

Introduction

The University of New Brunswick is the province's largest university. Home to an educational and research network with 230 years of history, it maintains two main campuses located in Fredericton and Saint John. More than half of the province's university students move through the two main campuses annually; several thousand more take advantage of distance education and programs at partner campuses around the world. Students are encouraged to get involved in UNB research at the undergraduate and graduate levels, and are mentored by outstanding faculty and researchers.

As the country's oldest English-language university, we are committed to being one of Canada's finest universities by providing exceptional educational and research opportunities. As a comprehensive university, and the premier research institute in New Brunswick – responsible for 75% of publicly funded research – we pride ourselves on embracing and supporting all aspects of research and related scholarly activity in the pursuit and advancement of knowledge. This rich environment provides a stimulus for our vibrant and growing undergraduate and graduate programs to support research efforts. We also offer one of the largest interdisciplinary research programs in Canada.

The overarching goal stated in the University's strategic plan is "to be the best teaching and learning institution in Canada, balancing and integrating excellence in education and research". In support of our goal, the Strategic Research Plan (SRP) is an institutional plan that has been informed by campus, faculty, and departmental/school plans as well as individual faculty and staff members. The SRP does not replace, nor does it diminish, the value and importance of unit or individual plans. It is a framework offering a collective vision for individual scholars so that they may capitalize on the supports and structures in place to pursue their research goals.

Research Guiding Principles

The following principles are inherent in UNB's commitment to research and our pursuit of research excellence:

Discovery - UNB believes that the drive toward, and act of, finding or learning something for the first time can lead to unexpected and exciting directions that can ultimately enhance our understanding of the world.

Innovation - Promoting and embracing innovation is recognized as a means through which UNB will play an important and growing role in a knowledge-based society. One way that UNB researchers are providing innovative solutions is through increased multidisciplinary and interdisciplinary research collaborations. Collaboration is valued and recognized at all levels - between disciplinary units, across campuses, between research institutions, with partners in the community, and most importantly, with our students.

Impact – Research at UNB will be guided by its potential to positively impact humanity. Community engagement, be it regional, national, or international, as well as an entrepreneurial mindset will be leveraged to maximize research impact.

Major Objectives of the SRP

UNB seeks to enhance our research reputation as one of the most research-intensive comprehensive universities in Canada. Objectives set out in this SRP include:

- Advancement of knowledge through ground-breaking, high impact research
- Increased use of research to enhance the transformative experience of students
- Recruitment and retention of exceptional researchers (including faculty, research fellows, and students)

UNB Strategic Research Plan (2016-2021)

- Growth and enhancement of our connections with community stakeholders (both civic and industrial)
- Continued improvements to the environmental, social and economic well-being of the Province of New Brunswick
- Generation of research to guide and support evidence-informed regional, national, and international policy decisions
- Enhance our world class, state of the art research infrastructure
- Expand upon our collaborative and interdisciplinary approach to research

Research Areas

Seven major research areas have been identified. Each area represents a scope of research which reflects emerging and core strengths as demonstrated through research leadership and reputation, our research centres and institutes, and investment from competitive funding programs. They help identify research strengths and synergies that will focus discussions and build critical mass.

Humanity, Culture, and Societal Change - Understanding culture and society is a complex and diverse area that is pursued by UNB researchers from a very wide range of disciplines. As such, it is often approached in a collaborative and interdisciplinary manner. Recognizing humanistic and artistic research as a public good, UNB researchers explore: human creative expression and communication; history; the origins and diversity of cultures, including those of indigenous peoples; and the foundations of social organization and human interaction. Significant contributions are being made from research carried out under major societal topics such as governance, law, policy, education, safety, security, and justice - in addition to specialized research areas like aging populations, immigration, employability, domestic violence, inequity, and understanding the impact of culture and society on individuals.

UNB currently supports research chairs related to: history and conflict studies, Atlantic Canada studies, and school to work transition.

Economy, Business, and Entrepreneurship - The economy is an inextricable part of modern society affecting nations, governments, communities, businesses, families, and individuals in very profound ways. UNB researchers explore macroeconomic policy issues at the federal and provincial level, striving to understand and improve our socioeconomic wellbeing, as well as pursue research in the regulation of capital markets. At the enterprise level, research into businesses and social enterprises is carried out under the broad domains of management, innovation, and commercialization, as well as the specific domains of operations management, logistics and supply chain management, optimization, social networks, corporate finance, quantitative investment management, business strategy, leadership, marketing, e-commerce, accounting, organizational behaviour, human resources management, workplace wellbeing and safety.

UNB currently supports research chairs related to: regional economics, and technology management and entrepreneurship.

Health, Wellness, and Human Behaviour & Development - Human health is not merely the absence of disease, but a state of physical, mental, and social wellbeing. UNB research in this area encompasses aspects of biomedical science, social science, health and wellness, and human behaviour and development. Biomedical research at UNB involves many disciplines and includes diverse topics such as chronic illness, cell and molecular biology, biostatistics, biomedical engineering, rehabilitation, and exercise. Health and wellness research into preventive, primary, and community health is carried out through individual and population health lenses with a broad view of wellbeing and health through the lifespan. Health and

UNB Strategic Research Plan (2016-2021)

wellness and social science focus areas include sexual health, violence and healthy living in the aftermath of abuse, healthy aging, and the social determinants of health. Research initiatives are pursued with the goals of generating knowledge, creating innovative interventions, improving information and management systems, and developing social and healthcare policy from an interdisciplinary perspective. Human behaviour and development research is pursued from the perspective of enhancing wellbeing by exploring and understanding mental illness, gender, human sexuality, and the process of education and learning.

Existing research chairs supported by UNB focus on: literacy and human development, social inequities in health, sexual behavior, inter-professional patient-centred care, cancer, diabetes, medical devices, and musculoskeletal health.

Digital Society, Computing, and Mathematical Foundations - Advances in digital technologies and the massive amounts of data, including open data, at our disposal continue to have a profound impact on individuals, societies, and the global community. Research at UNB explores how information and communication technologies impact, and can be used to benefit humanity. Forming the underpinning of this area is mathematical and statistical research that applies not only to digital technologies, computer science, and information theory, but also to pure and applied approaches to understanding other complex phenomenon in algebra, analysis, geometry, and their applications to mathematical modelling of physical and biological systems. Digital infrastructure research at UNB includes, but is not limited to, exploring: network and communication systems, embedded systems, sensor systems and signal processing, and advanced computing systems. Examples of research related to computing methodology include computational theory and artificial intelligence, software engineering, parallel and distributed computing, and modeling and simulation. Data management and analytics research involves pursuing novel approaches in: data mining and semantic technologies, image processing, and big data analytics. UNB research also continues to make significant contributions to advances in cybersecurity and digital privacy.

UNB presently supports research chairs in: advanced image processing, big data, cybersecurity, and mobility analytics.

Materials, Manufacturing, and Processing - Advances in materials science have benefited society in sectors such as medicine, computer science, energy, consumer products, architecture, and transportation, and hence continue to redefine the way we live. UNB research in this area deals with the characterization, modeling, testing/evaluating, and synthesizing/processing of traditional and advanced materials for a myriad of applications. It also involves design approaches, new manufacturing processes, and control techniques necessary to transform these basic materials into sustainable products which are useful to society. UNB scientists and engineers from multiple disciplines are making significant contributions to the materials science field through research in engineering materials (such as polymers, metals, and composites); natural materials (such as biomaterials and inorganic materials); and advanced materials (such as smart materials, nano-materials, and biomedical materials). UNB is also advancing the field through research in the design, modeling, and controlling of advanced manufacturing processes. This includes, but is not limited to, topics like mechatronics, robotics, and rapid manufacturing.

Current research chairs focus on: material science MRI, renewable materials, pulp and paper, advanced wood products, nanotechnology, and design.

Energy, Natural Resources, and Sustainable Development – Given increasing global demands for natural resources, UNB research develops innovative technologies to improve efficiencies of resource production, extraction and use while ensuring environmental protection and

UNB Strategic Research Plan (2016-2021)

sustainability. Major research advances into sustainable practices include the integrative assessment of fisheries, forestry, aquaculture, agriculture, mining, and energy activities, as well as waters and their watersheds. We are providing much-needed information for highly effective and timely resource management, conservation, mitigation, and remediation. Energy research includes, but is not limited to, improvements in fossil fuel exploration and conversion, nuclear energy, renewable energy generation and integration, energy storage technologies, energy efficiency, and smart grid technologies. Sustainable urbanization and civil infrastructure are other related areas of research.

Research effort is supported through current research chairs that study: contaminants /effects in food webs, economic geology, biofuels, nuclear engineering, and construction engineering.

Ecosystems, Earth, and the Universe - Research in this area involves exploration into the mysteries of life, the complexities of nature, and the laws of the universe. UNB researchers achieve a better understanding of the natural world by exploring the fundamental laws governing mathematics and statistics, physics, chemistry and biology and their links to our discovery science on ecosystems worldwide. Our exceptional, multidisciplinary research is using molecular- through community-level approaches - including the latest high throughput biology, integrative statistics, and bioinformatics - to advance our understanding of evolution, and terrestrial, marine, and freshwater ecology, physiology, and biodiversity. Earth science, planetary geology, and impact study research is undertaken to help us grasp our place in the universe. This is augmented with research into atmospheric studies, space weather, and astrophysics as well as gravitational physics. UNB also has world renowned research capability in geodesy and geomatics in fields such as global navigation satellite systems (GNSS), remote sensing, and Earth observation.

To support this research effort, UNB research chairs presently focus on: ecological genomics, molecular systematics and biodiversity, wildlife ecology, planetary materials and impacts, and ocean mapping.

Research Chairs

The foundation of UNB's research ecosystem is comprised of exceptional faculty and graduate students conducting leading research enabled by our world class research institutes, centers, and labs. Research chairs, including Canada Research Chairs (CRCs), contribute to that ecosystem, and are used strategically to seed new research initiatives and support existing research strengths.

Chairs Allocated by Research Area

UNB currently holds 12 CRCs and 20 other funded Research Chairs, distributed as shown in the table below. New research chairs are identified and filled as described below.

Theme	Canada Research Chairs						Other Research Chairs	Total
	NSERC		SSHRC		CIHR			
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2		
Humanity, Culture, and Societal Change			1	1			1	3
Economy, Business, and Entrepreneurship							2	2
Health, Wellness, and Human Behaviour & Development			1	1		1	5	8
Digital Society, Computing, and Mathematical Foundations		1					3	4
Materials, Manufacturing, and Processing	2						3	5
Energy, Natural Resources, and Sustainable Development	1	1					4	6
Ecosystems, Earth, and the Universe	1	1					3	5
Total	4	3	2	2		1	21	33

UNB Strategic Research Plan (2016-2021)

Equity and Gender Representation

UNB's Employment Equity program is designed to address historical disadvantages faced by some members of our society. As a signatory to the Federal Contractors Program (FCP), UNB's program identifies four Designated Groups, representing communities within our society that have traditionally faced disadvantages in participating in the Canadian workforce: women, persons with disabilities, visible minorities, and Aboriginal peoples. Of UNB's twelve current CRCs, women hold four positions (33%) and men hold eight (67%). Considering all UNB research chairs, the allocation is 30% female, and 70% male. While this is above CRC thresholds, as well as the national average, UNB ensures that equitable practices are employed, and gender representation is always considered when filling chair positions.

Use of Chairs for Recruitment and Retention

Research Chairs, and CRCs in particular, are an important recruitment and retention tool used to enhance the University's research capacity and performance. In all instances, UNB will pursue the best possible candidate in line with the University's strategic goals, whether the candidate be internal to the University or an external prominent national or international researcher.

Assessing Research Objectives

The University will routinely review research performance using both leading and lagging indicators. These will include:

- Research output such as: publication of journal articles and books, conference papers, and patents
- Measurable research quality metrics such as citations and national/international reputation
- Number of graduate students active in research
- Research ranking amongst peer group of universities
- Research intensity (research revenue generated per faculty member, as well as research output per faculty member)
- Number of research grant proposals, as well as the number of different faculty members submitting research grant proposals
- Success rate of Tri-Council and other funding submissions
- External research revenues

The Planning and Approval Process

Strategic Research Plan

UNB's Strategic Research Plan, which sets forth our vision for the next five years, was undertaken in parallel with the academic planning exercise; it aligns with, and supports, the University's Strategic Plan. The SRP was drafted under the leadership of the Vice-President Research (VPR), with guidance and oversight from a steering committee comprised of all sectors of research. Broad consultation was undertaken in the development of the SRP, including consultation with individual researchers and external stakeholders. The final SRP was endorsed by both Senates of UNB.

Research Chairs

To take advantage of research opportunities which align with our academic and strategic aims, Research Chair selection is carried out through a competitive process that respects our equity program. Deans first identify opportunities for research chairs through their academic planning process, then nominate a theme and one or more potential candidates. The nominations are then assessed by the office of the Vice President Research and a decision made through an internal committee.