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## New Spinal Implant to Help People with Paraplegia Exercise Paralyzed Limbs

*Engineers have developed a new type of microchip muscle stimulator implant that will enable people with paraplegia to exercise their paralyzed leg muscles.*

It is the first time that researchers have developed a device of this kind that is small enough to be implanted into the spinal canal and incorporates the electrodes and muscle stimulator in one unit. The implant is the size of a child's fingernail.

The Engineering and Physical Sciences Research Council (EPSRC) project, is being led by Professor Andreas Demosthenous from University College London. It includes engineers from Freiburg University and the Tyndall Institute in Cork.

"The work has the potential to stimulate more muscle groups than is currently possible with existing technology because a number of these devices can be implanted into the spinal canal," said Professor Andreas Demosthenous. "Stimulation of more muscle groups means users can perform enough movement to carry out controlled exercise such as cycling or rowing."

The devices could also be used for a wide range of restorative functions such as stimulating bladder muscles to help overcome incontinence and stimulating nerves to improve bowel capacity and suppress spasms.

The research team has overcome previous limitations by micro-packaging everything into one tiny unit. Latest laser processing technology has been used to cut tiny electrodes from platinum foil. These are then folded into a 3D shape (which looks like the pages of a book, earning the device the name of the Active Book). The pages close in around the

nerve roots. They are micro-welded to a silicon chip which is hermetically sealed to protect against water penetration, which can lead to corrosion of the electronics.

The exciting innovation has been welcomed by Universities and Science Minister David Willetts, who said: "The Active Book is a good example of how UK scientists and engineers are translating research into innovations that deliver real benefits for society. This tiny implant has the potential to make a real difference to the lives and long-term health of people with paraplegia in the UK and around the world."

The project is co-led by Professor Nick Donaldson of University College London.

Although, electrical stimulation of leg muscles has been used for some time, it is usually done by attaching electrodes to the outside of the legs and then connecting the electrodes to an external stimulator. This is too time consuming to be used every day so few people with spinal cord injury continue with this method despite the clear health benefits.

At the moment, electrical stimulation of nerve roots in the spinal canal can be carried out using implanted electrodes and an implanted stimulator connected by a cable. This latest research is the first to combine the electrodes and muscle stimulator in one unit so that more nerves can be stimulated and better function achieved.

**Editor's Note:** This article is not intended to provide medical advice, diagnosis or treatment.