

Paleontology of early dinosaurs and their kin at the Snyder Quarry: an exceptional Late Triassic site in the Chama Basin of northern New Mexico. J Stiegler, K Chapelle, and AJ Moore

1. Overview/Abstract (1 Page Limit)

Our research team aims to elucidate the anatomy, evolutionary relationships, and paleobiology of early dinosaurs and other archosaur contemporaries; and, to constrain the chronology of archosaur diversification prior to the End Triassic Mass Extinction. In service of securing long-term funding from the NSF for this consequential research, our proposed project seeks support for paleontological and geological field work at a Triassic fossil site called the Snyder Quarry (SQ) in northern New Mexico, as well as subsequent laboratory work on excavated fossils and radiometric dating of geological samples. Excavations at the site by others prior to 2010 showed that the SQ preserves an exceptional terrestrial vertebrate fauna from deposits of the Chinle Formation, including articulated and closely-associated skeletons of early dinosaurs and their archosauriform relatives. However, the site has since received little attention from researchers. Exploratory work at the quarry by us in summer '23 confirmed that the SQ remains densely fossiliferous past the historical quarry wall. Fully re-opening the quarry is therefore highly likely to yield significant new discoveries. One of the three major dinosaur lineages (Ornithischia) is nearly completely absent from the global Triassic fossil record, but our preliminary work indicates the presence of ornithischian fossils at the SQ and other nearby Triassic sites. **Establishment of a persistent Triassic North American ornithischian record would represent a paradigm-shift in our understanding of early dinosaur evolution, and necessitate wholesale re-evaluation of phylogenetic, biogeographic, and diversification hypotheses surrounding the End Triassic Mass Extinction.**

The lead scientists on this project are SBU Anatomical Sciences Department faculty PI Josef Stiegler (JS, hired in 2020), co-PI Kimberley Chapelle (KC, hired in 2023), and co-PI Andrew J. Moore (AJM, hired in 2018), who are each expert in the anatomy and evolutionary relationships of dinosaurs. Along with the participation of project-supported Stony Brook students and volunteers, our team will have sufficient manual labor to extract numerous fossils from the SQ, and **establishment of site productivity and radiometrically datable horizons will provide the proof of concept for our external proposal** (prerequisite for NSF-funded paleontology and geochronology proposals on which we and our colleagues have been involved). We request funding from the Seed Grant Program to: 1) remove overburden from SQ with heavy equipment and collect fossils in Summer '24; 2) digitize specimens in SBU Dept. of Radiology facilities and conduct analyses of SQ dinosaurs and other fossil vertebrates; 3) analyze geological samples for pilot radiometric dating experiments to be conducted in SBU's geochronology lab (FIRST); and, 4) to provide monetary support for student research assistants. Our seed grant-funded research will culminate in the formation of a multi-institutional, collaborative project on the Triassic paleontology and geochronology of Chinle Fm. deposits in the Chama Basin **to be submitted for co-review by the NSF EAR Sedimentary Geology and Paleobiology Program and by the NSF BIO Systematics and Biodiversity Science Cluster and Evolutionary Processes Cluster within the Division of Environmental Biology.**

Results from this team-based research at our field site will continue to promote Stony Brook as an international center of excellence in vertebrate paleontology, will advance the research careers of the PIs, and will provide opportunities for SBU undergraduate and graduate students to receive research training, field experience, and interaction with partner institutions. **The presence of key facilities and equipment, Triassic fossil collections, and colleagues with subject expertise at SBU (Alan Turner and E. Troy Rasbury who have each expressed support for the project) give us an excellent opportunity to develop a successful proposal for external funding.** The project will contribute to diversity, equity, and inclusion efforts in STEM: organization of the field operation by JS is focused on providing equal opportunity and recruitment and retention of women in the field sciences, and our summer '23 exploratory work included three female undergraduates and two neurodivergent students. The project will directly support an early-career female co-PI (KC); and, a female undergraduate (Juliet Slota) and neurodivergent graduate student (Anirudh Chaudhary) have already been identified for project-supported positions. AJM and KC have strong records of mentorship of underrepresented demographics in vertebrate paleontology, and their mentees will contribute to a diverse field and laboratory team.