

A Tale of Two Dinosaurs

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The Iron-rich fossil-bearing rocks of South Africa have tempered the success of traditional lab-CT scanning protocols, with results often lacking sufficient resolution and density contrast required for detailed analysis of fossil material. Two dinosaur specimens, from opposite sides of the dinosaurian family tree, were recently scanned on the BM05 and ID-19 beamlines at the ESRF. The results produced were not only of a high-enough calibre to permit allow analysis of already-known material, but simultaneously permitted the recovery of previously unknown and obscured material. The first dinosaur scanned, the basalmost ornithischian - *Heterodontosaurus*, is currently the largest fossil specimen visualised at the ESRF; and synchrotron-scanning of this specimen (AM4766) revealed a suite of anatomical elements previously unknown from the family that this dinosaur belongs to. The second dinosaur, the coelurosaurian theropod *Nqwebasaurus*, was scanned and formed the basis for my project at the 2016 ESRF Summer-School program. *Nqwebasaurus* is known from a single well-preserved specimen (AM4060) that contains most of the postcranial skeleton, but very little of the taxonomically-informative cranial anatomy. Synchrotron scanning of the *Nqwebasaurus* holotype revealed an abundance of unknown and unsuspected cranial elements – more than tripling the known elements for this species. These results would have been impossible to obtain without the technology and engineering of the ESRF. We will present digital reconstructions of these dinosaurs as well as pertinent new information on aspects of their biology. Our results are a testament to the power of the ESRF facilities to allow maximum utilization of exceedingly rare specimens, produce ground-breaking scientific discoveries, and redefine the status quo.

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