SNAPSHOT

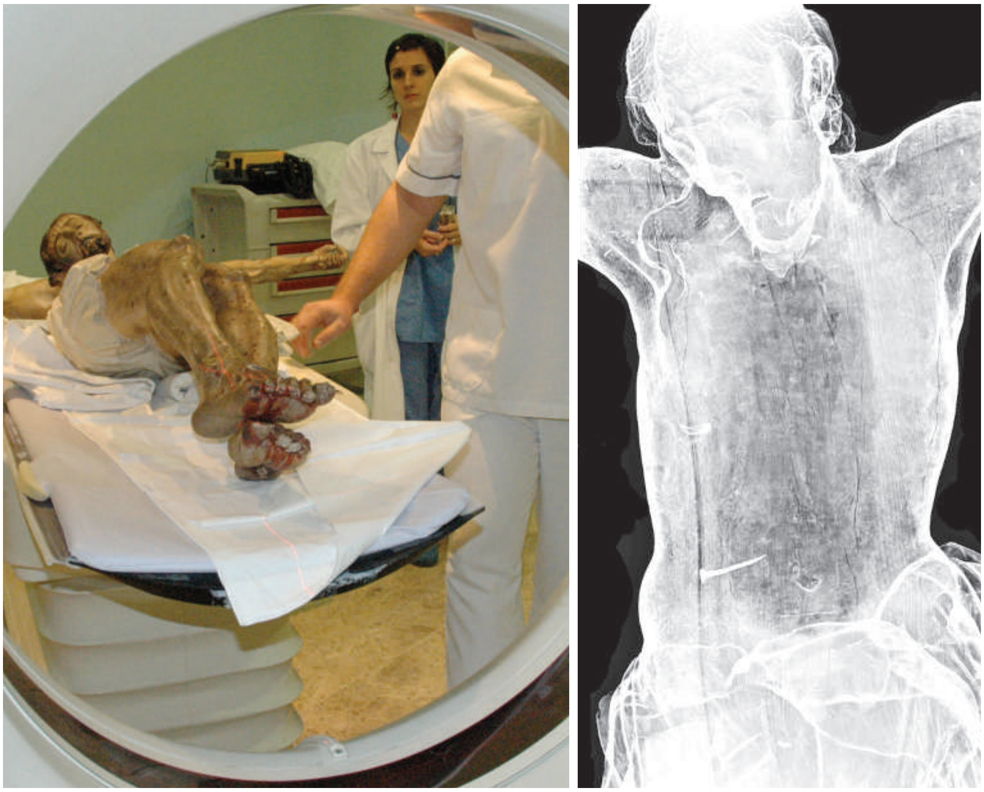
Idol scans

A precious eighteenth-century statue of Christ, *Cristo de la Peña*, that is carried in religious processions in the small town of Guadassuar, Spain, has been investigated by a novel form of imaging.

Ignasi Gironés Sarrió and Vicente Guerola Blay of the Heritage Conservation Institute in nearby Valencia are the first to use computerized multi-slice tomography on an artefact. The technique allows far more detailed three-dimensional imaging than normal computerized axial tomography. The results (pictured) show that the 1.5-metre-long figure was carved almost totally from a single piece of wood; only the arms and face were added on. Most statues of this era were made with separately carved legs.

The scan also shows that the artist reduced the weight of the sculpture by having a cavity in the torso, to make it lighter for those who had to carry it.

Alison Abbott



HERITAGE CONSERVATION INST.

That's no laser, it's a particle accelerator

Israeli physicists have turned a laser into a particle accelerator. Dubbed a paser — for particle acceleration by stimulated emission of radiation — the device accelerates bundles of electrons using the same principle as a laser.

At present it can only accelerate electrons by about 0.15% of their initial speed, but it could lead to compact particle accelerators and table-top X-ray devices, according to Samer Banna of the Israel Institute of Technology in Haifa. He and his colleagues will publish their work in *Physical Review Letters*.

Conventional lasers exploit the quantum properties of atoms. An energy source is used to boost the electrons in a group of atoms into an elevated energy state. Passing light in the form of photons stimulates the atoms and causes the electrons to fall back to the lower energy level, emitting more photons in the process. These in turn stimulate more atoms and so on, so that a large number of photons are emitted. The photons are all identical, which makes the beam of light uniform.

Pasers work on a similar principle, but the output is accelerated electrons. Packets of electrons are fired into a cloud of excited carbon dioxide gas. As in a laser, the gas releases a large number of identical photons. But those photons are instantly absorbed by the passing electrons, which get an energetic kick, and leave the device moving more quickly than when they came in.

The fact that the paser uses atoms to speed up electrons sets it apart from other particle accelerators. "This is unlike anything that's come before," says Eric Colby of the Stanford Linear Accelerator Center in California. The unique mode of action makes the paser far more efficient than current machines, which achieve acceleration by generating enormous electric fields inside huge cavities. Colby is optimistic about the paser's potential. "It's a pretty small effect now," he says, "but there are strong technical reasons to believe that a very significant gain in acceleration is possible."

> "If you can store energy in a material, a great many things can be done."

Levi Schächter, of the Israel Institute of Technology, believes that the paser could also make its mark as a source of X-rays. If the high-speed electrons have their paths bent after they leave the device, they will release a laser-like beam of X-rays that could be used for medical or nanotechnology applications. But Schächter is reluctant to guess exactly what may come of the technology. "In Hebrew we say, 'It's difficult to make predictions, particularly regarding the future.'"

It wouldn't be possible to produce the exact equivalent of a laser beam with electrons — the Pauli exclusion principle states that electrons cannot exist in the same energy state at the same time. But laser equivalents can in theory be created for other types of particle, such as gravitons (which carry the gravitational force), phonons (packets of vibration) or some nuclei — if a system can be found that emits them. In June, for example, a group of researchers reported building a sound laser, or saser, that uses semiconductor technology to create a uniform beam of phonons (A. J. Kent *et al. Phys. Rev. Lett.* **96,** 215504; 2006).

Colby says that these new systems show that it is easier than one might think to generate laser-like behaviour. "If you can store energy in a material," he says, "a great many things can be done." ■

Geoff Brumfiel