Book Review: *Dinosaurs – How They Lived and Evolved*

Neil R. Wright

GPO Box 2880, Darwin, NT 0801, Australia

This morning I awoke to the sounds of dinosaurs in the garden. No. I had not been magically transported back in time during my sleep, nor was someone outside watching the latest instalment of *Jurassic Park* on their personal device. It was birdsong … and it was beautiful!

One of the most interesting facts I discovered when reading the book by Darren Naish and Paul Barrett called *Dinosaurs – How They Lived and Evolved* is that about 160 million years ago a group of dinosaurs called therapods (small, feathered, predatory dinosaurs) evolved into birds. The authors present and analyse a considerable body of evidence that proves this hypothesis, so it's no longer correct to say that *all* dinosaurs became extinct – they still walk, fly and 'sing' among us every day. Some of us even have them as pets!

The authors are world-leading experts on dinosaurs and they provide a highly detailed account of the evolutionary relationship between dinosaurs and explain how the understanding of this important field is being built upon with each new fossil discovery, data analysis technique, theory, climate modelling enhancement and advancement in technology. Following their 2016 (hardback) book of the same title, this new book is officially a 'fully revised and updated' version, but it is really a second edition that includes a new (soft) cover, as well as modifications, updates and corrections.

Tracing the evolutionary path of dinosaurs from 225 million years ago through to the great extinction event 66 million years ago, the book is divided into six chapters: History, Origins and their World; The Dinosaur Family Tree; Anatomy; Biology, Ecology and Behaviour; The Origin of Birds; and the Great Extinction and Beyond.

The authors explain what is understood about the skeletons, organs and muscles of dinosaurs. Of note is that dinosaurs are tetrapods, which is part of the group of vertebrates and have similar skeletal structures to humans. As a reader possessing a basic knowledge of the human skeletal structure and an understanding of the spinal cord and the central nervous system, the chapter on the anatomy of dinosaurs was particularly interesting for me. It also discusses the skin and soft tissue of dinosaurs and applies well-reasoned logic to explain their facial features and functions.

Presenting a significant body of evidence and applying increasingly advanced scientific techniques, the authors examine the things that we take for granted when we are able to study living specimens – their feeding behaviour, movement, reproduction, growth rates and interactions with other species. Visualising a 7 m dinosaur preying on smaller

ones some 2–3 m in length is made possible with a very clear description of the 'grab and bite' theory. Equally interesting is the comparison to the technique used by hawks and falcons, whereby a dinosaur would restrain its prey with large, powerful clawed feet – with the predator eating its prey alive whilst perched on a vantage point.

Having lived and evolved over a considerable time, many species of dinosaur came and went throughout the period covered in the guide. Many of those that appeared earlier were significantly different to those that appeared in later time periods. Dinosaurs grew much bigger, their body shapes changed, diets varied, behaviours changed, some moved on four limbs, others on two and, as explained earlier, some even flew.

The guide discusses the evolution of feathers and other bird-related characteristics and presents the latest research and discoveries of the small therapods of the late Jurassic and Cretaceous periods – and the branch which evolved into modern birds.

Without living specimens to study, the authors hypothesise on their life histories, growth and reproductive behaviour through the extensive interpretation and application of direct fossil evidence and the behaviours of living animals. Given the size and shapes of some of the more well-known dinosaurs such as *Tyrannosaurus rex*, the three-horned *Triceratops* and the plate-backed *Stegosaurus*, it's fascinating to think of the physical interactions required that would enable them to get physically close enough to successfully mate.

In discussing the science underpinning the great extinction of 66 million years ago, the authors discount the many earlier hypotheses as to why this event occurred, including climate change, disease, fungal infection, inability to adapt, and parasites (even ravenous caterpillars!). Presenting evidence from the 1980s onwards, the authors explain the significance of different geological research and analysis which supports the asteroid impact hypothesis and the significant impact this had on dinosaurs. In discussing the 'great extinction' the authors also present evidence to demonstrate that the level of diversity among dinosaurs had been declining prior to the asteroid impact – indicating that habitat change, habitat loss and sustained volcanic activity all contributed to severe disruptions in breeding and migration cycles and this was accompanied by inconsistent plant growth across many regions. The authors note that the reason why *all* dinosaurs did not become extinct is yet to be answered satisfactorily – but they present a number of suggestions why species belonging to several bird groups managed to survive. These include their size and mobility, ability to fly and relocate to new areas, lower dietary requirements, and also that many that survived were largely inhabitants of the southern hemisphere where the effects of these major events may not have impacted as significantly as the northern hemisphere.

This guide to dinosaurs and how they lived, evolved and (largely) became extinct is extremely well written, researched and illustrated. It presents historical and recent evidence demonstrating how fossil discoveries, combined with enhancements in science and technology, have shaped our knowledge and understanding of how dinosaurs dominated the land environment for more than 160 million years. Using photographs,

artistic reconstructions, digital modelling and drawings, the illustrations throughout the book are incredibly striking and allow the reader to clearly visualise how dinosaurs lived – and the specific behaviours, anatomy and biology of each species.

From the perspective of someone without a science background or an in-depth knowledge of contemporary ideas about dinosaurs, understanding this book did require re-reading of text, regular checking of scientific terms and use of the extensive glossary. But in no way did that detract from the quality and enjoyment of what is a very informative, factual, educational and comprehensive guide.

References

Naish D. and Barrett P.M. (2016) *Dinosaurs – How They Lived and Evolved*. Natural History Museum, London, U.K

Naish D. and Barrett P.M. (2018) *Dinosaurs – How They Lived and Evolved*. CSIRO Publishing, Clayton, Victoria, Australia.