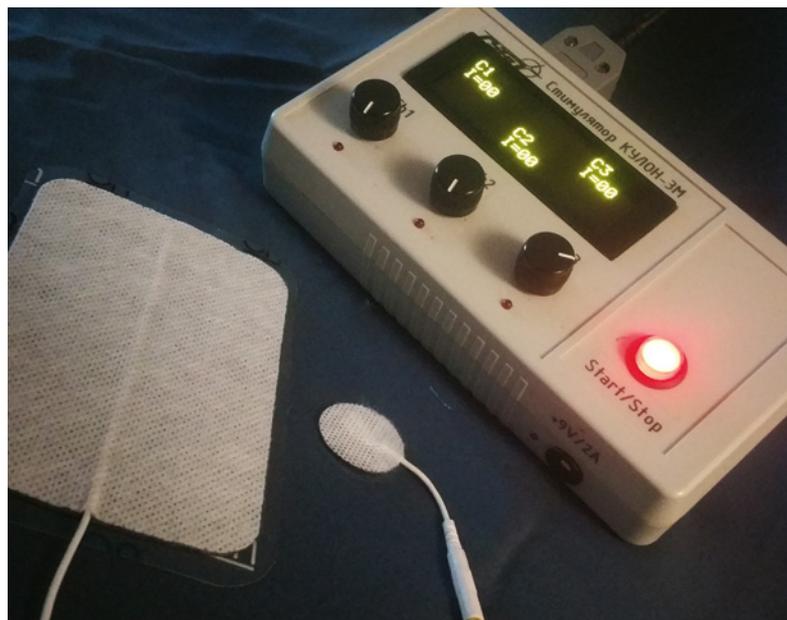


EDGING TOWARDS A BREAKTHROUGH

Between 350 and 400 new cases of spinal cord injury are recorded in Australia each year, costing the economy more than \$2 billion – inclusive of ongoing care and rehabilitation. Thanks to the pioneering work of Project Edge, however, those figures could decrease significantly very soon. Little wonder that the insurance sector is keeping a very close eye on progress.

BY STEPHANIE WANLESS



Above Non-invasive spinal cord stimulator with electrodes used during rehab sessions. **Top right** Emily James has high hopes for the new technology – and the increased independence it may bring.



“It was like a lightning bolt went through my body... and then there was nothing.”

Emily James was 22 years old when she broke her spine at the C5 vertebrae while on a snowboarding holiday in Vermont. She had just finished her university degree and had taken a year off to travel. Conditions were bad. She fell. The consequences were immediate.

“When I hit the ground I knew I had done something serious,” says Emily. “I didn’t even try to move because I just sensed I wouldn’t be able to.”

She was right. Aware of a loss of sensation and movement from the chest down, the severity of Emily’s injuries was confirmed by doctors within hours of her arriving at hospital: “Right after I had my MRI and scan, they said: *You’ve broken your neck. You’re going to be a quadriplegic. You’ll never walk again.*”

TALKING ABOUT A REVOLUTION

In the not-so-distant future, such words might never be spoken again thanks to Project Edge, a collaboration being developed between Sydney’s University of Technology (UTS) through its Centre for Neuroscience and Regenerative Medicine (CNRM), and SpinalCure Australia.

Established in September 2016 and headed up

by Professor Bryce Vissel, Director of CNRM, Project Edge is the first integrated programme of research outside the US building on the breakthrough research developed by Professor Reggie Edgerton over the course of four decades.

The neuromodulation technique developed by Professor Edgerton's team has already managed to re-awaken the spinal cord and successfully led to some restoration of feeling and movement to more than 20 paralysed people in the US. Now, it strives to have the same profound impact on the lives of Australians with spinal cord injuries.

The programme could also have a significant effect on Australia's insurance industry – particularly from an individual claims perspective – which could easily cost the industry hundreds of millions of dollars each year. Lloyds and Swiss Re are working to introduce the Project Edge team to the insurance industry. Both stalwarts of the insurance world hope their peers will follow suit.

And they should. Because – funding permitting – the work carried out by Edgerton and Vissel at UTS has the potential to be nothing short of revolutionary.

“This is one of those events in human history that really is a breakthrough,” says Vissel. “Right now, we don't fully understand

“A person injured today should not be told they will never walk again. There is every hope of significant recovery in the not-too-distant future, with life-changing benefits in general health and independence.”

how the technology works, but part of Project Edge's research going forward is to determine how it's working, both in animal models and humans, improve the technology and work to integrate a range of approaches including engineering, bioengineering and stem cells from day one of the Project. This will create a world-leading, integrated, neuromodulation-led solution to spinal cord injuries.”

The science behind the breakthrough is, naturally, complex. But Vissel explains that it essentially comes down to reigniting the communication pathways between the brain and the spinal cord.

“The spinal cord is an extraordinary ‘brain’ in its own right and has been greatly underestimated in science,” says Vissel. “This is one of the guiding

principles in Professor Edgerton's research which has established the very brilliant, complex and powerful circuitry of the spinal cord.

“In the case of a spinal cord injury, the signals travelling between the brain and the spinal cord are no longer substantial enough to drive the spinal cord's own functionality.

“The technology behind Edgerton's neuromodulation works by slightly exciting the nervous system just below the spinal injury. When it receives that input, the spinal cord is much more likely to respond to the very few, faint remaining signals travelling from the brain.”

Edgerton himself likens the technology to a hearing aid for your spinal cord, explaining that “without the stimulation, it can't hear the messages coming from the brain.”

THE PRICE OF PROGRESS

The first successful trial of the epidural stimulator created by Edgerton and his team was published in 2011. At that stage, the stimulator was implanted epidurally, below the level of injury and against the dura, the covering of the spinal cord.

This year, Edgerton, Vissel and an integrated team will be building on a

non-invasive method that they expect will stimulate some important recovery and eliminate the dangers and costs of surgery – ultimately making this life-changing treatment available to a much wider audience.

“Our three goals for Project Edge at UTS are to work to prove the current stage technology and roll it out across Australia and maybe Asia Pacific; attempt to demonstrate the potential for changing the lives of quadriplegics; and from day one, improve the technology and simultaneously work to integrate stem cells, engineering and biomaterials to achieve a

far more advanced neuromodulation-led approach than can be achieved by neuromodulation alone,” adds Vissel. “It is this integrated approach that truly separates us from other world efforts”

But progress comes at a price, and that's something Duncan Wallace, CEO and Executive Director of SpinalCure Australia, is striving to remedy.

“Progress always boils down to funding,” says Wallace. “SpinalCure, Spinal Cord Injuries Australia and UTS are co-funding two fellowships – the first being for the lead researcher to work with Edgerton and Vissel on neuromodulation, and the second has a focus on stem cell research.”

The state-of-the-art facility currently being developed and built by UTS will house the new neuromodulation research, an adjacent human physiology and exercise facility, cutting-edge engineering and bioengineering facilities and, remarkably, a human lab dedicated to developing and testing Edgerton's technology on people with spinal cord injuries. There are also facilities for preclinical research, directed to investigate how the technology works, improve it and integrate the range of approaches to create a neuromodulation-led approach to solving spinal cord injury.

It's a world-first, and it's worth millions.

UTS is investing well in excess of \$2 million in equipment for the research, \$2.5 million in facilities and is underwriting \$2 million, minimum, in other funding for Project Edge. Now, they urgently need the funds to actually operate the programme.

“This is several million dollars' worth of output – there's more than \$2 million »



Above Chris Mackinnon, Head of Lloyds Australia, and Mark Senkevics, Head of Swiss Re Australia and NZ, made a call to action to the insurance industry to rally behind and support Project Edge.



Left to right: Mark Senkevics, Head of Swiss Re Australia and NZ, Chris Mackinnon, Head of Lloyds Australia, Duncan Wallace, CEO of SpinalCure Australia and Professor Bryce Vissel, Director of the new UTS CNRM, working together to rally support for Project Edge.

worth of equipment alone being purchased and thanks to the Nielsen Foundation, SpinalCure has been able to commit \$1 million towards this,” says Wallace.

“But neuromodulation is repeatedly showing results that have very real potential to offer us a safe and low-cost way of achieving profound improvements in people’s abilities and quality of life.

“A person injured today should not be told they will never walk again. There is every hope of significant recovery in the not-too-distant future with life-changing benefits in general health, independence and the ability to hold down a job.”

A CALL TO ARMS

Not being able to walk is just the tip of what’s known as the SCIceberg (spinal cord injury iceberg) when it comes to spinal cord injuries. Those diagnosed as either a paraplegic or quadriplegic can also experience a lack of bladder and bowel control, a compromised digestive system, a loss of sexual function and an inability to control core body temperature.

But already, neuromodulation has proven to have a positive effect on bladder and bowel control, cardiovascular function, autonomic control – blood pressure and core body temperature – and sexual function. It has helped paralysed people recover a basic grip movement, and some even to stand.

Each of these milestones has a profound

impact on an individual’s quality of life and ability to return to work, not to mention an overall reduction in rehospitalisation.

Such results would significantly alleviate the financial burden spinal cord injuries place on the Australian economy – which currently comes in at a cost of \$2 billion a year and is a responsibility shared by State and Federal Governments, individuals and the insurance industry.

Chris MacKinnon, Lloyds General Representative in Australia and Country Manager, says while helping to raise

“I would love to see as many insurance companies getting engaged as possible,” says Senkevics.

funds towards Edgerton’s research will undoubtedly have a huge impact on the industry in terms of risk mitigation and the potential reduced claims cost, it’s also just the right thing to do.

“For the industry to get behind this initiative has clear benefits from a financial point of view,” says MacKinnon. “But this is also our chance to show we actually care about these things and we will invest in them. We’re asking the industry to make a contribution towards the \$15 million funding target, not as a charitable donation, but actually as a risk mitigation investment.

“It’s fair to say that, most of the time, the insurance industry can be a highly-

competitive, somewhat cutthroat world. But what I’d love to see come out of this project is for the whole industry to get behind this initiative and really try to help make a difference to the lives of those with a spinal cord injury.

“Ultimately, what I’m looking forward to seeing is the catastrophic effects of a spinal cord injury confined to the history books.”

Mark Senkevics, Managing Director Swiss Re Australia and New Zealand, joins MacKinnon in a call to arms from the industry as a whole. “I would love to see as many insurance companies getting engaged as possible,” says Senkevics. “We play an important role in society and mitigating risk is what we do every day. Through Project Edge, there is enormous potential for us to get involved through funding and raising awareness.

“As an Australian I am concerned about the resilience of our country; as a parent, the resilience of my family; and as an insurance professional, the resilience of our industry. Such a medical breakthrough could mean so much for governments, insurers, but most importantly, for those living with a spinal cord injury.”

HERE’S TO HOPE

The remarkable individuals behind Project Edge are hopeful Australia’s first neuromodulation patients will begin treatment in the latter half of this year, with first results expected by mid 2019 – but the programme can only proceed subject to funding. And while they don’t consider neuromodulation to be a full cure in itself,

the integrated effort is a chance at a very real and revolutionary step towards changing the future of spinal cord injuries forever.

Emily James, in particular, can’t wait to see what’s in store.

“It would be fabulous to walk again – who wouldn’t want that? But at this point I would just love to get some hand function back and, as a result, some independence. That’s the biggest thing that gets taken away after a spinal cord injury, independence. That would make a huge difference not only physically, but mentally,” she says.

“This research gives hope to a lot of people. And, one day, I just hope to make myself a cup of tea.” ■