SCANCO MEDICAL

Interesting applications from SCANCO scan service

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Paleontology

In paleontology, the researchers must often handle fragile, rare and valuable samples or small specimens, including both extinct fossils and extant comparative material or even fossils that cannot be separated from the surrounding material. A digitalization of the object allows for a virtual dissection and to expose obscured elements for a more thorough analysis that can reveal new aspects of morphological and functional changes.

Below is a *Neusticosaurus pusillus* fossil in a rock. Due to the nature of the rock, the surrounding matrix could not be removed using acid preparation. By scanning the rock at 70 kVp the fossil can be digitally separated from the rock and examined from all angles.

Courtesy of Torsten Scheyer, Paleontological Institution and Museum, University of Zürich, Switzerland

Figure 1: *Neusticosaurus pusillus* fossil in bituminous black shale.

Figure 2: 3D rendering of the *Neusticosaurus pusillus* fossil.

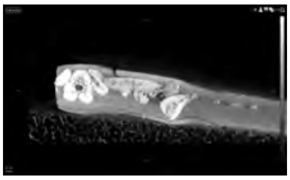

Figure 3: microCT gray level slice of a *Neusticosaurus peyeri.*

Grains of sand and lava

With the very high resolution of the μCT 50 it is possible to obtain high quality images of even the smallest grains. In the images below grains of sand and lava are shown. The images of quartz sand (left) shows the effects of high temperature exposure to soil surface structure (*Courtesy of Christine Switzer, University of Strathclyde, UK*).

The image to the right shows a grain of lava extracted from an ash layer in northern Denmark. What interests the scientists is to see how different layers have been formed on the grain during its travel. They are also interested in seeing the 3D surface reconstruction of the grain as well as its porosity. The grain is about 300 μm large and is composed of three smaller grains of different origin. (*Courtesy of The Natural History Museum of Denmark)*

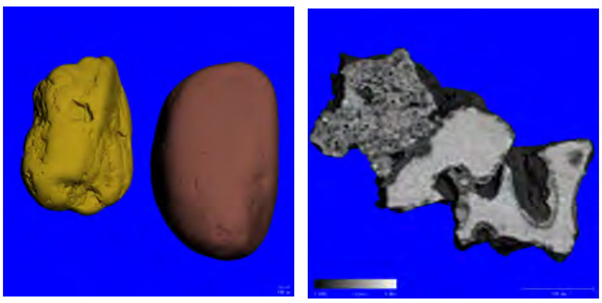

Figure 4: Left: Grain of quartz sand. Right: Grain of lava

Rock analysis

During rock blasting large quantities of fines are produced. This is unsellable waste that costs land, money and energy to produce and deposit. A better knowledge of how crack generated fines (CGF) are created may help improving blasting practices and suppress their generation at the source rather than dealing with them afterwards.

With the help of microCT the surface of the explosion induced cracks as well as micro cracks underneath the surface can be analyzed. In the sample to the right, the thickness of the crack was determined by segmenting the air inside the rock using the SCANCO Evaluation Program. By using the Component Labeling function in IPL, the crack could be separated from air bubbles within the sample. A Distance Transformation applied on the segmented object could then determine the local thickness of the crack. (*Courtesy of Dept Mineral Resources & Petroleum Engineering, Montanuniversität Leoben, Austria*)

The component labeling functions in IPL can also be used for many other applications in rock physics, such as for instance the size of inclusions of minerals within a rock.

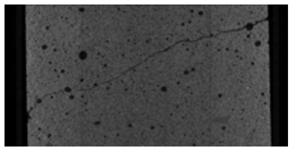

Figure 5: Gray scale slice image of a cracked rock.

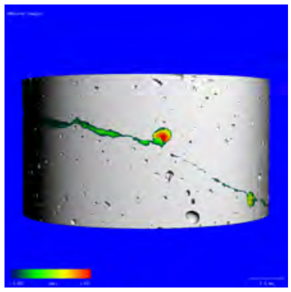

Figure 6: Thickness map of exposion induced crack.

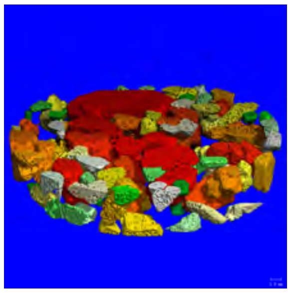

Figure 7: Rock inclusions color coded according to their size.

Pearls

The value of a pearl depends on whether it is natural or cultured, if it is a saltwater or a freshwater pearl, and for cultured pearls if it is gonad grown or mantle grown, beaded or beadless etc. Cultured pearls enter the market in large quantities and their quality is often outstanding compared to natural pearls. Their internal structures may be difficult and misleading, based on classical radiography. There are suspicions that part of such cultured pearls are purposely selected (and/or produced) to enter the market as natural pearls. With the help of microCT, the quality and authenticity of a pearl can be more easily determined. (*Courtesy of Swiss Gemmological Institute SSEF, Basel*)

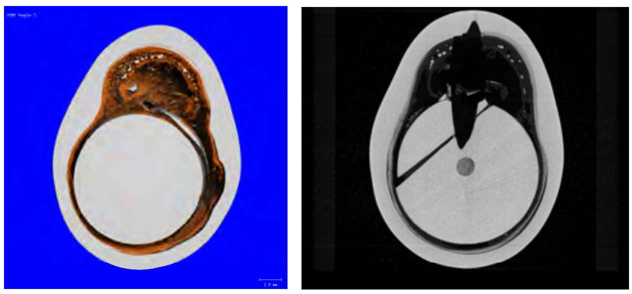

Figure 8: White cultured pearl from the Southern Pacific from a Pinctada maxima pearloyster. The nacre of the cultured pearl has grown around a spherical bead cut from a freshwater mussel with the goal to assist the growth of a large, round cultured pearl. The bead shows a drill hole and has split due to the drilling process. The dark (and brown) parts within the pearl are rich in organic matter (conchioline).