

Department of Biological Sciences

Prospective USRA supervisors

Gary Anderson

Research interests: There are two components to my research program on the physiology of ancient fishes. In the first we are examining the impact of early rearing environment on how lake sturgeon develops. In the second we are exploring control of energy balance in sharks, skates and rays.

Kevin Campbell

Website: <https://home.cc.umanitoba.ca/~campbelk/>

Research interests: My research employs phylogenomic and physiological approaches to better understand the evolution of respiratory pigments (hemoglobin/myoglobin) of birds and mammals ranging from the smallest shrews to the largest whales, with a focus on protein function adaptive for subterranean and aquatic life and the thermal specializations of extinct cold-adapted species (e.g. woolly mammoth, woolly rhinoceros and Steller's sea cow). Additional research is centered on historical contingencies arising from the inactivation of protein coding genes in select mammalian lineages and their associations with evolutionary transitions apparent in the fossil record.

Gail Davoren

Research interests: – please visit my website for information.

<https://davorenlab.wixsite.com/research>

Jillian Detwiler

Website: <https://detwilerlab.weebly.com/>

Research interests: My lab investigates interactions between wildlife hosts and helminth parasites. Our main goals are to characterize host and parasite diversity of aquatic and terrestrial snails and their nematode and trematode parasites as well as explore how parasites alter the behavior of their hosts to increase the likelihood of transmission. We perform work in the field and lab and use a variety of morphometric, genetic, immunological, behavioural and statistical tools to pursue our research questions.

Margaret Docker

Research interests: My research uses environmental DNA (eDNA) to monitor fish and other aquatic species of conservation and management concern lends itself nicely to participation by undergraduate students during the summer. eDNA research would involve field work (collecting and filtering water samples) and lab work (DNA extraction, qPCR) and be part of a large Canada-wide eDNA project (see <https://www.genomeprairie.ca/news/gen-fish-harnesses->)

Kevin Fraser

Website: www.abclab.ca

Research interests: I lead the Avian Behaviour Conservation Lab. The lab uses new tracking technologies to investigate how migratory birds time and select their routes and how they respond to climate change.

Mark Fry

Research interests: My research program focuses on understanding neural circuits that regulate numerous aspects of homeostasis, including blood pressure and appetite. The lab uses molecular, biological and electrophysiological techniques to investigate how circulating signals regulate the electrical activity neurons in homeostasis control centres of the mammalian brain.

Darren Gillis

Research interests: My research focuses on relationships between fishing success, vessel movement, species selection and information exchange. My lab develop analyses and models that reflect fish harvester's behavior. These can be used to better interpret historical fisheries data and improve estimates of fish abundance.

Cale Gushulak

Website: <https://gushulaklab.weebly.com/>

Research interests: My lab examines how freshwater environments are changing in response to multiple anthropogenic stressors through time. The lab uses changes in biogeochemical markers (fossil algae, pigments, stable isotopes) preserved in lake sediments to reconstruct parameters of past lake environments including biological production, phytoplankton communities and water quality and quantity.

Ken Jeffries

Research interests: My lab examines the effects of environmental stress on aquatic organisms. We look at how climate change or pollution-related stressor affect gene expression in ectotherms in the lab and in the wild.

Az (Ashley) Klymiuk

Research interests: I study contemporary wetland ecosystems with the aim of better interpreting fossil wetland assemblages. Work in my lab includes both paleomycology (fossil fungi) and characterizing the diversity of endogenous fungi inhabiting the rooting structures of living wetland plants, using culture – and sequencing-based methods.

Jae-Hyeok Lee

I takes a deep (!) dive into the cell of *Chlamydomonas reinhardtii*, a free-living single-celled photosynthetic eukaryote, to address fundamental and practical questions under two themes. One contemplates the macro-scale evolutionary transitions from a simple cell to the diverse life forms on earth. The second aims to harness the full potential of cellular photosynthesis to mitigate the climate crisis due to greenhouse gas emissions. Do you want to join us in the quest into the nuts and bolts of the *Chlamydomonas* cell? You will witness how life on earth could stride toward extraordinary productivity and diversity. Follow the paper trail of our research for additional

information ([Visit my Google Scholar.](#))

Jeff Marcus

Website: <http://home.cc.umanitoba.ca/~marcus/>

Research interests: Our lab studies the evolution of butterfly species and the diversification of butterfly colour patterns using molecular tools and techniques. Recent work has employed next generation sequencing to reconstruct complete mitochondrial genome sequences, which have been used to reconstruct evolutionary trees and explore how these organelles evolve in response to high altitude conditions.

John Markham

Website: <https://www.researchgate.net/profile/John-Markham-2>

Research interests: I am interested in the species interactions in communities. In particular, I examine how carnivores and forest floor species affect resources distribution and modify plant communities.

Particia Ramey-Balci

Website: <https://rameybalcilab.wordpress.com/>

Research interests: The Ramey-Balci lab is interested in how physical and biological processes, both natural and anthropogenic, affect marine invertebrate species diversity, community structure and population dynamics over space and time. Research questions linking pattern with process are addressed by combining quantitative field studies with experiments. Topical areas: marine invasive crabs, behaviour, environmental change, benthic ecology, biodiversity and environmental health/biotic indices.

Sylvie Renault

Research interests: My research focus is to investigate the physiological and biochemical changes in plants associated with environmental stresses (salinity) and to determine how these changes can alter the plant responses to other stresses (insect herbivory).

Jason Treberg

Research interests: My group applies techniques used to study metabolism to better understand how animals respond or tolerate environmental change and challenges from the scale of electron transport to whole organismal adaptation. Opportunities for undergraduate researchers include i) mechanistic studies of mitochondrial reactive oxygen species metabolism and ii) the influence of temperature on biological energetics.

Byron Van Nest

Research interests: Please visit my website for information <http://vannestlab.com/>

Jane Waterman

Research interests: My research program focuses on the behavior and ecology of African ground Squirrels, particularly factors influencing the evolution of sociality and mating systems. More

recently the lab has started to examine changes in squirrel morphology, population ecology and behaviour due changing environmental conditions (climate change).

Dirk Weihrauch

Website: <https://dirkweihrauch.wixsite.com/thecrablab>

Research interests: Investigating mechanisms related to crucial acid-base regulatory mechanisms in aquatic and terrestrial invertebrates, including the tobacco hornworm *Manduca sexta*, horseshoe crabs, lobster, highly invasive green crabs and local endangered Northern crayfish. In our integrative approach, we look at physiology and gene expression changes in the animals' physiology and gene expression patterns, but we also characterize newly discovered transporters involved in the transport mechanism of acid-base equivalents in heterologous expression systems. A new topic is now also cellular pathways (for example PKA, PKG) that regulate transepithelial ammonia transports.

Steve Whyard

Research interests: Molecular genetics of insect development; Genetic basis of sex differentiation in insects; Insect olfaction; Biotechnologies to control pest insects; Biotechnologies to protect crop plants from pathogens; Gene silencing technologies; Gene editing technologies.

Olivia Wilkins

Research interests: The Wilkins lab studies climate change resilient plants. We use high throughput sequencing technologies to study functional genomic responses to stress in the field conditions.

Anne Worley

Website: <https://sci.umanitoba.ca/biological-sciences/profiles/anneworley/>

Research interest: Evolution and ecology of plant reproduction. 1) Pollination biology in the tall grass prairie, with a focus on rewardless Lady's slipper orchids. 2) Natural selection by diverse pollinators on subalpine herbs (genus *Polemonium*) in the Rocky Mountains

Lei Xing

Website: <https://www.xing-lab.com>

Research interests: My research program focuses on understanding how neural stem cells in the developing brain are regulated by signaling molecules derived from the placenta. We use molecular biology techniques and confocal microscopy to examine embryonic mouse brains and human cerebral organoids, under physiological and pathological conditions.