# New technology helps scientists understand ancient fossils

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Some of the world's oldest human bones and other ancient relics are studied here using some of the world's newest technologies.

At Washington University, anthropologists team up with radiologists to share high-tech medical scanning machines and see inside the prehistoric bones to learn more about early human life.

The same computed tomography (CT) scanners that produce detailed pictures of clogged arteries and brain tumors in living patients can offer up clues about ancient fossils based on their size, weight, volume and structure.

"You can study the fossils without damaging them with CT scans," said Charles Hildebolt, professor of radiology and adjunct professor of anthropology at Washington University. "Because these CT scans are used to treat patients, the measurements are very accurate. And with the fossil you can use as much radiation as you want."

The measurements from the scans can then be used to create three-dimensional virtual models on the computer and life-size plastic molds. The molds, as accurate reproductions of the fossils, can also be scanned.

Ancient human skulls, bones and relics are often stored by the countries where they were discovered, mostly in Asia, Europe and the Middle East.

That's where the molds come in handy, since the bones can be too fragile for transport.

"Those (skull) endocasts don't contain as much information as the original brain but the shape, the size, some of the patterns and some of the positions of blood vessels are recorded," Hildebolt said.

X-rays have been used to study fossils for more than 100 years, but as the scanning technology has progressed, so has the ability to understand human evolution.

While most medical schools have CT scanning machines for looking inside living patients, they don't all have the advanced software and expertise to analyze images of ancient fossils.

Dean Falk, an anthropology professor at Florida State University, has collaborated with the WU team for 20 years and calls them "probably the best in the world" at combining modern science with ancient studies.

"What they have is an intellectual curiosity about the fossils and they've been willing to pursue that in addition to all of the other kinds of more medically related research they do," Falk said.

At Washington University's Mallinckrodt Institute of Radiology, engineers like Kirk Smith use the imaging technology to guide surgeons who recreate facial structures for patients and to help anthropologists who recreate the skeletons of ancient humans.

The researchers have helped study the bones and teeth of an ancient human found on an Indonesian island and nicknamed "Hobbit" for its small stature.

Casts of the Hobbit's grapefruit-sized skull were sent to Washington

University in 2004 to be scanned at the school's Center for Clinical Imaging Research.

Ever since, researchers have been debating the origins of the Hobbit and whether it represents a new human species.

Some who studied the Hobbit's brain believed it to be an ancestor of the modern human who suffered from microcephaly, a genetic disorder that results in a small head size.

But when Hildebolt and colleagues compared the Hobbit's skull to those of someone with microcephaly as well as a chimpanzee and a modern human, "the brain of the Hobbit least resembled that of a microcephalic," Hildebolt said.

Hildebolt and other researchers theorize that the Hobbit is a unique species of human who lived some 18,000 years ago. Archaeological digs are ongoing in Indonesia to find relatives of the Hobbit, and the research could last for decades.

Anthropology professor Erik Trinkaus also uses complex scanners to get a more precise look at what he calls "a bunch of dirty old bones out of the ground," mostly from Neanderthals, an extinct species related to humans.

Several years ago Trinkaus received a human jawbone that was found in a Romanian cave and still contained some teeth. Trinkaus teamed up with Hildebolt to scan the jawbone and learn that it dated back 36,000 years, some of the earliest evidence of modern humans in Europe.

Trinkaus has traveled the world to study these fossils, including to Iraq in the 1970s to work on Neanderthal skeletons and to Moscow last summer for an analysis of 30,000-year-old vertebrae.

"My real interest is trying to understand the biology of these prehistoric people and use that to try to understand their behavior," Trinkaus said.

Bones can tell researchers something about the diet and activities of ancient people. They can show evidence of growth and periods of starvation. They can track diseases and abnormalities, Trinkaus said.

"Ultimately it comes down to understanding where we came from."

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