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2016

http://hdl.handle.net/10539/21644

McPhee, Blair Wayne (2016) The South African Mesozoic: advances in our understanding of the evolution, palaeobiogeography, and palaeoecology of sauropodomorph dinosaurs, University of Witwatersrand, Johannesburg, <http://wiredspace.wits.ac.za/handle/10539/21644>

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The South African Mesozoic: Advances in our understanding of the evolution, palaeobiogeography, and palaeoecology of sauropodomorph dinosaurs

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ABSTRACT

The Palaeontological record of South Africa is remarkable in that it preserves the two major temporal transitions of the Mesozoic: The Triassic–Jurassic boundary (the Elliot Formation) and the earliest depositional stages of the Cretaceous (the Kirkwood Formation).

Work within the Elliot Formation has reiterated the importance of this horizon for our understanding of the early evolution and subsequent radiation/diversification of basal sauropodomorph dinosaurs. Moreover, inextricably contained within this radiation is the early evolution of the columnar-limbed, long necked sauropods, the largest terrestrial animals to have ever evolved. The Elliot Formation therefore imparts vital information on the genesis of the group that would become the dominant dinosaurian herbivores throughout most of the Mesozoic. However, several outstanding issues obscure a full understanding of this important radiation. Of primary concern is the complicated taxonomy of the sauropodomorphs of the Upper Triassic lower Elliot Formation and a lack of current consensus as to what precisely constitutes a true sauropod. The latter issue is further complicated by a lack of well-preserved sauropod material prior to the Toarcian. The discovery of new, associated material from both the lower and upper Elliot Formation has direct relevance to both of these concerns. Specifically, although the genus *Eucnemesaurus* is supported in the current analysis, the *bauplan* diversity of lower Elliot Sauropodomorpha remains relatively conservative save for the stocky pedal architecture of *Blikanasaurus* and the autapomorphically robust morphology of a newly rediscovered ilium that is potentially referable to it. Within the upper Elliot Formation, a recently discovered highly apomorphic bone-bed is diagnosed as a new species of sauropod that, in addition to placing the earliest unequivocal sauropods within the basal rocks of the Jurassic, suggests the underlying ecological factors driving the divergence of the derived sauropodan *bauplan*.

In addition to new information provided by the Elliot Formation, two decades' worth of collecting from the Early Cretaceous Kirkwood Formation affords a long overdue insight into the sauropod fauna occupying southern Gondwana at the outset of the Cretaceous. The surprising diversity of forms recognized from the Kirkwood suggests that the taxonomic decline of Sauropoda previously inferred for the earliest Cretaceous is a product of sampling bias compounded by a generally poor fossil record. However, a lack of absolute dates for the Kirkwood Formation means that the plethora of "Jurassic-type" specimens is potentially explicable via their being contemporaneous with similar Late Jurassic faunas of eastern Africa and North America.