known Morrison Formation (Upper Jurassic USA) drew attention to how little we know about ancient wetland ecosystems and the need for us to rectify this. In this context, M.A. Fregenal also set out the sedimentological and palaeogeographical basis underpinning the interpretation of some fossil associations of La Huérguina Formation (Iberian Ranges, Spain) as the record of wetland ecosystems. L. Chiappe's oral communication about the specific anatomical characters of early wading birds also adds to our knowledge of this increasingly interesting area of ancient wetlands.

The palaeoecological study of fossil wetlands is represented in this volume by A. Buscalioni's and M.A. Fregenal's paper, which provides a palaeoecological reconstruction of the famous locality of Las Hoyas in Spain, a Barremian konservat-lagerstätte. Furthermore, J.I. Canudo and collaborators reconstruct the vertebrate microremains association found in Hauterivian-Barremian marsh deposits of El Maestrazgo Basin in Spain. R. Matsumoto and S.E. Evans place the evolution of choristoderes in freshwater settings, considering also wetland.

Insights into forest ecosystems were gained from the discovery of fossil insects in amber from new Mesozoic, mainly Cretaceous, localities. Middle Cretaceous, Span-

ish and French localities were especially well represented in the contributions of the research groups of X. Delclòs and D. Néraudeau.

The results of research that relies on collaboration between different disciplines, such as stratigraphy, sedimentology, palaeogeography and geochemistry, were also presented at the Symposium. The scope of this interdisciplinary work encompasses two main areas: taphonomic studies and palaeoecological reconstructions.

Besides S. Dunagan's aforementioned plenary lecture on the Morrison Formation, which exemplifies the long-term trajectory of integrative research into geology and palaeontology, two papers in this volume provide different examples of interdisciplinary analyses. The paper by A. Buscalioni and M.A. Fregenal intimately links sedimentology and depositional architecture with the palaeobiology and taphonomic structure of the Barremian locality of Las Hoyas to provide insights into its palaeoecological dynamics. The contribution of G. Grellet-Tinner and co-workers explores how petrological techniques can be used in taphonomical research to distinguish pathological from diagenetic features of dinosaur egg shells.

The topic of taphonomy, addressed in these latter two papers, was represented in the Symposium by some notable, if not numerous, contributions. One of the most exciting was M. Schweitzer's plenary lecture, who illustrated how taphonomy is becoming a key analytical tool in the study of ancient molecules and cellular structures.

The Symposium highlighted the need for experimental taphonomic studies and research into the role of resins and biofilms in order to understand the mechanisms involved in exceptional preservation.

Ichnology is an area of research whose contribution to the reconstruction of Mesozoic ecosystems is crossing frontiers. Traditionally, ichnology in the MTE symposiums was chiefly focused on dinosaur tracks. However, L. Buatois' and G. Mángano's plenary lecture on the invertebrate ichnological record in Mesozoic continental ecosystems showed that invertebrate ichnological associations are crucial for the understanding of environmental conditions in these ecosystems. In the last two decades, the integration of ichnological evidence with other sedimentological and palaeontological data has proved to be a powerful method in palaeoecological and palaeobiogeographical research.

This special issue contains two papers on ichnology. A.R. Fiorillo and co-workers describe the presence of a track of a neoceratopsian in the Albian of Alaska that supports a palaeobiogeographical model of faunistic exchange between Asia and North America. M. Avanzini and collaborators report the earliest appearance of a lizard-like track, attributed to *Rhynchosauroides*, in the Up-

per Jurassic of Asturias (Spain).

A few general conclusions can be drawn from this overview of the main topics that featured in the Symposium and their treatment in the papers included in this issue of the *Journal of Iberian Geology*. In our opinion, the meeting was very fruitful and highly representative of the state of the art in the already numerous areas of research with which the Mesozoic continental fossil record may be analyzed. Although only the future will tell, it may prove to have been a turning point. From the point of view of the changes in topics, focuses, techniques and methods that we have highlighted in this preface, researchers in Mesozoic Terrestrial (Continental) Ecosystems are now faced with many challenges. We should continue with integrative efforts in terms of interdisciplinary feedback and analyses of assemblages, especially with respect to the methods of integration. Geobiology should be incorporated. Sedimentology may reveal more than the fore-

ground landscapes of associations. Taphonomy needs to take a step forward through the provision of experimental results and novel concepts. More research on the Triassic is needed. Many groups should be revised from new biological perspectives. There are still extensive geographical areas whose fossil record remains unknown.

The *11th Symposium on Mesozoic Terrestrial Ecosystems and Biota* will be held in South Korea, which is likely to enable many more researchers from Asia to participate. We expect that the tremendous amount of information the databases of Mesozoic Asian fossil localities have added to our knowledge of the Mesozoic record in recent years will play a starring role at that meeting.

As organizers of the *10th MTE* and editors of this Issue we would like to acknowledge all those people who, in their various ways, have contributed to the success of the Symposium and the publication of this volume. Thank you very much, indeed.

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