

Imaging with cold and with fast fission neutrons on breccia containing animal and hominid fossils

Tuesday 10 September 2013 13:40 (20 minutes)

A string of limestone caves spans more than half the African continent. When ceilings caved in, the holes formed a deadly trap for animals and hominids. Fossils mixed over time with soils and limestone into a conglomerate called breccia, sealing the fossils away from oxygen. The Ditsong Museum in Pretoria, South Africa, has a research program to retrieve fossils from breccia both mechanically and chemically, which is a very time-consuming process of many weeks and months even one block. However, some of the most valuable fossils, e.g. Ms. Ples, the oldest known hominid skull, were later found in blocks of breccia that had already been sorted out as worthless, and dumped. Pre-examination of the blocks before processing is thus desirable. X-rays deliver no contrast between fossils and breccia, so for the first time, examinations were done with cold, low energy neutrons, and fast fission (high energy) neutrons at the imaging facilities ANTARES and NECTAR of the research reactor FRM II of the Heinz Maier-Leibnitz Zentrum of Technische Universität München, Germany. This talk will explain the setup of the facilities and experiments, present the results and determine the penetration depths for slow and for fast neutrons. The results will be used for serial investigations at the upgraded neutron imaging facility SANRAD at NECSA, South Africa, and possibly influence the design of the future replacement reactor at NECSA.

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Session Classification: Neutron Imaging III

Track Classification: NINMACH