

”Into the past”: application of neutron imaging to paleontology

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The Cradle of Humankind World Heritage area is a richly fossiliferous karstic system found in the Krugersdorp region, Gauteng, South Africa. These karstic systems date from the Plio-Pleistocene (ca 1-4 mya) and have yielded many fossils, including hominids. Fossils are embedded in a cemented limestone matrix of sediment, known as breccia the density and composition of which varies greatly. Neutron imaging can aid by pre-preparation analysis of breccia blocks to prioritise those containing the most promising and/or complete fossils. Currently breccia blocks are prioritised for preparation by surface examination and preparing a standard 2kg block of breccia can take up to 6 months. Neutron imaging by allowing internal details of breccia blocks to be easily visualised would reveal the contents of a given block and fast-track preparation of promising blocks. A second important area where neutron imaging has advantages over classic paleontological methods is the examination of internal or hidden structures of the fossil specimens themselves. To see internal features, traditional methodology often entail destructive sampling of irreplaceable material. Neutron imaging would be advantageous by being non-destructive in revealing (internal) details. Neutron imaging can be used to study specific morphological features (e.g. trabecular details) inside specimens that is not possible by classical methods. Examples of successful application of neutron imaging to fossils will be discussed such as density variations in trabecular structures (i.e bipedal locomotion vs. quadrupedal locomotion). Application of neutron imaging has already stimulated new directions and research avenues in paleontology and the future promises further exciting results and insights.

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