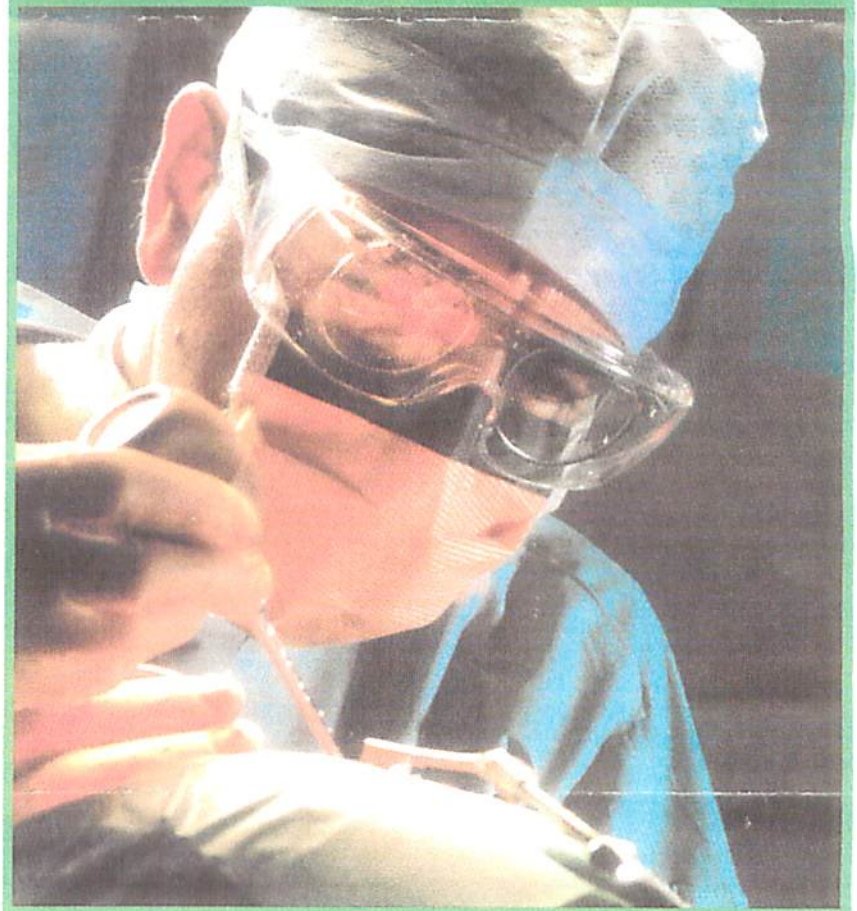
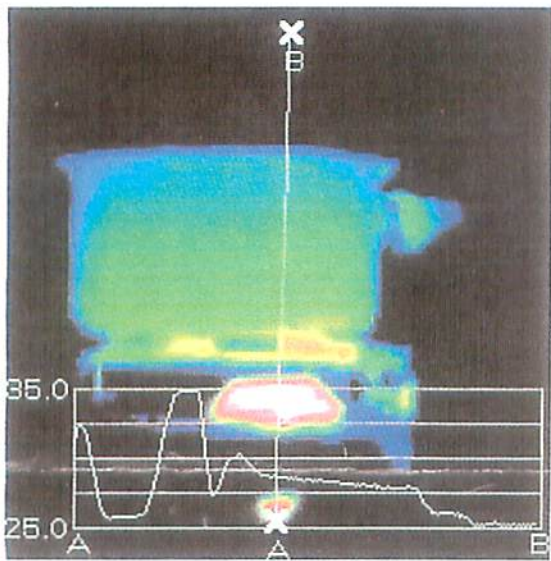


Wednesday 12 February 2003

Volume 16 Number 3

# At the cutting edge of surgery and engineering

Technology making our homes safer



Readers' views on Britain's Olympic possibilities  
Education changes: good news for engineers?

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# Electrical current gets paralysed to stand up

MECHANICAL engineers at Glasgow University have developed a way for people paralysed by spinal cord injuries to stand unsupported.

The research team at the university's Centre for Rehabilitation Engineering used low levels of pulsed electrical current to stimulate the nerves that control muscle movement. The current replaces signals from the brain, which are prevented from reaching the muscles by the spinal cord injury. The electrical stimulation can partially restore lost body functions by making the paralysed muscle contract.

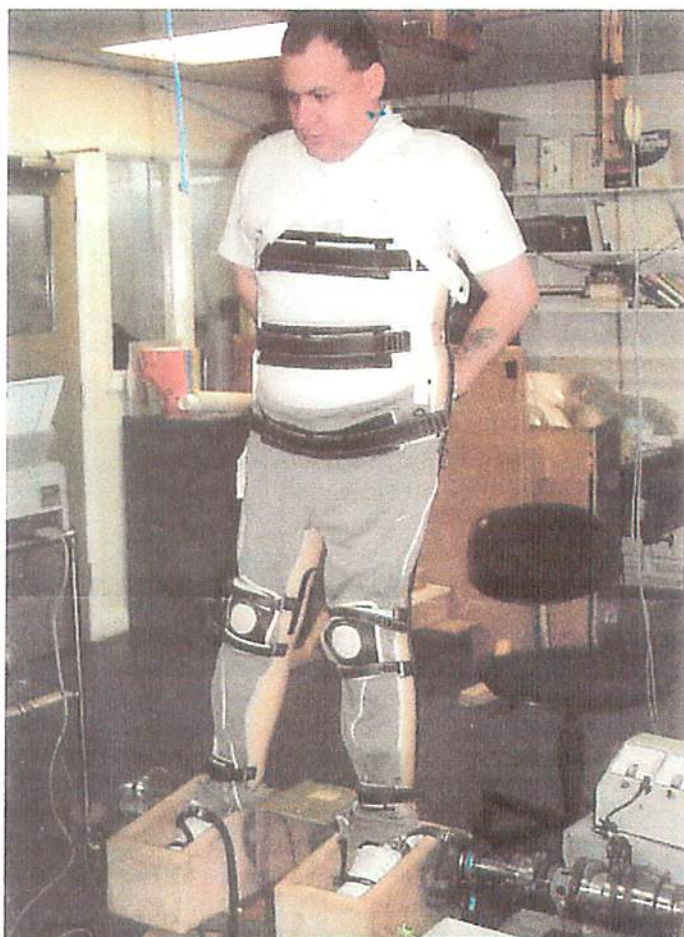
By stimulating the muscles controlling the ankle by an amount directly related to the person's standing posture, the team has been able to demonstrate paraplegics standing unaided in a stable fashion. A record

duration of seven minutes has been achieved so far.

Professor Ken Hunt, head of the centre, led the research. He described the process as a form of feedback control as, for example, if the person leans too far forward the stimulation is automatically increased to push them into an upright position.

He said: "Enabling spinally-injured people to stand again and remain balanced for this amount of time represents major progress. This has never been achieved before in experiments with human subjects."

The project was carried out in collaboration with the Queen Elizabeth National Spinal Injuries Unit at Glasgow's Southern General Hospital. The Engineering and Physical Sciences Research Council provided the funding as one of seven



Stimulation therapy: Low current excites the nerves that control muscles

grants for projects aimed at restoring lost function to paralysed individuals

through feedback control of electrical stimulation systems.

## Filters check in for a scan

A VERSION of the tomography technology used in hospitals to find out what's going on inside the human body is being used to improve pressure filtration technology. And the partners in the project are looking for further examples of pressure filtration, perhaps from the pharmaceuticals sector, to prove the technology.

The project, funded under the government's Link scheme, is led by Manchester-based Industrial Tomography Systems, with filter maker Rosenmund, bioprocessing company Syngenta and Umist. The aim is to improve basic performance including yield

and quality, to reduce the use of raw materials and to optimise processes so that smaller filters can be used.

Process tomography uses an array of electrodes that generate pulses which then highlight different resistances. In the pressure filter experiments, the array consists of 16 electrodes, and measuring the resistance between all combinations of paired electrodes can give 100 measurements in 25ms.

The result is a picture of the filter cake as it dries, a view from the inside of the process not seen before. The effects of changing parameters can be seen as the experiment progresses.

## Ceramics get stronger

WORK led by Sheffield University could see better ceramics used in engineering and medical applications such as cutting tools, hip replacement parts and medical instruments.

The work, funded by the Engineering and Physical Sciences Research Council, is aimed at increasing the usefulness of zirconia, a ceramic with strength and hardness properties akin to those of steels. Zirconia is already used to make blades that are sharper and smoother than conventional steel ones and that last up to 50 times longer.

But the use of zirconia has been hindered by a loss of

strength and a tendency to crack when it is subjected to temperatures from 100° to 600°C in the presence of water – a range that covers cleaning operations that potential uses often entail.

The Sheffield project, which also links to the universities at Leeds and Glasgow and to the small firm Dynamic Ceramic, is trying to overcome this "hydrothermal degradation" by adding trace quantities of materials such as alumina to the zirconia without compromising the toughness. This work is aimed at stopping any degradation proceeding into the zirconia from the surface.