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PREFACE

The Second International Congress on Ichnology in Kraków, Poland, herein referred to simply as Ichnia 2008, constituted another successful gathering of the world's most prominent and active ichnologists. The ichnologists, numbering more than 150 and hailing from more than 20 nations from all inhabited continents, represented the main flavors of ichnology: invertebrate, vertebrate, marine, and non-marine. Non-marine ichnology (also known by its less default appellation, continental ichnology) was also featured prominently during Ichnia 2004 (Argentina) in both the pre-meeting field trip in Patagonia and the meeting itself in Trelew. Likewise, non-marine ichnology comprised a significant part of Ichnia 2008. For example, 34% (26 of 75) of the oral presentations given during the congress dealt primarily with non-marine ichnology; 35% (55 of 156) of the abstracts in the proceedings volume were similarly themed. We think these percentages and the increasing number of participants in such subjects embody a trend representing tremendous progress in the broadening of ichnology as a holistic and global science. Indeed, only 25–30% of the earth's surface at any time in geologic history has hosted organismal traces in non-marine environments. Hence non-marine ichnology has certainly reached a sort of parity in representation relative to its presumed progenitor, marine ichnology: now they are more like siblings. Also related to Ichnia 2008 is a post-Congress volume on marine ichnology, which will be published as a special edition of *Acta Geologica Polonica*, whereas this volume is issued as the fourth volume of 2009 of *Geological Quarterly*.

With that said, non-marine ichnology is still dominated by the study of dinosaur tracks, a trend that shows no sign of waning. This is not surprising, considering the popularity of their tracemakers, and this volume reflects the continued preponderance of dinosaur ichnology. Some notable exceptions, however, include syntheses of continental invertebrate and vertebrate ichnology from throughout the Phanerozoic. For example, one of the most sensational discoveries in vertebrate ichnology was heralded by Piotr Szrek and Grzegorz Nied wiedzki at the Ichnia 2008 with a poster and abstract entitled “*Preliminary report about*



Participants of the Second International Congress on Ichnology at the Wawel Castle, Kraków, 28th August 2008



Andreas Wetzel trying to get Michael Wizewich out of *Tyrannosaurus rex* mouth, pre-Congress field trip, Bałtów

tetrapodomorph trace fossils from the Middle Devonian of the Holy Cross Mountains, Poland'. The results of further investigation were published on 7th January 2010 in *Nature* (vol. 463, 43–48) and crucially changed our knowledge on the earliest tetrapods, their evolution and the way on which they conquered the land. On the other hand, the most noteworthy progress in non-marine ichnology was the advent of new methods, such as 3D laser scanning and other image-analysis techniques, which now join the tried-and-true methods of macroscopic descriptions and diagnoses of continental trace fossils as added tools for analysis. Sadly, plant trace fossils, a common constituent of continental ichnology, continue to be underrepresented among mainstream ichnologists, but studies of these biogenic structures are bound to increase in both quantity and quality in coming years.

This *Ichnia* 2008 non-marine volume includes 10 articles and two short communications. The contribution can be characterized in brief as follows:

The paper by Aase Roland Jacobsen and Richard G. Bromley augments the ichnological nomenclature for traces made by teeth on bones. Certainly, biting constituted a crucial part of life activities of predatory animals, such as sharks and theropod dinosaurs, but still little is known about these trace fossils. The paper will help to recognize biting traces and will contribute to a better understanding of feeding behaviour for both recent and ancient carnivores and scavengers.

Next, the paper by Anthony J. Martin on neoichnology of an Arctic fluvial point bar, North Slope, Alaska (USA) links ichnology and sedimentology, and offers an original view on how organismal activities can influence sedimentary processes in fluvial environment by mixing, redistribution, and erosion of sediments. The article also provides very interesting insights on the complex lives of invertebrates and vertebrates in a harsh circumpolar environment, as reflected by well-documented ichnocoenoses.

Grzegorz Piekowski and Alfred Uchman describe a new bivalve locomotion trace fossil from the Lower Jurassic (Hettangian) alluvial sediments of Poland, and report on rhythmic (?diurnal) movement of the tracemakers in accordance with the direction of flow. This idyllic life was interrupted by occasional floods, which at best forced the animals to move upwards, but at the worst would kill them, instantly burying them.

Carlos Neto de Carvalho studied interesting vertebrate tracksites from the Mid–Late Pleistocene eolianites of Portugal. The animal world of this time, comprised of mammals and birds quite familiar to Europeans, also brought the first record of elephant tracks in Europe.

The remaining papers of this volume regard dinosaur footprints.

The “dinosauria” series is opened by Martin Lockley and his overview on morphological variation in tridactyl footprints. This synthetic paper gives clues to understanding of widespread convergence in developmental dynamics of dinosaur (including bird) tridactyl footprints. Despite these “general” convergences, “detailed” variation in the morphology of tridactyl, mesaxonic, Triassic through extant non-avian dinosaur and bird tracks has allowed the diagnosis of hundreds of ichnotaxa, as well as the recognition of nearly continuous subtle variation in modern bird tracks. This knowledge gives important clues to whole limb and whole body proportions, and suggests an intrinsic “lawfulness” to patterns of convergence.

Martin Lockley's second paper (co-authored by Gerard Gierliński) describes a *Grallator*-dominated tracksite from the Chinle Group (Late Triassic), Moab, Utah, USA. The tracksite provides important stratigraphic (Triassic/Jurassic boundary) and palaeobiogeographic conclusions. *Grallator* is the only ubiquitous ichnogenus that appears abundantly in both Triassic and Jurassic formations. In global context, it is not possible to draw unequivocal biostratigraphic inferences from the occurrence of monospecific *Grallator* assemblages.

The next paper and one of two short comments deal with dinosaur footprints from Morocco. Morocco has become one of the richest and most attractive places for studies on dinosaur tracks. Every year and every new expedition bring new, fascinating discoveries in well-exposed terrains of that country.

Shinobu Ishigaki and Yukihide Matsumoto re-examined long-debatable manus-only and manus-dominated sauropod trackways from Morocco. These peculiar trackways provoked on-going speculations on swimming behaviour in sauropods. The two manus-only trackways from Iouaridène tracksite show apparently alternating pace lengths, which suggests semi-galloping to galloping gaits by the trackmakers. A galloping gait has never been reported from land-walking sauropod trackways before, and the authors argue that a submerged body situation could be more suitable to form such a trackway.

In their short comment, Gerard Gierliński, Piotr Menducki, Katarzyna Janiszewska, Ireneusz Wicik and Andrzej Boczarowski reported on new track-bearing sites in the Middle Jurassic strata of Imilchil area in Morocco. Documentation of the sites and a brief description of track assemblages will certainly encourage further studies in these localities.

Similarly, an extensively illustrated paper by Shinobu Ishigaki, Mahito Watabe, Khishigjav Tsogtbaatar and Mototaka Saneyoshi describes new localities from Mongolia (another "classical" dinosaur hunting area) with more than 20,000 dinosaur footprints. The authors indicate that prolific footprint finds can significantly improve our knowledge of palaeoecological conditions, adding to information based on bones.

Grzegorz Piekrowski, Mihai E. Popa and Artur Kędzior described the first known sauropod footprints in the Early Jurassic strata of the Southern Carpathians, Romania. This study is a very good example of how only a few trace fossils can make for significant discoveries. The authors make an argument for the presence of sauropods at a time and place where they were previously unknown, which they apply to the "big picture" of why this matters. These tracks, along with other sauropod tracks of comparable age, help to fill in a few gaps in palaeogeography and early evolution of sauropods.

Finally, a short communication by Gerard Gierliński, Martin Lockley and Grzegorz Niedźwiedzki reports on a very interesting find of a new "crouching" theropod trace from the Early Jurassic of Poland. Usually, we find trackways of walking, running, or even wading or swimming dinosaurs, but in that case the authors deal with an extremely rarely recorded activity of dinosaurs — resting. This is only the seventh such specimen known.

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