Research Manitoba
Innovation Proof of Concept Grant Recipients

May 08, 2024

Read the full press release **here**

Recipients for Stream 1: Manitoba-Based Consortium

Name: Dan Butterworth (co-applicant: Qiuyan Yuan)
Project Title: Methane to Methanol Conversion
Institution: University of Manitoba
Industry Partner: SRML/ DAL Projects
Industry Contact: Dan Butterworth
Funding Pillar: Infrastructure and Transportation Industries and Technologies
Funding Amount: $73,305
Leveraged Funds: $73,305
Project Description: The Methane to Methanol team plans to assess the efficiency of a chemical reaction using 'clean' methane gas obtained from various industries including oil and gas, agriculture, and waste management. This methane, along with other source gases, will be combined with a proprietary catalyst to produce methanol.

Quote: "The funding through Research Manitoba has given SRML the opportunity to take the intellectual property to convert methane to methanol entrusted to our team by Frank Sim from theory through to lab testing and application. On behalf of the entire SRML team, we are thrilled to partner with the University of Manitoba and Research Manitoba to develop this home-grown technology."

Name: Raghavan Jayaraman
Project Title: Recycling of Ground Tire Rubber (GTR)
Institution: University of Manitoba
Industry Partner: Reliable Tire Recycling
Industry Contact: Josh Vickar
Funding Pillar: Advanced Manufacturing
Funding Amount: $131,400
Leveraged Funds: $101,730

Project Description: This research proposes to develop the knowledge, the technology and the tools required to fulfill the goals of RTR. A model, based on the relationship between process conditions, mold design, and properties of compression moulded 100% GTR products, will be developed to enable RTR to commercialize this research into expanding its product portfolio. Two products of interest to RTR will be developed and demonstrated to showcase the innovativeness of this research. In addition, the proposed research will reduce or eliminate tire waste sent to landfills contributing to the environmental stewardship of the province of Manitoba.

Quote: "This funding from Research Manitoba will enable us to develop the manufacturing process and the knowledge base required for recycling Ground Rubber Tire (GTR) crumbs from discarded tires into high-value products of interest to the industrial partner and enable them to commercialize this research. We are grateful to RM that this funding will help us work towards the elimination of plastic/tire waste sent to landfills."

Name: Lisa Bako
Project Title: Advancing Brain Research with a Cutting-Edge Brain Imaging Tool
Institution: University of Manitoba

Industry Partner: Cubresa
Industry Contact: Lisa Bako
Funding Pillar: Bioscience
Funding Amount: $150,000
Leveraged Funds: $969,322

Project Description: Cubresa is developing a head-only Positron Emission Tomography (PET) Insert of research-grade Magnetic Resonance Imagers (MRIs) with high-performance capabilities to support advanced brain research. Cubresa will be the first company in the world to develop a brain-focused PET insert for research MRIs that allows researchers to marry a high-quality metabolic PET scan with their most sophisticated research MRIs, with the goal of commercializing the system and leading the high-performance neuroimaging market.

Quote: "Research Manitoba's support will play a vital role in Cubresa's ability to analyze, design, and manufacture a critical component of its BrainPET scanner for the research market. Funding at this early stage of the project is vital and will enable the company to move from concept and testing through to commercialization. This component will ensure brain research centres from around the world are receiving a best-in-class brain imaging device."

Name: Mohammad Asefi (co-applicant: Dustin Isleifson)
Project Title: Modular Multi-Modal Radar for Opaque Media Monitoring
Institution: University of Manitoba
Industry Partner: TerraWave Radar Solutions
Industry Contact: Mohammad Asefi
Funding Pillar: ICT
Funding Amount: $150,000
Leveraged Funds: $148,000

Project Description: This proposal aims to develop a low-cost, modular software-defined radio (SDR) based ground-penetrating radar (GPR) system that can be mounted on unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs) for a variety of applications. The proposed system will provide high-resolution imaging in agriculture (e.g., soil moisture, drainage patterns, grain pile monitoring), infrastructure monitoring (rebar corrosion and detection of potential for damage in roads/bridges), military (land mine detection) etc. The proposed system is well-suited to address non-destructive evaluation of subsurface properties in industrial settings

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Name: Thomas Klonisch (co-applicants: Sabine Homback-Klonisch; Frederick Zeller)
Project Title: Novel Immunomodulatory Laser Interstitial Thermal Therapy (LITT): Turning allies into executioners.
Institution: University of Manitoba
Industry Partner: Monteris Medical
Industry Contact: Richard Tyc
Funding Pillar: Bioscience
Funding Amount: $150,000
Leveraged Funds: $75,000

Project Description: NeuroBlate® is a world-leading FDA- and Health Canada-approved clinical technology commercialized by Monteris Medical, Winnipeg, MB, which uses a minimally invasive laser procedure for heat destruction of brain tumours. This local laser interstitial thermal treatment (LITT) is the only clinical option for patients with unresectable brain tumours. This proposal uses the LITT mouse brain tumour model to test a new dual treatment: we combine the modulatory function of LITT on the immune system with the ability of a brain-permeable small molecules that can re-educate a tumour-friendly immune cell population into tumour-aggressive immune cells capable of destroying remaining brain tumor cells. We use multi-colour image profiling of distinct cell populations and markers of cell death and drug targets to elucidate immune responses in LITT mouse tumour brains.

Quote: "The recipients are very grateful to Research Manitoba for this prestigious Innovation Proof-of-Concept (IPoC) award which is critical in supporting the development of new LITT clinical applications for inoperable brain tumor patients. We proudly contribute as part of a collaborative effort between the University of Manitoba and Monteris Medical, a Winnipeg-based world leader in LITT technology."

Name: Xihui Liang (co-applicant: Carson Leung; Parlmala Thulaslraman)
Project Title: Machine Learning-powered Software for Bearing Condition Monitoring
Institution: University of Manitoba
Industry Partner: Standard Aero
Industry Contact: Brent Ostermann
Funding Pillar: Advanced Manufacturing
Funding Amount: $90,000
Leveraged Funds: $60,000

Project Description: In Manitoba, industries generate substantial amounts of digital data during their operations. However, this valuable data is underutilized when preventing, predicting, and addressing equipment degradation and failures. To address this issue, StandardAero and the University of Manitoba have joined forces to take a major step toward predictive maintenance capabilities. The main goal of this project is to develop effective and reliable equipment condition monitoring software. By harnessing advanced signal processing and machine learning methods, the software will be intelligent and user-friendly, enabling real-time monitoring and early detection of equipment faults.

Quote: "The Research Manitoba Innovation Proof-of-Concept (IPoC) Grant provides crucial support for the project's success and eventual commercialization. It enables the collaborative research efforts between StandardAero and the University of Manitoba, allowing for essential resources, expertise, and support throughout the software development process. It covers expenses for research activities, personnel, training, and validation efforts, ensuring that the developed bearing condition monitoring software meets industry standards and is well-prepared for commercialization."

Recipients for Stream 2: Manitoba Post-Secondary Researchers

Name: Can-Ming Hu
Project Title: Novel Microwave Emitter and Isolator for Quantum Computing Applications
Institution: University of Manitoba
Funding Pillar: ICT
Funding Amount: $100,000

Project Description: Quantum technologies are at the forefront of research and innovation, with enormous potential for commercialization and game-changing advancements. Here we propose the development of on-chip laser-like microwave emitters and miniaturized microwave isolators for quantum computing applications, with the goal of leveraging Manitoba-made technologies for Manitobans. Our cutting-edge innovative technology enables integrating both the emitters and isolators on the chip itself, housed within the quantum processor, thus reducing the system size and improving its scalability. The proposed project will enable us to further develop, fabricate, and test prototypes making them faster, more compact, and more powerful in an industry that demands these improvements.

Quote: "This funding will impact our ongoing research in developing novel microwave emitters and isolators, supporting my students to design and fabricate prototypes and deliver them to end-users. Thereby, the funding will greatly help us move our recent inventions towards commercialization."

Name: Cristina Rosell (co-applicant: Thomas Netticadan)
Project Title: Examining the Effects of Resveratrol-Fortified Bread with Alpha-Amylase Inhibitory Property on a Type 2 Diabetes Animal Model
Institution: University of Manitoba
Funding Pillar: Bioscience
Funding Amount: $100,000

Project Description: Diabetes mellitus has been defined as a "diabetic epidemic", with diet and lifestyle playing major roles in high-risk individuals with type 2 diabetes mellitus. Resveratrol is considered one of the most potent natural bioactive compounds. The integration of resveratrol in a food system could provide health benefits to a wider population. Bread provides an excellent carrier for those bioactive compounds, but breadmaking process constraints must be overcome to obtain fortified bread with resveratrol. To date, no study has explored the anti-diabetic potential of resveratrol incorporated into a staple food such as bread. The aim of the project will be to develop a resveratrol-fortified bread with alpha-amylase inhibitor activity to be useful for blood glucose management. By funding this proposal, the province accelerates the launch of a healthy bread that could have a great impact on Manitoba's health system, training highly qualified personnel.

Quote: "The funding from Research Manitoba is a crucial step forward for our resveratrol-fortified bread project, offering the promise of an innovative solution for type 2 diabetes management. This financial support allows us to incorporate resveratrol in a staple food like bread, extending health benefits to a broader population. The funding not only propels the project toward commercialization but also contributes to enhancing Manitoba's health system. Moreover, it plays a key role in developing highly qualified personnel, ensuring a lasting impact on both scientific and societal fronts."

Name: Gary Stern (co-applicant: Paul Larson)
Project Title: Developing a Socio-economic Impact Assessment Tool for Transport Modes in Northern Manitoba
Institution: University of Manitoba
Funding Pillar: Infrastructure and Transportation Industries and Technologies
Funding Amount: $100,000

Project Description: This project focuses on the development and commercialization of a practical tool to evaluate the socio-economic impacts of transport modes in northern Manitoba. The tool is timely as it is the first of its kind to have this capability. Benefiting from a holistic approach, it combines qualitative and quantitative data such as weather, oceanographic factors, and stakeholders' perceptions (e.g., decision-makers, rights-holders, consulting firms, insurance companies). The utilization of this tool presents a multitude of advantages, encompassing vulnerability assessment and social and economic evaluations, thus yielding notable benefits in terms of resilience planning, streamlined communication, and well-informed decision-making. Moreover, the tool's output effectively showcases the extent of the socio-economic impact that transport modes exert on their respective locations arising from incidents such as oil spills and floods. The tool would be developed into software that can be used by governments and Indigenous communities for strategic planning; consulting firms for project impact analysis; and insurance companies in setting premiums for Arctic and sub-Arctic areas. The market adoption for such a tool is expected to be high, as Arctic transportation development is a growing sector with increasing attention on environmental and social impact assessments.

Quote: "This funding from Research Manitoba will greatly facilitate the gathering of primary and secondary data needed to code and calibrate our risk assessment model. In addition, this funding will enable the team to build relationships with relevant stakeholders, including government officials and Indigenous communities"

Name: Raghavan Jayaraman
Project Title: Development of Environment-Friendly Natural Fiber Sheet Molding Compound (NFSMC) for Transportation Applications
Institution: University of Manitoba
Funding Pillar: Advanced Manufacturing
Funding Amount: $99,700

Project Description: City buses and coaches manufactured in Manitoba use polyester-glass fibre composite panels manufactured using Light Resin Transfer Molding (LRTM). The glass fibres and VOC (Volatile Organic Compounds) emitted during manufacturing are not environmentally friendly. OEMs like NFL /Carfair Composites, which manufacture these buses/coaches are currently interested in evaluating environmentally friendly materials and processes to manufacture composite parts for current and future bus models including Electric buses. Compression moulding of parts using Sheet Molding Compounds (SMC) is a relatively more environmentally friendly process but uses polyester and glass fibres. Hence, this research proposes to develop a natural fibre sheet moulding compound (NFSMC) replacing glass fibres with natural fibres like Canola and polyester with epoxy resin with bio-derived content. The developed material will be evaluated for demanding applications like compression moulding of battery cases of electric buses contributing to the lightweighting and use of environmentally friendly materials and processes goals of the OEMs in Manitoba. This research is

envisaged to contribute to the competitiveness of Manitoba industries in the emerging space of electrical vehicles while contributing to the environmental stewardship of the Province of Manitoba.

Quote"Using this funding, we will develop an environmentally friendly natural fibre sheet moulding compound (NFSMC) replacing glass fibres with natural fibres like Canola fibres, and polyester with epoxy resin with bio-derived content and demonstrate its application to a bus part. The developed material will contribute to the goals (lightweighting and use of environmentally friendly materials and processes) of the OEMs in Manitoba and this funding from Research Manitoba will help us contribute to these goals and to the competitiveness of Manitoba industries."

Name: Janfizza Bukhari and Gbenga Asala
Project Title: Capability Development in Additive Manufacturing of Advanced Metallic Materials for Supporting Industries
Institution: Red River College Polytechnic
Funding Pillar: Advanced Manufacturing
Funding Amount: $99,986

Project Description: RRC Polytech's Technology Access Centre for Aerospace and Manufacturing (TACAM) continues to establish itself as a regional centre of excellence in applied research, technology evaluation and training. To further expand its capabilities in supporting industry, TACAM recently invested in metal additive manufacturing (MAM) through the Canada Foundation for Innovation (CFI) grant. MAM is an evolving advanced manufacturing technology used to produce complex metallic products by joining materials layer-by-layer from 3D model data. This technology has revolutionized the way products are designed and manufactured. It enables the creation of complex shapes and structures with less waste, reduced lead times, and increased customization. Additive Manufacturing (AM) process development for specific materials is critical to obtaining high-quality products and is vital to harnessing the benefits of AM technology. However, it is an expensive endeavour. Reducing developmental costs, especially for advanced materials used in specific industries, will increase the adoption of this technology in Manitoba. This proposed project aims to expand TACAM's capabilities in AM of advanced materials with a focus on bridging knowledge gaps, developing processes and establishing baseline AM parameters to support industry. The outcome of this project will benefit the local industry in embracing this technology.

Name: Nasem Badreldin
Project Title: Develop Water Footprint Index for Agriculture Manitoba using Remote Sensing Technology and Artificial Intelligence
Institution: University of Manitoba
Funding Pillar: ICT
Funding Amount: $59,160

Project Description: This project provides cutting-edge agri-data analytics to boost water footprint modelling in Manitoba (MB) and improve adaptation methods to climate change. Policymakers, farmers, and stakeholders are pressured to find sustainable water management solutions in light of climate change impacts, including droughts and heat waves. 70% of freshwater resources are used for food production. In MB, the amount of water used for agriculture increased by 50.12% between 2010 - 2018; predictions indicate that irrigated croplands will continue to grow by 2030. The study aims to

simultaneously estimate water footprint and scarcity at landscape-to-watershed scales, considering the growing water demands in agriculture and vital economic sectors like cattle production, grazing, and the food industry. The project suggests utilizing geographical data analytics, remote sensing technology, artificial intelligence, big data, and cloud computing to solve the requirement for accurate and timely data. These technologies, a water footprint index particular to Manitoba's agricultural and natural lands, will be created to map and evaluate spatiotemporal dynamics of water supply and use. Additionally, the research intends to give MB decision-makers trustworthy data to improve their climate change mitigation plans and engage effectively with natural hazards such as drought.

Quote: "Research Manitoba's funds serve as a vital catalyst, promoting the development and implementation of our research in digital agriculture. This research is essential in advancing sustainable agricultural growth in Manitoba and developing data analytics that serve various decision-makers in achieving effective practices for agricultural productivity and environment conservation."

Name: Qiuyan Yuan
Project Title: A Proof-of-Concept Study for Mycelium Biofoams from Lignocellulosic Solid Wastes
Institution: University of Manitoba
Funding Pillar: Bioscience
Funding Amount: $100,000

Project Description: Plastics, including expanded polystyrene (EPS), pose a global challenge due to their extensive waste generation and fossil fuel-derived raw materials. In addition to an unsustainable production pathway, EPS waste management is a global challenge and a burden in Manitoba due to the absence of recycling programs for this material. A promising solution to EPS waste management is its reduction by introducing biodegradable alternatives. This study investigates mycelium bio-foam (MBF) as an eco-friendly alternative to shock absorption Styrofoam-based packaging, manufactured using local mycelium species and renewable raw materials. This study focuses on optimizing the physical and mechanical properties of MBFs while refining the fabrication process. The ultimate goal is to develop minimum viable product prototypes to evaluate the market readiness and the environmental impact of MBF compared to Styrofoam through simulation and a comprehensive life cycle assessment. Through this technology, the addition of a waste-to-value production chain to Manitoba's economy is envisioned.

Quote: "The global need for eco-friendly alternatives to single-use plastics is an urgent issue requiring more research and development. With funding from Research Manitoba, we will optimize our mycelium-based bio-foam production process to develop market-ready prototypes with validated environmental benefits. This ensures our bio-foam packaging meets both market needs and environmental safety standards, propelling us towards commercialization and aligning with Manitoba's commitment to innovation and environmental stewardship."

Name: Qiuyan Yuan
Project Title: Biocarbon as an Adsorbent for Treatment of Landfill Leachate and Promotion of Sustainable Landfills via Reduction of Odour and Methane Emissions
Institution: University of Manitoba
Funding Pillar: Bioscience

Funding Amount: $64,700

Project Description: Landfilling is a popular waste disposal method as it is economical and requires less infrastructure and no specialized collection services. Landfill leachate is any entrained environmentally harmful liquid material formed when rainwater filters through organic waste in landfills. It is characterized by high chemical and biological oxygen demand and consists of undesirable substances such as organic and inorganic contaminants. It seeps through the soil into local waterways where it can contaminate water supplies and spread disease. Landfills are also a contributor to greenhouse gas emissions (methane and carbon dioxide) via bacterial breakdown of organic waste and an increase in odour and scavengers. Treatment of landfill leachate is essential for minimizing risks to the environment and human health. Studying the use of biocarbon as an adsorbent for the treatment of landfill leachate and promoting sustainable landfills via methane and odour reduction is an important aspect that could lead to mitigating the climate crisis.

Quote: "This project funded through the Research Manitoba grant will investigate the impact of biocarbon from organic waste for the treatment of toxic landfill leachate and the commercialization of a process for creating sustainable landfills. The funding for this project will initially focus on demonstrating the proof of concept in a controlled environment and studying the impact of biocarbon's ability to reduce landfill leachate runoff. Consequently, the pyrolytic conversion of organic waste and its implementation in situ for treating landfill leachate and reduction of odour and scavengers will also be pursued as part of this project. The funding for this project should ensure a reliable path toward a commercial-scale conversion of organic waste to stable biocarbon that can be used as a medium for more sustainable landfills.."

Name: Sabine Mai
Project Title: Small Molecules for the Inhibition of Telomere Maintenance Pathways in Cancer
Institution: University of Manitoba
Funding Pillar: Bioscience
Funding Amount: $100,000

Project Description: Tumor cells use telomere maintenance pathways (TMPs) to achieve unlimited cell growth and survival. There are two TMPs, telomerase activation and an alternative telomere lengthening (ALT) pathway. Clinical studies have shown that inhibition of telomerase suppresses tumour cell growth for a while; however, the cells develop resistance to this treatment over time, and this happens through ALT activation. We were the first to achieve the dual inhibition of both TMPs. We successfully used a small molecule to inhibit telomerase (BIBR 1532) followed by an alkylating agent (trabectedin) to inhibit ALT in Hodgkin's Lymphoma and multiple myeloma cells. As BIBR 1532 and trabectedin are commercially available molecules (and BIBR 1532 is a marginal clinical compound), our goal is to identify new unique small molecules that inhibit these telomere maintenance pathways to allow us to move this new treatment paradigm from the bench to the bedside.

Quote: "I am deeply grateful to be a recipient of this award as it will enable my team to move the small molecules to commercialization."

Name: Vahab Khoshdel (co-applicant: Joe LoVetri)
Project Title: Deep Generative Models for Advancing Commercialization of Microwave Breast Imaging
Institution: University of Manitoba
Funding Pillar: Bioscience
Funding Amount: $100,000

Project Description: We propose a Generative Machine Learning (GML) approach to create a large realistic synthetic breast Microwave Imaging (MWI) database that will improve the robustness of MWI systems and advance the path to commercialization. Breast cancer is a significant public health issue in Canada, with 27400 new cases and 5100 deaths in 2020. MWI is a promising alternative to expensive MRI/CT scans, but the limited availability of MWI datasets hinders progress in the development of MWI that is required for improving the imaging algorithms and system design that will lead to commercial clinical systems. Our project aims to develop a GML approach to create synthetic MWI datasets using databases of existing MRI/CT breast scans. This development addresses a major barrier in the commercialization of MWI for breast cancer detection and will advance the EIL's current prototype from the TRL6 to the TRL7 category.