Faculty Research Project Profiles

Christopher Bidinosti (Physics) and Christopher Henry (Applied Computer Science)
High Performance Parallel Computing with Graphics Processing Units
Did you know computer gaming hardware recently was the cause of a revolution in the computational power of personal computers? Would you like to learn how to harness the computing power that was once only available in large supercomputers? Interested students can learn the skills to create high performance parallel computing applications that can execute on computer hardware ranging from laptops, to PCs, and all the way up to today's most powerful computing clusters. Better yet, these skills are in high demand in every sector of the job market. Examples include computational finance; climate, weather, and ocean modeling; data science and analytics; artificial intelligence; manufacturing and computer aided design; media and entertainment; medical imaging; and academic research of every kind. Join us to start learning this valuable skill!

Nora Casson, Environmental Studies and Sciences
Work in our lab investigates how human activities impact water quality of lakes, streams and wetlands. Current student projects include investigating impacts of climate change on carbon, nitrogen and phosphorus cycling in boreal forests, measuring rates of greenhouse gas emissions from urban and agricultural ponds and investigating changing nutrient dynamics in subarctic ponds. Our students gain hands-on experience working in the field, the lab or analyzing data while answering questions about how humans are impacting ecosystems. The P2GS student would assist with building and deploying field equipment either within Winnipeg or at a forested site near Kenora and processing soil and water samples in the lab.

Andrew Frey, Physics
An interested student will have the opportunity to use highly parallel, high-performance computing to simulate the formation of black holes in spacetimes relevant to string theory, the leading candidate for a theory of quantum gravity. The student will learn about string theory, general relativity, and scientific parallel computing while working in a collaborative research environment.

Blair Jamieson, Physics
Interested in learning more about the most weakly interacting particles of matter that have been detected? Come get your hand on some real neutrino interaction data that has been collected with the high intensity neutrino beam in Tokai Japan by Prof. Blair Jamieson. Neutrino's are an interesting particle to study because they have been found to quantum mechanically morph from one type to another as they travel through space. Students doing research with Jamieson's group learn about experimental particle physics, and have been involved in processing data, testing detector electronics, data acquisition, and simulation. Current possible projects include: building

a test stand and testing a Cerenkov detector; simulation of photomultiplier tube (PMT) test facility data; PMT test facility data collection at TRIUMF, Canada's national lab for particle physics; and developing a machine learning tool for water Cerenkov detector particle identification.

Jeff Martin, Physics

Ever wonder how an engine or a fridge works? Thermodynamics was invented in order to describe them mathematically. I'm developing a fridge to cool neutrons to a fraction of a degree above absolute zero. Let's learn how to design it, together, on a trip into the world of thermodynamics and cryogenic engineering.

Melanie Martin, Physics

As a physicist specializing in magnetic resonance imaging (MRI), I am developing a non-invasive empirical method to diagnose Alzheimer's disease, multiple sclerosis and other nervous system disorders earlier in the progression of the disease. I am also using MRI to follow the effectiveness of treatments over the course of time and to understand more about diseases. My program is multi-disciplinary. Students who work with me strengthen the skills they have and develop new skills in other disciplines. Projects include data analysis and collecting images using a 7T MRI. For more information see mri.uwinnipeg.ca.

Craig Willis, Biology

Tackling white-nose syndrome in endangered bats:

Disease-causing pathogens are increasingly recognized as a threat to wildlife populations and human activities can worsen the impacts of wildlife disease. My students and I conduct research to understand these impacts for white-nose syndrome (WNS), an invasive fungal disease of hibernating bats. In only 10 years since it was accidentally introduced to North America, WNS has caused the fastest declines of wild mammals in recorded history, killing millions of ecologically important insect-eating bats across the eastern half of the continent. Research projects in my lab involve field and laboratory experiments to understand how WNS affects physiology and behaviour of bats, and experiments testing potential mitigation strategies to help bat populations recover. Most opportunities in my group for summer 2018 would involve fieldwork throughout Manitoba and Northwestern Ontario testing potential treatments for WNS, identifying critical habitats of bats endangered by WNS, and testing the hypothesis that enhancement of summer habitat can help individuals and populations recover from the disease.

Tabitha Wood, Chemistry

This project involves performing research in the area of synthetic organic chemistry to add to the established research program in the Wood lab. The research will broaden our understanding of an organic rearrangement reaction and result in the preparation of new molecules. The reaction that is under investigation has potential to become a valuable tool in the preparation of useful molecules, such as pharmaceuticals, and conforms with the guidelines for Green Chemistry. The project includes investigating scientific literature, conducting a series of chemical synthesis experiments, analyzing the results with standard chemistry instruments, and documenting the experimental procedures and findings in a lab notebook.