**COMPARISONS OF FIDELITY IN THE DIGITIZATION AND 3D PRINTING OF VERTEBRATE FOSSILS FOR OUTREACH, EDUCATION, AND RESEARCH**

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Until recently, 3D surface digitization such as laser-texture scanning, and automated replication, such as 3D printing, were infeasible for many researchers and educators due to the overhead costs associated with high-fidelity digitization and replication devices and limitations of the technology, such as low print resolution. However, innovations in the development of digitization and replication techniques have led to significant reductions in the cost and complexity of their applications. The new availability of these technologies has opened up new venues for vertebrate paleontology in areas of research, education, and outreach. While the lowered cost and increased options for entry-level commercial printing and laser scanning units have led to their implementation in many research laboratories and classrooms, the question of fidelity and accuracy for their use as research and teaching aides has not been fully investigated. This study explores the quality of digitization and resolution of 3D printed specimens in quantitative terms to determine whether the usage of entry-level digitization and 3D printing units is feasible for the needs of most vertebrate paleontologists and educators, or if the technologies need further development to compete with traditional means of specimen reproduction. In order to test the fidelity of these techniques, resin casts of a *Tyrannosaurus rex* tooth (FMNH PR 2081) and crocodilian osteoderm (FMNH PR 3703) were digitized using two different techniques: white-light structured scanning and laser-texture scanning. Each resulting stereolithographic (STL) digital model was compared using standard T-Test and Chi2 statistical analyses (*p* < 0.05) to detect differences in morphology based on point cloud volume and average triangle surfaces. Next, the resulting digital models were printed on two commercially available models of fused deposition modeling (FDM) printers. Photomicrographs were taken and characterized in order to detect differences from the original digital file. The results of this study suggest that while differences in digitization methods and 3D printing units exist, they are virtually indistinguishable. However, observed differences were exacerbated by morphological variations of the original object; flat-shaped to tabular objects showed the greatest variability among digitization techniques. As such, even low-cost digitization and 3D printing systems are suitable for many paleontological research initiatives as well as the reproduction of high-quality teaching specimens.