LSI Strategic Plan 2021

Moving forward boldly to increase collaboration, efficiency, impact, and equity

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UBC Life Sciences Institute

Vision, Mission, and Values

"*People make science happen*" Josef Penninger, LSI Director

Vision

Improved health for people and the planet

Mission

Our mission is to inspire and enable innovative and interdisciplinary scientific research focused on gaining a comprehensive understanding of the mechanisms that make living organisms and systems resilient to intrinsic and extrinsic perturbations and translating this knowledge to new therapies and sustainable solutions.

Core Values

We create **equal opportunity** for all
We support **freedom to explore the unknown with creativity**
We **serve the society** with our science and collaborative spirit

Message from Dr. Josef Penninger MD, LSI Director

Human resilience requires foundational science often conducted decades before its impact is appreciated. From insulin in 1921, Penicillin in 1928, the structure of DNA in 1953, to the modern-day diagnostics, treatments, and vaccines that help societies stay resilient in the face of the COVID-19 pandemic — all major breakthroughs can be attributed to long-term foundational research. UBC recognized this in 2005 by establishing Canada's largest institute dedicated to basic biological research, the Life Sciences Institute (LSI).

For the last decade and a half, the LSI has been an innovation hub that occupies a unique space in the basic to applied research continuum. We are uniquely positioned in between the basic science departments of chemistry, physics, mathematics, etc. and the applied units that include the clinical departments, engineering and others. Working together with our collaborators across UBC, Canada, and the globe we have published over >4000 research findings, on 1100 topics that fall under 384 topic clusters, and have received ~130,624 citations. The impact of our research is reflected by >15 spin-off companies based on LSI research, over >250 patents granted, and >80 technologies commercialized. Lipid nanoparticle (LNP) technologies developed from 40 years of tenacious foundational research conducted at one of our laboratories recently became an important vehicle for the first ever mRNA vaccine - developed and approved in record time and deployed at global scales against COVID-19. This placed UBC among one of only two academic institutions in the world to have made a direct contribution to this 'breakthrough of the century. Building on this track-record, and learning from our collective experience of conducting research and responding to society's biggest health and environmental challenges, we look to the future with fresh approaches to take our place among the world's leading foundational biological research institutes.

This document outlines a new **Strategic Plan** for the Life Sciences institute. The goal for this plan is to provide clear direction and actions that improve our ability to generate new knowledge, enhance the impact of our research, support innovation, and prepare the next generation of scientists to extend the frontiers of science beyond our times. Life scientists know that it is hard to improve upon nature — its intricate mechanisms were molded over millennia of evolution and fine-tuned to precision. It is these mechanisms that impart resilience against extrinsic and intrinsic perturbations. Uncovering these resilience mechanisms and their failures, and learning from them, is the fundamental step towards developing evidence-based solutions for a variety of conditions that threaten our lives, our economies, and our environment. This is why we want to create the world-leading **Biological Resilience Initiative (BRI)** within the LSI– to uncover the amazing intricacies of life on all scales, from atoms, genes, molecules, cells, organisms, and the larger world around us, and use these findings to address the grandest of challenges facing humans and the planet. In this plan we outline our research strategies and objectives that will guide us on our path to global excellence, and the strategies that will enable us to achieve excellence.

We believe that innovations happen at the intersection of fields, making it paramount that we work together and collaborate across UBC and beyond, with academics and our colleagues in industry. How and with whom we walk along the often twisted and unlit paths is critical to the process of discovery. To paraphrase the first Canto of Dante's Inferno – "we all need a hand that holds us and believes in us."

With this renewed plan we align our strategies with those of the University of British Columbia (UBC), our parent faculties of Science and Medicine, other partner faculties, the School of Biomedical Engineering, and the Academy for Translational Medicine (ATM) as it develops. We outline strategies to increase interdisciplinary collaboration with foundational, translational, and clinical researchers, industry partners, and engagement with public, patients, practitioners, and policymakers.

As we tread the roadmap laid out in this document and give science our best effort, it is also our responsibility to prepare a worthy next generation of scientists to whom we can pass the torches shedding light on the mechanisms of biological resilience, and upon whom we can rely to develop solutions to challenges that may face the planet long after we have hung up our lab coats. Through this plan, we lay out strategies to train this next generation of scientists — from undergraduate to postdoctoral levels — in biological resilience research across scales – from molecules, to networks, to cells, to organisms, to ecosystems.

Above all, we believe that research is foremost about people – people who entrust us with their hopes and resources to improve health, quality of life, and societal resilience through our science and people who conduct and support the scientific research that leads to new knowledge and solutions. As biological researchers we understand that diversity underlies strength – from the genetic scale to communities and our entire society. In our plan we outline strategies that embrace diversity, and ensure equity, inclusion, and respect in all our actions.

In this way, together we write a new chapter of foundational biological research at UBC that will preface an exciting journey, in a new direction. We look forward to generating new knowledge and developing new treatments, transforming health for everyone, and creating new solutions to improve the world with science.

Josef Penninger MD, LSI Director

World-class Research at the LSI

Fundamental discovery science provides intellectual freedom for scientists to flex their creative muscle and develop ideas or concepts that capture their curiosity but may not have an immediate or obvious outcome or application. The path scientists follow to discovery is never a straight line and is inspired by a deep desire to explore new ground. It is from this new ground that all solutions germinate, whether they are treatments for a disease or sustainable solutions that harness the power of microbes to mitigate climate change.

The Road Thus Far

Since 2005, >100 Principal Investigators (retired and current) and > 4000 research trainees and staff, from several UBC faculties and departments have been conducting leading-edge, basic and preclinical research, and translating their findings into treatments and environmentally sustainable solutions, under one umbrella – The UBC Life Sciences Institute (LSI). For the last decade and a half, LSI research was organized by Research Groups, which focused on nine major themes: blood research; diabetes; cell and developmental biology; molecular epigenetics; infection, immunity and inflammation; chemical biology; neuroscience; and bacterial regulatory networks. Research groups provided researchers a framework to pursue common goals, share expertise and infrastructure, cross-pollinate ideas, and cross-train students and highly qualified professionals. Collaborations within and across groups have allowed us to make significant contributions to science. Over the last decade LSI researchers have published >3000 research articles, and have received ~130,624 citations. The economic impact of LSI research is reflected by >15 spin-off companies based on LSI research, over >250 patents granted, and >80 technologies commercialized. Over this time period, we have secured almost $400 M of research funding in individual and team grants.

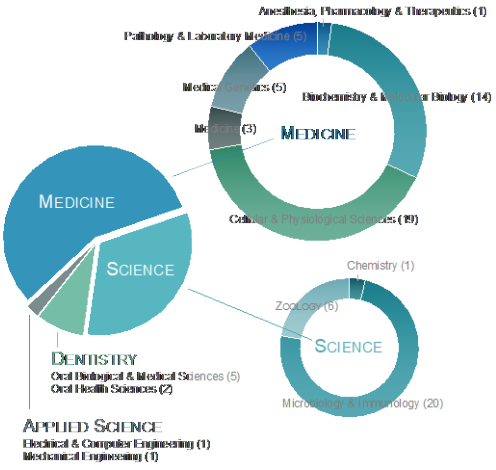
83 Principal Investigators in the LSI

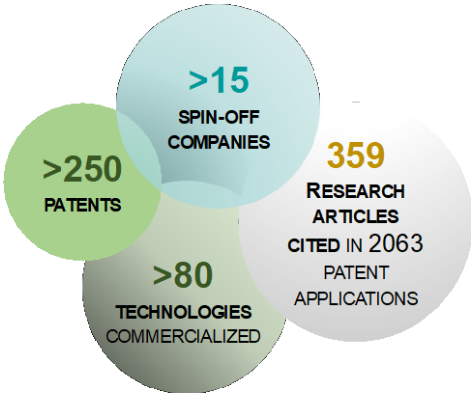
CHAIRS

- 1 Canada 150 Research Chair
- 16 Current and Previous Canada Research Chairs
  - 8 Tier 1 CRCs
  - 8 Tier 2 CRCs
- 1 CIHR Sex and Gender Science Chair in Genetics
- 1 Sauder Chair of Pediatric Virology

Scholar and Investigator Awardees

- 20 Current and Previous MSFHR Scholars
- 7 CIHR Foundation Grant Awards
- 3 UBC Distinguished University Scholars
- 2 CIFAR Global Scholars
- 1 Leopold/Earth Leadership Fellow
- 1 Diabetes Canada Investigator





Our Recent Contributions to Science and Society

Leading the fight against COVID-19

How the COVID-19 Virus Gets into our Cells: The ACE2-spike protein interaction

In the aftermath of the SARS epidemic, our Director Dr. Penninger demonstrated a critical role for ACE2 as the cellular receptor for the SARS Coronavirus and linking ACE2 to lung failure in coronavirus infections. In 2020, these pioneering findings became critical and catapulted ACE2 to the most researched molecule globally as the cellular receptor of SARS-CoV2. The interaction between the SARS-CoV2 spike protein and ACE2 forms the basis for all COVID-19 vaccines and therapies including the only rational therapy—human recombinant soluble ACE2 (APN01), which resulted directly from Dr. Penninger's work, and is being tested further as an early intervention against severe COVID-19.

The Pfizer/BioNTech Vaccine

Our Former Director (2014-2017) Dr. Pieter Cullis has been working on drug delivery systems based on lipid nanoparticles for over 40 years. In 2020, technology originating from his LSI laboratory became the vehicle for the Pfizer/BioNTech COVID-19 vaccine, the first mRNA vaccine to be deployed at global scales and the fasted vaccine ever developed. Importantly, this made UBC one of only two universities world-wide to have made a significant contribution to this vaccine.

How the COVID-19 Virus Replicates in Cells: A Key SARS-CoV-2 enzyme structure

Dr. Natalie Strynadka, Canada Research Chair in Antibiotic Biology and Medicine, and colleagues resolved the X-ray crystallographic structures of Nsp5 the main protease (M^{pro}) of SARS-Co-V2 at 1.8 Å resolution. M^{pro} is linked to essential processing events for viral assembly and maturation. This structure is essential to delineating atomic details of the mechanistic pathway of SARS-Co-V2 replication in infected cells and can be used to optimize current inhibitor hits and design highly potent, novel M^{pro} inhibitors as life-saving antiviral therapy.

Understanding the Foundational Biology of Cancer

Characterizing cancer-causing mutations

A team led by **Dr. Christopher Loewen** and **Dr. Calvin Roskelley** recently combined high-content microscopy and artificial intelligence (AI) to devise a new method that can quickly and accurately predict the functional consequences of hundreds of genetic variants in cancer-associated genes. Genetic testing is the cornerstone of personalized medicine, and can reveal predisposition to hereditary diseases like cancer. However, there is often little to no clinical data for many of the gene variants identified – resulting in their classification as "variants of unknown significance" – and limiting their value. The new software toolkit they developed, Machine Assisted Phenotype Scoring (MAPS), is a low-cost, cloud-based, automated image analysis platform, part of a novel workflow analyzing changes in protein subcellular localization as an indicator of loss of function. Their method will allow researchers to quickly assess the function of genetic variants at scale, and help realize the full potential of personalized medicine in cancer.

New Cancer Immunotherapies

Research led by **Dr. Kenneth Harder** and colleagues is driving the development of a next-generation cancer immunotherapy targeting myeloid cells in the immune system, which have been linked to suppression of anti-tumour immune responses. The team has formed a start-up, ME Therapeutics, to further develop their treatment, which is predicted to complement current immunotherapies and help overcome resistance in patients with refractory cancers. Their approach shows potential for treating multiple cancer types and will substantially impact cancer patient outcomes.

Modeling tumour spheroids under hypoxia

Dr. Karen Cheung and colleagues in the School of Biomedical Engineering have developed improved *in vitro* tumour models to study and test drugs for cancer. Their 3D tumour spheroid model incorporates a microfluidic platform that allows for spatiotemporal control of oxygen levels and thus re-creates hypoxic conditions found in tumours. By connecting this model to equipment for optical sectioning microscopy, Dr. Cheung performed time-lapse monitoring of the tumour in response to anti-cancer drugs, and determine the impact of changes to the microenvironment (hypoxia) on drug treatment, throughout the tumour. This work opens the door to understanding how the microenvironment drives cancer progression and resistance to anti-cancer therapy, and will facilitate improvements in diagnostics and treatment.

Foundational diabetes insights driving translation

Stem-cell derived insulin producing cells towards a cure for diabetes

Drs. **Tim Kieffer** and **Jim Johnson,** working with several industry partners, have been at the global forefront of the effort for a stem-cell derived diabetes cure for almost a decade. **Kieffer** demonstrated the reversal of diabetes in animal models using embryonic stem cells differentiated into insulin-producing beta-cell lineage and pioneered the use of macro-encapsulation for cell containment. This technology is now in a first-in-human and first-in-class clinical trial. **Kieffer** and **Johnson** were the first in the world to report an advanced differentiation protocol that resulted in cells capable of glucose-induced insulin secretion in culture, and rapid reversal of diabetes in rodents following transplant.

Blood vessel organoids to study diabetes

Dr. Penninger developed the world's first self-organizing 3D human blood vessel organoids from embryonic stem cells, which faithfully recapitulate the structure and function of human blood vessels and are amenable systems for modelling diabetic vasculopathy, a disease affecting hundreds of millions of people globally. As the Canadian lead on a UK-Canada Diabetes Research Team, **Dr. Penninger** will use his organoid model to investigate the potential of two previously identified molecules to reverse blood vessel changes caused by high blood sugar in diabetes. This research is expected to accelerate discovery of new treatments for blood vessel complications in diabetes.

Redefining the causal drivers of obesity, insulin resistance, and aging

Dr. **Jim Johnson** and colleagues have used genetically engineered mouse models to demonstrate causal roles for excess insulin levels in obesity, insulin resistance, aging, and even the initiation of cancer. While many in the field had assumed that high insulin levels were simply a consequence of insulin resistance and obesity, these studies challenge dogma and have shaken up the field. At the same time, it is becoming recognized that diets designed to reduce hyperinsulinemia can lead to rapid weight loss and remission of type 2 diabetes, and the Institute for Personalized Therapeutic Nutrition, co-founded by Johnson, has been a leading voice in practice change.

Understanding and Treating Tuberculosis

Targeting cholesterol catabolism to treat tuberculosis

Tier 1 Canada Research Chair in Microbial Catabolism and Biocatalysis, Dr. **Lindsay Eltis** has made seminal discoveries that advance our understanding of steroid catabolism by several bacteria including the pathogen of tuberculosis, *Mycobacterium tuberculosis*. This includes: elucidation of a pathway conserved in all known steroid-degrading bacteria by which they degrade the last two steroid rings; characterization of a novel ring-opening enzyme, IpdAB, which is required for the virulence of *Mycobacterium tuberculosis*; and establishing that the ability of *Mycobacterium tuberculosis* to catabolize host-derived cholesterol is essential to the pathogen's virulence and that targeting cholesterol catabolism in *Mycobacterium tuberculosis* is a promising therapeutic strategy. Based on these fundamental discoveries Dr. Eltis is collaborating with academic and industry partners on developing two classes of compounds as treatment and validating additional therapeutic targets in the cholesterol catabolic pathway.

New treatments for infectious respiratory diseases

Tuberculosis is one of the most devastating infectious diseases, causing ~10 million new infections and 2 million deaths each year. The emergence of multidrug-resistant strains of the bacteria that causes tuberculosis has created an urgent demand for new and better treatments. Dr. **Yossef Av-Gay** has developed specialized intracellular high-throughput screening assays to identify several novel anti-tuberculosis compounds active in human macrophages, focusing particularly on host-directed therapies as a strategy to avoid bacterial evolution of resistance. They have previously also shown efficacy of nitric oxide (NO) as an antimicrobial agent, leading to the foundation of Beyond Air (XAIR on NASDAQ), now developing treatments for bronchiolitis, viral infections, and cystic fibrosis based on his work.

Unlocking the brain's secrets throughout the lifespan

Normalizing brain function in children with intellectual disabilities and epilepsy

Dr. **Shernaz Bamji**, Associate Director for the Djavad Mowafaghian Center for Brain Health and President of the Canadian Association for Neuroscience, is at the forefront of work understanding the cellular and molecular underpinnings of neurodevelopmental disorders such as autism, schizophrenia and intellectual disability. Her recent work demonstrates that the dysfunction of one brain enzyme is causative for intellectual disability with epileptic comorbidities. Dr. Bamji's current work is actively looking to normalize brain function by targeting enzymatic function.

Foundational and Translational Blood Research

Universal blood donor cells for transfusion

Blood transfusion is a crucial part of all health care systems and saves numerous lives. Correct matching of blood types prior to transfusion is essential to avoid immune responses that can be fatal. O blood type has the least risk for causing serious reactions and is known as a universal donor – this blood type is often in short supply. By screening the human gut microbiome using the powerful technique of metagenomics, **Drs. Kizhakkedathu and Withers** identified enzymes that can cleave A antigens from red blood cells (RBCs). These enzymes constitute a novel pathway to convert A-type antigens to generate H antigen (O-blood type) on RBCs, and have high selectivity, high efficiency and work in whole blood. This discovery has led to the foundation of ABOzymes Biomedical Inc. (https://www.abozymes.com), now developing universal blood donor cells for transfusion and universal blood type organs for transplantation.

Innovating Sustainability and Fighting Climate Change

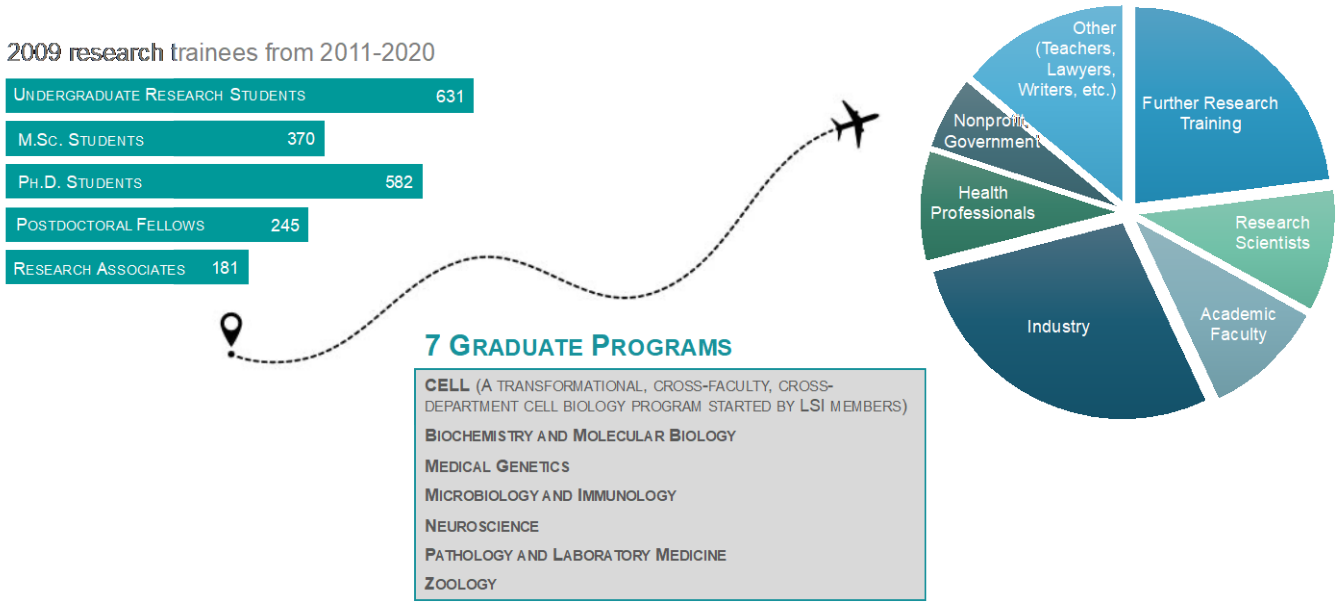
Ecosystem health via sustainable biomass utilization

The production of energy and materials from components of this biomass, including lignin, will lower our dependence on fossil fuels, reduce greenhouse gas emissions, and support our emerging bioeconomy. Drs. **Lindsay Eltis**, **William Mohn**, and **Steven Hallam** have combined the power of genomics with leading-edge synthetic biology research and bioinformatics to develop economically and environmentally sustainable technologies to valorize lignin using microbial whole cell biocatalysts and to understand how microbial activities sustain forest health. **Eltis**'s work has changed the way we think about how lignin-derived aromatic compounds are degraded in nature. He has also developed genetic tools to engineer novel whole cell biocatalysts for sustainable processes including the underlying technology used by the LSI start-up Rhyme Biotechnology. **Mohn** is internationally recognized for his research on microbial metabolism and microbial ecology. He pioneered methods for microbial community analysis, such as stable isotope probing coupled to metagenomics, providing important insights into bacterial diversity in arctic tundra and boreal forest soils. Hallam, is a global leader in environmental genomics research and a Leopold Leadership Fellow, working at the interface of microbial ecology, synthetic biology and bioinformatics. He has initiated time-series monitoring programs focused on marine biogeochemical cycles and developed functional screens that reveal hidden metabolic powers of uncultivated microbial communities including novel biocatalysts for lignocellulosic biomass conversion and removal of sugars from the surfaces of red blood cells. **Hallam**'s research has led to several patents and start-ups including MetaMixis and Koonkie Inc.

Our Track Record in Training the Next Generation

Since its inception in 2005, the LSI has trained more than 4000 undergraduate and graduate students, postdoctoral fellows, and research staff. We offer an unparalleled training environment, through hands-on research at the forefront of discovery and access to cutting-edge technologies through our technology-driven core facilities. Our trainees additionally benefit from opportunities to develop skills in communication, mentoring, and entrepreneurship, allowing them to discover their unique talents, transition to independent careers, and become leaders in academia, industry, and government.

These trainees leave the LSI with confidence, knowing they have tackled and found solutions to complex problems, built a network of lifelong colleagues through collaboration and partnerships, and received high-quality mentorship from a community of internationally recognized scientists and thought leaders.



Strategy for a new decade – message from Jim Johnson

Moving forward with consensus

In October of 2019, the entire LSI community gathered for a Town hall meeting in which Director, Josef Penninger, introduced the idea of reorienting the research focus of the LSI to the study of biological resilience as the reference point for health and disease, and other the strategies that would position us for success. The action item from that meeting was for everyone to introspect as individual labs, as research groups, and as a research community. We planned to reconvene in a few months but 2020 had completely different plans for us and for the rest of the world. As UBC's premiere fundamental biological research institute and home to the largest cohort of microbiologists and virologists in BC, we mobilized to combat the grandest challenge of our times — COVID-19. In January 2021, Jim Johnson joined the LSI leadership team as Deputy Director after successfully launching an academic-industry hybrid institute in Oxford, and immediately re-started efforts to transform the LSI. In the first 2 months of his tenure, Johnson focused on listening to LSI researchers, starting with the representative leaders of our nine research groups, in candid one-on-one meetings, to ensure that any direction we take and strategies we devise for the future are based on the desires of our research community. Below he summarizes the process of consultation that led to our Strategic Plan:

In January, 2021, my first order of business was to reach out to as many LSI PIs are possible, informally and in a series of structured interviews where I asked each of the Research Group Leads the same questions. 'What is the LSI doing well now? What did it do well in the past? What could it do better? Specifically, how can the LSI help the members of your research group in the future? I also asked about the status of the research groups – 'What can your research group contribute to the LSI community?' There was an impressive consensus about the need for a renewal of our general direction and strategies.

- There was broad support for increased support for shared core facilities and expertise to allow every lab to use the most state-of-the-art technologies? There was agreement that the golden era of the old research groups catalysing collaboration was behind us – more than half the groups were no longer meeting. The research group leaders sought better ways to fundraise.
- There was support for the idea that the LSI should have a more organized postdoctoral fellow program, to attract global top talent, especially to newly established labs that might not have an international profile yet. The lack of structure in the postdoctoral stage is something we had heard from trainees themselves, many lamenting that they felt unseen and falling through the cracks. A survey of trainees in the LSI, though not well subscribed too, reveal inconsistent mentoring quality of fellows and graduate students.
- LSI PIs were inspired by Josef's vision for a core-driven institute and were open to a change of focus towards biological resilience as a concept and towards more nimble collaborative teams.
- People felt it was time for a change.

In March 2021, we reconvened in another town hall meeting where Josef and myself shared our learnings and the strong appetite for change, including reorganizing ourselves around specific diseases and issues that would help us connect better with the public, potential donors, charities, and other sources of research support. Again, with a focus on grass-roots consultation and team building, I met with individual PIs and groups of PIs about this reorganization and our other strategies going forward (an overview of these discussions can be found here). Each PI was then asked to declare the research topics that they would be interested over the next 5 years. Based on these lists, 20 Research Focus Teams were formed organically. As of this writing, more than half these groups have had their first team meeting, in each case supported by FoM Development Staff and LSI Grant Support and Communications staff. The main points of discussion were:

- What do they think are the major challenges in their fields that their research can solve?
- How we might strengthen our already strong ties with both basic departments and applied units, by incorporating them into these problem-solving focus groups. Who should we invite to join, if they are not already affiliated with the LSI? What networks should we strengthen?
- What resources these groups oriented around specific challenges would need to accelerate this research – is it specialized new equipment, shared permanent staff scientists, or something else?

These meetings have been very successful, with positive feedback coming from PIs and from the development staff who reported that they are finally getting a strong sense of the type of work the LSI is doing. We are forming the basis of 'one-pagers', targeted to philanthropists and companies, highlighting how the LSI can partner with them to solve today's greatest challenges.

We now have a plan to move forward, informed by broad consultation with the LSI community, with UBC stakeholders and leadership in FoM and FoS, and with funders at all levels. This plan, the strategies, and objectives outlined in this plan represent our collective ideas and aspirations and will serve as our guide in the next 10 years.

Jim Johnson, PhD, LSI Deputy Director

Strategic Philosophy & Commitments going Forward

As UBC's premiere foundational research institute, with this strategic plan, we lay out a path to conduct globally leading foundational research and translate our findings into tangible solutions to achieve our vision of improved health for people and the planet. Our philosophy is guided by our commitments and responsibilities towards science and society.

Commitment to science

As basic scientists our foremost commitment is discovery and knowledge creation. Breakthroughs emerge from complex foundations of fundamental knowledge contributed by many people over many years. Never before has this been more axiomatic than in the collective global response of fundamental researchers to the threat of COVID-19. The unprecedented pace at which we have been able to respond to the pandemic would not have been possible without the tenacity of many fundamental researchers globally. To fulfill our commitment to science we will:

- Continue to generate knowledge across scales: atoms, molecules, cells, systems, organisms, and environment.
- Uncover resilience mechanisms inherent in all organisms and the failures in these mechanisms that lead to disease
- Strengthen research infrastructure and diversify funding sources to facilitate knowledge generation

Commitment to people and the planet

Scientific knowledge and its translation to real-world solutions is a critical driver for human health and well-being, economic development and environmental sustainability. We are answerable to our country and our society who place their trust in their research institutions and researchers to apply foundational knowledge to solve the grandest of challenges that face us and our planet. To fulfill our commitment to Canadians, our global society, and to our planet we will:

- Support innovation from discovery to translation: chronic and infectious diseases, harnessing bacteria for sustainable solutions
- Enhance translational collaborations across sectors: academic, clinical, industry, non-profit, government
- Engage patient, public, and community groups as research partners

Commitment to the future of science

The resilience of humankind and our planet depends upon our continued ability to learn and address the challenges that face us today and will threaten us in the future. Whether in our lifetimes or beyond them, there will be new pathogens that threaten life, new mutations that cause chronic diseases, increased incidence of existing diseases due to lifestyle or extrinsic exposures, and countless such challenges. It is our duty to train the next generation of scientists to help our societies through these challenges. To fulfill this commitment we will:

- Establish world-class training programs at all levels from undergraduate to post-doctoral
- Foster interdisciplinary training to ensure robust scientific discovery and application

Commitment to creating a fair and inclusive community

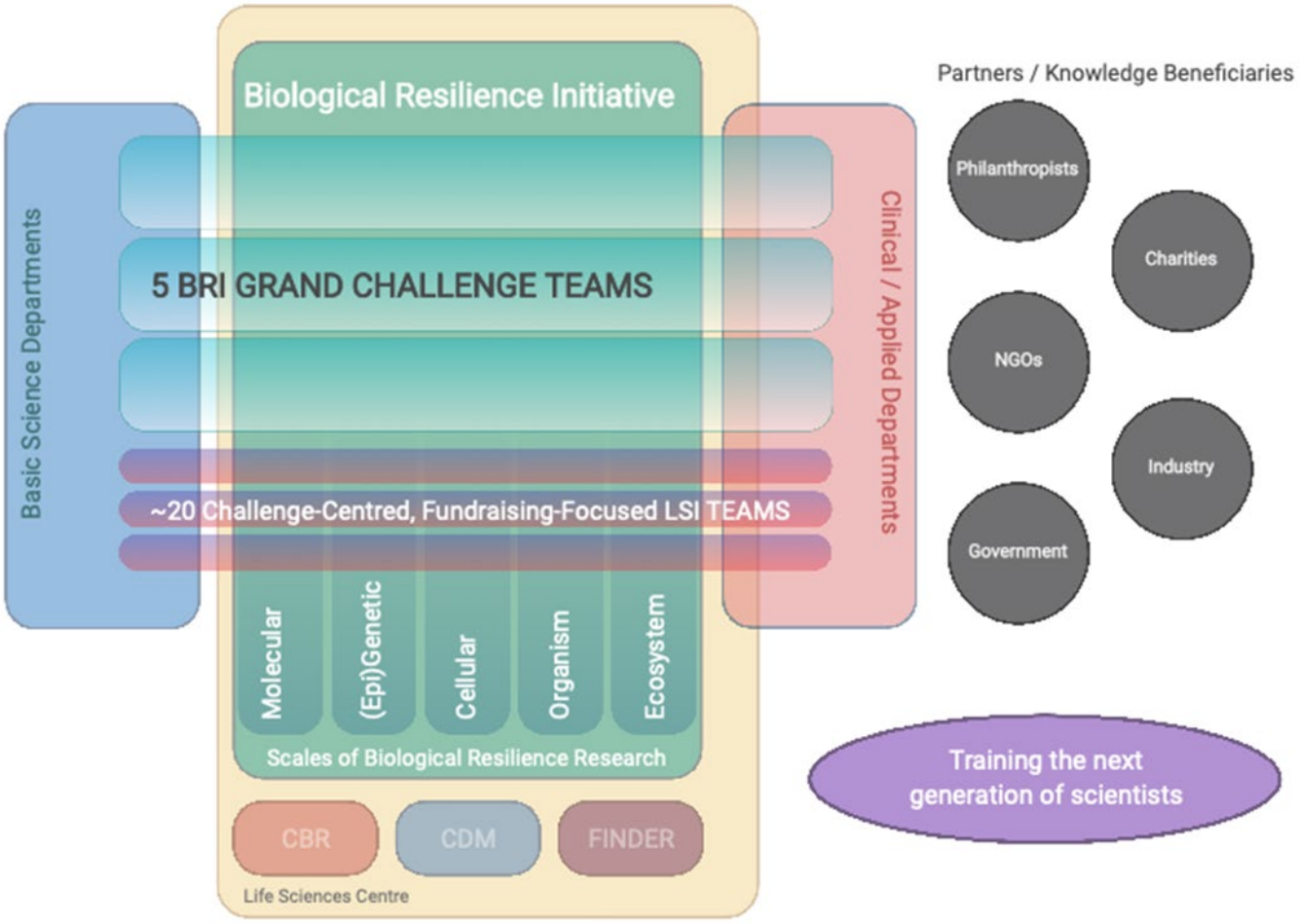
"*Sustained excellence in research, education and engagement depends on the integration of diverse perspectives and approaches*." Shaping UBC's Next Century.

As biologists we know that diversity is the cornerstone of resilience, and as members of society who have received the privilege of education and the liberty to pursue our dreams, we accept the responsibility to live and lead by example in the creation of a diverse, inclusive, equitable, and respectful society for a resilient future. Towards this commitment we will:

- Prioritize principles of respect, equity, diversity, and inclusion (REDI) in all our strategies and objectives
- Prioritize recruitment and engagement of individuals of diverse races, ethnicity, sex, gender, and neurodiversity in our faculty and training programs
- Increase research into topics affecting underrepresented minorities, women, neuro-diverse individuals and other diverse populations.

GREx – Biological Resilience Initiative

The LSI will apply to be designated as a Global Research Excellence Institute (GREx) of UBC under a renewed research initiative to study Biological Resilience, 20 Research Focus Teams, and occupy a critical pre-clinical/pre-applied niche between the basic sciences and the clinical/applied sciences.



Strategic Priorities for the Next Decade

The most important Priorities for success are ***Collaboration***, ***Focus***, and ***Talent***.
These Priorities align with our Core Values of ***Efficient Innovation***, ***Visible Impact***, and ***REDI***.

Strategic Priority Area 1: COLLABORATION

GREx status with renewed theme – Biological Resilience Initiative (BRI)

Reframing the study of key life sciences questions from a disease-centric viewpoint that focuses on what has failed to a ***biological resilience*** perspective highlights nature's solutions for overcoming adversity.

Collaboration is essential to discovery. Since the LSI's establishment 17 years ago, our researchers have crossed the boundaries of departments, faculties, and disciplines to collaborate. In the last 10 years our members have co-published 300 research articles, 10% of which featured collaborations between more than two LSI members. Beyond the LSI, in the last 10 years 51% of our publications have resulted from international collaborations, 16% from national collaboration, and 30% from collaboration within UBC.

> *Science is a collaborative effort. The combined results of several people working together is often much more effective than could be that of an individual scientist working alone*. John Bardeen

The development of most new treatments starts with target discovery - a key gene/protein involved in a normal process this dysfunctional in a disease state. In order to know what is dysfunctional we must first know what the normal resilience process is. Studying biological resilience offers us the opportunity to harness natural processes to improve the failing health of our environment, such as using bacteria for bioremediation, or as biocatalysts to sustainably convert waste materials to useful products without petrochemicals.

Specific Objectives & Actions

Objective 1.1: Catalyze synergies in foundational research to understand biological resilience

As UBC's largest basic biological research institute our foremost mandate is to support basic research ranging from curiosity-driven to that focused on disease. As a first action towards our strategic priority to increase collaboration and research efficiency, we propose to achieve status as a **Global Research Excellence Institute** (GREx) – whereby our research will be guided by the **Biological Resilience Initiative (BRI**, see GREx proposal for full details**)**. We will leverage are existing expertise in the study of life sciences across **5 scales – Structural (atomic and molecular), (Epi)genetic, Cellular, Organism, and Ecosystem scales** — from describing protein structures at the atomic level, to genetic and cellular mechanisms that cause specific diseases, to the microbial ecology of a mammalian gut or an entire forest site.

Objective 1.2. Support major interdisciplinary, high-reward collaborative projects

With unprecedented advances in research technology, researcher mobility, and remote collaboration platforms come unprecedented opportunities to ask bolder questions and devise innovative solutions that transcend the boundaries of disciplines. While funding streams for such trans-disciplinary projects are few, there is a consistent rise in such opportunities with programs such as the New Frontiers Research Fund (NFRF). Given the breadth of expertise among LSI members, our researchers are well-positioned to lead in interdisciplinary, high-risk, high reward, and collaborative projects. As technologies advance, the face of research is changing, and so are the possibilities of combining diverse expertise to accelerate discoveries and shorten the path from discovery to translation. The global rollout of the Pfizer BioNTech mRNA vaccine against COVID-19 is a prime example of such synergistic benefit. Drawing from our own role in that success, we are further confident that this is the right time for us to support research that combines our expertise across scales to address the grand challenges of today and tomorrow. Together, we identified a first group of **Grand Challenges**, which are particularly illustrative of the powerful impact of fundamental science through a conceptual lens of resilience: 1) Antimicrobial resistance, 2) Cancer as a failure of resilience across scales, 3) Resilience via immune cell plasticity, 4) Resilience in metabolism and aging, and 5) Environmental sustainability via microbial resilience. As agility and adaptation are the central tenets of biological resilience, so are they necessary for scientists, if we are to be able to fulfill our commitment to society. We will pursue new challenges as the needs and urgencies of the world around us change.

Objective 1.3: Expand technology-driven shared resources to promote collaboration.

Beyond the new focus on biological resilience, support through the GREx program will fundamentally change how we do our research by engaging shared core resources and expertise to allow every member of the LSI access to state-of-the-art technology. In some cases, research efficiency will by increased by orders of magnitude, such as the move from one-at-a-time pseudo-quantitative Western blots for protein determination to >5000 at-a-time fully quantitative proteomics. Technological progress in

> Through GREx investment, UBC will have the opportunity to strengthen and expand our research infrastructure to global excellence standards and dramatically increase research efficiency and capacity.

foundational life sciences research during the last decade has been breathtaking. Science is driven by good ideas and bright people, but access to the latest technology has become an indispensable prerequisite for scientific excellence. Only researchers who have access to state-of-the-art and unique technologies will be able to innovate, compete, and contribute at the top international level. Democratization of access to enabling technology is essential for meaningful collaborative projects.

Everyone in the LSI and the broader B.C. research community benefits when infrastructure and expertise resources are shared. Together, LSI scientists developed a strong repertoire of **technology-driven shared facilities and other key shared services** and a **shared equipment repository**. Most equipment in our facilities has been purchased through Canada Foundation for Innovation (CFI) grants awarded to individual or groups of investigators who generously agreed to make their equipment part of LSI Shared Facilities. In 2019, the LSI management team consolidated **5 major technology-driven facilities** and **5 key shared services** under the LSI's umbrella in order to ensure equitable and efficient access to the newest technologies, at affordable costs, to all LSI members. Users have access to in-house expertise, allowing them to incorporate new technologies in their research without investing time and resources to develop or recruit experts in their own labs. We have also extended these benefits beyond the LSI to our colleagues at UBC – this has made our technology-driven facilities a nexus to integrate LSI research with other research institutes, creating much needed synergies and platforms for transdisciplinary innovation. Going forward, we will build upon our current success to enhance infrastructure resources, through collaborative and competitive applications for CFI funding, to add new equipment to our existing technology-driven facilities and develop new facilities. The GREx mechanism will support the strengthening of existing shared resources and the addition of new shared resources.

Active Technology-Driven Shared Facilities

Advanced Structural Biology for Re-emerging Infectious diseases (ASTRID)	Structural analysis of proteins and protein-protein interactions
Bioinformatics	Consultation, training, and analysis services for whole genome sequencing, RNA sequencing, and more
High-Throughput Biology Facility (Biofactorial)	Unique, high-throughput automation infrastructure, compound libraries for screening
Imaging	State-of-the-art super resolution and confocal microscopy, high content imaging, live cell imaging
Single Cell Flow Analytics (ubcFLOW)	High-end flow analyzers, flow sorting, mass-cytometry (CyTOF)

Shared Scientific Services

Research Development Core	Grant development and communications services

Emerging Technology-Driven Shared Facilities

Proteomics and Metabolomics	Mass confirmations, large-scale quantitative proteomic screens and associated bioinformatics and a wide array of metabolomics platforms
Stem Cell and Genome Engineering	State-of-the-art capabilities for generating mouse mutant models through embryonic stem cell (ESC) gene targeting

Key Shared Services

Equipment services workshop	On-campus support for repair and maintenance of lab equipment, parts design, fabrication, and modification, as well as consultation services
LSI Stores	Convenient source for common lab supplies at reduced costs
LSI Quantitative PCR (QPCR) Core	Real time PCR systems for quantifying nucleic acid targets
Glass washing	Communal washing service for laboratory glassware

Planned Technology-Driven Shared Facility

Protein Production	Providing low-cost, high-quality proteins and viral vectors for structural biology, stem cell differentiation, and in vivo mechanistic and therapeutic experiments.
Disease Modelling Core	State-of-the-art pre-clinical human model systems and technologies to enable disease research and test candidate therapeutics

Guiding Principle 1: EFFICIENT INNOVATION

Accelerate innovation with shared technology and expertise

As responsible stewards of societies research investment, we have a duty to conduct research using gold-standard approaches, rapidly, robustly, and in the most reproducible manner possible. Technology is driving a revolution in high-throughput biology. In the past we would spend weeks trying to determine the concentrations of a handful of proteins, using largely non-specific antibodies to obtain at-best semi-quantitative results. Now, world-class labs have ready access to technologies that allow fully quantitative analysis of thousands of proteins in a few hours. Some of the larger and more well-funded labs in the LSI are using this and comparable high-throughput approaches in genomics, imaging, and cytometry, but most labs in the LSI do not have the expertise or resources to access these transformational technologies. ***The next step is to democratize access to these research tools, so anyone in the LSI can use them.*** With careful centralized management of shared physical infrastructure and shared expertise to ensure equitable use, we are confident that increased access will result in more new collaborative team projects and increased research funding from government, charities, industry and philanthropy, resulting in a handsome return on UBCs investment.

Commitments

1.1: Expand human resources and streamline shared facilities management

While CFI funding has helped us equip our technology cores with leading-edge equipment, a major challenge, which is not unique to our institute, is the long-term operation and management (O&M) of this infrastructure. In order to translate infrastructure expansion into long-term research success, it is critical to expand our team of expert technologists, managers and staff scientists, which will result in shorter wait periods for our researchers to complete critical steps in their experiments. A combination of CFI infrastructure operating funds (IOF) and additional support from the GREx program will help us realize this goal. As our services get established and optimally utilized by academics as well as industry, we project a partially self-sustained future, fueled by an equitable and tiered fee for service model.

Strategic Priority 2: FOCUS

Assemble Stakeholder-Facing Research Focus Teams

Increasing the visibility, engagement, and impact of LSI research towards the public, donors, charities, government, industry and academics by aligning into new more nimble and collaborative teams to solve problems.

The COVID-19 pandemic focused the public, government, donors, and fellow academics on value of research breakthroughs. The public has faith when they invest financially and with their hope in our work, that we will work diligently and efficiently with public funding or private donations. LSI researchers have been working towards breakthroughs in several areas of health- and ecosystem-related research. But we realize that in order to have meaningful discussions with stakeholders in our communities, we need a more effective way to communicate about our work — our research goals, as well as progress, and successes — which are a product of our labour and innovation and their investment in us.

Scientific knowledge and its translation to real-world solutions is a critical driver for human health and well-being, as well as economic development, and environmental sustainability. We have a rich history of collaborating with translational researchers, clinicians, and industry to translate our foundational discoveries into real-world solutions. Our contribution to knowledge translation is reflected by >15 spin-off companies based on LSI research, over >250 patents granted, >80 technologies commercialized, and 359 of our research articles being cited in 2063 patent applications. We are largest collection of diverse life sciences expertise under one roof at UBC – currently 83 labs from 4 faculties and 13 departments. Our blossoming collaborations show that there is a huge opportunity to combine our expertise and to circumvent barriers to efficient, innovative, and impactful research. When the LSI begun in 2005, researchers were told to identify with 9 Research Groups, which were academic in nature and designed to break down barriers between traditional departments. These Research Groups - Bacterial Adaptation Response Networks, Blood Research, Cardiovascular, Cell and Developmental Biology, Chemical Biology of Disease, Diabetes, Infection Inflammation & Immunity, Molecular Epigenetics, and Neuroscience - worked well for a time, but eventually became stale and mostly non-functional, according to our recent consultation process. Collaborations across groups over time point us towards a change in strategy, as does the realization that many LSI PIs can contribute to multiple collaborative efforts. Through a town hall meeting and in partnership with development staff in the Faculties of Medicine, we opted for a strategic new approach to increase the visibility and accessibility of the subject matter of our research to the general public, donors, and potential collaborators in academia and industry. We believe that the best way forward is to organize and identify ourselves by the specific challenges that we work to solve, using names with which people can easily relate.
Therefore, based on historical and emerging areas of strength we initiated a process by which LSI PIs self-selected into one or more of **20 Research Focus Teams** (alphabetically):

Addiction	Aging	Alzheimer's	Antibiotic Resistance	Arthritis
Autism	Blood Disorders	Cancer	Cardiovascular Disease	COVID-19
Crohn's and Colitis	Diabetes	Ecosystem Health	Fertility	Lung Diseases
Multiple sclerosis	Oral Health	Obesity	Rare Diseases	Tuberculosis

This way of collaborating and identifying ourselves will not only catalyze new cross-disciplinary collaborations within and beyond the LSI, but also enable us, as a collective, to convey our research goals, progress, and successes to the general public and to donors, increasing public confidence in research as a whole. It will open new conversations with stakeholders and introduce a new lens for us to look at problems and ask new questions. Importantly, via such engagement and conversations, young researchers starting out in a new field can find inspiration and motivation for their work and become aware that they carry the mantle of public trust and expectations to find creative and innovative solutions that could make a tangible difference in someone else's life.

Furthermore, increasing our public visibility and accessibility will help us cultivate donor interest in our work, opening new avenues of funding for our research. Working together as a team in each of these areas, we will: participate in meaningful ways in local and national fundraising campaigns, through partnerships with philanthropic organizations, disease-focused charities, and NGOs and continue to work with the Development teams at UBC and the Faculties of Medicine and Science to tailor our plans for effective fundraising. In the next 5 years, we aim to significantly increase our translational research collaborations, our collaborations with industry, and our connections with the community, including an increased emphasis in patient-oriented pre-clinical research. This will results in more, large team grants, increased research funding from charities and targeted philanthropy, and increased funding from B.C.s blossoming biotech sector.

Specific Objectives & Actions

Objective 2.1. Enhance our academic collaborations through greater focus and visibility

Within the LSI, removing the confinements of our traditional research groups and unite our expertise across scales to address specific problems in human and ecosystem health, including our initial Grand Challenges – the race against antimicrobial resistance, cancer as a failure of resilience across scales, cellular plasticity in immune resilience, resilience and homeostasis in metabolism and healthy aging, and resilience of microbial systems for sustainability (see full GREx proposal). Reorganization into **Research Focus Teams** that coalesce around specific diseases and concerns that are easily relatable to collaborators, funders, the public, and policy makers. This reorganization across scales and research foci will allow us to: a) access diverse expertise and devise innovative research projects under one roof; b) increase cross-training opportunities for the next generation of scientists; c) expand the horizons of individual labs and allow them to publish and disseminate findings to a wider audience; and most importantly d) provide more well-rounded solutions to the grand challenges and focus challenges identified by our scientists and their stakeholder partners, including patients (see below).

One of the most important actions to support these objectives is a complete overhaul of the LSI website to reflect our revitalization, our more public-facing Research Focus Teams, and the more academic-facing BRI-initiative.

Within UBC and BC, we will significantly increase the number of collaborations across the foundational-to-applied spectrum. The Research Focus Teams, while being nucleated in the LSI, will have members outside of the LSI from around B.C. This will include our clinical collaborators, and others working on the applied end of the academic spectrum, as well as collaborators from basic science departments including Mathematics, Physics, and Chemistry. These Teams will span disciplines to bring new synergy to the challenges they seek to surmount.

UBC's strategic plan – *Shaping UBC's Next Century* — identifies **Collaborative Clusters** as a key strategy towards achieving Research Excellence. Research excellence clusters supported by the VP Research + Innovation Office represent a primary avenue to enhance collaborative networks across UBC. Currently 32 of our members are part of 15 UBC Research Clusters, expanding our network across UBC, UBC Hospitals, and other BC-based research entities such as the BC Cancer Research Institute and the Genome Sciences Center. We will actively identify new areas that would benefit from wide network collaborations and increase our ability to address new challenges in biological resilience research.

Across Canada and internationally, academic research is becoming increasingly international. Whether it is to gain access to specialized equipment, develop new ideas or tap into new sources of funding, researchers must reach out to their colleagues around the world, and their work is better for it. In 2019, a UBC cluster, Nanomedicines, initiated at the LSI grew into a National Centre of Excellence (NCE) with members from 8 Canadian universities, and partners from 8 countries across 6 sectors including industry, non-profit, and federal agencies. We will further expand our national and international collaborations and consortia membership, and enhance our international reputation by hosting more international meetings and conferences.

Objective 2.2. Increased success with large grants and philanthropy

In addition to large team grants for research specific operating funds, with UBC's support, we will work towards securing sustainable funds via government programs such as the Canada First Research Excellence Fund (CFREF). In addition, the LSI expects to participate in one or more charity-funded centres of excellence, such as the JDRF funded UBC Diabetes Research Centre of Excellence, recently approved for its first installment of $5 M over the next 5 years. Our goal is to establish similar partnerships with charities in other disease areas, focusing on our strengths in pre-clinical and disease mechanisms research.

By establishing **20 Research Focus Teams** of direct relevance and interest to the general public and donors, we will work with the Development teams at UBC and the Faculties of Medicine and Science to tailor our plans for effective fundraising, targeting local and national fundraising campaigns, and through partnerships with philanthropic organizations, disease-focused charities, and NGOs.

Objective 2.3. Increase translational and industrial collaborations and commercialization

We are experts at answering deep mechanistic questions about what makes biological systems resilient and what causes the failure of resilience in disease. We are also experts at developing and validating animal models for preclinical drug studies. Our members collaborate with translational experts, pharmaceutical researchers, clinician scientists, and industry within and beyond BC, to bring our discoveries to translation. These collaborations are further expanded via our membership in various UBC clusters and organizations such as CIFAR. With the impending establishment of the Academy for Translational Medicine (ATM) right next door, the next 5 years will present an unprecedented opportunity for us to grow these collaborations. Our members are well engaged in the planning phase of the ATM, and we will actively build synergies with ATM members. The LSI also has a distinguished track-record of taking discoveries to practice via licensing and spin-offs; we have commercialized over 80 technologies, and founded/co-founded over 20 spin-off companies. Our research development team will help identify translational potential of findings from our grants and publications and will liaise with our partners at the

University Industry Liaison Office, and entrepreneurship @ ubc (e@ubc) to chart the course to commercialization. In the last 10 years, LSI conducted 115 projects with 77 local, national, and international companies. In the next 5 years, we will continue to grow this number. We will establish an Industry Advisory Roundtable (IAR) comprised of representatives from BC biotech companies and from Life Sciences BC. We will endeavor to develop translational components to our projects and engage industry in these projects, including through MITACS, which funds scholarships and fellowships for trainees to gain research experience on the industry partner's site.

Objective 2.4. Increase and improve collaborations with patients, community-representation groups, and indigenous communities

"***Nothing about us without us***". There is increasing appreciation for the role that patients and community representatives have in the co-creation and knowledge translation of even fundamental research. The LSI Grants Facilitation office will work specifically with patient advocates in the early stages of grant proposals to make sure that research efforts are aligned and person/patient-oriented. Co-development of research programs is becoming an essential part of pre-clinical research, as it should be.

We will work closely with existing patients and community-representation groups, to chart a course towards greater engagement. This will include thoughtful engagement with Indigenous leaders via channels recently established in the UBC Indigenous Strategic Plan, and initiatives being developed by the FoM and FoS. This will include program such as the BRI Summer Student Program, that will focus on research opportunities for learners who are indigenous and from other historically under-represented groups. The LSI leadership is fully committed to listening and learning and following the best forward towards decolonization and anti-racism. LSI member, Prof. Ninan Abraham, Associate Dean, Equity and Diversity, is responsible within the Faculty of Science for issues related to recruitment diversity initiatives, dual career positions, Faculty Affairs committee, data tracking and reporting, and communications with the UBC equity and inclusion office. We will work with him and other experts to ensure that our outreach efforts are inclusive.

Guiding Principle 2: VISIBLE IMPACT

Increase our visibility and engagement with stakeholders

The LSI has an enviable reputation for solid science and strong track-record of real-world impact. It's leading role in the fight against COVID-19 is but one example. However, how many members of the public in Canada, B.C., or even citizens of Vancouver getting their immunizations in the shadow of the LSI know that key component of their vaccine was invented here? The failure to clearly establish the impact of foundation science has lasting impacts on the publics willingness to fund research, and therefore on our resilience as a society. We must do better, we must engage, and we must make our science more accessible and visible to the public (including potential philanthropists), to charities, to government, and to industry.

Commitments

1.1: Increase our visibility and engagement with the broader community

As a guiding principle, we must look outwards to the public and engage to make clear the value of foundational science and the unique pre-clinical/pre-applied niche that we reside in within the research ecosystem at UBC and globally. Research should be made accessible (including open access articles) as possible, and with lay-direct broadcasting of key findings in easy-to-understand language using social media and traditional media. Even before studies are conducted, a culture of consultation and patient/public co-design and co-discovery of research should be adopted. Thorough consultation, listening and learning is especially important when considering communities who have previously been disadvantaged by the medical and medical research systems and who have good reason to trust us less.

Strategic Priority Area 3: TALENT

Train and attract the world's top researchers to LSI

We will lead the world in educational programs, not follow, and attract the very best of diverse and creative life sciences research talent to UBC.

As UBC's premier foundational research institute we are committed to perpetuating Canada's and UBC's leadership in this area by training the next generation of scientists. In the last 10 years, we have trained thousands of graduate students and postdoctoral fellows, and numerous undergraduates. We will now build upon this experience and take our training mission to the next level. Postdoctoral fellows, when surveyed, have asked for more structured training and more development towards diverse careers, including but not limited to the traditional academic route. At the same time, local biotechnology and pharma companies in the rapidly growing sector report difficulty finding highly skilled scientists to lead their laboratories and drive innovation. While the UBC LSI is home to no fewer than 6 graduate programs, students would benefit from more coordination between these programs. At the undergraduate level, the LSI is often the first hand-on scientific experience for a UBC life science student, but again more structure and coordination would benefit both learners and labs. In order to bring more structure to the LSI training environment and to pursue leadership in the emerging field of biological resilience, we will pursue these objectives:

Specific Objectives & Actions

Objective 3.1. Establish a novel, interdisciplinary post-doctoral training program in Biological Resilience – BRI-LSI International Fellows Program (BRI-LIFe)

We will establish a new, comprehensive international postdoctoral fellowship (PDF) program—BRI-LSI International Fellows Program (BRI-LIFe)—to attract talented researchers from around the world to UBC. This scheme will be a public-private 50:50 partnership between sources such as MITACS and a consortium of biotechnology companies. The BRI-LIFe will prepare PDFs for careers in both academia and industry within Canada and around the globe. Fellows will receive dual mentorship from a primary academic mentor in the LSI's Biological Resilience Initiative and additional mentorship from a second, cross-disciplinary mentor from our network of collaborators in academia, government, or biotech. This will enrich the scientific potential of the project and the breadth of networking possibilities. Additionally, the BRI-LIFe Program will provide PDFs broad training in transferable skills such as writing, presentation, teaching, and business, opportunities to work outside of their designated research lab through additional partner programs (e.g. MITACS fellowships) and introduce them to a diverse network of professionals. We will encourage and support PDF applications for international funding programs.

Objective 3.2. Support existing graduate training programs

LSI members train and support graduate students through several UBC programs such as Cell and Developmental Biology (CELL), Medical Genetics, Neuroscience, Microbiology and Immunology, and Zoology. The LSI has a role to play as an umbrella over these programs, adding value where needed. We will work closely with these programs to create training opportunities beyond the traditional path for graduate students in the Biological Resilience Initiative, synergizing with the structure being developed for the postdoctoral and undergraduate levels. For example, we will leverage our partnerships across sectors and facilitate research exchange programs between academia and industry (via MITACS scholarships), and between UBC and global organizations (via research collaborations). We will develop and maintain a roster of international exchange opportunities such as the German Academic Exchange Service (DAAD), and use it to match programs with graduate research projects and interests.

Objective 3.3. Develop and deliver an undergraduate summer research program

Each summer we will provide a unique opportunity for approximately 60 undergraduate students to work alongside leading researchers in our dynamic scientific environment. We aim to attract talented students from around the world, creating a vibrant and diverse atmosphere. At least 30 of these students will be from the IBPOC community traditionally underrepresented in scientific research. In addition to conducting research projects throughout the summer, students will attend a lecture series featuring scientists at all career-stages from UBC and beyond, STEM career advisors, and industry representatives.

Objective 3.4. Develop and secure external funding for translational training programs

The LSI is home to a large NSERC CREATE training program — Ecosystem Services, Commercialization Platforms and Entrepreneurship (ECOSCOPE). ECOSCOPE is an industrial stream program which provides UBC trainees with the skills to translate environmental sequence information derived from microbial communities in natural and engineered ecosystems into commercial and entrepreneurial activities. It additionally allows for internships in start-up environments, and provides professional and entrepreneurial training to augment research skills and empower trainees to commercialize their innovations. We will leverage this experience to develop 1-2 more such programs centered at the LSI, engaging partners across sectors and around the globe. For example, Johnson, Kieffer, Rideout and others are part of a nationwide group applying for an NSERC CREATE grant to support training in the Islet Biology sub-field of diabetes research. We aim to establish multiple similar team training grants.

Objective 3.4. Attract top global talent as faculty

Using resources that have already been committed by the VPRI and Provost Office, as well as secured commitments from 4 LSI Resident Departments (CPS, Biochemistry, Medical Genetics, and Zoology) and the School of Biomedical Engineering, we will recruit disruptive leaders at all career stages into 6 new tenured or tenure-track positions, including as Tier 1 and Tier 2 Canada Research Chairs (CRCs). The recruitments will focus on adding to our expertise in different areas of biological resilience research, in areas such as aging and metabolism, tissue regeneration, rare diseases, as well as experts in technology development, such as imaging, high-throughput systems, or emerging 'omics technologies. We will uphold equity, diversity, and inclusion (EDI) as a core principle in these recruitments, guided by UBC's Commitment to EDI in the CRC program, with a goal to recruit exceptional scientists from groups that are underrepresented at UBC and in academia in general on at-least 4 of the 6 positions. The hiring committee members will represent diversity across sex, gender, race, ethnicity, and career stages and the composition of this committee will be approved by the REDI committees of our member departments. In addition to these 6 new positions, we will work with UBC's Development Teams to secure sponsored chairs in various areas of biological resilience research.

Guiding Principle 3: REDI

Foster a culture of respect, equity, diversity, and inclusion

As biological scientists we understand that diversity underlies the biological resilience of systems and ecosystems. Similarly, diversity is important for the resilience of scientific endeavors as well as for the resilience of our society. In order for science and society to benefit from diversity, it must be accompanied by a culture of honor, respect, equity, and inclusion, such that all individuals have equal opportunities and feel like equal parts of a community. We are committed to being a community of honor and respect that embraces the values of equity, diversity and inclusion. The LSI is fortunate that we have amongst our membership, leaders in this area, including Dr. Ninan Abraham, Associate Dean, Equity and Diversity of the Faculty of Science, and Dr. Elizabeth Rideout, CIHR Chair in Sex and Gender Science who champion our EDI efforts. In order to nurture an enduring culture of REDI we will:

Commitments

3.1. Prioritize REDI principles in all strategic priorities and objectives

In the last two years LSI has welcomed seven new early-career investigators of whom five are women, two of whom are women and racialized minority, and three are immigrants. We will continue to work with member departments to prioritize the recruitment of women and members of underrepresented minorities (URM), such as members of the IBPOC communities, in faculty positions and in various training programs. Furthermore, following the principle of "nothing about us without us", we will engage URMs in designing all training programs and mechanisms therein, including students, faculty, and members of the wider community, for meaningful engagement across all groups.

3.2. Increase research into topics affecting URMs and women

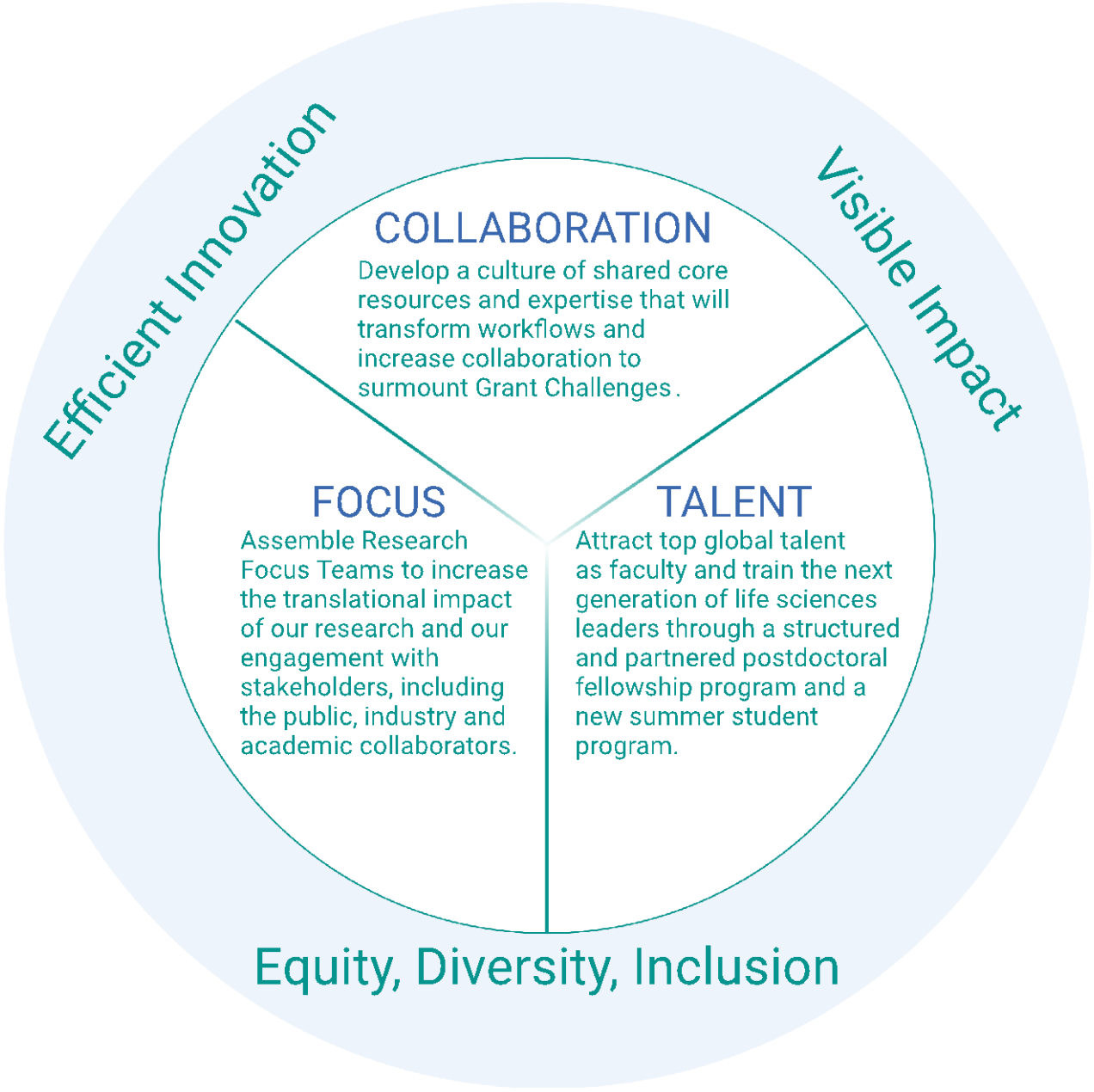
In partnership with the appropriate communities, we aim to aid and support projects that investigate mechanisms and solutions for health and environmental conditions that differentially affect individuals of a particular race, ethnicity, area, or demographic.

3.3. Support REDI training and activities for all LSI members

We will organize events and nurture opportunities focused on EDI for all members of the LSI community. For example**, in the last year** we partnered with the Djavad Mowafaghian Center for Brain Health (DMCBH) and the Center for Blood Research (CBR) to facilitate a viewing of Picture a Scientist, a recent film that draws attention to the inequity experienced by women and women of color in scientific research careers. We followed the viewing with a panel discussion with faculty members including our female early-career investigators, which drew a large audience from all over UBC. Our communications team has also been working with trainees to express their outlook on EDI topics in the newsletter and on the website. This is important to nurture a sense of partnership among all members of the LSI community, towards the common goal of establishing and perpetuating a culture of REDI.

3.4. Transparency in reporting and evaluation

We will work with UBC Equity and Inclusion Office to determine a set of EDI measures and outcomes on which we will report annually and transparently through our website and annual reports. Every year we will evaluate our performance on these measures which will guide our plans going forward. We will support the Dimensions pilot program to foster increased research excellence, innovation and creativity within the post-secondary sector across all disciplines, through greater equity, diversity and inclusion (EDI)



Our Partnerships

Faculties:
FoS, FoM, Dentistry, Applied Sciences, Pharmaceutical Sciences, Forestry, Land and Food Systems

Institutes, Centers and schools:
CBR, MSL, SBME, DMCBH, HLI, BCCHRI, BCCRI, ATM

Departments
All 13 of our represented departments: CPS, BMB, M&I, Zoology, Med Gen, PLM, Chemistry, APT, Medicine, Oral Health Sciences, Oral Biological & Medical Sciences, Mechanical Engineering, Electrical and Computer Engineering

VPRI Clusters
BCRegMed, BC Diabetes Research Network, Biomedical Imaging and Artificial Intelligence, Bionics Network, Dynamic Brain Circuits in Health and Disease, Gynecologic Cancer Initiative, The Airway Center, BeeHIVE, Women's Health Research Cluster, Biodiversity Research: An Emerging Global Research Priority, SmarT Innovations for Technology Connected Health (STITCH)

LSI Spin-offs:
https://lsi.ubc.ca/commercialization/spinoffs-technology/

Other partners: