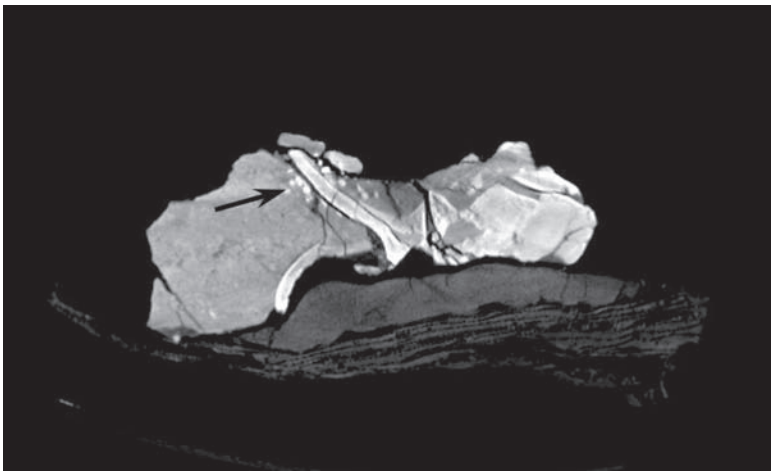
Imaging, 3-D Modeling Provides Clues to Ancient Mysteries

If you hear about a dinosaur in UPMC Montefiore, don't be alarmed. The dinosaur – or at least the bones of a dinosaur – were visiting as part of a joint project between the Carnegie Museum of Natural History and the University of Pittsburgh School of Medicine. Douglas Robertson, MD, PhD, Professor of Radiology and head of the Musculoskeletal Imaging and Biomechanics Laboratory, has been imaging the bones using CT and will be creating 3-D models of these bones in effort to learn more about our earthly predecessors.

The dinosaur bones, which include parts of the pelvis and tail of a Camptosaurus, are encased in sandstone. The bones were collected in 1922 by famed Carnegie paleontologist Earl Douglass and his crew at the Visitor's Center Quarry at Dinosaur National Monument in Utah. In order to create a free standing model of the dinosaur for a future exhibit, *Dinosaurs in Their World*, the museum wants to see exactly where the delicate bones are located before carving away the stone. This is exactly why the museum sought the expertise of Dr. Robertson and other faculty at the University of Pittsburgh Department of Radiology and School of Medicine.

"Our new CT scanner enables us to view higher resolution images of the bones and ossified tendons, which will help us create a more precise 3-D model of the skeletal structure for the museum," states Dr. Robertson.



Axial CT slice through the fossilized tail skeleton and ossified tail muscle tendons. The small white rounded dots in the stone are the ossified tendons that have been fossilized. The arrow points to one cluster of tendons.

CT imaging plays a vital role in the transformation of the Camptosaurus from 2-D to 3-D. Matthew Lamanna, Assistant Curator at the Carnegie Museum, stated, "We don't know a lot about the ossified tendons of the dinosaur, so we want a digital recording of them in the event that they have to be removed or are damaged as the skeleton is prepared." Lamanna also remarks that, "the study of the CT data and fully prepared skeletal structure by Dr. Robertson will likely provide new insights into the anatomy, distribution, and function of the ossified tendons."

Working with artifacts of the past is not a new area of interest for Dr. Robertson. Previously, he participated in CT imaging of a 5,300 year old Egyptian mummy mask for the St. Louis Art Museum while on faculty at Washington University in St. Louis, Missouri. The CT data on the mask allowed Robertson and his colleagues to understand how the mask was made, how it was repaired in the past, and what areas were in need of repair. From the images, Robertson and his research team were able to create a 3-D computerized model as well as a plaster, life-size replica of the mask that was used for restoration.

The modeling techniques used in Robertson's laboratory are also applicable to patient care – the majority of his work involves producing 3-D models from CT and MR images of bones and joints that allow surgeons to better visualize bone and joint movement before operations occur. This can lead to faster and more precise diagnosis for patients.

The Camptosaurus

The Camptosaurus, meaning "bent lizard", was a medium sized dinosaur which lived during the latter part of the Jurassic Period. Predominately found in western North America and England, this type of dinosaur was herbivore and could walk on either two or four legs. Unique characteristics of the Camptosaurus include a beak and four toes on each foot; the species measured up to 23 feet long.

Source: Carnegie Museum of Natural History