

FACULTY OF SCIENCE

at the forefront of
innovation and discovery



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Note: The Faculty of Science also has adjunct faculty members with wide-ranging experience.

Please consult individual departmental websites for more information.

upei.ca/science

BIOLOGY



Dr. Tracy Doucette

Dr. Doucette and two UPEI researchers were awarded a United States patent for creating an animal model to understand changes in brain development and function that lead to seizures in epilepsy, a disorder that affects more than 50 million people worldwide. Her research focuses on the role of kainate receptors in learning, memory, and neurobehavioural development.

Dr. Donna Giberson

Dr. Giberson is a freshwater ecologist who works in the Maritimes and the Canadian Arctic. She conducts research on the life history, diversity, habitat patterns of aquatic insects, and the effects of natural and human-caused disturbance on streams. She works with local community groups on stream projects.

Prof. Daryl Guignon (retired)

Professor Guignon, U.P.E.I. Community Environmental Liaison works closely with university staff, provincial and federal government agencies, watershed groups and landowners to address environmental issues on Prince Edward Island. He plays an active role in formulating strategies to deal with environmental problems in a practical and effective manner.

Dr. Lawrence Hale

Dr. Hale has a research focus on the molecular evolutionary genetics of insects, specifically fruit flies. He uses genetic analysis to better understand the macro- and micro-evolutionary histories of various insect species.

Dr. Natacha Hogan

Dr. Hogan's research focuses on the physiology and aquatic toxicology of amphibians and fishes. She is interested in how hormone pathways interact to direct processes such as metamorphosis and reproduction. She uses this knowledge to understand how environmental stress, particularly contaminant exposure, impacts animal health.

Dr. Robert Hurta

Dr. Hurta, a molecular/cellular biologist, conducts research on gene expression and regulation relevant to vascular and cancer cell biology. He investigates the effects of compounds from plant and marine sources on cancer cell and vascular smooth muscle cell behaviours and the possible chemopreventative and chemoprotective properties of these compounds.

Dr. James Kemp

Dr. Kemp's research involves pollination and floral morphology. He initiated and co-lead a project involving wild roses as an alternative crop for bioactive compounds in Atlantic Canada. His work also involves pesticides and the decline of honey bees in Atlantic Canada.

Dr. Christian Lacroix

Dr. Lacroix, dean of Science, researches plant structures from a developmental perspective. His research highlights relationships between morphologically different structures that share similar developmental pathways. His current research interests include leaf complexity in seed-bearing plants, developmental aspects of floral organ identity, and the biology of the Gulf of St. Lawrence Aster.

Dr. Pedro Quijón

Dr. Quijón researches estuarine and marine benthic ecology, with a focus on predator-prey (crab-clam) interactions, animal-sediment relationships, marine biodiversity, and invasive species. His research may lead to a better understanding of the natural history of our coastal habitats and the impact of different sources of disturbance on these habitats.

Dr. Karen Samis

Dr. Samis is an evolutionary ecologist interested in local adaptation in plants. Her research uses molecular, genetic and ecological techniques to understand the geographic and evolutionary factors that define the limits to species' distributions.

Dr. Marina Silva-Opps

Dr. Silva-Opps, a terrestrial ecologist, investigates how landscape structure, including habitat fragmentation caused largely by human activity, affects the abundance, diversity, and movement of mammals, birds, and amphibians. She also examines the ecological role of body size and how this morphological characteristic relates to the abundance, energy use, and movement of animal species.

Dr. Marva Sweeney-Nixon

Cardiovascular disease disables or kills more Canadians than any other disease, and up to 50,000 strokes occur in Canada each year. Dr. Sweeney-Nixon is working to change this. She researches the neuroprotective and anti-inflammatory effects of bioactives, extracted from blueberries and cranberries, on atherosclerosis, blood pressure, and stroke severity.

Dr. Kevin Teather

Dr. Teather is a behavioural ecologist interested in the effects of current land use practices on vertebrates. His primary focus is the impact of agricultural activity on individuals, populations, and communities of fish.

Dr. Michael van den Heuvel

Dr. van den Heuvel, Canada Research Chair in Watershed Ecological Integrity, studies the effects of agriculture and chemical use on freshwater and coastal environments. His focus is the endocrine responses, immunotoxicology, and population health of fish. He is working to develop methods and solutions to best monitor environmental problems and better protect rivers in Prince Edward Island.

Biology Department contact:
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upei.ca/biology

ENVIRONMENTAL STUDIES



Dr. Carolyn Peach Brown

Dr. Peach Brown is the director of Environmental Studies at UPEI. Her research interests include environmental governance, community-based resource management, international development, sustainable livelihoods and community resilience in a changing world. She has research projects in the Congo Basin rainforest of central Africa, and the forests of Canada.

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CHEMISTRY



Dr. Rabin Bissessur

Dr. Bissessur's research includes the development of nanocomposites for use in lithium rechargeable batteries like those found in cell phones. He also studies the use of specific types of nanocomposite to help remove sulphur from petroleum products which would lead to lower processing costs and reduce sulphur oxide emissions into the environment.

Dr. Nola Etkin

Dr. Etkin researches the preparation of new types of metal-containing compound that can be used as catalysts for industrial processes, such as olefin polymerization—the making of plastics. Her research targets specialty application plastics, including those that are strong or have high melting points. She is also interested in the synthesis of medically important compounds.

Dr. Russell Kerr

Dr. Kerr, Canada Research Chair in Marine Natural Products, works to discover sources of therapeutic agents from marine organisms. Within his drug discovery program, he aims to develop inexpensive and ecologically sound production methods of drugs or drug leads to fight, for example, inflammation and cancer.

Dr. Barry Linkletter

Dr. Linkletter works to better understand and synthesize molecules that will interact and associate with four-stranded DNA, a novel DNA structure. These stabilizing molecules are candidates for drugs that regulate cell proliferation and may find a use in cancer therapy and genetic research.

Dr. Michael T. H. Liu, Professor Emeritus

Dr. Liu's recent research traps carbenes with fullerenes such as C_{60} and C_{82} . He incorporates metal atoms into these carbon structures to obtain a new family of carbon clusters like the carbon nanotube—a capsule-shaped structure that has potential application in drug delivery.

Dr. Jason Pearson

Dr. Pearson is a computational chemist whose work is focused on the understanding of inter- and intra-molecular interactions and how they affect chemical properties as well as chemical reactivity. To accomplish this, his group uses and develops quantum chemical methods and software for electronic structure prediction and analysis.

Dr. Michael Shaver

Dr. Shaver, an organometallic chemist with a “green” focus, works to exchange toxic reagents for non-toxic alternatives, to perform “green” reactions without solvents to eliminate the release of toxic chemicals, and to replace petroleum-based products with renewable feedstocks (raw materials) with the help of metal catalysts.

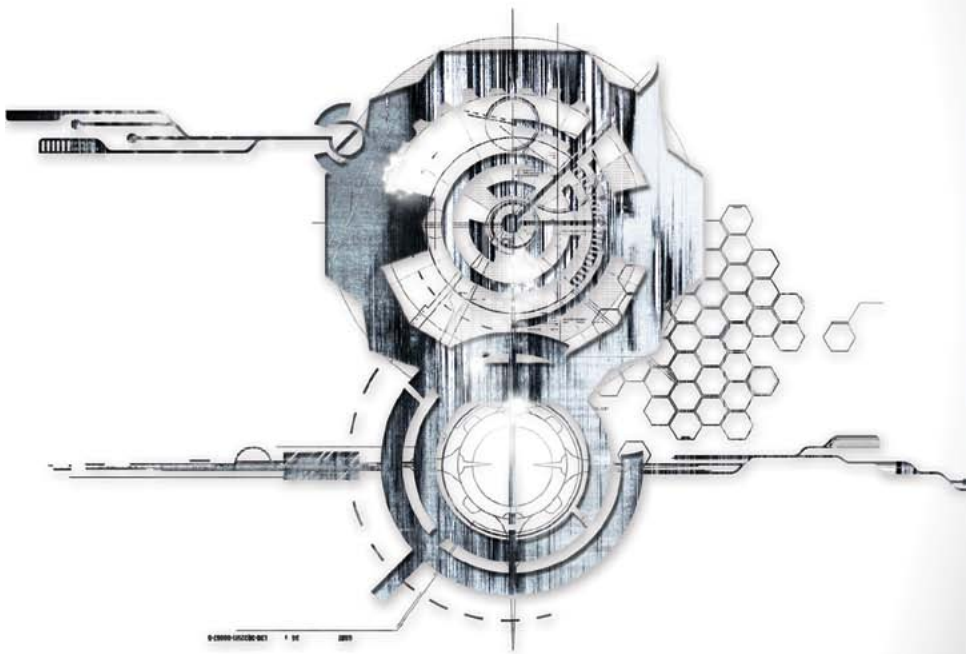
Dr. Brian Wagner

Dr. Wagner researches the ability of large, hollow, cage-like “host” molecules to encapsulate other small “guest” molecules. This often increases the fluorescence, or the ability to emit light, of the guests. Real-world applications include enhanced trace analysis of pesticides and the design of molecular sensors.

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COMPUTER SCIENCE AND INFORMATION TECHNOLOGY



Dr. Cezar Campeanu

Dr. Campeanu researches the theory of computing and works to describe efficiently a complex object by providing consistent information and eliminating redundancies. This philosophy, to compress information, carries through to his investigations into languages which may result in improved software packages that could be written faster and with fewer errors.

Professor Wayne Cutcliffe

Professor Cutcliffe, director of Co-operative Education for Computer Science, has research interests that encompass algorithm design, computing theory, compiler design, and programming paradigms such as object-oriented, functional, and logic languages. A recent focus of his research is databases.

Dr. Stephen Howard

Dr. Howard works to automate the management of distributed computing systems and, recently, has developed an interest in wireless sensor networks. These networks consist of motes, small sensing devices whose tiny size and need for energy efficiency are forcing researchers to rethink traditional approaches to hardware, software, and network design.

Dr. David LeBlanc

With a recent focus on cross-cultural interface design, Dr. LeBlanc is working to understand how different cultural groups approach, and learn from, various human-computer interfaces such as websites, office software, and computer games. Ultimately, his research may lead to the development of a system that automatically translates such interfaces from one culturally based design to another.

Dr. Yingwei Wang

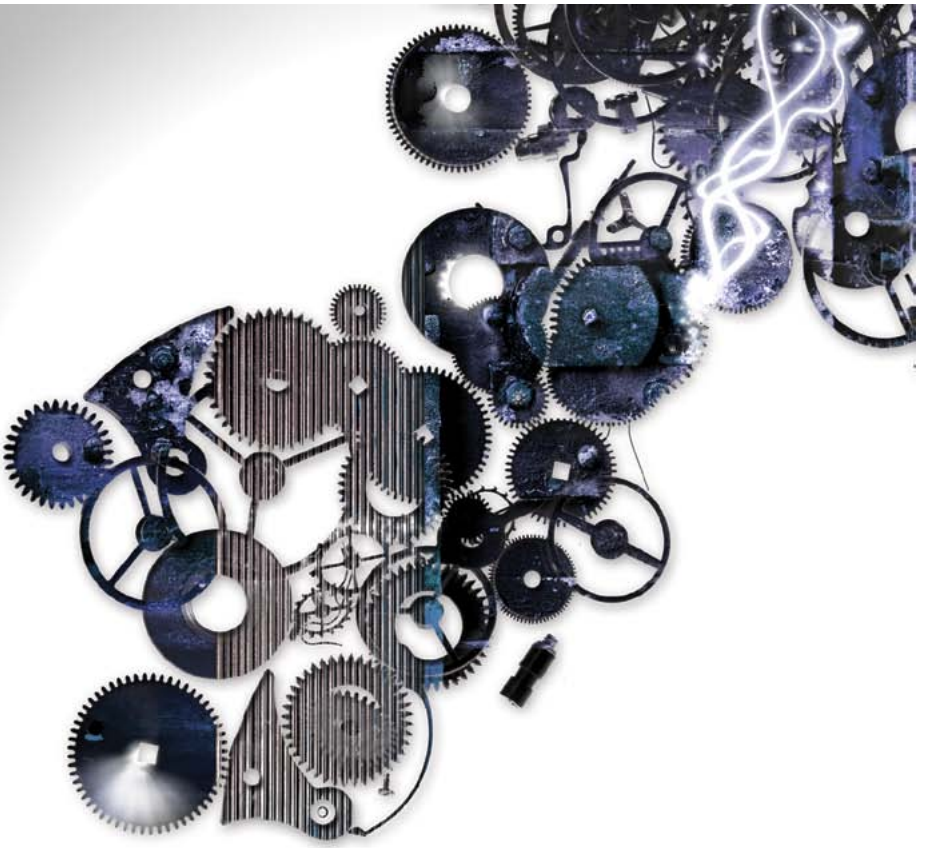
Conducting research in the field of bioinformatics, Dr. Wang explores the visual representation of DNA, specifically the method known as Chaos Game Representation. This method is useful in researching very long sequences of DNA, including entire genomes.

Dr. Qiang Ye

Dr. Ye researches communication networks, specifically protocol modelling and evaluation. He developed probing and pacing mechanisms to improve Transmission Control Protocol resilience and applied Petri nets to analyze the changed protocol. He also works on resilience mechanisms for the Internet and wireless networks.

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ENGINEERING

Professor Stephen Champion

Professor Champion is a civil engineer specializing in engineering design, construction engineering, and project management. He is investigating the applicability of a systems- and capability-based performance approach to demonstrate the effectiveness of problem-based learning in engineering education.

Professor Donald MacEwen

Professor MacEwen researches historical and modern ethical frameworks related to the professional practice of engineering. He works to increase understanding of the ethical dimension of engineering, focusing on communication, project management, and safety engineering skills. Such knowledge is key to understanding the causes of engineering disasters.

Dr. Wayne Peters

Dr. Peters is a mechanical engineer with a research background in fluid mechanics and hydraulics. Focusing on aquaculture, he works to improve water quality and production methods through optimizing the operation and design of water recirculation technology for fish production.

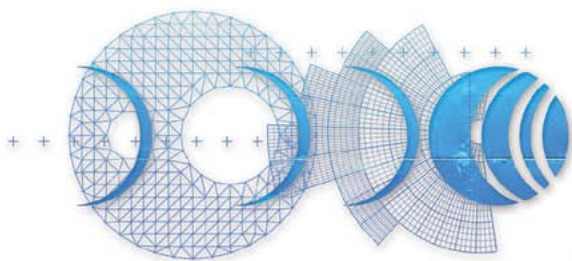
Dr. Andrew Trivett

With a background in oceanographic engineering, including the development of exhaust scrubbers for ship engines, Dr. Trivett's research continues to centre on pollution control. Through his investigations into solutions to the overgrowth of sea lettuce in coastal areas, he is working on the sustainable harvest of sea lettuce as a source of marine fuel.

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PHYSICS



Dr. Douglas Dahn

Dr. Dahn's research focuses on experimental materials science, scanning-probe microscopy, and instrumentation and measurement technologies. Collaborating with UPEI chemists, he is investigating the properties of materials that may be useful in rechargeable batteries. He also works on an innovative approach to automatically detect and monitor insects, using electrical capacitance.

Dr. Derek Lawther

Dr. Lawther, an experimental physicist, uses positron annihilation to identify defects in materials such as metals. He probes for defects at the atomic level and works to better understand how to manipulate these defects to produce enhanced physical properties such as increased strength or conductivity. He is also the director of Co-operative Education for Physics.

Dr. Sheldon Opps

Dr. Opps is a theoretical physicist who uses analytical and computational tools to investigate the properties of polymeric systems, including polypeptides, liquid crystals, and bilayer membranes. He has also adopted these tools to study the effects of habitat fragmentation on animal movement patterns in Prince Edward Island.

Dr. James Polson

Dr. Polson uses computer simulations and analytical theoretical methods to study the physical properties of polymers in solution. Recently, his research has focused on the effects of solvent on the polymer-collapse transition. The knowledge gained from this work could contribute to our understanding of the related process of protein folding, which in turn could lead to advances in health sciences.

Dr. Bill Whelan

Dr. Whelan, Canada Research Chair in the Physics of Biomedical Optics, works to develop minimally invasive technologies that use light and sound to deliver, monitor, and assess cancer treatments—with a focus on prostate cancer. Combining his optical-monitoring research with acoustics, he leads the way in the emerging medical imaging field of optoacoustics.

Physics Department contact:
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FAMILY AND NUTRITIONAL SCIENCES



Dr. Kathy Gottschall-Pass

Dr. Gottschall-Pass researches the food components and nutritional factors that help prevent disease, specifically anti-inflammatory and antioxidant compounds. Focusing on antioxidant-laden foods such as fruit and vegetables, she also works to understand why people eat the way they do.

Dr. Dany MacDonald

Dr. MacDonald's research interests are in positive youth development through sport. More specifically, he is interested in understanding which characteristics of youth sport programs are most effective in fostering positive personal development.

Dr. Debbie MacLellan

Dr. MacLellan, director of the Dietetics Internship Program and past chair of the Dietitians of Canada, leads a research program that works to understand factors influencing nutrition knowledge and eating behaviours in adolescents and adults. She also conducts research in the area of professional standards and dietetics education.

Dr. Carolanne Nelson

Dr. Nelson conducts research on gene-nutrient interactions, specifically those associated with diabetes and cardiovascular diseases. She also studies nutrients such as omega-3 fatty acids, plant-derived antioxidants, and anti-inflammatory compounds, and is particularly interested in the potential to develop nutraceutical products with bioactives found in marine algae and rosehips.

Dr. Jennifer Taylor

Dr. Taylor's research describes nutrition concerns in children and adults and the nature of food environments in Prince Edward Island schools. She researches the effectiveness of school nutrition policies in improving children's diet and health. Dr. Taylor helped create, and is chair of, the PEI Healthy Eating Alliance, which works to improve children's eating habits.

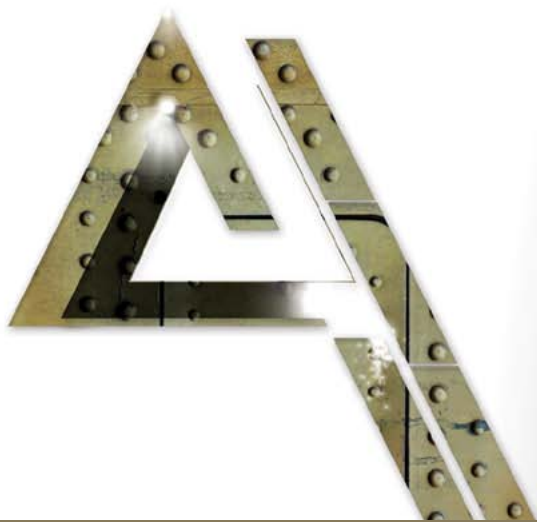
Dr. Lori Weeks

Dr. Weeks specializes in gerontology focusing on housing and long-term care for seniors, injury prevention and health promotion, and family gerontology. Increasing lifespans, combined with a large baby-boom cohort, underlie her interest in ensuring there are adequate care and support services for seniors and their caregivers.

Family & Nutritional
Sciences Department contact:
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MATHEMATICS AND STATISTICS



Dr. Maxim R. Burke

Through mathematical logic, Dr. Burke investigates whether a problem is solvable using techniques extending the classical work of Kurt Gödel and Paul J. Cohen. Within measure theory he studies quantities related to areas and volumes, and his research in general topology examines notions of nearness and continuous transformations.

Dr. Shannon Fitzpatrick

Dr. Fitzpatrick, a graph theorist, uses points (vertices) connected by lines (edges) to model relationships focusing on pursuit games and searching graphs. She works to find the most efficient search techniques for particular classes of graphs. Graph theory has many applications; for example, it could explain how a computer virus is spread.

Dr. David Horrocks

Dr. Horrocks works to develop fundamental mathematics. He researches a branch of mathematics known as combinatorics, with a focus on graph theory, partially ordered sets, and game theory. He has a particular interest in game theory, which is concerned with the mathematical analysis of two-player games, such as chess.

Dr. Shafiqul Islam

Dr. Islam investigates the long-term behaviour of mathematical models of real-life phenomena arising in the natural sciences such as physics, mathematics, finance, and biology. In particular, he is interested in random dynamical systems, Ergodic Theory, invariant measures, fractals, chaos theory, entropy, and numerical simulations.

Dr. Sami Khedhiri

Dr. Khedhiri has been working on time series analysis with particular interest in cointegration and vector autoregression modelling. He has proposed an alternative statistical testing procedure to detect structural change in time series. The method is based on rolling subsample estimates of the mean of the time series and he used Monte Carlo simulation analysis to show that this test is more powerful than the fluctuation test and the Lagrange Multiplier test in detecting multiple structural breaks. Current research work is focused on panel cointegration tests and panel VAR estimation.

Dr. Gordon MacDonald

Dr. MacDonald works to better understand collections of matrices or operators, specifically their properties and structure. With widespread applications in all the disciplines of science, matrices are arrays of numbers and realizations of linear transformations that act on finite-dimensional spaces while operators are the infinite-dimensional analogues of matrices.

Dr. Nasser Saad

Dr. Saad's research focuses on Special Functions and the asymptotic iteration method and their applications within Mathematical Physics. Special functions can arise in search of solutions to differential equations. The asymptotic iteration method has applications in quantum mechanics and is a technique he introduced in collaboration with Hakan Çiftci (Ankara, Turkey) and Richard Hall (Montreal, Canada).

Dr. Ken Sulston

Dr. Sulston, an applied mathematics researcher, develops and uses new mathematical models to better understand the electronic structure of different solid materials; in particular, quasi-crystals. His theoretical work may also predict new features of these materials. Through his interest in the emerging field of nanotechnology, he also investigates the molecular electronics of nanostructures.

Dr. Lowell Sweet (retired)

Dr. Sweet, an abstract mathematician, researches linear algebra theory and specializes in new ways to multiply vectors, which could have applications in physics as well as electrical and mechanical engineering. Specifically, he investigates ways to generalize the vector cross product that is a common mathematical construction in three dimensions for real numbers.

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