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EDITORIAL NOTE

Collection of Paleontology Papers in honor of the Centenary of the Brazilian Academy of Sciences

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The Brazilian Academy of Sciences is a non-profit organization (ABC 2019) that has completed one century of existence in 2016. A series of special publications was organized by the Annals of the Brazilian Academy of Sciences (AABC) in celebration of this important date (e.g., Kellner 2017, Crespilho 2018, Cavaleiro 2018). Here we have the pleasure to introduce the final of these volumes gathering 20 original contributions in paleontology, the science dedicated to the study of all evidences of life that have been preserved in layers of deep time. The topics presented here vary from the description of new species and specimens of flying reptiles, dinosaurs, and crocodylomorphs to studies on biogeography, osteohistology, and specific contributions provided by microfossils. Over 70 authors from different countries were involved in this volume, showing the increasing international integration of Brazilian paleontologists.

Overall, the study of fossils has gotten more and more diversified, which has also been represented by the papers recently published in the AABC. This includes new discoveries of rare specimens that expand the distribution of certain groups (e.g., Richter et al. 2017), studies on how Brazilian material might provide answers to more general questions such as the extinction of dinosaurs (e.g., Brusatte et al. 2017), discovery of distinct pattern of dental replacement in lizards (e.g., Chavarría-Arellano et al. 2018), and efforts to better understand complicated questions like the interpretation of cranial structures (e.g., Cheng et al. 2017) and new feeding modes (Kellner and Calvo 2017) of flying reptiles.

But that is not all. Brazilian researchers have also been concerned with ethical questions regarding on how specimens are collected (Mansur et al. 2017), a problem that has been addressed by several scientists around the world (e.g., Lipps and Granier 2009, MacFadyen 2011).

Paleontologists working in Brazil have also applied distinct techniques in the study of fossils. Paleohistology, through thin-section analysis, has a great potential for providing new information of the life history of extinct vertebrates, as accessing growth rates, ontogenetic stages, estimated age, and dental replacing patterns (e.g., Sayão 2003, Melo et al. 2019). This is an area that could be developed further, addressing more complex questions (e.g., Erickson et al. 2004, Padian and Lamm 2013, Botha-Brink et al. 2016). Another field of investigation that has been receiving more interest in Brazil is the computed

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tomography (CT) technique which acquires 3D images for the reconstruction of three-dimensional digital models of fossils. This non-destructive technique allows the acquisition of inaccessible data in traditional studies, such as the morphology of the internal skull cavities and the reconstruction of the soft tissues that filled them, including the brain, arteries, nerves, inner ear etc. (Witmer et al., 2008). These two research areas of investigation are widespread in international paleontology, accounting for numerous papers published in high impact journals. Nevertheless, in Brazil they are still far from having their full potential explored. The main reason is the lack of paleontological laboratories equipped with appropriate instruments for these analyzes. Thus, more detailed studies only have been made possible through cooperation with researchers from laboratories outside Brazil (e.g., Sobral et al. 2012, Rodrigues et al. 2013; Bronzati et al. 2017, Aureliano et al. 2018, Veiga et al. 2018).

Another very exciting field of investigation on paleontology is the search for biomolecules, such as lipid markers, aminoacids, and polymers originated from degraded proteins of fossils. This area is getting crescent importance internationally made possible by highly sophisticated analytical techniques. Schweitzer et al. (2013), using Mass Spectrometry, identified amino acid sequences in bones of *Tyrannosaurus rex* that matches with those of proteins as actin, myosin, and histones, present in all animals. Raman Spectroscopy was employed by Bobrovskiy et al. (2018) to clarify the phylogenetic position of the enigmatic Ediacaran fossil *Cloudina* as a true animal by the extraction of cholesteroids. Wiemann et al. (2018) also used Raman Spectroscopy to access complex polymers of several vertebrate bones that were end products of proteins glycoxidation and lipoxidation processes. These contributions represent a whole new approach that fossils can offer, making it possible to access physiological and metabolic issues, what until recently, was precluded. In Brazil, this field in the study of fossils is practically embryonic but we can cite the pioneer work of Pinheiro et al. (2019) that have characterized chemically by Raman Spectroscopy, and other techniques, the melanosomes (melanin-bearing organelles) of the headcrest of the Brazilian pterosaur *Tupandactylus imperator.* Here, again, the international partnership was fundamental for the development of the work.

Surely the cooperation with researchers from abroad is highly welcome and enriching, but we hope that Brazilian researchers will one day have working conditions that allow the development of cutting-edge research in our country, considering the exceptional preserved fossils found in several Brazilian deposits.

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