

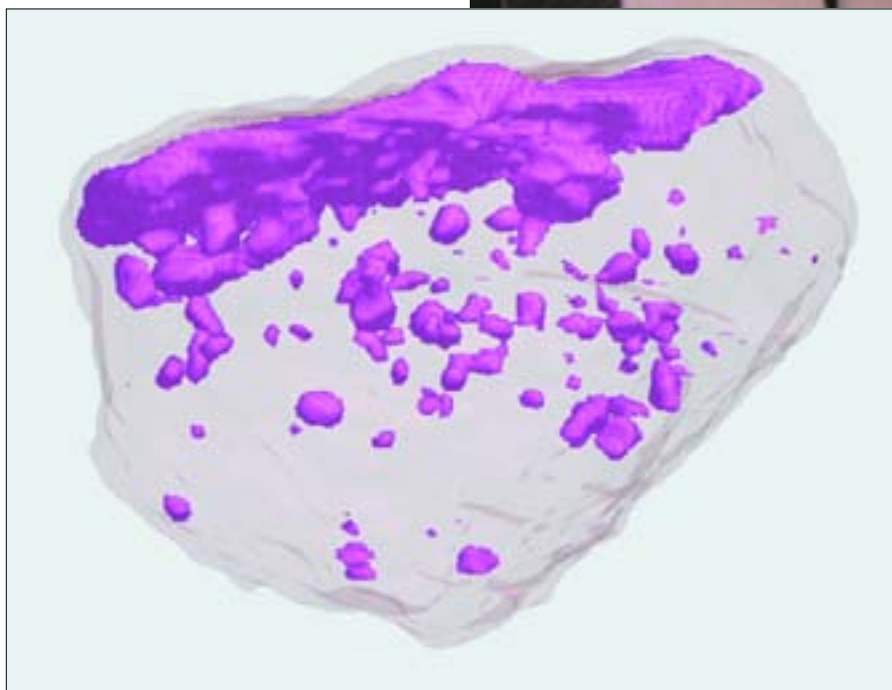
## TOMOGRAPHY

# Neutrons reveal hidden life of unusual rocks

**G**EOLOGISTS ARE USING neutron tomography to peer inside of rare rocks without destroying them. Researchers at the University of California, Davis, have used neutron beams from a nuclear reactor to find bacteria living inside rocks collected in the Mars-like environment of Antarctica's dry valleys and Israel's Negev Desert. They are also using it to study the structure of volcanic rocks and glasses, as well as compositions collected from the deep ocean floor.

"Normally, we'd make a three-dimensional image by cutting the rock in slices. With this method, we can do it without destroying the rock," said UC Davis geology professor Charles Leshner. "We're just scratching the surface of what we can do."

The process is comparable to a medical computed tomography, or CT, scan with X rays. The sample rotates in the neutron beam and a series of pictures are taken with



**Above:** A small rock taken from the Negev desert in Israel. **Left:** A neutron tomography scan of the same rock, with colonies of bacteria inside the rock shown as purple blobs. (Martin Wilding)

a digital camera system. These two-dimensional images are reconstructed, using the same equations used for CT scans, into a series of "slices" through the sample. The slices can also be made into a three-dimensional image.

The neutron beam is generated by the TRIGA reactor at UC Davis's McClellan Nuclear Radiation Center, which can operate at a steady-state power of up to 2 megawatts or pulse to approximately 1000 MW for 20 milliseconds. The reactor, the newest research reactor in the United States, was built in 1990 by the U.S. Air Force to check for corrosion in aircraft components. It was transferred to UC Davis in 2001.