Silkworm transformation is art

Gwynne D. Koch

When contemporary artist Gillian Steel approached scientists at the University of Abertay in Dundee, UK, with the aim of visualizing the hidden process of a silkworm developing inside its cocoon, they did not expect to capture the moment of transformation when the moth emerges.

Using x-ray tomography, scientists captured images of a silkworm larva inside its cocoon.

But that is just what Dmitri Grinev and his team at the university’s Scottish Informatics and Mathematics Biology and Statistics center did. Using x-ray tomography, a technique that relies on the principle that tissues attenuate x-rays at varying degrees, they examined the silkworm larva inside its cocoon.

Images were reconstructed from 1169 angular projections collected in 1 h 20 min using a benchtop apparatus from X-Tek Group of Tring, UK, with a resolution of approximately 89 μm. The system includes a 5-μm focal spot reflection target, an x-ray source that scanned the sample at 72 kV, an x-ray detector, a CCD camera and a sample-manipulation table.

The cocoon, measuring about 60 mm long and 25 mm in diameter, was placed in a plastic tube to stabilize it in the correct position for scanning, and the tube was fixed onto a rotating turntable inside the system’s imaging chamber. The team employed a 0.1-mm aluminum filter to minimize beam-hardening artifacts. The system took an additional 20 min to produce the finished three-dimensional images.

According to Grinev, x-ray tomography likely has never before been used to image silkworm cocoons because entomologists studying silkworms are not aware of the technique’s capabilities, do not have access to CT scanners or do not want to use ionizing radiation sources that might affect their experimental results.

The artist used the sequence of the moth emerging from its cocoon as a pivotal image describing a child’s world and his or her place in that world as part of a larger body of work looking at life span and