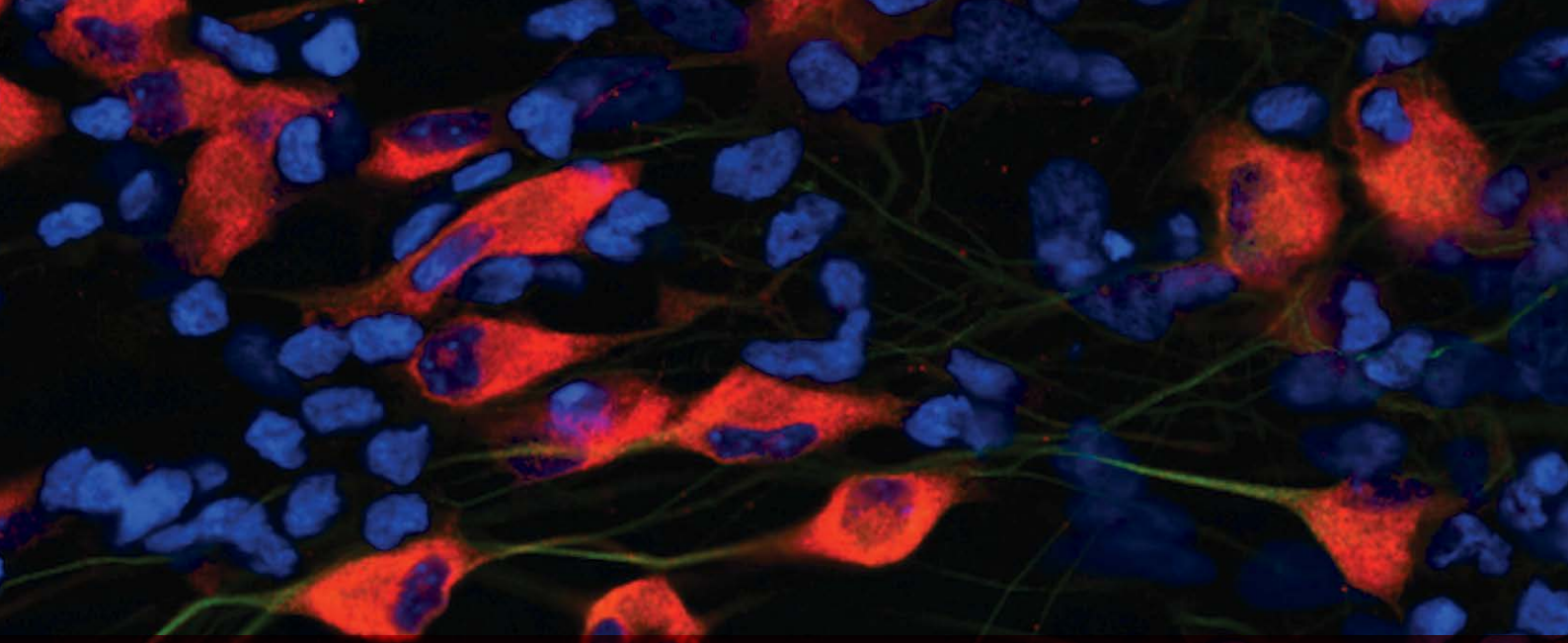

# Modelling brain circuitry

With the help of a revolutionary robot, Professor David Adams and Associate Professor Mirella Dottori are studying neurons, testing drug candidates for chronic pain, and working towards precise, personalised neurological treatment.

David has been studying the neurology of chronic pain, while Mirella is a neural stem cell expert. Based at the University of Wollongong, their collaboration focusses on cells called dorsal root ganglia sensory neurons. These cells sense pressure, temperature, position, touch and pain, and the duo believe they could hold the key to many neurological disorders including chronic pain.

**"We reached the limit of what we can discover in rat and mouse cells, so we needed to move into human cells."**

"Many diseases and disorders are caused by altered firing of signals along sensory nerves. Growing human sensory neurons [from stem cells] means we can study their development and function in both health and disease," says Mirella.

Electrical signals are converted to chemical signals and travel from one neuron to the next through membrane proteins called ion channels.

"Ion channels are a number one drug target in sensory neurons," David says.

Measuring electrical activity in neurons can help to understand how ion channels function, which in turn is expected to open up new avenues of treatment for neurological diseases and disorders.

David and Mirella are using a SynchroPatch 384PE robot which can measure the electrical activity of as many as 384 cells at a time.

"There are only a few of these robots worldwide and it's currently the most powerful way to study the activity of cells in real time. It not only measures responses to drugs, but also monitors and maps the activity of growing cells," David says.

This ability to monitor living cells is essential, Mirella says.

"We need to ensure that the sensory neurons we grow mimic real human tissue. The SynchroPatch helps us understand and validate these cells."

"I have been investigating chronic pain pathways in rodents for more than 20 years, but we have reached the limit of what we can discover in rat and mouse sensory neurons," David says. "The research needed to move into human cells, and that is where Mirella's expertise was vital."

"We see this as a two-way street," Mirella says. "David was moving into using human-derived cells, and I wanted to further test the functionality of the sensory neurons we generate from stem cells."

While Mirella and David are focussing on chronic pain for now, their larger goal is develop a platform to rapidly screen large numbers of drugs to deliver personalised treatments for people with neurological conditions.

"This technology is versatile," Mirella says. "It could be applied to most neurological conditions."