



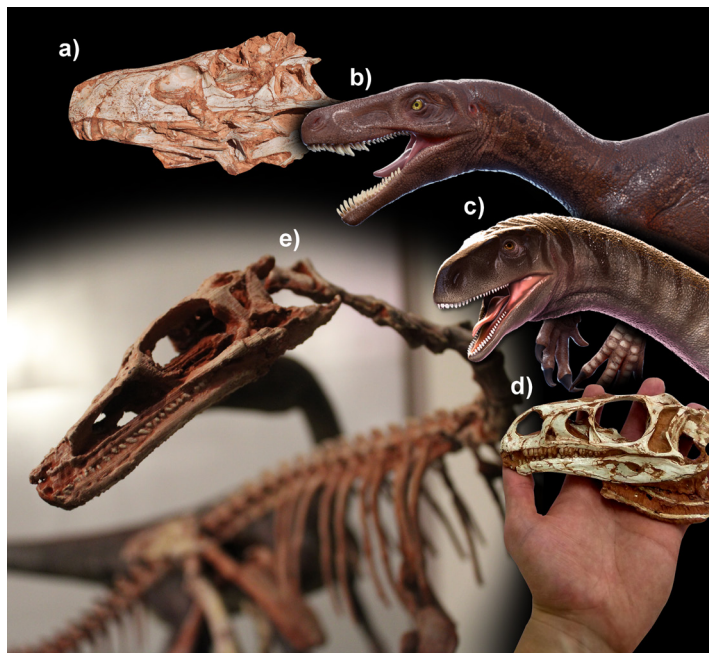
## LETTER TO THE EDITOR

# The role of Brazil in the golden age of dinosaur origins discoveries

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Three decades ago, paleontologists presented the first complete skull of an early dinosaur (Serenó & Novas 1992). With approximately 230 million years, the fossil provided the first look into the face of the terrific predators that would rule the land ecosystems during the next 165 million years. One year later, an international crew published an almost complete skeleton of a coeval dinosaur (Serenó et al. 1993). The new creature was far smaller than the former, representing a distinct kind of dinosaur. Both species were excavated from an arid region of northwest Argentina, known as “Valle de la Luna”. During the two next decades, the Carnian strata from Argentina were the main source for investigations of origin and initial radiation of dinosaurs.

Whereas early dinosaurs from Brazil are known for a long time, this record was poorly preserved and/or underrated. Nevertheless, intense fieldwork efforts yielded several new specimens during the last decade. These discoveries reshaped our understanding regarding the early evolution of dinosaurs. The new fossils from Brazil are exquisitely preserved, illuminating obscure details of the skeleton. For instance, the internal regions of the skulls hold data on the behavior of these creatures, which was crucial to access information on balance, olfaction, diet and “cognitive capabilities”. These were pioneer studies on the neurobiology of the oldest dinosaurs (Bronzati et al. 2017, Müller et al. 2021). An unusual association of a small creature related to pterosaurs (Ezcurra et al. 2020) and an early dinosaur brings to us the first unambiguous carnivorous member of lineage that encompasses the giant long necked sauropods (Figure 1e; Cabreira et al. 2016). Regarding the lineage that originated the colossal sauropods, another specimen preserved the first adaptations related to the acquisition of an herbivorous diet (Pretto et al. 2019), whereas an impressive association with complete and articulated skeletons provided evidences on the oldest long necked sauropodomorphs worldwide (Figure 1c–d; Müller et al. 2018). Advanced geochronology investigations constrained the age of these discoveries (Langer et al. 2018), ordering the sequence of evolutionary innovations and faunistic shifts during the rise of dinosaurs. Finally, the first complete skeleton of an early predatory dinosaur from the lineage of herrerasaurids was unearthed from these Brazilian beds (Figure 1a–b; Pacheco et al. 2019), depicting the whole skeletal anatomy of these beasts.



**Figure 1.** Representative early dinosaurs from the Late Triassic of Southern Brazil. **a)** Fossilized skull of *Gnathovorax cabreirai*. **b)** Life reconstruction of *Gnathovorax cabreirai* by Márcio L. Castro. **c)** Life reconstruction of *Macrocollum itaquii* by Márcio L. Castro. **d)** Fossilized skull of *Macrocollum itaquii*. **e)** Detail of the skull cast of *Buriolestes schultzi*.

The impact of Brazilian discoveries on the knowledge regarding the origin of the “Terrible Lizards” is undeniable. Despite the phylogenetic disputes, the frontiers of gross anatomy have been crossed, leading us to another level of investigations. Our challenges are the alpha taxonomy of early dinosaurs, the limits of intraspecific variation, the biology of these creatures, and precise age of dinosaur-bearing sites. Fortunately, there are several new specimens recently unearthed from Brazil and other countries being prepared and studied. During the next few years, we will witness far more discoveries on this exciting topic of natural history.

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