VERNA J. KIRKNESS
EDUCATION FOUNDATION

Please note: As Mentors are still sending in their program blurbs, **this is NOT a complete list of mentor projects for our 2023 program.** Our program will be at 6 universities with projects areas in pure and applied science, technology, engineering and mathematics.

This list will be updated as blurbs are submitted for this year's program.

2023 Verna J. Kirkness Education Foundation Program

The University of British Columbia

May 28th–June 2nd, 2023

Are you curious about what VJKF Programs will be offered at The University of British Columbia? Attached are only a few of the projects that will be offered through the VJKF UBC Program week! Take a sneak peek at what some of our UBC Mentors are offering as projects this year!

Quantitative Analysis of Acetylsalicylic Acid (Aspirin) from Tablets by Spectrophotometric Analysis

adMare BioInnovations

In addition to the active drug, medicines contain other inactive ingredients that are important for the stability and storage of the drug, help with absorption in the body, and more. These include binders, fillers, dyes, drying agents, etc. The amount of active pharmaceutical ingredient in a tablet will always be stated on the package insert. In this experiment we will use spectrophotometric analysis to determine the percentage of active compound in a commercially available aspirin tablet.

Understanding the Fundamentals of Cell Culture

adMare BioInnovations

Cell culture is an essential technique in life sciences from basic research through to vaccine and therapeutics development. Students will learn how to grow cancer cell lines in a culture dish and in the process learn about how and why we study cell lines, how they are used to better understand biology and disease, and how they are used to develop new therapies to treat diseases. Laboratory lessons will focus on important elements of cell culture, including aseptic techniques, culture conditions, and microscopy to observe and monitor the morphology, health, and growth of cells.

Let it Glow - Designing Light-Emitting Materials

Zac Hudson

Zac Hudson's research group designs new materials that emit light. These luminescent molecules can be used to create the colours you see in the display of your mobile phone, to visualize living cells and tissues with powerful microscopes, or even to power chemical reactions using light. In Dr. Hudson's research group, you will learn how light-emitting molecules are designed, prepared using chemical reactions, and used in the electronics, life sciences, and pharmaceutical industries. To learn more, visit our website at hudsonlab.ca.

Plastics are Out, Biopolymers are In

Parisa Mehrkhodavandi

Parisa Mehrkhodavandi's research group designs new biodegradable and bio-based materials using metal-based catalysts. There is a real and growing problem with plastic waste in the environment, and our group is hoping to replace some of these materials with biodegradable and bio-based alternatives. In our group, you will learn how we design catalysts for this process, and get a chance to synthesize and characterize biodegradable polymers.
To learn more, visit our website at https://www.chem.ubc.ca/parisa-mehrkhodavandi.

Building Enzymes from the Ground Up

Harry Brumer

In Harry Brumer's laboratory, dig deeper into the way nature's biological catalysis - enzymes - transform carbohydrates and other organic molecules in biological systems. In this lab, you will learn about molecular biology, protein production, biochemistry, and analytical chemistry while gaining university level skills in electrophoresis, microbial cultures, protein chromatography, spectrophotometry, and nuclear magnetic resonance spectroscopy. Using these skills, you will produce a recently discovered enzyme and use it in a biocatalytic reaction to make a valuable flavor and fragrance molecule. The project will demonstrate how we can learn from nature's diversity to develop new, environmentally considerate biotechnology to make materials that improve our lives.

Designing Nature-Inspired Materials

Mark MacLachlan

Mark MacLachlan's research group makes new materials for a range of applications, including oil spill recovery, alternative energy and chemical sensing. One major area of research is developing materials for chemical sensing and displays based on architectures that mimic colourful structures found in nature, including butterfly wings and beetle shells. In Dr. MacLachlan's group, you will learn how we synthesize new molecules and materials, and characterize them to identify them and study their structures. For more information, visit our website at https://groups.chem.ubc.ca/maclachlan/.

Enzyme Engineers

Katherine Ryan

Katherine Ryan's research group studies how natural products like antibiotics are assembled in bacteria, fungi, and plants. The group employs a wide range of techniques, ranging from genome sequencing to macromolecular X-ray crystallography to synthetic chemistry. In the Ryan group, you will learn about molecular biology, protein purification, and chemical analysis.
To learn more, visit our website at https://blogs.ubc.ca/ksryan/

Nanomedicine at Home: Developing Smartphone-based Biomedical Tools

Russ Algar

Russ Algar's research group develops light-emitting nanoparticles as next-generation tools for biomedical research and health care. These nanoparticles are used to create fluorescent sensors for molecules that indicate health and disease, and are paired with low-cost and portable smartphone-based devices. Such devices can be used all around the world—even in communities that don't have medical labs. In Prof. Algar's research group, you will learn how nanoparticles and devices are designed and integrated for biological analysis.
Visit https://groups.chem.ubc.ca/algar/ for more information.

Imaging Single Molecules

Sarah Burke

The Laboratory for Atomic Imaging Research (LAIR) led by Prof. Burke of Chemistry and Physics & Astronomy, and Prof. Bonn of Physics & Astronomy, uses Scanning Probe Microscopy to probe molecules at the atomic scale. Combined with a range of spectroscopies, these techniques allow us to understand the behaviour of materials from organic semiconductors like those used in solar cells and light emitting diodes to superconductors. You will see the ultrahigh vacuum and cryogenic instruments used to study and take pictures of individual molecules, and experience how we collaborate with other scientists that create new materials to predict new properties.

Where There's Smoke, There's Chemistry: Investigating Atmospheric Aerosols

Allan Bertram

Allan Bertram's research group studies important properties of atmospheric aerosol particles. Atmospheric aerosol particles are tiny (smaller than the thickness of a human hair) but they can strongly influence Earth's climate. They also cause respiratory and cardiovascular disease and result in millions of premature deaths yearly. In the Bertram research group, you will learn about these aerosol particles and investigate their chemical and physical properties. To learn more, visit https://bertram.chem.ubc.ca/.

Additional exciting program blurbs are coming for the faculties of Engineering, Land and Foods, Science and more! Stay tuned for program updates to this form.

University of Manitoba

May 7th–May 12th, 2023

Are you curious about what VJKF Programs will be offered at the University of Manitoba? Attached are only a few of the projects that will be offered through the VJKF UOFM Program week! Take a sneak peek at what some of our UOFM Mentors are offering as projects this year!

Migratory Landbirds - Biological Sciences

Kevin Fraser

The Avian Behaviour and Conservation lab in the Department of Biological Sciences conducts research focused on the movements and timing of long-distance migratory landbirds. Students enrolled in the Verna J. Kirkness Program would join our spring-summer field research team and visit local breeding colonies of the purple martin – a songbird species that migrates 10, 000 km between the Brazilian Amazon and Manitoba. Students will learn avian research techniques as they help to observe, capture, band, monitor nests, and collect GPS tracking devices the birds have carried over the past year.

Parasitism and DNA Sequencing - Biological Sciences

Jillian Detwiler

Did you know that parasitism is THE most common symbiosis on Earth? This lifestyle occurs throughout the tree of life and has a profound influence on health, economics, politics, and the environment. In this lab, you will learn more about the diversity of parasites that are relevant to human and animal health. Although parasitism has serious negative consequences, you will also learn about how parasites can be used to assess ecosystem health. To illustrate this concept, you will get hands-on training in a variety of skills including aquatic field sampling, necropsies, microscopy, and parasite identification using morphology as well as DNA sequencing. Our goal is to help you appreciate parasitism's place in nature while providing some training in parasitological skills.

Plant-fungal Interactions - Biological Sciences

Az Klymiuk

The Klymiuk Lab focusses on plant-fungal interactions, often in wetland settings. Plant-fungal interactions can range from symbioses, where both plants and fungi benefit from living in intimate association with one another and exchanging resources, to parasitic or pathogenic interactions, where fungi diminish plant health. During your week in the Klymiuk Lab, you will explore the diversity of fungi living within plant tissues using culturing approaches.

Cosmic Rays and the Aurora - Physics and Astronomy

Juliette Mammei

Have you ever wondered, “What are we made of?” In this lab you will learn about the most fundamental particles that we are made of, in fact, what “everything” is made of! You will also learn about the forces that determine how these particles interact with each other. You will learn about how we see things that are so small, or so far away, that we can’t see them with our eyes alone. During the week you will measure the charge and mass of an electron, test the effectiveness of radiation shielding, and more – ending the week by building a detector that will allow you to see cosmic ray tracks! You will learn how fundamental particles affect our lives from radiation and its effects to the difference between cosmic rays and the aurora.

Antibiotic Resistance in Bacteria - Microbiology

Ayush Kumar

Antibiotic resistance is a global health problem that resulted in the death of more than 1.2 million people in 2019. By 2050, antibiotic resistant infections are expected to kill 10 million people every year. Therefore, there is an urgent need to address this problem. In our laboratory, we study the mechanisms of antibiotic resistance in bacteria with a long term goal generating knowledge that can be used to design approaches that can help treat antibiotic resistant infections. During your stay in our laboratory, you will learn about antibiotic resistance in bacteria. You will also carry out experiments to understand how bacteria exchange antibiotic resistant genes.

Baking a Better Bread - Agricultural and Food Sciences

Dr Cristina Rosell

Would you like to design a new food product? Or learn how to develop different foods from grains or pulses. Join us in our lab where we will guide you through the steps that go into creating healthy and nutritious food products. You will learn how to analyze what is in the market and how to select a target food. We will show you how to mill grains or pulses into flour and how those flours have different characteristics. Together, we will explore the science behind dough-making and learn about the equipment used to analyze dough properties. And finally, you will have a chance to put your hands into the dough to make bakery goods, like bread or cakes. Learn about grains and pulses while having fun!

Foods for Health - Agricultural and Food Sciences

Dr Harold Aukema

Students will be hosted by a team of researchers at the Canadian Centre for Agri-Food Research in Health and Medicine (CCARM), dedicated to investigating and understanding the potential health-related benefits found in nutraceuticals, functional foods, and natural health products (health food). Students will experience lab procedures and see what graduate students do. For example, they could do a protein assay, or prepare samples for nuclear magnetic resonance or Mass Spectrometry analysis and learn about the concepts of repeatability, precision, and accuracy. They will also shadow graduate students, learn how nutrition works in relation to disease states (e.g diabetes, brain damage with Fetal Alcohol Spectrum Disorders), and learn how functional vegetables are developed with high agricultural technology.

Farm to Fork: A Sustainable Agriculture Journey - Agricultural and Food Sciences

Dr Joanne Thiessen-Martens

We all depend on the land for food. In sustainable agriculture, our goal is to provide healthy and abundant food to people while protecting our ecosystems and environment. This week-long journey will introduce students to research in many parts of food production systems. Beginning in the field, we will observe agricultural and natural landscapes, collect samples of soil, and learn how drones can provide information on how to use the land sustainably. Back in the lab, students will analyze several important soil properties and discover how these characteristics affect crops and the environment. We will then learn about how grain crops are made into the foods we eat and how they are transported to where they need to go. Students will even have a chance to bake some delicious treats! Linking it all together, we will discuss how each part of the agricultural production system connects to our everyday life as researchers and citizens.

Healthy Animals, Healthy Farms - Agricultural and Food Sciences

Dr Meagan King

Join Meagan King and her graduate students to learn more about animal health and welfare. First, students will learn about the connection between farm management and dairy farmer mental health to cow health and welfare. At the University’s Glenlea Research Station in the dairy barn, students will learn about how researchers are using an indoor GPS system to monitor cow behaviour and movement, to one day use machine learning algorithms to detect even the earliest signs of sickness in cows. Participating students can also visit the pig and chicken barns at Glenlea if they are interested. As well, one of Meagan’s graduate student’s will share their research that is looking at reducing piglet stress during the weaning process.

Losing ground – how soil erosion works - Agricultural and Food Sciences

Dr David Lobb

Exciting new opportunities are available for Indigenous students interested in understanding soil erosion and sedimentation within the land and waters of Indigenous communities in Manitoba. Students will work with scientists and community members to design and carry out research studies. They will be trained in making observations in the field, using sampling equipment and handling samples, making measurements in the field and in the laboratory, and analyzing data and presenting results. Specifically, students will participate in the assessments of soil erosion on the land, assessments of sedimentation rates in waterbodies, and the sourcing and tracking of sediments within waterways, all using environmental radioisotopes and other complementary methods.

Chemistry

John Sorensen

Chemistry magic show!