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Neutron micro-CT as a non-destructive tool for Palaeontology in Australia

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The physical extraction of fossilised remains from rocks enables quantitative physiological investigation of bone-dimensions, volume, and porosity, however leads to the destruction of valuable contextual information and soft-tissue remains within the matrix.

Conventional and synchrotron-based X-ray computed tomography (XCT) have been utilised for many years as critical tools in uncovering valuable 3-D internal and surface renderings of scientifically important fossils, however poor contrast and X-ray penetration often prevents thorough tomographic analysis.

DINGO, Australia's first and only neutron micro-computed tomography (nCT) instrument, located at the OPAL nuclear research reactor, is being used to obtain unprecedented reconstructions of extraordinary fossilised anatomical features not visible with conventional imaging techniques. This presentation will outline the physical capabilities of DINGO, the limitations and results to-date in the field of palaeontology. Drawing upon specimens scanned from across Australia, North America, New Zealand, and China, this presentation will demonstrate the complementarity of nCT to classic XCT methods for certain geological formations and fossil localities.

nCT has yielded unprecedented contrast and detailed-reconstructions of fossilised soft tissue in a Jurassic cynodont. The stomach contents and digestive function of herbivorous and carnivorous dinosaurs, and a Cretaceous Australian crocodilian have been revealed, providing insights into ancient environments and food chains. In this way, a new species of Australian dinosaur has been discovered.

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