The MacDiarmid Institute
for Advanced Materials and Nanotechnology

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Neuromorphic Computing: A Computer Chip That Thinks Like The Brain

PhD scholarships in Physics in New Zealand

PhD Scholarships are available to work on brain-like (or "neuromorphic") computing using electronic devices that are self-assembled from nanoparticles (or "clusters"). We have recently shown that these complex networks of memristor-like elements have both brain-like structures and strongly correlated brain-like patterns of electrical signals. The main research goals of the project are to exploit these signals in order to implement on-chip computational processes such as pattern recognition and time series prediction. Projects are available that focus on each of

- Nanoscale physics in the devices
- Network properties / percolation theory
- Brain-like computation
- Computer simulations of the devices

This work builds on fifteen years of experience in building cluster-based electronic devices and is part of a project that has recently been funded by both New Zealand's Marsden Fund and the MacDiarmid Institute which is a national Centre of Research Excellence. The successful applicant will enjoy access to the extensive facilities and programs of the Institute. Scholarships are for 3 years and are worth approx. $33,000 per annum and include all student fees.

A successful candidate will have enthusiasm, a good honours or masters degree in physics (or related subject such as electrical engineering or computer science), and a desire to work in a multi-institutional, multi-disciplinary, collaborative environment.

Covid-19: New Zealand has recently announced that border restrictions will end in coming months, and so applications are encouraged from international students. Students who have NZ or Australian citizenship or residency should make this clear in their applications.

Please note that all applications must include:
- A full Curriculum Vitae, INCLUDING your University transcript (i.e. list of grades awarded).
- The names of at least two people who are prepared to act as referees.

Applications received before the **30 April 2022** will be given preference, and should be emailed to Simon.Brown@canterbury.ac.nz.

For further information go to:

https://www.canterbury.ac.nz/science/schools-and-departments/phys-chem/research/nano/

Recent Papers:

1. Acharya et al, 'Stochastic spiking behaviour in neuromorphic devices enables true random number generation', ACS Applied Materials and Interfaces **13**, 52861 (2021).
2. Pike et al, 'Atomic scale dynamics drive brain-like avalanches in percolating nanostructured networks', Nano Letters **20**, 3935 (2020).
3. Shirai et al, 'Long-range temporal correlations in scale-free neuromorphic networks', Network Neuroscience **4**, 432 (2020).
4. Mallinson et al, 'Avalanches and criticality in self-organised nanoscale networks', Science Advances **5**, eaaw8438 (2019).