

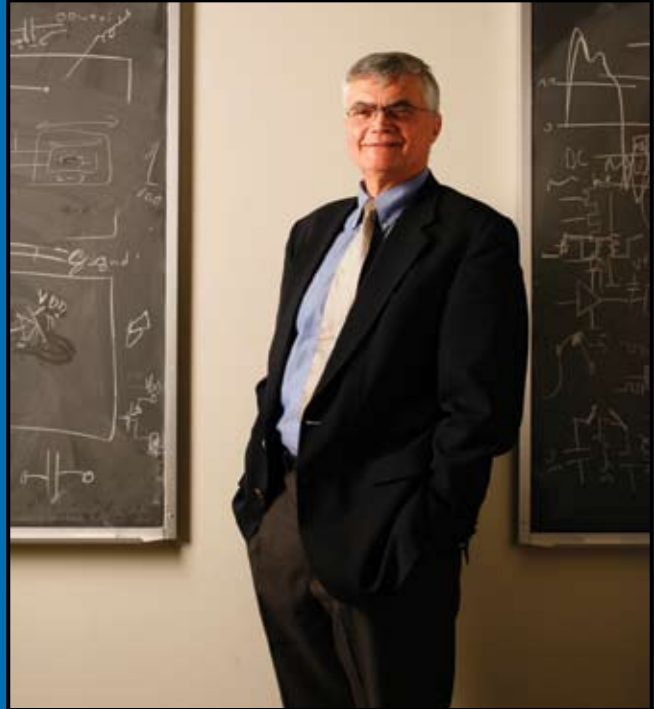


Improving our Understanding of the Complex Functions of the Human Brain and Repairing Damaged Nervous Tissue at the Micro-Scale Level

Three years ago, Canadian and German researchers achieved international acclaim by growing networks of interconnected brain cells on a special microchip, with 'memory capability' mirroring the function of a healthy human brain. Today, a University of Calgary team is investigating how this technology could be further developed and commercialized.

"We relied extensively on infrastructure provided by CMC Microsystems during this project. Access to design tools, brokering and design coordination for fabrication and packaging allowed us to develop a proof-of-concept prototype. It is the first chip of its kind ever built in Canada. It offers tremendous potential for future research in neurosciences."

Dr. Graham Jullien
iCORE Research Chair in Advanced
Technology Information Processing Systems
University of Calgary



Dr. Graham Jullien of the University of Calgary is collaborating with neurologists to develop a unique microchip that promises to improve our understanding of complex brain functions and enable new ways to repair neurological damage.

Neurological diseases such as schizophrenia, autism, cerebral palsy, Alzheimer's and Parkinson's disease affect millions of people each year. Dr. Graham Jullien and a research team at the University of Calgary are using tools and technologies provided by CMC Microsystems to accelerate the development of new technology that will make it possible to observe how individual brain cells communicate with each other. This research promises to improve our understanding of complex brain functions and help to repair damaged nervous tissue at the micro-scale level.

Dr. Jullien, iCORE Research Chair in Advanced Technology Information Processing Systems, working with a team of electrical engineers led by Dr. Lee Hartley. The team, which includes Dr. Yehya Ghallab, Dr. Ivars Finvers and Holly Pekau, is developing neural stimulators and sensors, together with the algorithms required to process information between different brain cells, using networks of neurons grown on a microelectronic wafer.

The group is working closely with CMC to design, fabricate and test their initial prototypes. The engineers are collaborating with Dr. Naweed Syed, Head of the Department of Cell Biology and Anatomy in the Faculty of Medicine, and his team of neurological scientists on the project.

"The international team that performed the initial research in this area worked directly with the chip maker on a custom process," explains Dr. Jullien. "This approach isn't feasible when you need to produce chips on a mass scale. By working with CMC, our team can experiment with different concepts and develop prototypes using commercial processes. We are using a proof-of-concept device to explore new techniques that are sensitive enough to monitor and track how neurons interact. This could help to improve our understanding of many neurological diseases and enable the development of new treatments."

Once developed, the microchip could be used by pharmaceutical companies to accelerate the discovery of new drugs or therapies for brain disorders. The team is working with Neurosilicon Inc., a spinoff company from the University of Calgary, to assess future commercialization of this technology. [cmc](#)